SAP Feasibility Study

Climate Adaptation and Resilience in Thua Thien Hue Province ("CARe Hue")

March 2024

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Acronyms

AE	Accredited Entity
CBEWS	Community-based Early Warning System
CFR	Coastal forest restoration
CORENAM	Centre on Natural Resources Management
CRD	Centre for Rural Development
CTC	Chief Technical Coordinator
DA	Delegation Agreement
DARD	Department of Agriculture and Rural Development
DOLISA	Department of Labor, Invalids and Social Affairs
DONRE	Department of Natural Resources and Environment
DPC	District People's Committee
DPI	Department of Planning and Investment
DRR	Disaster Risk Reduction
EE	Executing Entity
ESS	Environmental and Social Safeguards
EWS	Early Warning System
FP	Funding Proposal
FPD	Sub-Department of Forest Protection
FPDF	Forest Protection and Development Fund
GACP	Good Agricultural and Collection Practices
GAP	Good Agricultural Practices
GCF	Green Climate Fund
GHG	Greenhouse gases
LPB	Lien Viet Post Bank
LPPP	Local participatory planning process
MARD	Ministry of Agriculture and Rural Development
MECB	Luxembourg's Ministry of Environment Climate and Biodiversity
MONRE	Ministry of Natural Resources and Environment
MPI	Ministry of Planning and Investment
MSME	Micro, Small and Medium-sized Enterprises
NDA	National Designated Authority
NDC	Nationally Determined Contributions (NDCs)
NGO	Non-governmental organization
NTFP	Non-timber forest products
PC	People's Committee
PFES	Payments for Environmental Services
PPC	Provincial People's Committee

PPMB	Provincial Project Management Board
PSC	Project Steering Committee
SAP	Simplified Approval Process
SDG	Sustainable Development Goals
SEDP	Socio-Economic Development Plan
TAO	Technical Assistance Office
USD	US Dollar
VBSP	Vietnam Bank for Social Policies
VND	Vietnamese Dong
WU	Women's Union

Executive summary

Vietnam is one of the countries most exposed to climate change. The province of Thua Thien Hue (TT Hue) is highly exposed to climate-related hazards and vulnerable to the effects of climate change – including storms, floods and droughts, coastal and river erosion, and salinisation of soil and lagoon water – which are already impacting livelihoods and the ecosystems on which they rely. Persistent and increasingly heavy rainfall are already overwhelming the three main river systems in the mountainous western part of the province, causing landslides in hilly areas and floods in low-lying areas.

This project builds on the experience and lessons learned of projects implemented by LuxDev in collaboration with the Government of Vietnam. It aims to increase the climate resilience of local communities and the ecosystems upon which they depend in TT Hue province, directly 306,000 persons (male 151,500, female 154,500) and indirectly benefit 406,000 persons (female 205,030, male 200,970) that will be covered under an improved EWS. It will bring over 115,900 hectares of agricultural and forested land in TT Hue under improved climate-resilient planning. It will do so through the implementation of activities focused on strengthening the enabling environment for climate change adaptation, scaling up investments in ecosystem-based adaptation, and climate-resilient value chains in the agriculture sector. The project aims to continue supporting TT Hue on its path to becoming a model province for climate change adaptation planning, investing, and monitoring in the country.

The project is comprised of three components and four outcomes that are aligned to the GCF's Strategic Plan for 2024-2027 (specifically on Climate Information and Early Warning Systems, the support to locally-led adaptation action; transformation of food systems, and greening finance).

Component 1 (Outcomes 1 and 2) contribute to strengthening the institutional framework for climate change adaptation in TT Hue by improving the province's Early Warning System; supporting locally-led adaptation by mainstreaming climate adaptation considerations and responses into Socio-Economic Development Plans (SEDP); and enhancing the overall capacities for adaptation monitoring at the provincial level.

Component 2 (Outcome 3) aims to enhance the resilience of local men and women through the support for scaling ecosystem-based adaptation.

Component 3 (Outcome 4) will work with producers and local financial institutions to support the development of climate-resilient value chains and of financial products attuned to the characteristics of climate-resilient agriculture.

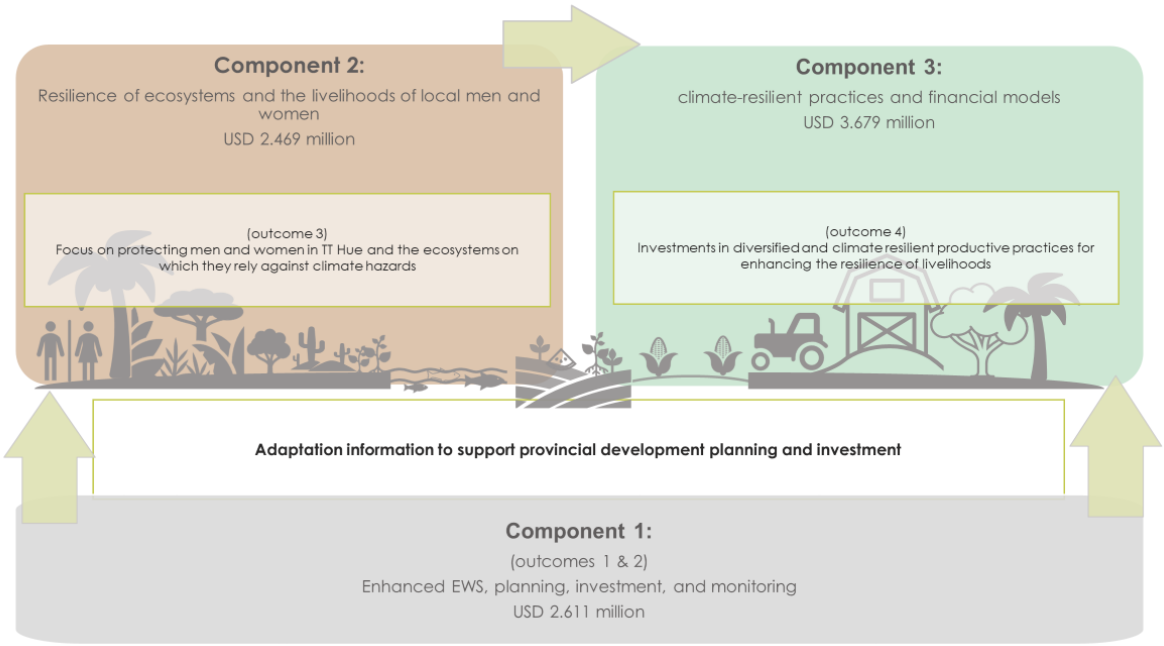

Figure 1. Overview of project components

The total cost of the project is USD 10 million (USD 8.65 from the Green Climate Fund (GCF); USD 0.9 million in co-finance from the Government of Luxembourg and USD 0.45 million from the Government of Vietnam). Funding from the GCF for the implementation of this project is considered critical due to the limited availability of public funds for climate change adaptation and the urgent need to close the funding gap for covering the incremental costs of adapting to climate change in Vietnam (USD 2.7-6.42 billion per year as estimated in the country's Nationally Determined Contribution (NDC)).

A note on the selection of districts

The selection of districts and communes changed from that proposed in the concept note due to the following reasons: During the development of the funding proposal, it came to light that, in accordance with the broader initiative for Hue's transition into a centrally governed municipality by 2025, specific communes within the originally targeted districts were earmarked for re-districting into Hue City or for reallocation to other districts. In response to this, a rapid vulnerability assessment was undertaken (see appendix A), drawing upon previously gathered primary and secondary data. This process aimed to identify the most vulnerable communes and inform the prioritization of project interventions. Notably, the prioritization exercise excluded the two mountainous districts of A Luoi and Nam Dong, in accordance with guidance received from the Department of Planning and Investment (DPI). Despite these districts also being vulnerable to climate impacts, their exclusion was justified by the considerable concentration of financial and developmental projects in these areas. Notwithstanding, these two districts will be covered through activities under outcomes 1 and 2.

1. Project Profile

1.1. Project location

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The project area TT Hue (Figure 2) of in in Vietnam's North-Central Region, stretches over 128 km North to South along the central coastline. Much of its 5,033 km^2 is low-lying land, including a large 220 km^2 lagoon, it is in in this low-lying land where most of TT Hue's 1.13 million people live. The province is highly exposed to climate-related hazards and vulnerable to the effects of climate change, in particular from storms coming in from the east, which increasingly impact Vietnam's Central Region both in frequency and severity,[1] as well as persistent and increasingly heavy rainfall overwhelming the three main river systems in the mountainous western part of the province, causing landslides in hilly areas, and floods in low-lying areas. TT Hue had a relatively low poverty rate pre-COVID-19 at 4.7% (Government of Vietnam, 2015). However, Vietnam, as most countries in the world, was severely impacted by COVID-19; where by July 2021, 63.5% of households had experienced an income drop of 30% or more relative to 2019 levels, impacting food security in over 50% of affected households (UNDP, 2021) (no disaggregated data by province is available). Prior to COVID-19, an analysis by the World Bank and the Asian Development Bank (ADB) revealed that, despite Vietnam having a medium coping capacity for climate change, many households had a "high probability of falling into extreme poverty when exposed to relatively high-frequency flood and drought events" (World Bank & ADB, 2021) with an event that can occur every four years having a circa 50% possibility of pushing a household in TT Hue into extreme poverty (World Bank & ADB, 2021 p.23). Climate action is urgently needed to strengthen the resilience of TT Hue's coastal and inland communities and ecosystems.

[1] Storms that since 1952 have not dramatically increased in number, have become more complex, appear earlier, and end later in the season, and the number of heaviest storms (typhoons) is increasing (UNEP/UNISDR 2013) https://preview.grid.unep.ch/

The implementation of project activities under outputs 1 and 2 (except for sub-activity 1.1.3 focused on the implementation of Community-based Early Warning Systems) will target the entire province, while activities under outputs 3 and 4 will focus on three districts, namely Phong Dien, Huong Tra, and Quang Dien and in the most vulnerable communes of Huong Thuy district. The 44 prioritized communes in these districts have a total population of close to 335,000 people.

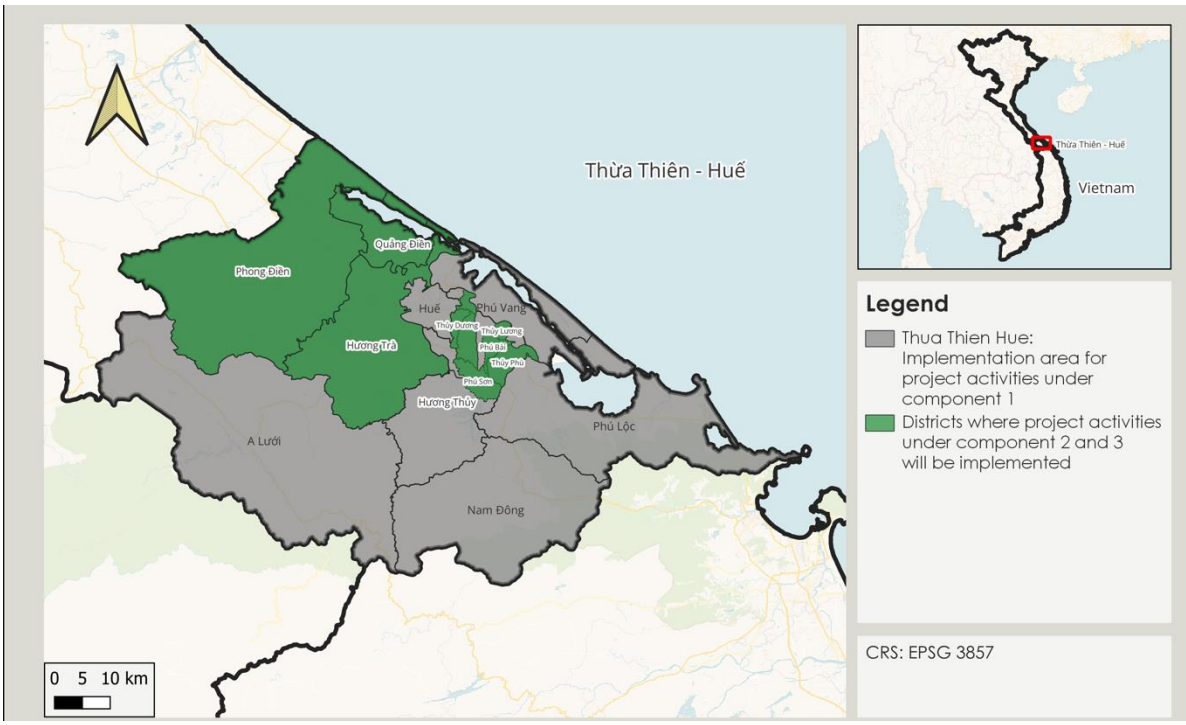


Figure 2. Project location

1.2. Nature characteristics

TT Hue is located along the coastal and inland mountainous area of central Vietnam, falling within the North Central Agro-ecological Zone with geographical coordinates of 16 - 16.80° North latitude and 107.8 - 108.,20° Eastern longitude. TT Hue borders Quang Trị province to the north, the city of Da Nang and Quang Nam province to the south, and the Savannakhet, Salavan and Sekong provinces of Laos to the west. The Eastern side has a coastline of about 128 km. TT Hue is divided into six districts, two municipalities and Hue city with 145 communes and wards.

The topography of TT Hue is comprised of a distinct step structure, increasing in elevation from the coast and rising to mountainous areas along the Lao PDR border. The distance from the Truong Son (Annamites) mountains to the coastal plain is less than 50 km, creating a steep slope from uplands to the coastal plane. There are four different zones: a mountainous area, hills, plains, and lagoon separated from the sea by sandbanks. The mountains, covering more

than half the total surface of the province, range from 500 metres to 1,480 metres in altitude. The hills – between the mountains and the plains – stand between 20 metres and 400 metres and occupy about a third of the province's area. The plains account for about a tenth of the surface area, with an elevation up to just 20 metres above sea level (DONRE, 2021).

The river system is relatively dense with the total length of rivers, streams and canals reaching 1,055 km and a total basin area of 4,195 km^2 (World Bank, 2019). From North to South, the major rivers in the province are the O Lau River, Huong River System, Nong River, Truoi River, Cau Hai River, and the Bu Lu River. The Huong River is the largest, with two main sources both originating in the Truong Son Mountain range. In addition to natural rivers, there are numerous canals around Hue city.

The province also contains the Tam Giang–Cau Hai lagoon, the largest lagoon in Southeast Asia at 68 kilometres long with a surface area of 220 km^2. Part of the coast is comprised of a strip of dunes that separates the lagoon from the sea and extends from Dien Mon to the Tu Hien estuary in Vinh Hien commune. Lagoon water is a mixture of fresh water and saltwater which intrudes from the sea at each high tide. When the river flow is low during the dry season, the water supply to the lagoon is reversed and seawater is carried on tidal currents through the Thuan An and Tu Hien inlets. The water level also varies seasonally. In the dry season, the water level in the lagoon is 5 - 15 centimetres (cm) lower than sea level in Tam Giang lagoon and 25 - 30 cm lower in Cau Hai lagoon. During the rainy season, the water level in the lagoon is typically higher than sea level and can reach 70 cm in Cau Hai Lagoon. Water storage in the lagoon is 300 to 350 million cubic metres (m^3) in the dry season and 400 to 500 million m^3 in the rainy season.

1.3. Socio-economic characteristics

In 2020, the province's population was estimated at circa 1.13 million people, an increase of 1% compared to 2019. Circa 561,000 (49.5%) of the population are male, and 572,000 (50.5%) are female. The population density is of 229 people/km^2 and the urban population is estimated at 562,000 people, accounting for 49.6% of the total population in the province. Over 571,000 people reside in rural areas, close to 50.4% of the total population. The working age population, from 15 years old and above, is 621,000 people. Of this number, male workers account for circa 52% and 48% are female workers. Regarding geographical classification, 49.3% of employed people are rurally located with 50.7% in urban areas (DONRE, 2021). Most poor (9,400) and near poor households (7,900) are located in rural areas.

The economic growth rate (GDP) was estimated at 4.36% in 2021. The services sector accounts for 46.5% of the economy, with a very strong tourism sector. Industrial production value is estimated at 38,500 billion VND, 9.15% higher than in 2020. The industrial production index was estimated at 5.9% (DONRE, 2021). Agricultural production remains critical for economic growth, job creation, rural livelihoods, and food security in the province and is explained in more detail in the next section.

TT Hue had a relatively low poverty rate pre-COVID-19 at 4.0% (Government of Vietnam, 2022). Given the relevance of the tourism sector in the province, TT Hue's economy was particularly affected by COVID-19. Turnover associated to travelling decreased from circa 238 billion VND in 2019 to 21 billion VND in 2021, only to slightly recover to 127 billion VND in in 2022 (Government of Vietnam, 2022). It was estimated that as a result of the pandemic, by July 2021, 63.5% of households at the country level had experienced an income drop of 30% or more relative to 2019 levels, impacting food security in over 50% of affected households (no disaggregated data by province is available) (UNDP, 2021).

1.3.1. Agriculture in TT Hue

Agriculture, Forestry and Fisheries (the agriculture sector) play an important role in the economic structure of TT Hue. Agriculture accounts for 11.69% of the province's GDP, and employs 22.19% of the labor force (circa 125,000 people). The land area dedicated to agriculture in the province is of 68,205 hectares (ha) (13.79% of province total), with paddy land covering circa 31,869.8 ha (46.73% of agricultural land cover) (TT Hue Statistics Office, 2022). In the coastal plain, the primary land use is agriculture. The predominant commodity is paddy rice, but maize, cassava, sweet potato, beans, and melons are also grown. Farming is a low-income, but relatively stable occupation.

In 2022, the planted area of paddy rice throughout the year was 52,496 ha[2] a decrease of 1,456 ha (including 345 ha of inefficient rice land being converted to other crops) relative to 2021 with a total production of 268,000 tons (TT Hue PPC, 2022b). High-quality rice production covered over 19,582 ha throughout the year.

Corn was grown in 1,484 ha with the production quantity reaching almost 6,000 tons. Meanwhile, cassava covered 4,100 ha, and the area for peanut production was 2,400 ha. Vegetable farming covered 4,700 ha, lotus 530 ha, and fruit trees 3,282 ha. The province has continued to expand the area of fruit trees through converting some forest areas to fruit trees. Specialty trees of Thanh Tra pomelo and Nam Dong orange have been developed, along with some other valuable tree species such as medicinal herbs and non-timber forest products.

The general trend for livestock production is from scattered and small models to more concentrated larger farms with high-technology application as well as VietGAP, organic, biosafety and disease-free breeding models. The total number of pigs in 2022 was 148,544 heads, with buffalo at 15,121 heads, cows 28,584 heads, poultry 4.7 million heads.

The area of concentrated afforestation in the whole province is 6,250 ha. and timber production from planted forests is 647,000 m^3. The area certified for sustainable forest management has reached 10,926 ha (10,074 ha under FSC certification and 852 ha under VFCS/PEFC certification).

The total area under aquaculture is estimated at 7,800 ha. The total production of fishery exploitation and aquaculture is estimated at 60,000 tons (exploitation over 40,000 tons and

[2] This is the sum of the three crop seasons: Winter Spring paddy: 28,380 ha; Summer Autumn paddy: 25,359 ha and Winter paddy: 213 ha.

farming close to 20,000 tons). Aquaculture systems are diversified, ranging from fish farming in ponds, cages, cement tanks or pens, including mollusc farming and seaweed culture.

Aquaculture production has been declining in recent years, mainly due to water pollution and to the negative effects of climate change.

The agriculture sector remains highly fragmented with most farms operating on less than 0.5 ha, and production mainly focused on domestic consumption. The level of organization of farmers is low, especially for those outside of the rice value chain. Small farm sizes lead to the low value of collateralized assets, and farmers lack professional capacities and skills which constrains the access to commercial finance. Both the fragmented production and the low level of organization of farmers imposes challenges on agricultural transformation to large scale commercial production. It also makes the sector highly vulnerable to climate change (IFC, 2019). The use of new technologies is limited, and agricultural enterprises tend to use outdated machinery. In 2013, Vietnam issued an Agriculture Restructuring Plan with the aim of shifting from a resource-intensive agricultural sector to one that is technology-intensive and more resilient to climate change (IFC, 2019). At the province level, TT Hue's Agricultural Restructuring Plan 2021-2025 also aims to foster technology-driven, climate-resilient agriculture, promotion practices like organic[3] and sustainable agricultural practices.

The sector is already being affected by climate hazards. An assessment of climate impacts in the province commissioned by LuxDev in 2022 (XYZ), shows that a number of climate hazards: prolonged heat, increasing average temperatures, and higher frequency of drought; more typhoons and strong winds in the province cause beach erosion, and increased drought frequency results in soil salinity and alum in coastal communes; typhoons/tropical depressions, heavy rains/torrential rains cause inundation, waterlogging; and unusual cold temperatures in winter cause cold damage in crops to increase.

These climate hazards have impacted the sector, leading to yield reductions, lower quality of agriculture products, and negative impacts on farmer incomes. Multiple impacts of climate change have negatively affected agricultural and fishery production in recent years. This has included damages to over 4,000 ha. of rice, 815 ha. of vegetables following the typhoon and floods in 2020. Additionally, 30 ha of sugarcane, 241 ha. of banana, 295 ha of cassava, 726 ha of fruit trees; 33.7 ha of flowers were damaged by typhoons, and 171 ha of fields were filled with sandy soil. 16 ha of fields were also filled with water hyacinth and 3,921 cattle and 751,974 poultry died or drifted.

The project will work on 3 commodities (rice, lotus, and pomelo) that are key for the province. Further background Information on these commodities is included in Table 1 below and their prioritization process is described in Appendix B.

[3] TT Hue has seen the emerging development of organic production models on a number of crops such as rice, peanuts, soybean, watermelon, vegetables, chicken and pigs through association with Que Lam Joint Stock Company and the support of previous LuxDev projects.

Table 1. Information on key crops

Crop	Background information
Rice	Rice is an important food crop for TT Hue province, and it is classified as national key product. According to the TT Hue Statistical Yearbook 2021 (TT Hue Statistics Office, 2022), paddy land was 31,869.8 ha, accounting for 46.73% of the agricultural production land of the province. The planted area of paddy for 2021 was 53,952 ha (Winter Spring paddy: 28,380 ha; Summer Autumn paddy: 25,359 ha and Winter paddy: 213 ha); with an average yield for 2021 of 63.5 quintals/ha and total rice production 342,520 tons. Rice is the main crop and occupies the largest area across all districts/municipalities/and cities in TT Hue province, except for Nam Dong district. Abnormal climate patterns, especially the unusually heavy rains in the last two years, have caused significant damage to rice production, with rice fields inundated and destroyed, resulting in reduced rice productivity. Frequent droughts caused 4,864 ha of rice land in coastal and lagoon communes in TT Hue to become saline and alum (TT Hue PPC, 2023). The implementation plan of the Sustainable Agriculture and Rural Development Strategies for the period of 2021 - 2030, with a vision toward 2050 in TT Hue (TTH PPC, 2022), sets out priority actions for rice production in the province. It is focused on developing and expanding the areas of high-quality rice, as well as strengthening linkages in rice production and consumption. The plan supports a shift from old to new production methods that apply advanced technology to adapt to climate change. It highlights the need to flexibly convert rice cultivation land to food crops (such as peanuts, maize, vegetables, lotus or aquaculture) or combine rice production with agriculture on the areas of low-efficient rice cultivation, salinity and alum soils, or that lack sufficient water. The total area of low efficiency paddy land converted to the other crops was 2,257 ha from 2019 to 2022 (TTH PPC, 2022).
Lotus	Lotus is a specialty crop of TT Hue province and is Vietnam's national flower. Most parts of the lotus plant are used; including seeds, mirrors, roots, leaves and flowers. Parts of the lotus are also valuable in food and drink production, including lotus seed sweet soup, lotus seed jam, lotus root jam, and lotus tea (lotus flower tea, lotus leaf tea, lotus embryo tea). Lotus also has medicinal value. The area of lotus cultivation in the province in 2022 was 530 ha, with an average yield of 2.29 tons/ha and quantity of 1,216 tons of lotus seeds (fresh unpeeled lotus seeds) (TTH Sub-Department of Crops and Plant Protection, 2022),. Average profit from Hue white lotus variety is 97 million VND/ha, whilst the high yielding pink lotus variety commands 27.75 million VND/ha; considerably more than rice. The average lotus production area per household is still low and the production scale is fragmented and small (average area is from 0.24 to 0.48 ha/household). Lotus is grown mainly on land converted from inefficient low-lying rice land (accounting for about 75%) and on natural lakes/ponds (accounting for about 25%). Lotus production land is distributed across the districts of Phong Dien, Quang Dien, Huong Tra, Huong Thuy, Phu Vang, Phu Loc and Hue city. Phong Dien district has the largest lotus growing area with 252 ha (47.55%). In recent years, due to the impacts of climate change, extreme weather patterns such as typhoons/tropical depressions and increased frequency and intensity of precipitation have caused the inundation and waterlogging of low-lying rice fields. This has resulted reduced economic efficiency of rice cultivation requiring the diversification of crops. Hue lotus seeds are sold not only in TT Hue province (to the local population as well as tourists) but also in the southern and northern provinces.

	Currently, lotus seeds from the province are not produced in a sufficient volume for in the domestic market.
Pomelo	Thanh Tra pomelo is a high-quality specialty citrus fruit tree with a long history of production in TT Hue. It is classified as a key product at the provincial level. The planted area of Thanh Tra in 2022 was 740 ha, accounting for 22.5% of the province's fruit tree area. Thanh Tra pomelo is predominantly planted in alluvial soil along the O Lau river, Bo river, Truoi river and Huong rivers, as well as in Huong Van, Phong Thu, Thuy Bieu, Duong Hoa communes, and Phong Dien town. The cultivation of Thanh Tra pomelo can generate substantial revenues, generating between 80 to 200 million VND/ha each year. The production scale is also fragmented and small, with an average area of 0.1 - 0.2 ha per ha/household, mainly in mixed and/or in household gardens. Therefore, the application of scientific and technological advances to production is still limited, and no concentrated production area exists. Thanh Tra is a perennial crop, in which the investment from planting to first harvesting is 5 years on average. The economic cycle of Thanh Tra is determined to be 25 years. Therefore, farmers have to intercrop the pomelo with peanuts, vegetables, corns, or seek alternative income sources during that time. Due to the impacts of climate change, droughts, inundations, and floods have affected the Thanh Tra production in TT Hue province. According to the provincial DARD and the district DARDs of Huong Tra and Phong Dien, the flood in 2020 caused death of 300 ha out of a total of 900 ha of Thanh Tra (death rate of 33.33%). After this flood, the provincial DARD and the district DARDs guided farmers to produce Thanh Tra in higher areas to adapt to large floods. TT Hue province in the period of 2021 - 2025 (TT Hue PPC, 2022a) has also outlined the objective of developing fruit trees for specialized cultivation, closely linking production with preservation, processing and consumption markets.

1.3.1.1. Forest sector profile

In 2022, TT Hue province had circa 282,000 ha of forest in (close to 57% of total land area) of which 205,602 ha (73%) is natural forest and 77,148 ha is plantation[4] (see Figure 3).

[4] Forest sector statistics as obtained directly from the TT Hue Province Forest Protection Department during the formulation and feasibility missions

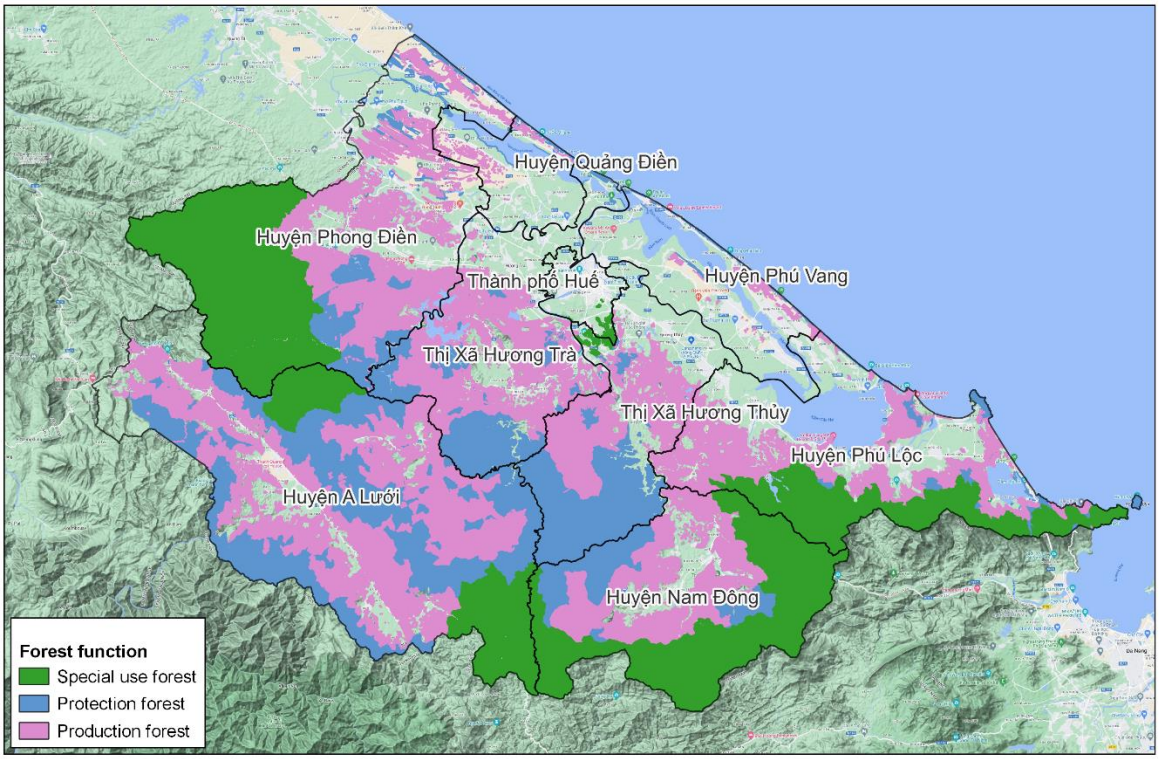


Figure 3. Forests by function in TT Hue

The forest cover rate in TT Hue has remained broadly stable 57% since 2021 (Figure 4).

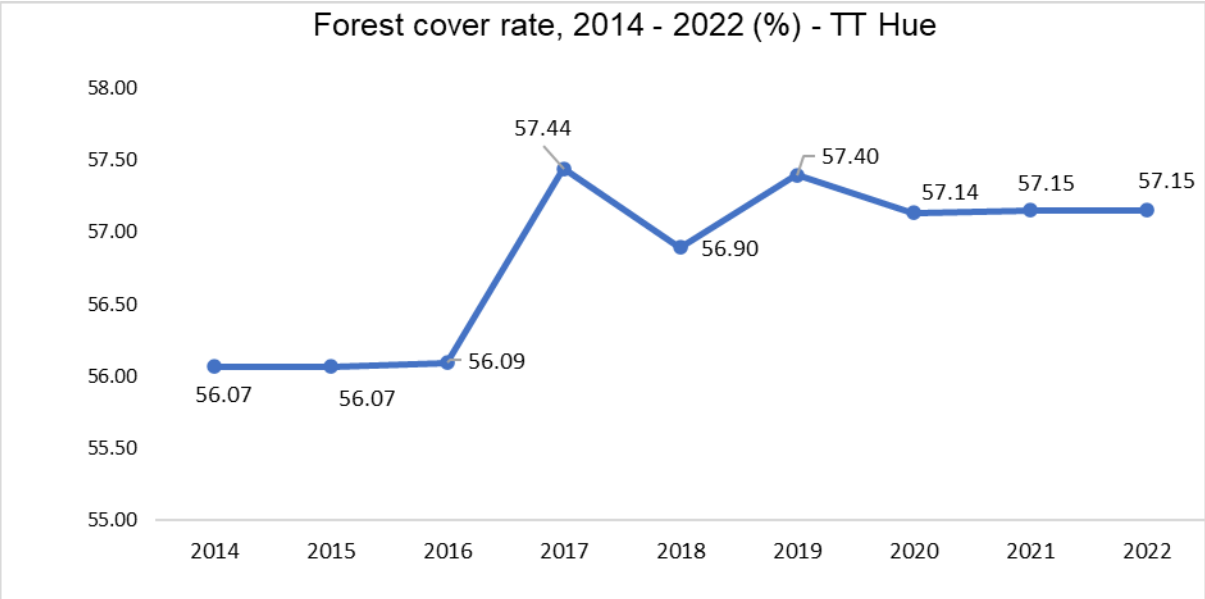


Figure 4. Forest cover rate 2014 – 2022, Source TT Hue FPD, 2022

Across the Province, forests are owned by a diverse range of groups: Management Boards of Special Use Forests[5] cover close to 84,855 ha (27%); Protected Forest Management Boards

[5] In Vietnam, forests can be classified differently: According to Purpose, origin, species, site-conditions, reserves and forestation (forest/no forest). Two key indicators frequently used are purpose and reserves (forest quality/degradation).

– 74,905 ha (24%); economic organizations – 26,160 ha (8%); Household/Individuals – 54,718 ha (18%); Communities – 17,323 (6%); Commune People's Committees – 45,427 ha (15%); Army – 3,320 ha (0.1%); and others – 2,704 ha (0.1%) (see Figure 5).

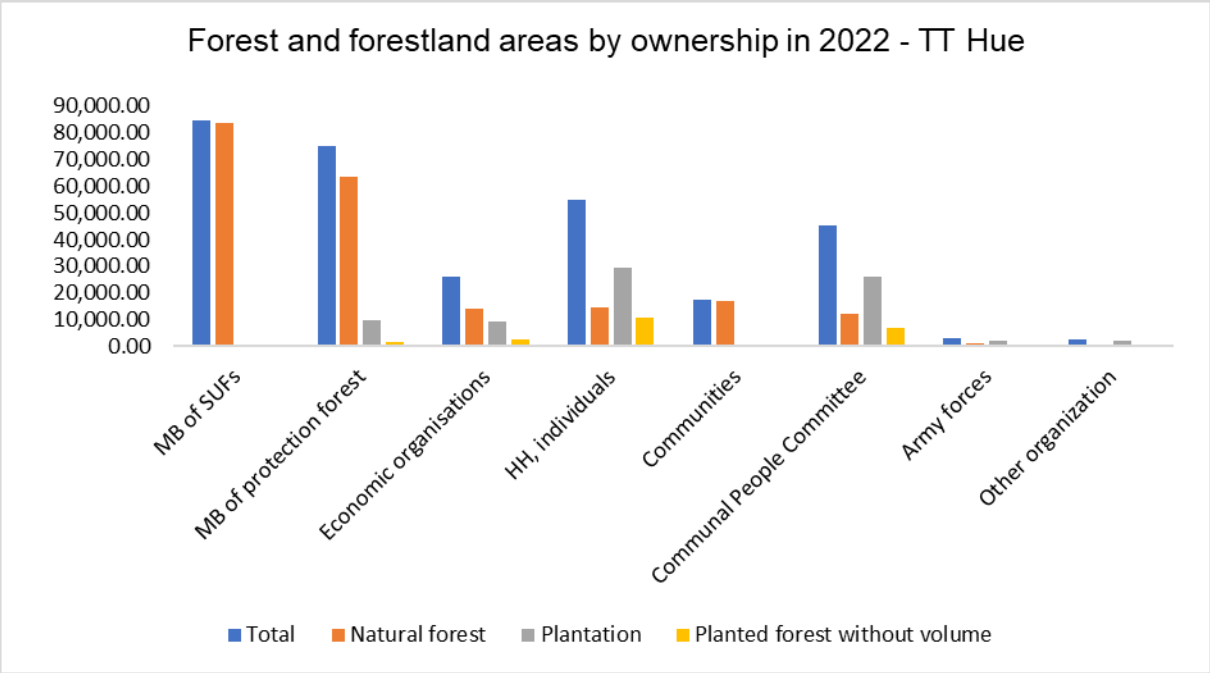


Figure 5. Forest and forestland area by ownership 2022

Source: FPD, 2022

Figure 5 shows that forest and forestlands are mainly state-owned in TT Hue. Forest Management Boards (FMBs) of protection and Special Use Forests (SUFs) manage 52% of total province forests and forestland, while the Commune People Committees (CPCs) manage 45,427 ha of forest. This equates to 15% of TT Hue's natural forests and forest land. Figure 6 breaks down the forest by quality[6]. Most of the forest areas in TT Hue are categorized as poor forest, at 131,537 ha (or 66%). Rich forest covers 21,129 ha (11%), while medium forest quality accounts for 44,446 ha (22%). The degraded forest area is 1,828ha (0.92%), and the forest area without standing stock volume is 344 ha (0.17%).

According to Vietnams Forestry Law, Law 16/2017/QH14, forests in the country are classified per their purpose as follows: Protection forest (rừng phòng hộ) are used mainly to protect water sources and land, prevent erosion and desertification, restrict natural calamities and regulate climate. Protection forests with relevance to the project are (1) watershed protection forests; (2) wind- and sand-shielding protection forest; Special-use forest (rừng đặc dụng) are used mainly for conservation of nature, national forest ecosystems and forest biodiversity; etc. Such are mainly Protected Areas & National Parks; and Production forest (rừng sản xuất) are used mainly for production, such are mainly plantations.

[6] According to Circular No. 34/2009 / TT-BNNPTNT on the criteria for determining and classifying forests, forest reserves (as an indicator for forest quality/level of degradation) are classified through their standing stocks as follows: Rich forest: standing trees of 201-300 m3 / ha; Medium forest: standing trees of 101 - 200 m3 / ha; and Poor forest: standing trees of 10 to 100 m 3 / ha.

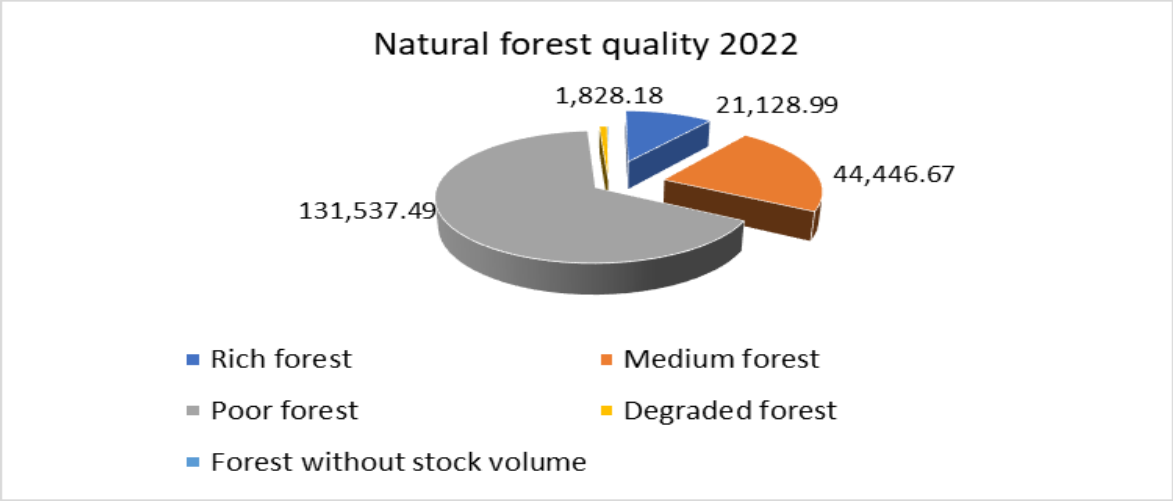


Figure 6. Quality of natural forest in TTH

Source: FPD, 2022

1.3.1.2. Forest cover change

Figure 7 shows forest area in the period 2014 - 2022 increased by 3,356 ha. Much of the increase was due to planation forests which rose from 73,358 ha in 2014 to 79,825 ha by 2021 (+6,466 ha). At the same time, the area of natural forest declined from 207,926 ha in 2014 down to 206,806 ha in 2021 (-1,120 ha). The area of planted forest has increased rapidly over the past two decades to meet the demand for raw materials for the wood processing industry. This has been a major driver of the reduction of the natural forest area.

The largest change is a result of “planned deforestation”, i.e., harvesting short rotation plantation forests -37,951 ha (94% of total forest change area), which are then replanted with the same species, as can be observed through the area of afforestation in the same period, which is +46,495 ha (see Figure 7). Due to a high demand for raw timber material for the wood processing industry along with the market price of woodchip, there have been encroachments of acacia plantation forests into natural forest.

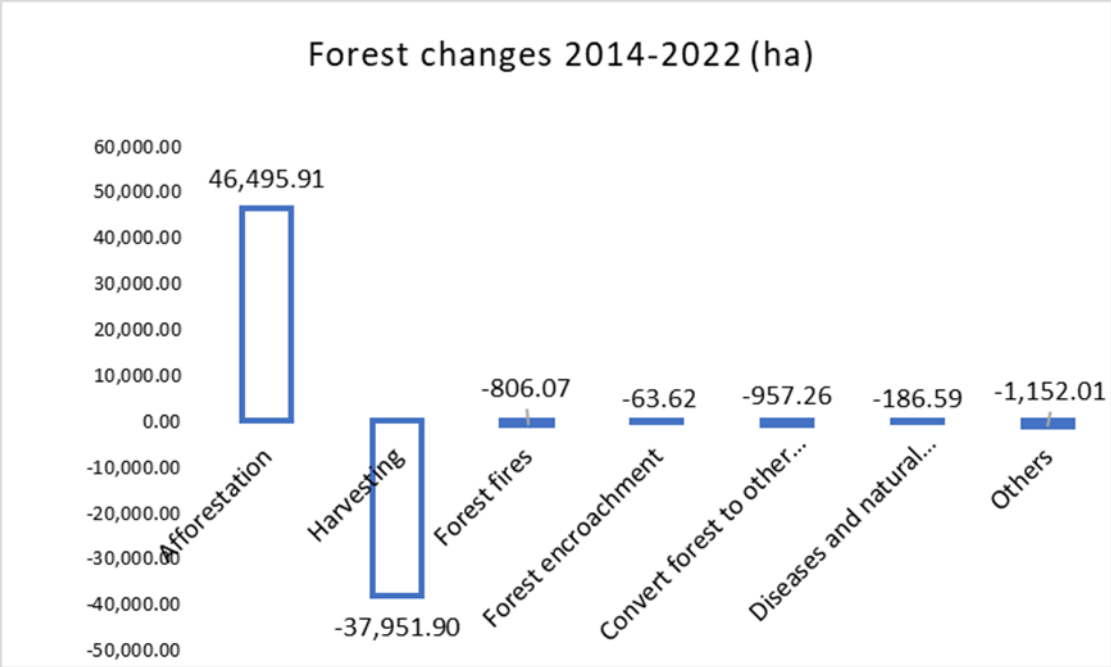


Figure 7. Forest changes 2014 - 2022

Source: FPD, 2022

The main causes of forest loss are forest fires, which have led to of loss of over 1,000 ha over the last ten years. Other causes include forest encroachment (-63 ha (2.7%)), converted forest to other land use purposes (-957ha (40.57%)), diseases and natural hazards (-186 ha. (7.9%)), and other causes (e.g., adjusted plantation area not yet considered as a forest area; inaccuracy of statistical maps, etc.). The application of the current silvicultural practices (clear-cut, burning vegetation, and replanting over many cycles in an area) contributes to soil degradation and destruction of biodiversity.

Forest fires	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	Total
Total number of fires	18	9	18	46	7	6	13	54	64	95	16	66	**412**
Number of fires extinguished in a timely manner	18	9	18	45	7	6	13	54	40	95		66	**371**
Area of forest burned (ha)	75.95	2.71	33.52	17.41			17.30	265.11	50.89	549.82	11.41	51.43	**1,075**
Planted forest (ha)	67.85	2.58	31.50	17.41			14.62	264.11	50.89	485.98		49.18	**984**
Natural forest (ha)	8.10	0.13	2.02				2.68	1.00		63.84		2.25	**80**
Area of forest destroyed (ha)	58.08	2.00	23.21	17.41	5.47	22	13.35	226.58	35.53	516.89		25.61	**946**
Planted forest (ha)	55.58	1.87	21.59	17.41	5.47	22	13.35	226.58	35.53	461.04		23.76	**884**
Natural forest (ha)	2.50	0.13	1.62							55.85		1.85	**62**

Table 2. Forest fires in TT Hue

1.3.1.3. The coastal sand and lagoon forest area

The coastal and lagoon in TT Hue area covers more than 42 communes in the districts of Phong Dien, Quang Dien, Huong Tra, Phu Vang and Phu Loc, over a length of nearly 50 km. Coastal protection forests perform a critical role in fixing sand dunes and limiting coastal erosion. One role of the dune system is to act as a buffer, diminishing the impact of storms, hurricanes, floods, and waves, and thereby contributing to the well-being of low-lying coastal area communities. The forest also creates a fresh ecological environment for the coastal sandy area. At the same time, the forest regulates harsh environmental conditions. However, sand dune forests in TT Hue have been heavily degraded over the last few years (see Figure 8).

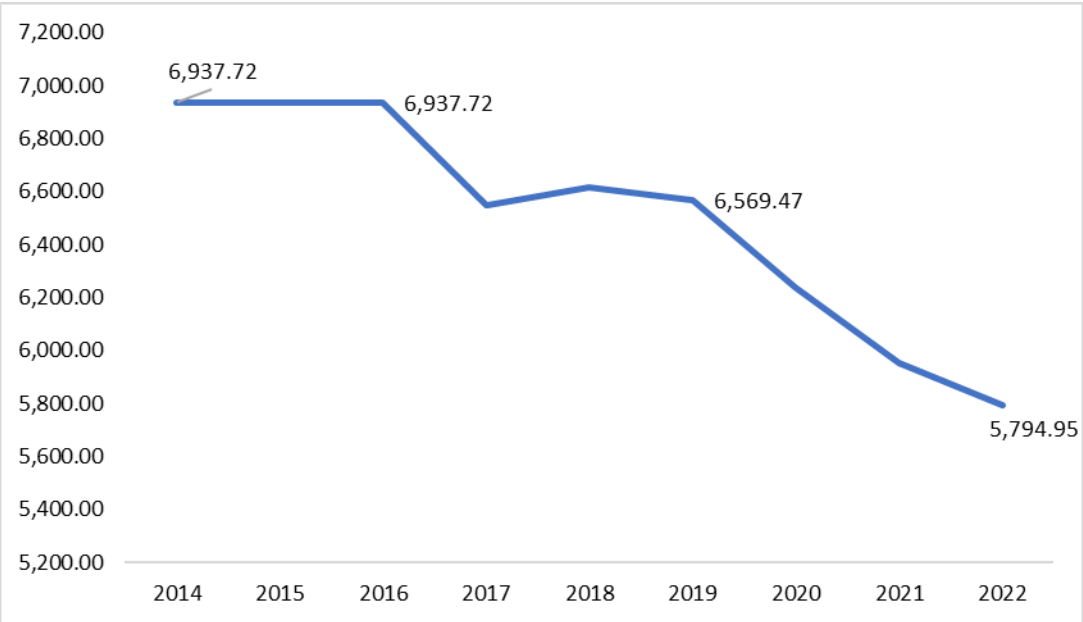


Figure 8. Loss of sand dunes forest

Source: FPD, 2022

Figure 8 shows that over 1,140 (16% of the total sand dune forests of TT Hue) ha of sand dune forests have been in TT Hue from 2014 to 2022. The areas that are more prone to further degradation and/or loss are in Phong Dien, Quang Dien and Phu Vang districts (Figure 9).

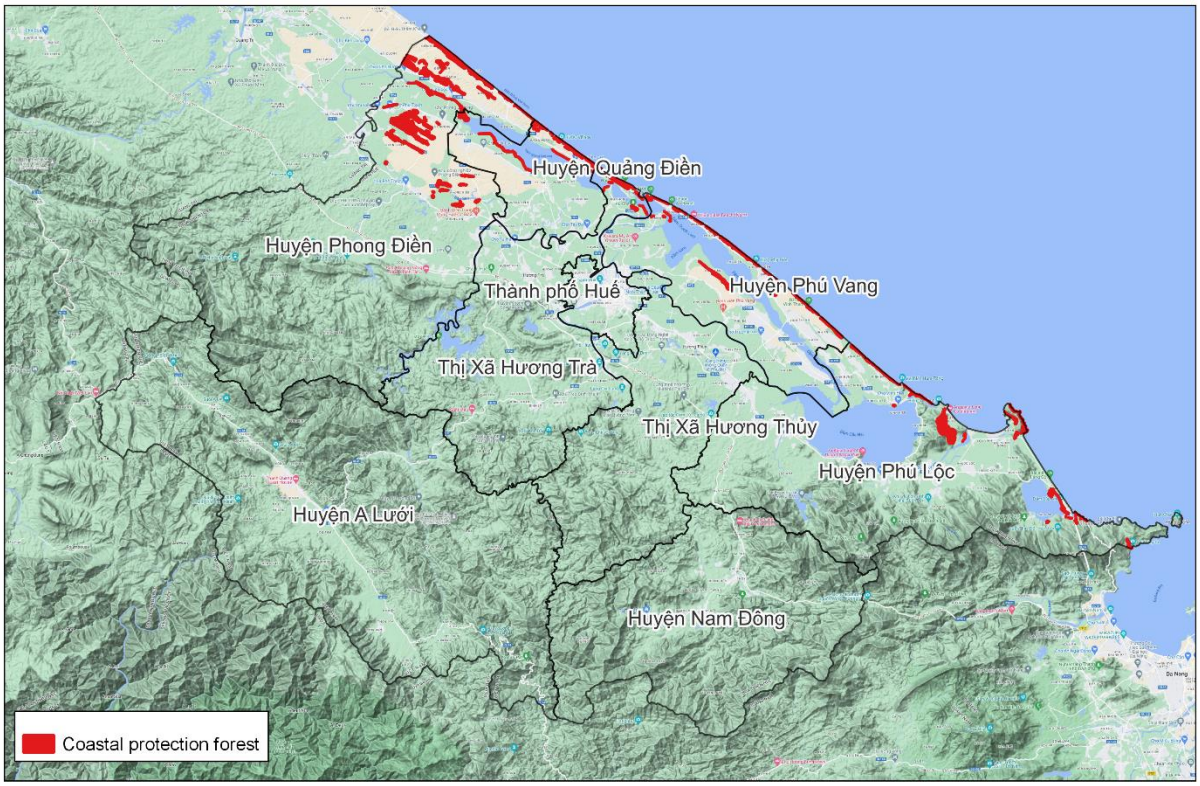


Figure 9. Coastal protection forests in TT Hue

Those severely degraded sandy areas are of little direct economic value, whereas they do have a potential value (livelihoods, soil organic carbon, ecosystem services), which thus far has not been quantified, resulting in an underappreciation of such areas. Due to the generally high demand for land in Vietnam, they are thus at risk of being converted into other land uses (aquaculture, tourism, industrial parks, mining) (IUCN, IISD, 2003). Against this background, restoration would increase the economic value through enhancing both the protective function of these forests, as well as the provided ecosystem services (Pistorius et al, 2023).

Furthermore, though not part of this project, mangrove forests are an important ecosystem in the lagoon, providing ecological services such as protection from coastal storms, absorption of flood flows, and nursery habitats for aquatic species. The area of mangroves has also declined dramatically in recent decades, mainly because of aquaculture expansion. Currently, only about 8 ha of the original mangrove forests remain (USAID, 2018). Some mangrove restoration activities are underway, particularly at aquaculture ponds in Ru Cha and Tan My though the potential for mangrove restoration is severely limited in Hue province – as could be observed through the challenging implementation of past projects (SRD, WB-FMCR), which either had limited survival rates – or very labor and cost intensive interventions for their restoration measures.

1.3.1.4. Non-Timber Forest Products in the project area

In TT Hue there is also harvesting of Non-Timber Forest Products in the forest areas. There are more than 1,126 species of medicinal plants distributed across TT Hue, accounting for more than 30% of the total number of medicinal plant species in the country (Thuong, 2022).

Many species of precious medicinal plants can be found in the province, including melaleuca, patchouli, white basil, purple basil, and king pine. Various of these medical plant species can grow under the canopy of secondary and restored forests.

TT Hue is one of the natural distribution areas for Melaleuca tree (*Melaleuca cajuputi)*, concentrated mainly in coastal communes in Phong Dien, Quang Dien, Phu Loc, Huong Tra, and Huong Thuy districts. Melaleuca was included in the Ministry of Health's[7] list of priority medicinal plants prioritized for development from 2015 – 2020. The trees can provide significant economic benefits to people on nutrient-poor sandy soils in coastal areas. Currently, more than 200 enterprises and facilities are producing and trading Melaleuca oil in TT Hue with nearly 60 distilleries - many of which cannot generate enough product to meet the current market demand[8]. To help produce Melaleuca oil sustainably with high quality and economic value, while contributing to improving and stabilizing livelihoods, TT Hue's PPC set a target of 473 ha for Melaleuca oil production by 2025 (Plan No. 150/KH-UBND by PPC, 2019).

While reliable economic data and in-depth analyses on most of the mentioned NTFPs are limited, a cost-benefit analysis carried out by Vorlaufer et.al. (2019) revealed that Melaleuca cajuputi oil production is economically viable, regardless of vertical integration. Processed, profitability per hectare annually ranges from 1,369,333 VND (59 USD) to 3,654,392 VND (158 USD). Through value addition and investments in processing facilities, households can boost their income by 36% to 167%.

Vorlaufer further associated the economic risk with these investments as low due to limited initial expenses[9]. Sensitivity analysis indicates resilience to price fluctuations, with profitability secured even with price decreases of 41% to 70%, depending on the business model.

Expanding Melaleuca cajuputi oil production by within the scope of the area faces no demand constraints. 100-hectare of sustainable harvested Melaleuca forest are expected to yield 40 to 60 tons of Melaleuca leaves annually, resulting in 140 to 300 litres of oil production. This additional output, contributing 0.2% to Thua Thien-Hue's total annual production of 16,000 litres, can likely be absorbed by the market without significant price disruptions, particularly as processors intend to increase production areas[10].

1.3.2. Finance sector and access to finance in the agriculture sector

Financial institutions are increasingly playing an important in agriculture and rural development financing in TT Hue. Banking services are readily available in urbanized areas (over 50% of the adult population has bank accounts (TTH PPC, 2022)), however, access to financial

[7] TTH PPC Decision No. 206/QD-BYT, by MoH, 2015

[8] Interview with Hoa Nen Essential Oil company during FS & FP missions

[9] Up-front investments for Melaleuca cajuputi oil production are relatively low, ranging from zero to 2,600,000 VND (112 USD) per hectare, depending on vertical integration

[10] Interview with Hoa Nen Essential Oil company and Phong Dien CPC during FS & FP missions

services in rural areas remains low. There are three main financial institutions active in rural areas in TT Hue:

- **Agribank** is the largest and most important financial institution for agriculture and rural development. It has an outstanding portfolio of circa VND 8,000 billion (USD 340 million), which constitutes close to 65% of the bank's portfolio. The bank has over 40,000 individual customers in the province, which account for 90% of its customer base. In addition, the bank has 4,000 institutional customers including cooperatives and businesses. 43.8% of customers have businesses in the agriculture, forestry, and fisheries sector, and hold 44.3% of total portfolio. The average loan size in the province is USD 8,250 (VND 198 million). Clients are required to deposit a household land use certificate or other asset rights as a form of collateral when seeking a loan. Agribank's non-collateralized lending is still very limited. The bank usually provide loans of less than USD 1,700 (VND 40 million) (TTH Sub-Department of Crops and Plant Protection, 2022), which is the size generally required by the most vulnerable population.
- The **Vietnam Bank for Social Policies (VBSP)**[11] provides government-sponsored non-collateral targeted lending for income generation activities for poor and near-poor households, and for job, employment, and export programmes. VBSP also provides loans the construction of houses in flood-prone areas. Lending from VBSP is non-commercial, capitalized from government resources, and follows government-mandated guidance. The loan portfolio of VBSP in TT Hue is estimated at USD 119 mil (VND 2800 billion) (TT Hue PPC, 2022a).
- **Lien Viet Post Bank (LPB)** is the only private commercial bank that has an explicit strategy to cover rural areas. It has a large operational footprint by using its partnership with Vietnam Post, which has post offices in all districts and communes in Vietnam. LPB, in partnership with the women's union (WU), has developed a non-collateralized group-lending scheme where group members are responsible for the group member's individual borrowing. Loan size is relatively small, usually between USD 500 to USD 2,000 (VND 12 million to 48 million). This group lending model contributes to reducing the risks and transaction costs for the bank. Currently, the outstanding portfolio is around USD 12.5 million (VND 300 billion), covering over 600 women's groups and 10,000 loans. This constitutes about 15% of the LPB portfolio in TT Hue. The approach is innovative, covering significant unmet development financing needs. However, LPB currently does not have a plan to increase this type of lending citing limited human resources and the high cost involved.

Other financial institutions have a more limited interest in rural and agriculture finance as they lack a distribution network in rural areas. Therefore, their lending is mostly opportunistic. Some banks, like Dong A Bank, are also interested in a group lending model through women's unions, but the portfolio size is still insignificant compared to that of the three largest financial institutions described above. Overall, bank financing has provided significant resources for rural

[11] Efforts were made during the development of the project to engage with VBSP, but the bank did not have a mandate to work in supporting the project's activities.

development, but significant unmet demand remains, since banks are less interested in rural areas and financing for risky sectors such as agriculture.

Over time, some of this unmet demand could be filled by commercial loans as banking services evolve and become more developed. However, in the medium-term, banks are unlikely to adequately reach certain niche services such as non-collateral loans, small-sized loans (less than USD 1,700 (VND 40 million), and loans for disaster recovery (especially for more disadvantaged groups). Long-term loans for multiple-year investment, or cash-flow-based loans will also not likely be available sufficiently. Those markets are considered more fragmented, high risk, and require high transaction costs for commercial financial institutions.

In addition to banks, other relevant actors financing agriculture in TT Hue include WUs and other mass organizations.[12] These have set up models for community-based micro-funds for small savings and credit funds. Such models have also been used for disaster preparedness, response, and recovery. Members usually contribute a small amount of over USD 0.40 (VND 10000) per month. They also work on community projects such as tree growing as a form of fundraising. Most of these micro-funds are still very small (few thousand USD) and only provide very small loans (less than USD 100) for a limited number of households.

Vietnam's government has developed a of instruments to mobilize private finance for agriculture by reducing the perceived risks of the sector including partial credit guarantee schemes and agricultural insurance programmes (IFC, 2019). The success of these instruments has been limited.

[12] Under a previous Luxembourg-funded adaptation project, three district-level revolving (saving and credit) funds were established in 2016 in partnership with the WU, aimed at giving poor women access to opportunities in productive, climate-resilient activities. Since 2016, the funds have allocated over USD 800,000 in loans. Loans are capped at close to USD 800, with repayment periods of up to 24 months. Interest rates range from 0.5% to 0.8% per month depending on whether the borrower is from a poor household or not. By the end of 2021, over 1,200 household members were saving in funds, and loans had been allocated to over 500 borrowers. For the agricultural sector, the proceeds from loans from the funds tended to be used for animal breeding, cultivation, trading, and purchasing tools and equipment. In addition, under these funds, training on income generation opportunities and women's economic empowerment are delivered to WU members.

2. Climate Change Context

Vietnam is particularly at risk of climate change due to its geographic location, in the path of tropical storms and typhoons, as well as its terrain and extensive coastline. For the period from 2000-2019, Vietnam ranked 13th in the global Climate Risk Index. During this period, the country experienced a high number of fatalities and extensive economic losses due to climate-related natural hazards and sea level rise (Eckstein et al., 2021). Agriculture, forestry, and fisheries remain important sectors for the economy and contributed circa 15% of GDP[13] and employed 34.50% of the Vietnamese workforce in 2019, down from 55% in 2005 (Government of Vietnam, 2021).

