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Ecosystem Services in Viet Nam: Recommendations for the National Forestry Sector Development Strategy 2021-2030, with a vision to 2045

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In cooperation with

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On behalf of the

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EXECUTIVE SUMMARY

This report focuses on the issue of payment for ecosystem services (PES) in the National Forestry Sector Development Strategy (NFDS) 2021-2030, with a vision to 2045. The report is a joint product of the German Agency for International Cooperation (GIZ) and ICRAF (The World Agroforestry) in Viet Nam.

Forests are widely recognized as the providers of key ecosystem services, which are forest goods and services that bring direct or indirect economic, materialistic, physiological, psychological, emotional or social advantages to the human population. Forest ecosystem services are very diverse and can be classified into four main categories, namely: (i) provisioning services; (ii) regulating services; (iii) cultural services; and (iv) supporting services.

The contribution of the forestry sector to Viet Nam's economy is mainly calculated from the value of timber and furniture exports. The contribution from ecosystem services has not been fully identified, quantified, or evaluated.

Following an initial pilot phase that began in 2008, Viet Nam introduced payments for forest environmental services (PFES) across the country in 2011. At present, five forest environmental services are regulated as part of the PFES program under current legislation. For the NFDS 2021-2030, with a vision to 2045 (hereinafter referred to as NFDS 2021-2030), three options with regards to ecosystem services are discussed in this report:

Option 1: No additional ecosystem services in the NFDS 2021-2030. Instead, it is recommended that focus is placed on addressing the pending issues and shortfalls of the current PFES policy.

Option 2: Review and assess two new (groups of) ecosystem services and undertake field pilots for payment of these two new services. At the same time, address the pending issues and shortfalls of the current PFES policy.

Option 3: Review and assess the possibility of applying payment for packages of services that the forest ecosystem provides instead of payment per individual services as currently the case.

Option 3 is recommended for the NFDS 2021-2030. Under this option, ecosystem services will be integrated into the national and provincial accounting system. Further studies/research will be needed to identify the overall contribution of forest ecosystems to the economy for use as one of the bases for determining the payment level of ecosystem services.

On that basis, the NFDS 2021-2030 needs to include a study and/or pilot on payment for all the ecosystem services provided by forests (as a package/bundle), with the view that ecosystem services are inputs for all socio-economic activities. The key benefit of this option is the quantification of the contribution of the forest sector to other economic sectors and to society as a whole. Besides, successful implementation of this option can also increase revenue from ecosystem services and address issues in the current PFES policy.

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I. INTRODUCTION

The Viet Nam National Forestry Sector Development Strategy (NFDS) 2006-2020 was approved by the Prime Minister through Decision 18/2007/QD-TTg dated 05/02/2007. As 2020 is the final year of its implementation, it is time to develop the NFDS for the next period. In early 2020, the Viet Nam Administration of Forestry (VNFOREST) – the organization in charge of developing the NFDS for 2021-2030 – requested support from all relevant national and international organizations.

This report has been prepared in response to the request from VNFOREST. It focuses on the issue of (expanding) payment for ecosystem services (PES) in the NFDS 2021-2030. To be more specific, the report:

- reviews and synthesizes discussions on ecosystem services (ES) and the potential to expand new ES for payment schemes in Viet Nam,
- discusses and makes recommendations on relevant objectives, tasks, contents and solutions for the expansion of ES in the NFDS 2021-2030.

The report has been prepared by a group of experts from ICRAF (The World Agroforestry) in Viet Nam in collaboration with staff from GIZ Viet Nam. GIZ provided financial support for the preparation of this report.

Comprehensive assessments of the implementation of payment for forest environmental services (PFES) in Viet Nam have been conducted by various organizations, including the Centre for International Forestry Research (CIFOR), VNFOREST, UNDP, Winrock International and the Viet Nam Forest Protection and Development Fund (VNFF). This report therefore does not aim to provide an assessment of PFES implementation. Instead, it focuses on the potential ES that can be included in the new NFDS.

The report is organized as followed: following the introduction in Chapter 1, Chapter 2 provides a review of key ES. In Chapter 3, the linkages between ES and other economic sectors are discussed using the example of the Green Growth Action Planning in Lam Dong Province. Chapter 4 follows with a brief discussion of relevant world trends and scenarios for including additional ES in the NFDS 2021-2030. Finally, Chapter 5 presents a detailed discussion of recommendations for ES in the NFDS 2021-2030.

II. FOREST ECOSYSTEM SERVICES

1. OVERVIEW OF FOREST ECOSYSTEM SERVICES

According to the UN Convention on Biological Diversity (CBD), a forest ecosystem can be identified as a dynamic complex of plant, animal and micro-organism communities and their non-living environment interacting as a functional unit (United Nations 1992). Forests are widely recognized as the providers of key ecosystem services (Aznar-Sánchez et al. 2018). Forest ecosystem services (FES) are the "forests' contribution to people: forest goods and services that bring direct or indirect economic, materialistic, physiological, psychological, emotional or social advantage to the human population"[1]. FES are very diverse. Researchers have identified nearly 100 different classifications (Aznar-Sánchez et al. 2018). In the Millennium Ecosystem Assessment report, ES have been classified into four main categories, namely: (i) provisioning services, such as food and water; (ii) regulating services, such as regulation of drought and flood, land degradation, pests and diseases; (iii) cultural services, such as recreation, aesthetic experiences, spiritual enrichment; and (iv) supporting services, such as soil formation, nutrient

[1] Source: https://sincereforests.eu/forests/glossary/, accessed on 20 June 2020

recycling (MEA 2005a). Although there are issues with this classification, including the presence of some FES in more than one category, the classification of FES into four categories is widely used (Lusiana et al. 2018; Sing, Ray, & Watts 2015).

Key ES discussed in the current literature are briefly presented below (Aznar-Sánchez et al. 2018; Costanza et al. 1997; Daily 1997; Jenkins & Schaap 2018; Lusiana et al. 2018; MEA 2005b, 2005a; Renaud et al. 2016; Sing et al. 2015). Biodiversity appears in two categories as it has multiple functions. It is important to note that the classification and description of the ES below are only suggestive. Depending on the specific contexts, the definition of the ES and their classification may change.

- Provisioning Services: These are the products obtained directly from ecosystems, including:
  - Fibre and fuel products: Timber for construction, veneers and flooring; wood chip for board, pulp for paper; timber products for wood fuel, including stumps and roots, and harvesting residue.
  - Non-timber forest products (NTFPs): Food products derived from plants (tree fruit, berries, foliage, nuts, edible products from plants); wild deer or livestock raised in woodland or forest settings in agroforestry systems; beverages; crafts; ornamental and gardening materials; toys; medicinal products and chemicals derived from gums, resins, waxes, oils and fatty acids.
  - Water supply: The provision of water through the interception of rain, mist and fog, which is then transferred to the soil and into watercourses and groundwater. Woody debris creates dams in watercourses that increases storage and slows the water flow (contributing to flood hazard reduction, a regulating service).
  - Genetic resources: Seed orchards of locally adapted provenances provide genetic resources for British growing conditions.
  - Biodiversity: Forests that are managed to deliver particular types of diversity and species assemblages; for example, through Biodiversity Action Plans and agro-environment schemes, providing habitats for rare, protected and priority species including red squirrels and rare butterfly or bird species.
- Regulating Services: the regulatory functions that FES provide include:
  - Climate regulation: Carbon capture and storage (sequestration); protection from or moderation of the effects of extreme temperatures, wind, ultra-violet light and precipitation, such as shelter for people or livestock and protection for fish through regulating water temperatures in streams.
  - Hazard regulation: Protection from soil erosion and slope failure. Rainfall interception moderates flooding by delaying and attenuating peak river flows.
  - Detoxification and purification of soils, air and water (including noise): Trees are able to capture and absorb pollution, including diffuse pollution, from soils, water and the atmosphere, improving the quality of each. Belts of trees can act as noise buffers to reduce noise pollution (noise abatement), providing health benefits.
  - Disease and pest regulation: Woodlands with high biodiversity tend to exhibit increased age and tree species structure. These structural components have been shown to reduce the damaging effect of some pests and pathogens in woodlands.
  - Pollination: Trees, woodlands and forests provide habitats for pollinator species.
- Cultural Services: These are the nonmaterial benefits people obtain from ecosystems through spiritual enrichment, cognitive development, reflection, recreation, and aesthetic experiences, including:
  - Health: Physical well-being, involving some form of physical activity, action or movement; mental restoration from spending time in woodlands; escape and freedom,