TT Hue province is highly exposed to climate related hazards and vulnerable to the effects of climate change. Storms coming in from the east are of particular threat and increasingly impact Vietnam's Central Region both in frequency and severity.[14] Persistent and increasingly heavy rainfall often overwhelms the three main river systems in the mountainous western part of the province, causing landslides in hilly areas and floods in low-lying areas. TT Hue had a relatively low poverty rate pre-COVID 19 at 4.7% (Government of Vietnam, 2015). However, Vietnam, as most countries in the world, was severely impacted by COVID19. By July 2021, 63.5% of households had experienced an income drop of 30% or more relative to 2019 levels, impacting food security in over 50% of affected households (UNDP, 2021) (no disaggregated data by province is available). Prior to COVID19, an analysis by World Bank and the Asian Development Bank (ADB) revealed that despite Vietnam having a medium coping capacity for climate change, many households had a "high probability of falling into extreme poverty even when exposed to relatively high frequency flood and drought events" (World Bank & ADB, 2021). In fact, there was a circa 50% possibility of a household in TT Hue falling into extreme poverty with an event that can occur every four years (World Bank & ADB, 2021). Climate adaptation measures are therefore urgently required in order to strengthen the resilience of TT Hue's coastal and inland communities and ecosystems.

The country has a tropical monsoon climate, yet given its geographic characteristics and size, there are significant differences and distinct climates between regions, as it has a tropical climate zone and a temperate climate zone (MONRE, 2019). The rainy seasons in the country are aligned to monsoon circulations which produce heavy rains during the October-May period in the north and south of the country and in the September-January period in the central regions (World Bank & ADB, 2021). In terms of temperature, the northern regions of the country have average temperature ranges of 22-27.5°C in the summer and 15-20°C in the winter, while the southern regions have average temperatures ranging from 28-29°C in the summer and 26-27°C in the winter (World Bank & ADB, 2021). The climate of the country is also influenced by the El Niño Southern Oscillation (ENSO), which affects temperatures and rainfall patterns (World Bank & ADB, 2021).

[13] World Bank: https://data.worldbank.org/country/vietnam

[14] Storms that since 1952 have not dramatically increased in number, have become more complex, appear earlier, and end later in the season, and the number of heaviest storms (typhoons) is increasing.

2.1. Climate rationale

Observed changes- temperature

Vietnam has been experiencing the effects of climate change for some time. Observed temperature records from weather monitoring stations in the country show that the annual average temperature has increased by 0.62ºC during the period 1958-2014 at a rate of circa 0.1ºC per decade (MONRE, 2019). The World Bank and Asian Development Bank (ADB) (2021) also document observed temperature increases ranging from 0.5-0.7ºC since 1960, with steeper rises in Southern Vietnam and the Central Highlands, with increases at a rate of 0.26ºC per decade from 1971 to 2010. Observed highest and lowest daily temperatures record a strong increase of up to 1ºC, and the number of hot days (above 35ºC) has increased at a rate of 2 to 3 days per decade in the North-East, Red River Delta and decreased in the North-West, South Central and the South (MONRE, 2019). The dynamics are largely replicated in TT Hue, belonging to the North-Central Region, where temperature increases have been recorded in local meteo-hydrological monitoring stations of 0.4ºC in 2010-2019, using as a reference the 1976-2019 period, with larger variations in some months and with increases of over 1ºC recorded (DONRE, 2020a). The occurrence of hot days in TT Hue province increased by a rate of 6 days/decade in the period comprising 1961-2019. The trend for the number of cold days and severe cold days did not change significantly in the aforementioned period. Nevertheless, the recent decade shows an increasing trend across the province. The absolute lowest temperature during the period of 1961-2019 has increased at a rate of about 0.4-0.5 ºC. However, it is noteworthy that the absolute lowest temperature has tended to decrease across the province in recent decades.

a) *b)*

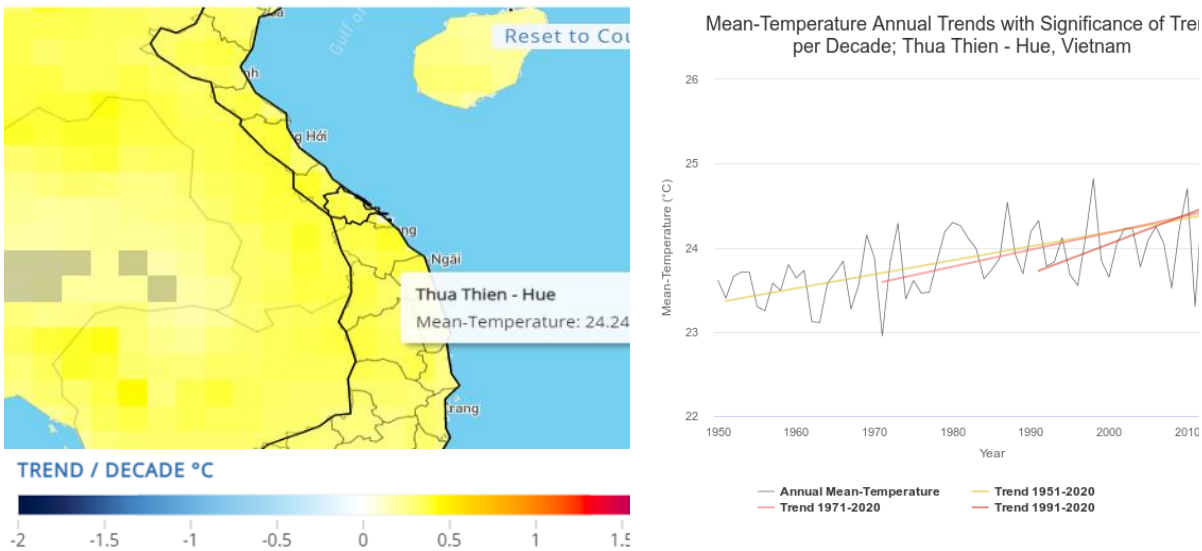


Figure 10. Trends in a) mean temperature and b) mean-temperature annual trends with trends per decade for the period from 1950 – 2020

Source: World Bank Climate Change Knowledge Portal, 2021

Observed changes- precipitation

a) *b)*

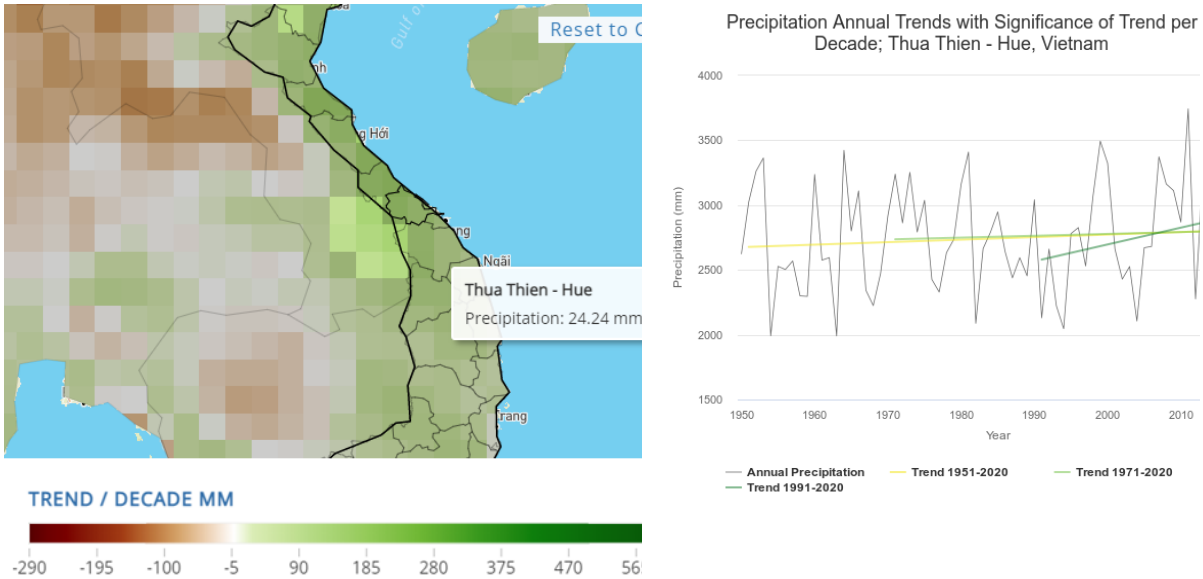


Figure 11. Trends in annual precipitation a) map of TT Hue showing trend per decade and b) graph of precipitation trends per decade for the period from 1950 - 2020

Source: World Bank Climate Change Knowledge Portal, 2021

Observed average annual precipitation does not record significant changes at the national level (World Bank & ADB, 2021). However, there are some significant changes at the sub-national level where one study observed annual precipitation decreased in the North from -5.8% to -12.5% and increased in the South from 6.9% to 19.8% from 1958 to 2014 (MONRE, 2019).[15] Historically observed data shows that "*the two phases of ENSO, El Niño and La Niña, tend to depress and increase average rainfall, respectively. Also, while both phases decrease average rainfall in the north, only El Niño depresses rainfall in the centre and south of Vietnam, with La Niña increasing rainfall in both*" (Sutton et al., 2019). In the North-Central Region, from 2010-2019, using 1976-2010 as a reference period, there has been a decrease in observed rainfall in the plain areas during the dry season (-15 to -30%) and increases during the rainy season (20%) (DONRE, 2020a).

In TT Hue province, overall, there were no significant changes in precipitation observed in the period from 1961-2019. However, there are some internal fluctuations that show a decreasing trend in rainfall in recent decades. The seasonal rainfall patterns, especially for the winter season, tended to increase clearly at a rate of 10 to 20% per decade. Thus, distribution of rain during the year in TT Hue is very uneven, with a profound contrast between the rainy season and the low rainy season. Droughts have been experienced during the low rainy season, while floods are experienced during the rainy season.(DONRE, 2020a).

[15] The study by World Bank and ADB for the same time period recorded a trend towards increased rainfall in the central regions and declined rainfall in the northern and southern regions, with ENSO strongly influencing trends of precipitation.

Observed changes- sea level rise

Sea level rise has also been recorded in different coastal stations in the country at an average rate of 2.45 mm per year from 1960-2014 and 3.34 mm per year from 1993-2014 (DONRE, 2020a). TT Hue recorded a sea level rise of 3.39 mm/year and 3.05 mm/year in the relevant stations during the 1980-2018 period (see Figure 12). The available land for agriculture and aquaculture, as well as the saline land area in coastal communities has already been reduced as a result of sea level rise (MONRE, 2019). In combination with the overexploitation of aquifers and droughts, sea level rise in the project area is also contributing to saltwater intrusion in water resources for human consumption and agriculture as well as to the salinization of soils (DONRE, 2020a).

a) b)

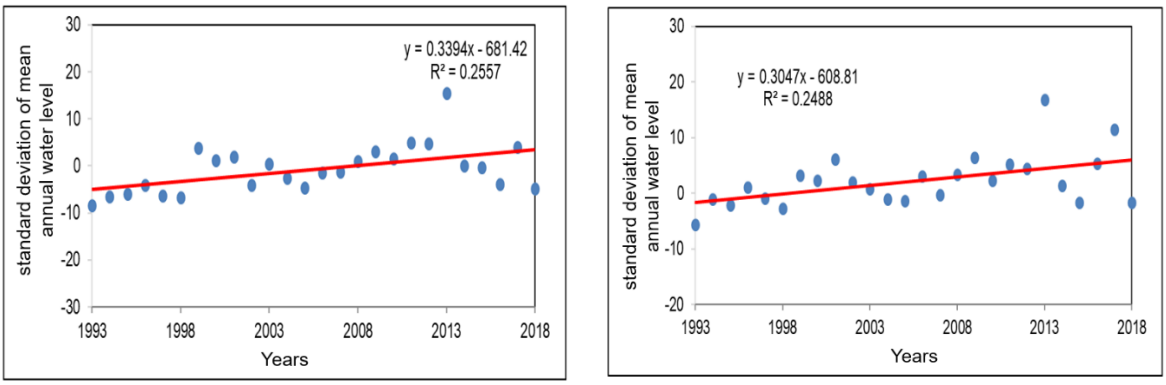


Figure 12. Change trend of sea level rise in the period 1993 - 2018 in a) Con Co Station and b) Son Tra station in TT Hue

Source: DONRE, 2020

Climate risks

According to INFORM (2021), Vietnam is amongst the countries most exposed to climate-related hazards[16]: flooding (riverine, flash, and coastal) (ranked 1st globally), with the project area particularly prone to floods given its three major river systems and its over 120 km coast; cyclones and storms (ranked 8th) with the project area being a particularly storm-prone area; and droughts (ranked 66th). The country has also experienced several landslides (World Bank & ADB, 2021). There have been 232 registered natural hazards in the country since 1960, resulting in the loss of 24,975 lives and in damages of over USD 23 billion. Storms and floods have been the most common observed hazards during that period. Further, climate drivers – increases in temperatures, increases in precipitation in some areas, and sea level rise – contribute to coastal erosion, river erosion, saline intrusion, and changes in agroecological conditions adversely impacting agriculture and aquaculture, which are particularly relevant in the project area (USAID, 2018).

[16] As per the Third National Communication, Vietnam follows IPCC (2012) in that "vulnerability and exposure to increasing risks are identified in specific contexts, linking with the sources of the risk".

The North-Central Region, where TT Hue lies, is exposed to eight types of climate-related hazards. Among those, drought and floods are the biggest threats to livelihoods and food security in the region, and their impact is aggravated by the timing of these events in the agricultural calendar. For instance, since 2011, prolonged periods of drought have become a lot more frequent, with five years having a measurement above 1.1 on the Drought Severity Index, something that had only occurred nine times in the preceding 30 years (1980-2010). Participatory assessments with farmers also highlight that the most relevant perceived climate-related threats to agricultural activities and livelihoods are floods and droughts. These issues are further compounded by unsustainable practices, including overexploitation of water resources and the unsustainable use of chemicals for agricultural practices, which are exacerbating climate vulnerability and contributing to increasingly depleted soils, uncertain incomes, and a major food safety problem, with paddy for example, the staple food, typically sprayed seven times before it is harvested.

Climate-related hazards are already impacting natural resources and ecosystems with detrimental impacts on livelihoods in TT Hue. The combination of droughts and high temperatures has led to water shortages, negatively impacting agriculture and aquaculture, and has also contributed to saline intrusion on coastal areas, further affecting water, soils, and land resources (DONRE, 2020a). Salinization levels in both soil and lagoon water are increasing, especially impacting rice farmers who have occasionally lost entire crops. Further, temperature changes and precipitation threaten natural systems and people's livelihoods, making aquaculture and traditional rice and fruit production less suitable (Binh et al., 2010). The variability of rainfall in the province described above is also associated with riverbank erosions (concentrated heavy rains), with a total of 64 km of river embankment already considered 'heavily eroded', directly affecting thousands of households living along the banks and agricultural production activities. The combination of sea level rise and floods is also contributing to coastal erosion, where coastal communes are rapidly losing land to the ocean, in some communes as much as 500 meters in the last 10 years alone. Climate-related hazards have also created substantial impacts on lives and economic losses in TT Hue. According to DONRE, in the 20-year period from 1999 to 2018, 518 people in the province lost their lives due to extreme weather events, and the economic cost of climate-related hazards amounted to USD 420 million. Women tend to be disproportionately affected by climate-related hazards, as their livelihoods usually rely more heavily on climate-sensitive natural resources and constitute most of the workforce in the rural and agriculture sectors (UNDP, n.d.). Women-led households in Vietnam have less adaptive capacity to cope with the impacts of climate change, as they have less access to information, credit, and technologies (UNDP, n.d.). Major weather events are increasing in severity and lead more regularly to casualties and damage in areas with low coping capacity.[17]

[17] Most recently (Sep-Nov 2020), TT Hue was hit by 5 tropical storms and 2 typhoons, causing a major disaster with much of the low-lying plains under flood waters averaging 1-2 meters and tens of thousands of people stuck in their flooded houses for weeks, with power lines cut off, and depending on emergency supplies. That latest period saw the first ever Category IV disaster alert for heavy rainfall. Despite the dire warnings and evacuations, 45 people lost their lives, most due to landslides, and 131 were seriously injured.

2.2. Future projections

Future projections – temperature

Average annual temperatures in Vietnam are expected to increase due to climate change. Projections under the RCP 4.5 scenario[18], validated using observed data from weather stations, show that temperatures are estimated to increase by 1.3-1.7°C by the middle of the century throughout the country, and by 1.9-2.4°C in the North and by 1.7-1.9°C in the South by the end of the century (MONRE, 2019). Average annual precipitation is also expected to increase under both scenarios RCP 4.5 and RCP 8.5. By mid-century, rainfall is expected to increase by 5-15% in the North and North Central regions, where the project area is, and by 20% in the mid-central regions under scenario RCP 4.5. Under the same scenario, rainfall is projected to increase by more than 20% in several areas of the country by the end of the century. Under scenario RCP 8.5, rain could increase by more than 20% in a wider area of the country by 2100 (MONRE, 2019).

For TT Hue province, under the RCP4.5 scenario, the average annual temperature is projected to increase by 1.4-1.5°C by the middle of the century and reach approximately 1.9°C by the end of the century. Under the RCP 8.5 scenario, the average annual temperature is likely to increase by 0.8°C at the beginning of the century, while the increase in the middle of the century will reach approximately 1.9°C. At the end of the 21st century, the increase in mean annual temperature is projected to reach 3.4-3.5°C. The average annual temperature is likely to increase for all seasons compared to the base period (1961-2019), especially in the summer. The average annual minimum and maximum temperature trend shows a similar behaviour. Under the RCP4.5, average minimum temperatures are projected to increase by the end of the century by 1.9 °C, respectively by 3.5-3.6°C for the RCP 8.5 scenario. For the average maximum temperature, the increase by the end of the century is projected to reach 2.0-2.1°C for RCP4.5 and 3.5-3.6°C for RCP8.5.

Table 3 below shows the projected anomaly for average daily temperatures in TT Hue under different climate scenarios and comprising different periods. It shows the median of the CCKP multi-model ensemble and figures in brackets show the 10th and 90th percentile respectively.

Table 3. Projected anomaly for average daily temperatures in TT Hue for different periods

Scenario	Projected anomaly in °C for average daily temperature for TT Hue (reference period 1986-2005)			
	2020-2039	2040-2059	2060-2079	2080-2099
RCP2.6	0.87 (-0.22 – 1.61)	1.05 (-0.10 – 1.95)	1.14 (-0.02 – 2.14)	1.15 (-0.05 – 2.03)
RCP4.5	0.90 (-.45 – 1.68)	1.39 (0.06 – 2.28)	1.76 (0.43 – 2.81)	1.92 (0.63 – 3.04)
RCP6.0	0.76 (-0.55 – 1.47)	1.14 (-0.13 – 1.94)	1.65 (0.24 – 2.36)	2.30 (0.88 – 3.15)

[18] All scenarios built for the Third National Communication use a 1986-2005 baseline period. All projections included have the same baseline period unless otherwise stated.

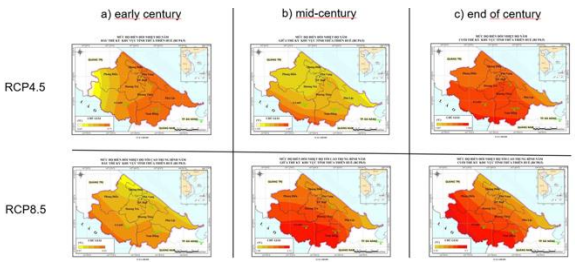
RCP8.5	0.86 (-0.55 – 1.99)	1.70 (0.36 – 2.97)	2.61 (1.00 – 3.90)	3.42 (1.78 – 5.23)

Source: World Bank, Climate Change Knowledge Portal.

Future projections – precipitation

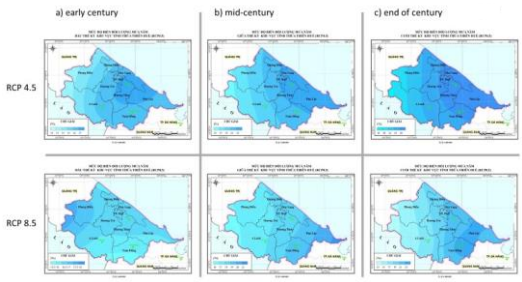
Average annual precipitation is also expected to increase in TT Hue under both scenarios RCP4.5 and RCP 8.5. By mid-century precipitation is expected to increase by 20-35% in TT Hue under scenario RCP8.5. Under the same scenario, rainfall is projected to increase by more than 25-35% in several areas of the province by the end of the century. Under scenario RCP4.5, rain could increase by 15-20% for the mid-century and by 15-25% in vast areas of the province by 2100. The rainfall patterns vary between seasons. While there is a predicted increase in precipitation in the winter season under RCP4.5 and 8.5, the precipitation during the spring season is predicted to decrease in the middle of the century. This trend shifts by the end of the 21st century to an increase for the spring season. The RCP4.5 scenario projects drastic increases for the maximum 1-day and 5-day precipitation. Likewise, the intensity of maximum 1-day and maximum 5-day precipitation is projected to increase under RCP8.5, with an increased rate of 45-90% for maximum 1-day precipitation and 45-65 % for maximum 5-day precipitation in the middle of the century. Sea level rise is also expected. Under scenario RCP4.5 average sea level will be 22.4 cm higher in TT Hue by mid-century and 52.8 cm by 2100, whereas under scenario RCP 8.5 sea level rises are projected of 25.2 cm by 2050 and of 73 cm by 2100 (DONRE, 2020b).

Figure 13. Average annual temperature variation (oC) in TTH under the RCP4.5 and RCP8.5 scenarios



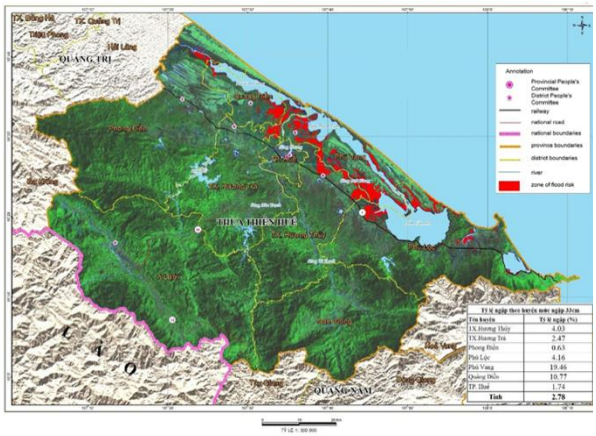
Source: TT HUE Department of Natural Resources and Environment (2020). Developing and Updating Action Plan to Respond to Climate Change in Thua Thien Hue Province in the Period 2021-2030, And Vision To 2050.

Figure 14. Annual rainfall variation (%) in Thua Thien-Hue under scenarios RCP4.5 and RCP8.5



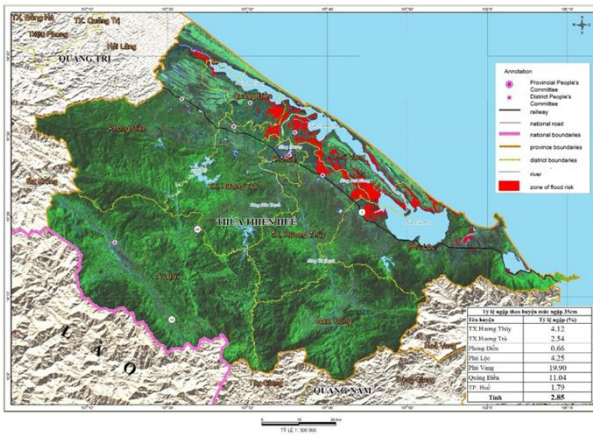
Source: TT HUE Department of Natural Resources and Environment (2020). Developing and Updating Action Plan to Respond to Climate Change in Thua Thien Hue Province in the Period 2021-2030, And Vision To 2050.

Figure 15. Flood risk map for sea level rise in 2050 under the RPC 4.5 scenario in TTH



Source: TT HUE Department of Natural Resources and Environment (2020). Developing and Updating Action Plan to Respond to Climate Change in Thua Thien Hue Province in the Period 2021-2030, And Vision To 2050.

Figure 16. Flood risk map for sea level rise 2050 under the RPC 8.5 scenario in TTH



Source: TT HUE Department of Natural Resources and Environment (2020). Developing and Updating Action Plan to Respond to Climate Change in Thua Thien Hue Province in the Period 2021-2030, And Vision To 2050.

Future projections - Climate hazards affecting critical sectors targeted by the SAP project

At the national and provincial level, climate hazards are also projected to increase under climate change. Heat waves are projected to increase and contribute to chronic heat stress in several regions of the country (World Bank & ADB, 2021). Episodes of drought are expected to increase under scenarios where temperature increase rises above 2.0 to 3.0°C with drought episodes occurring more frequently and drought periods being more prolonged (Naumann et al, 2018 in World Bank & ADB, 2021). Under the RCP4.5 scenario, the average KBDI Index (Keetch-Byram Drought Index) is projected to increase across the whole TT Hue province by the end of the century by 50-70 units, with the largest increase in the A Luoi mountain area (DONRE 2020b). This trend is even more intense under the RCP8.5 scenario, with an increase of 70-90 units by 2100. Overall, the intensification of drought periods seems to be greater in mountainous areas, especially during the summer, compared to other seasons (DONRE, 2020b). With changing rainfall patterns, floods are also expected to increase in occurrence and severity, with analysis estimating that the percentage of the population exposed to floods can increase by 13 to 27% under scenarios RCP 2.6 and RCP 8.5, respectively (Bangalore et al., 2017). Under the RCP4.5 scenario, the projected sea level rise reaching a maximum of 22.4 cm in 2050 would affect about 2.78 % of the area of the TT Hue province with flooding. The Phu Vang district has the highest flood risk, with an inundated area of about 5,413 ha (19,46 % of the total area). Under the RCP8.5 scenario, approximately 2.85% of the TT Hue province would be at risk of being flooded (DONRE, 2020b). Heavy rainfalls are projected to also contribute to the occurrence of landslides (MONRE, 2019). Under a changing climate, as projected under scenarios RCP 4.5 and RCP 8.5, the incidence of saltwater intrusion is also expected to increase (MONRE, 2019). Last, Vietnam may experience an increase in the

frequency and intensity of severe storms and tropical cyclones (World Bank & ADB, 2021). While the way in which climate change may interact with cyclones is not known with a high degree of certainty, some analyses project a reduced overall frequency of cyclones but an increased frequency and intensity of the most extreme events (World Bank & ADB, 2021).

2.3. Climate change impacts, risks, and vulnerability

Climate change will continue having adverse impacts on livelihoods as well as on the ecosystems on which those livelihoods depend, making Vietnam, according to the World Bank (2021), one of the 5 countries that will be most affected by climate change. This will have disproportionate effects on particularly vulnerable persons, including poor men and women, in the project area.

Coastal zones and the people and ecosystems therein will be increasingly negatively impacted by climate change. Sea level rises of above 50cm, as projected to occur by 2100 under RCP 4.5 and RCP 8.5, would expose more than 8% of the natural vegetation area in coastal zones to risk of flooding (MONRE, 2019) and would put economic activities responsible for circa 2.4% GDP at risk of inundation (Neumann et al 2015 in World Bank & ADB, 2021). Saline intrusion and coastal erosion are also factors that will be exacerbated by climate change and will negatively affect coastal zones and communities.

Several climate stressors – high temperatures, droughts, floods, and saline intrusion – will adversely impact the agricultural sector, especially food crops (World Bank & ADB, 2021). For instance, rice production is projected to have yield reductions in the range of 5-10% by 2040 under scenarios RCP 4.5 and RCP 8.5. In TT Hue, long-lasting extreme temperatures can be detrimental to the growth and yields of the agricultural sector, with rice being particularly sensitive. Under high temperatures in the dry season during mid-day, the leaves can be damaged, seeds can be much degraded, and infertility can be increased as a result of the excessive heat. Low temperatures can affect the germination and the growth rate of seedlings.

Another consequence of the rising temperature is the increasing density of plant pests and diseases. The resilience of plants and animals decreases, making it more difficult to fight insects and fungi. This can result in increasing annual costs by tens of billions of dong for pesticides while productivity is still reduced, but environmental pollution increases (DONRE, 2020b). Projected sea level rises will also have negative impacts on the agriculture sector by reducing the area of agricultural lands in coastal areas via saltwater intrusion and by reducing the quality of water for crop production (MONRE, 2019). This will adversely impact ~34% of the working population (and 38% of the female working population)[19] that are employed in the agricultural sector.[20] Furthermore, the climatic changes in precipitation intensity, duration, and intensification of extreme temperatures will alter the water management for crops used as fodder for livestock. The increase in temperature rapidly reduces the quality of forage crops on

19 World Bank Data Bank. 2021. Employment in agriculture, female. Available online: https://data.worldbank.org/indicator/SL.AGR.EMPL.FE.ZS?locations=VN

20 Vietnam General Statistics Office - https://www.gso.gov.vn/en/px-web/?pxid=E0239-40&theme=Population and Employment. Accessed 1 October 2021.

grasslands, impacting the well-being of livestock. Hence, the vulnerability to dangerous outbreaks of diseases is likely to increase.

The aquaculture sector will also continue to be negatively impacted by climate change. An increase in temperatures affects the growth and development rates of fish and aquatic products for both fisheries and aquaculture (MONRE, 2019). FAO (2018) estimates that the catch potential in Vietnam will be reduced by 6.7% and 11.7% by mid-century under scenarios RCP 2.6 and RCP 8.5, respectively. Higher temperatures are estimated to create economic impacts of USD 19.5 million per year for the aquaculture sector until 2050 relative to a 2012 baseline (MONRE, 2019). Changes in rainfall patterns are also projected to negatively impact the aquaculture sectors by 2050 by circa USD 2.6 million. In addition, extreme weather events and storms can adversely impact the aquaculture sector through direct impacts and damage to aquaculture infrastructure. Storms are projected to have annual economic impacts in the North Central Region of USD 2.6 million for aquaculture by 2050 relative to a 2012 baseline (MONRE, 2019). Further, sea level rise is expected to negatively affect the sector, with a projected rise of circa 22 cm under RCP 4.5, reducing the area with available freshwater for aquaculture by circa 1 million hectares (relative to a 2004 baseline) (MONRE, 2019).

In TT Hue, climate change also poses a risk for ecosystems. Changes in precipitation patterns, temperature, and sea level rise due to climate change will increase the vulnerability of ecosystems and the ecosystem services they provide (MONRE, 2019). These risks are exacerbated by human and development drivers such as the overutilization of groundwater, land use change, including the removal or degradation of coastal forests and other forest ecosystems, and unplanned urban development (Erban et al 2014, in World Bank & ADB, 2021). Extreme heat creates a higher risk of forest fires, which can be exacerbated by human activities such as burning vegetation, incense rituals, and the use of votive items. The province has experienced over 330 forest fires over the last 10 years affecting over 1,000 hectares, most concentrated in the Phong Dien, Huong Thuy, and Huong Tra districts.[21] Increased precipitation, including intense precipitation events and flooding, may contribute to further erosion and landslides (where slopes have been cleared for competing land uses), while droughts and increased temperatures will lead to further saline intrusion in the lagoon and in soils, a phenomenon which can be further compounded by sea level rise which will affect the availability of freshwater for human consumption and agricultural activities (DONRE, 2020a). Climate change-related damages and losses in key sectors in the region, notably agriculture and aquaculture, will have increasingly drastic adverse impacts on local livelihoods, as close to 20% of the rural population in TT Hue is employed in these sectors.

2.4. Climate change vulnerability assessment at the commune level in TT Hue

During the development of the feasibility study, it became known that some of the communes within the target districts would be merged into Hue City as part of the wider transition for Hue

[21] Statistical data from the Sub-department of Forest Protection, 2023

to become a centrally governed municipality by 2025 or reallocated to other districts. A rapid vulnerability assessment, based on earlier collected primary and secondary data, was undertaken to identify the most vulnerable communes across all communes for prioritized project interventions. The two mountainous districts of A Luoi and Nam Dong were excluded from the analysis, as requested by the Department of Planning and Investment (DPI) given high volumes of finance and development projects targeting the area.

The assessment carried out determines the vulnerability of each commune based on three key determinants: exposure, sensitivity, and adaptive capacity (as guided by the IPCC's definition of vulnerability)[22]. It included seven major components: climate variability, hazards, socio-demographic profile, livelihood activities, natural resources, human resources, and social resources. This was measured by 46 indicators. The assessment is included in full in appendix A.

The assessment shows that 69.5% of wards and communes in the province can be categorized as highly vulnerable. Based on this assessment and in consultation with DPI, it was decided that the project focus should concentrate on Huong Tra, Phong Dien, Quang Dien, and the most vulnerable communes of Huong Thuy, as some areas in that district will be absorbed by Hue City and some will be passed onto Huong Tra.

In terms of vulnerability in the project target area, Quang Dien stands out, with 9 of its 11 communes being assessed as highly vulnerable or very highly vulnerable, followed by Huong Thuy and Huong Tra, both 7 of their 10 communes assessed as highly vulnerable, and Phong Dien, where 11 out of its 16 communes are considered highly vulnerable (see Table 4).

District/City	Total No. communes/wards	Vulnerability level			
		Low	Moderate	High	Very high
Huong Thuy	10	3	0	7	0
Huong Tra	10	1	2	7	0
Phong Dien	16	0	5	11	0
Quang Dien	11	1	0	9	1

Table 4. Aggregate results of vulnerability assessment at the commune level in the project area

The level of vulnerability at the commune is shown in Figure 17. The full report can be found in appendix A.

[22] Give data limitations, the assessment followed the guidance from AR4.

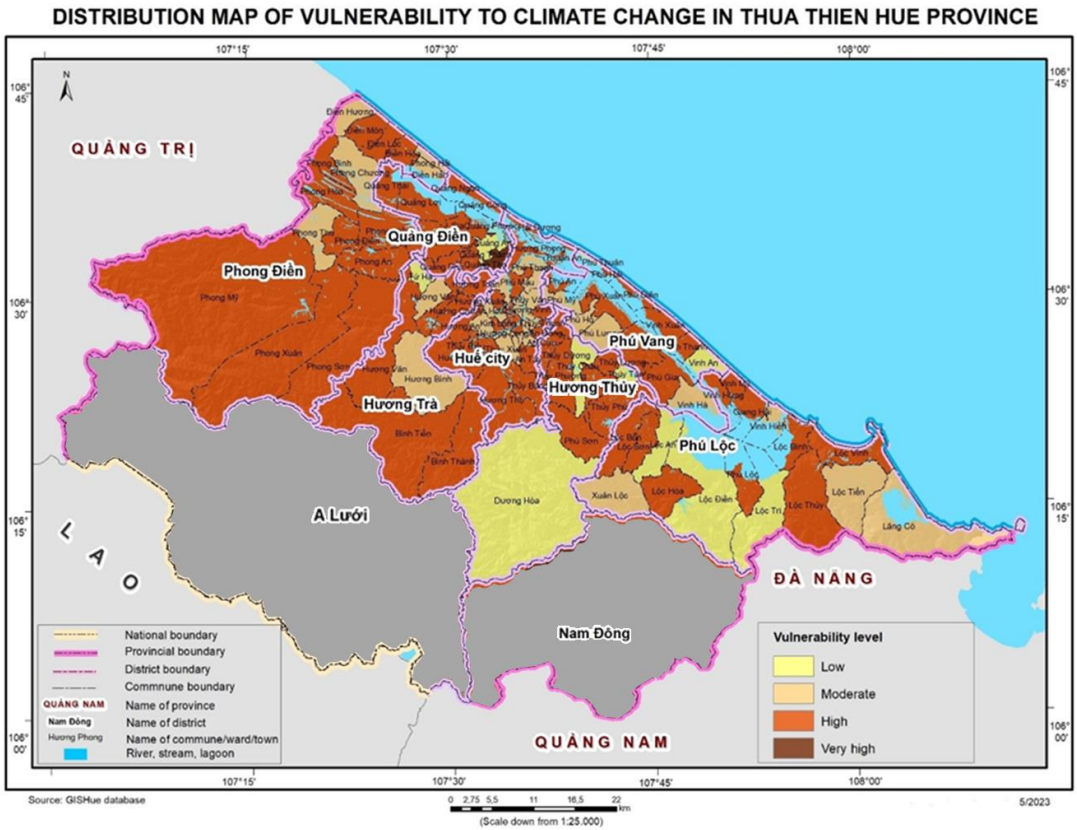


Figure 17. Distribution map of vulnerability to climate change in Thua Thien Hue Province

3. Institutional, Policy, and Regulatory Framework

3.1. Institutional framework

The table below provides a brief overview of the public institutions relevant to climate change and natural resources as well as the implementation of the GCF project at the national level and in TT Hue.

Table 5. Overview of relevant institutions

Organization Name	Jurisdiction Level	Role	Role in the project
Ministry of Planning and Investment (MPI)	National	The Ministry of Planning and Investment is the National Designated Authority of Vietnam to the Green Climate Fund	MPI will be a member of the Project Steering Committee and support the project with strategic guidance and direction.
Ministry of Natural Resources and Environment (MONRE), Department of Climate Change (DCC)	National	Responsible for climate change policy development, implementing international agreements, and coordinating climate change mitigation and adaptation efforts.	MONRE will be a critical partner for replicating the province's adaptation M&E system
Vietnam Environment Administration (VEA)	National	Operates under MONRE, responsible for environmental protection, pollution control, and climate change response.	
Ministry of Agriculture and Rural Development (MARD)	National	Develops and implements policies and programs aimed at climate-resilient agricultural practices and sustainable rural development.	
National Committee on Climate Change (NCCC)	National	High-level coordinating body, chaired by the Prime Minister, overseeing climate change policy implementation, and coordinating national and international efforts.	
TT Hue Provincial People's Committee	Provincial	Political oversight of all government agencies.	It has been a project owner of previous Luxembourg funded climate adaptation projects. It will play similar role in this project.
Department of Natural Resources and Environment (DONRE) – Hue Province	Provincial	Implements MONRE policies and programs at the provincial level, coordinating with local authorities on	DONRE is a key partner for activity 2.2 focused on climate change adaptation monitoring.

		climate change mitigation and adaptation efforts.	
Department of Agriculture and Rural Development (DARD) – Hue Province	Provincial	Implements MARD policies and programs at the provincial level, focusing on climate-resilient agriculture and rural development.	DARD is a key partner for activity 4.1.1 under output 4 on climate resilient agriculture and for forest based EbA interventions under output 3.
Department of Planning and Investment	Provincial	DPI is responsible for devising and coordinating development plans, overseeing investments and resource allocation between different sectors and provincial departments.	DPI is a key project partner. It was the project counterpart agency of previous LuxDev projects in TT Hue, the host of the provincial project management board (PPMB), and key member of the project steering committee.
TT Hue provincial Commanding Committee for natural disaster prevention, control, search and rescue	Provincial	Falls under DARD and consists of senior staff of all relevant government agencies, and supports the provincial P.C in implementing the policies and activities of natural disaster prevention, control, search and rescue in TT Hue province	Key implementing partner for activity 1.1 under output 1 on Early Warning System (EWS).
National Institute of Medicinal Materials (NIMM)	National	NIMM belongs to Ministry of Health (MoH) advising the MoH on the development of medicinal herbs; modernizing traditional medicine research; organization of production, business and joint venture and association in the production and trading of herbal ingredients, drugs and other preparations from herbal ingredients.	A key partner for transferring and certification of GACP-WHO for the production of the key medicinal herbal plants (Melaleuca Cajuputi)
Sub-Department of Forest Protection P-FPD, TT Hue	Provincial	P-FPD belongs to DARD, helping the Director of the DARD and to advise the Provincial People's Committee to perform the specialized state management functions in forestry and organize the enforcement of the law on forest protection, and forest development	Implementing partner for activity 3.1, to guide and inspect the implementation of project activity on forest restoration, zoning and promotion of forest regeneration.
Agribank	National/Province	Agribank is the largest and most important commercial financier for agriculture and rural development with an	Agribank is a key project partner for activity 4.2.1 and for the LuxDev parallel

		outstanding portfolio of circa VND 8000 billion (USD 340 million), which constitutes 65% of the Agribank portfolio	finance project "Fostering climate-smart agriculture financial and non-financial services in Vietnam by improving Agribank services to smallholder farmers especially women" which the GCF funded project aims to scale.

3.2. Relevant policies and regulations

3.2.1. National and TT Hue priorities for climate change adaptation

Vietnam recognizes the urgency of adapting to climate change, and has increasingly strengthened its policy framework to facilitate climate change action:

In 2021, Vietnam adopted the country's 5-year Socio-Economic Development Plan 2021 - 2025, where one of the general objectives is to focus on environmental protection and respond effectively to climate change. The plan outlines key climate change adaptation actions, including: the promotion of climate resilient agriculture; the modernization and climate proofing of infrastructure; improving monitoring and response capacity to climate change; and the need to focus on preventing and mitigating the impact of floods, landslides, and saltwater intrusion.

Vietnam's updated (2022) Nationally Determined Contribution (NDC) to the United Nations Framework Convention on Climate Change (UNFCCC) identifies the need for strengthening the management capacities and resources of stakeholders; supporting the integration of climate change into the country's policies and plans; enhancing the protection of coastal areas; and developing mechanisms for businesses to invest in climate change adaptation. The NDC also highlights the need to enhance the resilience of ecosystems, including through the implementation of ecosystem-based adaptation approaches. Its strategic tasks further emphasize the need to strengthen capacities for climate change monitoring, forecasting warning and information dissemination to enable climate change adaptation.

The country's 2020 National Plan on Climate Change Adaptation 2021 - 2030, with Vision towards 2050 includes the following priorities: the strengthening of climate change adaptation effectiveness through enhancing state management on climate change, improving the adaptive capacity and resilience of communities, reducing natural disaster risks and damages, and improving capacities to respond to natural disasters and extreme climates derived from climate change.

At the provincial level, TT Hue's 5-year Socio-Economic Development Plan 2021 - 2025 outlines the need to proactively address climate change and to prevent and control natural disasters. The plan foresees the strengthening of awareness raising amongst stakeholders on disaster prevention and proactive responses to climate change. It also aims to mobilize resources

and prioritize investments for climate change adaptation and to work on enhancing capacities for enabling climate change adaptation in the agricultural sector.

TT Hue's Climate Change Action Plan 2021 - 2030, vision 2050 aims to prevent and mitigate the impacts of climate change while ensuring sustainable development and protecting lives. The plan identifies key sectors for climate change adaptation; amongst them agriculture, forestry, and fisheries within which key solutions are highlighted. Climate change adaptation priorities in the agriculture sector are to minimize the impact of climate change on the supply of water for agriculture; adopting climate-sensitive farming measures that protect arable land and soil fertility; adopting plant varieties adapted to climate change; enhancing agricultural extension services; and implementing insurance products that reduce risks to agricultural and livestock production. The plan also promotes interspersed aquaculture and transitional farming, with the aim of harmonizing mangrove plantation with the livelihoods of people dependent on fisheries. Key priorities for the forestry sector relate to strengthening the management and protection of forestry land area by selecting tree species suitable to changing natural conditions, promoting agroforestry models, including models combining aquaculture in mangrove forest areas; working with drought tolerant varieties suitable for sand dunes to reduce flying sand and restoring degraded forests.

Table 6 provides an overview of the main relevant policies and plans for climate change adaptation.

Table 6. Relevant policies and plans for climate change adaptation

Policy document	Specific contents on climate change adaptation
National Strategy on Climate Change until 2050 - MONRE, Decision No. 896/QD-TTg, dated July 26, 2022	The strategy aims for effective adaptation to climate change through the reduction of vulnerability and damage caused by climate hazards. It underlines the need to build resilient communities, prioritizing the integration of climate change adaptation into provincial and local development plans. It emphasizes measures such as coastal forest restoration, improving forecasting capabilities, and developing resilient infrastructure, especially in vulnerable areas like the Mekong Delta, coastal, and mountainous regions.
Vietnam Green Growth Strategy (2021-2030) with vision towards 2050 - MPI, Decision No. 1658/QD-TTg, dated October 01, 2021	This strategy promotes the conservation and efficient use of natural resources, strengthening the resilience of ecosystems, especially (coastal) forests, wetlands, and water resources. It calls for investments in climate-smart agricultural systems and infrastructure adjustments for climate resilience.
National Climate Change Adaptation Plan for 2021 - 2030 Period with a Vision by 2050 – MONRE, Decision 1055/QD-TTg, dated July 07., 2020	The general objectives of the NAP are to reduce vulnerability and risks from climate change impacts through strengthening resilience and adaptation capacity, implementing climate commitments under the NDC. Specifically, it aims at mainstreaming CC-adaptation into the country's planning efforts, increasing public investments and reducing disaster risks. Agriculture and infrastructure play crucial roles for the NAP targets.
Five-year Socio-economic development plan for the period 2021-2025 – NA, Strategy 16/2021/QH15, dated July 27, 2021	In relation to climate change, the SEDP 2021-2025 encourages the development of ecological, organic, and climate-smart agriculture; the modernization/climate-proofing of key infrastructure along the central coast of Vietnam; and the improved monitoring of climate change

Decision on approval for a scheme on setting out tasks and solutions for the implementation of outcomes of COP26 – MONRE, Decision No. 888/QD-TTg dated July 25, 2022	Undertake climate change adaptation and natural resource and ecosystem restoration consistently and efficiently. Specifically, it aims to develop ecological, low-carbon and climate-smart agriculture; ensure protection, conservation, and sustainable use and development of forests; undertake investments in the development of climate-resilient infrastructure; and improve capacity to monitor, forecast and warning on hydro-meteorological hazards and disasters.
Decision on approving a National System of Monitoring and Evaluation of Climate Change Adaptation Activities – MONRE, Decision 148/QD-TTg, dated July 28, 2022	This document promulgates a national monitoring and evaluation system for climate change adaptation activities. Outlined M&E contents include mitigation of natural disaster risks, minimizing damage caused by climate change; resources for climate change adaptation; as well as strengthened resilience and adaptative capacities in various sectors, including agriculture, forestry, environment and infrastructure.
Law on Environmental Protection – MONRE, Law 72/2020/QH14, dated November 17, 2020 including Decree 08/2022/ND-CP dated January 10, 2022, and Circular 02/2022/TT-BTNMT, dated January 10, 2022, both detailing articles of the Law	Besides laying the foundation for a national emission trading scheme and carbon market, the LEP aims to contribute to climate change adaptation efforts through various measures, such as improved infrastructure planning, forecasting, increased monitoring efforts as well as a stronger focus on Ecosystem-based Adaptation measures.
Vietnams Forestry Development Strategy for the period 2021 – 2030 with a vision to 2050 – MARD, Decision 523/QD-TTG, dated April 01, 2021	Beyond promoting sustainable forest management, the VFDS clearly recognizes forests' role in climate change adaptation – and the need for enhanced forest quality (in both uphill and coastal areas) to fulfil this role. It recognizes forests' roles in watershed protection, as storm barriers and preventing land degradation, providing livelihoods, thereby fostering both ecological and community resilience. A specific solution is the use of high-quality seedlings and nurseries to ensure successful forest restoration efforts.
National REDD+ Action Program (2017-2030) - MARD, Decision No. 419/QD-TTg, dated April 05, 2017	A significant part of REDD+ is enhancing forest carbon stocks, which can improve ecosystem resilience against climate change effects. The program also highlights community-based forest management and promoting sustainable livelihoods that are resilient to climate change for forest-dependent communities. Enhancing forest quality and coastal forest restoration play key roles in the NRAP.
Strategy for Sustainable Agriculture and Rural Development for the period of 2021-2030, Vision to 2050 – MARD, Decision No. 150/QD - TTg on January 28, 2022	This Strategy aims to promote low-carbon and climate-smart agriculture practices and promotes the production of high-value, diversified products of specific local origin along the respective value chains and in accordance with market demands. It further aims to enhance farmers capacities as well as their access to finance.
Strategy on Crop Production Development (2008-2020) - MARD, Resolution No. 53/NQ-TW, dated August 02, 2012	This strategy encourages research into and adoption of climate-resilient crop varieties, with training for farmers on techniques that conserve water and soil, reducing vulnerability to drought and erosion. It also promotes crop diversification as an adaptive measure against climate uncertainties.
Master Plan for Coastal Forest Development and Protection in Response to Climate Change and Green Growth for	The plan focuses on restoring and conserving coastal forests that serve as natural barriers against sea-level rise, storm surges, and coastal erosion – it specifically sets

2021-2030 - MARD, Decision 1662/QD-TTg dated October 04, 2021	targets for restoration and protection of coastal sand dune forests as well as the use of native tree species in restoration efforts. It also fosters community participation in forest management and disaster risk reduction, boosting local adaptive capacities.
National Action Plan on Sustainable Production and Consumption (2021-2030) – MOIT, Decision 889/QD-TTg. June 24, 2023	This plan identifies areas of resource scarcity and promotes sustainable consumption to ensure long-term resilience. It integrates adaptation considerations in sectors such as agriculture, aiming to minimize resource depletion and reduce vulnerability to climate impacts by promoting organic and climate-smart agriculture models.
Strategy for Sustainable Development of Vietnam's Marine Economy (2018-2030) - MPI, Resolution No. 36/NQ-CTW, dated October 22, 2018	This strategy seeks to enhance the resilience of marine and coastal ecosystems by promoting sustainable fishing practices, establishing marine protected areas, and developing early warning systems for marine and coastal extreme events, ensuring that marine-dependent & coastal communities can adapt to changing climate conditions.
Action Plan for the Implementation of the Paris Agreement (2016-2030) - MONRE, Decision No. 2053/QD-TTg, dated October 28, 2016	In line with the adaptation goals of the Paris Agreement, this plan focuses on application of vulnerability assessments, the formulation of sectoral and local adaptation plans, and the development of adaptive capacities in sectors like agriculture, water resources, and coastal regions.
Circular on Environmental Impact Assessment - MONRE, Circular No. 27/2015/TT-BTNMT, dated May 29, 2015	The circular mandates that environmental assessments for investment and infrastructure projects factor in potential climate change impacts. It ensures that planned developments are adaptable to future climatic shifts and are equipped to handle extreme events.
National Strategy on natural disaster prevention through 2030 - MONRE, Decision No. 48/2014/QD-TTg, dated March 17, 2021	Defines objectives, priorities, and solutions for disaster risk management in the context of intensified challenges posed by climate change. Guides specific infrastructure measures for disaster prevention and control.

3.2.2. Agriculture policies

Since 2008, there has been a shift in emphasis from extensive development of agriculture based on quantity to one focused on quality and efficiency improvements. Vietnam has embarked on an agricultural transformation track, shifting from resource-intensive to technology-intensive agricultural growth with greater resilience to climate change. On climate change, in March 2020, MARD approved its Plan to implement the Paris Agreement on Climate Change for the period of 2021 - 2030 (Decision No. 891/2020/QD-BNN-KHCN). The decision sets out the tasks for the sector to implement the government's 2016 action plan for implementing the Paris Agreement. The government promulgated the National Climate Change Adaptation Plan for 2021 - 2030, with a Vision to 2050 (Decision No. 1055/2020/QD-TTg), which aims to minimize vulnerability and risk of climate change impacts by strengthening the adaptability of the community, economic sectors – including agriculture – and ecosystems. Adaptation needs in the agricultural sector include improving the resilience of the agricultural sector through revising and completing laws and policies as well as providing training and improving capacities. This includes adjusting farming plans, arranging crop structures and scaling-up appropriate models for improving the effectiveness of agricultural land use and climate change adaptation,

and improving the resistance of plants and livestock to disease and pests under climate change impacts.

The 16th Party Congress of TT Hue province held in October 2020 for the 2020 – 2025 term, set out the direction of agricultural development towards commodity production for increased productivity, quality, and value of agricultural products. This includes, prioritizing the development of high-tech agricultural production, organic agriculture, linking with value chains, associating with consumption markets, and adapting to climate change. The PM Decision No. 1819/QD-TTg outlining the Agricultural Restructuring Plan, aims to accelerate agricultural transformation and modernization building on the lessons of the first five years of its implementation. However, major barriers to transformation remain (IFC, 2019).

3.2.3. Forestry plans and policies

Decision 523/QD-TTg by the PM, dated April 1st, 2021, approved Vietnam's Forestry Development Strategy (VFDS) for the 2021-2030 period, with a vision toward 2050. Specifically, the strategy focuses on achieving a modern, effective, and highly competitive economic-technical forestry sector by 2050, bringing potential and advantages of tropical forest resources into full play. Under the strategy, Vietnam seeks to become one of the world's leading manufacturing and trading centres for timber products, while, in parallel, acknowledging the crucial role of Special Use and Protection Forests and the need to increase forest quality throughout all three types of forests. Scientific and technological applications are expected to contribute up to 30% of forestry growth value. To implement the VFDS, the Vietnamese government has issued Resolution No. 84/NQ-CP and Decision 809/QD-TTg, providing policies for implementation of the sustainable forest development programme in the 2021-2025 period. These legal frameworks aim to reduce greenhouse gas emissions and contribute to the implementation of Vietnam's net-zero by 2050 commitment by reforestation and forest restoration efforts throughout the country.

To materialize its' goals, the programme set a series of tasks including forestry protection, conservation of biodiversity of forest ecosystems, development of forests, improvement of forest productivity and quality, sustainable forest management, and enforcement of forest certifications for planted production forests.

To support implementation of the VFDS and SFM programme 2021-2025 in the forestry sector, MARD is in the process of formulating a Decree on policies for forestry investment which will replace a number of earlier Decisions and Decrees (Decision No. 38/2016/QD-TTg, Decision 24/2012/QD-TTg, Decree No 75/2015/ND-CP, Decree No 119/2019/ND-CP, Circular 15/2019/TT-BNNPTNT, etc.). The new decree provides the principles, criteria to support protection, development and biodiversity conservation of forests including investment support for silvicultural infrastructure.

Besides the VFDS, the Master Plan for Coastal Forest Development and Protection in Response to Climate Change and Green Growth for 2021-2030 (Decision 1662/QD-TTg dated October 04, 2021) is another key document, aiming to restore and conserve close to 40.000 ha of coastal forests (sand dune forests & mangroves) throughout the country, acknowledging

their crucial rule in climate change adaptation, by shielding coastal areas from increasingly extreme weather events, particularly typhoons.

3.3. The Early Warning System (EWS) in TT Hue province

The United Nations defines an Early Warning System (EWS) as an integrated framework encompassing hazard monitoring, forecasting, prediction, disaster risk assessment, communication, and preparedness activities. This system enables individuals, communities, governments, businesses, and others to take timely actions, reducing disaster risks ahead of hazardous events. An EWS serves as a vital mechanism that alerts individuals and communities at risk to the potential dangers posed by natural disasters. To achieve effectiveness, EWSs hinge on the active and direct involvement of at-risk communities, emphasizing public education, awareness of climate-hazard risks and consequences, efficient dissemination and communication of forecasting messages, and the formulation of effective emergency response and preparedness plans for early action. Consequently, the efficacy of an EWS is gauged by its ability to perform its four core functions seamlessly: risk knowledge, monitoring and warning, dissemination and communication, and response capability.

3.3.1. Description of the existing EWS

The following sections describes TT Hue's current EWS system across the different categories of a what a multi-hazard impact based EWS should have. Namely: Institutional arrangements; earth data observation; data and information collection; hazard detection; hazard assessment; impact-based forecasting; warnings; dissemination methods; risk communication; and community response.

3.3.1.1. Institutional arrangement for EWS

EWSs are crucial for mitigating potential impacts on individuals, communities, and organizations arising from natural disasters. Early warning activities play a pivotal role in the prevention and control of such disasters. The Government of Vietnam, through Decree No. 66/2021 issued on July 6th, 2021, mandates the establishment of Steering Committees (SCs) for natural disaster prevention, control, search, and rescue at all administrative levels—national, provincial, district, and commune.

The Provincial Steering Committee and its Standing Office for Disaster Prevention, Control, Search, and Rescue were instituted by provincial P.C. Decision No. 1893/QD-UBND on September 22, 2014, and further consolidated by provincial P.C. Decision No. 1877/QD-UBND on August 11, 2016. The committee is entrusted with ten tasks outlined in compliance with the provisions of GOV Decree No. 66/2021:

1. Advise and assist the provincial People's Committee in natural disaster prevention and control tasks as per the Law on Natural Disaster Prevention and Control.

2. Direct and oversee the formulation and submission of response plans for natural disasters.
3. Command the response, search, and rescue efforts during natural disasters.
4. Inspect and encourage local departments and agencies to carry out natural disaster prevention and control tasks.
5. Assist the Provincial People's Committee in directing, inspecting, urging, and compiling damage assessment statistics, determining support needs, and implementing post-disaster remedial and reconstruction work.
6. Manage the natural disaster prevention and control fund in accordance with regulations.
7. Organize training, rehearsals, and provide technical training for forces involved in natural disaster prevention and control, as well as search and rescue activities.
8. Conduct awareness campaigns to inform the public about natural disaster prevention and control.
9. Direct and organize effective solutions to enhance civil capacity in disaster response activities gradually.
10. Mobilize human resources, equipment, and develop supporting tools for the Standing Office of the Provincial SC, maintaining online connectivity with national and local disaster prevention and control agencies to facilitate direction, command, and control of natural disaster prevention and control efforts.

TT Hue Provincial Steering Committee's Decision No. 115/QĐ-PCTT, dated August 2, 2022, outlines its 44 members, with the provincial People's Committee chairman serving as the SC Head. The standing deputy head is a vice-chairman of the People's Committee, and four deputy heads include directors of DARD and the Department of Public Security, along with chief commanders of the provincial military headquarters and border military forces. Other members comprise directors and heads of relevant provincial agencies and organizations.

The assignment of tasks to the Provincial Steering Committee for Natural Disaster Prevention and Control and Search and Rescue members is detailed in Notice No. 90/TB-PCTT, dated August 27, 2016, by the Provincial Steering Committee. The Standing Office of TT Hue Provincial Commanding Committee is situated at the DARD Sub-Department of Irrigation.

TT Hue Provincial People's Committee has established a regulatory framework to respond to natural disaster risks, as summarized in the table below:

Table 7. Framework to respond to natural disasters

TT	Plan/Action Plans	Decisions /approval time	Advisory Agencies
1	Plans to respond to strong storms and super storms	No. 1088/QD-UBND dated June 15, 2015	Department of Agricultural and Rural Development

2	Plan to respond to natural disasters like storms, tropical depressions, floods, flash floods, pipe floods, and landslides	No. 1343/QD-UBND dated June 21, 2018	Department of Agricultural and Rural Development
3	Plan to respond to earthquake and tsunami incidents	No. 149/KH-UBND dated September 28, 2016	Department of Agricultural and Rural Development
4	Plan to implement the Master Plan for Incident and Disaster Response and Search and Rescue until 2020 in Thua Thien Hue province	No. 2711/QD-UBND	Provincial Military Headquarter
5	Plan to respond to particularly serious incidents of ship and boat accidents at sea, aircraft accidents, and especially serious road, rail, and inland waterway accidents	No. 3066/QD-UBND dated December 2, 2016	Provincial Military Headquarter
6	Plan to respond to collapse incidents in open-pit mines and underground mineral extraction mines	No. 134/KH-UBND dated September 5, 2016	Provincial Military Headquarter
7	Responding to incidents of collapsed buildings and high-rise buildings	No. 1955/QD-UBND dated August 22, 2016	Department of Construction
8	Natural disaster response plan according to natural disaster risk level	No. 2260/QD-UBND dated September 28, 2016	Department of Agricultural and Rural Development
9	Irrigation planning of Thua Thien - Hue province to 2025 and vision to 2035	No. 01/2018/QD-UBND dated January 8, 2018	Department of Agricultural and Rural Development
10	Integrated flood management plan (IFMP)	No. 1933/QD-UBND dated August 18, 2016, and No. 14/QD-UBND dated January 5, 2012	Department of Agricultural and Rural Development
11	Action plan to proactively respond to climate change, strengthen resource management and environmental protection	No. 962/QD-UBND dated May 13, 2014	Department of Natural Resources and Environment
12	Plan for natural disaster prevention, control, search and rescue in TT Hue province for the period of 2020-2025	No. 2365/QĐ/UBND dated September 11, 2020	Department of Agricultural and Rural Development

At the district level, Steering Committees (SCs) for natural disaster prevention, control, search, and rescue are established, with the district People's Committee chairman serving as the head and a vice-chairman as the deputy head. The committee comprises members who are leaders of relevant sectoral agencies. As per the Government Decree 06/2021, the district SC is tasked with:

1. Advising and assisting the district People's Committee in effectively carrying out natural disaster prevention and control measures.
2. Directing and urging the development and submission of local disaster response plans for approval, and overseeing the command and organization of disaster response, search, and rescue operations during natural disasters within the district.
3. Conducting training for forces involved in natural disaster prevention, search, and rescue activities.