allowing people to gain physical and mental distance from sources of anxiety or everyday life; and enjoyment and fun from recreational and leisure activities undertaken in woodlands and forests.
    - Nature/landscape connections: Sensory stimulation and feelings of connection to both the landscape and wildlife, including biodiversity and the wellbeing benefits from gathering NTFPs (Non-timber forest products).
    - Education and learning: This function ranges from formal learning through Forest Schools to personal development gained through volunteering and apprenticeships.
    - Economy: Contribution to local livelihoods through generating employment, both directly through timber production, forest-based recreation and other enterprises including NTFP gathering, and indirectly to local economies (e.g. associated tourist industry).
    - Social development and connections: Activities undertaken within forests can strengthen existing social relationships, including people's involvement with volunteer groups and community forests (social capital).
    - Symbolic, cultural and spiritual significance: Use and non-use values through cultural or historical associations, such as connections to historical or folk figures.
- Supporting Services: Supporting services are those that are necessary for the production of ecosystem services under 'Provisioning', 'Regulating', and 'Cultural' categories above.
    - Primary production: The fixation of carbon dioxide by photosynthesis produces organic matter, resulting in plant growth and oxygen production.
    - Soil formation: The breakdown of the underlying geology by roots and microbial fauna (mineral weathering) and the accumulation of organic matter from leaf litter within the soil layer.
    - Photosynthesis: Photosynthesis produces oxygen necessary for most living organisms.
    - Nutrient cycling: Trees, woodlands and forests enhance the cycling of nutrients between the leaf litter and the soil, as well as the interception of atmospheric compounds by the canopy, which provides essential nutrients to the soil, such as nitrogen required for primary production.
    - Water cycling: in addition to the provisioning service through the capture and supply of water, forests have an important role in the wider hydrological cycle through moisture interception and transpiration.
    - Biodiversity: Biodiversity and the associated genetic variation within locally adapted species and provenances can support flora and fauna that contribute to woodland dynamics, including providing habitats for pollinators and below-ground flora and fauna that maintain the decomposition processes underpinning soil formation and nutrient recycling.

Although widely used, the MEA's classification of ecosystem services into four groups does not clearly show the benefits/contribution of ES to the society. Instead, it mainly focuses on the functions of the ecosystem. Furthermore, MEA's classification is not clear, so it is difficult to conduct research in practice. Haines-young & Potschin (2018) suggest a new classification called 'Common International Classification of Ecosystem Services' or CICES for short, in which the regulating and supporting functions of ecosystems are grouped together into Regulating and Maintenance.

Overall, the discussion about ES has evolved substantially over the last two decades. Since the end of 1990 when Costanza et al. (1997) and Daily (1997) published their first research, ES has become one of the key themes in discussion across the world. In the period 1998-2002, the key interests of ES literature were on management issues such as 'forest management', 'ecosystem management' and 'environmental management', and issues specifically related to forest ecosystems such as biodiversity, deforestation, carbon sequestration and land use (Aznar-Sánchez et al. 2018).

In the period 2003-2007, the main concerns in the discussion of ecosystem services extended to natural resource conservation, climate change, and sustainable development. Also during this period, interest in the ecosystem services was no longer concentrated in certain countries or territories but began to expand globally (Aznar-Sánchez et al. 2018).

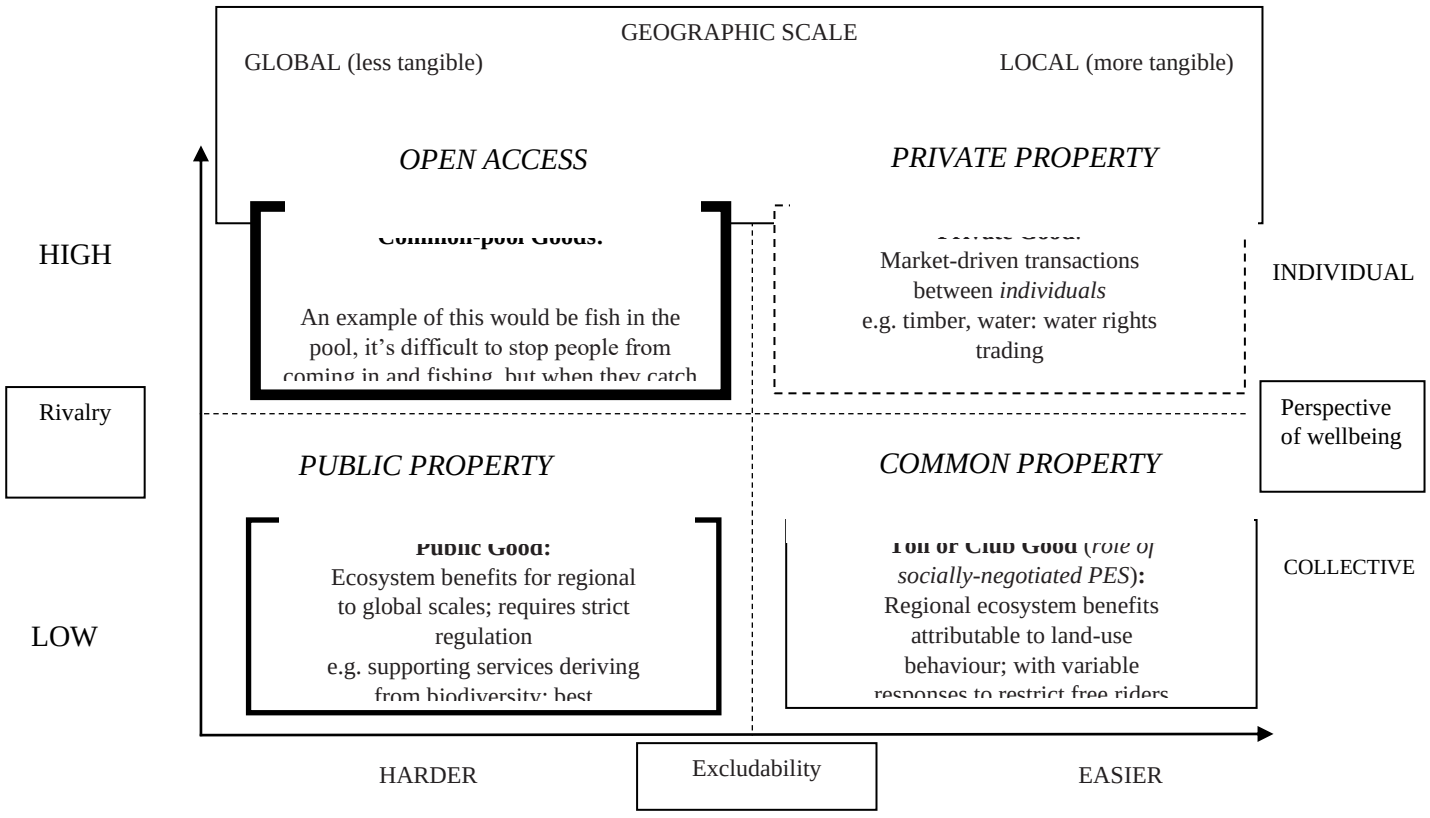
In the period 2008-2013, interest in the ecotourism service focused on 'tropical forests', 'reforestation' and 'land use change'. Also during this period, the economics of ecosystems and biodiversity became an international initiative emphasizing the services provided by ecosystems and biodiversity (Aznar-Sánchez et al. 2018).