In addition, district SCs bear the responsibility of organizing activities for disseminating information to enhance public awareness of disaster prevention. These committees adhere to directives outlined in the official telegram issued by the provincial SC for natural disaster prevention, control, search, and rescue in response to emerging natural hazards.

In every commune, the Steering Committee (SC) is established to carry out seven essential tasks, in accordance with the Government Decree 06/2021. These tasks include:

1. Transmitting information on directing and commanding natural disaster response at all levels to the community.
2. Commanding the response to natural disasters, as well as search and rescue operations during natural disasters within the commune.
3. Directing and urging the formulation and approval of local disaster response plans and plans.
4. Inspecting and urging local organizations and individuals to fulfil natural disaster prevention and control tasks.
5. Presiding over and advising the Commune People's Committee (P.C) to establish, organize, train, and maintain a shock force for natural disaster prevention and control at the commune level, with the militia and self-defence forces as the core, and the participation of organizations like the Red Cross, youth union, and other mass organizations in the locality.
6. Implementing activities of the Natural Disaster Prevention and Control Fund.
7. Organizing annual dissemination and communication campaigns to raise public awareness on natural disaster prevention and control.

Additionally, the People's Committee in each commune issues a decision to establish grassroots shock forces, supporting the commune Steering Committee in implementing communication activities and action plans for emergency response, search, and rescue.

Despite the regulatory framework that outlines the scope of work, roles, responsibilities, and interagency collaboration for natural disaster prevention, control, search, and rescue, TT Hue province lacks a concept of operation (document) for early warning systems (EWSs). Specifically, there is no long-term development plan for the provincial EWS as a consolidated system across all levels. This gap in planning and documentation results in limited coordination, and interoperability among EWSs at different levels, leading to a lack of effectiveness.

3.3.1.2. Earth Data Observation

The early warning system (EWS) in TT Hue province currently relies on two networks of hydrometeorological monitoring stations: the national hydrometeorological station network and the local network of hydrometeorological stations with special purposes. The national network, managed by national, regional, and provincial Hydrometeorological Stations, consists of 21 monitoring stations, including 05 meteorological stations, 07 hydrological stations, and 09 rain gauges within TT Hue province. The provincial network, managed by the provincial Commanding Committee for natural disaster prevention, control, search and rescue (provincial CC), comprises 55 automatic rain gauge stations and 05 automatic monitoring stations at coastal areas. Additionally, the network has 28 stations monitoring the water level of irrigation and hydropower reservoirs. The regulations, standardized processes, roles, and responsibilities of all agencies for monitoring techniques, generating forecasting messages, and issuing warnings are established and mandated by laws and legal documents on hydrometeorology and disaster prevention and control.

However, the current system of hydrometeorological monitoring stations in the province faces several difficulties and gaps. According to the Standing Office of TT Hue provincial CC, the existing number of rain gauge stations and specialized hydrometeorological stations is insufficient to meet the needs of hydrometeorological monitoring across the provincial geography. The current monitoring stations primarily assist in collecting hydrometeorological data, proving more useful for forecasting rather than issuing warnings for natural disaster risks. Presently, DONRE is in the process of developing a masterplan to enhance the network of specialized hydrometeorological stations in the province [8], aligning with the existing legal framework. Upon approval and implementation of the masterplan, the identification of additional specialized hydrometeorological stations and their optimal locations will address the current limitations in the system.

Forest fire prevention and fighting constitute key tasks outlined in national legal documents, including Law 11. The TT Hue Sub-Department of Forest Protection, under the Department of Agriculture and Rural Development (DARD), is entrusted with legal functions and tasks related to forest management, protection, development, use, and nature reserves. For early fire warning efforts, the Forest Protection Department of Thua Thien Hue province employs the following systems:

i) Early Fire Warning System at the Forest Protection Department: This system operates on a web platform, utilizing a thermal scanning satellite system to pinpoint fire locations. It effectively warns of forest fire risks based on hydrometeorological data. However, a limitation is that fire point warning information is delayed as it requires processing through a data center. The software, supported by the MARD project on forest fire prevention, is open source and prone to errors. It has not undergone proper upgrades for optimal use. The system relies on heat data from specialized hydrometeorological stations in specific areas, leading to delayed warning messages for forest fires. This system is integrated into the MARD, Department of Forest Protection warning system, limiting the TT Hue Sub-Department of Forest Protection's ability to enhance it.

ii) Thua Thien Hue Province Early Fire Warning Software: This software operates on a web platform through a satellite system scanning thermal backgrounds, sending data to the province's data center for automatic processing. Simultaneously, it connects to the mobile platform to provide fire warning location messages to mobile subscribers identified by the Forest Protection Department. The limitation here is that fire warning information reaches recipients slower than real-time.

To support accurate forest fire forecasting, command, and direct forest fire fighting in the province, the Forest Protection Department has established a center to update hydrometeorological data and calculate results. Daily forecast results rely on manual methodology. Information about forest fire forecast levels is disseminated to the Provincial Radio and Television Station for widespread notification. However, a limitation is that the entire province identifies only three climate zones (A Luoi, Nam Dong, Hue - including delta districts), resulting in relatively accurate forecast information.

3.3.1.3. Data and information collection

The EWS in TT Hue province primarily focuses on collecting data and information essential for forecasting and issuing warnings related to hydrometeorological hazards, including floods, droughts, and storms/typhoons. The provincial Steering Committee for natural disaster prevention, control, search and rescue relies on forecasting and warning data from authoritative sources such as the National Centre for Hydrometeorological Forecasting, VHMA, the Central Middle Regional Hydrometeorological Station, and the provincial Hydrometeorological Station. Additionally, it references data and information from international sources, including the European Centre for Medium-Range Weather Forecasts, the US Navy weather forecast, and the Meteorological Agencies of Japan, the Philippines, and China. Various applications and software tools, such as Windy, Ventusky, Disaster Alert, Zoom Earth, Meteoblue, are employed for hazard detection.

For hazard detection and assessment, the provincial Steering Committee utilizes forecasting results from global models like GEM, GFS, GME, GSM, and NOGAPS from the European Centre for Medium-Range Weather Forecasts (ECMWF) with a prediction period of 15 days. The committee also leverages satellite images from HIMAWARI, including IR, VIS, WV, DUST images. In the case of flash floods and landslides, the provincial committee applies a pilot system developed and tested by the Vietnam Meteorological and Hydrological Administration (VMHA), along with flood forecasting software such as RRI and HEC.

The provincial SC in TT Hue province collects data and information from 55 automatic rain gauge stations, offering real-time rainfall data used for forecasting and warning of heavy rains, floods, and regulating operations of irrigation and hydropower reservoirs. Another 5 automatic monitoring stations at coastal areas provide additional data on rain, wind, temperature, humidity, and air pressure. Data collection for the EWS occurs through two methods: automatic monitoring, where installed systems automatically collect and transmit data to the center, and manual monitoring, temporarily used in areas lacking automatic equipment.

In the manual monitoring process, observers measure and collect data, sending it to the control center via emails, phone calls, or text messages. Supervisors at the center consolidate data from both monitoring systems, creating aggregate monitoring data for all reservoirs, irrigation dams, and hydropower plants. This information is then forwarded to specialized departments and reported to leaders of the management board for natural disaster prevention and control for administrative purposes. However, the combination of these two systems using mixed methods presents several challenges, including time-consuming data collection, processing, and analysis, potential errors from manual steps affecting data quality, lack of synchronization leading to data loss and errors, difficulty in implementing real-time monitoring, challenges in decision-making due to inconsistent, discrete, and stored observed data, and additional workload for synchronizing monitoring data.

The inefficiency of the existing monitoring database management system has resulted in ineffective monitoring and forecasting, negatively impacting early warnings for flood risks in low-lying areas inhabited by at-risk communities.

3.3.1.4. Hazard assessment

Identifying and assessing natural hazard risks and levels of common hazard risks, along with evaluating the impact of climate change on socio-economic activities in localities and sectors, is a key component of the natural disaster prevention plan as prescribed in Clause 4, Article 15 of the Law on Natural Disaster Prevention and Control. Natural hazard risk assessment serves as the foundation for proposing appropriate solutions and measures for natural disaster prevention, control, search, and rescue.

In Vietnam, the assessment of natural hazards is required to comply with the national regulatory framework, including:

i) PM Decision No. 18/2021/QD-TTg dated April 22, 2021, which provides regulations for forecasting, warning, and communication of natural hazards and levels of hazard risks. ii) PM Decision No. 632/QD-TTg dated May 10, 2010, regulating water levels corresponding to flood warning levels on rivers nationwide. iii) MONRE Decision No. 1857/QD-BTNMT dated August 29, 2014, announcing the results of storm zoning. iv) MONRE Decision No. 2901/QD-BTNMT dated December 16, 2016, updating storm zoning to determine storm levels (or wind speed).

TT Hue Provincial People's Committee issued Decision No. 2260/QD-UBND dated September 28, 2016, approving and promulgating the natural hazard response plan by risk levels. This plan establishes a set of criteria for hazard assessment based on five levels of risks caused by natural hazards that may occur in the province area.

In September 2020, the provincial People's Committee promulgated the Plan for natural hazard prevention, control, search, and rescue for the period of 2020-2025 (Decision No.2365/QĐ-UBND). The plan identifies various types of natural hazard events that may occur in TT Hue province, including:

1. Tropical depression, storms;

2. Tornado, thunder, hail, and fog;
3. Heavy rains, floods, flash floods, and inundation;
4. Landslide, land subsidence caused by rain and flood or water flow;
5. Cold spell, heat wave, mist, drought, saline intrusion;
6. Sea level rise and tides;
7. Strong wind at sea;
8. Earthquake and tsunami.

The plan also summarizes the latest assessment results of natural hazard events by levels of risk and impacts by districts and types of natural hazards, as well as the damage caused by natural disasters in the period of 1999-2019.

In compliance with Article 4 of the Regulation issued by PM Decision 18/202, methods for determining risk levels of natural hazard events in TT Hue province include:

i) Classifying natural hazard risks based on intensity, scope of influence, area directly affected, and the ability to cause damage; ii) Determining risk levels for each type of natural hazard event and publishing them along with the content of natural hazard forecast and warning bulletins; iii) Dividing the risk level of each type of natural hazard event into a maximum of 5 levels, associated with specific colours on the maps: Level 1 in light blue (low risk), Level 2 in light yellow (medium risk), Level 3 in orange (high risk), Level 4 in red (very high risk), and Level 5 in purple (catastrophic risk); and iv) Adjusting the risk level of two or more natural hazard events occurring simultaneously or consecutively, increasing it by one more level based on the impact of the natural hazard. In case of a risk of serious damage to people and property, the risk level can be considered to be increased by two levels, with the highest being Level 5. Chapter III of the Regulation, with 15 Articles (Articles 42-56), provides detailed criteria for assessing the risk level per type of natural hazard events.

The provincial SC has not conducted any risk assessment in the last three years. In 2019, a risk assessment was carried out, primarily focusing on evaluating the impacts of natural disasters that occurred in the province. It identified the risk levels of natural hazards and the vulnerability of districts and communes based on qualitative information. However, this risk information was not effectively utilized for impact-based forecasting/warning of hazard risks and response activities due to the assessment relying on hazard, exposure, and vulnerability without incorporating quantitative data for analysis.

In contrast, DONRE is in the process of developing a Monitoring and Evaluation (M&E) system for climate change adaptation. This system collects and stores monitoring data on relevant variables used to assess risks based on the three determinants of hazard, exposure, and vulnerability (sensitivity and adaptive capacity). In 2022, with funding from the Lux Dev project VIE/433, the province implemented a study to assess CC impacts on TT Hue. The study partially utilized data from DONRE's M&E system for climate change adaptation and secondary data from other sources. Conducted by the Center for Climate Change Studies in Central Region (CCCSC) in Hue, this assessment examined climate change impacts on various sectors,

vulnerability, and risks to climate change in districts, towns, and Hue city. The study also employed the Standardized Precipitation Index (SPI) of two scenarios, RCP4.5 and RCP8.5, to forecast and simulate drought and flood in TT Hue province for the period of 2020-2035. The assessment report has been shared with relevant provincial agencies.

3.3.1.5. Regulations on forecasting, warning and communication

The implementation of forecasting, warning, and communication on natural hazards and levels of hazard risks in TT Hue province adheres to the Regulation promulgated under the PM Decision No. 18/2021/QD-TTg dated April 22, 2021. Chapter II of the Regulation comprises 07 Sections with 26 Articles (Articles 8-33), providing detailed stipulations and guidelines for forecasting and warning of each type of natural hazard events. Section 8 of Chapter II, consisting of 8 Articles (Article 34-41), establishes regulations on communication regarding natural hazard events. This includes responsible agencies and organizations for promulgating natural disaster forecast and warning bulletins, the time and method of providing information, and mechanisms for broadcasting/transmitting information on forecasts and warnings for each type of natural hazard event.

Furthermore, Chapter IV, encompassing 5 Articles (Article 57-61), outlines the responsibilities of agencies/organizations and individuals in forecasting, warning, and communication about natural hazard events. Article 60 specifically details the responsibilities of People's Committees at the provincial, district, and commune levels.

3.3.1.6. Dissemination and notification methods

In TT Hue province, forecasts and early warnings regarding the risk levels of natural hazard events are primarily generated by the provincial hydro-meteorological station. However, the advisories on early warnings of natural hazard risks are officially released to the public and local communities by the provincial SC. District and commune SCs are responsible for notifying individuals, organizations, and communities at risk about the statements of forecasts and early warnings. The provincial SC typically employs multiple communication channels to disseminate forecast and warning information to district and commune Commanding Committees and communities at risk. Various suitable communication formats are used in TT Hue province, including the issuance of official emergency dispatches, an interagency specialized network, mass media (TV, Radio), and social media platforms such as Hue-S application, SMS messages, Zalo, and Facebook. These platforms prove to be useful and effective channels for disseminating information on forecasts and early warnings of natural hazard events to local people.

The Department of Information and Communication, a provincial SC member, is responsible for ensuring regularly and smoothly connected radio networks that operate 24/24 between concerned provincial agencies and professional units via an inter-network frequency of 140,600MHz and hand-to-hand communication frequency of 141,550 MHz, and communication via ICOM-HF machine with frequencies of 7963 KHz and 8149KHz. TT Hue VNPT

currently operates the radio network, comprising 11 CODAN machines organized into 02 inter-provincial and intra-provincial networks; 66 KenWood machines organized into 02 intra-provincial and intra-district networks, along with telecommunications stations at the frequency of 143,000MHz; 20 ICOM-2W machines for network mobility; 01 CODAN machine and 01 KenWood machine mounted on the vehicle for manoeuvring. Backup devices for communication in emergency situations for disaster prevention and control are available, including Inmarsat satellite phones (05 units), Vinaphone S (04 units), and VSAT IP information system (05 stations). Additionally, the provincial CC has two satellite phones and 14 satellite phones ready for communication in any situation. The provincial Smart City Monitoring and Operation Center is equipped with 02 Kenwood and ICOM-710 radios, 01 handheld ICOM machine, and 02 fixed and mobile satellite phones to serve the control work of operating and connecting communication with other agencies.

3.3.1.7. Warnings and other infrastructure products

For infrastructure products used for warnings, the EWS in TT Hue province has constructed 60 flood warning towers situated in low-land areas. These towers utilize conventional methods to alert local people in low-land areas about flood risks, based on benchmarks of flood inundation levels. The flood inundation levels marked on these towers rely on water levels from past floods. Consequently, these towers face limitations—they cannot provide real-time risk alerts for ongoing floods to local people, and they cannot offer updated information on the flooding situation in at-risk communities for the provincial CC monitoring centre. This situation impacts the effectiveness of provincial flood monitoring and warning systems, as well as local emergency responses.

The provincial CC recently piloted the application of the smart flood warning system (VFASS) in 04 flood warning towers. The VFASS monitors the level of floodwater in target areas and signals warning sounds to alert local people in at-risk communities. The VFASS electronic water level sensor/radar converts the monitored water level into a signal sent to the data logger device, where data is collected, processed, and standardized. Subsequently, the data is transferred to the SMS/GPRS/3G device, which sends the data to the operating centre via the telecommunications network. In the opposite direction, commands to control the water level monitoring station from the Operations Centre are sent via the mobile network through SMS/GPRS/3G to the monitoring station. From here, the commands are transferred to the Data logger device to process the station's operation configuration according to the received command request from the Operations Centre. The VFASS proves to be a highly efficient and effective technology for early flood warning within at-risk communities. It requires support for replication to build more smart flood warning towers, either to replace existing conventional towers or to install in new locations in the province.

Currently, the EWS in TT Hue province lacks siren towers for early warning. The province requires financial support to build 10 pilot warning towers with high-power sirens located in target areas of districts, towns, and Hue City.

The existing monitoring and warning system for forest fires in TT Hue province primarily relies on a network of 24 fire watchtowers established by the Sub-department of Forest Protection. These watchtowers are strategically located in target areas to provide early warnings for forest fires across five key zones. Each watchtower is staffed with 2-3 forest rangers who are on duty 24 hours a day, using binoculars to surveil and detect potential fires in the designated forest areas.

However, the current system of fire watchtowers has proven ineffective in providing early warnings for potential forest fires. To enhance its functionality, there is a need for strengthening the system through the application of modern surveillance technology and equipment.

3.3.1.8. Risk Communication

The National SC for natural disaster prevention, control, search, and rescue is responsible for the Government notification of the risks caused by natural hazard events. Warnings on risks of natural hazards/disasters are generated by the national centre for hydro-meteorological forecasting (NCHF) but officially released to the public by the National SC for natural disaster prevention, control, search, and rescue. Based on the advisories/statements issued by the National SC, the provincial SC for natural disaster prevention, control, search, and rescue, with the advice from the provincial hydrometeorological station, issues and releases the official emergency dispatch to alert the natural hazard risks and guide on measures to respond to the public and local communities. Based on the provincial SC advisories, the SCs in district and communes have the responsibility to notify early warnings on natural hazard risks to individuals, organizations, and communities at risk via mass media (TV, Radio), local PA system, and social media platforms such as Zalo and Facebook. Grassroots shock forces and village authorities in each commune also assist in notifying the early warning of natural hazard risks to local people. Local people are usually notified early warnings of natural hazard risks in a timely manner to have sufficient time to get prepared to respond to the potential impacts of natural hazard events. Usually, at-risk communities can receive official notifications of early warnings on natural hazard risks about 5-7 days in advance, depending on the type of hazard events, and get further regular updates on a daily or hourly basis. Department of Culture, Sports, and Tourism and Department of Foreign Affairs are responsible to notify early warnings of natural hazard risks to international and national tourists with the support of the hotel facilities and services.

In areas frequently affected by natural disasters like storms and floods, access to information, knowledge, and techniques related to climate change adaptation is crucial for minimizing damage and risks. According to a survey conducted by DONRE as part of its monitoring and evaluation system, most households agree that they regularly receive updated information about climate change adaptation and disaster reduction. The survey indicates that a significant percentage of respondents (85.2%) have access to daily weather forecast information. However, the accessibility levels for information aimed at reducing risks and damage before natural disasters, such as relocation and warning of disaster relocation, range from about 50-60%.

The primary channels through which most households receive updated information on weather forecasts, warnings of natural disasters, landslides, and relocation are the loudspeaker systems of villages and communes/wards, constituting the highest proportion at 83.96%. Following closely is information received through the Local Television Station, accounting for 82.4%. Additionally, a significant portion of information comes from sources such as Zalo, mobile phones, and social networking sites like Facebook, ranging from 33.8% to 44.9%.

Many people in at-risk communities in TT Hue still have limited knowledge and understanding of warnings and risks of natural disasters and therefore do not properly follow guidance on emergency response and do not take response action in a timely manner to mitigate their risk and protect themselves and family (only about 29% having had exposure to such information and 23.8% mentioning that they did not know about the existence of a local EWS according to the DONRE survey). It is crucial that those at risk understand their risks based on early warnings and know how to take appropriate response action. Therefore, the EWS in TT Hue province needs support in facilitating public education and awareness of risks and developing effective risk dissemination and communication systems to ensure that those at risks are warned of impending natural hazard events in an effective and timely manner, well understand their risks, and know how to act.

3.3.1.9. Community connection and response

The TT Hue Plan for Natural Disaster Prevention, Control, Search, and Rescue in TT Hue Province for the Period of 2020-2025 outlines a set of comprehensive stipulations and guidelines for responses to natural hazard events. The most relevant are summarized below:

The TT Hue Plan for Natural Disaster Prevention, Control, Search, and Rescue in TT Hue Province, covering the period 2020-2025, provides a comprehensive framework for responding to natural hazard events. The plan outlines a series of response measures, including timely communication from the Provincial Steering Committee for Natural Disaster Prevention and Search and Rescue, proactive evacuation strategies, permission for school students to be absent during storms, and the implementation of safety measures for critical infrastructure. Additionally, the plan emphasizes the importance of inspection and handling of incidents related to natural disaster prevention and control, along with the urgent mobilization of resources for prompt responses.

The plan outlines the duties of various entities, such as departments, branches, and people's committees, stressing the need for strict duty organization, coordination with local authorities, and readiness to respond to emerging situations. Responsibilities for vehicle owners, boat/ship captains, and fishermen are outlined, including monitoring storm developments, reporting to relevant agencies, and taking safety measures. Residents in local communities are expected to proactively prepare for evacuations, adhere to safety guidelines during floods, and participate in community-based prevention efforts. Accommodation establishments are assigned responsibilities such as proactive reservation of essential supplies, ensuring the safety of tourists, and coordination with authorities for rescue operations during incidents. The plan reflects

a multi-faceted approach involving various stakeholders to enhance the province's resilience to natural disasters.

The provincial plan further formulates specific response measures for distinct types of natural hazard events, including storms, tropical depressions, heavy rains, floods, flash floods, inundations, rising waters, landslides, land subsidence, and other related occurrences.

Organization of responses in accordance with risk levels of natural hazard events

The table below shows the organization of response measures for different risk levels (from 1 to 5).

Table 8. Risk levels and organisation responses

Risk Level	Description of Organization Responses
Level 1	‣ Chairman of the People's Committee and Head of the Commune-level Commanding Committee for Natural Disaster Prevention and Control and Search and Rescue: ○ Direct command and mobilization of on-site resources for prompt response. ○ Mobilization of local resources, including militia, self-defense, police, youth, and volunteer organizations. ○ Coordination of forces under the command of the Chairman of the Commune-level People's Committee. ○ Request for support from higher-level authorities if needed. ‣ Chairman of the People's Committee and Head of the District Steering Committee for Natural Disaster Prevention and Control and Search and Rescue: ○ Direct command and mobilization of resources for level 1 natural disasters in multiple communes. ○ Mobilization of district and commune police, military, militia, youth, and volunteer organizations. ○ Utilization of district-level resources and coordination with local entities.
Level 2	‣ Chairman of the People's Committee and Head of the Steering Committee for Natural Disaster Prevention and Control and Search and Rescue at district and commune levels: ○ Organization of response to level 2 natural disasters. ○ Enforcement of evacuation orders, including forced evacuation if necessary. ○ Chairman of the People's Committee and Head of the Provincial Steering Committee for Natural Disaster Prevention, Control, and Search and Rescue: ○ Direction and mobilization of resources for prompt response to local natural disaster developments. ○ Overcoming consequences and ensuring stability in the aftermath of natural disasters. ○ Mobilization of forces, supplies, and vehicles from organizations and individuals in the area. ○ Reporting and requesting support from higher authorities when needed.

Level 3	‣ Chairman of the People's Committee and Head of the Commanding Committee for Natural Disaster Prevention and Control and Search and Rescue at district and commune levels: ○ Task performance according to authority, considering specific local situations. ○ Compliance with direction and command from superior agencies. ○ Chairman of the People's Committee and Head of the Provincial Steering Committee for Natural Disaster Prevention, Control, and Search and Rescue: ○ Command and mobilization of resources for urgent natural disaster response. ○ Reporting to higher authorities if the disaster exceeds level 3 or poses a serious threat.
Level 4	‣ Chairman of the People's Committee and Head of the Steering Committee for Natural Disaster Prevention and Control and Search and Rescue at district and commune levels: ○ Task performance according to authority, adapting to specific local situations. ○ Compliance with direction and command from superior agencies. ‣ Chairman of the People's Committee and Head of the Provincial Steering Committee for Natural Disaster Prevention, Control, and Search and Rescue: ○ Command and mobilization of resources for urgent natural disaster response. ○ Compliance with the direction of higher authorities.
Level 5	‣ Coordination and responsibilities adhere to the regulatory framework on emergencies, subject to assignment and decentralization of tasks in responding to natural disaster emergencies.

3.3.1.10. Human Resources for Responding to Natural Hazard Events

The strategy for human resources in responding to natural hazard events is well-structured and involves a multifaceted approach. On-site forces, including organizations, households, and individuals, actively participate in natural disaster prevention and control activities. Local militia and self-defence forces play a key role in executing tasks aligned with local plans, overseen by military commanding divisions in TT Hue districts, towns, and the city. The People's Army and People's Police serve as core forces responsible for executing prevention and control tasks, focusing on evacuations, rescues, and maintaining security.

Volunteer organizations and individuals voluntarily contribute to supporting these activities under the guidance of competent authorities. The Provincial Military Command plays a coordinating role, organizing on-site prevention forces, mobile forces, synergistic forces, and reserve forces, ensuring a comprehensive and organized response. Synergistic forces may be requested from the Military Region and Ministry units based on the situation. The Border Guard Command Force, Provincial Police Force, and various supporting units, including youth forces, the Red Cross, and civil defence forces, collaborate to form a diverse network, ensuring a swift and coordinated response to natural hazard events. This approach highlights the importance

of coordinated efforts from a variety of forces to effectively address the challenges posed by natural disasters.

Reserve Supplies, Vehicles, Equipment, and Necessities

Preparedness for natural disasters involves various agencies ensuring they have the necessary resources. The Provincial Military Command has a fleet of vehicles and rescue equipment, while the Border Guard Command is equipped with patrol ships and various boats. The Provincial Police have a diverse set of resources, including life jackets, canoes, boats, and fire trucks.

In terms of necessities, the Provincial People's Committee has directed reserves, including rice, instant noodles, gasoline, diesel oil, kerosene, and bottled water. Residents in remote and flood-prone areas are encouraged to store goods for at least seven days. Safety assurance for health services involves relocating medical facilities, backup generators, plans for food and necessities during facility flooding, and reserves of medicine and equipment at different health centers for immediate use during strong storms.

3.3.1.11. Financial resources for responses

The table below shows the financial resources that are available from different sources for responding to different risks and events.

Table 9. Financial resources available for responding to events

Source	Description
Provincial and Local Budgets:	Provincial and district, town, and city budgets include emergency reserve funds specifically allocated for unforeseen circumstances. These funds serve a crucial role in addressing the immediate needs arising from natural disasters, facilitating prompt responses and recovery efforts. Additionally, the Provincial People's Committee makes annual budget allocations to procure necessary materials, reinforcing the proactive approach to natural disaster prevention and management.
Departmental and Unit Budgets:	Various departments, branches, units, and localities embed financial allocations in their budgets to invest in and equip essential conditions supporting information work related to natural disaster prevention, control, search and rescue. Following the principle of "four in place," these budgetary provisions aim to ensure readiness and effectiveness in managing natural disaster-related challenges.
Natural Disaster Prevention and Control Fund:	In December 2021, the TT Hue provincial People's Committee established the TT Hue Disaster Prevention Fund, as outlined in Decision No. 33/QĐ-QPCTT. This fund acts as a dedicated resource pool, mobilizing contributions from public and private sectors, as well as domestic and international organizations. The fund prioritizes activities such as supporting emergency response, aiding recovery efforts, and broader initiatives encompassing education, communication, training, and infrastructure acquisition.
Mobilization of Other Resources:	Beyond governmental funds, TT Hue actively engages in mobilizing support from diverse sources. This includes domestic and foreign organizations and individuals who contribute resources to enhance the overall effectiveness of natural disaster prevention and mitigation activities. The collaborative approach to resource mobilization ensures a more comprehensive and robust response to the challenges posed by natural disasters.

3.3.1.12. Evacuation map

TT Hue province has proactively developed a comprehensive Disaster Preparedness and Emergency Response Plan covering the period 2020-2025. This strategic framework outlines a mobilization strategy encompassing a provincewide force of 34,253 personnel from various sectoral agencies specializing in natural disaster prevention, control, and search and rescue. Additionally, the plan includes the deployment of numerous pieces of equipment, facilities, and transportation means crucial for the evacuation of individuals facing potential risks.

The plan strategically addresses the evacuation of specific populations, targeting 93,743 individuals (24,591 households) for storms and tropical cyclones, 82,241 individuals (20,970 households) for flood and inundation scenarios, and 38,929 individuals (9,496 households) for flash floods and landslides.

In adherence to the regulations outlined in Government Decree 66/2021, each district and commune People's Committee is mandated to formulate a disaster preparedness and emergency response plan periodically. The Steering Committees play a crucial supportive role in both the planning and implementation phases. Furthermore, these district and commune-level plans undergo an annual review and update process to ensure relevance and effectiveness. These localized plans serve as essential inputs for the formulation of the provincial Safe Evacuation Plan, enhancing the overall preparedness and resilience of TT Hue province in the face of potential natural disasters.

3.3.1.13. Overall gaps

The disaster management and early warning systems in TT Hue province face significant gaps across various dimensions:

- Institutionally, there is a notable lack of a concept of operation for early warning systems at the provincial level, contributing to limited coordination and interoperability among systems at different levels
- Limited effectiveness of interagency collaboration and interoperability due to the absence of specific provincial mandate policies for EWSs at all levels, and regulations establishing effective linkages and assigning responsibilities/tasks among relevant provincial sectors, provincial, district, commune CCs, and at-risk communities for the operation and development of local EWSs.
- The assessment of earth data observation reveals that current monitoring stations are primarily focused on data collection for forecasting rather than issuing real-time warnings, and the fire watchtower system is rendered ineffective due to outdated methods and the absence of modern technology equipment.
- In terms of data and information collection, inefficiencies in the existing monitoring database management system lead to ineffective monitoring and forecasting, posing challenges in implementing real-time monitoring and decision-making.

- Hazard assessment gaps include a limited risk assessment conducted by the provincial Steering Committee in the last three years, emphasizing the need for quantitative data incorporation to enhance impact-based forecasting and warning.
- Lack of emphasis on capacity building and operational regulations of grassroots shock forces in local policies and planning and limited resources for district and commune SCs.[23]

3.4. Complementarity with other development initiatives

A summary of the different development and climate change interventions that have been or are being implemented in TT Hue alongside an assessment of synergies is provided in Table 10.

Table 10. Relevant development interventions

Project	Budget	Notes on potential linkages
Improving the resilience of vulnerable coastal communities to climate change related impacts in Viet Nam (FP013) 2017-2024 UNDP GCF	USD 40.5 million	The project is being implemented in 28 coastal provinces in Vietnam, including TT Hue. The project is currently supporting the restoration of mangrove forests in TT Hue (22 ha) and supporting the construction of 731 houses in safe sites to benefit vulnerable and exposed people in the province. CBDRM assessments developed under the project will be used to inform activities under output 1.
Green Annamites Project 2016-2020 USAID	USD 24 million	The project implementation concluded, however, relevant lessons of the now terminated USAID funded Green Annamites Project were integrated into project design and specifically output 2.
Building Disaster Resilient Society in Vietnam Phase 2 2013-2016 JICA	USD 0.14 million	The Project for "Building Disaster Resilient Society in Vietnam Phase 2" supported various DRR activities, including but not limited to: i) Integrated flood management plans, ii) provincial DRR funds for preventive measures, iii) disaster risk analysis, and iv) community-based disaster risk management. Lessons

[23] In response to this gap, the Lux Dev project VIE/433, in 2021-2022, supported the establishment of Community-Based Early Warning Systems (CBEWS) in seven communes within TT Hue province. The project activities included capacity-building training, provision of necessary facilities for grassroots shock forces, communication and awareness-raising on natural disaster prevention, and the development of regulations for CBEWS operations. This initiative received positive feedback from local communities and authorities for enhancing climate hazard preparedness and emergency response. The success of these CBEWSs suggests the need for replication in additional communes across the province.

		from the implementation of the project will have been considered during the formulation of the funding proposal (FP).
Ecosystem-based adaptation on the northern central coast of Vietnam: restoration and co-management of degraded dunes and mangroves 2018-2024 BMU-IKI	EUR 2.5 million	The project is funded through the International Climate Initiative of the German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU-IKI). The project is implemented in Hue, Quang Tri, Quang Binh. It has developed a proof-of-concept for an EbA-Approach to restore degraded coastal sand-dune forests with site adapted native tree species. In a community-based planting approach, the project restores degraded sand dune forests, strengthening communities' and ecosystem resilience against typhoons and ensuring improved groundwater provision as well as biodiversity co-benefits such as nesting grounds for migratory birds. This approach is to be replicated in coastal communes under output 3.
Climate and Disaster Resilience **2021** SRD	EUR 0.94 million	The "Centre for Sustainable Rural Development" (CSRD) is a Hue based NGO working on various projects in the fields of i) capacity building for climate change, ii) climate change communication and advocacy, iii) strengthening the role of CSOs for participation and M&E in the development and implementation of the National Adaptation Plan NAP, iv) forest restoration and livelihood development for vulnerable coastal communities.
Forest Sector Modernization and Coastal Resilience Enhancement Project 2017-2023 World Bank	USD 180 million	The project aims to modernize the technical know-how and approaches used for planning and financing coastal resilience. The FMCR aims to improve coastal forest management in project provinces to enhance coastal resilience to climate change. The project beneficiaries include coastal households and communities; PFMBs; and provincial, district, and commune governments. The project works in communes in eight provinces: Quang Ninh, Hai Phong, Thanh Hoa, Nghe An, Ha Tinh, Quang Binh, Quang Tri and Thua Thien Hue. FMCR makes investments that augment the potential for generating income, employment, and public revenue from coastal protection forests. It includes 3 interrelated packages for investments: (1) For activities that strengthen communities' ability to partner with private enterprises and generate benefits that lead to improved coastal forest management (Investment Package); (2) upgrading productive technology (Technology Package); and (3) infrastructure (Infrastructure Package) for production, processing, and marketing of goods and services from coastal protection forests.

4. Barriers and Responses

4.1. Barriers to action

To strengthen the resilience of local men and women and the ecosystems upon which they depend, a set of targeted interventions, including EbA coastal restoration and climate resilient agriculture are urgently required in TT Hue. However, despite a commitment from the government of Vietnam and of the provincial authorities to effectively adapt to climate change, barriers remain to more climate resilient development pathways in the province, notably:

Barrier 1: Insufficient public finance to support the implementation of climate change adaptation plans. The NDC identifies a funding gap for meeting the country's climate targets, where state resources can only meet circa 30% of the estimated financial needs and highlights the need for international support and finance to meet them. The NDC also emphasises the need to develop incentives that can mobilize additional private funding for climate change adaptation activities. The missing mobilisation of international grant-funding sources at times of economic difficulty in the province caused by the drastic reduction of tourism revenue due to COVID-19 also impedes the implementation of the provincial climate change response plan. Alternative sources of funding are limited as TT Hue has reached its public debt ceiling and is no longer eligible for loans or on-lending. At the provincial level, the financial resources invested in the field of climate change response have not yet met the requirements for warning, forecasting and response to environmental incidents and climate change. Commercial and public sector bank loans for climate adaptation are also limited (see barrier 6). Furthermore, other funding sources such as Payments for Ecosystem Services are very case and purpose specific (i.e., exclusively for forest protection, without the option to repurpose for restoration efforts), hence often not applicable for funding adaptation focused interventions in most vulnerable areas.

Barrier 2: Limited coordination and management capacity to prepare for and respond to climate risks and impacts. The NDC underscores the need to strengthen the capacities of technical staff at local levels to better forecast and prepare for climate-related hazards and prioritise adaptation interventions and assessments of their impacts and efficiency. A major barrier to mainstreaming climate change across the government is the lack of coordination across government agencies as well as the local capacity to respond. While, through legal instruments[24,25], roles, tasks, and responsibilities have been assigned for Early Warning Systems (EWS) where numerous government agencies such as DONRE, DARD, and the provincial Station of Hydrometeorology are involved there lacks a concept of operations and a long-term plan for the development of a provincial EWS. The Commanding Committees (CCs) for Natural Disaster Prevention, Control, Search and Rescue, established at all levels, are responsible for coordinating the implementation of natural disaster prevention work and the

[24] Law on Hydrology and Meteorology promulgated under the National Assembly Law No. 90/2015/QH13 dated November 23rd, 2015

[25] Law on natural disaster prevention and control promulgated under the National Assembly Law No. 33/2013/QH13 dated June 19th, 2013.

functioning of different level EWSs (as stipulated by the Government of Vietnam's Decree No.66/2021[26]). TT Hue province still lacks a legal framework that highlights specific management and long-term development of a provincial EWS as a consolidated system across the provincial, district, and commune levels. In addition, regulation is lacking on the consolidation of cohesion of all-level EWSs. There is currently no mandate for effective linkage or assignment of responsibilities/tasks between relevant provincial sectors, provincial, district, commune Commanding Committees and at-risk communities for better coordination, management, and development of the EWSs.

Within the core functions of district and commune-level EWSs, district and commune Commanding Committees play a key role in disseminating risk warnings and building local response capabilities. They are responsible for communicating warning messages on the risks of hazards to local people and developing preparedness and emergency response plans in line with the provincial guidelines. Grassroot shock forces established in each commune support commune Commanding Committees with implementing communication activities and action plans for emergency response, search and rescue. Therefore, members of district and commune Commanding Committees and grassroots shock taskforces require substantial capacity, knowledge and skills in communication, preparedness, and emergency response, including search and rescue of at-risk people. However, district and commune Commanding Committees do not organize capacity-building activities for these forces due to their limited technical capacity and resources. In addition, grassroots shock task forces in many communes are not properly equipped with the facilities and tools necessary for emergency response, search, and rescue tasks.

Barrier 3: Barrier 3 Limited effective integration of climate risks into local government development plans. TT Hue province is currently implementing its 5-year SEDP 2021-2025, which maps out socio-economic objectives, results, and performance targets10. Based on this provincial SEDP, all districts and communes established and implemented their 5-year SEDPs for 2021-2025 with an annual review planning. A technical evaluation found that the provincial, district and commune SEDPs for the period of 2021-2025 do not sufficiently integrate climate change adaptation considerations, such as natural disaster risks, climate change impacts and measures to respond to climate change. In addition, staff of district and commune authorities and planning agencies have i) limited knowledge and understanding of climate change adaptation issues, ii) limited understanding of how to integrate climate change considerations into local development planning, and iii) did not plan to integrate any content of climate change response into their SEDPs for the period 2021-2025. With no mandate for the integration of climate change response content and limited knowledge and understanding of how to integrate climate change considerations into local development planning, there continues to be no effective mainstreaming of climate change into 5-year socio-economic development planning. It is critical that support is provided to assist the province in mainstreaming climate change considerations into the 5-year socio-economic development planning cycle at the district and commune level, as required and guided by the national government.

[26] Government Decree No. 66/2021/NĐ-CP dated July 6th 2021 on detailed regulations to implement the Law on natural disaster prevention and control.

Barrier 4: Lack of a robust climate data, information system, and capabilities to ensure coping and response capacity and plan for climate-resilient local development. As highlighted in the NDC (2022), highlighted in the NDC, gaps remain in the provision of climate data (especially for forecasting) as well as warning capacities for abnormal and extreme weather events. The NDC also identifies the lack of adequate M&E systems for climate change adaptation at the project, sectoral and national levels that can also inform climate-resilient development. Climate change monitoring at the provincial level still faces many difficulties. Amongst them, insufficient equipment and facilities for climate information services that can deliver the best available climate information poses a huge challenge. The disaster monitoring and control centre under TT Hue provincial Commanding Committee is responsible for monitoring 28 reservoirs, irrigation dams and hydropower plants distributed across districts. 15 of these are located in remote areas. Existing monitoring is carried out in two forms: automatic and manual monitoring. These two outdated systems with mixed methods of monitoring do not function effectively and have caused extensive constraints and difficulties in the management and operation of the monitoring data management system. TT Hue's provincial Commanding Committee is managing 57 flood warning towers in the province. These towers still apply conventional methods for local people to flood risks in low-land areas via the benchmarks of flood inundation levels. As a result, these towers are incapable of i) making real-time risk alerts on occurring floods for local people and ii) providing updated information on the flooding situation in at-risk communities for the provincial climate change monitoring centre. This impacts the effectiveness of provincial flood monitoring and warning as well as local emergency responses.

In terms of M&E, MONRE issued guidelines in 2022 for assessing climate change impacts, vulnerability, risks, losses and damages associated with natural disasters.[27] DONRE has developed a system with support from LuxDev that focuses on monitoring climate change vulnerability factors (exposure, sensitivity, and adaptive capacity) and climate adaptation responses (financial resources, adaptation outcomes, and impacts of 10 different types of adaptation actions that can be used across sectors). DONRE lacks the human and financial resources as well as the technical capabilities to strengthen the existing M&E system to comply with MONRE guidelines.

Barrier 5: Limited technical knowledge, skills, and technologies in agriculture production, as well as weak value chain linkages for implementing climate-resilient agriculture. Lack of capacities, limited climate change information, and skilled labor for applying new techniques remain some of the key barriers. These issues come alongside market price fluctuations, hampering the adoption of climate change adaptation strategies amongst farmers in TT Hue. The increased use of fertilizer has been applied as an adaptation strategy by farmers to maintain yields which, as outlined above, has contributed to soil depletion. Extension services in Vietnam are relatively well-resourced. However, the provision of services remains supply-driven rather than responding to specific farmer demands, and there has been limited focus on climate-resilient agriculture. It is, therefore, critical to strengthen linkages along the supply chains. There is a lack of connection between producers, input providers, processors, and

[27] MONRE Circular No.01/2022/TT-BTNMT dated January 7th, 2022, detailing the implementation of the Law on Environmental Protection regarding climate change response

consumers. Strengthening the value chain and working with leading companies on the promotion of climate-resilient and sustainable practices can help transformations to climate-resilient practices. The lack of value chain linkages has also been a barrier to technology dissemination and adoption, for example of post-harvest technologies. There are opportunities for greater adoption of new technologies by working closely through co-operatives, technology providers and financial institutions.

Barrier 6: Limited access to finance for farmers to adopt climate-resilient models. Several factors hamper access to finance for smallholder farmers. These include a lack of collateral/land use right certificates (despite a policy promoting uncollateralized lending), credit repayment schedules that do not match the productive cycle, the lack of a financially viable business plan and financial management capacities (which relates to the barrier above) and non-diversified sources of income creating a risk of repayment in case there is crop failure. Despite government efforts to promote financial inclusion, access to finance remains a barrier that limits farmers' abilities to undertake necessary investments to address climate change impacts in agriculture and aquaculture. Further, from the supply side of finance, while Agribank has a strong presence in rural areas (with over 2,000 transaction office**)**, private banks face growth constraints (limited to 15% annual portfolio growth) which make them less interested in rural areas due to low volume of businesses and therefore lack justification for opening a transaction office. The main agricultural lender, Agribank, does not have differentiated products for different crops or value chains with products being one size fits all. Additional regulatory constraints include the fact that the State Bank of Vietnam requires that the portfolio at risk (PAR) does not exceed 2% for public banks and 3% for private banks, which can be very challenging to achieve with a large portfolio focused on the agricultural sector. Thus, banks are less likely to show interest in small loans as the transaction cost is comparatively high in proportion to the loan. Most commercial loans are short-term, making it much more difficult to get long-term loans unless it is from government-subsidized programmes. For example, loans for investment in perennial trees, forestry production, or climate-resilient housing/small-scale infrastructure. MSMEs, including cooperatives working within agriculture value chains, have difficulty accessing finance for climate-related investments, as agriculture is considered risky and MSME business capacity is weak. They are, therefore, less bankable. There is a limited supply of diversified and sophisticated financial products and services (such as leasing, warehouse finance, receivables and contracts, insurance, and guarantees) to fulfil the dynamic demands of farmers and agribusinesses experiencing agricultural transformation, and banks tend to have limited interest in product innovation. Furthermore, banks do not provide emergency financing, for example, when loans are needed for post-disaster recovery, such as in the event of flooding, which are frequent in TT Hue (almost every year).

Barrier 7: Limited technical capacity for planning and implementing EbA and other soft adaptation interventions. Knowledge and capacities on the use of ecosystems and ecosystem services for climate adaptation and their complementarity to green infrastructure remain low at the sub-national level, which has hindered their adoption. The NDC highlights that soft adaptation measures are highly suitable, including some EbA approaches such as mangrove forest restoration and tree planting to help break the impact of wave surges. However, they are

yet to receive adequate attention, and an assessment of key technological needs is required for adaptation in accordance with the country's conditions.

4.2. Theory of change

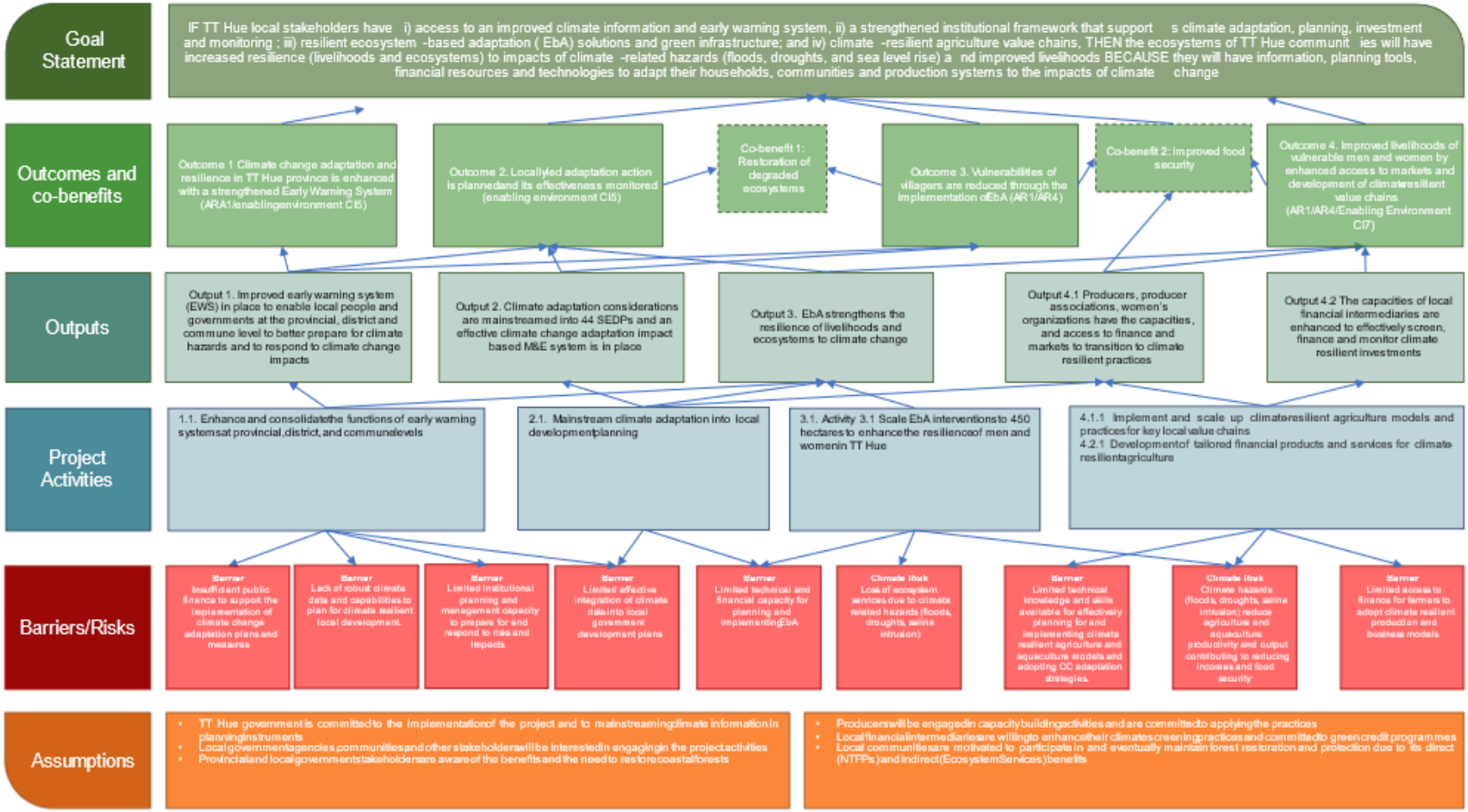


Figure 18. Project's theory of change

4.2.1. Project's goal statement and outcomes, outputs, and activities

Goal statement: Goal statement: IF TT Hue local stakeholders have i) access to an improved climate information and early warning system, ii) a strengthened institutional framework that supports climate adaptation, planning, investment and monitoring ; iii) resilient ecosystem-based adaptation (EbA) solutions; and iii) climate-resilient agriculture value chains, THEN TT Hue's population and ecosystems will have increased resilience to impacts from climate related hazards (floods, droughts, and sea level rise) and improved livelihoods BECAUSE they will have information, planning tools, financial resources and technologies to adapt their households, communities and production systems to the impacts of climate change. It is anticipated that the project strengthens the climate resilience of 306,000 direct beneficiaries and of 115,900 hectares of forest ecosystems and agricultural land.

The project has been designed to address the barriers described in section 1.5, and is comprised of the following outcomes, outputs, and activities (see Table 11).

Table 11. Overview of project activities and barriers addressed

Outcome/Output	Activities	Barriers Addressed
Outcome 1. Climate change adaptation and resilience in TT Hue province is enhanced with a strengthened early warning system		
Output 1. Improved early warning system (EWS) in place to enable local people and governments at the provincial, district and commune level to better prepare for climate hazards and to respond to climate change impacts	Activity 1.1 Strengthen the existing early warning system in TT Hue province	Barriers 1, 2,3 & 4
Outcome 2. Locally-led adaptation action is planned and its effectiveness monitored		
Output 2. Climate adaptation considerations are mainstreamed into the SEDPs of target districts and 44 communes, and an effective M&E system is in place to monitor adaptation action	Activity 2.1 Mainstream climate adaptation into the SEDPs of the target districts and 44 communes	Barrier 3
	Activity 2.2 Improve climate change adaptation impact-based monitoring at the provincial level	Barrier 4
Outcome 3. Vulnerabilities of villagers are reduced through the implementation of EbA		
Output 3. EbA strengthens the resilience of livelihoods and ecosystems to climate change	Activity 3.1 Scale EbA interventions to 450 hectares to enhance the resilience of men and women in TT Hue	Barrier 1 & 7
Outcome 4. Improved livelihoods of vulnerable men and women by enhanced access to markets and development of climate-resilient value chains		
0utput 4.1 Producers, producer associations, women's organizations have the capacities, and access to finance and markets to transition to climate-resilient practices	Activity 4.1.1: Implement and scale up climate-resilient agriculture models and practices for key local value chains (supporting 6,000)	Barriers 1, 5, 6 & 7
Output 4.2 The capacities of local financial intermediaries are	Activity 4.2.1: Development of tailored financial products and	Barriers 1, 5, 6 & 7

enhanced to effectively screen, finance and monitor climate-resilient investments	services for climate-resilient agriculture	

4.2.2. Project's assumptions

The project's theory of change and project interventions have been designed based on the following assumptions:

- TT Hue government is committed to the implementation of the project, to work on enhancing its CIEWS and to mainstreaming climate information into planning instruments
- Local government agencies, communities, and other stakeholders will be interested in engaging in the project activities and support the integration of climate adaptation considerations into SEDPs
- Producers will be engaged in capacity building activities and are committed to applying climate-resilient practices
- Local financial intermediaries are willing to enhance their climate screening practices and committed to green credit programmes
- Local communities are motivated to participate in and eventually maintain forest restoration and protection due to its direct (NTFPs) and indirect (Ecosystem Services) benefits

The assumptions were validated during the development of this feasibility study.

4.3. Expected paradigm shift

The project will invest in improved technologies and consolidation of the existing institutional framework for better development, coordination, and interoperability among EWSs in the provincial, district, and commune. This will ensure a more streamlined and effective EWS that provides timely information to aide decision-making to respond to climate hazards and risks.

Providing guidance and working through the steps to integrate climate change risks into SEDPs will have far-reaching impacts on how the province responds to climate risks and the areas in which public expenditure is targeted. This will be supported with the development of tools for Cost-Effectiveness Analysis and capacity development for its use that will support the prioritisation of future climate adaptation investments at the local level. With enhanced climate adaptation monitoring systems, the province will obtain a high-quality system to ensure the effectiveness of adaptation interventions can be monitored and responded to accordingly. These activities will strengthen the internal systems, structures, and ability of TT Hue to respond to climate change impacts. TT Hue province will have highly advanced and effective systems in place, allowing responses to climate change which can provide a blueprint for other provinces in Vietnam to follow. The results will be scaled and replicated across the country, creating widespread and lasting impacts. TT Hue will be a model province on climate change

adaptation planning, investment, and monitoring that can provide the foundation for replicating the identification, measurement, and monitoring of climate change adaptation in other provinces in the country. This will be a core contribution of the project towards a paradigm shift. Experiences will not only influence other provinces but will also demonstrate global best practice.

At the farm level, there is a need to shift away from low yield, high chemical use, and environmentally degrading agricultural practices, which are making households increasingly vulnerable to climate change. The project activities are designed to overcome critical barriers hampering the transition to a more climate-resilient and sustainable agricultural development in TT Hue. This will be achieved by enhancing farmers' skills and capacities to adopt climate-resilient production models through access to markets and finance. The project will work with leading supply chain companies across the three value chains, such as TT Hue Seed Company and Loc Troi, who are promoting climate-smart practices, modernization, and transformation within their supply chains. The project will work with Agribank, to provide financing to scale and replicate impact. The companies and banks will take these actions forward beyond the project lifetime to ensure long-term sustainability. Given the national scope of both Agribank, Loc Troi and other companies, the results from this project will be replicated in other provinces. In the case of Agribank, the project will seek to influence the organization's operational systems for the provision of green/climate lending across its portfolio. This would also have nationwide impacts.

Climate risks and vulnerability are reduced through the adoption of ecosystem-based adaptation measures. The project will take up proof-of-concept projects (such as the Coastal Forest Restoration Project) and support its replication at the provincial scale – the projects' approach on restoring degraded dune forests with native species has been pointed out as a priority activity by various recent laws (such as the Vietnam Forestry Development Strategy 2021-2035). The project also aims to increase the availability of finance for EbA and other inland and coastal forest and ecosystem restoration approaches that deliver climate adaptation outcomes, thereby scaling replication and scale.

Innovations to be introduced by the project

This SAP project will introduce the following innovations in the province that will contribute to the transition to a climate-resilient development pathway. These are further described in the detailed description of activities.

Table 12. Innovations to be introduced by the project

Outcome/Output	Innovations introduced
Outcome 1. Climate change adaptation and resilience in TT Hue province is enhanced with a strengthened early warning system	
Output 1. Improved early warning system (EWS) in place to enable local people and governments at the provincial, district and commune level to better prepare for	• At the institutional level, a master plan that consolidates EWS functions at provincial, district, and commune levels. • Establishment of an automatic database system for monitoring water levels at reservoirs, irrigation dams,

climate hazards and to respond to climate change impacts	and hydropower plants that enables the development of timely and effective response plans and warnings. • A smart flood warning system – through the introduction of smart flood warning posts in at-risk communities. • Solar-powered rotating cameras for 8 forest watch towers and flycams to support fire warnings • 8 high-power early warning sirens
Outcome 2. Locally-led adaptation action is planned and its effectiveness monitored	
Output 2. Climate adaptation considerations are mainstreamed into the SEDPs of target districts and 44 communes, and an effective M&E system is in place to monitor adaptation action	• Development of tools for Cost-Effectiveness Analysis for climate change adaptation planning alongside capacity development for their use at the district and commune levels. • Introduction of an impact-based climate change adaptation monitoring and evaluation system • Indicators and methods for monitoring forest resilience and forest quality
Outcome 3. Vulnerabilities of villagers are reduced through the implementation of EbA	
Output 3. EbA strengthens the resilience of livelihoods and ecosystems to climate change	• A planting approach for the restoration of coastal forests that mimics natural growth and regeneration patterns • Knowledge generation on the use of native tree species for forest restoration which remains scarce at the province and country level
Outcome 4. Improved livelihoods of vulnerable men and women by enhanced access to markets and development of climate-resilient value chains	
0utput 4.1 Producers, producer associations, women's organisations have the capacities, and access to finance and markets to transition to climate-resilient practices	• Delivery of climate-informed technical assistance for producers, producer associations, and women's organisations • Climate-resilient rice varieties
Output 4.2 The capacities of local financial intermediaries are enhanced to effectively screen, finance and monitor climate-resilient investments	• Innovative financial product that responds to the needs and characteristics of climate-resilient agriculture (including a potential cash flow based product) • Development of a gender lens financing approach

5. Project design

The project will catalyse investments in climate change adaptation, specifically through enhancing the province's Early Warning System and supporting locally-led adaptation by mainstreaming climate adaptation into development planning and monitoring, ecosystem-based adaptation, and climate-resilient agriculture. This will be developed through the following components (see Figure 19):

- Component 1 Strengthened institutional framework for enhanced risk-based decision and climate change adaptation planning, investment, and monitoring (comprised of outcomes 1 and 2)
- Component 2. Enhanced resilience of ecosystems and the livelihoods of local men and women (comprised of outcome 3)
- Component 3. Scaling up of climate-resilient practices and financial mechanisms (comprised of outcome 4)

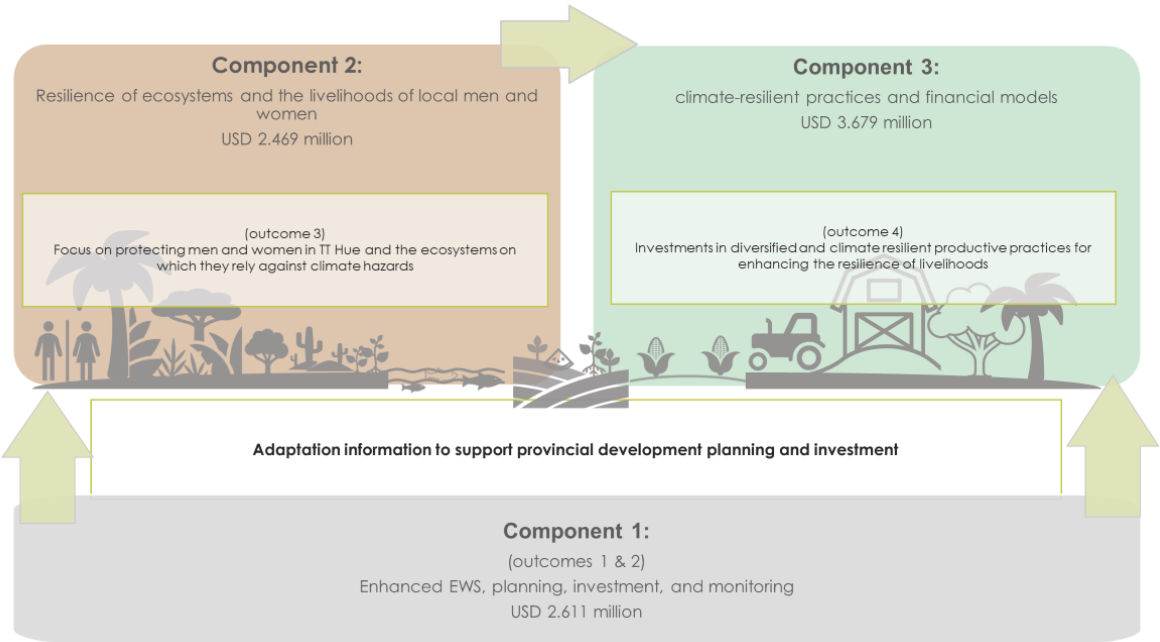


Figure 19. Overview of project components

Activities under the three components are complementary. Activities under component 1 will inform the development of activities under component 2 which focus on protecting men and women in TT Hue against climate change hazards, while activities under component 3 focus on supporting the diversification and enhanced resilience of livelihoods through the promotion of climate resilient productive practices. Social inclusion and gender equality are crosscutting elements throughout the project, as climate change has a disproportionate impact on the livelihoods of women, girls and vulnerable households and communities.