In recent years, in the face of increasingly obvious impacts of climate change and its relationship with ecosystem services, climate change continues to be the main topic of interest in discussions about ecosystem services (Aznar-Sánchez et al. 2018). The role of ecosystem services in preventing soil degradation, desertification and mitigating the impacts of climate change and extreme weather phenomena such as floods and drought is also widely discussed (Jenkins & Schaap 2018).

2. ECOSYSTEM SERVICES AS 'SPECIAL GOODS'

Ecosystem services are "special goods". While private goods are rival (the consumption of a particular good or service reduces the quantity or quality available to others either spatially or temporally) and excludable (it is possible to prevent consumers who have not paid for a good/service from having access to it), ecosystem services often do not possess these two features in full. There are four categories of goods in economics, which are defined based on two attributes as shown in Figure 1 below (see more in Kolinjivadi & Sunderland, 2012).

Figure 1: A classification framework of ecosystem services



Note: The thickness of boxes surrounding each characterization of watershed service reflects increasingly larger scales of institutions needed for effective governance, with private goods being the most nested among toll or club goods, public goods, and common-pool goods respectively. Open

Access/Common pool watershed services cater to individual perspectives of well-being due to their highly rival nature, but affect interests at the global scale.

Source: (Kolinjivadi & Sunderland 2012)

Public goods are often open to utilization and therefore it is not possible to exclude somebody from using the goods. For this characteristic, public goods are often overused and soon depleted, as referred to as the "tragedy of the commons" (Hardin, 1968). As most ecosystem services have the features of public or open-access goods, market-economic instruments are often ineffective in regulating the use of such services. This should inform policy making for ecosystem services protection and management.

3. KEY SERVICES IN VIETNAM'S PAYMENT FOR FOREST ENVIRONMENTAL SERVICES POLICY

This section only summarizes key milestones in the implementation of payment for environmental services (PFES) in Viet Nam and the services covered in PFES policy in each period. Comprehensive assessments of PFES policy and implementation in Viet Nam have been undertaken by the Vietnam Administration of Forestry and other agencies.

Viet Nam started piloting payments for forest environmental services in 2008 in Son La and Lam Dong provinces (following Decision 380 / QD-TTg dated April 10, 2008 of the Prime Minister) focusing on three key services, namely: (1) Water supply and regulation services; (2) Soil protection, erosion control, reservoir sedimentation prevention; and (3) Tourism services (Article 5).

After two years of piloting, PFES implementation was expanded nationwide following Decree 99/2010 / ND-CP dated September 24, 2010 of the Prime Minister. Accordingly, the types of services covered in Viet Nam PFES include five (05) main groups (Article 4):

- Soil protection, reduction of erosion and sedimentation in lakes, rivers, and streams;
- Regulating and maintaining water resources for production and daily use;
- Forest carbon sequestration and retention, reducing greenhouse emissions through measures that reduce deforestation and forest degradation, and sustainably develop forests resources;
- Protection of natural landscapes and conservation of forest biodiversity for tourism services;
- Provision of spawning grounds, natural food and seed sources, using water resources from the forest for aquaculture.

In 2017, the Forestry Law of Viet Nam (Law No. 16/2017 / QH14) was passed by the National Assembly. The services covered by PFES as specified in the Forestry Law (Article 61) are similar to Article 4 of Decree 99/2010 / ND-CP mentioned above.

III. LINKAGES BETWEEN ECOSYSTEM SERVICES AND OTHER SECTORS

1. NATIONAL ACCOUNTING-BASED APPROACH FOR THE VALUATION OF ECOSYSTEM SERVICES

Natural capital assets support the ecosystem services that underpin the economy and thus deliver inputs or indirect benefits to business (Guerry et al., 2015). It is an extension of the economic notion of capital (resources which enable the production of more resources) to goods and services provided by the natural environment. A major limitation of the current framing of natural capital is its perceived isolation from other forms of capital and the mainstream of economic and social activity. This is often down to three key reasons: (1) lack of understanding about the role of ecosystem services; (2) lack of market values for many types of natural assets and ecosystem services; and (3) the ecosystem services themselves are often "public" in nature and therefore difficult to consider and calculate like other services (discussed in Section 2.2).

Services from natural assets are rarely quantified in economic models and accounting frameworks yet they are central to any sustainable development strategy. The OECD (2011) developed a framework to track progress on aligning natural assets and functions with the socio-economic system as illustrated in Figure 2 below. The starting point is sphere of production where economic inputs are transformed into economic outputs (goods and services). A direct source of economic growth is therefore the growth of inputs, in particular labour, produced capital such as machines, and intermediate inputs that are used in production. But production also uses services from natural assets, either in the form of natural resource inputs into production (these may be non-renewable such as minerals extracted from the ground or renewable such as fish stocks) or in the form of disposal services where the natural environment provides services as a sink for pollutants and residuals emitted during production. Reducing the intensity of environment and natural resources use is not necessarily counterproductive to economic growth as it can be driven by changes in technology or efficiency (i.e. overall efficiency of the production process rises through improved organisation, or technical change).

Such a consistent environment-economy accounting framework is at the centre of emerging economic development strategies such as sustainable development, green growth, and circular economy. The general principle of these strategies is to ensure the maintenance and enhancement of the three functions of the natural system to the economic system, in which the circular economy sets the rather ambitious goal of mitigating the role of the natural system's resource function by extending the life of matter and by minimising the use of resource inputs and the creation of waste, pollution and carbon emissions.

The contribution of the forestry sector to Vietnam's economy is mainly calculated from timber and furniture exports. The World Bank recently expanded the forestry sector's contribution to include NTFPs, watershed protection (about USD 125 million in 2018), carbon-payment from the LULUCF (land use, land-use change, and forestry) sector, coastal protection, tourism and recreational activities, and agroforestry and intercropping (World Bank 2019). However, the World Bank report also pointed out that these statistics are incomplete in both the number and value of ecosystem services. Quantitatively, apart from timber exports, the report does not mention the contribution of forest ecosystem services to GDP.

Although forest and ecosystem services evaluation studies in Vietnam are numerous (Emerton et al. 2014; Vũ Tấn Phương 2009), several challenges lie in the way those studies can be used in policy making. First, scientific data are often discipline specific and based on observations in specific areas, which means they are not scalable to national or even provincial levels. The data are also measured using different methods and definitions and most often not presented in

reference to economic or human activity. Second, most researches focus on one or a small number of ecosystem services and thus there is a lack of comprehensive data sets showing the contribution of ecosystem services to the economy. In addition, there is a lack of national or even provincial-level studies on the value of ecosystem services and their role in national and provincial economies. Statistical data used for GDP calculation do not include important data such as pollution, land, forests, water, or ecosystem services (see Box 1 - Green GDP).

Box 1: Green GDP

While the gross national/domestic product (GNP/GDP) index is a highly reliable indicator that reflects economic performance of a country, it still largely ignores the depreciation of assets, non-market economy and especially damages to the environment caused by growth. The green gross domestic product (green GDP) is an index of economic growth with the environmental consequences of that growth factored into a country's conventional GDP. Green GDP would arguably be a more accurate indicator or measure of societal wellbeing.