The section below provides the detailed activity descriptions of the project.

Component 1. Strengthened institutional framework for enhanced climate change adaptation risk-based planning, investment, and monitoring

Total cost: USD 2.611 million (GCF: USD 2.391; Government of Luxembourg – MECB: USD 0.22 million)

Output 1. Improved early warning system (EWS) in place to enable local people and governments at the provincial, district and commune level to better prepare for climate hazards and to respond to climate change impacts

Output 1 focuses on addressing key information, capacity, and technological constraints described in section 3 for improving responses to climate-related hazards through strengthening and consolidating a multi-hazard EWS in the province. It contributes to the priorities of the GCF2 strategic plan focused on early warning systems.

Activity 1.1 Strengthen the existing early warning system in TT Hue province

Activity 1.1 Strengthen the existing early warning system in TT Hue province	
Description of activity	An EWS forecasts and detects climate-related disturbances that adversely affect the life, assets, and livelihoods of vulnerable and at-risk communities. This occurs through a chain of forecasting and warning systems, information and communication systems and governance with institutional arrangements. To be effective, EWSs need the relevant capabilities to implement four core functions: risk knowledge, monitoring and warning service, dissemination and communication, and response capability. EWS rely on the active and direct involvement of at-risk people and communities through public education, and awareness of climate hazards risks and consequences. This involvement also depends on the efficient dissemination and communication of forecasting messages and warnings and on an effective emergency response and preparedness plan for early action. Building upon earlier work and lessons learned from previous Luxembourg-supported interventions, this activity will support TT Hue province to develop an effective EWS system based on the EW4A concept by strengthening the four core functions of the province's existing EWS, namely: i) risk knowledge and management; ii) monitoring and warning; iii) dissemination and communication; and iv) response capability. The proposed interventions under this activity include 1) Strengthen capacity for management and operation of the provincial-level EWS; 2) strengthen monitoring and warning capacity of the provincial-level EWS; and 3) enhance communication capacity and response capability for district and commune-level EWSs;
Description of sub-activities	<u>Sub-activity 1.1.1: Strengthen the capacities for management and operation of the provincial-level EWS</u> Interventions under this sub-activity will help to strengthen the capacity for management and operation of the provincial level EWS and include. *i) Develop a masterplan for long-term development and guidelines for management, and operations of a provincial consolidated EWS4A;* Although there exist institutional arrangements for EWS governance at different levels as provided by legislation, the coordination and collaboration among Commanding Committees for Natural Disaster Prevention, Control, Search and Rescue (CCs), at provincial, district and commune levels is not cohesive and properly linked for effective implementation of the core functions of an effective EWS. This intervention will support the consolidation of the existing institutional framework to enhance the risk

	management, development, coordination, and linkages among EWSs at provincial, district, and commune levels. *ii) Develop a set of indicators and guidelines for assessment of district and commune-level natural disaster prevention and control in line with national guidelines* This intervention will support the provincial SC for Natural Disaster Prevention, Control, Search and Rescue to develop a set of indicators for assessing natural hazard prevention and response at the district and commune level and guidelines for data collection, storage and analysis, which are aligned with the national guidelines. *iii) Mapping risks of natural hazards in TT Hue province.* Natural hazard risk mapping is critical for the risk assessment and preparedness to respond as highlighted in the Plan for natural disaster prevention, control, search, and rescue in TT Hue province for the period of 2020-2025. Work under this intervention will support the implementation of activities formulated in this plan with regard to the planning of responses to climate related hazards at all levels and plans for responses according to risk levels of natural hazard events. Natural hazard risk mapping includes making four types of maps of i) flood risks; ii) risks of flash flood and landslide; iii) risks of storm and sea level rise; and iv) risks of riverine and coastal erosion. <u>Sub-activity 1.1. 2: Improve the monitoring and warning capacity of the provincial-level EWS (with an improved monitoring database management system, 96 smart flood monitoring towers, 10 warning sirens, and 8 improved forest fires watch towers</u> To enhance monitoring and warning capacity for the provincial EWS, the project will support the implementation of the following interventions: *i) Improve the existing monitoring database management system for reservoirs, irrigation dams, and hydropower plants* To strengthen the existing management system for collecting monitoring data and information on reservoirs, irrigation dams, and hydropower plants in TT Hue province, this sub-activity will support TT Hue Centre for Natural Disaster Prevention, the provincial Steering Committee for Natural Disaster Prevention, Control, Search and Rescue (SC) to develop an automatic monitoring database management system. This will enable better observation and collection of monitoring data on rainfall and water levels used for forecasts and warning of flood risk and effective management and operation of existing reservoirs, irrigation dams, and hydropower plants. With a software system, it automatically collects real-time data and updates monitoring data at reservoirs, irrigation dams and hydropower plants. Based on updated data reported, the provincial SC can forecast based on real time climate conditions, thereby providing timely and effective response plans and warnings, helping to reduce damage caused by floods. Please see more detailed description of the automatic monitoring database management system in the Technical Evaluation section. *ii) Install a system of smart flood warning posts in target at-risk communities province-wide* Real-time automatic flood management, monitoring and warning in cities and flood plains are urgently required to effectively respond to heavy rains, local inundation, and floods in TT Hue province. This intervention will support the installation of a system of 96 VFASS smart flood warning posts placed at target locations in at-risk communities. The VFASS is a very effective smart flood warning system that monitors the real-time level of flood water in target areas and signals warning light and sounds to alert local people. Support under this intervention is to the provincial SC and mainly includes equipment and software procurement, implementation costs and technical training. Please see more detailed description of the VFASS in the Technical Evaluation section. *iii) Develop a system of siren towers for early warning provincewide* This intervention supports the improvement of the existing warning infrastructure for the EWS in TT Hue province through the installing a system of siren towers for early warning of natural hazard risks. The project will support the installation of 10 towers with high-powered outdoor sirens which will be located in 9 districts, towns and Hue

	city. Target locations will be surveyed and planned and subject to the approval of local authorities, but no land acquisition or involuntary resettlement will be required. *iv) Strengthen the provincial monitoring and warning system for forest fires* Monitoring and warning of forest fires are the most crucial tasks of the forest management and protection, for which TT Hue provincial P.C has highlighted in its plan for forest fire prevention and fighting. However, the current implementation of monitoring and warning forest fires and firefighting at target areas is not yet effective because the existing monitoring and warning system of the Sub-department of Forest Management lacks necessary equipment and facilities of modern technology for effective observation and early warning of forest fires. Support under this intervention will enable the Sub-Department of Forest Protection, DARD to improve its capacity for forest fire monitoring and early warning through the establishment of a consolidated system of forest observation and management. The project support includes planning, provision of automatic surveillance cameras, flycams (drone with camera) with a speaker at 08 target locations of fire watchtowers in three key areas of frequent forest fires, a server operating system and technical training for the system operation and management. <u>Sub-activity 1.1.3: Enhance communication capacities and response capabilities of district and commune-level EWSs</u> This sub-activity will support the consolidation of communication and response capabilities of district and commune-level EWSs through the following two interventions: i*) Improve communication and response capacity of stakeholders of district and commune-level EWSs* This intervention will support the organisation of workshops and trainings that improve knowledge and skills on communication, preparedness, and emergency response for members of district and commune committees for natural disaster prevention and grassroot shock taskforces. This activity will involve the provincial SC experts for technical support. *ii) Scale up the Community-based Early Warning System (CBEWS) model in target vulnerable communes* This activity supports the strengthening of local response capability and community engagement through the scale-up of the CBEWS model successfully implemented with the support of LuxDev project VIE/433. CBEWS is a system developed, managed, and sustained by the community itself, in which the empowerment of the people is the centre. Project support includes capacity building trainings; provision of necessary facilities for grassroots shock taskforces; communication and awareness raising on natural disaster prevention; consultation, planning and development of regulations for CBEWS operations, particular of the grassroots taskforces; disaster warning facilities such as water level measurement poles and flood warning poles; and distribution of disaster risk maps and evacuation plans. Interventions under this sub-activity will highlight the involvement of mass organisations and community-based organisations (CBOs) in capacity building activities and ensure women's participation in decision-making and planning of district and commune-level EWSs.
Target indicators	<u>Sub-activity 1.1.1: Strengthen capacity for management and operation of the provincial-level EWS</u> <u>Baseline:</u> • No provincial policy for long-term planning and development of EWSs at all levels exists in TT Hue province. • Linkage and collaboration among provincial sectors and SC and district & commune-level SCs for the operation and development of local EWSs is limited and inefficient. • No set of indicators and guidelines for evaluation of natural disaster prevention and control at the district and commune level exists in TT Hue province. • No mapping of natural hazard risks is made in TT Hue

	Target: • A master plan for long-term development, management, and operations of a provincial consolidated EWS developed. • A set of indicators and guidelines for evaluation of natural disaster prevention and control at the district and commune level is developed and put into use. • 04 maps of flood risks, risks of flash flood and landslide, risks of storm and sea level rise, and risks of riverine and coastal erosion Means of Verification: • Activity completion reports • Periodical project implementation progress reports • Periodical M&E reports • Assessment final report • Provincial P.C Decision to approve the masterplan • Provincial Steering Committee for natural disaster prevention, control, search and rescue to approve and issue the set of evaluating indicators and guidelines used to evaluate the performance of district and commune level C.Cs • Maps of natural hazard risks • Professional Certificates for forest fire fighting and preventions issued Sub-activity 1.1. 2: Improve the monitoring and warning capacity of the provincial-level EWS (with an improved monitoring database management system, 96 smart flood monitoring towers, 10 warning sirens, and 8 improved forest fires watch towers Baseline: • The reservoir monitoring database management system functions inefficiently with manual monitoring methods. • Lack of a data synchronization system that gathers data from the manual and automatic monitoring systems of reservoirs, irrigation dams and hydropower plants for real-time predictive analysis. • Existing posts for early warning of flood risks in low-land areas of at-risk communities with conventional technology are inefficient. • The existing system of smart flood warning posts using VFASS is limited within a small number of target locations in at-risk communes • No siren towers for timely warning of natural hazard risks exist in TT Hue province • Existing system for observation and waring of forest fires in TT Hue province is ineffective due to the lack of necessary equipment/facilities of modern technology for real-time observation and early warning of forest fire. Target: • An automatic monitoring database management system for reservoirs, irrigation dams and hydropower plants is built to improve quality and synchronization of monitoring data used for real-time predictive analysis. • 96 flood warning posts installed with VFASS systems to scale up to improve the efficiency of existing flood warning posts located at at-risk communes. • A system of warning siren sound will be installed with 10 high-powered outdoor siren towers • The system for forest fire observation and warning capacity in TT Hue province will be strengthened with the equipment of necessary facilities and tools of modern

	technology for automatic surveillance and early warning of forest fires in 08 watch-towers of target locations in 03 key areas of frequent forest fires Means of Verification: • Activity completion reports • Periodical project implementation progress reports • Periodical M&E reports • Inventories of equipment and facilities procured Sub-activity 1.1.3: Enhance communication and response capability for district and commune-level EWSs Baseline: • Members of district and commune committees for natural disaster prevention still have limited knowledge and skills for effective communication, preparedness, and emergency response. • Grassroot shock taskforces in many communes lack necessary knowledge and skills in communication, emergency response, search, and rescue. • Numerous commune-level EWSs in TT Hue province are not well equipped with necessary knowledge, capacity and facilities/tools used for effective communication, preparedness, and emergency response. • The model of community based early warning system (CBEWS), properly structured and functioning with people-centred elements, is not widely adopted in TT Hue province. Target: • District and commune committees for natural disaster prevention will have improved necessary capacity for effective communication, preparedness, and emergency response. • Grassroot shock taskforces in target communes will be well equipped with knowledge and capacities needed for active and effective involvement in commune-level natural disaster prevention activities. • The model of CBEWS will be supported to scale up in 44 target communes. Means of Verification: • Activity completion reports • Periodical project implementation progress reports • Periodical M&E reports • Commune P.C Decisions to promulgate the regulation on management, use and operation of the communication system to warn disasters, operation of equipment for disaster preparedness and community-based early warning system.
	Sub-activity 1.1.1: Strengthen capacity for management and operation of the provincial-level EWS • TAO to hire external service provider to technically support the provincial SC to develop a master plan for or long-term development, management, and operations of a provincial consolidated EWS and mapping of natural hazard risks • TAO expert to technically support the provincial SC to develop the set of indicators and guidelines for evaluation of natural disaster prevention and control at the district and commune level. • TAO financially supports the provincial SC in organizing needed consultation and dissemination workshops and communication activities.

Inputs and investment items	<u>Sub-activity 1.1. 2: Improve the monitoring and warning capacity of the provincial-level EWS (with an improved monitoring database management system, 96 smart flood monitoring towers, 10 warning sirens, and 8 improved forest fires watch towers</u> • TAO financially supports the provincial SC for natural disaster prevention, control, search and rescue i) to develop an automatic monitoring database management system for reservoirs, irrigation dams and hydropower plants and ii) install a provincewide system of 96 VFASS smart flood warning posts installed at target locations in at risk communes; and iii) develop a system of siren towers for warning of natural hazard risks • The provincial SC under the signed Delegation Agreement (DA) will hire external service providers to i) build an automatic monitoring database management system for reservoirs, irrigation dams and hydropower plants; ii) technically support the survey of target locations and installation of 96 VFASS smart flood warning posts; and iii) technically support the survey of target locations and installation of 10 siren towers • TAO financially supports the Sub-Department of Forest Protection to procure necessary equipment/facilities provided for 08 watchtowers and technical training • The provincial SC under the signed Delegation Agreement (DA) will hire external service providers for necessary equipment/facilities provided for 08 watchtowers and technical training <u>Sub-activity 1.1.3: Enhance communication capacity and response capability for district and commune-level EWSs</u> • TAO to hire external service provider to develop training materials and deliver trainings for district and commune-level EWS stakeholders. • TAO financially supports district SCs (or District DARDs) to organise capacity building activities on communication, preparedness and emergency response for district and commune-level EWS stakeholders, with the technical support of TAO experts and the provincial CC experts. • TAO financially and technically supports district SCs (or District DARDs) to establish CBEWSs in target communes with the technical assistance of the provincial CC.
Technical evaluation /justification/barriers addressed	<u>Sub-activity 1.2.1: Strengthen capacity for management and operation of the provincial-level EWS</u> The allocation of roles, tasks, and responsibilities within early warning services involves multiple government agencies, including DONRE, DARD, and the provincial Station of Hydrometeorology, as mandated by various laws. To facilitate coordination and implementation, Steering Committees for Natural Disaster Prevention, Control, Search, and Rescue (SCs) have been established at all levels, in accordance with the provisions outlined in Government Decree No. 66/2021. Under TT Hue provincial SC Decision No. 115/QĐ-PCTT dated August 2, 2022, the committee comprises 44 members. The provincial People's Committee chairman serves as the SC Head, with a vice-chairman from the People's Committee as the standing deputy head. Additionally, four deputy heads include the directors of DARD and the Department of Public Security, along with the chief commanders of the provincial military headquarters and border military forces. Remaining members consist of directors and heads of relevant provincial agencies and organizations. The distribution of tasks among members of the Provincial Steering Committee for Natural Disaster Prevention and Control and Search and Rescue is outlined in Notice No. 90/TB-PCTT dated August 27, 2016, issued by the Provincial Steering Committee for Natural Disaster Prevention and Control and Search and Rescue. The Standing Office of TT Hue provincial CC is situated at the premises of the DARD sub-Department of Irrigation. The technical evaluation by the feasibility team shows that TT Hue province still lacks a legal framework that highlights specific management and long-term development of a provincial EWS as a consolidated system of EWSs at all

	levels. In addition, the provincial SC currently encounters challenges and difficulties in evaluating natural disaster prevention and control, particularly early warning performance at the district and commune level due to the lack of the set of indicators and guidelines for evaluation data collection in line with the national guidelines. In mid-November 2022, the national steering committee for natural disaster prevention and control has issued the set of indicators for evaluating the natural disaster prevention and control at the provincial level, which includes 72 indicators assessing the institutional capacity, activities to prevent natural disaster risks and early warning, facilities and equipment, local capacity building activities, activities to respond to natural disasters, and recover the consequences of natural disasters. However, the provincial SC has not been able to carry out the evaluation of natural disaster prevention and control in TT Hue province, for this set of indicators cannot be used to collect evaluation data on the natural disaster prevention and control at the district and commune level. More sub-indicators which are suitable and based on more detailed data at the local level need to be formulated in line with the provincial evaluation indicators and finalised with the consultation and validation of district and commune level SCs for committees for natural disaster prevention and control. Guidelines for the use of this evaluation tool are also critical for data collection on the ground and needs to be technical supported by the project. Mapping of natural hazard risks was formulated as one of key activities in the Plan for natural disaster prevention, control, search, and rescue in TT Hue province for the period of 2020-2025. However, the provincial SC has not been able to implement this activity because its limited financial resources and technical capabilities. <u>Sub-activity 1.1. 2: Improve the monitoring and warning capacity of the provincial-level EWS (with an improved monitoring database management system, 96 smart flood monitoring towers, 10 warning sirens, and 8 improved forest fires watch towers</u> *i) Improve the existing monitoring database management system for reservoirs, irrigation dams, and hydropower plants* The Centre for natural disaster monitoring and control under the TT Hue provincial SC for natural disaster prevention, control, search and rescue is responsible for observing/monitoring 28 reservoirs, irrigation dams, and hydropower plants distributed across districts. 15 of which are located in remote areas. Existing monitoring is carried out in two forms: automatic monitoring and manual monitoring. The automatic monitoring system is installed at the monitoring points and automatically collects data to send to the Centre, while manual monitoring is temporarily used to collect data at the places where automatic monitoring equipment has not been installed. The automatic monitoring system is installed at the monitoring points and automatically collects data to send to the centre, while manual monitoring is temporarily used to collect data at the places where automatic monitoring equipment has not been installed. Under manual monitoring, observers take measurements, collect monitoring data, and then send the data to the control centre in different forms: emails, phone calls, and text messages. At the Centre, supervisors gather data from the two monitoring systems to generate aggregate monitoring data of all reservoirs, irrigation dams and hydropower plants that are sent to specialized departments and reported to the leaders

of the management board for natural disaster prevention and control to perform administrative work.

These two outdated systems with mixed methods of monitoring, do not function effectively and are a constraint to the management and operation of the monitoring data management system. Amongst the challenges that the use of these two systems have generated there is i) it is cumbersome and effort-intensive to perform data collection, processing, and analysis; ii) errors can be caused by manual steps, affecting the data quality; iii) data is not synchronized, leading to loss of data and erroneous information; iv) real-time monitoring is difficult to implement, making monitoring management more difficult; v) it is difficult to analyse and make decisions based on inconsistent, discrete, stored observed data; and vi) additional workload to synchronize monitoring data is required. That the existing monitoring database management system does not work well has resulted in ineffective monitoring and forecasting; adversely affecting the early warning on the flood risks for at-risk communities living in low-lying areas.

The new system built with project support will help to save time and effort for the Centre's monitoring work. The IT software system makes the automatic collection, processing, analysis, and reporting of monitoring data faster and more accurate. In addition, this system will make the analysis and evaluation of monitoring results more accurate and effective to help the disaster management board to take appropriate measures to respond to the complex hydrological events and potential disaster risks.

Finally, it can enhance interoperability, communication, and coordination among concerned agencies because it is easier and faster to exchange information, report and share monitoring results between relevant units and departments. This new automatic monitoring system will allow observers to take measurements and update information on smart devices. This helps to ensure data is updated in a uniform structure to facilitate management and analysis. Data is updated at the Centre at the time of monitoring. It also has a data synchronization system in which the software automatically gathers data from the manual and automatic monitoring systems to update it into the monitoring database system as the foundation for real-time predictive analysis. It automatically sends monitoring data and analytical results to relevant departments and the disaster prevention and control board in real time for operating purposes. The building of an automatic monitoring database management system for reservoirs, irrigation dams and hydropower plants will support the improvement of monitoring and warning capacity for the provincial EWS.

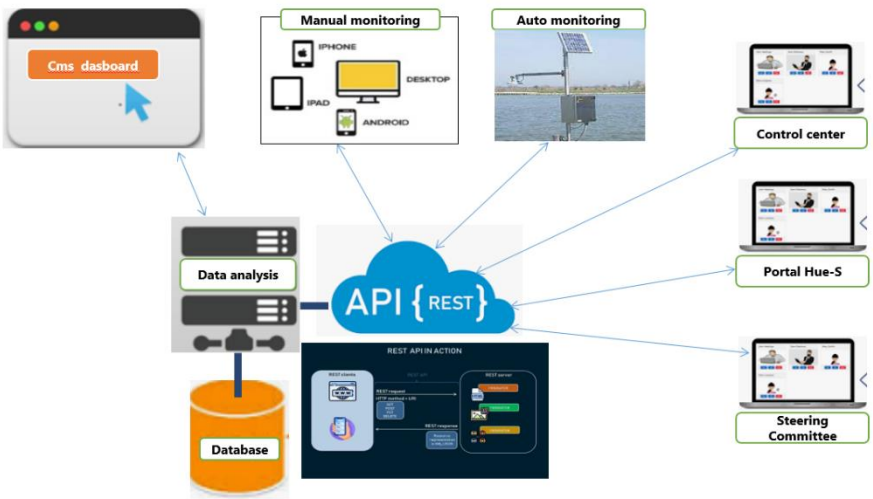


Figure 20. Functioning of the automatic monitoring database management system

Table 13. Roles and functions within the automatic monitoring system

Item	Description
CMS dashboard	Allows system administration

Manual monitoring	At the monitoring site, technicians update monitoring results through a software application installed on a smartphone device or on a computer.
Auto monitoring	Automatic monitoring devices are connected to the data centre to update measured data
Control centre	Executives rely on collected data to make decisions
Portal Hue-S	Through the Hue-S portal, people can understand the flood situation in the area
Steering Committee	Responsible for collecting, analysing, and reporting data
Database	Store data
API	Allows applications to connect to the server to update and retrieve data

ii) Build a system of smart flood warning posts in target at-risk communities province-wide

TT Hue's provincial Commanding Committee manages 60 flood warning posts in the province. These posts still apply conventional ways to alert about flood risks to local people in low-land areas using benchmarks of flood inundation levels. The flood inundation levels marked on these towers use water levels of past floods. As a result, these posts are not able to i) make real time risk alerts on occurring floods for local people and ii) provide updated information on the flooding situation in at-risk communities for the provincial Commanding Committee monitoring centre; hence affecting the effectiveness of provincial flood monitoring and warning as well as local emergency responses.

Existing flood warning post

Smart flood warning post (VFASS)

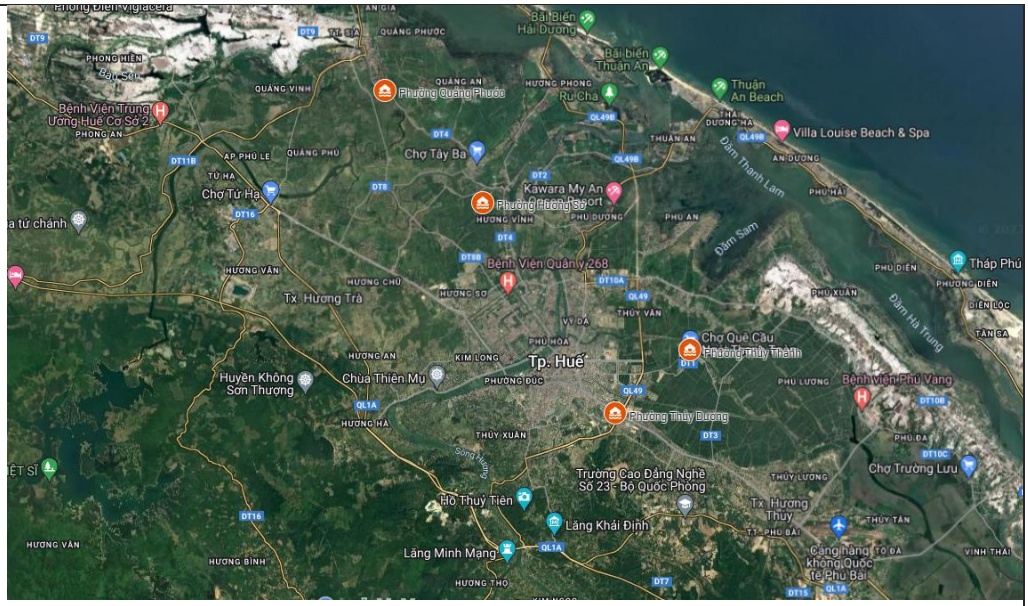


Figure 21. Map of locations where conventional flood warning posts are placed

Source: Provincial SC, 2023

The provincial SC has recently installed 10 smart flood warning posts using the VFASS system which monitor the level of flood water in target areas and signals warning sounds to alert local people in at-risk communities without relying on a power supply source or telecommunication network. The VFASS electronic water level sensor/radar converts the monitored water level into a signal sent to the datalogger device at which data is collected, processed and standardized, then transferred to the SMS/GPRS/3G device that send real-time data to the operating centre via the telecommunications network.

In the opposite direction, commands to control the water level monitoring station from the Operations Center will be sent via mobile network via SMS/GPRS/3G network to the monitoring station. From here, the commands will be transferred to the Datalogger device to process the station's operation configuration according to the command request received from the Operations Centre. The operating power of the station is taken from solar battery power and converted to the corresponding voltage to charge the battery and also supply the operating system. The application of this smart flood warning system will enable early warning of flood risks at target locations with a more efficient warning sound signals in real-time manner. This system is also connected with the centre for natural disaster prevention and control to provide real-time update monitoring data of existing flood warning posts for better formulation and operation of DRR measures.

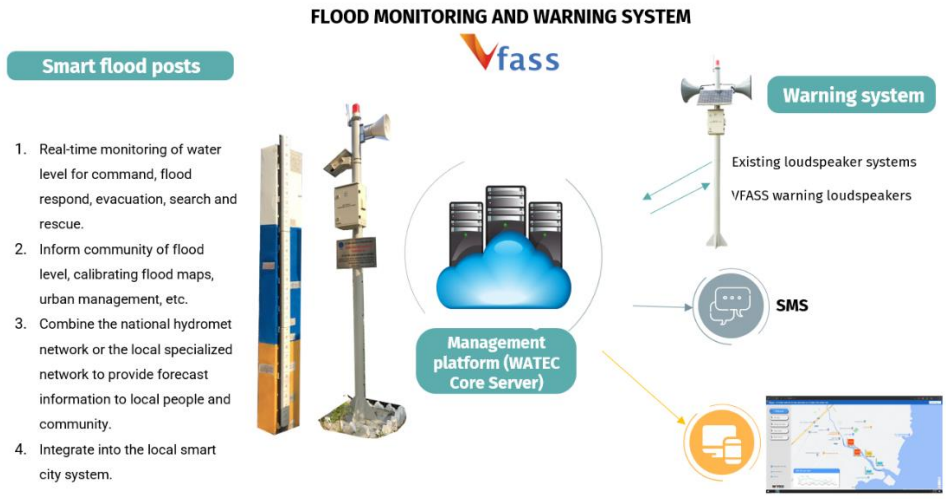


Figure 22. Flood monitoring and warning system (Vfass)

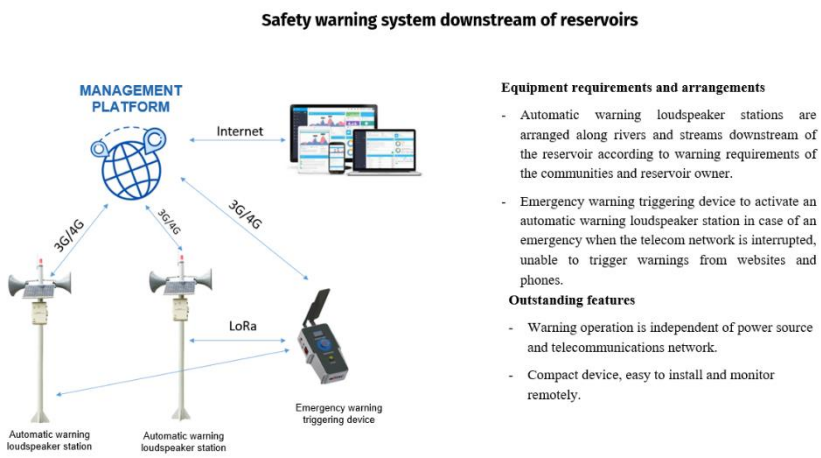


Figure 23. Safety warning system downstream of reservoirs

The VFASS smart flood warning posts have proved to be very effective in producing real-time early warning of flood risks in target at-risk communities and providing update data on the water level at flooded areas. However, the number of these smart flood warning posts remains limited relative the needs of target locations that are severely flooded at the province level. Therefore, to strengthen the climate information system in the province, the project will support the installation of a network of 96 VFASS smart flood warning posts that can be consistently monitored and provide update information through the application of the Vrain App.

iii) Install a system of siren towers for early warning provincewide

Sirens are considered an effective means of providing early warnings for natural hazard risks. However, there are currently no siren towers in TT Hue province capable of alerting local communities at risk of natural hazards. Recognizing the necessity, it is important to establish a provincewide system of siren towers. Financial constraints prevent the province from undertaking this initiative independently. Therefore, the project will support the installation of a system of 10 high-powered outdoor siren towers

for emergency alerts, allocating one tower for each district and town, and two towers for Hue city.

iv) Strengthen the provincial monitoring and warning system for forest fires covering over 28,000 hectares

Forest fire prevention and control constitute vital responsibilities outlined in national laws and legal frameworks. The TT Hue Sub-Department of Forest Protection, operating under the Department of Agriculture and Rural Development (DARD), holds the mandate for overseeing forest management, protection, and development. Presently, TT Hue province encompasses 305,560 hectares of forested land, comprising 205,602 hectares of natural forest, 77,148 hectares of planted forest, and an additional 22,809 hectares categorized as areas not meeting the criteria for forest classification. The province boasts a forest cover rate nearing 57%, with special-use forests spanning 93,693 hectares, protection forests covering 75,156 hectares, and production forests extending over 136,710 hectares.

Despite these extensive forest resources, forest management and protection, as well as fire prevention and control, face substantial challenges. Over recent years, the province has encountered difficulties attributed to the rapid growth of production afforestation, adverse weather conditions, including prolonged hot spells from April to September annually, and human activities. Notably, the incidence of forest fires has surged over the past decade.

Statistical data presented in the table below illustrate the severity of the issue, with 330 forest fires recorded in the province between 2012 and 2021. These fires collectively resulted in a devastating total burned area of 1,040 hectares, causing destruction to both planted and natural forests, exceeding 920 hectares. In 2021 alone, 95 forest fires occurred, leading to losses of over 515 hectares of planted and natural forest. Alarmingly, 41 of these fires were not promptly extinguished, constituting nearly 10% of the total forest fires recorded in the period from 2012 to 2023.

Table 14. Forest fires in TT Hue

No	Forest fires	2012	13	14	15	16	17	18	19	20	21	22	23
1	Total number of fires	18	9	18	46	7	6	13	54	64	95	16	66
2	Number of fires extinguished in a timely manner	18	9	18	45	7	6	13	54	40	95		66
3	Area of forest burned (ha)	76,0	2,7	33,5	17,4			17,3	265,1	50,9	549,8	11,4	51,4
3.1	Planted forest (ha)	67,9	2,6	31,5	17,4			14,6	264,1	50,9	486,0		49,2
3.2	Natural forest (ha)	8,1	0,1	2,0				2,7	1,0		63,8		2,3
4	Area of forest destroyed (ha)	58,1	2,0	23,2	17,4	5,5	22,0	13,4	226,6	35,5	516,9	-	25,6
4.1	Planted forest (ha)	55,6	1,9	21,6	17,4	5,5	22,0	13,4	226,6	35,5	461,0		23,8
4.2	Natural forest (ha)	2,5	0,1	1,6							55,9		1,9

(Source: Sub-department of Forest Protection, 12/2023)

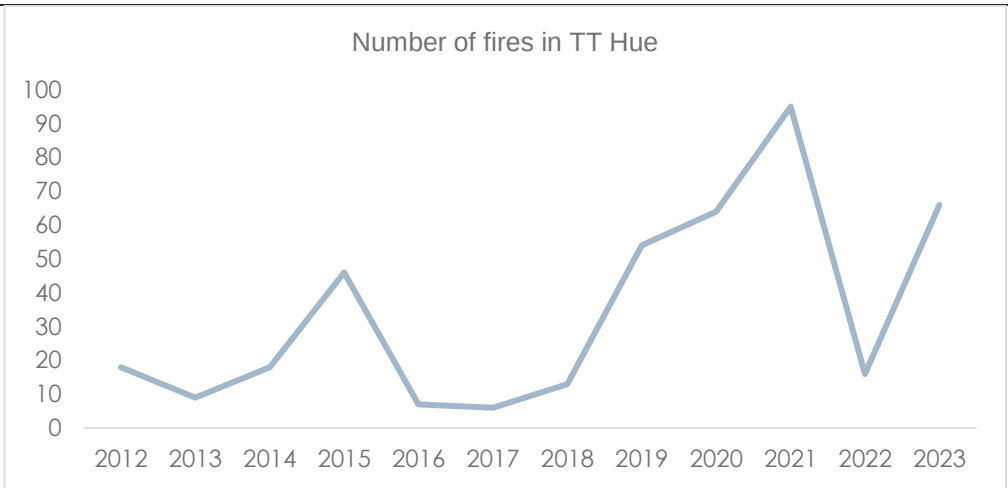


Figure 24. Number of fires in the province

(Source: Sub-department of Forest Protection, 12/2023)

In June 2021, wildfires hit Thuy Phuong, Thuy Chau, Phu Bai, and Huong Thuy town, causing a loss of over 200 hectares of forests. The firefighting effort involved more than 1,000 people, incurring significant financial costs. In 2022, 16 forest fires led to the loss of 11 hectares of planted forests. About 77,000 hectares of planted forests in Phong Dien, Phu Loc, Huong Tra, Huong Thuy, and Hue city are considered highly susceptible to fires. The forest fire alert system, updated in June 2023, designates over 66,000 hectares at level V (very high alert) in Phong Dien, Huong Thuy, and Phu Loc.

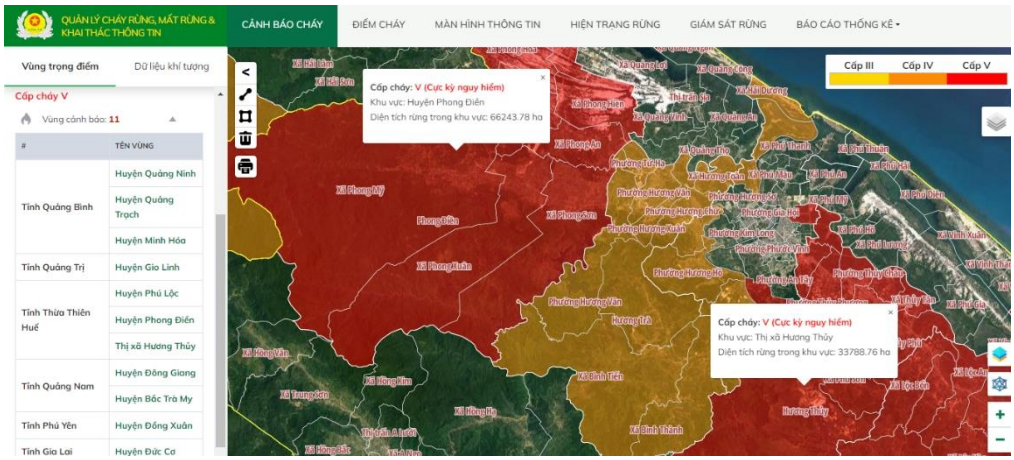


Figure 25. Risk of forest fires

Source: kiemlam.org.vn, link https://watch.pcccr.vn/CanhBao

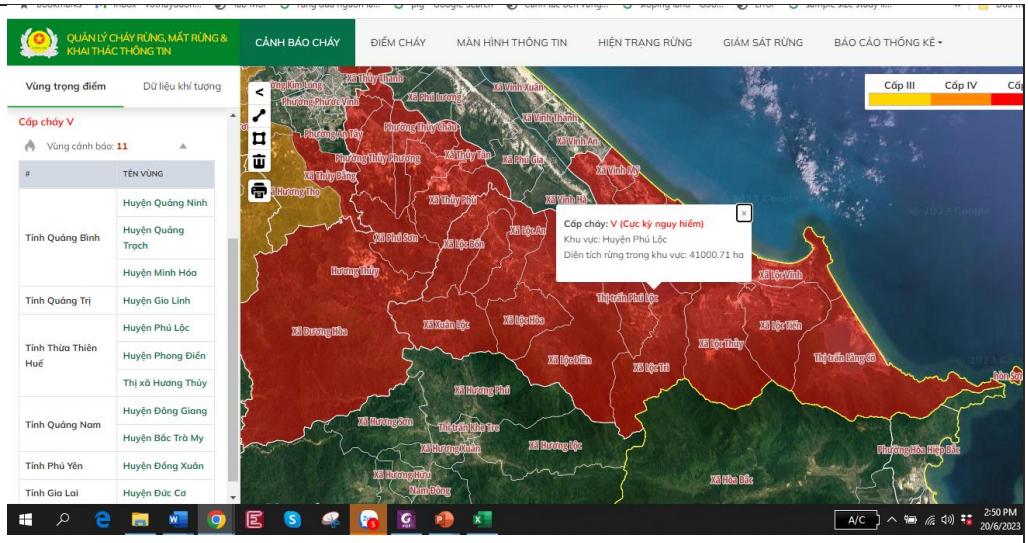


Figure 26. Risk of forest fires

Source: kiemlam.org.vn, link https://watch.pcccr.vn/CanhBao

In response to the increased risk of forests, TT Hue has formulated a plan to organize forest fire prevention and forest control in the province. The plan identifies 5 zones (Zone 1: North Hai Van - Phu Loc, from Phu Loc town to Lang Co town; Zone 2: Huong Thuy - Southwest of Hue city; Zone 3: Huong Tra and National Highway 49 are located in Huong Tra town; Zone 4: A Luoi and National Highway 49 are located in A Luoi district; and Zone 5: Phong Dien - Quang Dien) at risk of large forest fires and outlines the measures to take in the occurrence of a significant fire.

The Forest Protection Department of Thua Thien Hue province is presently employing the following systems for early fire detection and warning purposes:

i) Early fire warning system located at the Forest Protection Department: This system operates on a web-based platform utilizing a thermal scanning satellite system to pin-point fire locations accurately. This system proves effective in assessing forest fire risks based on hydrometeorological data. However, it has certain limitations, notably a delayed delivery of fire point warnings due to the necessity of data processing through a centralized center. The software is part of the MARD project on forest fire prevention and is open source, making it susceptible to errors, yet it has not undergone proper upgrades.

Moreover, the system relies on heat data from specialized hydrometeorological stations located in specific target areas, resulting in a lack of comprehensive coverage. The warning messages for forest fires are not issued in a timely manner, hampering effective fire prevention and response. The satellite-dependent process further contributes to delays in generating forest fire warnings. Unfortunately, as an integral part of the MARD and Department of Forest Protection warning system, the Thua Thien Hue Sub-Department of Forest Protection is unable to independently enhance or address these shortcomings.

ii) Thua Thien Hue province early fire warning software: it operates on a web platform, utilizing a satellite system for thermal background scanning. The scanned data is transmitted to a central data centre within the province for automatic processing. Simultaneously, the system connects to a mobile platform, delivering fire warning location messages to mobile subscribers identified by the Forest Protection Department. However, a limitation of this system is that the dissemination of fire warning information to recipients is slower than real-time.

To enhance forest fire forecasting and facilitate command and control of firefighting efforts, the Forest Protection Department has established a centre dedicated to updating hydrometeorological data and performing calculations to generate daily forecast results using a manual methodology. The forecast information is then

broadcasted by the Provincial Radio and Television Station for widespread notification. However, the drawback lies in the provincial identification of only three climate zones (A Luoi, Nam Dong, Hue, including delta districts), resulting in relative accuracy of forecast information.

Additionally, the Forest Protection Department utilizes two surveillance cameras strategically placed at high points in the province, managed by the Department of Information and Communications. While this system promptly detects fire locations within the camera's visible range, it falls short in providing the exact location of the fire point. Consequently, a considerable deployment of local Forest Rangers is required to verify the situation when information about the fire point is received.

The existing real-time observation and warning system for forest fires in Thua Thien Hue province heavily relies on a network of 24 fire watchtowers established by the Sub-department of Forest Protection in key areas. Each watchtower is manned by 2-3 forest rangers on a 24/7 basis, employing binoculars to surveil and monitor potential fires in target forest areas for early warning in five key zones.

Figure 27. A fire watchtower at Forest Protection Station 252 located in Bac Hai Van forest area

The current system of fire watchtowers has proven ineffective for the observation and early warning of potential forest fires, necessitating a reinforcement through the integration of modern surveillance technology. The implementation of monitoring rotating cameras and flycams (drones) for real-time observation of potential forest fires is poised to augment the existing monitoring and warning capabilities of the Sub-department of Forest Protection. This enhancement is crucial for significantly contributing to the efficacy of forest fire prevention and firefighting in Thua Thien Hue province.

To exert better control over the forest fire situation through enhanced monitoring and warning in identified key areas, it is important to install monitoring rotating cameras powered by integrated solar panels at the elevated points of fire watchtowers. Additionally, equipping each location with a flycams device will facilitate observation, detection, and immediate response to identified fire situations. Given the Sub-department of Forest Protection's limited financial resources, financial support is required for the installation of the following equipment at each target location:

i) A surveillance camera system for monitoring and early warning of forest fires, comprising 08 rotating cameras, solar power supplies, and camera maintenance components. Establishing a link for observation information to the management centre and the monitoring data management section at the Sub-department of Forest Protection is also part of this initiative.

ii) 08 flycams devices to handle forest fire situations in the observation area upon detecting fires, enabling prompt response to early fire information, and preventing the escalation of fires.

	iii) A server operating system with 08 computers and software to support the integrated forest observation systems at the designated key locations in the three identified key areas. The Sub-department of Forest Protection will establish the automatic forest observation systems at 08 key locations within these 03 key areas, aiming to significantly enhance the region's capacity for forest fire monitoring and prevention. **Key area 1:** The area of planted forests at risk of fire in this area is 15,065 hectares, of which the area with high risk of fire from Phu Loc town to Lang Co town with a planted forest area of 7,480 hectares, to monitor and warn of early fire in this area, 3 cameras should be equipped at the following locations: • Location 1: Cua Khem Cape guard tower (top of Hai Van pass) of Bac Hai Van Protection Management Board, Sub-zone 251; • Location 2: Phu Gia Pass guard tower of Bac Hai Van Protection Management Board, Sub-zone 246; • Location 3: Chan May watchtower of Bac Hai Van Protection Management Board, Sub-zone 195. **Key area 4:** The area of forest at risk of fire in the area of Highway 49, through Huong Nguyen and Hong Ha communes, A Luoi district is over 4,000 hectares. In this area, it is necessary to have 01 surveillance camera placed at the watchtower of the A Luoi Forest Protection Management Board, Sub-area 283 (Location 4) to cover and support fire prevention and early fire warning in the entire region; **Key area 5:** With the area of planted forests at risk of fire in this area being 9,919.09 hectares, in order to be able to observe the entire area, it is necessary to equip 04 cameras at the following locations: • Location 5: Dien Huong watchtower of Dien Huong Commune People's Committee, Sub-zone 1; • Location 6: Dong Lam watchtower of Phong Dien Forestry Company Limited, Sub-zone 15; • Location 7: Cay Loi watchtower, of Phong Dien Forestry Company Limited, sub-zone 23; • Location 8: Khe Liem watchtower of Phong Dien Nature Reserve Management Board, Sub-zone 21. The deployment of surveillance cameras at 08 watchtowers in targeted locations is anticipated to facilitate close observation and monitoring of forested areas spanning over 28,984 hectares in the three identified key areas prone to the risk of spreading and large fires (Areas 1, 4, and 5). The use of flycams equipped with speakers is expected to extend monitoring to a broader expanse of forest land totalling 305,560 hectares. This extensive coverage encompasses 205,602 hectares of natural forest and 99,957 hectares of planted forest. The incorporation of these technologies aims to provide comprehensive surveillance and timely intervention, minimizing the potential impact of forest fires across the specified landscape. <u>Sub-activity 1.2.3: Strengthen communication capacity and response capability for district and commune-level EWSs</u> are officially tasked with carrying out significant duties and obligations in the realm of natural disaster prevention and search and rescue. In the core functions of district and commune level EWSs, these Commanding Committees play a key role in disseminating risk warnings and enhancing the local capacity to respond. They also have the responsibility to communicate warning messages on regarding imminent hazards to local residents, as well as the formulation of readiness plans and emergency response strategies in accordance with provincial directives and tailored to local circumstances and available resources. These committees receive support from grassroots shock task forces established within each commune, which aid them in executing

	communication initiatives and coordinating action plans for emergency response and search and rescue operations. Members of district and commune Commanding Committees, along with grass-root shock taskforces, should have sufficient capacity, including essential skills in communication, preparedness, emergency response, and search and rescue of at-risk people. However, district and commune Commanding Committees do not organize capacity building activities for these forces due to their limited technical capacity and resources. In addition, grassroot shock taskforces in many communes are not properly equipped with facilities and tools needed for their tasks in emergency response, search, and rescue and commune PCs cannot afford to provide these facilities and tools for their grassroots taskforces. To overcome the barriers faced by the current district and commune-level EWSs in TT Hue province, this sub-activity will provide financial and technical assistance to district Commanding Committees. This will include capacity-building activities (workshops and Training of Trainers (TOT) courses) for both district and commune Commanding Committee members. Additionally, training will be rolled out for members of grassroots taskforces. With the improved knowledge and skills gained from workshops and TOT trainings, members of district and commune Commanding Committees will be better equipped to carry out their tasks effectively. They will also be able to provide technical training for grassroot shock taskforce members at the commune level, who directly support and help local communities at risk. These capacity-building activities will improve the communication abilities and response effectiveness of district and commune-level EWSs on a sustainable basis. In addition, this sub-activity will support the establishment of Community Based Early Warning System (CBEWS), which is an effective people-centred approach to the strengthening of commune-level EWSs successfully implemented in 7 communes with LuxDev project VIE/433. District DARDs, reported that the implementation of CBEWSs contributed to significant results, including: i) local people in target communes improved their basic knowledge and awareness of local early warning system, their access to forecasting and warning information; and are better prepared to cope with natural hazards/disasters; ii) members of commune Commanding Committees and grassroot shock taskforces improved their necessary knowledge and skills in communication of early warnings, preparedness and emergency response, search and rescue; and iii) commune-based plans for natural disaster preparedness, emergency response, and search & rescue; and post-disaster recovery and response were prepared. These CBEWSs are highly valued by both local communities and authorities. They help local communities better prepare for climate hazards with more efficient preparedness and emergency responses. However, there's a need to extend these successful CBEWSs to other communes.
Implementation arrangements	<u>Sub-activity 1.1.1: Strengthen capacity for management and operation of the provincial-level EWS</u> • The Provincial SC and Sub-department of Forest Management have the responsibility to make implementation plans (IPs) of approved activities with the technical assistance of the assigned TAO expert. • TAO approves the IPs prior to the activity implementation, and the Provincial SC and Sub-department of Forest Management are responsible for the implementation of planned activities with the technical support and supervision of the assigned TAO expert. • The Provincial SC and Sub-department of Forest Management are responsible for reporting on achieved results after activity completion to TAO. • The Provincial SC and Sub-department of Forest Management are responsible for recruiting and contracting external service providers needed for the technical support to their activities. • Project financial support will be provided under the Delegation Agreement (DA) signed by three parties, including TAO, LuxDev and implementing partner

	Sub-activity 1.1. 2: Improve the monitoring and warning capacity of the provincial-level EWS (with an improved monitoring database management system, 96 smart flood monitoring towers, 10 warning sirens, and 8 improved forest fires watch towers • The Provincial SC and Sub-department of Forest Management have the responsibility to make implementation plans (IPs) of approved activities with the technical assistance of the assigned TAO expert. • TAO approves the IPs prior to the activity implementation, and The Provincial SC and Sub-department of Forest Management are responsible for the implementation of planned activities with the technical support and supervision of the assigned TAO expert. • The Provincial SC and Sub-department of Forest Management are responsible for reporting on achieved results after activity completion to TAO. • Project financial support will be provided under the Delegation Agreement (DA) signed by three parties, including TAO, LuxDev and implementing partner Sub-activity 1.1.3: Strengthen communication capacity and response capability for district and commune-level EWSs • District SCs (or District DARDs) have the responsibility to make implementation plans (IPs) of approved activities with the technical assistance of the assigned TAO expert. • TAO approves the IPs prior to the activity implementation, and District SCs (or District DARDs) are responsible for the implementation of planned activities with the technical support and supervision of the assigned TAO expert. • District SCs (or District DARDs) are responsible for reporting on achieved results after activity completion to TAO. • TAO is responsible for recruiting and contracting external service providers needed for the technical support to capacity building activities. • TAO financial support to District SCs (or District DARDs) will be provided under the Delegation Agreement (DA) signed by three parties including TAO, LuxDev and implementing partner
Co-finance / leverage	Total activity cost: USD 1,867,429 GCF finance: USD 1,867,429 Co-finance (GoL MECB): 0 USD Co-finance (GoV): 0 USD
Exit strategy / long-term sustainability	Sub-activity 1.1.1: Strengthen capacity for management and operation of the provincial-level EWS The developed long-term masterplan, set of indicators and guidelines for evaluation of natural disaster prevention and control will generate an institutional framework that sets a legal basis for sustainable development, coordination and interoperability among EWS at all levels. This consolidated legal framework will strengthen and sustain institutional arrangements for governance of EWSs and formulate a legal basis for allocation and mobilisation of financial resources for the long-term development, management and operationalisation of EWSs at all levels in TT Hue province. The project interventions supported the implementation of natural hazard risk mapping which is one of prioritised activities for natural hazard prevention and control in the provincial plan for the period of 2021-2025. Beneficiaries of capacity building activities are forest rangers and concerned forces which have legal functions in the forest fire fighting and prevention. Sub-activity 1.1. 2: Improve the monitoring and warning capacity of the provincial-level EWS (with an improved monitoring database management system, 96 smart flood monitoring towers, 10 warning sirens, and 8 improved forest fires watch towers The results achieved from this sub-activity will be technically and institutionally sustained because its interventions mainly build on existing system for monitoring and warning of flood risks and forest fires and routinised tasks of the provincial SC and Sub-department of Forest Management. Project supported warning infrastructure and

	products will used and managed by concerned agencies in the provincial EWS and therefore, the fund for their O&M activities will be mobilised from the provincial budget <u>Sub-activity 1.1.3: Strengthen communication capacity and response capability for district and commune-level EWSs</u> The TOT course under this sub-activity will bring about the long-term sustainability in terms of capabilities for district and commune-level EWSs. These trainings will not only strengthen necessary knowledge of and skills in communication, preparedness and emergency response, search, and rescue for staff of district and commune Commanding Committees, but also generate a team of district and commune master trainers who will be able to conduct rollout trainings on similar contents for members of grassroots shock taskforces at the commune level. Through roll-out trainings, necessary knowledge and skills will be cascaded down to local people at the communities at risk. With their improved necessary knowledge and skills, these EWS stakeholders will make great contribution to effectively implement their legally assigned tasks and responsibilities for natural disaster prevention and core functions of district and commune-level EWSs on a sustainable basis. The project support of upscaling the CBEWS model in target communes will strengthen commune-level EWSs supporting their technical and institutional sustainability. Through technical trainings that equip them with needed knowledge and skills in communication, preparedness and emergency response, search and rescue, commune authorities, village leaders and grassroot taskforces will have strengthened technological capability and continue to cascade down knowledge and skills to local people at risk communities. The CBEWS with the people-centred approach to developing the regulations for EWS operationalization and management, and planning, implementing the communication of early warnings, natural disaster preparedness, emergency response, and post-disaster recovery will strengthen the institutional framework of commune-level EWSs on a sustainable basis. The establishment and operation of this CBEWS model directly and actively involve and empower at-risk people and communities in natural disaster prevention. The CBEWS established with the project support will build on the existing institutional framework and local resources in target communes. As reported by DARDs[28], the CBEWSs, established in 7 communes with LuxDev project VIE/433, still continue to operate effectively in compliance with Commune PCs' regulation on management, use and operation of the communication system to warn disasters, operation of equipment for disaster preparedness and early warning. In addition, work under this project intervention will result in a showcase of good practices for early warning system to be scaled up provincewide and can be replicated in other provinces across Vietnam.
Beneficiaries	**Direct beneficiaries:** • Total vulnerable population in target communes TT Hue province – 306,000 people • Number of provincial EWS stakeholders trained on the management and use of the smart flood warning system (VFASS) installed at target flood warning posts. • Number of commune-level EWSs strengthened with the CBEWS establishment. **Indirect beneficiaries** • Total vulnerable population in TT Hue province under the improved EWS – 406,000 people
Impacts and co-benefits	• EWSs in TT Hue province strengthened with consolidated institutional framework for better development, coordination and interoperability, and risk management with maps of natural hazard risks

[28] LuxDev Project VIE/433, 2022. Activity Completion Reports on support of Community-based Early Warning Systems under Delegate Agreement with District DARDs in Phu Loc, Phu Vang and Quang Dien districts

	• The forest fire management capacity of the Sub-department of Forest management is strengthened with the improved system for observation and warning of forest fires • The professional capabilities of provincial and district forest rangers are enhanced with improved knowledge and skills for forest fire fighting and prevention • District EWSs strengthened with district SC members' improved technical capacity for communication and response actions. • Commune EWSs strengthened with its stakeholders' improved knowledge and skills in communication, preparedness and emergency response, search and rescue. • Commune EWSs in target communes improved with the establishment of CBEWSs.
Risks	

Risks	Mitigating measures
Concerned provincial and district agencies are in support of the strengthening of existing institutional framework for development, coordination and interoperability of EWSs in the province	TAO will support the provincial Commanding Committee to assess the status quo of existing EWSs at all levels and use the key findings to advocate and consult concerned provincial and district agencies on the development of long-term masterplan and regulations.
Concerned provincial agencies are not in support of strengthening the existing climate information service with the automatic monitoring database management system and the development of a provincewide system of VFASS smart flood warning posts	TAO will include these sub-activities in the annual Workplan and Budget which is approved by the provincial P.C. TAO and the provincial SC will work closely to advocate, and consult concerned provincial agencies on the need for improving the existing climate information system with project supported interventions.
The established systems for automatic monitoring of reservoirs, irrigation dams, and hydropower plants & VFASS smart flood warning posts may be not able to be integrated with others of existing climate information system	Technical requirements for possible integration of established system into the existing climate system is formulated in detailed implementation plan and bidding procedure.
It may be impossible to recruit qualified external service providers for technical support needed for project activities in the region	TAO will apply the open tendering to recruit qualified external service providers; LuxDev will provide access to pool of experts
District and commune SCs do not have technological capability to organise IEC and capacity building activities for their members and members of commune-level grassroot shock taskforces	TAO will request the provincial SC for technical support in organising IEC and capacity building activities organised in target districts and communes
Women may be not given opportunities to participate in capacity building activities organised by district and commune SCs.	TAO will technically support district and commune SCs in organising IEC and capacity building activities to ensure women participation; LuxDev will bring in a gender expert to provide technical support to ensure women participation in capacity building activities; A required proportion of female beneficiaries per activity will be formulated in the activity implementation plan; Performance target with disaggregate data

		by sex will be set forth for monitoring and evaluation per activity
	District and commune authorities may not be in support of adopting the CBEWS model in target communes	TAO will support district SCs to organise necessary activities to advocate for the establishment of CBEWS in target communes with district P.Cs

Output 2. Climate adaptation considerations are mainstreamed into 44 SEDPs and an effective climate change adaptation impact-based M&E system is in place

Activity 2.1 Mainstreaming climate adaptation into local development planning

Activity 2.1: Mainstreaming climate adaptation into local development planning	
Description of activity	Mainstreaming adaptation to climate change refers to the systematic inclusion of climate risk and adaptation considerations in decision-making and planning processes as opposed to implementation of 'standalone' adaptation measures (Schaar, 2008). It is defined as a process of integrating climate change adaptation information, policies, and measures to address climate change within development planning (Afers 2013). The systematic integration of adaptation takes place at various planning steps and decision-making levels such as national, sub-national, sectoral, community and project levels (OECD, 2009). This activity will support the effective mainstreaming of climate adaptation considerations into development planning in target districts and communes in compliance with government regulations.[29] This will ensure that potential climate change impacts and adaptation responses are considered in the process of local development planning, with the objective of minimizing potential impacts and risks from climate-related hazards. In addition, mainstreaming climate change adaptation considerations will contribute to improving investment efficiency, strengthening inter-sectoral and inter-regional coordination, and ensuring consistency in implementing provincial climate change responses. The activity will be developed with two sub-activities focused on enhancing the knowledge and capacity of relevant stakeholders for the effective integration of climate change considerations into 5-year socio-economic development planning; and on the process of integrating climate change adaptation criteria into district and commune SEDPs for the period 2026-2030, in adherence with national and provincial regulations and guidelines.
Description of sub-activities	<u>Sub-activity 2.1.1: Enhance knowledge and capacities of relevant stakeholders for the effective integration of climate change considerations and response contents into 5-year socio-economic development planning</u> This sub-activity will focus on enhancing district and commune authorities' relevant knowledge and capacities to enable them to integrate climate change adaptation considerations into local socio-economic development planning. Efforts will be directed towards disseminating awareness of legal regulations governing planning procedures that mandate the integration of climate change response criteria into the 5-year SEDPs at the district and commune levels. In addition, targeted technical training sessions on climate change impacts and adaptation responses, MONRE technical guidelines for integrating contents of climate change adaptation responses into strategies, planning and plans, investment decision-making tools such as Cost-Effectiveness Analysis and Multiple Criteria Analysis, and local participatory planning process (LPPP) will be provided to provincial, district and commune authorities. ToT training focusing on LPPP and

[29] Law on Environmental Protection and MONRE's technical guidelines

	integrating climate change considerations into local development plans will be organized for district staff, followed by a wider training rollout aimed at relevant staff in the target communes. Results and lessons learnt from the mainstreaming process will be documented and shared at the provincial level. Special emphasis will be placed on climate adaptation considerations related to agriculture and EbA to inform the development of activities under components 2 and 3. <u>Sub-activity 2.1.2: Integration of climate change adaptation considerations into district and commune 5-year SEDPs for the 2026-2030 period in line with national regulations and guidelines.</u> This sub-activity will support target districts and communes in preparing their 5-year SEDPs through a local participatory planning process (LPPP) following a 5-step integration process. This process includes: • Developing an outline of the planning tasks and an assessment of natural disaster risks, climate change impacts, and climate change adaptation response measures. • Collecting data and synthesizing the assessment, information, and results. • Analyse and identify potential risk management solutions for natural disasters and climate change adaptation measures to be integrated into SEDPs. • Integrate prioritized climate change adaptation measures into the SEPDs. • Consult, validate, revise, and finalize the SEDPs. The project will support district and commune authorities to assess natural disaster risks, climate change impacts, and adaptation response measures at the district and commune level, and to develop their respective SEPDs for 2026-2030.
Target indicators	<u>Sub-activity 2.1.1: Enhance knowledge and capacities of relevant stakeholders for the effective integration of climate change considerations into 5-year socio-economic development planning</u> <u>Baseline:</u> • Local authorities at the district and commune levels have limited knowledge of climate change adaptation and climate change adaptation mainstreaming into socio-economic development planning • Staff of district and commune authorities and planning agencies lack knowledge of and have limited understanding of legal regulations and national guidelines for integration of climate change response contents into development planning and plans • Technical capacity for development planning with climate change response integration for district and commune staff are not properly highlighted. <u>Target:</u> • Local authorities and planning agencies at the district and commune levels will have improved knowledge of climate change adaptation and climate change adaptation mainstream into their SEDPs. • Staff of P.C district, planning agencies and commune P.C.s will have strengthened technical capacity as a result of their improved knowledge and better understanding of legal regulations and national guidelines for integration of climate change response contents into local socio-economic planning and plans. <u>Means of Verification:</u> • Activity completion reports • Periodical project implementation progress reports • Periodical M&E reports

	Sub-activity 2.1.2: Integrate climate change response contents into district and commune five-year SEDPs for the 2026-2030 in compliance with national regulations and guidelines. Baseline: • No enforcement of regulations on integration of climate change response contents into socio-economic development planning and plans exists in TT Hue province. • Climate change response contents were not properly integrated into district and commune level SEDPs for 2021 - 2025 in compliance with legal regulations and guidelines. • District and commune five-year SEDPs will be continuously established without integrating climate change response contents due to the absence of mandate and limited knowledge and understanding of required regulations and procedures for mainstreaming climate change response contents. Target: • Law enforcement on integration of climate change response contents into socio-economic planning will be strengthened in TT Hue province. • climate change response contents will be integrated into the process of establishing 4 district and 44 commune SEDPs for the 2026-2030 period and continuous periods in compliance with legal regulations and national guidelines. Means of Verification: • Activity completion reports • Periodical project implementation progress reports • Periodical M&E reports • Assessment reports on natural disaster risks, climate change impacts and response measures at the district and commune level • District and commune SEDPs for 2026 - 2030 with integration of climate change response established at target districts and communes
Inputs and investment items	Sub-activity 2.1.1: Enhance knowledge and capacities of relevant stakeholders for the effective integration of climate change considerations into 5-year socio-economic development planning • TAO to hire external service providers to develop training materials and deliver trainings for provincial, district and commune staff. • TAO financially supports district authorities/Division of Finance and Planning (DFP) to organize workshop and training activities to enhance knowledge and capacity for district and commune staff with the technical support of TAO experts and external consultants. Sub-activity 2.1.2: Integration of climate change adaptation considerations into district and commune 5-year SEDPs for the 2026-2030 period in line with national regulations and guidelines. • TAO to hire external service providers to technically assist target district authorities/DFPs to conduct the assessments of natural disaster risks, climate change impacts and response measures that provide inputs for the establishment of district and commune SEDPs in the period of 2026 - 2030. • TAO financially supports target district authorities/DFPs in establishing district and commune SEDPs and organize activities to have SEDP consultation with relevant agencies and communities, with the technical support of TAO experts and external consultants.

Technical evaluation /justification / barriers addressed	TT Hue province has already completed the socio-economic development plan (SEDP) which maps out the objectives, results, and performance targets for a time period of five years, from 2021 to 2025[30]. In alignment with this provincial SEDP, all districts and communes have developed and implemented their respective five-year SEDPs for 2021-2025, incorporating annual review planning processes. However, a technical evaluation carried out during the development of the study, revealed that these planning documents do not sufficiently integrate considerations related to climate change, such as natural disaster risks, impacts of climate change, and measures to respond and adapt to climate change hazards. Several challenges have been identified, including: i) Limited knowledge and understanding among staff at district and commune authorities and planning agencies regarding climate change adaptation issues. ii) Lack of awareness on how to effectively integrate climate change response elements into local development planning. iii) Absence of provisions to integrate climate change response content into the SEDPs for the 2021-2025 period. Despite the absence of regulatory mandates for compliance with climate change response integration and the limited understanding of how to incorporate climate change considerations into local development planning, there is a pressing need for effective mainstreaming of climate change considerations into the five-year socio-economic development planning. To address these challenges and enhance climate resilience, it is crucial to provide support for mainstreaming climate change into the five-year socio-economic development planning at the district and commune levels. Thus, proposed interventions under this activity will support target district and communes in TT Hue province to mainstream climate change response contents into their five-year SEDPs for the period of 2026 - 2030.
Implementation arrangements	Sub-activity 2.1.1: Enhance knowledge and capacities of relevant stakeholders for the effective integration of climate change considerations into 5-year socio-economic development planning • District DFPs have the responsibility to make implementation plans (IPs) of approved activities with the technical assistance of the assigned TAO expert. • TAO approves the IPs prior to the activity implementation, and District DFPs are responsible for the implementation of planned activities with the technical support and supervision of the assigned TAO expert. • District DFPs are required to report on achieved results after activity completion to TAO. • TAO is responsible for recruiting and contracting external service providers for the technical support needed capacity building activities. • TAO financial support will be provided in form of the Delegation Agreement (DA) signed by two parties. Sub-activity 2.1.2: Integration of climate change adaptation considerations into district and commune 5-year SEDPs for the 2026-2030 period in line with national regulations and guidelines. • District DFPs have the responsibility to make implementation plans (IPs) of approved activities with the technical assistance of the assigned TAO expert. • TAO approves the IPs prior to the activity implementation, and District DFPs are responsible for the implementation of planned activities with the technical support and supervision of the assigned TAO expert.

[30] TT Hue provincial P.C Plan No. 348/2021/KH-UBND dated November 9th, 2021

	• District DFPs are required to report on achieved results after activity completion to TAO. • TAO is responsible for recruiting and contracting external service providers for the technical support needed for strategic environment assessment and adjustments of land use masterplans. • TAO financial support will be provided in form of the Delegation Agreement (DA) signed by two parties.
Budget	Total activity cost: USD 310,700 GCF finance: USD 90,700 Co-finance (GoL MECB): USD 220,000 Co-finance (GoV): 0 USD
Exit strategy/ long-term sustainability	<u>Sub-activity 2.2.1: Enhances knowledge and capacities of relevant stakeholders for the effective integration of climate change considerations into 5-year socio-economic development planning</u> Interventions under this sub-activity will sustain the mainstreaming of climate change responses into district and commune socio-economic development planning on a long-term basis. A team of master trainers, trained and established in each district to implement a rollout training for commune staff on LPPP and integration of climate change response contents into five-year SEDPs at the commune level. With improved knowledge and capacity for integration of climate change considerations into local development planning, concerned staff in target districts and communes will know how to integrate climate change adaptation and response contents into their five-year SEDPs for 2016 - 2030 period in compliance with the national regulations and technical guidelines; and sustain capabilities for mainstreaming climate change responses into local development planning in TT Hue province in following periods. <u>Sub-activity 2.1.2: Integration of climate change adaptation considerations into district and commune 5-year SEDPs for the 2026-2030 period in line with national regulations and guidelines.</u> This sub-activity will bring about long-term technical and institutional sustainability for the mainstreaming of climate change response contents into local development planning in TT Hue. Under this sub-activity, interventions supporting the implementation of the five steps of integrating climate change response contents into district and commune five-year SEDPs in compliance with national regulations and guidelines will strengthen the technological capabilities of district and commune authorities and planning agencies through a routinized standard planning procedure that considers and integrates climate change responses. This will not only ensure that the process can be replicated in other communes and districts in the province but will also ensure greater funds and investment going towards activities which build resilience to future climate hazards and impacts. Such standard operating procedures can also be used by other provinces and at the national level.
Beneficiaries	**Direct beneficiaries:** • Number of provincial, district and commune authorities trained on local participatory planning process (LPPP). • Number of district and commune staff trained on integration of climate change response contents into five-year SEDPs in compliance with the law regulations and guidelines. • Number of district and commune staff trained on investment decision-making tools.

	• Number of staff provincial, district and commune government agencies attending the evaluation and sharing workshop. **Indirect beneficiaries** • Number of staff of provincial, district and commune government agencies involved in the assessments of natural disaster risks, climate change impacts and climate change response measures. • Number of staff of district and commune government agencies involved in establishing their district and commune five-year SEDPs for 2026 - 2030.
Impacts and co-benefits	• Law enforcement for the integration of climate change response contents into local development planning strengthened and routinized in TT Hue province. • Five-year SEDPs in target districts and communes integrated with climate change response contents in compliance with the national and provincial regulations and guidelines. • District authorities and planning agencies, commune P.Cs improved knowledge and capacity for local development planning procedure integrated with climate change response contents in compliance with national and provincial regulations and guidelines. • More investments on climate change response measures to be highlighted in five-year SEDPs at the district and commune level.
Risks	

Risks	Mitigating measures
Staff of district planning agencies, district and commune PCs are not involved in the project capacity building activities	TAO will work closely with district PCs to ensure staff of concerned district agencies and commune authorities to actively participate in the project capacity building activities
It may be challenging for recruiting qualified local external service providers for technical support needed for activities that integrate climate change response contents into district and commune five-year SEDPs	TAO will apply the open tendering to recruit qualified external service providers.; LuxDev will provide access to pool of experts
District and commune authorities may not be in support of integrating climate change response contents into five-year SEDPs for the period of 2026 - 2030	TAO will propose this sub-activity in the project Annual Workplan and Budget (AWPB) which will be approved by the provincial P.C prior to the implementation. This will be a provincial mandate for the implementation of the climate change response mainstream into establishing district and commune five-year SEDPs for 2026 - 2030.

Activity 2.2 Improving climate change adaptation impact monitoring at the provincial level

Activity 2.2: Improving climate change adaptation impact-based monitoring at the provincial level	
Description of activity	This activity aims to help TT Hue province become the first in the country to establish a functional and reliable provincial M&E system for climate change adaptation. This system will provide essential data for comprehensively assessing climate change impacts, based on identified vulnerabilities and risks. The process of institutionalization at the provincial level will be crucial for making this M&E system a permanent and integral part of the formal government structure.[31] With the support from LuxDev's project VIE/433, an M&E system for climate change adaptation within DONRE was established through a structured roadmap consisting of five developmental stages. At present, this system has completed the institutionalization transitional phases of awareness and experimentation, and still requires further support. Work under this activity will further support DONRE's M&E system to step into the next institutionalization phases of consolidation, expansion and maturity so that it can be legally endorsed as a provincial M&E system for climate change adaptation. As a means of reaching this level of institutionalization, under this activity the project will focus on i) strengthening and aligning the DONRE M&E system for climate change adaptation with the national M&E system; and ii) supporting the DONRE M&E system institutionalization in order to become a provincial M&E for climate change adaptation. It is expected that provincial a M&E system for climate change adaptation would be able to i) efficiently function and operate to provide reliable data and information. This would be used for assessments of vulnerability, risks of climate hazards, as well as climate change impact assessments for the formulation and M&E for climate change adaptation interventions; to enable climate change adaptation integration into strategies and planning, early warning and DRR; ii) actively involve concerned agencies and authorities at all levels and vulnerable communities; iii) facilitate the dissemination and public sharing of the updated M&E data and information on climate change response. In addition, this activity will support TT Hue Forest Protection and Development Fund (FPDF) to effectively integrate contents of forest resilience into its monitoring and evaluation activities. This intervention is expected to enable the FPDF's M&E system to i) provide reliable up to date, reliable data that can be used effectively for assessing the climate resilience/forest quality and the EbA interventions mapped out in the activities under Output 3; and ii) contribute substantial monitoring data on climate change adaptation to the provincial M&E system for climate change adaptation. It is expected that this can incentivize higher payments for areas providing high forest resilience/quality over the long term.
Description of sub-activities	<u>Sub-activity 2.2.1 Strengthen and align the DONRE M&E system for climate change adaptation with the national M&E system</u> This purpose of this sub-activity is to support the consolidation of the DONRE M&E system so that it can reach the transitional institutionalization phase of expansion and maturity. DONRE's M&E system for climate change adaptation was supported to become a provincial M&E for climate change adaptation under the LuxDev project VIE/433. This system was established two years before the establishment of the national M&E system for climate change adaptation activities[32], and of MONRE's guidelines for assessment of climate change impacts, vulnerability, and risks[33]

[31] Institutionalization is the process through which a series of activities and structures become an integral and enduring component of a formal system. It involves the progression of events that lead to the establishment of new practices which eventually become standard procedures. This process is viable when it gains ongoing support and validation through official government endorsement. The various phases of institutionalization can be categorized into five transitional stages: awareness, experimentation, expansion, consolidation, and maturity.

[32] The Prime Minister Decision No. 148/QĐ-TTg dated 28/1/2022 to promulgate the national M&E system for CCA activities

[33] MONRE Circular No.01/2022/TT-BTNMT dated January 7th, 2022, detailing the implementation of the Law on Environmental Protection regarding climate change response.

	which were promulgated in early 2022. Therefore, it is not yet in line with the national M&E system and MONRE's guidelines in terms of M&E contents, indicators, regulations and technical guidelines for operationalization. In addition, a technical assessment indicates that this system requires further strengthening in order to fulfil expected functions based on its current gaps. Proposed interventions under this sub-activity which seek to strengthen and align DONRE M&E system for climate change adaptation are i) improve its M&E data collection, reporting and database system in line with the national M&E system; ii) enhance awareness of and build necessary M&E capacity for climate change adaptation for professional agencies and authorities at all levels; and iii) upgrade its existing web portal for better public sharing on climate change response monitoring and evaluation. <u>Sub-activity 2.2.2 Support DONRE in the institutionalization of its climate change adaptation M&E system</u> This sub-activity aims to support the DONRE M&E system to step into institutionalization phases of expansion and maturity. Work under this sub-activity will focus on the following interventions: i. Create a legal framework that institutionalizes DONRE's M&E system as a provincial M&E system for climate change adaptation. This intervention will technically support the development of legal documents such as technical guidelines for implementation, and regulations for the operationalization the provincial system. Such documents are endorsed and promulgated for official implementation under the provincial P.C Decision. This provincial government mandate will generate an enabling environment along with a mechanism to ensure oversight, coordination, delegation of roles and responsibilities, and accountability for the effective operationalization of the provincial M&E system. This intervention also includes a number of activities for consultation with concerned professional and authoritative agencies. ii. Support the operationalization of the provincial M&E system for climate change adaptation. This intervention will support DONRE in organizing activities to raise awareness and understanding of the provincial M&E system amongst provincial and district agencies and authorities, which will contribute to the effective operationalization of the provincial system. Supporting the expanded operationalization of the provincial system to the district and commune levels will focus on strengthening the necessary capacity for data collection, storage, analysis and reporting in compliance with national and provincial technical guidelines for concerned district and commune staff. Project interventions include trainings to guide designated staff from district agencies and commune authorities on how to collect, store and report monitoring data to ensure compliance, quality and provision of necessary facilities and equipment for data storage, analysis and reporting. Technical support will be provided to DONRE for coordinating and implementing the collection and analysis of baseline data at all levels for the provincial M&E system. The end activity under this intervention will support the evaluation of the operationalization of the provincial M&E system. iii. Disseminate and share the provincial M&E system for climate change adaptation nationwide. This intervention will support the documentation of TT Hue's provincial M&E system for climate change adaptation as an example of good practice. This will include the organization of national conferences to disseminate and share the model of provincial the M&E system and lessons learned in its establishment. These activities will help to influence MONRE on the development of technical guidelines on the establishment of a sub-national M&E system, as well as other provinces in adopting the model of TT Hue's provincial M&E system for climate change adaptation.

	Sub-activity 2.2.3 Support the integration of forest resilience into the monitoring of TT Hue's Forest Protection and Development Fund operations The main focus of the provincial's FPDF M&E system is to gather information to measure how fair, transparent, and effective the payments for environmental services (PFES) are. The fund's M&E system uses 22 monitoring indicators and 13 evaluation indicators provided by the FPDF at the national level. This sub-activity will strengthen the provincial FPDF's M&E system by integrating forest resilience and quality criteria to assess the climate change adaptation-related impacts of the fund's payments. This will be done through supporting the development of M&E indicators on forest resilience; upgrading the existing database management system; and building the capacities of key stakeholders (FPDF staff, forest owners, and forest enterprises receiving PFES) for assessing and monitoring forest resilience.
Target indicators	Sub-activity 2.2.1 Strengthen and align the DONRE M&E system for climate change adaptation with the national M&E system Baseline: • DONRE M&E system for climate change adaptation is not yet in line with the national M&E system for climate change adaptation activities and MONRE guidelines for climate change impact assessment in terms of M&E contents and indicators, data collection tools and database schema as well as technical guidelines for operationalization. • DONRE M&E system is not qualified to be institutionalized to become a provincial M&E system for climate change adaptation. • DONRE have limited technological capability to strengthen and upgrade the existing M&E system to become a provincial M&E system. Target: • Upgraded M&E DBMS software and equipment and staff trained on its use • DONRE M&E system is strengthened to be well integrated and aligned with the national M&E system for climate change adaptation activities and MONRE guidelines for climate change impact assessment. • DONRE M&E system is ready to be proposed for provincial-level institutionalization to become a provincial M&E system for climate change adaptation. Means of Verification: • Activity completion reports • Periodical project implementation progress reports • Periodical M&E reports • Revised M&E contents and indicators, tools, database schema as well as technical guidelines for operationalization of DONRE M&E system for climate change adaptation Sub-activity 2.2.2: Support DONRE in the institutionalization of its climate change adaptation M&E system Baseline: • No official provincial government mandate for the provincewide operationalization of DONRE M&E system exists in TT Hue. • There exists no institutional framework for DONRE M&E system for climate change adaptation to function and operate as a provincial-level system. • DONRE has limited resources and technical capability to implement the provincial-level institutionalization of its M&E system. Target:

	• DONRE M&E system is endorsed to become a provincial M&E system for climate change adaptation by TT Hue provincial P.C. • The operationalization of the provincial M&E system for climate change adaptation is legally mandated on the regulation and technical guidelines constituting an institutional framework for implementation. • TT Hue provincial M&E system for climate change adaptation is put into operation provincewide and effectively functions to serve provincial efforts to respond to climate change. Means of Verification: • Activity completion reports • Periodical project implementation progress reports • Periodical M&E reports • Technical documents and workplan for implementation of the provincial M&E system for climate change adaptation • Regulations for operationalization of the provincial M&E system for climate change adaptation • Provincial P.C Decision that promulgates the provincial M&E system for climate change adaptation • Baseline household survey to collect primary data for the provincial M&E system • Evaluation report on the operationalization of the provincial M&E system <u>Sub-activity 2.2.3: Support the integration of forest resilience into the monitoring of TT Hue's Forest Protection and Development Fund operations</u> Baseline: • The FPDF M&E system do not collect monitoring data that can be used for assessing the forest ecosystem resilience. • FPDF stakeholders have limited understanding and awareness of forest resilience/quality related to the PFES activities. Target: • Set of M&E indicators, data collection tools and database schema are revised with the integration of forest resilience. • The Fund M&E database system is strengthened and properly upgraded with additional database on forest quality. • FPDF stakeholders have improved capacity for monitoring and assessing of forest resilience. Means of Verification: • Activity completion reports • Periodical project implementation progress reports • Periodical M&E reports • TT Hue FPDF Database Management System • The assessment report on the climate change impact of the Fund operations
	<u>Sub-activity 2.2.1 Strengthen and align the DONRE M&E system for climate change adaptation with the national M&E system</u> • TAO to hire external service provider to technically support DONRE in revising the set of M&E, data collection tools, and database schema.

Inputs and investment items	• TAO to hire external service provider to technically support DONRE in developing training materials and delivering trainings for staff of provincial and district concerned agencies and authorities. • TAO financially supports DONRE in organizing training courses on the regulations and guidelines of national M&E system for staff of provincial and district concerned agencies and authorities, with the technical support of TAO experts. • TAO financially support DONRE to strengthen and update its web portal. <u>Sub-activity 2.2.2 Support DONRE in the institutionalization of its climate change adaptation M&E system</u> • TAO to hire external service provider to technically support DONRE in developing technical guidelines, regulations and plan for the operationalization of the provincial M&E system for climate change adaptation. • TAO financially supports DONRE in organizing workshops on process and procedures of provincial-level institutionalization for its M&E system, with the technical support of TAO experts. • TAO financially supports DONRE in organizing training courses on collection, storage and reporting of monitoring data for the provincial M&E system for provincial, district and commune government staff, with the technical support of TAO experts. • TAO financially supports the establishment of M&E system for climate change adaptation at the district and commune level, with the technical support of TAO experts. • TAO technically supports DONRE in organizing the collection of data for the provincial M&E system. • TAO to hire external service provider to evaluate the operationalization of the provincial M&E system for climate change adaptation for further consolidation and improvements. <u>Sub-activity 2.2.3: Support the integration of forest resilience into the monitoring of TT Hue's Forest Protection and Development Fund operations</u> • TAO expert to technically support TT Hue FPDF in revising the set of M&E, data collection tools and database schema. • TAO financially supports TT Hue FPDF to upgrade its existing M&E database management system. • TAO financially supports TT Hue FPDF in organizing awareness raising and capacity building activities on monitoring and assessment of forest resilience, with the technical assistance of TAO experts.
	<u>Sub-activity 2.2.1 Strengthen and align the DONRE M&E system for climate change adaptation with the national M&E system</u> Adopting the IPCC key contents of climate change adaptation monitoring (UNFCCC, 2013; Adaptation Committee, 2019) and the conceptual model of climate change adaptation (GIZ, 2015), DONRE's M&E system focuses on two key monitoring contents i) climate change vulnerability factors; ii) climate change adaptation response. The first set of monitoring indicators[34,35] adopted from technical documents and research reports was formulated to monitor data which can be used to assess determinants of vulnerability such as exposure, sensitivity and adaptive capacity

[34] TT Hue DONRE (2020). Sets of adaptation M&E indicators for provincial system

[35] TT Hue DONRE (2021). Tài liệu hướng dẫn kỹ thuật xây dựng và vận hành hệ thống giám sát và đánh giá thích ứng với BĐKH tỉnh TT Huế (*Technical manual for development and operation of TT Hue provincial M&E system for climate change adaptation*)

Technical evaluation / justification/ barriers addressed	(AR4) as well as potential impacts based on risk elements such as hazards, exposure, vulnerability caused by climate hazard events and in certain sector. The second set of indicators was developed to monitor financial resources, adaptation outcomes and impacts of ten types of climate change adaptation actions (Bonizella, 2014) which can be used for climate change adaptation activities in all sectors and areas. The first round of collecting baseline data for DONRE's M&E system that tested the feasibility and applicability of data available for the formulated indicators showed that these sets of indicators need to be streamlined for their more effective use. The set of M&E indicators for vulnerability factors are required to be revised so that the system can collect M&E data in accordance with MONRE's guidelines and stipulations for assessing climate change impacts, vulnerability, risks and loss and damage caused by natural disasters.[36] In addition, the existing indicators monitoring adaptation actions/activities are not aligned with those of the national M&E system for climate change adaptation activities which focus on: monitoring state management of climate change; strengthen resilience, capacity to adapt to climate change; mitigating natural disaster risks, minimizing damage caused by climate change; resources invested for climate change adaptation; science, technology and international cooperation; and training, propaganda and awareness raising. Provincial People's Committees are required to annually report on the outcomes of climate change adaptation activities based on this number of indicators that are in compliance with the provided reporting templates for monitoring and assessing climate change adaptation activities. MONRE is currently preparing a manual to guide the operation of the national M&E system. When this manual is issued, concerned provincial and district agencies will have to follow these national technical guidelines for data collection and reporting. Therefore, it is critical that provincial and district agencies will be trained on how to adopt these national guidelines. Therefore, DONRE's M&E system needs to update M&E contents, define climate change adaptation indicators, and create technical guidelines and 27 data collection tools. The staff at the provincial and district agencies involved in the operations of the M&E system will undergo training to familiarize themselves with the updated tools and guidelines. The DONRE M&E database system, which currently holds baseline data from 2020 collected from various sources, including 13 provincial agencies, 9 districts, 141 communes, and a household survey of 4,069 sampled households, will also need to be strengthened with the new database schema and refreshed data. The data collected through the revised M&E contents, indicators, and tools can serve for assessing climate change vulnerability, risks, and impacts in alignment with MONRE guidelines. This information can also contribute to strategic environmental assessments that integrate climate change adaptation. This serves as an initial step in formulating or revising development plans, as outlined in activity 1.2. Additionally, the DONRE web portal, integrated into the database management system, serves as a platform to document, and disseminate M&E data and information to the public. If improved and integrated with the national database system, this web portal will simplify online data collection from districts and communes. This enhancement will also make the province's climate change adaptation M&E data more accessible to the public and can serve as a model for other provinces to adopt. DONRE faces barriers to implement the activities to strengthen and align its M&E system with the national M&E system. These include i) limited human and financial resources and ii) its staff with limited technological capability to do technical

[36] MONRE Circular No.01/2022/TT-BTNMT dated January 7th, 2022, detailing the implementation of the Law on Environmental Protection regarding climate change response

	activities that strengthen its M&E system in terms of M&E contents, data collection tools, database system and necessary capacity building. <u>Sub-activity 2.2.2 Support DONRE in the institutionalization of its climate change adaptation M&E system</u> This sub-activity aims to further support DONRE to complete the institutionalization phases of expansion and maturity. The key barrier to the expansion of DONRE M&E system to a provincewide scale, particularly to the district and commune level is the absence of a provincial government mandate. To propose for the provincial P.C Decision that promulgates the provincial M&E system, DONRE needs to prepare the necessary documents such as technical guidelines for data collection and reporting, plan and regulations for operationalization of the provincial system, and go through a consultation procedure with provincial and district government agencies. All these tasks require to have full-time technical personnel with a high level of expertise on climate change adaptation monitoring and evaluation. However, DONRE does not have any technical staff working full time on climate change issues and its staff have limited technological capability to carry out such technical activities. As a result, the initial intervention under this sub-activity will technically support DONRE to create an institutional framework by developing these important documents and organizing activities on consultation procedure at the provincial and district level. This intervention will help to build the internal capacity for DONRE staff so it exists, and efforts can be sustainable and taken forward after GCF funding. After the provincial P.C Decision established the provincial M&E system, further technical support is needed for effective province-wide expansion and evaluation. The regulations and guidelines for data collection, along with the implementation plan of the provincial M&E system, must be effectively communicated to relevant provincial and district agencies. Given the significance of district and commune-level data for the provincial M&E database system, this intervention also emphasizes the importance of establishing an M&E system network at these levels. This network would require technical guidelines for district and commune-level climate change adaptation M&E activities, as well as the necessary infrastructure for data storage, analysis, and reporting. Lastly, it is essential to evaluate the operationalization of the provincial M&E system to provide guidance for further improvements and to assess its maturity in terms of values, leadership, policy alignment, resource allocation, integration, and more. The evaluation will also help identify lessons learned and best practices that can be shared for replication. With support from the GCF project, TT Hue province aims to establish an efficient M&E system, making it the pioneering province in Vietnam to collect and provide reliable data for assessing vulnerability, climate hazard risks, impact evaluation, adaptation interventions, strategic planning, and early warning and DRR. MONRE has issued regulations and guidelines for indicators and methods, equations to assess climate change impacts and hazard risks based on key factors of hazards, exposure and vulnerability, loss and damage caused by natural disasters. However, it is impossible for relevant government agencies, organizations, and research individuals to follow these national guidelines because MONRE has not formulates any technical guidelines for collecting monitoring data. In addition, it has not issued any guidelines for the establishment of a provincial M&E system, which enables collecting monitoring data possibly used for assessment of vulnerability, risks of climate hazards and climate change impacts in compliance with its guidelines. This is currently a barrier that makes DONREs in other provinces unable to establish a M&E system for climate change adaptation or to collect monitoring data in line with national guidelines on climate change assessment because of data deficiency and unavailability. TT Hue's provincial M&E system for climate change adaptation will influence the strengthening of the national M&E system with more focus on monitoring climate change vulnerability, risks and impacts and will be a basis of good practice to be adopted and scaled up nationally. <u>Sub-activity 2.2.3: Support the integration of forest resilience into the monitoring of TT Hue's Forest Protection and Development Fund operations</u>

	The TT Hue FPDF needs to update its existing monitoring and evaluation system by incorporating climate change considerations. This update is crucial for gathering data to assess forest resilience and quality. To achieve this, they need to adjust M&E content, indicators, data collection tools, and technical guidelines, and improve their current database management system. Additionally, documents related to capacity building and stakeholder awareness should be updated to include forest resilience aspects. However, the FPDF lacks the technical know-how to carry out these changes on its own. This sub-activity will provide the necessary technical and financial support to help the Fund make these adjustments, especially to its M&E system. This improved system will align with the provincial M&E system for climate change adaptation and enhance data sharing.
Implementation arrangements	<u>Sub-activity 2.2.1 Strengthen and align the DONRE M&E system for climate change adaptation with the national M&E system</u> • DONRE is responsible for making implementation plans (IPs) of approved activities with the technical assistance of the assigned TAO expert. • TAO approves the IPs prior to the activity implementation, and DONRE is responsible for the implementation of planned activities with the technical support and supervision of the assigned TAO expert. • DONRE is responsible for reporting on achieved results after activity completion to TAO. • TAO is responsible for recruiting and contracting external service providers needed for the technical support to a number of activities. • TAO financial support of DONRE will be provided under the Delegation Agreement (DA) signed by two parties. <u>Sub-activity 2.2.2 Support DONRE in the institutionalization of its climate change adaptation M&E system</u> • DONRE is responsible for making implementation plans (IPs) of approved activities with the technical assistance of the assigned TAO expert. • TAO approves the IPs prior to the activity implementation, and DONRE is responsible for the implementation of planned activities with the technical support and supervision of the assigned TAO expert. • DONRE is responsible for reporting on achieved results to TAO after activity completion. • TAO is responsible for contracting external service providers needed for the technical support to a number of activities. • TAO financial support of DONRE will be provided under the Delegation Agreement (DA) signed by two parties. • For activities implemented and managed at the district and commune level, district agencies/authorities are responsible for making IPs with the technical support of the assigned TAO expert. • TAO approves the IPs prior to the activity implementation, and district agencies/authorities are responsible for the implementation of planned activities with the technical support and supervision of the assigned TAO expert. • TAO is responsible for contracting external service providers needed for provision of necessary facilities and equipment for the district and commune M&E systems. • District agencies and authorities are responsible for reporting on achieved results to TAO after activity completion. <u>Sub-activity 2.2.3: Support the integration of forest resilience into the monitoring of TT Hue's Forest Protection and Development Fund operations</u>

	• TT Hue FPDF is responsible for making implementation plans (IPs) of approved activities with the technical assistance of the assigned TAO expert. • TAO approves the IPs prior to the activity implementation, and TT Hue FPDF is responsible for the implementation of planned activities with the technical support and supervision of the assigned TAO expert. • TT Hue FPDF is responsible for reporting on achieved results to TAO after activity completion. • TAO is responsible for contracting external service providers needed for the technical support to TT Hue FPDF. • TAO financial support of TT Hue FPDF will be provided under the Delegation Agreement (DA) signed by two parties.
Budget	Total activity cost USD 433,000 GCF finance: USD 433,000 Co-finance (GoL MECB): 0 USD Co-finance (GoV): 0 USD
Exit strategy / long-term sustainability	<u>Sub-activity 2.2.1 Strengthen and align the DONRE M&E system for climate change adaptation with the national M&E system</u> This sub-activity will not only enhance the functionality of DONRE's M&E system, making it eligible achieving its status as provincial M&E, but it will also enable both provincial and district DONRE to manage, coordinate, and oversee the M&E system more effectively. This will be facilitated by the improved technological capacity gained through their involvement in and the benefits derived from the technical activities implemented. Aligning DONRE's M&E system with the national M&E framework will also influence the broader national M&E system for climate change adaptation, emphasizing the assessment of climate change vulnerability, risks, and impacts. Furthermore, this will serve as a valuable model for other provinces to follow when establishing their own climate change adaptation monitoring and evaluation systems. <u>Sub-activity 2.2.2 Support DONRE in the institutionalization of its climate change adaptation M&E system</u> Interventions under this sub-activity will bring about a long-term institutional, technical, and financial sustainability, of DONRE's M&E system through its provincial-level institutionalization. The institutional framework created under this sub-activity will result in the issuance of the provincial P.C Decision that endorses DONRE M&E system to become a provincial M&E system. This official provincial government mandate will sustain the institutional arrangements for the operationalization of the provincial M&E systems. In addition, the mandatory adoption of issued guidelines, regulations, and plan for implementation of the provincial M&E system, developed as a result of this sub-activity interventions, will sustain the climate change adaptation monitoring activities. <u>Sub-activity 2.2.3: Support the integration of forest resilience into the monitoring of TT Hue's Forest Protection and Development Fund operations</u> Monitoring and evaluation is a mandatory and routinized task of TT Hue FPDF so the outcomes of forest resilience integration its M&E system will be sustained on a long-term basis. In addition, this system will be aligned with and required to provide data on climate impacts on forest ecosystems to the provincial M&E system for climate change adaptation.
Beneficiaries	**Direct beneficiaries:** • Number of provincial and district DONRE staff • Number of staff from other concerned provincial and district agencies • Number of commune staff

	• Number of FPDF staff • Number of forest owners • Number of PFES users **Indirect beneficiaries** • Number of people can have access to the M&E data and information • Number of people who live on forest ecosystems in the province
Impacts and co-benefits	• DONRE M&E system for climate change adaptation strengthened and institutionalized to become a provincial M&E system, aligned with the national M&E system. • TT Hue province becomes the first province in Vietnam with a comprehensive M&E system for climate change adaptation which effectively functions and operate to provide substantial inputs for effective management to respond to climate change and can be scaled up nationally. • TT Hue provincial M&E system for climate change adaptation is a good practice that can adopted and replicated in other provinces.
Risks	

Risks	Mitigating measures
It may be challenging to recruit qualified local external service providers to provide technical support to DONRE in a timely manner, due to the limited source of experts on climate change adaptation monitoring and evaluation	TAO will apply the open tendering to recruit qualified external service providers.
MONRE manual on regulations and technical guidelines for implementation of the national M&E system for climate change adaptation activities may not be finalized and issued for adoption at the project implementation time	TAO and DONRE will work closely to request technical assistance from DCC, MONRE and other concerned national institutions. LuxDev will provide access to pool of experts for technical assistance
Concerned provincial and district agencies are not actively involved in project activities on capacity building and consultation procedure for the institutionalization of DONRE M&E system for climate change adaptation	TAO will prepare detailed Annual Work Plan on project activities and get it approved by the provincial P.C Decision. This is a legal basis for DONRE will send official dispatches to inform and propose provincial and district agencies to participate in project activities
Provincial authorities are not in support of the institutionalization of DONRE M&E system to become a provincial M&E system	TAO and DONRE will carry out necessary activities to advocate for institutionalization of existing M&E system at the provincial level which is a continuous important end stage in the roadmap for developing the provincial M&E system as in the LuxDev project VIE/433 Annual Workplans and Budget (AWPB) approved by TT Hue provincial P.C
District and commune PCs are not actively involved in the expanded operationalization of	TAO will support DONRE to organize workshops to disseminate regulations and guidelines the operationalization of

	DONRE M&E system in terms of data collection and reporting	provincial M&E system at the district and commune level
	FPDF stakeholders are not actively involved in collecting and reporting adequate necessary data for the FPDF M&E system	FPDF will organize activities to raise FPDF awareness of and build necessary capacity for integration of climate change impact assessment into monitoring and evaluation performance for forest owners and PFES users prior to the implementation of data collection for the strengthened M&E system
	FPDF M&E system may not be able to provide relevant data that can be integrated with the provincial M&E system for climate change adaptation	TAO will make sure that the FPDF M&E system will use relevant climate impact assessing indicators of the provincial M&E system for revision of data collection and reporting templates/tools.

Component 2. Enhanced resilience of ecosystems and the livelihoods of local men and women

Total cost: USD 2.469 million (GCF: USD 2.267 million, Government of Luxembourg – MECB: USD 0.202 million)

Output 3. EbA strengthens the resilience of livelihoods and ecosystems to climate change

To address the climate change risks and impacts on the livelihoods of local men and women and the ecosystems on which they depend, this output will support scaling EbA interventions that will be designed, implemented, managed, and monitored in a participatory manner. The planning under this output will build on the climate information generated and participatory processes conducted under activity 2.1, and the M&E system developed under activity 2.2 will be used to monitor their impact.

EbA-supported investments under this activity will focus on the restoration of degraded ecosystems and natural and protection forests with site-adapted native tree species to strengthen ecosystems to climate change. Output 3 will be implemented in the target districts and municipalities.

Activity 3.1 Scale EbA interventions to enhance the resilience of men and women in TT Hue

Scaling EbA interventions in 450 ha to enhance the resilience of men and women in TT Hue	
Description of activity	Forest quality plays a critical role in climate change adaptation due to the numerous ecosystem services that healthy forests provide. These services are essential for the well-being of communities and the stability of ecosystems. Ecosystem-based Adaptation (EbA) offers a practical approach to climate change adaptation by enhancing ecosystem quality and, thus, ecosystem service provision. While EbA has demonstrated many benefits for climate change adaptation, there are

	situations where its use may be limited, and additional engineered solutions are required to complement or enhance its effectiveness. The activity is twofold on EbA interventions in the province's hilly and coastal areas. Its primary goal is to enhance the climate resilience of men and women in TT Hue through EbA approaches bolstering the protective functions of forest ecosystems in the province. This activity has two sub-activities; i. improving climate resilience through scaling and further enhancing existing coastal forest restoration measures in order to develop cost-effective and investment-ready EbA approaches to scale throughout central Vietnam, while mobilizing finance to enable independent scaling; ii. developing business models for forest owners to independently implement forest restoration measures in severely degraded natural protection forest areas in both coastal and hilly areas of Hue Province, This activity operationalizes integrated and climate-responsive planning as supported under activity 2.1. <u>On coastal and inland-sand dune areas:</u> The typhoon-prone north-central coast of Vietnam (NCC-VN) is home to vulnerable (coastal) populations who rely on subsistence agriculture and fishing. Historically, dense dune forests protected these communities from extreme weather events and provided additional livelihood sources. However, land use intensification and deforestation have left Hue's forests in a state of high degradation and low quality – particularly coastal forests (Nehren et al, 2016; Nehren et al, 2017). Current measures to enhance forests (i.e., PFES) do neither consider forest quality as an indicator nor do they invest in crucially important coastal forest restoration. Furthermore, engineering dune repair measures are temporary and ineffective without accompanying EbA measures. Therefore, restoration of coastal sand dune forests with site-adapted native tree species is an adequate measure to further stabilize both coastal and inland sand dune the dunes and thus both, a measure of erosion protection and flood protection. Previously, natural forests covered the sandy soils of TT Hue. However, most of these forests have been cleared, leaving only small remnants (Hoa et al, 2010). These remnants can no longer fulfil their protective function against climate change impacts, such as typhoons. The sandy sites present significant challenges for restoration efforts: many sites are so degraded that protection alone is insufficient, but active reforestation is required to enhance forest quality (Thao & Hoang, 2019). The sustainability of such restoration measures can only be ensured through community ownership. Once an economic value is associated with coastal dune forests, their independent restoration and protection are incentivized. <u>On hilly areas</u> In the hilly regions of Hue Province, forest restoration efforts have taken on a new level of importance as communities grapple with the impacts of climate change and land degradation. The once-lush forests that covered the slopes provided essential ecosystem services, including water regulation, soil conservation, carbon sequestration, and diverse flora and fauna habitat. However, deforestation and unsustainable land use practices have compromised the integrity of these forests, leading to increased vulnerability to climate change, soil erosion, and loss of biodiversity. Recognizing the situation's urgency and potential negative impacts on forest-dependent communities, the government aims to restore the hilly forests. Still, it lacks options and incentives to do so at scale. Therefore, by implementing innovative strategies that combine ecological restoration with sustainable livelihood development, a central component of the projects' effort is the promotion of Non-Timber Forest Product (NTFP) business models, which encourage communities

	to cultivate and sustainably harvest valuable non-timber forest products – and by doing so develop a business case for forest restoration. This business case is further supported by improved channelling of public funds into enhancement of forest quality through natural forest restoration and protection, and the monitoring thereof, particularly through PFES – as takes place under sub-activity 2.2.3.
Description of sub-activities	<u>Sub-activity 3.1.1. Enhancing resilience through Coastal Forest Restoration in 400 hectares</u> Sand dune forests are crucial to enhancing coastal resilience (Hoa et al, 2010). Intact coastal forests on coastal dunes and adjacent sandy areas, are highly diverse[37] and resilient, functioning as a natural protection against extreme weather events for resident local communities. Furthermore, coastal forests provide numerous other regulatory, provisioning and cultural ecosystem services (Hoa et al, 2010). However, to restore these at scale, two preconditions must be met: Firstly, the availability of a proof-of-concept which shows success and provides confidence to private & public stakeholders for investments at scale. Secondly, the lasting impacts of any EbA measure can only be guaranteed through community ownership. Hence economic incentives for communities to restore, maintain and protect coastal forests are crucial. While the need to restore these degraded coastal forests is widely acknowledged (UNEP, ND), it lacks severe public funding. Thus far, this has mainly been carried out with external funds (BMU-IKI, WB-FMCR). To reach impact at scale, public and private financing for coastal forest restoration needs to be leveraged. Therefore, this activity will focus on scaling and further refining the Coastal Forest Restoration (CFR) approach: The CFR approach follows the principals of Assisted natural regeneration (ANR) and mimics the clustered distribution of native trees as observed in coastal forest remnants. It assumes that such clusters create more favourable micro-climates, including moisture retention and better protection against drifting sand. The clusters each consist of ten to twelve individual seedlings and are distributed in two circles and a central tree) (**Error! Reference source not found.**). The central seedling is from species with potential to grow into a medium or large tree, while the surrounding concentric rings are composed of shrub and pioneer species with economic value for the land-owning communities. The clusters are planted in lines at a distance of ten meters apart, planting holes are supplemented with mycelium penetrated rice straw for improved moisture and nutrient provision during the crucial establishment phase.

[37] Coastal forests cover dunes and more adjacent sandy areas, up to 10 km from the shoreline are vital habitats for migratory birds and many endemics, and in some cases critically endangered, species

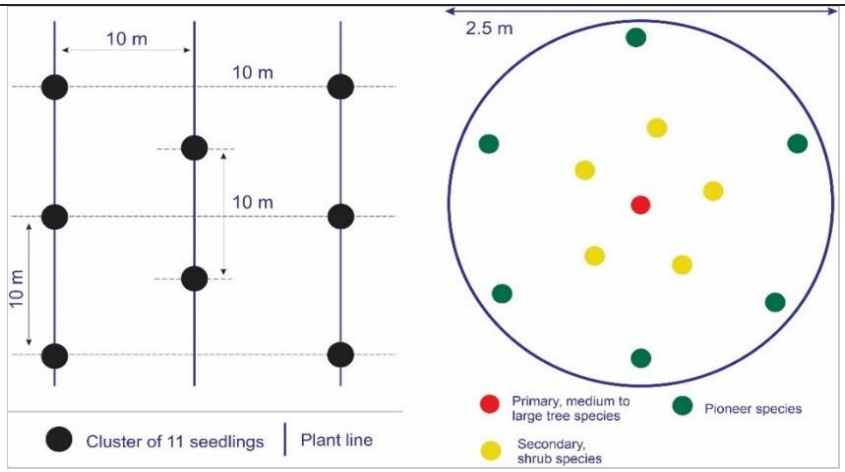


Figure 28. CFR planting approach with 10 - 12 native seedlings per plot, mimicking natural growth clusters.

The projects' goal is to actively contribute to and ensure a scalable, investment-ready EbA solution that enhances coastal resilience, catalysing public and private investments in CFR for greater impact. It does so by sourcing this sub-activity to a technical service provider with proven technical work experience in native species coastal dune restoration measures. This service provider will be working directly with local communities, jointly restoring 400 ha of degraded coastal sand dune forests in Hue Province as a showcase example:

i. The project will work with local communities in the coastal areas of Hue Province (particularly Phong Dien District) on the implementation of plantings (specific restoration sites to be identified under activity and through an initial site-suitability assessment), following an approach mimicking natural plant clusters in degraded coastal forest areas (Thao et al , 2015), accompanied by capacity building for local communities and relevant gov't stakeholders to ensure proper implementation of native tree species plantings through the development and institutionalization of technical guidance documents for coastal forest restoration (cf. point iii). In this context, a low-impact approach will be implemented to ensure no unintended impacts[38] from CFR measures.

ii. In parallel, the project will work with relevant stakeholders to further enhance the business case around CFR, providing incentives to households to protect and maintain coastal dune forests restored under the prior sub-activity.

iii. It does so by providing communities with capacities on high quality native tree species seedling. Furthermore, the project will cooperate with communities and private sector stakeholders[39] to develop offtake/pre-buyer agreements for NTFP sources growing in the restoration areas. This will create an economic incentive for local communities to manage, maintain and protect these areas sustainably.

iv. Based on lessons learnt from steps i) and ii), the project will provide support to, and work directly with, the provincial government (DARD) in the development of technical guidelines for coastal forest restoration in Hue Province for independent scaling and to contribute to the targets of the Provincial Climate Change Action Plan as well as Decision 1662/QĐ-TTg on the restoration of coastal forests[40].

v. This activity will further help to identify critical sites for future scaling of restoration measures based on the projects' assessment of climate risks to integrate into the land use/SEDP planning processes (as carried out under activity 2.1)

vi. Based on the successful showcase of sub-activities i) and ii), the project will disseminate its experience and technical knowledge and develop

financing options for investing in coastal forest restoration and the long-term management and protection of these crucial ecosystems, and their associated climate adaptation and ecosystem service values.

vii. Specifically, the project will quantify these values and work with private (CSR[41] and under the upcoming VN Emission Trading Scheme) and public (DARD[42], i.e., operationalization of other PFES payments [tourism, biodiversity] with the provincial FPDF; and the provincial infrastructure offsetting fund, which exclusively invests in forest landscape restoration with native tree species, but thus far rarely in coastal forest restoration[43]) stakeholders, developing financing options and mobilizing both private and public funding for restoration of coastal forests at scale. Through the valuation of coastal forests and the subsequent development of financing and investment cases for CFR, long-term management of restoration areas under i) will be ensured, and additional finance will be mobilized for coastal forest restoration and thus enhanced coastal resilience within Hue Province and through the Central Coast of Vietnam.[44]

The following process and criteria will be used to determine the intervention sites: potential sites will be screened against the project's exclusion list and the ESS screening checklist (including SEAh assessment) to ensure that all activities are Category C. The project will prioritise sites that require immediate attention (i.e. areas are classified as "Protection Forests" and where forest quality has been classified as "poor"). Following the prioritisation, specific sites are chosen in collaboration between the project, local governments (Commune level and DARD-FPD) as well as local communities through participatory workshops. This method not only ensures that the project address areas of concern but also fosters a strong sense of local ownership, making the project more sustainable and aligned with the community's needs. The participatory approach is pivotal to the project's approach focused on emphasizing community involvement and empowerment.

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Table 15. Coastal Restoration and adaptation benefits

Climate related hazard	Impact	Intervention	Adaptation benefit

[38] Such aspects include but are not limited to the use of buffers to waterbodies in order to avoid potential changes in sedimentation further downstream.

[39] During the development of the project consultations were held with different NTFP and herbal medicine processors in Hue (such as: Kim Vui Co. Ltd., Huong Cat Agro-Forestry Company as well as Hoa Nen Co. Ltd.) all enterprises, in particular Hoa Nen, have indicated interest to cooperate with the project – under 3.1.2. the project would cooperate with the same group of enterprises.

[40] PM Decision 1662/QD-TTg, signed 04.10.2021 on protecting and developing coastal forests for climate adaptation and green growth in 2021-2030 aims to protect and restore close to 20.000 ha of coastal sand dune forests in Vietnam.

[41] Locally present tourism operators (such as Laguna Lang Co and Alba Thanh Tan Wellness Resort by Fusion) do invest into CSR-related tree planting activities – scoping of potential cooperation opportunities pending during project development phase.

[42] Mr Nguyen Dai Anh Tuan, Vice-Director of DARD and director of FPD indicated (in a recent BMU-IKI Workshop on CFR) the clear need for external expertise to further enhance existing CFR approaches for dune restoration, and the interest and willingness of DARD to explored co-finance opportunities to invest in scaling of future areas as well as maintenance/management of established restoration sites

[43] As part of stakeholder consultations during the project design mission, Mr. Hai, Director of Provincial FPDF stated the importance of coastal dune forests to improve resilience of coastal communities; and the technical challenges requiring additional support to enhance the existing proof of concept. Provincial FPDF signalled openness to identify investment opportunities into CFR within the scope of the provincial offsetting fund

[44] The north-central provinces of Ha Thinh, Quang Binh and Quang Tri, as well as the south-central provinces of Quang Ngai, Binh Dinh, Phu Yen and Binh Thuan have large areas of coastal and in-land sand dunes

Tropical cyclones; storms	coastal erosion and sand movement	Restoration of 450 ha of coastal sand dune forests with site-adapted native tree species	• Can reduce direct storm impacts on neighbouring communities • Can reduce sand-movement and erosion, increase community and ecosystem resilience against typhoons • Protection of livelihoods (aquaculture & agriculture) of coastal communities against "sand drift" • Groundwater provision and retention increasing resilience of agricultural systems Co-benefits: • Improved carbon storage and sequestration • Increased biodiversity: planting of various native species instead of single species plantations with exotic trees (casuarina/acacia). • Commercial value NTFP provision (such as Melaleuca cajuputi – essential oils) and cooking oil (extraction of the camellia sasanqua fruits)
Increased heat and drought	Damages to and increased vulnerability of local ecosystems	Restoration of 450 ha of coastal sand dune forests with site-adapted native tree species	• Provision of improved microclimate • Groundwater provision and retention increasing resilience of local ecosystems and thus reducing desertification/wildfire risks Co-benefits: see above

<u>Sub-activity 3.1.2 Development of business models for the sustainable management of degraded forest areas</u>

Restoration activities across degraded forest ecosystem areas aim to increase productivity and provide environmental services while addressing local people's needs. By focusing on reintroducing native forest tree species instead of the "business as usual" exotic species, forest restoration efforts contribute to climate change adaptation as native tree species are better adapted to local climatic conditions and more resistant to pests and diseases, reducing the vulnerability of forests to climate-related stressors.

This sub-activity will support the development of business models for sustainable cultivation and harvesting of NTFPs in highly degraded (and thus vulnerable) natural forests in the hilly areas of Hue Province. The project will work directly with

	Protection Forest Management Boards (PFMBs) in the target districts[45] and support them in cooperating with local communities, incentivizing. By engaging in NTFP-based enterprises, PFMBs and community members are incentivized to actively restore and protect forests, which in turn helps restore watersheds, prevent soil erosion, and reduce the risk of extreme weather events-induced impacts such as landslides or flooding. As the forests recover, they regain their ability to provide vital ecosystem services, enhancing the environment's and local communities' resilience to climate change's impacts. To support these efforts, capacity-building programs are implemented to train community members in sustainable forest management practices, NTFP cultivation and harvesting techniques, and business development skills. This knowledge empowers communities to adapt to climate change by diversifying their livelihoods, reducing dependence on climate-sensitive agriculture, and promoting sustainable land use. Additionally, establishing community-based forest management groups ensures ongoing stewardship of the restored forests and the equitable distribution of benefits derived from establishing or cooperating with NTFP enterprises. Specifically, the project will viii. apply on-farm cultivation of Good Agricultural and Collection Practices (GACP) developed by the Ministry of Health (MoH) and work closely with the National Institute of Medicinal Materials (NIMM) on the transfer of on-farm cultivation on GACP and capacity building for officials, local people in the development of medicinal plants. The potential herbal medicines species to be cultivated are Sâm bố chính *(Abelmoschus sagittifolius),* Cà gai leo *(Solanum procumbens),* Sâm cau *(Curculigo orchioides),* and Tràm gió (*Melaleuca Cajuputi*). ix. The project will support the provincial government in the development of sustainable management and harvesting guidelines for cultivation, collection and processing in line with Good Agricultural Practices (GAP) x. provide capacity building for project stakeholders, local authorities and communities on the development of herbal medicinal plants according to GACP; value chain and market linkage of key valuable NTFPs (particularly for the already established Melaleuca cajuputi; but also exploring the production of Sam bo chinh *(Abelmoschus sagittifolius),* Cà gai leo *(Solanum procumbens in coastal dune environments*), as well as the development of sustainable management and harvesting guidelines for cultivation, collection and processing will be crucial steps xi. develop a value chain approach, working with producers, off takers and processors along the value chain to ensure equitable access & benefit sharing for local communities, creating a viable business model which incentivizes restoration & protection of degraded forest areas[46]. Intervention sites will be selected by applying the following criteria: potential sites will be screened against the project's exclusion list and the ESS screening checklist (including SEAH assessment) to ensure that all activities are Category C, the target site should be a forest area where land use rights are clearly defined and where Land Use Plans & Investment Plans indicate no intention of future conversion to other purposes; interventions are only to take place in so called protection forests or special use forests (production forests where timber harvesting is the priority are excluded); interventions follow exclusively on what

[45] Song Bo PFMB, Phong Dien NR and particularly Song Huong PFMB have been consulted during project development and have indicated interest in cooperating with the project and respective neighbouring local communities.

[46] The project has consulted with different NTFP and herbal medicine processors in Hue (such as: Kim Vui Co. Ltd., Huong Cat Agro-Forestry Company as well as Hoa Nen Co. Ltd.) all enterprises have indicated interest to cooperate with the project – under 3.1. the project would cooperate with the same group of enterprises

is classified as natural forests; and interventions will focus on degraded forests (where forest quality is classified as medium / poor).

Table 16. Restoration of upland forests and adaptation benefits

Climate related hazard	Impact	Interven-tion	Adaptation benefit
Increase in extreme precipitation events; potential	Contribution to landslides in areas where slopes have been cleared/deforested	Restoration of 50 hectares of natural forests in upland areas – with site-adapted tree species	• Contributes to reducing risk of landslides through slope stabilization.[47] • Strengthening community resilience through more diverse livelihood options Co-benefits: • Improved carbon storage and sequestration • Increased biodiversity: planting of various native species instead of single species plantations with exotic trees (casuarina/acacia). • Commercial value NTFP provision (such as Melaleuca cajuputi – essential oils) and cooking oil (extraction of the camellia sasanqua fruits)

Target indicators

Sub-activity 3.1.1. Enhancing resilience through Coastal Forest Restoration in 400 hectares

Baseline:

- Over 5,000 ha of sand dune forests in TTH are severely degraded, lacking public funding for restoration, leading to negative impacts on neighbouring communities (groundwater provision, typhoon protection, and sand influx in agricultural areas). Government stakeholders are willing but lack confidence to invest in existing CFR models.
- Public and private stakeholders lack technical capacities (seed collection, nursery management, planting practices, site-species matching) for proper coastal forest restoration with native tree species, resulting in limited forest establishment and ownership.
- Cooperation modalities and financial incentives are lacking among stakeholders for joint implementation and long-term maintenance of coastal forest restoration measures. As a result, businesses benefiting from coastal forest areas don't invest in preservation or restoration.
- Awareness of coastal sand dune forests' critical value is low, and public funding for CFR is often invested in non-site-appropriate approaches with exotic tree species, aggravating pressure on natural forest remnants.
- Other public funding options (provincial offsetting fund, Tourism PFES) are underutilized or not invested in coastal forest restoration, and

[47] UNEP-WCMC and UNEP (2019) EbA in different ecosystems: placing measures in context

	ecosystem services provided by (forested) sand dunes are not valued, limiting ownership in restoration and protection. • Development projects have established a proof of concept for large-scale public CFR efforts but require further scaling and refinement. • Private funding sources (CSR payments, tree planting organizations, carbon projects) are largely unaware of CFR and often invest in non-site-appropriate mangrove restoration instead (requiring dredging or earthworks). Public funding for native-tree forest restoration efforts exists but is mainly channelled into other ecosystems. Target: • Agreements with community landowners signed. • Improved capacities of 500 public & private stakeholders (of which at least 150 female) for implementing CFR measures. • Restoration of 400 ha of degraded coastal sand dune forests with native tree species enhances the existing proof-of-concept and showcases CFR implementation for further scaling. • Two successful business models surrounding CFR are established and operational (e.g., community-owned nurseries, essential oil production). • Ecosystem service valuation for coastal sand dune forests available for dissemination. • Provincial stakeholders commit to long-term funding for further scaling the CFR approach and maintaining project areas after the project ends. • CFR approach was independently replicated in two other provinces based on technical guidance and lessons learned from the LuxDev/GCF project. • A strategy for provincial coastal forest restoration • Ecosystem service valuation for coastal sand dune forests available for dissemination. • Agreement with DARD for further scaling the CFR approach and maintaining project areas. Means of Verification: • Activity reports (planting/maintenance) • Monitoring reports and establishment rates (as part of the Forest Resource Monitoring System under MARD) • Provincial technical guidelines for CFR developed & promulgated. • Activity reports (mapping & matchmaking of existing and potential funding sources for scaling CFR throughout Vietnam; ES valuation) • Workshops and events through which the CFR approach is disseminated. • Funding allocated/provincial legal decisions on funding allocation or co-finance for CFR <u>Sub-activity 3.1.2 Development of business models for the sustainable management of degraded forest areas</u> Baseline: • Large areas of natural forests are so degraded, that these do not regenerate by themselves, require active restoration efforts • Unsustainable use of NTFPs in degraded natural forest areas further increases degradation due to a lack of technical guidelines on medicinal

	plant cultivation and a lack of capacities for sustainable management and harvesting of medicinal plants according to the GAP-WHO process. • There are no existing incentives for local communities and protection forest management boards to protect or restore degraded forest areas actively Target: • Development of sustainable harvesting and management guidelines for *Melaleuca cajuputi* • 50 ha of Melaleuca cajuputi are under improved & sustainable management with GAP certification by MoH • 10ha of NTFP cultivation under the forest canopy have been established in cooperation between local communities and PFMBs • 2 Cooperation/Pre-buyer agreements between processors and community-producer groups signed Means of Verification: • Management Plans/guidelines for Melaleuca cajuputi cultivation areas and/or GAP certification award for said areas • Activity reports • MoUs / agreements between producers and off-takers
Inputs and investment items	<u>Sub-activity 3.1.1. Enhancing resilience through Coastal Forest Restoration in 400 hectares</u> • TAO hire external service providers for technical support in designing restoration interventions and training stakeholders for coastal forest restoration activities (site assessment, species selection, planting, maintaining, protecting, and monitoring); conducting training courses on silvicultural measures for sand dune forest restoration; and establishing local nurseries for native coastal tree species. • TAO provides financial support for local communities: implementation of demonstration EbA models for sand dune forest restoration (seedling production/purchase, labor cost); community nursery establishment; relevant expenses of trainees in project training courses on coastal forest restoration and NTFP cultivation in coastal sand dune areas; • TAO: consultation meetings, validation workshops, activity supervision and appraisal. • TAO hire external service providers to assess current forest financial schemes, develop a strategic approach for coastal ecosystems, explore financing options, engage stakeholders, and secure funding for the restoration and protection of coastal forests. <u>Sub-activity 3.1.2.: Development of business models for the sustainable management of degraded forest areas</u> • TAO to hire external service providers for technical support to DARD and relevant district/commune line departments, PFMBs, and local communities in the design and transfer of the process of cultivation of Sam Bo chinh (*Abelmoschus sagittifolius*) according to GAP; • TAO to hire external service providers to technically support DARD in the formulation of the technical guideline for sustainable management and exploitation of Melaleuca according to GACP-WHO • TAO financially supports the implementation of demonstration models of the selected NTFPs (PFMBs, local communities)

Technical evaluation/justification/barriers addressed	Sub-activity 3.1.1. Enhancing resilience through Coastal Forest Restoration in 400 hectares The technical evaluation of the previous restoration projects in TTH indicated that survival rates of native species in coastal forest restoration can be a common challenge that is often caused by a combination of factors such as unsuitable site conditions, in appropriate species selection, poor planting techniques, natural hazards, climate change, lack of maintenance and protection – and overall implementation may not align with the needs and priorities of local communities. To further improve the establishment of native species in coastal forest restoration, it is crucial to assess and address the causes of the problems. With a participatory approach, the project will use integrated experiences from past projects as well as from local people to further refine existing coastal forest restoration approaches (particularly from BMU-IKI) to embed this knowledge for replication and upscaling. These contribute directly to the GOVs intentions on increasing the use of native tree species for forest restoration[48] and restoring, protecting and replanting close to 20,000 ha of coastal dune forests until 2030[49]. Not having enough funding is widely recognized as a crucial constraint for coastal forest restoration. The costs associated with coastal forest restoration can be substantial, and many organizations and communities may not have the financial resources to support these projects fully. Although there are currently different funding sources, the province is also facing difficulties in accessing these funding sources due to the lack of clear and simple legal guidance. To address the challenge of limited funding for coastal forest restoration, it is crucial to explore various financing options, such as grants, public-private partnerships, carbon credits, PFES, and debt financing. In the short time period, the project will establish a funding mechanism to use GCF funds as an additional budget which is still a gap from a government fund. This mechanism plays as a catalytic method to accelerate the restoration processes while additional finance is mobilized. Sub-activity 3.1.2.: Development of business models for the sustainable management of degraded forest areas At the current PFES mechanism, the contracted forest protection is focused only on the areas of forest providing environmental services to be protected[50]; it lacks a system to actively invest in forest restoration both within PFES areas and outside of these areas. Even within PFES areas, existing payments are not sufficient to actively restore heavily degraded forest areas. To address this issue, the project will introduce alternative income modalities/business models for forest restoration by guiding forest owners in the establishment and sustainable management of multiple-use trees under the existing forest canopy in highly degraded forest areas – which would not be able to regenerate naturally. TTH has policies to support the development of herbal medicinal plants[51]. However, growers still lack NTFP's market information, and farmers cultivate NTFP without value chains built. Without access to market information, farmers may be unable to identify potential buyers effectively, understand market trends and prices, or negotiate favourable terms. Additionally, NTFP cultivation may not be profitable for farmers without well-established value chains, which can discourage further investment in the sector. To address these barriers, the project will support local communities in working with buyers, demand trends, and pricing information

[48] As laid out under Decision No. 523/QD-TTg 2021 Approving Vietnam's forestry development strategy for the 2021-2030 period, with a vision toward 2050

[49] PM Decision 1662/QD-TTg, signed 04.10.2021 on protecting and developing coastal forests for climate adaptation and green growth in 2021-2030.