As it was stipulated in the Prime Minister's Decision No. 43/2010/QD-TTg dated June 2, 2010, the Government of Vietnam plans to introduce the so called "green GDP indicator" in the overall national socio-economic indicator system from 2014. Viet Nam's Central Institute for Economic Management (CIEM) and the General Statistics Office have been conducting research to develop a methodological framework for a national Green GDP but it has yet to be successful. The main reason is that national statistics has so far not included data to calculate natural assets, ecosystem services or pollution accounts. While some reports on energy and CO2 emissions accounts exist (CIEM 2012), there has been no attempt to calculate accounts of forest, water, and other ecosystem services. Records on expenditure/investment for environmental protection have only accounted for the state budget but not private investment.

Ecosystem accounting is an application of national accounting principles established for the measurement of the economy to the measurement of ecosystems and biodiversity. To illustrate the accounting of ecosystem services in the national account system, we present in Table 1 an example from Obst et al. (2015). Table 1 is a stylized supply and use table and is divided into three parts. Part A reflects a standard recording, i.e. no ecosystem services of timber production for furniture purchased by households. The recording ignores all other inputs and potentially relevant flows (e.g. labour costs, retail margins). Part B extends this recording to include the flow of the provisioning service of timber from the ecosystem asset (the forest) to the forestry industry. The main effect is to partition the value added of the forestry industry between the industry and the ecosystem asset. Note that the overall value added is unchanged (at 80 currency units) even though total supply has increased. This reflects the increase in the production boundary and demonstrates how the accounting framework deals with the challenge of double counting. Part C introduces a second ecosystem service, air filtration, which is generated by the ecosystem asset. Again, total production is increased but in this case value added also rises since the additional production is not an input to existing products. The increase in value-addition is also reflected in increased final demand of households.

Table 1: Integration of final ecosystem services with current national accounts estimates

	Ecosystem asset (forest)	Forestry Industry	Manufacturing Industry	Household final demands	Total
Part A					
Supply					
Logged timber		50			50
Furniture			80		80
Use					

Logged timber			50		50
Furniture				80	80
Value added (supply less use)		50	30		80
Part B					
Supply					
ES (growth in timber)	30				30
Logged timber		50			50
Furniture			80		80
Use					
ES (growth in timber)		30			30
Logged timber			50		50
Furniture				80	80
Value added (supply less use)	30	20	30		80
Part C					
Supply					
ES (growth in timber)	30				30
ES (air filtration)	15				
Logged timber		50			50
Furniture			80		80
Use					
ES (growth in timber)		30			30
ES (air filtration)				15	
Logged timber			50		50
Furniture				80	80
Value added (supply less use)	45	20	30		95

Source: (Obst et al. 2016)

The most important development in the ecosystem accounting model is the expansion of the production boundary to include a full suite of ecosystem services. This expansion becomes an important basis to develop natural assets protection measures. The lack of national accounts for ecosystem services, however, makes it unfeasible to measure the direct contribution of ecosystem services to national GDP. Some studies are currently applying indirect estimation methods such as the case of Emerton et al (2014), which provides two scenarios (a business-as-usual scenario and a development scenario under the assumption of research). The difference between these two economic scenarios and the ecosystem services shows the added/lost value of development activities both economically and ecologically.

The following section summarizes a study with a similar approach as that undertaken in Lam Dong Province in the context of the development of a green growth action plan for the province for the period 2021-2030, with a vision to 2050. In this case study conducted by ICRAF, two scenarios were developed: A reference scenario (as per usual developments) and a green growth scenario. Each scenario was assessed and compared on economic (GDP, labour) and ecological (ecosystem services and important ecosystems) aspects.

2. LAM DONG'S GREEN GRWOTH ACTION PLAN

1.1. Context

The Green Growth Action Plan (GGAP) of Lam Dong Province for 2021-2030, with a vision to 2050 is a blueprint for the province to become a frontrunner, particularly among provinces in the Central Highlands, in implementing a green economy (in which a strong economy grows alongside a sustainable environment). The GGAP is developed partly as compliance to a task mandated in the national GGAP to "formulate local GGAP in provinces and cities through synthesizing and scaling up best practices." More importantly, the GGAP will help the province enhance resilience to economic and environmental shocks, which have been occurring more frequently in the past decades due to the intensified impact of global market competition and climate change.