[50] Point a, Article 20, Decree 147/2016/ND-TTg dated 2/11/2016 on amending **Decree** 99/2010/**ND-CP** on the Payment of Forest Environment Services (PFES)

[51] Decision No 1622/QD-UBND dated 6/7/2020 by PPC approving the project for the development of medicinal herbs material zone and ingredient products associated with OCOP programme

	that can help farmers to understand the market better, develop value chains for NTFPs for key valuable NTFPs, and provide training and capacity building to farmers on cultivation, post-harvest handling, and marketing of key high-value NTFPs to improve the quality of the products and increase their market value. Some high-value medicinal species cultivated under the forest canopy and on forest land have contributed to improving the livelihoods of local people while increasing the value of biodiversity and providing forest environmental services. However, most medicinal plant cultivation models in TTH are spontaneous and based on local folk experiences. The destructive harvesting method without any technical procedures leads to increasing depletion of resources, particularly with Melaleuca. To address this issue, the project will help to carry out capacity building and technology transfer on-farm cultivation of key valuable herbal plants according to GACP focusing on Sam bo chinh *(Abelmoschus sagittifolius),* Cà gai leo *(Solanum procumbens),* Sâm cau *(Curculigo orchioides,* Melaleuca cajuputi.
Implementation arrangements	<u>Sub-activity 3.1.1. Enhancing resilience through Coastal Forest Restoration in 400 hectares</u> • TAO is responsible for recruiting and contracting external service providers to implement CFR restoration measures, working directly with local communities and providing technical support needed through capacity building activities. • TAO financial support will be provided through the Delegation Agreement (DA) signed by the two parties. • External Service Provider in charge of implementing CFR measures to cooperate directly with District DARD, FPD and Commune PCs to make implementation plans (IPs) of approved activities with the technical assistance of the assigned TAO expert. • TAO approves the IPs before the activity implementation; the external Service Provider is responsible for working directly with local communities in activity implementation and is responsible for cooperating closely with District DARD, FPD and Commune PCs • External SP and District DARD must report on achieved results after activity completion to TAO. <u>Sub-activity 3.1.2 Development of business models for the sustainable management of degraded forest areas</u> • TAO is responsible for recruiting and contracting external service providers for the necessary technical support for capacity-building activities. • TAO financial support will be provided through the Delegation Agreement (DA) signed by the two parties. • District DARD and relevant PFMBs are responsible for making implementation plans (IPs) of approved activities with the technical assistance of the assigned TAO expert. • TAO approves the IPs before the activity implementation, and District DARD and PFMBs are responsible for implementing planned activities with the technical support and supervision of the assigned TAO expert. • District DARD and PFMBs are required to report on achieved results after activity completion to TAO.
Budget	Total activity cost: USD 2,469,038 GCF finance: USD 2,267,038 Co-finance (Government of Luxembourg - MECB): USD 202,000 Co-finance (GoV): 0 USD

Exit strategy / long-term sustainability	Under parts of this activity stream, the project will deliver field-level investments and enable environmental interventions to improve the provision of ecosystem goods and services, thereby reducing the vulnerability of communities in coastal areas in TTH to the impending impacts of climate change while reducing greenhouse gas emissions. The successful introduction of sand dune forest restoration at the target districts would provide a model for replication in other districts in TTH Provinces and other coastal provinces in Central Vietnam and for more significant domestic funds to be used for this purpose. Besides the field-level investments to showcasing successful CFR implementation on 250 ha (2.1.1), further outcomes of activity 2 are to institutionalize provincial-level policies for: • Coastal forest restoration and resilience enhancement (3.1.1) • Sustainable management & use of NTFPs (3.1.2) • Committed provincial funding, i.e., through the provincial offsetting fund (3.1.1) Besides the legal framework integration, the development and operationalization of pre-buyer/offtake agreements between businesses and local communities are a cornerstone to ensure the long-term sustainability of the CFR interventions beyond the project timeframe. These agreements are a paradigm shift away from public-funded forest establishment and protection measures and outline rights, roles and responsibilities of signatories and thus ensure clear, sustainable and equitable management (and use) of the restoration areas for years to come, placing economic incentives for protection and sustainable management of forests over conversion. Additionally, the mobilization of additional finance and attracting both investments and independent replication of the CFR approach will ensure a lasting impact of the project. Lastly, Capacity building is an important activity of this project and a critical element in ensuring sustainability. The project will leave a lasting legacy in terms of strengthening the capacity of local institutions to work independently on issues relating to forest resilience and climate change from the restoration of degraded forests.
Beneficiaries	**Direct beneficiaries:** • 6,300 (3,780 female) **Indirect beneficiaries:** • 21,428 (10,764 female)
Impacts and co-benefits	**Socio-economic:** The activity aims to uplift economically vulnerable communities in coastal areas of TTH by offering new income sources through participation in forest restoration, protection & maintenance, and non-timber forest product (NTFP) cultivation activities. These initiatives are alternative & additional sources of income for local communities' livelihoods, such as aquaculture and agriculture, safeguarding communities from the detrimental effects of climate change through income diversification. Further, restored forest areas reduce the impacts of storms & sand movement on neighbouring local communities' livelihoods (agriculture), further enhancing their resilience. Coastal forest restoration can provide a range of economic benefits to local communities through the cultivation of commercial value NTFP provision (such as Melaleuca cajuputi – essential oils), including the potential creation of jobs in forestry and related industries, the development of sustainable tourism and the

	production of non-timber forest products. This can help to improve livelihoods and support sustainable economic development in coastal areas. **Environmental:** By reducing degraded forest areas and restoring native vegetation, the project bolsters the resilience of both ecosystems and dependent communities against climate change impacts. Restored forests provide essential ecological services such as carbon storage, pollination, wildlife habitats (nesting grounds for migratory birds), watershed protection, clean water provision, and prevention of sand movement. These efforts are an important contribution to a healthy environment for the well-being of both human and wildlife populations in coastal areas of Hue Province. Coastal forest restoration can have significant climate adaptation impacts, as it can help mitigate climate change's effects through Improved carbon storage and sequestration, increase the resilience of coastal communities and ecosystems, and provide a range of economic and social benefits. Investing in coastal forest restoration can support the sustainable management of coastal ecosystems and help build more resilient communities in the face of climate change. **Gender:** The project promotes gender equity by enhancing women's knowledge and technical capacities in forest restoration through training programs. Participatory planning and designing of forest restoration interventions consider the distinct roles and needs of both men and women, ensuring a fair gender representation in decision-making processes. Furthermore, managing, harvesting, processing, and distributing climate-resilient NTFPs create job opportunities and increase women's income, fostering their economic empowerment.
Risks	

Risks	Mitigating measures
Technical risks through extreme weather events	Extreme weather events such as typhoons making landfall in NCC-VN or extended periods of extreme heat/drought could jeopardize restoration areas and project activities - especially if such events occur before planted seedlings have stabilized. However, the magnitude of potential damage can be mitigated to some degree through proper management, timing and particularly through appropriate planting techniques. Silvicultural studies and site-specific planning will elicit and evaluate all feasible options for proactively minimizing these risks and, to the extent possible.
Land use conflicts / unauthorized land use conversion	Participatory planning and mapping of project intervention areas involving local authorities, agencies, and households, will prevent conflicts. Active community participation and agreements and co-management of restoration areas ensure compliance; foster awareness and ownership of the coastal ecosystem's importance, conservation functions, and co-benefits. The risk of unauthorized conversion of restored areas is low due to their "protection forest" classification. Land use and ownership rights are regulated by "red books," and violations are prosecuted.
The low survival rate of seedlings will	To ensure maximum survival rates, awareness raising for local communities will be implemented, besides silvicultural training on

		threaten the restoration process	appropriate approaches. Furthermore, close cooperation with local communities and the establishment of incentives for protection, maintenance and restoration (through sub-activity 3.1.2.) ensure compliance to forest restoration objectives and mitigate the potential of illicit activities such as sand mining, forest fires, and free-livestock grazing. Investment in good nursery practices is a key measure to ensure high quality & health seedlings, and thus successful establishment and restoration of CFR plantings.	
		Unsustainable NTFP development	The project will provide training and develop the Medicinal cultivation model for certification of GACP-WHO (the priority is Melaleuca)	
		Soil Contamination / inappropriate fertilizer application	To establish native tree species on sandy dunes long-term, it is necessary to support the growth with moderate applications of organic fertilizers. However, if not properly applied, fertilizers can have minor ecological impacts (e.g., nitrate in water). Therefore, the project intends to use only organic fertilizers from cow dung and other natural sources (i.e., rice husk) as possible. During the project, there will be training on the appropriate use of fertilizers for restoration. This includes information on appropriate quantities, application methods and work safety.	
		Unintended sediment capture and increased erosion	The Hue shoreline as a morphologically active area with shoreline changes and cross-shore changes of the beach profiles. The restoration of coastal and inland sand dune forests with site-adapted native tree species is an adequate measure to stabilize the beach and the dunes and thus both, a measure of erosion protection and flood protection. However, in such a morphologically active area, the stabilization of one coastal section may have impacts on sections on the lee side. Sediments caught in the first location might be missing in the second location and lead to increased erosion rates there. To address this, specific site-assessments are carried out initially, before implementing CFR measures. These include the delineating to waterbodies in order to reduce the risk of unintended sediment capture Furthermore, it should be noted that coastal ecosystems in Hue include large inland sand dune areas, which are also considered during site assessments, and carry lower risk potential	

Component 3. Scaling up of climate-resilient practices & financial mechanisms

Total cost USD 3.679 million (GCF: USD 3.579 million; Government of Luxembourg – MECB: USD 0.10 million).

Climate change is already having an impact on agriculture production and productivity in TT Hue as highlighted in the baseline section. Current strategies to maintain productivity despite the impacts from climate change, such as the indiscriminate use of chemical fertilizer, are giving rise to food safety issues and further deterioration of ecosystems that in turn increases vulnerabilities to climate change. There is, thus, a need for adapting and diversifying agricultural practices to increase productivity, incomes, and resilience to threats posed by climate change.

Specifically, the activities under component 3 will support farmers to implement and scale climate-resilient investments for key local value chains and strengthen their management and technical capacities to develop short- and medium-term climate-informed adaptation plans and strategies, providing climate-informed technical assistance, and supporting the adoption of climate-resilient farming models. In addition, it will support value chain development and market access for products produced via climate-resilient practices. To help overcome barriers to financing climate-resilient agricultural practices and value chains, the project will work first with Agribank with the expectation of scaling the financial products developed for climate-resilient agriculture developed under a parallel intervention (VIE/039: Finance for resilience project) financed by the MFEA of Luxembourg and implemented by LuxDev. Under the Finance for resilience project, Agribank, with the support of LuxDev, will develop a financial offer tailored to the needs of the actors across two value chains in TT Hue to finance climate-resilient and smart practices. While the project focuses on TT Hue province, product development will be led by Agribank HQ with the support of the Hue branch to ensure full buy-in from the bank and scalability to other value chains and provinces. Thus, GCF funding will be crucial to ensure replicability and scale in terms of number of value chains, geographic scope and lessons learnt that will be shared within the financial sector in Vietnam. Activities under component 3 will be implemented in the target districts and municipalities and will contribute to the strategic priorities on food and greening finance of the updated GCF strategic plan.

Output 4.1. Producers, producer associations, and women's organizations have the capacities and access to finance and markets to transition to climate-resilient practices that support food security

Activity 4.1.1 Implement and scale up climate-resilient agriculture models and practices for key local value chains (supporting 6,000 people)

Activity 4.1.1: Implement and scale up climate-resilient agriculture models and practices for key local value chains (supporting 6,000 people)	
Description of activity	Activity 4.1.1 aims to enhance production practices, technologies, and value chain linkages for key agricultural crops in TT Hue province. The objective is to improve climate- resilience while maximizing food security and addressing concerns regarding food safety. Drawing from experiences and lessons learned from LuxDev projects VIE 033 and 433, which focused on introducing climate-resilient agriculture models, this activity will prioritize specific crops based on research, field work, stakeholder interviews, and an assessment against GCF investment criteria. The following will be worked on: Rice, Lotus, and Thanh Tra Pomelo (refer to appendix B for the crop prioritization assessment in TT Hue and the adaptation benefits of the intervention) and Table 17 for an overview of the adaptation benefits arising from project interventions. *Rice* is by far the largest crop produced in TT Hue. Abnormal climate patterns, especially the unusually intense precipitation events during the last two years, have caused significant damages to rice production, with rice fields inundated and destroyed, resulting in reduced rice productivity. Frequent droughts have also resulted in over 4,864 ha of rice land in coastal and lagoon communes in TT Hue province becoming saline and alum[52]. In response to the ever-growing threats from a changing climate, the project will introduce the following interventions on the rice value chain: (i) cooperate with leading companies (TT Hue Seed company and Loc Troi Group) to scale more climate-resilient rice varieties; (ii) support the adoption of climate-resilient rice varieties by local farmers, cooperatives, farmers groups and women's groups; and (iii) support the introduction and adoption of post-harvest technologies. *Lotus* is a specialty crop of TT Hue province. In recent years, due to erratic climate patterns, more low-lying areas have become inundated and waterlogged resulting in increasing areas of abandoned low-lying, often former rice fields. There is an opportunity to convert abandoned areas and low-efficiency low-lying rice fields to lotus and/or aquaculture. This is more resilient to inundation and waterlogging and can contribute to the diversification of farmer income. In response to the impacts of climate change, the project will promote the following: (i) conversion of low-efficiency inundated rice fields in low-lying areas into lotus planting, (ii) improve access of high-quality lotus seedlings, (iii) strengthen women's groups in supporting inputs, finance and technical support to lotus production. *Thanh Tra pomelo* is a specialty fruit tree that has a long history of production in TT Hue province and is classified as a key product by the province. It is mainly planted in alluvial soil along the O Lau river, Bo river, Truoi river and Huong rivers within Huong Van, Phong Thu, Thuy Bieu and Duong Hoa communes along with Phong Dien town. It is a crop with high economic potential[53]. However, due to the impacts of droughts, inundations, and waterlogging, its production has been significantly affected. According to the provincial DARD and the district DARDs of Huong Tra and Phong Dien, 2020 flooding caused the loss of 300 of a total of 900 hectares of Thanh Tra production area. To adapt to climate hazards (droughts, inundation and waterlogging), and to respond to the overuse of chemical fertilizers and pesticides in Thanh Tra pomelo production, the project will: (i) support the planting of conventional and organic Thanh Tra pomelo to new higher areas of alluvial soil along the rivers, (ii) improve access of high-yield and quality

[52] TT Hue PPC (2023). The plan to improve alum and salinity rice soil in coastal areas and lagoons of Thua Thien Hue province in the period of 2023 - 2025

[53] Nguyen Hoang Son, Tran Huu Duyen, Le Phuc Chi Lang, Nguyen Trong Quan (2018). Analysing the VietGAP Rice and Thanh Tra Pomelo value chains in Phong Dien district, TT Hue province.

	seedlings, (iii) support farmer groups and cooperatives to improve sustainable production practices and access inputs, finance and marketing, (iv) support the installation of irrigation equipment to address drought issues in the dry season.
Description of sub-activities	<u>4.1.1.1. Provision of climate-informed technical assistance to support adoption of climate-resilient production models (covering 6,000 producers)</u> Under this sub-activity, the project will work with agricultural research bodies to strengthen capacities and provide inputs to farmers, farmer groups, women's groups, agricultural cooperatives, and farmer extension. This will facilitate the transition to more climate-resilient production practices for rice, lotus, and conventional and organic Thanh Tra pomelo. • Aligned with activity 2.1, highly vulnerable areas will be identified[54] which are in particular need of transition away from low-efficiency rice production to higher value, more resilient crops such as lotus and/or aquaculture. In the same manner, high risk areas for Thanh Tra pomelo and potential higher areas of alluvial soil along the rivers which are suitable for planting will be identified. • Hold multi-stakeholder platforms with farmers, cooperatives local authorities and off-takers to identify suitable areas for expansion of lotus production, and Thanh Tra pomelo. • Develop Best Management Practice guidelines and deliver training and technical assistance to farmers across vulnerable communes on more climate resilient production models in Rice, Lotus, and conventional and organic Thanh Tra pomelo. Such training and technical assistance will mainly take place through farmers groups, cooperatives and women's groups. • Provide support (training and inputs) to farmers via cooperatives, women's groups and famers groups to scale up existing rice varieties which are more resilient to climate change; for example, HG12, HG244, DT100, HN6, JO2 varieties produced by TT Hue Seed company and Loc Troi Group (e.g., OM18 variety). • Provide support (training and inputs) for production of conventional and organic Thanh Tra pomelo in key production areas and to upgrade production by replacing old Thanh Tra pomelo trees with high-quality seedlings. Work through women's groups to introduce best management practices in areas identified for Lotus expansion, providing inputs and training. • Build financial management capacities along with business and marketing plan development for Cooperatives and Woman's Groups. Sub activities to facilitate access to finance are described in activity 4.2.1. • Strengthen Cooperatives in organizational and financial management helping them play a key role in orienting production, applying, and transferring advanced techniques, supporting inputs, and purchasing products from farmers. The following criteria will be used to determine the beneficiaries: Producers in the target communes; producers already cultivating rice, pomelo, or lotus (and/or willing to change from rice to lotus in areas no longer suitable for rice based on assessments undertaken under the project); women led and poor and near poor households will be prioritized. For cooperatives, the cooperatives must be legally registered with DPI/DPC; the cooperative must have operations in at least 1 of the target districts; must have operations within the links of the rice, lotus, and pomelo value chains (prioritising those that can influence primary production) <u>4.1.1.2 Market access and development of climate-resilient value chains</u> This sub-activity will focus on supporting the development of climate-resilient value chains for Rice, Lotus, and conventional and organic Thanh Tra pomelo. It will do this by strengthening the relationships between different actors and groups

[54] The results of this activity are expected to feed into the future development of development plans for the districts.

	at the length of the value chain, while enhancing market access for producers seeking adoption of climate-resilient agriculture technologies and practices. The sub-activity will be developed by: • Collaborating with leading companies (TT Hue Seed Company and Loc Troi Group) to scale salinity-tolerant rice varieties and waterlogged resilient rice varieties. This includes the examination of efforts to restore local rice varieties that are more resistant to climate change, such as De An Cuu and red rice varieties. • Provide support (training and inputs) to farmers on the production of Thanh Tra pomelo trees with the view of propagating and producing Thanh Tra seedlings. Work with companies to upgrade nursery gardens with high-quality seedlings and support the establishment of a lotus seeding centre in the key lotus growing area in Phong Dien district to propagate and produce lotus seedlings. • Strengthen linkages between the lotus producers, women's groups and companies in the supply chain of lotus (GO group, Coopmart). • Strengthen the capacity of TT Hue's Organic Agriculture Association and Participatory Guarantee System (PGS) with the aim of certifying organic Thanh Tra pomelo produced by smallholders and improving their market access. • Introduce post-harvest technologies, including drying facilities to manage heavy rain and floods in Summer-Autumn crop. • Install sprinkler and drip irrigation systems for Thanh Tra pomelo during periods of droughts. • Provide technical assistance for the development of bankable projects for MSMEs that can be financed by local financial intermediaries (e.g., Agribank) or private investors. This is further described in Activity 4.2. • Enhance market access capacity for rice, lotus and conventional and organic Thanh Tra pomelo products through improved processing, packaging, branding and marketing.
Target indicators	<u>4.1.1.1. Provision of climate-informed technical assistance to support adoption of climate-resilient production models (covering 6,000 producers)</u> Baseline: • Farmers, cooperatives, and stakeholders lack management and technical capacities to adopt climate-resilient production models. • Limited adoption of climate resilient production models across the 4 districts. • Most products sold to traders are raw, unprocessed with low quality • The capacity of agriculture cooperatives and Women's Groups is limited and has not played a key role in orienting production, transferring new technologies, supporting inputs and purchasing products from farmers. • Residues of chemical fertilizers and pesticides in agricultural products are causing environmental damage, and threatening food safety and human health. Target: • 6,000 people (30% women) enhanced technical capacity for more climate resilient technologies and practices.

	• 1,400 hectares of agricultural land[55] (1,062 hectares of rice, 182 hectares of lotus, and 180 hectares of Thanh Tra pomelo) under improved management system as a result of project support. • Capacity of Cooperatives in organizational and financial management strengthen. Means of Verification: • HH surveys • M&E reports • Final evaluation report <u>Sub-activity 4.1.1.2 Market access and development of climate-resilient value chains</u> Baseline: • The availability and accessibility of climate resilient seeds and seedlings is limited. • Weak linkages by groups along the value chain. • A lack of access to markets for sustainable production. • Post-harvest technology of farmers and cooperatives is unknown and not available • Lack of packaging, labels, or brands to make attractive to markets. • Irrigation and drainage systems to mitigate impacts of droughts and inundations are limited. Target: • Strengthened value chains amongst farmers, cooperatives, and private companies. • 02 Thanh Tra Pomelo nursery gardens in 02 districts are upgraded and a Lotus seeding centre in Phong Dien district is operational. • 03 local rice varieties that are more resistant to climate change are restored. • 6,000 people (rice: 2,620; Thanh Tra pomelo: 2,800; Lotus: 1,180) can access climate resilient rice, lotus and Thanh Tra pomelo seeds/seedlings. • Improved capacity to support Rice, Lotus and Pomelo value chains in 60 cooperatives and 3 companies, while capacity TTH Organic Agriculture Association improved. • Competitiveness and value of rice, lotus and Thanh Tra pomelo increased due to adoption of post-harvest technology, marketing and connecting to off-takers and service providers, resulting in farmers‘ increased income Means of Verification: • M&E reports • Field trip reports • Final evaluation report
	<u>4.1.1.1. Provision of climate-informed technical assistance to support adoption of climate-resilient production models (covering 6,000 producers)</u>

[55] Assuming average landholdings of 0.25 hectares of rice; 0.33 hectares of lotus; and 0.15 hectares of Thanh Tra pomelo.

Technical evaluation / justification / barriers addressed	• Climate-related hazards are increasingly impacting agricultural production and productivity in TT Hue province. Prolonged heat, typhoons, tropical depressions, heavy rains, and torrential rains are leading to issues like droughts, waterlogging, and soil salinity. These challenges are causing damage to agricultural lands, resulting in reduced yields and farmers' income. The absence of climate-informed agricultural practices in TT Hue presents a significant barrier that needs to be addressed through the refinement and co-designing of climate-resilient agricultural practices that are locally relevant. • Farmers, cooperatives, and other producer groups in the highly vulnerable communes have limited management and technical capacities and are not applying advanced farming practices to adapt to climate change. There is the need to introduce improved climate-resilient production technologies, training on advanced farming techniques and management skills to farmers and farmer associations, women's unions, and agricultural production cooperatives. • Knowledge and skills of farmers/cooperatives in developing business and marketing plans remain limited, acting as an obstacle to accessing finance by local financial intermediaries. The provision of technical assistance on financial management capacities, business and marketing plan development to farmers/cooperative will address this barrier. <u>4.1.1.2 Market access and development of climate-resilient value chains</u> • To overcome the barrier of a lack of availability and access to climate-resilient seeds the project will (i) cooperate with leading companies (TT Hue Seed Company and Loc Troi Group) to scale the adoption of tolerant rice varieties, waterlogged resilient rice varieties, and to restore local rice varieties that are adaptive and resistant to climate change; (iii) encourage the adoption and scaling of these climate-resilient rice seeds; (iii) help in the establishment a lotus seeding centre in the key lotus growing area of Phong Dien district to propagate and produce lotus seedlings, (v) provide technical assistance to improve the management of Thanh Tra pomelo trees and to propagate and produce Thanh Tra seedlings and support cooperatives to build nursery gardens. • To enhance access from farmers to markets, the project will strengthen linkages across the value chains, amongst farmers/ cooperatives, input suppliers, off-takers etc. It will also strengthen and support further establishment of cooperatives to enable them to play a key role in orienting production, applying and transferring advanced techniques, supporting inputs and purchasing products from farmers. • As most products sold to traders are raw, unprocessed products with low quality, without packaging, labels, or brands, which fetch low prices, there is the need for support of processing, post-harvest technology, packaging, marketing access improvement, connection of market supply and demand to improve quality and prices of products, increase farmers' income. • Knowledge and skills of MSMEs in developing business plans remains limited acting as an obstacle to them receiving loans from local banks. The provision of technical assistance on financial management capacities, business and marketing will help MSMEs to access bank finance. At the same time there is need to build banks awareness of the risks of climate change and to work with them to develop financial products amenable to SMEs.
	<u>4.1.1.1. Provision of climate-informed technical assistance to support adoption of climate-resilient production models (covering 6,000 producers)</u> • TAO to hire external service providers to develop training materials, deliver TOT to project counterparts

Inputs and investment items	• TAO and project counterparts sign Delegation Agreements (DAs). The project counterparts deliver trainings to farmers and local authorities, develop demonstration models and do the contracting with service providers. • TAO supervise project implementation of the counterparts <u>Sub activity 4.1.1.2. Market access and development of climate-resilient value chains</u> • TAO will hire consultants to support value chain strengthening activities for climate-resilient rice, lotus and conventional and organic Thanh Tra pomelo. Visions, strategies and detailed workplans to upgrade and strengthen these value chains will be developed. • TAO, counterparts and off-takers' expert inputs • TAO facilitate to set up the linkages amongst farmers/cooperatives and off-takers (potentially TT Hue Seed Company, Loc Troi Group, Hue Viet Organic Ltd.,Co., GO group, Coopmart) • TAO/ to hire external service providers to develop training materials and deliver TOT to project counterparts • TAO and project counterparts sign DAs. The project counterparts deliver trainings to farmers and cooperatives, and do the contracting with service providers • TAO supervise project implementation of the counterparts.
Implementation arrangements	<u>4.1.1.1. Provision of climate-informed technical assistance to support adoption of climate-resilient production models (covering 6,000 producers)</u> • TAO to hire external service providers to develop training materials and deliver TOT to project counterparts (the Provincial Agriculture Extension Centres, Sub-Department of Crops and Plant Protection, district DARDS, district Centre of Agriculture Services, TT Hue Organic Agriculture Association) • TAO and project counterparts sign Delegation Agreement for Funds and Implementations (DAs). The project counterparts deliver training to farmers and local authorities, develop demonstration models, implement project activities and do the procurement for the activity • TAO supervise the implementation of project activities <u>4.1.1.2. Market access and development of climate-resilient value chains</u> • TAO facilitate to set up the linkages between farmers/cooperatives and off-takers/private enterprises • TAO to hire external service providers to develop training materials and deliver TOT to project counterparts and companies/off-takers • TAO and project counterparts sign DAs. The project counterparts deliver training to farmers and cooperatives, implement project activities and do the procurement for the activity • TAO supervise the implementation of project activities • TAO provides technical assistance to help the companies access capital financed by Agribank for climate-resilient agriculture value chains
Budget	Total activity cost: USD 2,831,700 GCF finance: USD 2,831,700 Co-finance (Luxembourg MECB): USD 0 Co-finance (GoV): USD 0
	There are a number of means through which the lasting impacts of this project will be achieved.

Exit strategy / long-term sustainability	Support in climate resilient production practices will help capacity of local farmers, to be able to introduce and maintain climate resilient production models. Particular attention will be to work through cooperatives, farmers groups and women's groups as a conduit to support the wider population and disseminate expertise once the project is complete. To transform the agriculture value chains, a key ingredient is the research and development and uptake of climate resilient seed varieties. Development will be supported under the project with the largest producer and distributor of seeds in the province (Hue Seed Company). Distribution of more resilient seed varieties will continue through seed companies once the project has completed. Through strengthening linkages throughout the supply chain, amongst farmers, cooperatives, input supplier, technology providers, off take companies (TT Hue Seed Company, Loc Troi Group and Hue Viet Organic Ltd., Co) will help to modernize and enhance the functioning of the supply chain, creates systemic changes. This will help to drive climate resilient production into the future. Linked to Activity 4.2.1 supporting access to finance will enable farmers, coops, farmers groups and women's groups to mobilize finance to scale up activities now and into the future.
Beneficiaries	**Direct beneficiaries:** 6,000 farmers (30% women) become more resilient to climate change, through the adoption of climate resilient technologies and practices and/or trained in climate resilient production technologies, advanced farming techniques and management skills; and their income from climate resilient rice, lotus and Thanh Tra pomelo increased. **Indirect beneficiaries:** 16,140 indirect beneficiaries (11,298 female)
Impacts and co-benefits	**Socio-economic:** • Climate resilient agriculture production can deliver higher yields, high-quality products and higher selling prices. It also reduces the risk of crop failures and losses. • Strengthening the linkages along the value chain will improve competitiveness of agriculture production and improve yields **Environment:** • The use of improved production practices and post-harvest technologies will also reduce overall emissions coming from the agriculture supply chains. • More efficient planting techniques like the system of rice intensification (alternate wetting) can result in less CH4 emissions. **Gender:** • Management and technical capacities of women
	Risks / **Mitigating measures** Quality of technical assistance delivered to farmers is insufficient • Project will strictly follow procurement procedures of LuxDev to hire qualified TOT trainers, to train counterparts, local authorities and companies. • Project will strictly supervise and evaluate the performance of external service providers and counterpart experts as well as strictly supervise implementation of project activities in the field.

			• Enhance training for local authorities, farmers and cooperatives.
		Droughts, typhoons, heavy rains or other extreme weather events negatively affect farmer yields	• The project will work with different drought resilient crops and varieties • Apply appropriate solutions to mitigate disaster impacts (such as change crops, delay crops, use of varieties and species tolerant/resilient to diseases and harsh climate)
		Local people in project areas are not willing to adopt climate resilient agriculture practices	• Make careful selection of suitable and interested beneficiaries for project activities that support adaptive agriculture practices • -Mobilize and communicate to raise local people's awareness of their benefits from climate resilient agriculture practices via local mass organizations; • -Regularly monitor local people's wishes, interest, attitudes & satisfaction in order to formulate appropriate solutions/measures
		Off-takers, private enterprises are not willing to link with farmers in the value chains	• Interest has been expressed by Loc Troi Group, TT Hue Seed company and Hue Viet Organic company prior to planning and implementation of project activities • Strengthen involvement of private enterprises to planning and implementation of project activities • Project will facilitate to set up the linkages of farmers and private enterprises, of which cooperatives are the intermediary entity of the linkages. • Project will facilitate the contracting between farmers, cooperatives and private enterprises on the production and consumption

Table 17. Overview of commodities, interventions, and adaptation benefits

Commodity	Threat / Climate risk	Climate Change impacts and proposed interventions	Adaptation benefits
Rice (≈4,250 beneficiaries and 1,060 ha)	Intensification of precipitation – flooding and waterlogging/inundation. Increase in extreme weather events e.g., typhoons – compounds flooding, destruction of flood defences Frequent droughts and high temperatures – soil degradation. Increasing number of cold days across the province for the previous decade –rice crop damage.	Climate change impacts: Rice fields in TT Hue province fall predominantly in low-lying areas vulnerable to flooding. Rice crop damage has been a major impact of intensified precipitation and more frequent extreme weather events, such as typhoons and tropical storms. In 2017 alone, 5,181 hectares of rice fields across TT Hue province suffered heavy damages due to floods. In January 2019, 2,250 hectares of newly planted rice were also flooded due to heavy precipitation and high tides. Average annual precipitation is expected to increase under RCP 4.5 and RCP 8.5 scenarios (MONRE, 2019), with rainfall projected at a 5-15% increase in the North and Central regions of Vietnam, where the project area lies. Much of TT Hue's 5,033km^2 land area and 1.13 million inhabitants reside in low-lying areas that are particularly vulnerable to this: including the target districts of Phong Dien, Huong Tra and Quang Dien. Frequent droughts and high temperatures have caused saline intrusion of soil. 4,864 hectares of rice land in coastal and lagoon communities across the province have become saline and alum, with some farmers consulted reported to have lost entire crops. The average annual temperature is	Benefit: Adopting climate-resilient rice varieties is an important measure for climate change adaptation and food security in North-central Vietnam (Dam et al., 2021). Rice that is more resilient to waterlogging and salinization will support quality and quantity of continued productivity. This will allow farmers to become more resilient to the impacts of flooding caused by intensified precipitation, extreme weather, and degraded soils due to drought and temperature increases. Rice production can also bring relevant mitigation co-benefits. Where possible, the project will support practices that enhance the sustainability of rice production and aim to reduce GHG emissions (methane) (e.g., alternate wetting-drying; and avoidance of burning residues, which while illegal, remains a common practice).

Commodity	Threat / Climate risk	Climate Change impacts and proposed interventions	Adaptation benefits
		projected to increase in Vietnam by 1.3-1.7 °C by 2050 under RCP 4.5. RCP 8.5 projects a 1.9 °C increase by 2050 and a 3.5-3.6 °C increase by the end of the century. This will intensify the frequency and length of droughts and further impact rice production (World Bank & ADB, 2021). There were delays for summer-autumn rice crops in 2022 across TT Hue as a result of these impacts. Pests and diseases in rice fields are also rising along with a number of cold days, which damages rice crops. Total yields last year fell to 50.5 quintals/ha, a 13 quintals/ha decrease compared to 2021. Interventions: Support the adoption and scaling of climate-resilient rice varieties by local farmers, co-operatives, farmer groups and women's groups. Support the introduction and adoption of post-harvest technologies.	
Lotus (≈ 550 beneficiaries, ≈ 180 ha)	Intensification of precipitation – flooding and waterlogging/inundation. Extreme weather events e.g., typhoons – compound flooding, destruction of flood defences	Climate change impacts: Over the last few years, many of the heavily damaged 5,000 hectares of rice across TT Hue province have been abandoned due to compromised cultivability following intensified precipitation and extreme weather events. Farmer incomes in vulnerable low-lying target areas are threatened by reduced productivity, where large portions of	Benefit: Lotus farming offers diversification of farmer incomes where the impacts of climate change have compromised rice production. This is a lower-risk alternative to reliance on rice for income. The flower offers diverse products, including wrapping, edible food or lotus wine/tea. This also offers resilience to fluctuating

Commodity	Threat / Climate risk	Climate Change impacts and proposed interventions	Adaptation benefits
		land are becoming incompatible with rice production (Tran et al., 2022). Vietnam is ranked first globally for exposure to flood risks. The percentage of the population exposed to floods is expected to increase by 13% and 27% under RCP 2.6 and RCP 8.5, respectively (Bangalore et al., 2019) and RCP 8.5 would see 2.85% of the entire TT Hue province at risk of permanent inundation(DONRE, 2020b). Lotus is a specialty crop in TT Hue that is more resilient to waterlogging and inundation than currently available rice breeds. In light of current and projected flood risks, lotus farming has therefore been increasingly adopted as a flood-adaptive livelihood practice by farmers in other areas of Vietnam (Vo et al., 2021). TT Hue has an opportunity to convert abandoned rice fields to lotus fields in low-lying areas susceptible to flooding. <u>Interventions</u>: Conversion of inundated low-lying rice fields to lotus planting. Improve access to high-quality lotus seedlings. Strengthen women's groups in supporting inputs, finance and technical support to lotus production.	market prices, where various market-entry options exist. Lotus can also be combined with aquaculture, providing an additional revenue stream to producers and contributing to food security.

Commodity	Threat / Climate risk	Climate Change impacts and proposed interventions	Adaptation benefits
Thanh Tra pomelo (≈1,200 beneficiaries, 180 ha)	Intensification of precipitation – flooding and waterlogging/inundation. Extreme weather events - e.g., typhoons – compound flooding, destruction of flood defences Frequent droughts – soil degradation.	Climate change impacts: Thanh Tra pomelo is a specialty fruit of high economic potential in TT Hue province. It is currently planted in alluvial soil in low-lying areas adjacent to rivers. However, flooding has led to waterlogging and inundation of plantations. For Huong Tra and Phong Dien, flooding in 2020 cost 300 out of a total of 900 hectares of Thanh Tra pomelo production area. Flooding would also be heightened by an expected increase in frequency and intensity of severe storms and tropical cyclones in Vietnam over the coming years. This is already a significant impact of climate change, with 5 tropical storms and 2 typhoons hitting TT Hue province in 2020 alone, with low-lying areas particularly exposed. Furthermore, droughts can compromise ground water supply for alluvial soil (Dimkić et al., 2021) where irrigation is lacking. Interventions: Support the planting of Thanh Tra pomelo in higher areas of alluvial soil along the rivers. Improve access to high-yield and quality seedlings. Support farmer groups and cooperatives to improve production practices and access to inputs, finance and marketing.	Benefit: Shifting Thanh Tra pomelo planting to higher areas along the rivers will avoid low-lying areas vulnerable to flooding, inundation and waterlogging. Quality seedlings will also improve the yield for the volume planted.

Commodity	Threat / Climate risk	Climate Change impacts and proposed interventions	Adaptation benefits
		Support the installation of irrigation equipment to address drought issues.	

Output 4.2 The capacities of local financial intermediaries are enhanced to effectively screen, finance and monitor climate-resilient investments

Activity 4.2.1 Development of tailored financial products and services for climate-resilient agriculture

Activity 4.2.1: Development of tailored financial products and services for climate-resilient agriculture	
Description of activity	Access to finance remains a significant barrier to the widespread adoption of climate-resilient agriculture and rural development practices in TT Hue province. The project will focus on collaborating with Agribank and potentially other local financial institutions (LFIs) and mass organizations such as the Women's Union (WU) to address this challenge. The objective is to enhance their understanding of gender-responsive climate-resilient models and associated risks. The activity aims to i) improve the financial and business management of rural households so they can better manage their income and expenses and improve their ability to use financial products responsibly; ii) promote the development of tailor-made and affordable loan products to support climate-resilient agriculture investments. To effectively achieve these objectives, the project will implement two sub-activities that are designed to address key barriers. These sub-activities aim to enhance the resilience of vulnerable groups in disaster-prone communities and improve the capacity of financial institutions to identify and manage climate-related risks and develop products attuned to the characteristics of climate-resilient agriculture. In collaboration with the women's union (WU) and financial institutions, the project will work extensively at the grassroots level to enhance farming households' financial and business skills in disaster-prone communities. This targeted approach will enable vulnerable groups to effectively manage their income and expenses while maximizing the utilization of available financial services and market opportunities. By strengthening their financial literacy and business acumen, these groups will be better equipped to improve their income, savings, and overall resilience to climate change impacts. The second sub-activity will focus on working with Agribank and other local financial institutions (LFIs), supporting them to effectively identify and manage climate-related risks. The project will provide the necessary support, including tools, knowledge, and expertise, to enhance the institutions' ability to assess and address the challenges posed by climate change. By strengthening their capacity, LFIs will be better positioned to develop and offer tailored financial products that cater to the specific needs of climate-resilient agricultural value chains. This targeted approach will help bridge the gap between financial institutions and producers, aiming to facilitate access to financial resources required for climate-resilient agricultural practices. This activity will build on the activities under a parallel finance LuxDev implemented project[56] to support Agribank and to be implemented over two years (January 2024- December 2025) to develop systems and products that will be piloted in TT Hue to be further refined and adjusted for scaling in further provinces. Given the sequencing of interventions, GCF funds will support the adjustment and potential scale-up of the financial products and services attuned to the needs of climate-resilient agricultural models to other value chains and provinces. In fact, Agribank has the wider network in Vietnam with more than 2,330 branches and transaction offices all over the country, thus there is a huge potential for climate-resilient agriculture financing through the bank. In collaboration with Agribank, a scale-up plan will be developed and level 1 branches to be supported by GCF will be selected according to criteria such as climate

[56] "Finance for resilience – Fostering climate-smart agriculture and financial inclusion in Vietnam to improve resilience of smallholder farmers, especially women."

	risk exposure, vulnerability, resilient value chains. At least 10 additional level 1 branch offices will be included to incorporate the "finance for resilience" package that will be developed and piloted at the Hue level through the VIE/039. Finally, under this activity, trainings and awareness raising activities on climate-resilient agriculture financing will be organised to reach other stakeholders in the financial sector and stimulate their interest and offer.

Description of sub-activities	<u>4.2.1.1 Capacity building on financial and business literacy for vulnerable groups to improve climate change resilience in disaster-prone communities.</u>
	
	This sub-activity will build on actions carried out by the LuxDev parallel finance project to support the development of capacities within the WU and grassroots organizations through:
	
	• Adjusting training material on climate risks and financial and business skills with a view to enhancing the resilience of vulnerable people.
	• Training and coaching, first for identified master trainers from women's groups and their associated organizations, including Provincial Centre for Women Development or District/commune WU staff, cooperatives, as well as staff from cooperating financial institutions such as Agribank. Priority will be given to women-led groups, which are:
	  ○ In most disaster-prone areas (typically frequent floodings)
	  ○ Involved in the agri-value chains supported under activity 3.1.1 (but their household income could be from other alternative income sources and not necessarily limited within the identified value chains).
	• Support ToT to conduct training and coaching for women group leaders at the grass-roots level and cooperatives, especially those who are currently supporting banks in group lending.
	• Provide ongoing support for women groups leaders to provide training and mentoring for women so that they can improve their financial and business literacy skills and can better manage their income, expenses, saving, and asset as well as improve their income by better managing their household business models.
	• Support the provincial WU, which plays the coordination role in partnering with banks active in rural banking such as Agribank, Vietnam Bank for Social Policies, or Lien Viet Post Bank, to make use of their expertise and, at the same time, promote rural banking products.
	
	Trained and capacitated women group leaders and their members are the founding alongside the farmers supported under activity 3.1 are blocks for the implementation of sub-activity 3.2.2.
	
	<u>4.2.1.2 Develop bank service provision and promote the use of banking and financial products, so that agri-value chains are more bankable and resilient.</u>
	
	The sub-activity will also build on the capacities generated amongst cooperatives and MSMEs under activity 4.1, which should render them more bankable and better able to access credit. It will leverage the experience of Agribank in financing agriculture and rural development, the bank's ambition in green lending, as well as the enabling framework established by the State Bank of Vietnam in the Action plan of the banking sector for implementation of the National Strategy for Green Growth 2020. Through targeted support, the sub-activity will encourage the bank to support the agri-sector in TT Hue to become more resilient by focusing on upgrading production, post-harvest and processing technologies, improving product design, and doing better marketing to

	improve product value and market linkages. To scale up the impact, in addition to Agribank, the project will seek to engage with additional financial institutions that are active in TT Hue and have expressed interest in serving agriculture and rural markets through targeted trainings on value chain financing, and gender mainstreaming. The project will build on the activities of the parallel finance LuxDev project and continue providing technical assistance to Agribank on climate-resilient agriculture and for the development of financial products tailored to the needs of climate-resilient agriculture models – with emphasis on support for piloting the products in crops prioritized in activity 4.1 and on enhancing access to finance for women. Agribank staff will be supported to intentionally integrate gender lens in their financial offer and to remove bias when assessing a business led by a women Special attention will be given to designing products suitable to the farmer's needs, such as cash-flow-based lending, a non-collateral loan through group lending, and where possible, long-term loans for climate-resilient production technologies, post-harvest, and processing technologies to increase both the productivity and the resilience of farming. Lessons learned through the development process will be shared with the wider financial ecosystem in TT Hue and Vietnam through knowledge events. Under this sub-activity, the project will continue providing technical support in line with the LuxDev parallel finance project for agricultural cooperatives and MSMEs in the project areas to be more climate-resilient and bankable. Under this sub-activity the following actions are considered: • Provide technical assistance and capacity development to Agribank for better understanding climate risks. • Technical assistance to Agribank for the development of financial products tailored to the needs of climate-resilient agriculture models – and support for piloting the products in crops prioritized in activity 3.1.1 Special attention will be given to designing products suitable to the farmer's needs such as cash-flow-based lending, a non-collateral loan through group lending, and long-term loans for climate-smart production technology, post-harvest, and processing technology to increase both productivity and resilience of farming. • Promote the use of designed banking products for agriculture and rural areas to facilitate climate-resilient investment such as climate-smart technology and services, and climate change resistance agri-varieties. This work will be leveraged on digital technology as well as the network provided by mass organizations like WU. • Share lessons learnt and best practices on both climate risk management and product design with the wider financial ecosystem in TT Hue through knowledge events. • Provide technical support for agricultural cooperatives and MSMEs in the project areas to be more climate resilient and bankable. Through technical assistance on climate risks, financial and business training/mentoring, business plan development, and linking agri-businesses to banks.
Targets	<u>4.2.1.1 Capacity building on financial and business literacy for vulnerable groups to improve climate change resilience in disaster-prone communities</u>. Baseline: • Households in the project areas have limited capacities to manage household finance and their climate-resilient production models to build up their resilience

	• No services and relevant expertise available in TT Hue to provide training and coaching for households in rural areas on climate-smart finance and business skills. • Adoption of climate resilient production models is limited in the project areas in part due to limited financial and business skills. Target: • Training material and communication products developed and used in project areas to improve household financial and business skills. • 20 people, including at least 10 women received ToT training on financial, and business skills and can work as master trainers/counsellors in TT Hue[57]. • 200 leaders from grassroots organizations received necessary training & coaching and be able to provide training and/or mentoring for households in project areas[58] Means of Verification: • HH surveys • M&E reports <u>4.2.1.2 Develop bank service provision and promote the use of banking and financial products, so that agri-value chains are more bankable and resilient.</u> Baseline: • Agri and Rural businesses especially cooperatives and MSME have limited access to climate-smart financing to invest in their climate change adaptation business models (production, sourcing/contract farming, climate change adaptation facility, technology, and infrastructure) • Banks/Financial Institutions have limited awareness of small-scale climate-smart finance, and do not offer climate change adaptation-friendly products in agriculture and rural areas. • Agri and Rural businesses especially cooperatives and MSME have limited access to climate-smart financing to invest in their climate change business models (production, sourcing/contract farming, climate change adaptation facility, technology, and infrastructure) • Farmers in the targeted areas have limited management and technical capacities to adopt climate-resilient production models. Target: • 20 cooperatives and MSMEs are trained and coached enhance their bankability • At least 1 product developed tailored to the needs of climate-resilient agriculture and offer climate-smart banking services to their customers.

[57] Combination of master trainers from women union and participating financial institutions such as Agribank, LVPB would be recommended.

[58] 10-15 training for group leaders might be needed. Small classes with follow-up meetings, training updates or coaching are needed to motivate women group leaders and sustain the activity.

	Means of Verification: • Partner reports • M&E reports
Inputs and investment items	<u>4.2.1.1 Capacity building on financial and business literacy for vulnerable groups to improve climate change resilience in disaster-prone communities.</u> • TAO and partner expert inputs • TAO to hire external service providers to develop training materials (including digitalization of the training products) and deliver ToT training and provide continuing support for trained master trainers. • Women Union to organize training and ongoing coaching support for women group leaders. • Transportation and logistics to deliver training and coaching at the identified locations. • Documentation of field experiences when delivering training and identification of best practice <u>4.2.1.2 Develop bank service provision and promote the use of banking and financial products, so that agri-value chains are more bankable and resilient.</u> • TAO and partner expert inputs • TAO to hire expertise (individual or service providers) to support the bank develop products, communication, and training material for climate-smart banking products. • TAO to hire expertise (individual or service providers) to provide training and mentoring for cooperatives and MSMEs to build capacity to be more bankable. • TAO and Partners to organize communication campaigns for awareness raising to individual/household customers and to promote banking services to protect remote and disaster-prone areas.
Technical evaluation / justification / barriers addressed	Financial institutions are increasingly important in agriculture and rural development financing in TT Hue. The 3 largest lenders (see baseline section 2.4) provided substantial resources of over USD 471mil credit to the sector. Access to financial services remains low in rural areas. Most financial institutions have limited interest in rural and agriculture financing and do not have distribution network in rural areas Overall bank financing provided significant development resources for the rural development, but there are still significant unmet demands as: • Banks are less interested in rural areas, as the volume of businesses here is low, not justifying opening a transaction office. An alternative model of the transaction is needed like the partnership between Liên Viet Bank and women's unions. • Banks are less likely to be interested in small loans as the transaction cost as a proportion to the loan is comparatively high. • Most commercial loans are short-term. It is much more difficult to get long-term loans for example to invest in perennial trees, forestry production, or

	climate change resilient agriculture unless it comes from government-subsidized programs[59]. • Cash flow-based loans from private commercial banks taking into crop production cycle are insufficiently provided partly because agriculture in Hue is fragmented. • It is difficult to get a loan without explicit or implicit collateral (such as depositing land use certificates). • Disadvantaged groups such as ethnic minorities, migrants, and people with disabilities have added difficulty with financial access outside banks provided by VBSP. • MSMEs including cooperatives working in agriculture value chains have difficulty in accessing finance including for climate-related investment, as agriculture is considered risky, and MSME business capacity is weak, and therefore less bankable. • In addition, MSMEs often lack sufficient assets acceptable as collateral for bank loans. This activity will specifically address the following barriers: • People in rural areas, especially women disadvantaged groups, do not have the necessary skills, capacity, and confidence to manage household finance and household business models to improve their income and resilience, especially in climate-smart way. Building up capacity for WU and utilizing its network for training and mentoring will address these barriers. • Transaction cost for banking services in rural areas is too high discouraging banks to develop and offer services. Support in designing and offering customized banking products such as group lending will reduce transaction costs and improve service availability in rural areas. Support in monitoring climate risks will improve offering of climate smart financial services by the banks. • People in rural areas, especially women disadvantaged groups, have difficulty accessing credit-saving options especially small non-collateral loans promptly to respond to & recover from disasters, and to improve their livelihood and their resilience. **On climate risk management:** At the concept note stage, it was envisioned that this activity would also support Agribank in enhancing its environmental and social risk management system with specific support for identifying, managing, and reducing climate risks. However, a gap assessment undertaken by the team developing the LuxDev parallel finance intervention revealed that the bank currently lacks sufficient data to be able to perform a climate risk exposure assessment. The parallel finance project will support Agribank in collecting better and more complete data (digitalizing the loan origination system) including geo-localization of the farm and develop a database that can be used to assess climate exposure risk at a later stage. The SAP project will thus focus on building on the process started by the LuxDev parallel project focused on supporting Agribank, aiming to scale the climate-resilient value chain products developed and to build capacity internally

[59] For example, loans under Decree 55/2015/NĐ-CP provided substantial resources for agriculture and rural development. For the full text, refer to https://lawnet.vn/en/vb/Decree-No-55-2015-ND-CP-the-credit-policy-for-agricultural-and-rural-development-43F6B.html?tab=4

	on climate resilient practices and financing, gender lens financing, as well as on supporting their replication outside of TT Hue (63 branches of Agribank).
Implementation arrangements	4.2.1.1 Capacity building on financial and business literacy for vulnerable groups to improve climate change resilience in disaster-prone communities. • TAO will lead the procurement of service provider in close consultation with the Women Union 4.2.1.2 Develop bank service provision and promote the use of banking and financial products, so that agri-value chains are more bankable and resilient. • TAO leads the procurement of external resources and expertise in consultation with partners
Co-finance / leverage	Total activity cost: USD 848,190 GCF finance: USD 748,190 Co-finance (Luxembourg): USD 100,000 Co-finance (GoV): USD 0 Parallel finance[60] (Luxembourg MFEA) EUR 2,000,000
Exit strategy / long-term sustainability	Exit strategies have been integrated in the design of each of the sub-activities, specifically: For 4.2.1.1, ToT and Network of qualified trainers/coaches under the women network is critical to ensure lasting impact. For 4.2.1.2 Involvement of bank local branches at the early stage of the projects, developing bank's products and services to serve its core customer base are important factors for long-term sustainability. In addition: • Financial products will be developed based on solid market needs using market-based mechanisms to be more sustainable. These will be provided by banks after the end of the project, reaching larger segments of the population. • Good experiences will be documented and shared to spread good practices. • The project will focus on supporting farming and household business models that have clear market demand and there are competitive advantages. • The project will focus on building local expertise and capacity by working closely with its partners (WU and banks) at both provincial and local (district/commune) levels.
Beneficiaries	**Direct beneficiaries:** • 20 cooperatives and small businesses are trained and coached to be more bankable
Impacts and co-benefits	Socio-economic: • Increased financial and business skills, leading to increased confidence and income for women living in rural disaster-probe area. • New saving and credit options for most disadvantaged groups in rural disaster-prone areas through micro-funds and banking services • Availability of resources for disaster preparedness and response.

[60] Through LuxDev Project with Agribank at HQ level and to be piloted in TT Hue. The project is under development and is expected to be implemented between 2024 and 2026.

<table>
<tr><td></td><td>Environmental:

• Improved environment as financing options gear to environmental-friendly and Climate-Smart production models

Gender:

• Main beneficiaries are women, leading to improved confidence and income for participating women</td></tr>
<tr><td>Risks</td><td>
<table>
<tr><th>Risks</th><th>Mitigating measures</th></tr>
<tr><td>The quality of technical assistance delivered to farmers (mentoring and training) is insufficient</td><td>The project will:

• Work with different service providers to ensure the best expertise for capacity building.
• Cooperate with WU to screen to select relevant candidates for ToT and group leaders training.
• On-going support and capacity building for qualified trainers/group leaders</td></tr>
<tr><td>Disaster events such as resinous flooding could increase the borrowing needs or reduce household capacity to pay back the existing loans.</td><td>• Work with the banks on climate risk management framework including mitigation measures in the case of disaster events.</td></tr>
</table>
</td></tr>
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6. Institutional and Implementation Arrangements

Lux-Development S.A (LuxDev), is the sole legal entity and is the accredited entity (AE) and executing entity (EE) for this SAP Project.

6.1. Accredited entity

As the AE, LuxDev's Programme Directorate at HQ is responsible for overseeing the project throughout its implementation, maintaining documentation and communication with the GCF Secretariat through the GCF focal point at LuxDev HQ, establishing internal control routines, and continuous risk assessment incl. backstopping if required. In its role as the AE, LuxDev HQ will also handle the overall financial management of the project, including receiving GCF proceeds and disbursing, administering, and processing the funds. This also includes the management of the co-financing share from the Ministry of Environment, Climate and Biodiversity of Luxembourg (MECB). LuxDev HQ, through its Finance department as well as its Audits and Controls department, will ensure the proper use of GCF funds, set up the necessary agreements with the EE, monitor their performance and ensure that procurement activities comply with LuxDev's policies and rules. LuxDev HQ is also responsible for evaluating the project, including commissioning independent mid-term and final reviews, work that is overseen by the evaluations and knowledge management unit.

The quality assurance and project oversight functions carried out by LuxDev’s HQ will be supported by additional departments within LuxDev’s Administration and Finance Directorate and various technical units. Specifically, the Department of Accounting and Finance is responsible for, amongst other aspects, financial control, upkeeping financial management standards, and producing financial reports and statements. The Department for Procedures, Contracts, and Acquisitions is, amongst other aspects, responsible for monitoring tendering processes, contracting, and monitoring the procurement plan. The Department of Audit and Internal Control will be responsible for ensuring overall compliance with LuxDev rules and regulations, as well as compiling the information received via the grievance redress and accountability mechanism (GRAM) on an annual basis.

6.2. Executing entity

LuxDev, acting through its Regional Office in Vientiane, Lao PDR, will be the Executing Entity for all activities of this Project. LuxDev’s Regional Office in Asia is based in Vientiane, Lao PDR, with a small liaison office in Hanoi, Vietnam.. LuxDev, comprising its regional and liaison office, will serve as both Accredited Entity (AE) and Executing Entity (EE) for this project. It is important to note that LuxDev operates as a singular legal entity in its capacity as the Luxembourg development cooperation agency.

LuxDev’s Regional Office in Asia has been operating in Vietnam since 2003 and has implemented several development and climate-focused interventions both at the national level and

in TT Hue. In its capacity as EE, LuxDev will be responsible for the following: managing the LuxDev project budget, coordinating project implementation with project partners (including co-financing partners), assessing the capacity of implementation partners with whom it will sign Delegation Agreements, setting up the relevant Delegation Agreements with project implementation partner agencies at the province and district level, ensuring that activities carried out under delegation agreements comply with LuxDev's rules and procedures, provide additional technical support to the Provincial Project Management Board (PPMB) at the DPI as counterpart agency and to partner agencies as required, maintaining coordination with other projects being implemented in Vietnam and in TT Hue specifically and with the same technical focus, and coordinating with line departments involved in the implementation of the project, and the MPI in its role as NDA in Vietnam. LuxDev project implementation at the field level will be carried out by a Technical Assistance Office (TAO) based at and working closely in support of the PPMB at DPI and staffed by regular DPI employees, to work with the LuxDev TAO team to jointly implement the project. The TAO will be comprised of a Chief Technical Coordinator (CTC) supported by technical and operational staff.

6.3. Governance of the project

Figure 29 depicts the governance and management arrangements of the SAP project. The specific responsibilities of the different governance bodies are further described in the sub-sections below.

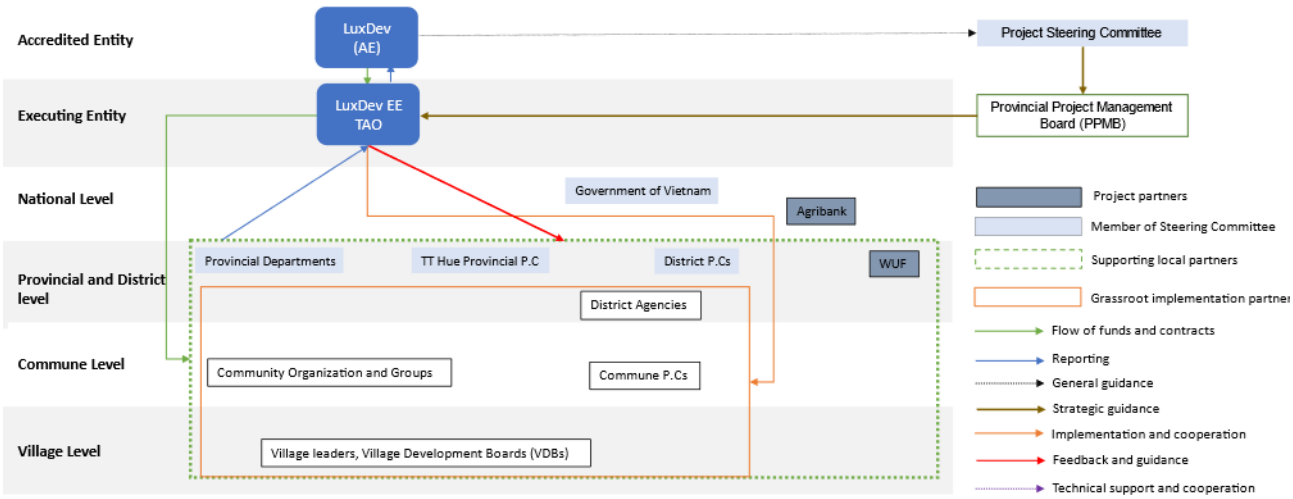

Figure 29. Institutional arrangements

6.3.1. Project Steering Committee

LuxDev will follow the same governance arrangements that have been used for its previous interventions in the country and province. The project will have a Project Steering Committee (PSC) that will be responsible for providing strategic direction during project implementation,

decision-making on policy and project management issues, reviewing and endorsing annual workplans and budgets, and monitoring the overall performance of the project.

The PSC will meet at least once per year and will be comprised of the following:

- Chairperson of the TT Hue PPC;
- A representative of the Government of Luxembourg;
- A representative of MPI;
- Chairpersons of the target district DPCs;
- A representative of the AE/LuxDev;
- Representatives of the relevant provincial line departments;
- The CTC as representative of the LuxDev TAO;
- Others may be invited as observers if necessary.

The PSC meetings are co-chaired by representatives from the Luxembourg and Vietnamese governments, which supports the principle of equal partnership and shared decision-making. Both LuxDev and the government partner must sign off on all documents of importance, including work plans and PSC minutes. This requirement for dual signatures ensures that all decisions are mutually agreed upon and, by extension, compliant with both the AMA and the Funded Activity Agreement (FAA). The preparation of issues for the PSC meetings involves consultation with the PPC and possibly the supervising ministry. This ensures that the decisions taken are in alignment with broader governmental policies and objectives. LuxDev positions itself to guide the PSC and ensure that all decisions are consistent with and compliant with the AMA and FAA.

6.3.2. Provincial Project Management Board

In line with previous LuxDev interventions, a PPMB will be established by the TT Hue PPC. The PPMB will be under provincial DPI and be comprised staff from relevant Sections of the DPI and project target districts (if necessary)

The PPMB is responsible for overall project management and its main tasks and functions are to:

- Provide strategic coordination with related programmes and projects at all levels;
- Give guidance on policy and project management issues;
- Review, synthesize and submit the AWPB to the PSC for endorsement;
- Review and comment on bidding plans and results of contractors' selection;
- Review activity implementation plans exceeding 10,000 USD;
- Review and propose solutions for the PSC to make decisions on any fundamental project changes;

- Report on project performance to the PSC and other entities as required by Vietnamese law, in line with the ongoing decentralization of processes and procedures that are promulgated by the GoV and TT Hue PPC.

Co-finance from the Government of Vietnam will be used to cover the project management and operational costs of the Provincial Project Management Board.

6.4. Flow of funds

Figure 30 below shows the overall flow of funds. Funds from the GCF (and co-finance from the Government of Luxembourg) will be transferred to LuxDev as AE. The funds will be subsequently transferred directly to LuxDev's Regional Office in Asia, in its role as EE. LuxDev as EE will then work with project implementation partners agencies at the province, district, and commune level though its Delegation Agreement for Funds and Implementation (DA) mechanism described above.

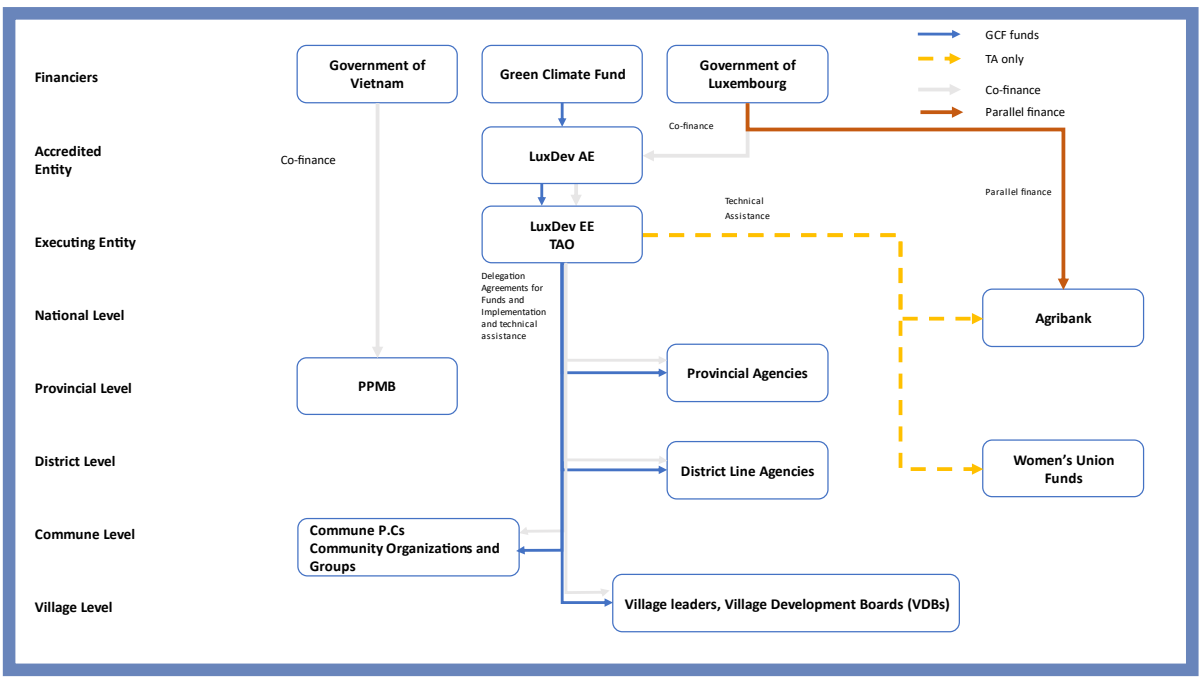

Figure 30. Flow of funds

6.5. Implementation mechanism

The project will have two management mechanisms, i.e., 1) Direct management, whereby LuxDev as contracting authority will be acting in the name and on behalf of the project following its general regulations, and 2) Through transfer of responsibility to partners. As for the latter, if and when appropriate, LuxDev will primarily use the DA that has been used for its previous climate and development interventions in the province as its main implementation mechanism.

Under this mechanism, implementation is delegated to partner agencies[61] based on annual work plans and budgets (AWPB) endorsed by the PSC and following a preliminary institutional capacity assessment if and where necessary as per LuxDev procedures and requirements. For each activity in the AWPB, a detailed implementation plan (IP) is prepared, by the relevant partner agency, with technical support of the TAO.[62] An IP includes a description of the activities and their objectives, the location, timeline, additional partners, its expected contribution to project outputs and outcomes, additional stakeholders involved in the implementation of the activity; expected milestones and performance indicators; and completion dates; and budget detail. Payments by the LuxDev (EE) are made in instalments according to disbursement plans and the progress of activity implementation. Final payments are only made once an Activity Completion Report and financial reports have been received and approved by the TAO.[63]

The TAO provides technical advice to partner agencies, follows up on activity implementation, and monitors adherence to LuxDev's rules and procedures in line with the built-in controls in the DA, including various endorsement steps. The DAs are sufficiently flexible to be adjusted on a case-by-case basis and according to the administrative and financial management capacities of the partner(s).

[61] The implementation partners undergo a due diligence process to assess their financial and technical capacity.
[62] Where the capacity of partner agencies is assessed to be insufficient the TAO will actively support the partner agency, and the activity will be implemented under more direct management.
[63] In instances where the capacity of partner agencies is deemed insufficient to use

6.6. Summary of roles and responsibilities of key implementing partners

The table below summarises the roles and responsibilities of key implementing partners for project activities and sub-activities. For more detailed information please refer to the corresponding activity sheets.

Table 18. Roles and responsibilities of key implementing partners

Activity/sub-activity	Implementation partner	Roles and responsibilities
Activity 1.1 Strengthen the existing early warning system in TT Hue province		
Sub-activity 1.1.1: Consolidate the existing institutional framework for better development, coordination, and interoperability among EWSs at provincial, district, and commune levels	TT Hue provincial Steering Committee for Natural Disaster Prevention, Control, Search and Rescue and Sub-department of Forest Management	• The Provincial SC and Sub-department of Forest Management have the responsibility to make implementation plans (IPs) of approved activities with the technical assistance of the assigned TAO expert. • TAO approves the IPs prior to the activity implementation, and the Provincial SC and Sub-department of Forest Management are responsible for the implementation of planned activities with the technical support and supervision of the assigned TAO expert. • The Provincial SC and Sub-department of Forest Management are responsible for reporting on achieved results after activity completion to TAO. • The Provincial SC and Sub-department of Forest Management are responsible for recruiting and contracting external service providers needed for the technical support to their activities. • Project financial support will be provided under the Delegation Agreement (DA) signed by three parties, including TAO, LuxDev and implementing partner

Activity/sub-activity	Implementation partner	Roles and responsibilities
Sub-activity 1.1.2: Improve the monitoring and warning capacity of the provincial-level EWS (with an improved monitoring database management system, 96 smart flood monitoring towers, 10 warning sirens, and 8 improved forest fires watch towers)	TT Hue provincial Steering Committee for Natural Disaster Prevention, Control, Search and Rescue and Sub-department of Forest Management	• The Provincial SC and Sub-department of Forest Management have the responsibility to make implementation plans (IPs) of approved activities with the technical assistance of the assigned TAO expert. • TAO approves the IPs prior to the activity implementation, and The Provincial SC and Sub-department of Forest Management are responsible for the implementation of planned activities with the technical support and supervision of the assigned TAO expert. • The Provincial SC and Sub-department of Forest Management are responsible for reporting on achieved results after activity completion to TAO. • Project financial support will be provided under the Delegation Agreement (DA) signed by three parties, including TAO, LuxDev and implementing partner
Sub-activity 1.1.3: Enhance communication capacities and response capabilities of target district and 44 commune-level EWSs	District Steering Committees for Natural Disaster Prevention, Control, Search and Rescue	• District SCs have the responsibility to make implementation plans (IPs) of approved activities with the technical assistance of the assigned TAO expert. • TAO approves the IPs prior to the activity implementation, and District SCs are responsible for the implementation of planned activities with the technical support and supervision of the assigned TAO expert. • District SCs are responsible for reporting on achieved results after activity completion to TAO. • TAO is responsible for recruiting and contracting external service providers needed for the technical support to capacity building activities. • TAO financial support to District SCs will be provided under the Delegation Agreement (DA) signed by three parties including TAO, LuxDev and implementing partner
Activity 2.1 Mainstream climate adaptation into the SEDPs of the target districts and 44 communes		

Activity/sub-activity	Implementation partner	Roles and responsibilities
Sub-activity 2.1.1: Enhance knowledge and capacities of relevant stakeholders for the effective integration of climate change considerations into 5-year socio-economic development planning	Implementation partner: District Division of Finance and Planning	• District DFPs have the responsibility to make implementation plans (IPs) of approved activities with the technical assistance of the assigned TAO expert. • TAO approves the IPs prior to the activity implementation, and District DFPs are responsible for the implementation of planned activities with the technical support and supervision of the assigned TAO expert. • District DFPs are required to report on achieved results after activity completion to TAO. • TAO financial support will be provided in form of the Delegation Agreement (DA) signed by two parties.
Sub-activity 2.1.2: Integration of climate change adaptation considerations into target district and 44 commune 5-year SEDPs for the 2026-2030 period in line with national regulations and guidelines	District Division of Finance and Planning	• District DFPs have the responsibility to make implementation plans (IPs) of approved activities with the technical assistance of the assigned TAO expert. • TAO approves the IPs prior to the activity implementation, and District DFPs are responsible for the implementation of planned activities with the technical support and supervision of the assigned TAO expert. • District DFPs are required to report on achieved results after activity completion to TAO. • TAO financial support will be provided in form of the Delegation Agreement (DA) signed by two parties.
Activity 2.2 Improve climate change adaptation impact-based monitoring at the provincial level		
Strengthen and align the DONRE M&E system for climate change adaptation with the national M&E system	DONRE	• DONRE is responsible for making implementation plans (IPs) of approved activities with the technical assistance of the assigned TAO expert. • TAO approves the IPs prior to the activity implementation, and DONRE is responsible for the implementation of planned activities with the technical support and supervision of the assigned TAO expert. • DONRE is responsible for reporting on achieved results after activity completion to TAO.

Activity/sub-activity	Implementation partner	Roles and responsibilities
		• TAO is responsible for recruiting and contracting external service providers needed for the technical support to a number of activities. • TAO financial support of DONRE will be provided under the Delegation Agreement (DA) signed by two parties. • DONRE is responsible for making implementation plans (IPs) of approved activities with the technical assistance of the assigned TAO expert. • TAO approves the IPs prior to the activity implementation, and DONRE is responsible for the implementation of planned activities with the technical support and supervision of the assigned TAO expert. • DONRE is responsible for reporting on achieved results to TAO after activity completion. • TAO is responsible for contracting external service providers needed for the technical support to a number of activities. • TAO financial support of DONRE will be provided under the Delegation Agreement (DA) signed by two parties. • For activities implemented and managed at the district and commune level, district agencies/authorities are responsible for making IPs with the technical support of the assigned TAO expert. • TAO approves the IPs prior to the activity implementation, and district agencies/authorities are responsible for the implementation of planned activities with the technical support and supervision of the assigned TAO expert. • TAO is responsible for contracting external service providers needed for provision of necessary facilities and equipment for the district and commune M&E systems.

Activity/sub-activity	Implementation partner	Roles and responsibilities
		• District agencies and authorities are responsible for reporting on achieved results to TAO after activity completion.
Sub-activity 2.2.2. Support DONRE in the institutionalisation of its climate change adaptation M&E system	DONRE	• DONRE is responsible for making implementation plans (IPs) of approved activities with the technical assistance of the assigned TAO expert. • TAO approves the IPs prior to the activity implementation, and DONRE is responsible for the implementation of planned activities with the technical support and supervision of the assigned TAO expert. • DONRE is responsible for reporting on achieved results to TAO after activity completion. • TAO is responsible for contracting external service providers needed for the technical support to a number of activities. • TAO financial support of DONRE will be provided under the Delegation Agreement (DA) signed by two parties. • For activities implemented and managed at the district and commune level, district agencies/authorities are responsible for making IPs with the technical support of the assigned TAO expert. • TAO approves the IPs prior to the activity implementation, and district agencies/authorities are responsible for the implementation of planned activities with the technical support and supervision of the assigned TAO expert. • TAO is responsible for contracting external service providers needed for provision of necessary facilities and equipment for the district and commune M&E systems.

Activity/sub-activity	Implementation partner	Roles and responsibilities
		• District agencies and authorities are responsible for reporting on achieved results to TAO after activity completion.
Sub-activity 2.2.3 Support the integration of forest resilience into the monitoring of TT Hue's Forest Protection and Development Fund operations	DONRE and FPDF	• TT Hue FPDF is responsible for making implementation plans (IPs) of approved activities with the technical assistance of the assigned TAO expert. • TAO approves the IPs prior to the activity implementation, and TT Hue FPDF is responsible for the implementation of planned activities with the technical support and supervision of the assigned TAO expert. • TT Hue FPDF is responsible for reporting on achieved results to TAO after activity completion. • TAO is responsible for contracting external service providers needed for the technical support to TT Hue FPDF. • TAO financial support of TT Hue FPDF will be provided under the Delegation Agreement (DA) signed by two parties.
Activity 3.1 Scale EbA interventions to 450 hectares to enhance the resilience of men and women in TT Hue		
Sub-activity 3.1.1. Enhancing resilience through Coastal Forest Restoration in 400 hectares	DARD	• TAO is responsible for recruiting and contracting external service providers to implement CFR restoration measures, working directly with local communities and providing technical support needed through capacity building activities. • TAO financial support will be provided through the Delegation Agreement (DA) signed by the two parties. • External Service Provider in charge of implementing CFR measures to cooperate directly with District DARD, FPD and Commune PCs to make implementation plans (IPs) of approved activities with the technical assistance of the assigned TAO expert.

Activity/sub-activity	Implementation partner	Roles and responsibilities
		• TAO approves the IPs before the activity implementation; the external Service Provider is responsible for working directly with local communities in activity implementation and is responsible for cooperating closely with District DARD, FPD and Commune PCs • External SP and District DARD must report on achieved results after activity completion to TAO.
Sub-activity 3.1.2 Development of business models for the sustainable management of degraded forest area)	DARD	• TAO is responsible for recruiting and contracting external service providers for the necessary technical support for capacity-building activities. • TAO financial support will be provided through the Delegation Agreement (DA) signed by the two parties. • District DARD and relevant PFMBs are responsible for making implementation plans (IPs) of approved activities with the technical assistance of the assigned TAO expert. • TAO approves the IPs before the activity implementation, and District DARD and PFMBs are responsible for implementing planned activities with the technical support and supervision of the assigned TAO expert. • District DARD and PFMBs are required to report on achieved results after activity completion to TAO.
Activity 4.1.1: Implement and scale up climate-resilient agriculture models and practices for key local value chains		
Sub-activity 4.1.1.1. Provision of climate-informed technical assistance to support the adoption of climate-resilient production models	DARD	• TAO to hire external service providers to develop training materials and deliver TOT to project counterparts (the Provincial Agriculture Extension Centres, Sub-Department of Crops and Plant Protection,

Activity/sub-activity	Implementation partner	Roles and responsibilities
		district DARDS, district Centre of Agriculture Services, TT Hue Organic Agriculture Association) • TAO and DARD sign Delegation Agreement for Funds and Implementations (DAs). The project counterparts deliver training to farmers and local authorities, develop demonstration models, implement project activities and do the procurement for the activity • TAO supervises the implementation of project activities
Sub-activity 4.1.1.2 Market access and development of climate-resilient value chains	DARD	• TAO and DARD sign Delegation Agreement for Funds and Implementations (DAs). • TAO supervise the implementation of project activities
• Activity 4.2.1: Development of tailored financial products and services for climate-resilient agriculture		
Sub-activity 4.2.1.1 Capacity building on financial and business literacy for vulnerable groups to improve climate change resilience	WU	• TAO will lead the procurement of service provider in close consultation with the WU • WU will support the capacity building activities
Sub-activity 4.2.1.2 Develop bank service provision and promote the use of banking and financial products, so that agri-value chains are more bankable and resilient	LuxDev direct management	

7. Arrangements for M&E

Monitoring and evaluation arrangements will comply with the GCF policies as outlined in the Accreditation Master Agreement and Funding Activity Agreement.

LuxDev as the AE will have oversight over the M&E. LuxDev as EE will implement the M&E system working in close collaboration with project partners. The project will apply a tailored results-based monitoring and evaluation (M&E) system. The performance of the project will be tracked and measured along three dimensions: (i) results-based monitoring, (ii) efficiency monitoring, and (iii) context monitoring.

For results-based monitoring, the project will follow the outcome and output indicators of the logical framework. Collecting, processing, and analysing monitoring data will involve all project stakeholders and the M&E specialist. M&E data will be bi-annually and annually collected, processed, analysed and reported to provide key inputs for periodic project progress reports and recommendations for improved project implementation.

Efficiency monitoring will focus on finances and procurement issues and how project funds are used in compliance with GCF rules. In liaison with project counterparts, the finance officer at the TAO will be responsible for following up and preparing periodical financial reports.

Context monitoring will be done to systematically re-assess the risks and implementation of proposed mitigation measures (for more details see Annex 7 of the FP) on an annual basis. These data will also be reflected in field trip reports and periodic progress reports of relevant project stakeholders.

The M&E system is based on the following:

- LuxDev's Monitoring Guidelines and Toolkit for Results-based Management
- M&E tools, including M&E Matrix, Risk Assessment and Management Matrix (RAMM) and M&E Manual developed to guide and manage the operation of the project M&E system, and other data collection and analysis tools and database templates adopted from the M&E systems of previous LuxDev projects in TT Hue (VIE/033 and VIE/433).
- The project´s logical framework
- The procedures of national project partners
- GCF Annual Performance Report

7.1. Mid-term and final evaluation

LuxDev, in its role as AE, will commission an external mid-term evaluation and a final external evaluation before the end of the project. Evaluations will be carried out by a team of external independent experts. The evaluations will assess the performance of the project against its theory of change, outcomes and outputs, as well as the effectiveness of its implementation. LuxDev uses the six evaluation criteria of the Development Assistance Committee of the Organization for Economic Cooperation and Development for its evaluations.

8. Project Financing Plan

8.1. Funding sources

The project's funding sources by outcome are shown in the table below. The detailed project budget can be seen in Annex 3 to the FP. In addition, the project will benefit from the implementation of a EUR 2 million Luxembourg funded project – *Fostering climate-smart agriculture financial and non-financial services in Vietnam by improving Agribank services to smallholder farmers, especially women.*

Table 19. Project funding by outcome and sources

	GCF	MECB	GoV	Total
Outcome 1	**1,867,429**			**1,867,429**
Outcome 2	**523,700**	**220,000**		**743,700**
Outcome 3	**2,267,038**	**202,000**		**2,469,038**
Outcome 4	**3,579,890**	**100,000**		**3,679,890**
PMC	**411,943**	**378,000**	**450,000**	**1,239,943**
Total	**8,650,000**	**900,000**	**450,000**	**10,000,000**

8.2. Procurement

LuxDev will follow its procurement rules and regulations during the implementation of the project (LuxDev, n.d.) (LuxDev, 2021). A detailed procurement plan is included in Annex 8 to the FP.

9. Project Impacts

9.1. Summary of adaptation impacts

The implementation of project activities is expected to increase the resilience of 306,000 persons (male 151,500, female 154,500) and indirectly benefit 406,000 persons (female 205,030, male 200,970) that will be covered under an improved EWS. It will bring over 115,900 hectares of agricultural and forested land in TT Hue under improved climate-resilient management.

This will be achieved through a combination of interventions. The project will enhance the province's EWS, allowing people in the province to better prepare for the climate hazards described in the baseline section. The project also enables the transition to a climate-resilient development pathway by supporting the integration of climate change adaptation considerations into SEDPs in 44 vulnerable communes, contributing to improved climate resilient planning of circa 113,000 ha of forest and agricultural land. The planning will also inform the implementation of EbA to protect livelihoods against climate-related hazards. The project will support 6,000 persons (approx. 2,000 female) in the agriculture sector to implement climate-resilient agricultural practices in circa 1,400 hectares and contribute to the development of sustainable value chains in TT Hue through facilitating access to markets and finance.

In terms of ecosystems, the project will support improved planning on over 24,000 hectares of agricultural land and 90,000 ha of forested land, including over 28,000 ha of forests under improved forest fire monitoring system. EbA interventions under the project will support the restoration of 400 hectares of degraded coastal sand dune forests and the sustainable use of at least 50 hectares of forests through NTFP cultivation.

9.2. Contributions to sustainable development and co-benefits

The project is expected to generate the following additional environmental, social, and economic co-benefits.

9.2.1. Economic Co-benefits

The project will generate the following economic co-benefits:

- **Improved resilience against the risk of poverty through livelihood improvements:** The project area covers communities particularly vulnerable to income losses and poverty due to the impacts of climate change on livelihood sources. Analysis has shown that households in TT Hue province have a high probability of slipping into extreme poverty when faced with a high frequency of flood and drought events. Project activities which help local people adapt to the impacts of these increasingly frequent extreme weather events and provide livelihood opportunities which support stable incomes despite the impacts are therefore essential for preventing households from

falling below the poverty line. For instance, the project will boost incomes and support the diversification of agricultural activities via a shift to more productive climate-resilient crop varieties and production models. Agricultural business models and value chains that boost market linkages will also be supported, generating higher selling prices for farmers (activity 3.1.1).

- **Income support through increased land productivity:** Land productivity is currently compromised for important commodities in the project area due to the effects of drought, flooding, extreme weather events and saline intrusion in soils. Currently, climate-resilient crop varieties and capacities for adaptive farming methods are lacking. The project will support income generation via increased land productivity by scaling up climate-resilient production practices and technologies, such as saline and flooding-resilient rice varieties, as well as shifting to a more diverse set of commodities where appropriate (e.g., lotus production on alluvial soil). This will enhance incomes from existing commodities of high economic importance, such as rice, whilst diversifying income streams through introducing and supporting other commodities. A randomised control trial (RCT) to evaluate the impact of LuxDev's project VIE033 found that incomes in areas under the project had increased by 1,927,196 VND/month (circa USD 80) relative to control areas, but no ex-ante estimations were carried for this SAP project.
- **Preventing loss and damages through strengthened climate adaptive capacities:** Target communities for the project reside in low-lying areas particularly vulnerable to climate change impacts. The project will target support for households in these climate-vulnerable areas to strengthen the resilience of livelihood sources in the face of climate change. For example, better preparation for climate-hazards will be developed through early warning systems and response capabilities of communities (activity 1.1). The coping capacities of farmers will be particularly targeted through the diversification of agricultural commodities and crop varieties, ultimately also contributing to greater resilience.
- **Access to finance for climate-resilient land management:** Through supporting access to finance, the project will seek to overcome barriers to the adoption of climate-resilient agriculture and rural development in TT Hue province. This will include capacity building for vulnerable farming households to utilize available financial services and develop linkages to market (activity 4.2.1) as well as capacity building for Agribank and other LFIs to develop tailored financial products for climate-resilient agricultural value chains (activity 4.2.2).
- **Capacity building for climate-resilient business models and strengthened value chains:** The skills, capacity, and confidence for managing household finance and business models in rural areas are currently lacking. The project will boost incomes in a climate-resilient manner by working with the Women's Union and agri/rural MSMEs to develop training and mentoring for improved business models under activity 4.1.1. This will assist in the development of bankable businesses which can access climate-related investments. Strengthening value chains will also lead to clearer market linkages for

farmers and raise incomes directly by opening access to the market and boosting selling prices. Activity 3.1 will also mobilize finance and develop business models for forest owners to independently implement forest restoration measures in both coastal and hilly areas of TT Hue, thus supporting EbA.

Table 20. Summary of project economic co-benefits and their contribution to the SDGs

SDG	Examples of relevant SDG target	Example of how the project contributes to SDG
SDG 1 No poverty	• **1.1** By 2030, eradicate extreme poverty for all people everywhere, currently measured as people living on less than USD 1.25 a day. • **1.2** By 2030, reduce at least by half the proportion of men, women and children of all ages living in poverty in all its dimensions according to national definitions. • **1.5** By 2030, build the resilience of the poor and those in vulnerable situations and reduce their exposure and vulnerability to climate-related extreme events and other economic, social and environmental shocks and disasters.	• Boosting incomes via access to markets, higher selling prices and land productivity. • Increasing farmer coping capacities via crop diversification and resilient crop varieties.
SDG 8 Decent Work and Economic Growth	• **8.2** Achieve higher levels of economic productivity through diversification, technological upgrading and innovation, including through a focus on high-value added and labour-intensive sectors. • **8.3** Promote development-oriented policies that support productive activities, decent job creation, entrepreneurship, creativity and innovation, and encourage the formalization and growth of micro-, small- and medium-sized enterprises, including through access to financial services. • **8.10** Strengthen the capacity of domestic financial institutions to encourage and expand access to banking, insurance and financial services for all.	• Diversification of commodities and crop varieties to promote adaptive agricultural practices. • Development of climate-resilient value chains. • Development of bankable MSMEs to encourage climate resilient activities and sustainability-oriented investments. • Capacity building for Agribank and LFIs for tailored financial products.
SDG 10 Reduced Inequalities	• **10.1** By 2030, progressively achieve and sustain income growth of the bottom 40 per cent of the population at a rate higher than the national average.	• Increase productivity for vulnerable households through adoption of climate-resilient agricultural models.
SDG 12 Responsible Consumption and Production	• **12.8** By 2030, ensure that people everywhere have the relevant information and awareness for sustainable development and lifestyles in harmony with nature.	• Capacity building for household finance and business models to develop climate-resilient practices.

9.2.2. Environmental Co-benefits

In addition to the key climate change adaptation benefits provided, the project is also expected to generate the following environmental benefits:

- **Introduction of sustainable agricultural models:** post-harvest technologies are currently unavailable to farmers and cooperatives in TT Hue, and knowledge is lacking on their use and application. Not only will post-harvest technology introduction and capacity building (activity 3.1.1) prevent loss and damages and protect incomes but will place emphasis on the efficiency of overall production processes by saving post-harvest waste, preventing the need for over-production and excessive inputs. Using improved production practices can also contribute to reducing overall emissions from agricultural supply chains.
- **Protection and development of biodiversity:** The biodiversity of forest ecosystems in coastal and hilly areas of TT Hue province has been damaged by land use intensification and deforestation, leading to the degradation of native species and the destruction of habitats. The project will directly address this issue by engaging in EbA measures, including forest protection and planting of a variety of native species as opposed to single species plantations (activity 2.1), with the aim of restoring degraded natural forests, protecting habitats and increasing vegetation.
- **Ecosystem services provision and bolstered resilience:** EbA measures under activity 3.1 will contribute to forest restoration, which provides essential ecological services such as carbon storage, pollination, wildlife habitats, watershed protection, better air quality, clean water provision, and prevention of sand movement. As well as this, improved forest cover will provide local cooling services and protect the health of outdoor workers whilst preventing the potential reduction of safe working hours due to excessive heat. Furthermore, better local response capacities to early warning systems (activity 1.1), along with improved protection from coastal and hilly forest cover (activity 3.1), will help to prevent excessive damage to soil and subsequent run-off (e.g., due to flooding).. These efforts are an important contribution to a healthy environment for the well-being and resilience of both human and wildlife populations in TT Hue Province.

Table 21. Summary of project environmental co-benefits and their contribution to the SDGs

SDG	Examples of relevant SDG target	Example of how the project contributes to SDG
SDG 6 Clean Water and Sanitation	• **6.6** By 2020, protect and restore water-related ecosystems, including mountains, forests, wetlands, rivers, aquifers and lakes.	• Flood protection through EbA
SDG 12 Responsible Consumption and Production	• **12.3** By 2030, halve per capita global food waste at the retail and consumer levels and reduce food losses along production and supply chains, including post-harvest losses.	• Introduction and capacity building for post-harvest technologies.

SDG 13 Climate Action	• **13.1** Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries. • **13.3** Improve education, awareness-raising and human and institutional capacity on climate change mitigation, adaptation, impact reduction and early warning.	• EWS, EbA and capacity building and access to finance for climate-resilient agricultural models and value chains.
SDG 15 Life on Land	• **15.1** By 2020, ensure the conservation, restoration and sustainable use of terrestrial and inland freshwater ecosystems and their services, in particular forests, wetlands, mountains and drylands, in line with obligations under international agreements. • **15.2** By 2020, promote the implementation of sustainable management of all types of forests, halt deforestation, restore degraded forests and substantially increase afforestation and reforestation globally. • **15.5** Take urgent and significant action to reduce the degradation of natural habitats, halt the loss of biodiversity and, by 2020, protect and prevent the extinction of threatened species. • **15.9** By 2020, integrate ecosystem and biodiversity values into national and local planning, development processes, poverty reduction strategies and accounts.	• Protection and enhancement of degraded forests through native species plantations. • Plantation of diverse species as opposed to single species plantation.

9.2.3. Social Co-benefits

- **Improved food security:** Food security is a focal issue for over 50% of households affected by climate hazards in TT Hue province (World Bank & ADB, 2021). This is caused by falling incomes as a result of climate-vulnerable food production systems as well as post-COVID-19 income drops. Activity 4.1.1 will contribute to addressing one of the root causes of food insecurity by implementing scalable climate-resilient agricultural models in a transition away from low-efficiency production methods to higher-value, more resilient crops. Supporting better market access and developing value chains will allow income streams for farmers to be enhanced (sub-activity 4.1.2). Overall, this will help achieve higher yields, higher quality products and selling prices whilst reducing the risk of crop failures and subsequent financial losses, damaging household incomes and purchasing power.
- **Improved knowledge, attitudes, and practices (KAP) for climate change adaptation:** Human, budgetary and technical resources are currently limited for forecasting disaster prevention under early warning systems (EWS), which leaves target communities highly vulnerable to extreme weather events. The project will address these barriers by strengthening institutional frameworks and technical capacities to better prepare and process information on climate-hazards (activity 1.1). This will allow hazard responses to develop based on a cohesive set of information, communicated in a

coordinated manner to vulnerable communities. Local knowledge of climate hazards will be boosted where information is received in a form which communities can disseminate and translate into actions (sub-activity 1.1.3). Consolidation of cohesive EWS interoperability among Commanding Committees for Natural Disaster Prevention, Control, Search and Rescue (CCs), at provincial, district and commune levels will therefore be essential for coordinated communication between governance levels and local communities most at risk (sub-activity 1.1.1). Sub-activity 1.1.2 will also strengthen the capacities of technical staff at local levels for forecasting climate-related hazards through specialized technical support as well as the provision of equipment and technologies for enhancing meteorological monitoring and forecasting.

- **Health and wellbeing benefits:** Various health benefits can be realized as a result of project activities. Historically, dense forests have provided protection for typhoon-vulnerable communities in north-central coastal Vietnam. However, land use intensification and deforestation have left forests in a state of high degradation, thus increasing vulnerability to extreme weather events, which can lead to injury and fatalities. In addition, studies covering South-East Asia show the impact of deforestation on local warming, creating dangerous levels of heat exposure (Parsons et al., 2021). EbA measures will therefore provide local cooling services to communities in coastal and hilly areas where there is high emphasis on outdoor agricultural labor. Activity 3.1 will enhance resilience to climate risks in hilly and coastal areas of the province by providing increased forest cover and addressing threats to human well-being from such events. Furthermore, a shift towards more sustainable modes of agricultural production under activity 4.1.1 will increase food safety whilst decreasing pollution of water sources.

Table 22. Summary of project social co-benefits and their contribution to the SDGs

SDG	Examples of relevant SDG target	Example of how the project contributes to SDG
SDG 2 Zero Hunger	• **2.3** By 2030, double the agricultural productivity and incomes of small-scale food producers, in particular women, indigenous peoples, family farmers, pastoralists and fishers, including through secure and equal access to land, other productive resources and inputs, knowledge, financial services, markets and opportunities for value addition and non-farm employment. • **2.4** By 2030, ensure sustainable food production systems and implement resilient agricultural practices that increase productivity and production, that help maintain ecosystems, that strengthen capacity for adaptation to climate change, extreme weather, drought, flooding and other disasters and that progressively improve land and soil quality.	• Boosting income via shifting away from low yielding, low quality crop varieties to more productive climate resilient varieties and production models. • Strengthening market access and value chains to increase selling prices. • Avoiding loss and damages via strengthening capacity of EWSs, as well as avoiding crop failure of non-resilient varieties
SDG 3 Good Health and Well-being	• **3.9** By 2030, substantially reduce the number of deaths and illnesses from hazardous chemicals and air, water and soil pollution and contamination. • **3.d** Strengthen the capacity of all countries, in particular developing countries, for early	• Prevent human harm and fatalities through strengthening capacity of EWSs. • Improve protection against extreme weather and dangerous local warming

	warning, risk reduction and management of national and global health risks.	through EbA measures such as coastal reforestation
SDG 6 Clean Water and Sanitation	• **6.3** By 2030, improve water quality by reducing pollution, eliminating dumping and minimizing release of hazardous chemicals and materials, halving the proportion of untreated wastewater and substantially increasing recycling and safe reuse globally.	• Reduce input of chemical fertilizer and pesticides

9.2.4. Gender Co-benefits

The project is expected to contribute to the realization of the following co-benefits promoting gender-sensitive development.

- **Enhancing women's knowledge, management, and technical capacities:** To support the active participation of women throughout the project in TT Hue, with priority for the most vulnerable women, it is anticipated that at least 30% of participants in capacity-building activities will be women. Under output 1, a gender expert will provide technical support for capacity-building activities for EWSs to ensure gender-specific training needs are met. Moreover, cooperation with the Vietnam Women's Union (VWU) is foreseen. Activity 3.1 also enhances women's knowledge and technical capacities in forest restoration activities through training programmes, considering the distinct needs of both men and women. Targeted measures under activity 4.1.1 will also support management and technical capacities to foster gender-inclusive transitions to climate-resilient agricultural models by supporting women to become more proficient in household and business finance management.
- **Developing fair gender representation in decision-making processes:** The Gender and Social Assessment revealed that women in Vietnam tend to be less represented in decision-making positions than men. Fair representation will be ensured through gender-inclusive decision-making and planning structures for improved early warning systems and forecasting capacities at district and commune levels. This will allow better preparation for climate-hazards by local government agencies and communities (activity 1.1). Activity 3.1 will also ensure the representation of women and men in decision-making processes regarding EbA measures, ensuring that men and women's distinct roles and needs are represented in management and planning.

Table 23. Summary of project gender co-benefits and their contribution to the SDGs

SDG	Examples of relevant SDG target	Example of how the project contributes to SDG
SDG 1 No Poverty	• **1.2** By 2030, reduce at least by half the proportion of men, women and children of all ages living in poverty in all its dimensions according to national definitions. • **1.4** By 2030, ensure that all men and women, in particular the poor and the vulnerable, have equal rights to economic resources, as well as access to basic services, ownership and control	• Economic empowerment, job creation and training on financial management for vulnerable women via climate-resilient agricultural models and EbA measures. • Women's inclusion and capacity building for EWS to

	over land and other forms of property, inheritance, natural resources, appropriate new technology and financial services, including microfinance. • **1.5** By 2030, build the resilience of the poor and those in vulnerable situations and reduce their exposure and vulnerability to climate-related extreme events and other economic, social and environmental shocks and disasters.	build resilience to extreme weather events.
SDG 5 Gender Equality	• **5.1** End all forms of discrimination against all women and girls everywhere. • **5.5** Ensure women's full and effective participation and equal opportunities for leadership at all levels of decision-making in political, economic and public life. • **5.a** Undertake reforms to give women equal rights to economic resources, as well as access to ownership and control over land and other forms of property, financial services, inheritance and natural resources, in accordance with national laws. • **5.b** Enhance the use of enabling technology, in particular information and communications technology, to promote the empowerment of women.	• Ensuring fairer gender representation in decision-making though active training and inclusion. • Working via women's unions to create access to tailored financial services for climate-resilient agricultural practices. • Promote women's inclusion in EWS participation.
SDG 10 Reduced Inequalities	• **10.2** By 2030, empower and promote the social, economic and political inclusion of all, irrespective of age, sex, disability, race, ethnicity, origin, religion or economic or other status. • **10.3** Ensure equal opportunity and reduce inequalities of outcome, including by eliminating discriminatory laws, policies and practices and promoting appropriate legislation, policies and action in this regard.	• Inclusion of women in decision-making positions for both EWS and EbA measures. • Financial capacity building for climate-resilient household and business models.

10. Justification for GCF Funding Request

10.1. GCF value added and concessionality

Funding from the GCF is critical due to the limited availability of public funds for climate change adaptation and the urgent need to close the adaptation funding gap in Vietnam. Vietnam is experiencing a significant financing gap to cover the incremental costs of adapting to climate change. According to Vietnam's NDC, the projected financing needs for climate change adaptation in 2030 are estimated to be over 3-5% of GDP (in 2020).[64] If Vietnam continues to implement the current plan to spend 1.5% of its GDP on climate change adaptation, on average, it needs to mobilize an additional amount of USD2.75-6.42 billion per year, or USD27.5-64.16 billion in the 2021-2030 period (2022). Attracting investment from domestic economic sectors along with international financial and technological support is essential for expanding climate change adaptation activities. Therefore, external funding support to meet the incremental costs of managing climate change risks and impacts is critical, particularly in highly vulnerable sectors such as agriculture, which are capital constrained. Most of the vulnerable poor live in rural areas and work mainly in the agriculture sector.

The NDC specifically highlights the need for funding for storm shelters and effective flood prevention works. The protection, restoration and planting of mangroves and coastal protection forests is estimated to have only achieved about 30% of the plan set out by 2020. Flooding from heavy rains and high tides has not been significantly addressed, especially in the delta and coastal areas, which are densely populated and have numerous production activities. The NDC chapter on adaptation clearly highlights the lack of capacity for natural disaster forecasting and warning, particularly with regard to unusual and irregular developments of extreme weather conditions, with insufficient resources for prevention. Specifically, the NDC requests international support for improved forecasting and early warning capacity. This project is targeting these adaptation finance gaps.

Agriculture resilience projects are not attractive to commercial finance since financial markets value short-term gains, which means that there is a shortage of financing for investments that are required to cope with long-term or distant climate impacts, while the financial returns resulting from an agriculture adaptation project are inherently difficult to quantify because the effects of climate change are unpredictable (Tordo et al., 2017). Also, the prevalence of MSMEs in agriculture value chains results in market fragmentation, which in turn increases the due diligence and monitoring costs for investors. GCF resources are needed to crowd-in finance from local financial institutions. Local banks in Vietnam are not providing financing for climate-resilient investments in agriculture. MSMEs and Cooperatives working in agriculture value chains have difficulty accessing finance, as agriculture is considered too risky, and MSME business capacity is considered weak and, therefore, less bankable. For example, they have difficulty getting long-term loans to invest in perennial trees or climate-resilient

[64] TT Hue's Climate Action Plan 2020-2030 has an investment plan totalling circa USD 28 million, but this does not reflect the financing gap for adaptation.

agriculture. GCF funds will be used to work with companies and banks, to better integrate climate risks and to explore financing products for SMEs providing goods and services which build resilience to climate change. Such requirements are already being requested by the State Bank of Vietnam as part of its stricter Environmental, Social and Governance banking requirements[65]. Also, it is difficult for households and farmer groups to get access to finance without explicit or implicit collateral (such as depositing land use certificates). Disadvantaged groups such as ethnic minorities, migrants, and people with disability have added difficulty with financial access. Banks are unlikely to adequately reach certain *niche services* such as non-collateral loans, small-sized loans, and responsive loans for recovery from disaster, especially for more disadvantaged groups. Those markets are considered too risky for commercial lenders. This segment will be targeted by working through providing technical assistance to providers of finance, such as the Women's Union, who are able to provide non-collateralized loans.

There is limited financing available for CFR in Vietnam. Currently, a significant amount of funds for forest protection are from Payments for Forest Ecological Services (PFES). PFES has been effective in channelling significant funds for watershed forests in areas above key hydro-electric dams. This means that lowland and coastal forests have not received PFES payments. Given the costs associated with CFR can be substantial, while there is limited public expenditure available, there is a serious lack of investment in CFR projects. There is a need to address the challenge of limited funding for CFR by identifying and introducing a range of financing options, such as grants, public-private partnerships, carbon credits, PFES, and debt financing. The project will use GCF funds to establish alternative sources of finance.

It must also be noted that to support long-term macroeconomic stability, the Government of Vietnam has imposed stricter loan guidelines and limits, with loans now only approved for large infrastructure projects, many of which have been in the pipeline for years. New projects, or those that focus on softer investments, must be funded through grants or local tax revenues. Nevertheless, the project will be supported with co-finance from the government of Vietnam. The Government of Vietnam will contribute a USD 450,000 budget and mobilize and organize counterpart staff at the provincial and district level in support of project implementation. It will provide suitable free office space to the technical support team and several other in-kind contributions to support efficient project implementation. Additional funds to be levered from government sources will be sought during project implementation.

10.2. Exit strategy and sustainability

The sustainability strategy of the project results will build on and improve on the sustainability strategies of previous LuxDev interventions in Vietnam.[66]. LuxDev follows the following principles for the design of its projects exit strategies.

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[65] Vietnam was among 38 emerging market economies that initiated banking reforms to drive development and address climate change in 2019.

[66] It is worth noting that most of these interventions were not related to climate change adaptation, but to sectoral support and transformation.

Robust Local Capacity Building: LuxDev prioritizes the development of local capacities by engaging with and training local stakeholders, ensuring that project ownership and expertise remain within the region post-exit. This focus on strengthening local institutions and communities aims to embed the necessary skills and knowledge that will continue driving the project's objectives forward sustainably, even after the conclusion of external support. As examples, the selection process and criteria developed for small scale infrastructure developed under project VIE033 and 433 helped inform that now used by TT Hue's provincial authorities to prioritise infrastructure interventions (it was adopted with some modifications) (see annex 11 p.21).

Institutional Memory and Documentation: To mitigate sustainability challenges and ensure continuity, LuxDev implements comprehensive documentation and knowledge transfer protocols. These protocols are designed to capture institutional memory, project learnings, and operational strategies, thereby facilitating smooth transitions to local management teams and maintaining the efficacy of institutional arrangements over time.

To ensure replicability, LuxDev has developed a modular project framework that allows for the adaptation of core project components to different contexts without sacrificing the integrity of the project outcomes. This framework is complemented by detailed guides and toolkits that provide step-by-step instructions for replicating project success in new locations, considering variations in cultural, economic, and environmental factors.

Financial and Institutional Stability: LuxDev's supported financial models for projects are designed to be robust, with clear paths to financial independence through strategic planning and the establishment of revenue-generating activities where applicable. Moreover, LuxDev's institutional arrangements are crafted to ensure that projects can continue to operate and thrive without reliance on a single entity or funding source, contributing to both sustainability and scale-up potential. (e.g., see value chain development for climate resilient agriculture, the strengthening of Agribank to develop and offer appropriate financial products).

The independent evaluations of previous LuxDev projects rated the sustainability of results at 1.8 (out of a 6-point scale where 1 is highest) for VIE033 and 2.7 for VIE0433.

Following these principles, GCF grant financing and co-financing will be strategically used to generate the conditions that can facilitate and sustain the transition to a climate-resilient development pathway in TT Hue and nationwide. This will be achieved by focusing on catalytic activities which address outstanding barriers to change. The project will work through key 'agents of change', who will take forward the activities once the project ends

10.2.1. Government commitment and institutional capacities

- The project is closely aligned with the policy and regulatory framework in Vietnam and TT Hue. The final evaluation of LuxDev's project VIE/033 highlighted LuxDev's approach of working in support of the provincial government, ensuring ownership and alignment, as a key element of project impact and sustainability. By following this approach, LuxDev will ensure that there is a sustained commitment to the project's interventions.

- Activity 1.1 will enhance the capacity and ability of the provincial authorities, in particular the Commanding Committees for Natural Disaster Prevention, Control, Search and Rescue (CCs), to function more effectively. Activities will enhance EWS and forecasting capacity to allow local government agencies and communities to better prepare for climate hazards, ensuring all groups, including women, are involved in decision-making and planning structures.
- Activity 2.1 will support the effective mainstreaming of climate change adaptation into SEDPs supporting locally-led adaptation action in compliance with relevant regulations. The project will enhance capacities to better understand and integrate climate risks into SEDPs. This will also have implications for public expenditure to support the plans, with more funds allocated to responding to climate change. Activity 2.1 will be developed through LPPP, which previous evaluations of LuxDev projects in the country have found to be effective for ensuring that plans are aligned to local capacities and sustainability strategies as well as for increasing that overall ownership.
- Through Activity 2.2, TT Hue will become the first province in the country with an effectively functioning and reliable provincial M&E system for climate change adaptation. While DONRE will take this forward in the province, planned close collaboration with MONRE at the national level will help ensure the replication of such systems to other provinces across Vietnam.
- There will be support for the TT Hue FPDF so it can effectively integrate contents of forest resilience into its monitoring and evaluation activities. It is expected over the longer term; this can incentivize higher payments for areas providing high forest resilience/quality.
- Lessons learned from project experience will be identified and shared by DARD staff in other provinces and MARD for publication and dissemination to policymakers and other institutions and organizations, primarily aiming to develop the policy and programmatic frameworks for upscaling best practices more widely

10.2.2. Capacity building of households, farmers/ farmers groups to sustain climate resilient cropping systems and coastal protection.

- A bottom-up and participatory approach to CFR is recognized as critical for the long-term success and sustainability of CFR. Without sufficient buy-in from local communities, the potential for the long-term success of such models is highly diminished. It is also understood that local communities must have financial and economic incentives for CFR. The project activities are designed to provide such incentives by identifying and accessing new financing sources which can be secured during the life of the project. To provide a long-term economic incentive for change, the project will also support sustainable business models for NTFPs, within highly degraded forest areas. These will be adopted and scaled by the local communities working with companies. Further, there are preliminary commitments from TT Hue authorities to cover the costs of EbA beyond the life of the project.

- The project will also strengthen the capacities of farmers to transition to more climate-resilient production practices for Rice, Thanh Tra Pomelo and Lotus. Best Management Practice guidelines, training, and technical assistance will be provided to farmers, mainly through farmer groups, cooperatives and women's groups.
- Farmers will receive improved information and inputs for more resilient farming practices. For example, in the rice value chain, training and inputs will be provided to farmers, cooperatives, Women Groups and Farmer groups to scale up existing rice varieties which are more resilient to climate change (HG12, HG244, DT100, HN6, JO2 varieties produced by TT Hue Seed Company and by Loc Troi Group OM18 variety). Farmers producing Thanh Tra Pomelo will have greater information on areas for planting that are less vulnerable to flooding and on technologies which can reduce the lack of water in the dry season.
- Strengthening cooperatives in organizational and financial management will help them play a pivotal role in orienting production, applying, and transferring advanced techniques, supporting inputs, and purchasing products from farmers.

10.2.3. Private sector engagement, stakeholder platforms and facilitating access to finance

- Key agents to facilitate lasting change are companies along the different value chains. A few actors such as Loc Troi, [67] are leading the way in working with farmers on modernizing rice production practices and adopting seed varieties which are more resilient to climate change. In value chains like Lotus, seed companies such as Hue Viet Organic are paving the way for sustainable sourcing, responding to local and international markets. Support to strengthen market access for climate-resilient practices through working with off-takers who recognize the need for more resilient practices (and the potential costs of doing nothing, for example, using seed varieties which are not saline resilient) ensures the sustainability of interventions.
- The project will bring value chain actors together in stakeholder platforms to develop commodity-specific strategies encompassing all aspects from production to commercialization. These will include representatives of key stakeholders in a particular value chain, including farmers, private sector buyers, government technical assistance agencies, lenders, commune and district authorities, representatives of the farmer's groups and/or Women's Unions, research institutions and others, as necessary. Within the platforms, information will be shared on climate-resilient agricultural production and marketing and finding solutions to obstacles to sustainability. The partnerships generated around strengthening value chain linkages will provide economic incentives for different groups along the value chain to move towards more resilient practices.
- The project facilitates MSME access to finance for climate-resilient goods and services through collaboration with local banks. This activity includes the development of

[67] See for instance recent credit facility announced by FMO https://www.fmo.nl/project-detail/62835

financial products with local financial institutions such as Agribank, tailored to the needs of climate-resilient agriculture models, designing products suitable to the farmer's needs and seeking to enhance women's access to finance. The project will influence Agribank's operational systems and structures to be able to integrate, in the future, climate risk and provide x/climate lending across its portfolio. It is expected that these activities will be rolled out by the bank at the national level.

- There will also be efforts to target the poorest groups and women who are unable to access bank financing by technically supporting women's groups to provide climate-linked small loans. Women's groups have established models of community-based micro-funds for savings and credit funds, which have proven good models for micro saving and credit. They are potentially also good vehicles for disaster preparedness, response, and recovery finance.

11. Project Risks and Mitigation Approaches

Project risks and mitigation approaches are documented in Annex 7 to the FP. Activity specific risks are detailed risk sections of activity descriptions in section 6.

12. Stakeholder Consultations

12.1. Summary of stakeholder consultations

The design of this project has been informed by stakeholder consultations. At concept note stage, consultations had already been conducted with communities and District People's Committees in Huong Thuy, Huong Tra and Phong Dien to identify key interventions to increase resilience to climate change, as well as with Agribank, VBSP, Vietnam Development Bank, and the provincial FPDF. Additional consultations were held with 190 persons (of which 33% women) throughout the development process of the funding proposal and relevant Annexes. These included, a final provincial level sharing and endorsement workshop, four district level consultations in Huong Thuy, Huong Tra, Phong Dien, and Quang Dien, and targeted one-on-one consultations with government agencies at the provincial and district levels, grassroots organizations, including Women Unions, private sector stakeholders, state-owned and commercial financial institutions, development partners, and CSOs. Annex 12 to the FP includes more details on the stakeholder consultation process and also outlines the stakeholder engagement plan for project implementation. Table 24 provides an overview of the stakeholders consulted.

Table 24. Overview of consulted stakeholders

Date	Institution consulted	Level	Total	Male	Female
15.03.	VWU (Vietnam Women's Union)	Province	3	-	3
17.03.	PFPDF (Provincial Forest Development and Protection Fund)	Province	3	2	1
15.03.	Loc Troi Rice Company	Province	1	1	-
20.03.	Hue Viet Agribank-Company	Province	1	-	1
20.03.	DPI (Department for Planning and Investment)	Province	4	3	1
18.03.	DONRE (Department of Natural Resources and Environment)	Province	7	5	2
18.03.	DOLISA (Department of Labour, Invalids and Social Affairs)	Province	3	2	1
15.03.	DARD (Department of Agriculture and Rural Development)	Province	11	10	1
14.03.	CSRD (Centre for Social Research and Development)	Province	3	1	2
17.03.	CRD (Center for Rural Development)	Province	2	1	1
14.03.	CORENAM (Center on Natural Resources Management)	Province	2	1	1
13.03.	CEM (Committee for Ethnic Minorities)	Province	3	2	1
14.03.	My Hai Ag Cooperative (LuxDev433 Model 1)	Commune	7	6	1
17.03.	Agribank	Province	5	3	2
17.03.	Phong Dien DPC, DONRE, DARD, DOLISA, VWU	District	28	20	8
16.03.	Huong Tra DPC, DONRE, DARD, DOLISA, VWU	District	20	15	5
17.03.	Huong Thuy DPC, DONRE, DARD, DOLISA, VWU	District	11	8	3
16.03.	Vinh My (Organic Vegetable LuxDev Model 2)	Commune	7	5	2
16.03.	Phu My 1 Community Cooperative (LuxDev Model 3)	Commune	3	3	-

22.03.	CKC (Center for Knowledge Co-creation and Development Research)	Province	1	-	1
08.06.	Quang Dien(DPC, DONRE, DARD, DOLISA, VWU	District	26	14	12
09.06.	Hue Seed Company	Province	4	3	1
12.06.	WWF Office Hue	National	2	2	0
13.06.	Song Huong Protection Forest Mgmt Board	Province	3	2	1
13.06.	Hoa Nen Essential Oil Company	Province	2	2	0
14.06.	Provincial Consultation Meeting	Province	29	18	11
16.06.	Ministry of Planning and Investment	National	2	1	1
			193	130	63
			100%	67%	33%

Information was collected concerning the provincial and district status of gender equality and vulnerable groups. This information, including assessments, statistical data, information on public activities, and plans, was fed into the Environmental and Social Action Plan (Annex 12 to the FP) and the Gender Action Plan (Annex 4 to the FP).

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List of appendices

Table 25. List of appendices

APPENDIX A	Rapid Commune Vulnerability Assessment
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Appendix A – Climate Change Vulnerability Assessment at the Commune Level in TT Hue

1. Introduction

This vulnerability assessment is to identify the vulnerable communes out of total 141 communes for prioritized project interventions with the focus on all low-lying and coastal districts in TT Hue province. The assessment determines the vulnerability of each commune based on three key determinants of vulnerability: exposure, sensitivity and adaptive capacity, as guided by the IPCC's definition of vulnerability.

Vulnerability is a key concept for assessment of natural hazard risks and climate change impacts on a system and/or a community. Therefore, understanding the levels of vulnerability is crucial to any intervention on climate change adaptation and resilience. Effective climate change adaptation and disaster risk management strategies and practices depend on a good understanding of the dimensions of current vulnerability to climate related hazards in target areas. Exposure is a necessary determinant of vulnerability, but not sufficient. A location may be exposed to hazard events but may not be vulnerable. However, to be considered as vulnerable to climate change, it is necessary that a location experienced an extent of exposure to a certain hazard event. Vulnerability is the degree to which a system (natural, socio-economic) is susceptible to, and unable to cope with adverse effects of climate change, including climate variability and extremes (Intergovernmental Panel on Climate Change, 2001). Vulnerability is a function of the character, magnitude, and rate of climate change and variation to which a system is exposed, its sensitivity, and its adaptive capacity. Vulnerability (V) is presented with a function of Exposure-E, Sensitivity-S and Adaptive Capacity-AC.

V= f (E, S, AC) (McCarthy et al., 2001).

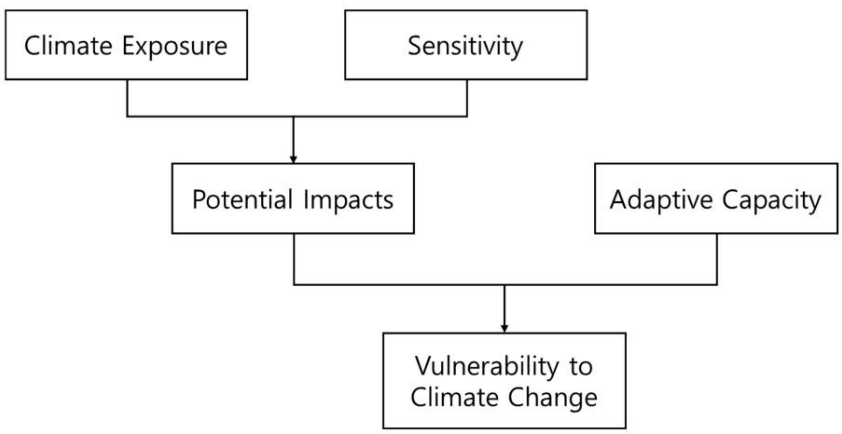

Figure 31. Schematic diagram of climate change vulnerability (McCarthy et al., 2001)

Climate exposure is the nature and degree to which a system is exposed to significant climatic variations where the exposure unit is an activity, group, region, or resource that is subjected to climatic stimuli' (Intergovernmental Panel on Climate Change, 2001). Exposure also shows the presence of people, livelihood, species or ecosystem, environmental services and resources,

infrastructure, or economic, social or cultural assets in places that could be adversely affected by climate risks (Intergovernmental Panel on Climate Change, 2001). Sensitivity is 'the degree to which a system or species is affected, either adversely or beneficially, by climate variability or change' (Intergovernmental Panel on Climate Change, 2001). The potential impact is determined from the combination of climate and sensitivity of a system or a community.

Adaptive capacity is the 'ability of systems, institutions, humans, and other organisms to adjust to potential damage, to take advantage of opportunities, or to respond to consequences' (Intergovernmental Panel on Climate Change, 2001). Adaptive capacity also refers to the ability of a system to adjust to climate change (including *climate variability* and extremes) to moderate potential damages, to take advantage of beneficial factors or to align with climate change impacts; or adaptive capacity is the adjustment in natural and human systems to cope with present and future climate factors, to moderate damages or take advantage of beneficial opportunities.

Vulnerability Assessment at the commune level is to assess the climate change vulnerability of target(s) communes or villages under climate change impacts.

2. Assessment Methodology

2.1 Vulnerability Index Construct

This assessment adopted the method for calculating a vulnerability index (VI) that incorporates the IPCC vulnerability definition that depends on exposure (E), sensitivity (S) and adaptive capacity (AC) (Hahn et al., 2008; Thi Huyen et al., 2022; Ngoc et al., 2019).

The VI assessing the vulnerability of a commune includes seven major components: Climate Variability, Hazards, Socio-Demographic Profile, Livelihood Activities, Natural Resources, Human Resources and Social Resources, measured by 46 indicators as presented in Table 26 and Table 27 below.

Table 26. Major components categorized in the contributing factors from the IPCC vulnerability definition

IPCC contributing factors to vulnerability	Major components	Number of indicators
Exposure (E)	Climate Variability	6
	Hazards	3
Sensitivity (S)	Socio-Demographic Profile	11
	Livelihood Activities	10
Adaptive Capacity (AC)	Natural Resources	6
	Human Resources	5
	Social Resources	5
Total		46

Table 27. IPCC Contributing Factors, major components and Indicators of Vulnerability Index

IPCC contributing factors (CFs)	Major components	Indicators/Variables	Sources of data
Exposure (E)	Climate variability (E1)	1.Lowest annual mean temperature deviation	TT Hue Station of Hydrometeorology
		2. Highest annual mean temperature deviation	TT Hue Station of Hydrometeorology
		3. Average annual temperature deviation	TT Hue Station of Hydrometeorology
		4.The lowest mean annual rainfall deviation	TT Hue Station of Hydrometeorology
		5. The highest average annual rainfall deviation	TT Hue Station of Hydrometeorology
		6. Average annual rainfall deviation	TT Hue Station of Hydrometeorology
	Hazards (E2)	7. Number of floods occurred	DONRE M&E Database
		8. Number of storms that hit	DONRE M&E Database
		9. Number of droughts occurred	DONRE M&E Database
Sensitivity (S)	Social Demographic Profile (S1)	10. Percentage of population in rural areas	DONRE M&E Database
		11. Percentage of agricultural labor structure	DONRE M&E Database
		12.The rate of poor households	DONRE M&E Database
		13. Percentage of elderly people over 60 years old	DONRE M&E Database
		14. Percentage of children under 15 years old	DONRE M&E Database
		15. Percentage of ethnic minorities	DONRE M&E Database
		16. Number of households with people with disabilities	DONRE M&E Database
		17. Number of people dead and missing due to floods	DONRE M&E Database
		18. Number of people injured by floods	DONRE M&E Database
		19. Number of people dead and missing due to storms	DONRE M&E Database
		20. Number of people injured due to storms	DONRE M&E Database
	Livelihood activities (S2)	21.Damaged rice area (due to storms, floods, salinization, etc.)	DONRE
		22.Areas of crops and annual crops damaged (due to storms, floods, salinization, etc.)	DONRE M&E Database
		23.Area of land for perennial crops (industrial crops, fruit trees, oil crops, spices, medicinal plants, other perennial plants) damaged (due to storms, floods, floods, ...)	DONRE M&E Database
		24.Number of livestock (buffalo, cows, pigs, rabbits, goats, sheep, horses, ...) that died due to natural disasters, epidemics	DONRE M&E Database
		25.Number of poultry (birds, chickens, ducks, geese, birds, etc.) killed by natural disasters, epidemics	DONRE M&E Database
		26.Number of fishing vessels/boats damaged (lost, damaged) due to natural disasters	DONRE M&E Database
		27.Damaged farming area (diseases, storms, floods, flash floods, saltwater intrusion, ..)	DONRE M&E Database
		28.Damaged forest area (due to storms, floods, forest fires, landslides, etc.)	DONRE M&E Database
		29.Number of public infrastructure works (stations, roads, production facilities, canals, dikes, embankments, dams, etc.) collapsed/damaged annually due to natural disasters	DONRE M&E Database
		30.Number of tourist attractions affected/damaged by climate change	DONRE M&E Database
Adaptive Capacity (AC)	Natural Resources (AC1)	31.Land area	DONRE M&E Database
		32.Forest area	DONRE M&E Database
		33.Area of production forest	DONRE M&E Database
		34.Aquaculture water surface area	DONRE M&E Database
		35.Percentage of unused land	DONRE M&E Database
		36.Area of agricultural land per capita or household	DONRE M&E Database
	Human Resources (AC2)	37.Total population	DONRE M&E Database
		38.Percentage of female-headed households	DONRE M&E Database
		39.Percentage of employed people	DONRE M&E Database
		40.Percentage of villages with disaster warning systems	DONRE M&E Database
		41.Area of residential land per capita	DONRE M&E Database
	Social Resources (AC3)	42.Total number of tourism festivals held	DONRE M&E Database
		43Number of cooperatives and cooperative groups	DONRE M&E Database

		44.Number of social and professional organizations (hobby groups, agricultural extension clubs, fisheries associations, savings-credit groups, etc.)	DONRE M&E Database
		45.Number of agricultural enterprises	DONRE M&E Database
		46.Total number of tourist attractions	DONRE M&E Database

2.2 Methods of assessment

This assessment primarily used secondary quantitative data available from TT Hue DONRE M&E database system and TT Hue Provincial Station of Hydrometeorology. Balanced weighted average method, that each indicator contributes equally to the overall index even though each major component is comprised of a different number of indicators, is adopted (Sullivan, 2019). In addition, the VI formula also uses the simple approach of applying equal weights to all major components (Hahn et al., 2008). Because each of the indicators is measured on a different scale, its value is standardized as an index by using the following equation (Hahn et al., 2008; Thi Huyen et al., 2022):

$$index_{s_d} = \frac{s_d - s_{\min}}{s_{\max} - s_{\min}}$$

where s_d is the original indicator for commune d, and s_{min} and s_{max} are the minimum and maximum values, respectively, for each indicator determined using data from both communes. After each was standardized, the indicators were averaged using the below equation to calculate the value of each major component (Hahn et al., 2008; Thi Huyen et al., 2022).

$$M_d = \frac{\sum_{i=1}^{n} index_{s_d i}}{n}$$

where M_d = one of the seven major components for commune d, $index_{sdi}$ represents the indicators indexed by i, that make up each major component, and n is the number of indicators in each major component. Once values for each of the seven major components for a commune were calculated, they were averaged using the following equation to obtain the commune-level VI:

$$VI_d = \frac{\sum_{i=1}^{7} w_{M_i} M_{di}}{\sum_{i=1}^{7} w_{M_i}}$$

where VI_d, the Vulnerability Index for commune d, equals the weighted average of the seven major components. The weights of each major component, w_{Mi}, are determined by the number of indicators that make up each major component and are included to ensure that all indicators contribute equally to the overall VI (Sullivan, 2002). Once the VI of Exposure (E), Sensitivity (S) and Adaptive capacity (AC) in a commune were calculated, the following equation is used to calculate the CC Vulnerability of that commune based on the combination of three IPCC contributing factors (E,S, AC) (Hahn et al., 2008; Thi Huyen et al., 2022; Ngoc et al., 2019).

CC Vulnerability $_{commune}$**=(Exposure**$_{commune}$ **-Adaptive Capactiy**$_{commune}$**) * Sensitivity**$_{commune}$

The scale of CC Vulnerability from -1 (least vulnerable) to 1 (most vulnerable) is employed for assessment (Hahn et al., 2008; Thi Huyen et al., 2022; Ngoc et al., 2019). It has four levels: Low, Moderate, High and Very High, as per below value ranges:

Table 28. Four levels of vulnerability, as per IPCC guidelines (Thi Huyen et al., 2022; Ngoc et al., 2019)

Value range of vulnerability levels	Levels of vulnerability to CC
-1< VL ≤ -0.5	Low
-0.5 < VL ≤ 0	Moderate
0< VL ≤ 0.5	High
0.5< VL ≤ 1	Very High

3. Results of Vulnerability Assessment at the commune level

This study has assessed the vulnerability level of 141 communes and wards in TT Hue province.

In Annex 1 are all actual values for Exposure (E), Sensitivity (S) and Adaptive Capacity (AC), as well as resulting overall Vulnerability value (as per V=[E-AC]*S), for each of these 141 communes and wards.

If the above value range (Table 28) is used, it gives following aggregate result (Table 29): 98 communes/wards are assessed as *highly vulnerable*, representing 69.5% of all communes & wards in the province. Whereas other 43 communes/wards are assessed as *moderately vulnerable*. Using this IPCC scale and ranges, no communes would qualify as to have either *low* or *very high* vulnerability.

As per that scale and range, most of the communes with high vulnerability are located in (primarily mountainous) areas, e.g. A Luoi and Nam Dong districts, where all (100%) of their 18 and 9 communes, respectively, are assessed as *highly vulnerable*. As for the low-lying areas, Quang Dien stands out, with 10 of its 11 communes (91%) being assessed as *highly vulnerable*, followed by Huong Thuy and Huong Tra, both 7 of their 10 communes (70%) and Phong Dien (69%) considered *highly vulnerable.*

Table 29. Aggregate results of vulnerability assessment at the commune level

No	District/City	Total No. communes/wards	Vulnerability level			
			Low	Moderate	High	Very high
1	A Luoi	18	0	0	18	0
2	Huong Thuy	10	0	3	7	0
3	Huong Tra	10	0	3	7	0
4	Nam Dong	9	0	0	9	0
5	Phong Dien	16	0	5	11	0
6	Phu Loc	17	0	7	10	0
7	Phu Vang	14	0	6	8	0
8	Quang Dien	11	0	1	10	0
9	Hue	36	0	18	18	0

	Total	141	0	43	98	0

Alternatively, we can change the value ranges, not using -1<x<1 as the two extreme values, but the lowest and highest actually measured results as per Annex 1 instead, as follows:

Table 30. Four levels of vulnerability, with actually measured values as min/max values

Value range of vulnerability levels	Levels of vulnerability to CC
-0.042852 < VL ≤ -0.021426	Low
-0.021425 < VL ≤ 0.000000	Moderate
0.000001< VL ≤ 0.058366	High
0.058367< VL ≤ 0.116731	Very High

This would give a different result with more refined levels of vulnerability, with 141 communes/wards classified in four levels, instead of two, as follows:

Table 31. Aggregate results of vulnerability assessment at the commune level, as per Table 5 ranges

No	District/City	Total No. communes/wards	Vulnerability level			
			Low	Moderate	High	Very high
1	A Luoi	18	0	0	5	13
2	Huong Thuy	10	3	0	7	0
3	Huong Tra	10	1	2	7	0
4	Nam Dong	9	0	0	3	6
5	Phong Dien	16	0	5	11	0
6	Phu Loc	17	3	4	10	0
7	Phu Vang	14	2	4	8	0
8	Quang Dien	11	1	0	9	1
9	Hue	36	0	18	18	0
	Total	141	10	33	78	20

Findings from the analysis of data in the above table are summarized as follows:

- All *very high* thus most vulnerable communes in TT Hue province, are located in the mountainous districts of A Luoi and Nam Dong, except for one (in Quang Dien).
- None of the 16 communes in Phong Dien are considered to be of *low* vulnerability.
- That is different in all other low-lying districts: 6 communes in the districts where VIE033 and VIE433 have operated are now considered to have *low* vulnerability, and another 8 to have *moderate* vulnerability. Likely, an indication of project impact, considering that these communes used to be selected as most vulnerable at the time of project design (2011 - 12). Disaggregated data in Annex 1 can give some indication as to how and what has changed (e.g., increased Adaptive Capacity).

- Hue is a bit of a strange creature, as it is now a fairly large area, following integration of many communes and wards that hitherto were part of other districts. Hue now stretches to as far as the beach area and includes two coastal communes. Nevertheless, meaningful that 18 of the 36 communes/wards in Hue municipal area are considered to be *highly vulnerable*.

4. CC Vulnerability Mapping

A spatial vulnerability assessment using ArcGIS is made by integrating data layers of geo-referenced indicators for the three components of vulnerability (exposure, sensitivity, adaptive capacity). The same value range for vulnerability as in Table 30 is used, with following color codes:

Symbol	Range	Label
	-0,042852 - -0,021426	Low
	-0,021425 - 0,000000	Moderate
	0,000001 - 0,058366	High
	0,058367 - 0,116731	Very high

Figure 32. Value range and colours of vulnerability levels

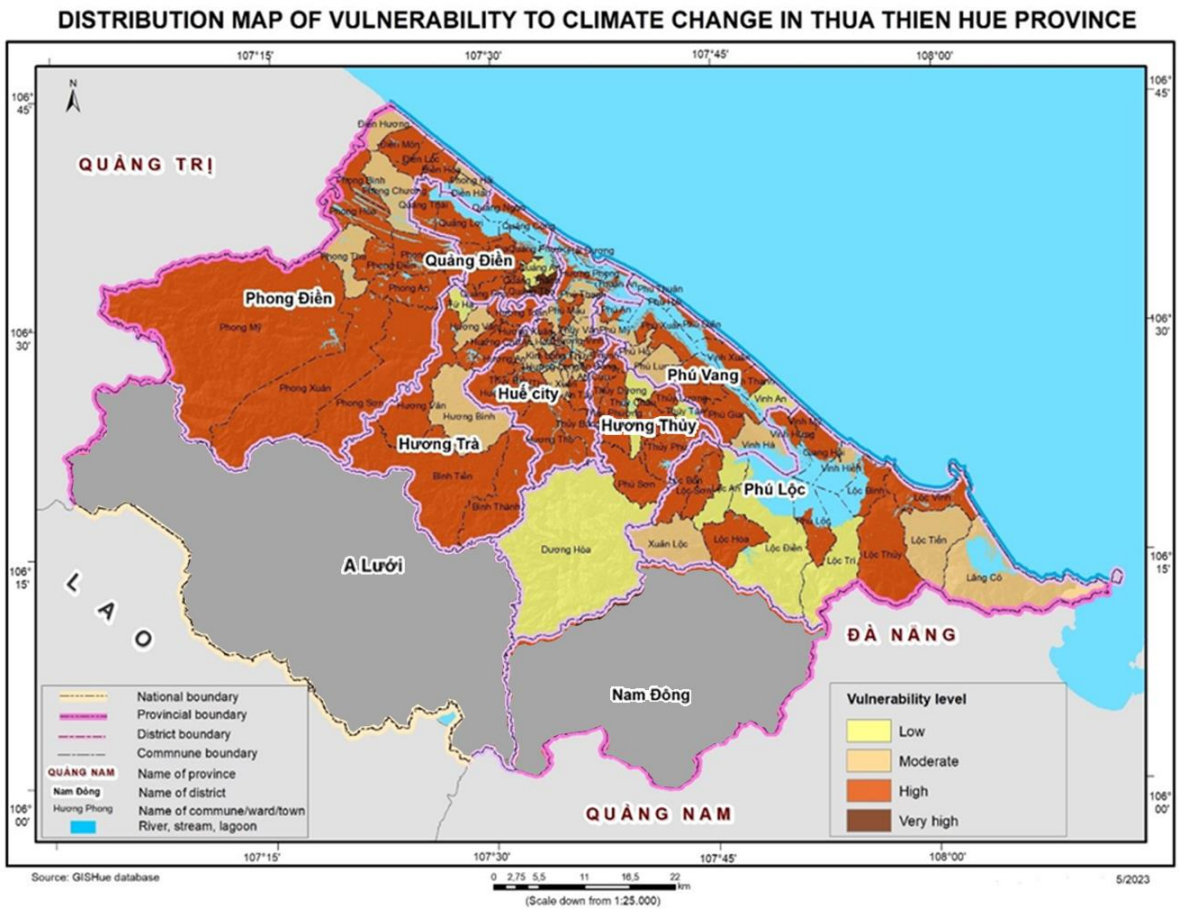

Figure 33. Map of vulnerable communes in TT Hue

5. Implications for the selection of target districts

The selection of districts and communes changed from that proposed in the concept note due to the following reasons: during the development of the funding proposal and feasibility study, it came to light that, in accordance with the broader initiative for Hue's transition into a centrally governed municipality by 2025, specific communes within the originally targeted districts were earmarked for re-districting into Hue City or for reallocation to other districts. In response to this dynamic, a rapid vulnerability assessment was promptly conducted, leveraging previously collected primary and secondary data. The objective was to pinpoint the most vulnerable communes, guiding the prioritization of project interventions. Although the vulnerability assessment covered the entire province, the selection of targeted districts and communes intentionally excluded the two mountainous districts of A Luoi and Nam Dong, as per the directive from the Department of Planning and Investment (DPI). This decision, while acknowledging the heightened vulnerability of these districts to climate change, was justified by the substantial concentration of financial and developmental projects already underway in these areas.

6. Assessment Limitations

This assessment has its limitations in terms of data availability, resources and time. It mainly used secondary quantitative data from available sources such as DONRE M&E system, which can provide enough data of 141 communes for 46 indicators. If following MONRE/AR5 guidelines for assessment of climate change impacts which is based on the risks determined by hazards, exposure, and vulnerability, it is required to have enough data from 141 communes for more than 100 indicators. In addition, the allocated time for this assessment is too short to collect more qualitative information and to make more in-depth analysis. Therefore, it should be considered as a rapid assessment of vulnerability at the commune level that serves the development of funding proposal.

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Annex 1: Ranking of communes by vulnerability levels

No	Commune	District	E	S	AC	V	Vulnerability level
1	Hồng Bắc	A Lưới	0.735406	0.288327	0.330548	0.116731	High
2	Hồng Thượng	A Lưới	0.582175	0.326811	0.262616	0.104435	High
3	Trung Sơn	A Lưới	0.707011	0.242555	0.284762	0.102419	High
4	A Roàng	A Lưới	0.618853	0.264907	0.235657	0.101511	High
5	A Ngo	A Lưới	0.698369	0.182748	0.174295	0.095774	High
6	Thượng Long	Nam Đông	0.619968	0.251878	0.243631	0.094791	High
7	Đông Sơn	A Lưới	0.584551	0.22542	0.175423	0.092226	High
8	Hương Hữu	Nam Đông	0.566795	0.250741	0.208682	0.089793	High
9	Thượng Lộ	Nam Đông	0.610258	0.213757	0.207477	0.086097	High
10	HươngNguyên	A Lưới	0.70557	0.187287	0.24787	0.085722	High
11	Hương Sơn	Nam Đông	0.591794	0.215972	0.200677	0.084471	High
12	Hồng Kim	A Lưới	0.556532	0.231019	0.191551	0.084318	High
13	Lâm Đớt	A Lưới	0.575333	0.286495	0.292952	0.080901	High
14	Thượng Nhật	Nam Đông	0.652836	0.194633	0.266192	0.075254	High
15	Hồng Vân	A Lưới	0.51446	0.297971	0.263244	0.074855	High
16	Hồng Hạ	A Lưới	0.659284	0.247793	0.35785	0.074693	High
17	TT Khe Tre	Nam Đông	0.66244	0.15998	0.213677	0.071793	High
18	Hồng Thái	A Lưới	0.546555	0.240326	0.261528	0.068499	High
19	Quảng Nhâm	A Lưới	0.604616	0.211531	0.284114	0.067796	High
20	Quảng Thành	Quảng Điền	0.458564	0.294183	0.247467	0.062101	High
21	Hương Lộc	Nam Đông	0.594871	0.157067	0.225327	0.058043	High
22	Bình Thành	Hương Trà	0.474734	0.190996	0.193576	0.0537	High
23	Sơn Thủy	A Lưới	0.53325	0.188982	0.249919	0.053544	High
24	Hồng Thủy	A Lưới	0.596083	0.174503	0.299876	0.051689	High
25	Hương Phú	Nam Đông	0.567198	0.167866	0.26806	0.050215	High
26	Thủy Lương	Hương Thủy	0.44876	0.213804	0.217836	0.049372	High
27	Quảng Lợi	Quảng Điền	0.408177	0.229294	0.193684	0.049182	High
28	Điền Hòa	Phong Điền	0.452622	0.211583	0.237852	0.045442	High
29	Phong Hòa	Nam Đông	0.452166	0.24304	0.268257	0.044697	High
30	Quảng Công	Quảng Điền	0.449741	0.180613	0.212302	0.042885	High
31	Phú Vinh	A Lưới	0.508816	0.153573	0.23595	0.041905	High
32	Thị Trấn A lưới	A Lưới	0.508666	0.154705	0.256136	0.039068	High
33	Quảng Phước	Quảng Điền	0.411598	0.200422	0.220104	0.03838	High
34	Hương Phong	A Lưới	0.434446	0.209851	0.252437	0.038195	High
35	Hương Xuân	Nam Đông	0.652836	0.090679	0.255534	0.036027	High

No	Commune	District	E	S	AC	V	Vulnerability level
36	Phong Hiền	Phong Điền	0.384615	0.218226	0.220879	0.035731	High
37	Lộc Hòa	Phú Lộc	0.400612	0.235576	0.251607	0.035102	High
38	Thượng Quảng	Nam Đông	0.619503	0.152143	0.398928	0.033559	High
39	Giang Hải	Phú Lộc	0.409686	0.203001	0.248812	0.032658	High
40	Hương Hồ	TP Huế	0.430399	0.174159	0.243136	0.032614	High
41	Hải Dương	TP Huế	0.458736	0.147992	0.24601	0.031482	High
42	Vinh Thanh	Phú Vang	0.40386	0.208311	0.254781	0.031055	High
43	Vinh Xuân	Phú Vang	0.394087	0.214972	0.253392	0.030246	High
44	Hương Toàn	Hương Trà	0.379227	0.211797	0.237948	0.029923	High
45	TT Phú Đa	Phú Vang	0.401622	0.239472	0.277653	0.029687	High
46	Thủy Thanh	Hương Thủy	0.382461	0.221541	0.250703	0.02919	High
47	Quảng Vinh	Quảng Điền	0.346949	0.255103	0.235784	0.028358	High
48	Hương Chữ	Hương Trà	0.401542	0.170182	0.239858	0.027516	High
49	Phú Hải	Phú Vang	0.357097	0.15252	0.177095	0.027454	High
50	Phú Xuân	Phú Vang	0.392194	0.156769	0.226441	0.025985	High
51	Phong Xuân	Nam Đông	0.360426	0.235595	0.252297	0.025475	High
52	Điền Lộc	Phong Điền	0.389659	0.16581	0.237256	0.02527	High
53	TT Phú Lộc	Phú Lộc	0.399429	0.170988	0.25186	0.025233	High
54	Hương Thọ	TP Huế	0.445986	0.136221	0.268279	0.024208	High
55	Hương Xuân	Hương Trà	0.373104	0.197617	0.255377	0.023265	High
56	TT. Phong Điền	Phong Điền	0.386627	0.125651	0.205772	0.022725	High
57	Thủy Phù	Hương Thủy	0.332364	0.175848	0.204468	0.02249	High
58	Phong An	Phong Điền	0.363858	0.198002	0.251172	0.022312	High
59	Phú Mậu	TP Huế	0.359699	0.171549	0.230438	0.022175	High
60	Thuận Hoà	TP Huế	0.461257	0.122924	0.288503	0.021236	High
61	Lộc Vĩnh	Phú Lộc	0.404235	0.116421	0.224143	0.020967	High
62	Hương Phong	TP Huế	0.368161	0.231624	0.27816	0.020846	High
63	Thủy Dương	Hương Thủy	0.363858	0.112917	0.179847	0.020778	High
64	Phú Sơn	Hương Thủy	0.331024	0.167677	0.211993	0.019959	High
65	Quảng Thọ	Quảng Điền	0.383023	0.186866	0.276504	0.019905	High
66	Thuận Lộc	TP Huế	0.416539	0.11196	0.246686	0.019017	High
67	Thủy Vân	TP Huế	0.419005	0.114633	0.254146	0.018898	High
68	Thuỷ Biều	TP Huế	0.445424	0.140254	0.312391	0.018659	High
69	Thủy Phương	Hương Thủy	0.363858	0.140597	0.234021	0.018255	High
70	Lộc Bình	Phú Lộc	0.397838	0.222519	0.320816	0.017139	High
71	Vinh Mỹ	Phú Lộc	0.391897	0.13441	0.272598	0.016035	High
72	Phú Gia	Phú Vang	0.338204	0.155201	0.236051	0.015854	High

No	Commune	District	E	S	AC	V	Vulnerability level
73	Hương An	TP Huế	0.338659	0.122845	0.211759	0.015589	High
74	Hương Vân	Hương Trà	0.34118	0.121697	0.214295	0.015441	High
75	Lộc Sơn	Phú Lộc	0.363575	0.1362	0.25126	0.015297	High
76	Phong Mỹ	Nam Đông	0.405325	0.175491	0.318313	0.01527	High
77	Lộc Bổn	Phú Lộc	0.366981	0.13588	0.259187	0.014647	High
78	Vĩnh Ninh	TP Huế	0.373785	0.113925	0.257553	0.013242	High
79	Lộc Thủy	Phú Lộc	0.338204	0.117919	0.227199	0.01309	High
80	Phong Bình	Phong Điền	0.34876	0.220975	0.293353	0.012243	High
81	Thuỷ Bằng	TP Huế	0.348463	0.170249	0.277629	0.012059	High
82	TT Sịa	Quảng Điền	0.316437	0.220359	0.26269	0.011843	High
83	Kim Long	TP Huế	0.310822	0.104643	0.198296	0.011775	High
84	Bình Tiến	Hương Trà	0.306208	0.177916	0.240783	0.01164	High
85	Hương Sơ	TP Huế	0.35746	0.08585	0.226942	0.011205	High
86	Thuận An	TP Huế	0.390383	0.097219	0.276135	0.011107	High
87	Đông Ba	TP Huế	0.338942	0.131233	0.257973	0.010626	High
88	Quảng Thái	Quảng Điền	0.326038	0.144208	0.252811	0.01056	High
89	Phú Bài	Hương Thủy	0.316811	0.126108	0.237478	0.010005	High
90	Phong Sơn	Phong Điền	0.409455	0.28987	0.377645	0.009221	High
91	Phú An	Phú Vang	0.351054	0.145858	0.28805	0.00919	High
92	An Tây	TP Huế	0.335238	0.094548	0.238378	0.009158	High
93	An Đông	TP Huế	0.36496	0.084996	0.25951	0.008963	High
94	Vinh Hưng	Phú Lộc	0.361764	0.207143	0.319712	0.008711	High
95	Phú Diên	Phú Vang	0.328205	0.215953	0.313513	0.003173	High
96	Quảng Ngạn	Quảng Điền	0.306686	0.240489	0.298863	0.001881	High
97	Quảng Phú	Quảng Điền	0.307005	0.198158	0.300066	0.001375	High
98	Điền Môn	Phong Điền	0.342818	0.155961	0.335103	0.001203	High
99	Phú Hồ	Phú Vang	0.296585	0.166608	0.314085	-0.00292	Moderate
100	Phú Nhuận	TP Huế	0.182443	0.029388	0.292595	-0.00324	Moderate
101	Phú Lương	Phú Vang	0.188552	0.17324	0.217015	-0.00493	Moderate
102	Hương Bình	Hương Trà	0.165085	0.167866	0.196145	-0.00521	Moderate
103	Phú Hậu	TP Huế	0.196658	0.079713	0.276884	-0.0064	Moderate
104	Phú Thuận	TP Huế	0.204666	0.103812	0.267411	-0.00651	Moderate
105	An Hoà	TP Huế	0.196658	0.101627	0.264426	-0.00689	Moderate
106	Gia Hội	TP Huế	0.196585	0.063262	0.305623	-0.0069	Moderate
107	Phú Hội	TP Huế	0.196658	0.085476	0.282338	-0.00732	Moderate
108	Phường Đúc	TP Huế	0.182443	0.0891	0.266932	-0.00753	Moderate
109	Phú Thanh	TP Huế	0.236898	0.136384	0.293415	-0.00771	Moderate

No	Commune	District	E	S	AC	V	Vulnerability level
110	Phong Hải	Phong Điền	0.233033	0.131988	0.291646	-0.00774	Moderate
111	Phước Vĩnh	TP Huế	0.192453	0.06433	0.31722	-0.00803	Moderate
112	Xuân Phú	TP Huế	0.182443	0.07079	0.300733	-0.00837	Moderate
113	Hương Vinh	TP Huế	0.163925	0.107466	0.258171	-0.01013	Moderate
114	Trường An	TP Huế	0.141703	0.063815	0.303571	-0.01033	Moderate
115	Phú Thượng	TP Huế	0.145406	0.086928	0.289508	-0.01253	Moderate
116	Hương Văn	Hương Trà	0.234632	0.148521	0.31946	-0.0126	Moderate
117	An Cựu	TP Huế	0.160221	0.07216	0.342614	-0.01316	Moderate
118	Hương Long	TP Huế	0.196658	0.105169	0.331151	-0.01414	Moderate
119	Tây Lộc	TP Huế	0.204666	0.122316	0.320691	-0.01419	Moderate
120	Điền Hương	Phong Điền	0.209885	0.21294	0.278672	-0.01465	Moderate
121	Vỹ Dạ	TP Huế	0.182443	0.092645	0.343774	-0.01495	Moderate
122	Phong Thu	Phong Điền	0.209885	0.203635	0.286226	-0.01555	Moderate
123	Phú Dương	TP Huế	0.160221	0.15105	0.263673	-0.01563	Moderate
124	TT Lăng Cô	Phú Lộc	0.19749	0.0986	0.372685	-0.01727	Moderate
125	Phú Mỹ	Phú Vang	0.144108	0.135646	0.274468	-0.01768	Moderate
126	Phong Chương	Phong Điền	0.16544	0.224057	0.244738	-0.01777	Moderate
127	Vinh Hà	Phú Vang	0.210774	0.208623	0.301772	-0.01898	Moderate
128	Điền Hải	Phong Điền	0.169144	0.157254	0.296428	-0.02002	Moderate
129	Thuỷ Xuân	TP Huế	0.141703	0.11707	0.313462	-0.02011	Moderate
130	Vinh Hiền	Phú Lộc	0.148184	0.139415	0.29481	-0.02044	Moderate
131	Xuân Lộc	Phú Lộc	0.194733	0.163751	0.320273	-0.02056	Moderate
132	TT Tứ Hạ	Hương Trà	0.165085	0.114976	0.359538	-0.02236	Moderate
133	Thủy Tân	Hương Thủy	0.197494	0.160788	0.339669	-0.02286	Moderate
134	Lộc Điền	Phú Lộc	0.158601	0.141664	0.36762	-0.02961	Moderate
135	Vinh An	Phú Vang	0.125589	0.150264	0.323916	-0.0298	Moderate
136	Quảng An	Quảng Điền	0.184831	0.236036	0.313872	-0.03046	Moderate
137	Phú Thuận	Phú Vang	0.175854	0.21011	0.328343	-0.03204	Moderate
138	Lộc Trì	Phú Lộc	0.114262	0.134537	0.364595	-0.03368	Moderate
139	Lộc An	Phú Lộc	0.185221	0.200353	0.368989	-0.03682	Moderate
140	Thủy Châu	Hương Thủy	0.13342	0.211258	0.333169	-0.0422	Moderate
141	Dương Hòa	Hương Thủy	0.167965	0.185465	0.399017	-0.04285	Moderate

Annex 2: List of 141 communes/wards, by vulnerability level, per district

District, City	Communes, Wards	Vulnerability levels
A Lưới		

District, City	Communes, Wards	Vulnerability levels
1	TT. A Lưới	High
2	A Ngo	Very high
3	A Roàng	Very high
4	Đông Sơn	Very high
5	Hồng Bắc	Very high
6	Hồng Hạ	Very high
7	Hồng Kim	Very high
8	Hồng Thái	Very high
9	Hồng Thượng	Very high
10	Hồng Thủy	High
11	Hồng Vân	Very high
12	Hương Nguyên	Very high
13	Hương Phong	High
14	Lâm Đớt	Very high
15	Phú Vinh	High
16	Quảng Nhâm	Very high
17	Sơn Thủy	High
18	Trung Sơn	Very high
Hương Thủy		
1	Phú Bài	High
2	Thủy Châu	Low
3	Thủy Dương	High
4	Thủy Lương	High
5	Thủy Phương	High
6	Dương Hòa	Low
7	Phú Sơn	High
8	Thủy Phù	High
9	Thủy Tân	Low
10	Thủy Thanh	High
Hương Trà		
1	Hương Chữ	High
2	Hương Văn	Moderate
3	Hương Vân	High
4	Hương Xuân	High
5	Tứ Hạ	Low
6	Bình Thành	High
7	BìnhTiến	High
8	Hương Bình	Moderate

District, City	Communes, Wards	Vulnerability levels
9	Hương Toàn	High
10	Hương Xuân	High
Nam Đông		
1	Khe Tre	Very high
2	Hương Hữu	Very high
3	Hương Lộc	High
4	Hương Phú	High
5	Hương Sơn	Very high
6	Thượng Lộ	Very high
7	Thượng Long	Very high
8	Thượng Nhật	Very high
9	Thượng Quảng	High
Phong Điền		
1	TT. Phong Điền	High
2	Điền Hải	Moderate
3	Điền Hòa	High
4	Điền Hương	Moderate
5	Điền Lộc	High
6	Điền Môn	High
7	Phong An	High
8	Phong Bình	High
9	Phong Chương	Moderate
10	Phong Hải	Moderate
11	Phong Hiền	High
12	Phong Sơn	High
13	Phong Thu	Moderate
14	Phong Hòa	High
15	Phong Mỹ	High
16	Phong Xuân	High
Phú Lộc		
1	Lăng Cô	Moderate
2	TT. Phú Lộc	High
3	Giang Hải	High
4	Lộc An	Low
5	Lộc Bình	High
6	Lộc Bổn	High
7	Lộc Điền	Low
8	Lộc Hòa	High

District, City	Communes, Wards	Vulnerability levels
9	Lộc Sơn	High
10	Lộc Thủy	High
11	Lộc Tiến	Moderate
12	Lộc Trì	Low
13	Lộc Vĩnh	High
14	Vinh Hiền	Moderate
15	Vinh Hưng	High
16	Vinh Mỹ	High
17	Xuân Lộc	Moderate
Phú Vang		
1	Phú Đa	High
2	Phú An	High
3	Phú Diên	High
4	Phú Gia	High
5	Phú Hải	High
6	Phú Hồ	Moderate
7	Phú Lương	Moderate
8	Phú Mỹ	Moderate
9	Phú Thuận	Low
10	Phú Xuân	High
11	Vinh An	Low
12	Vinh Hà	Moderate
13	Vinh Thanh	High
14	Vinh Xuân	High
Quảng Điền		
1	Sịa	High
2	Quảng An	Low
3	Quảng Công	High
4	Quảng Lợi	High
5	Quảng Ngạn	High
6	Quảng Phú	High
7	Quảng Phước	High
8	Quảng Thái	High
9	Quảng Thành	Very high
10	Quảng Thọ	High
11	Quảng Vinh	High
TP Huế		
1	P. An Cựu	Moderate

District, City	Communes, Wards	Vulnerability levels
2	P. An Đông	High
3	P. An Hòa	Moderate
4	P. An Tây	High
5	P. Hương An	High
6	P. Hương Hồ	High
7	P. Hương Long	Moderate
8	P. Hương Phong	High
9	P. Hương Sơ	High
10	P. Hương Vinh	Moderate
11	P. Kim Long	High
12	P. Gia Hội	Moderate
13	P. Phú Hậu	Moderate
14	P. Phú Hội	Moderate
15	P. Phú Nhuận	Moderate
16	P. Phú Thượng	Moderate
17	P. Phước Vĩnh	Moderate
18	P. Phường Đúc	Moderate
19	P. Tây Lộc	Moderate
20	P. Thuận An	High
21	P. Thuận Hòa	High
22	P. Thuận Lộc	High
23	P. Đông Ba	High
24	P. Thủy Biều	High
25	P. Thủy Vân	High
26	P. Thủy Xuân	Moderate
27	P. Trường An	Moderate
28	P. Vĩ Dạ	Moderate
29	P. Vĩnh Ninh	High
30	P. Xuân Phú	Moderate
31	X. Hải Dương	High
32	X. Hương Thọ	High
33	X. Phú Dương	Moderate
34	X. Phú Mậu	High
35	X. Phú Thanh	Moderate
36	X. Thủy Bằng	High

Appendix B – Prioritisation of Crops and Commodities

Several commodities were initially considered for support in the concept note (see Table 32). As part of the feasibility study, these crops were assessed and prioritized based on the following criteria: climate adaptation benefits, production scale and scalability, market, growth potential, contribution to poverty reduction or other social co-benefits, and alignment with provincial plans[68].

Table 32. Overview of initial value chain/commodities identified, and potential support areas outlined in the concept note

Value chain/Commodity	Potential support areas
Peanut oil	• Organic and introduction of variety KT 10
Rice	• More resilient rice varieties • Intercropping with perennial tree crops or maize • Rice aquaculture
Lotus/fish polyculture	• Lotus/fish polyculture in abandoned wetlands • Re-constitution of flooded coastal rice fields
Thanh Tra pomelo	• Home gardens with vertical stratification
Organic vegetables	• Diversify farming systems
Watermelon	• Cultivation in saline land • Rice-watermelon-sesame crop rotation

As a result of this assessment the following crops/commodities were prioritized: rice, lotus, and Thanh Tra pomelo. The interventions and adaptation benefits in the selected crops are summarized in Table 33.

Table 33. Overview of selected commodities, interventions, and their adaptation benefits

Commodity	Threat / Climate risk	Climate Change impacts and proposed interventions	Adaptation benefits
Rice	Intensification of precipitation – flooding and waterlogging/inundation. Increase in extreme weather events e.g., typhoons – compounds flooding,	Climate change impacts: Rice fields in TT Hue province fall predominantly in low-lying areas vulnerable to flooding. Rice crop damage has been a major impact of intensified precipitation and more frequent extreme weather events, such as typhoons and tropical storms. In 2017 alone, 5,181 hectares of rice fields across TT Hue province suffered heavy damages due to floods[69]. In January 2019, 2,250 hectares of	Benefit: Adopting climate-resilient rice varieties is an important measure for climate change adaptation and food security in North-central Vietnam[73]. Rice that is more resilient to

[68] This assessment also included field visits areas targeted by previous LuxDev projects as well as meetings with key stakeholders including DARD, producers, and potential off takers.

[69] CCCSC (2022) 'Technical Report - Assessment of Climate Change Impacts in Thua Thien Hue Province', Centre for Climate Change Study in Central Vietnam (CCCSC).

[73] Dam, T. H. T et al. (2021) ‚Incremental and transformative adaptation preferences of rice farmers against increasing soil salinity – Evidence from choice experiments in north central Vietnam', Agricultural systems, 190, available at: https://doi.org/10.1016/j.agsy.2021.103090 (Accessed: 19/05/2023).

	destruction of flood defences Frequent droughts and high temperatures – soil degradation. Increasing number of cold days across the province for the previous decade – rice crop damage.	newly planted rice were also flooded due to heavy precipitation and high tides. Average annual precipitation is expected to increase under RCP 4.5 and RCP 8.5 scenarios[70], with rainfall projected at a 5-15% increase in the North and Central regions of Vietnam, where the project area lies. Much of TT Hue's 5,033km^2 land area and 1.13 million inhabitants reside in low-lying areas that are particularly vulnerable to this: including the target districts of Phong Dien, Huong Tra and Quang Dien. Frequent droughts and high temperatures have caused saline intrusion of soil. 4,864 hectares of rice land in coastal and lagoon communities across the province have become saline and alum[71], with some farmers consulted reported to have lost entire crops. The average annual temperature is projected to increase in Vietnam by 1.3-1.7 °C by 2050 under RCP 4.5. RCP 8.5 projects a 1.9 °C increase by 2050 and a 3.5-3.6 °C increase by the end of the century. This will intensify the frequency and length of droughts and further impact rice production[72]. There were delays for summer-autumn rice crops in 2022 across TT Hue as a result of these impacts. Pests and diseases in rice fields are also rising along with a number of cold days, which damages rice crops. Total yields last year fell to 50.5 quintals/ha, a 13 quintals/ha decrease compared to 2021. Interventions: • Support the adoption and scaling of climate-resilient rice varieties by local farmers, cooperatives, farmer groups and women's groups. • Support the introduction and adoption of post-harvest technologies.	waterlogging and salinisation will support quality and quantity of continued productivity. This will allow farmers to become more resilient to the impacts of flooding caused by intensified precipitation, extreme weather, and degraded soils due to drought and temperature increases. Rice production can also bring relevant mitigation co-benefits. Where possible, the project will support practices that enhance the sustainability of rice production and aim to reduce GHG emissions (methane) (e.g., alternate wetting-drying; and avoidance of burning residues, which while illegal, remains a common practice).
Lotus	Intensification of precipitation – flooding and waterlogging/inundation. Extreme weather events e.g., typhoons –	Climate change impacts: Over the last few years, many of the heavily damaged 5,000 hectares of rice across TT Hue province have been abandoned due to compromised cultivability following intensified precipitation and extreme weather events. Farmer incomes in vulnerable low-lying target areas are threatened by reduced productivity,	Benefit: Lotus farming offers diversification of farmer incomes where the impacts of climate change have compromised rice production. This

[70] MONRE (2019) The Third National Communication of Vietnam to the United Nations framework Convention on Climate Change.

[71] TT Hue PPC (2023) The plan to improve alum and salinity rice soil in coastal areas and lagoons of Thua Thien Hue Province in the period of 2023 – 2025.

[72] World Bank and Asian Development Bank (2021) Climate Risk and Country Profile, available at: 15077-Vietnam Country Profile-WEB.pdf (worldbank.org) (Accessed: 15/05/2023).

	compound flooding, destruction of flood defences	where large portions of land are becoming incompatible with rice production[74]. Vietnam is ranked first globally for exposure to flood risks[75]. The percentage of the population exposed to floods is expected to increase by 13% and 27% under RCP 2.6 and RCP 8.5, respectively[76] and RCP 8.5 would see 2.85% of the entire TT Hue province at risk of permanent inundation[77]. Lotus is a speciality crop in TT Hue that is more resilient to waterlogging and inundation than currently available rice breeds. In light of current and projected flood risks, lotus farming has therefore been increasingly adopted as a flood-adaptive livelihood practice by farmers in other areas of Vietnam[78]. TT Hue has an opportunity to convert abandoned rice fields to lotus fields in low-lying areas susceptible to flooding. Interventions: • Conversion of inundated low-lying rice fields to lotus planting. • Improve access to high-quality lotus seedlings. • Strengthen women's groups in supporting inputs, finance and technical support to lotus production.	is a lower-risk alternative to reliance on rice for income. The flower offers diverse products, including wrapping, edible food or lotus wine/tea. This also offers resilience to fluctuating market prices, where various market-entry options exist. Lotus can also be combined with aquaculture, providing an additional revenue stream to producers and contributing to food security.
Thanh Tra pomelo	Intensification of precipitation – flooding and waterlogging/inundation. Extreme weather events - e.g., typhoons – compound flooding,	Climate change impacts: Thanh Tra pomelo is a speciality fruit of high economic potential in TT Hue province[79]. It is currently planted in alluvial soil in low-lying areas adjacent to rivers. However, flooding has led to waterlogging and inundation of plantations. For Huong Tra and Phong Dien, flooding in 2020 cost 300 out of a total of 900 hectares of Thanh Tra pomelo production area. Flooding would also be	Benefit: Shifting Thanh Tra pomelo planting to higher areas along the rivers will avoid low-lying areas vulnerable to flooding, inundation and waterlogging.

[74] Tran, P. T. et al. (2022) ,Climate change and livelihood vulnerability of the rice farmers in the North Central Region of Vietnam: A case study in Nghe An province, Vietnam', Environmental Challenges, 7, available at: https://doi.org/10.1016/j.envc.2022.100460 (Accessed: 15/05/2023).

[75] Inter-Agency Standing Committee and the European Commission, INFORM REPORT 2021; Shared evidence for managing crises and disasters, EUR 30754 EN, Publications Office of the European Union, Luxembourg 2021, ISBN 978-92-76-39355-9, DOI: https://dx.doi.org/10.2760/238523 (Accessed: 15/05/2023).

[76] Bangalore, M. et al. (2019) 'Exposure to Floods, Climate Change, and Poverty in Vietnam', Economics of Disasters and Climate Change, 3, pp.79-99, available at: https://doi.org/10.1007/s41885-018-0035-4 (Accessed: 15/05/2023).

[77] TT HUE Department of Natural Resources and Environment (2020), 'Developing and Updating Action Plan to Respond to Climate Change in Thau Thien Province in the Period 2021-2030, And Vision to 2050'.

[78] Thi Minh Ho et al. (2021) ,The Emergence of Lotus Farming as an Innovation for Adapting to Climate Change in the Upper Vietnamese Mekong Delta', Land, 10, 350, https://doi.org/10.3390/land10040350 (Accessed: 11/05/2023).

[79] Son N. H. (2018). Analysing the VietGAP Rice and Thanh Tra Pomelo value chains in Phong Dien district, TT Hue province

	destruction of flood defences Frequent droughts – soil degradation.	heightened by an expected increase in frequency and intensity of severe storms and tropical cyclones in Vietnam over the coming. This is already a significant impact of climate change, with 5 tropical storms and 2 typhoons hitting TT Hue province in 2020 alone, with low-lying areas particularly exposed. Furthermore, droughts can compromise ground water supply for alluvial soil[80] where irrigation is lacking. Interventions: • Support the planting of Thanh Tra pomelo in higher areas of alluvial soil along the rivers. • Improve access to high-yield and quality seedlings. • Support farmer groups and cooperatives to improve production practices and access to inputs, finance and marketing. • Support the installation of irrigation equipment to address drought issues.	Quality seedlings will also improve the yield for the volume planted.

The rationale for not including the rest of the crops/commodities is included in Table 34.

Table 34. Justification for exclusion of commodities not selected

Considered but not integrated into prioritized crops/commodities	Rationale
Peanut oil	• Peanut is difficult to scale up as organic peanut farming is highly labour intensive and demand from the mainstream market is unclear, with no established value chain in place. • Total revenue for the crop in 2022 was around 1 billion VND (less than 10 million VND/household) with production input of up to 50%. Total average GDP is 100 million VND/yea per household, meaning that peanut oil makes up just a small fraction of household income. • Peanut is currently sold at a small-scale to the e-commerce exchange/platform of POSTSMART or to relatives and acquaintances via local cooperative shops. There is no sale through modern distribution networks such a super/mini market, meaning that modern supply chains or export would be challenging to implement. • The majority of day-to-day labour for peanut production is born by women and requires long working hours of a high intensity. A typical working day commences at 4:30am, followed by household work at lunchtime and a return to the fields in the afternoon for further farming work.

[80] Dimkic et al., 2021 'Drought and alluvial groundwater resources', ch. In: Alluvial Aquifer Processes, pp. 573-665, Available at: http://dx.doi.org/10.2166/9781789060904_0573 (Accessed: 11/05/2023).

	• Given the small proportion of household income generated against the high labour intensity, returns for organic peanut production relative to required inputs are low.
Organic vegetables	• Organic vegetable production was suggested as one approach to diversify farming systems without reliance on chemical pesticides and fertilizers. • However, the commodity lacks an established modern supply chain and cannot be sold as organic products to super/mini markets due to certification issues. Scalability is also limited by no proven market demand for organic vegetables from the existing production model. Currently, the cooperative lacks capacity for meeting demand from major customers such as super/mini markets, further challenging scalability potential. Barriers to entry for supporting value chain development would therefore be high. • The production area of vegetables is small in scale in the target areas. It is concentrated on low-lying land susceptible to flooding[81], against which organic production would remain at risk. • Whilst organic production was seen as important, vegetables themselves were not raised as a priority value chain in meetings across any of the target districts.
Watermelon cultivation in saline land	• Watermelon was initially proposed as a potential replacement for rice in saline land. However, watermelon does not have an established value chain approach in the target districts. • Establishing a new value chain in place of rice for saline land would therefore have a high barrier to entry. The opportunity cost of forgoing rice production in favour of watermelon would also be high given that rice already has a well-established value chain with significant annual revenue, which can be enhanced via breeding of climate-resilient varieties. • This is why priority will be given to development of saline-resilient rice breeds as opposed to replacement of parts of the value chain with watermelon.

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[81] Raised during stakeholder meeting in Huong Tra district.

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Appendix C – Lessons learned from previous LuxDev implemented projects

This appendix presents the information on lessons learnt gathered from the previous LuxDev interventions implemented in TT Hue. These sections have been extracted from the independent final evaluations of VIE433 and VIE033.

VIE433 LESSONS LEARNED AND RECOMMENDATIONS

While being a climate project, VIE/433 was built on the earlier interventions and lessons learnt of VIE/033 and other evaluations.

What are the 1-2 most important results/successes for VIE/433, and 1-2 most important challenges for future projects?

Result #1: The "winner" in the previous VIE/033 project was lagoon fisheries, where a complex cooperation result was achieved. During that project assistance to adaptive agricultural activities, e.g., new varieties began. The proving of the viability and business case (at small scale) of OA has been the most impressive result from VIE/433. This needs to be built upon in any future project.

Result #2: VIE/433-led work on the CCA M&E and mitigation MRV systems was an innovative and unique contribution of the project. It is clear that much progress has been made on this, and that this impacted national level. The counterfactual (what would have happened "without project"), in our view, is that very little would have been achieved in this area without VIE/433.

Future challenge #1: Scaling up OA – this is discussed in some detail below.

Future challenge # 2: Ensuring the sustainability of the fisheries lagoon cooperative system (associations, etc.), as discussed below.

Assess VIE/433 achievements in identifying, documenting and sharing good practice or innovative approaches?

The M&E system of VIE/433 continues from the previous project to be of the highest standard. Integral to a high-quality system is sharing and explaining what the data actually shows and means. This has also been done well, and flexibly. The cooperation with DONRE and MONRE about the CCA M&E and mitigation MRV systems is the outstanding example. Asian Development Bank and PWC consultants are frequently consulting with TAO on the project's MRV work. Infrastructure prioritization score cards, OA models are other good examples of tools/approaches that could be adapted/ replicated in other contexts.

There were also numerous examples of informal dialogue and mutual assistance between project staff and DPI at provincial and district levels. Close and friendly working relations facilitate the exchange of ideas and tacit knowledge.

Other key achievements included the establishment of the TT Hue OA Association and PGS Coordination Board (under DARD), and the involvement of teachers and students and the dynamics in secondary schools in CC and environmental issues. For the purpose of sharing good practices, in Quarter I/2023, the project will focus on documentation (e.g., LuxDev capitalization notes) of a number of interventions and impact, including OA and CC - environmental activities in/with schools.

What lessons learned have potential for scale up? Are there any paradigm shifting/innovative elements that would invite having a closer look at (good practices? lessons learned)? How could the sustainability dimension be enhanced? Any sustainable financial mechanisms that could enhance the (financial) sustainability of project components? What links could be built to the private sector and what role could it play?

A future project would be wise to allocate modest funds to support the fisheries associations and associated activities (patrols, water testing, etc.). The sustainability (which basically means government co-funding) of lagoon management is not clear. Public, comprehensive and regular water quality testing is not yet fully transferred to non-project options, yet it is essential (for example, there were complaints from fisheries association members that pollution from increasing numbers of upstream fish cages is becoming a problem). Maintaining patrols is another issue. At present about 15 patrols are done per year, but present association membership fees could cover the costs of only one patrol. Marker posts will also require upkeep. One approach might be for a new project to reach agreement for 1-to-1 contributions to a dedicated account (so the projects deposits, say, 50,000 USD per annum after the government has done the same). In this, and in other areas where financial sustainability is an issue, innovative ideas to "nudge" government to take over some or all of the responsibility are needed.

If OA is supported in a future project, the ultimate goal is to achieve scale, which is reflected in numerous farmers shifting to OA products at relatively low one-off costs to themselves and to the project (and Government). In other words, the marginal costs (and risks) of "adding one more farmer" needs to be low – which can be achieved if expert local key farmers are available to mentor and train, if processing and all up-markets aspects of the value chain are established and cost-competitive, and if the cost of per-farmer certification falls as the total number grows.

As was part of the project awareness raising interventions in the beginning, any new project needs to "get inside the mind" of the farmer considering to move to organic farming. What is stopping them? Is it some sort of distrust, or just lack of information? Are they not confident in meeting new requirements? Etc.

From such an understanding we can consider "tipping point" ideas such as: insurance for the first two years of transition (e.g. a guaranteed income even if total crop failure, and some subsidy if OA income less than previous crop income); signed agreements with selected OA partners with additional financial support from surplus funds, expansion of OA work province-wide under a new to be expected GCF-funded adaptation project (e.g. advanced technologies, collaboration with the private sector and Agribank); or vouchers to pay for transition costs (e.g. vouchers for 5 million VND or 207 EUR to pay a key farmer of your choice to support you); or guaranteed sales prices for two years for crops that meet OA standard. Covering certification costs is another option. In this way the "leap to scale" can be achieved (without making promises of unsustainable subsidies after two years).

Many of the activities funded under VIE/433 are public goods that have no prospect for commercial profit (OA being the exception, of course). Consequently, "linking to the private sector" (beyond paying for services) is problematic. Even in OA we should be cautious and avoid giving private firms exclusive access (e.g., "all farmers must sell to this firm"). Firms, like farmers, are profit maximising, and should be understood as such (i.e., not charities).

What a future project might consider, however, is underwriting the up-front (high risk) feasibility study costs of interested private firms (e.g., on 50/50 basis). Thus, for example, if OA grew rapidly with export potential, interested foreign buyers could have expenses covered to visit TT Hue producers (or maybe just Hanoi and Ho Chi Minh city buyers initially)

Lessons learned and recommendations from VIE033

In terms of Knowledge Management and Sharing, assess the project's achievements in identifying, documenting and sharing/replicating good practice and/or innovative approaches

The M&E of VIE/033 was exceptionally detailed and of high quality. Supporting regular indicator data were numerous studies, workshops, and other documents that explained the complex stories of interventions. The project developed a compendium of its interventions and results to share with related stakeholders, which was highly useful for analysis. The recent reports on the chicken model and tree planting, for example, gave a precise understanding of the results in these areas. It is important that such studies are uploaded on various websites (e.g., ELDIS) to enable a wider audience to learn from the specific successes and potential limitations of this project.

Over 40 different agreements with numerous amendments (without those relating to ISPs) have been signed with various public partners for a total amount of around 4.5 million EUR. Using this very participatory approach, whereby partners are directly "contracted" and implement activities instead of the project team or using a higher level financial flow (through province authorities) that would re- distribute the funds to the various partners, what are lessons learned about this type of delegation approaches

VIE/033 was already implementing a similar system to DAs, yet nevertheless the transition from the old model (FinAs, initially designed specifically for infrastructure under VIE/033) to the new DAs caused some delays. The essential difference, of course, is that the DAs thrust implementation authority and responsibility upon the contracted implementing partners (IPs) (shifting some responsibilities away from the TAO).

When one delegates, however, it can be assumed that some institutions may have a lower capacity than others. Some IPs proved weaker than others. Under DAs, these weaker IPs unfortunately slowed the project progress. This was evident when we contrast the performance of the DARDs contracted through DAs under VIE/033: one was more limited than the other (a number of proposed activities were delayed and/or cancelled during 2014-2017). The lesson is to be flexible: Learn quickly and move activities (and funds) annually from one IP to another as justified.

Further to this, the project may have been enhanced further if certain activities were to remain under TAO management. Often this is because of peculiarities in counterpart processes and regulations. Vietnamese Government cost norms, for example, fix low rates for national trainers and consultants, and consequently these were recruited directly by the TAO. It is suggested that LuxDev therefore should identify such issues in design phases to understand the degree and where they can delegate, and what to keep outside of Government systems. This will differ from country-to-country.

Hardware interventions

One lesson learnt about small-scale infrastructure investments of the project is the selection of the portfolio. The infrastructure subprojects (ISPs) were proposed from the bottom up in LPPP. The ISPs evaluation and selection followed a set of detailed criteria that was developed based on socio- economic standards in the project area. The proper selection of ISPs reflected the need of local beneficiaries, effectiveness, and efficiency of the works when putting into use, as well as meeting the project objective.

The proper monitoring and supervision in the entire process of investment (work selection, design, contractor selection, construction, acceptance, handover) helped to ensure transparency and avoid negative risks. The close management of the project by the TAO contributed to the success of the project.

If the project requires O&M for infrastructure works, it must be linked to specific policies and resources, preferably allocating a budget for the O&M. The O&M should not be "delegated" completely to partners following current regulations that may result in inadequate compliance when there is a lack of attention of the authorities and beneficiaries.

98.6% of completed ISPs had sufficient O&M measures in place. It is necessary to ensure the necessary funding for the project infrastructure works for at least 5 years after the project ends with the commitment of resources of the DPCs of the project districts. The experience of the VIE/023 project, which allocated an O&M budget for the project works in 10 years, should be considered to be replicated. The project prepared for IPs to use INFRA contingency

funds for O&M in coming years, and plenty of other O&M measures were in place, which are regarded to be highly important steps in ensuring sustainability.

FAs

Whilst these activities can be held in high regard to the mentioned advantages experienced, further improvements to these activities are required. Specifically, the requirement of the fishermen to contribute funds to the patrol boat limited the effectiveness of stopping illegal fishermen. Relying on the community contributions meant that the boats purchased were slower than the boats used by illegal fishermen, meaning that preventing the exploitation of fisheries is difficult.

Secondly, the participation of women in the FAs was minimal. Whilst some women attended when their husbands could not make it, women generally did not go to the meetings. Women are active stakeholders in the fishing market due to their role on the upkeep of equipment and sorting the boats and fish on shore. Therefore, they were clearly underrepresented in the Associations and the project could have been more proactive on this matter.

M&E system: The project results were monitored through a set of indicators updated every 6 months or annually from the project commencement by the project staff, collaborators, and volunteers. This regular monitoring helped to control the project progress and outputs to meet the project objectives.

Institutional mechanism: The TA team worked in tandem with the PPMB. The project witnessed excellent relationships with local partners and communities, which greatly contributed to the project success. Having a dedicated full-time TA team allowed an effective implementation and monitoring of the project interventions.

LPPP: This ensured that the project interventions were aligned with local capacities and sustainability strategies. The project adhered to a bottom-up planning process in the identification, selection, and prioritization of interventions. This indicated that local expectations were heard by the project and that ownership by communities was enhanced through their participation in the planning process.

Others

Rural Economy and Production Organization & Development

More training should be needed in production models to help HHs deal with some issues during their application of models, such as diseases of animals and aquaculture species. In fact, the project supported much more of this than normal under GoV extension models, yet when trying to support the poorest HHs there is a need for continuous, regular, and even repetitive assistance and advice.

The connection between unemployed labourers with the labour market was guaranteed to a large extent in this project, which is good for replication (e.g. seasonal access to employment in urban centres). For example, the project mostly worked with/through vocational training centres who have a direct link with the industry, this is why almost all graduates in industrial sewing for instance are now employed in the Phu Bai textile companies.

Climate Change Adaptation and Emergency Preparedness

Reducing the bureaucracy of paperwork will contribute to increasing the project efficiency and reducing delays in project implementation. Many organizations and management levels of the project noted that paperwork was laborious and time consuming. In addition, a few processes were not harmonious with rural Vietnamese culture, and were therefore met with resistance. This included the paperwork required by the WU financial initiative. However, most required procedures are same as GoV procedures. LuxDev expectations however, e.g., on technical and financial reporting, may indeed be at a higher level than in GoV. It is also about the capacity building, and perhaps therefore it is a bonus rather than an obstacle.

Future projects should supply a platform on which different stakeholders can provide real-time feedback on projects and processes. The introduction of this system can improve project relevance and effectiveness and provide initiatives to solve many issues that were recorded. Indeed, it is probably advisable for LuxDev to explicitly study how new

technologies (such as VOTO) can be easily applied to many projects to ensure information sharing, transparency, efficiency, etc.