The province recorded an annual growth rate of 9.32% of gross regional domestic product (GRDP) in 2010–2016 (according to comparative prices in 2010). The agriculture sector, which includes forestry, livestock and fisheries shared about 46.33% of the GRDP; the service sector accounted for 36.99%; with industry and construction 16.68%. The data shows that remarkable economic growth in the province has recently led to negative impacts on the environment and the safeguards for natural resources. If further impacts are not properly anticipated, economic growth will be seriously affected due to the absence of supporting quality resources. The environmental issues are results of activities in the main economic sectors of the province. For example, in the agriculture and forestry sector, the rapid expansion of commercial crops has been associated with the conversion of different types of forests. As a result, in the period 1990-2010, emissions from land conversion reached 69.5 million tons CO2 eq. with an average of 3.47 million tons CO2 eq. per year. If this trend continues without intervention, the total emissions from 2010 to 2030 is projected to reach 92.1 million tons CO2 eq. with an average of 4.6 million tons CO2 eq. per year. Forest degradation and deforestation substantially affect the provision of ecosystem services, including biodiversity.

In the tourism sector, a number of issues have emerged such as increasing threats to biodiversity as an impact of tourist activities exploiting rare and precious wildlife species, and serious impact from untreated waste. These issues will worsen when provincial targets to welcome 6.5 million tourists by 2020 and 15 million by 2030 are implemented without impact mitigation measures.

1.2. Steps to integrating ecosystem services into the GGAP

Integrating ecosystem services into the GGAP aims to help Lam Dong address environmental problems while maintaining the desired economic growth rate. The integration of ecosystem services into the GGAP is achieved through the following six steps:

Step 1: Defining the scope of assessment and setting the stage: In this step, we identify major issues related to development, environment and management. One of the problems identified is that in order to be more competitive in both national and international markets while maintaining the level of other services, the main direction of the agriculture sector in the province should not be towards higher outputs but higher product quality.

Step 2: Screening and prioritizing ecosystem services: This step prioritizes ecosystem services which are most relevant to the development plan and key beneficiaries/target groups. The relevance relates to the risk or opportunity that ecosystem services can bring to the plan and those which may affect or be affected by the plan.

Step 3: Identifying ecosystem services conditions, trends and trade-offs: In this step, the guiding questions lead to the identification of the current status and main trends in the supply and demand of the selected ecosystem services, the main drivers of change, and potential trade-offs which might arise between development goals, ecosystem services and stakeholder groups.

Step 4: Appraising the institutional and cultural framework: In this step we conduct an overall appraisal of the institutional and cultural framework through analysis of the policies,

regulations and informal rules which will directly or indirectly affect the key ecosystem services, as well as the key institutions and traditional authorities which will influence the management of the ecosystem services.

Step 5: Preparing better decision-making: This step summarizes the main ecosystem service-related risks and opportunities to the development plan, and based on the summary identifies different policy options, instruments and entry points in order to maintain or enhance the flow of the selected ecosystem services.

Step 6: Implementing change: In this step, we identify an implementation strategy and a concrete work plan including policies and instruments, stakeholder involvement, responsibilities and actions, as well as financial resources. A plan for the monitoring and evaluation of the impacts of policy measures is also required.

1.3. Green Growth orientations

The GGAP contains nine orientations to ensure the provincial economy grows within a sustainable environment. The nine orientations are further elaborated into potential measures and activities. The orientations link with six sectors namely: agriculture, forestry, and tourism as the main economic sectors, with transport, water resources management, and energy as supporting sectors. The nine orientations are:

(1) Enhance the use of renewable energy and energy efficiency

(2) Reduce greenhouse gas (GHG) emissions from all sectors

(3) Control waste production and improve waste treatment

(4) Promote a climate-smart and sustainable land-use system

(5) Conserve water, natural resources and biodiversity

(6) Enhance market access and export of main commodities

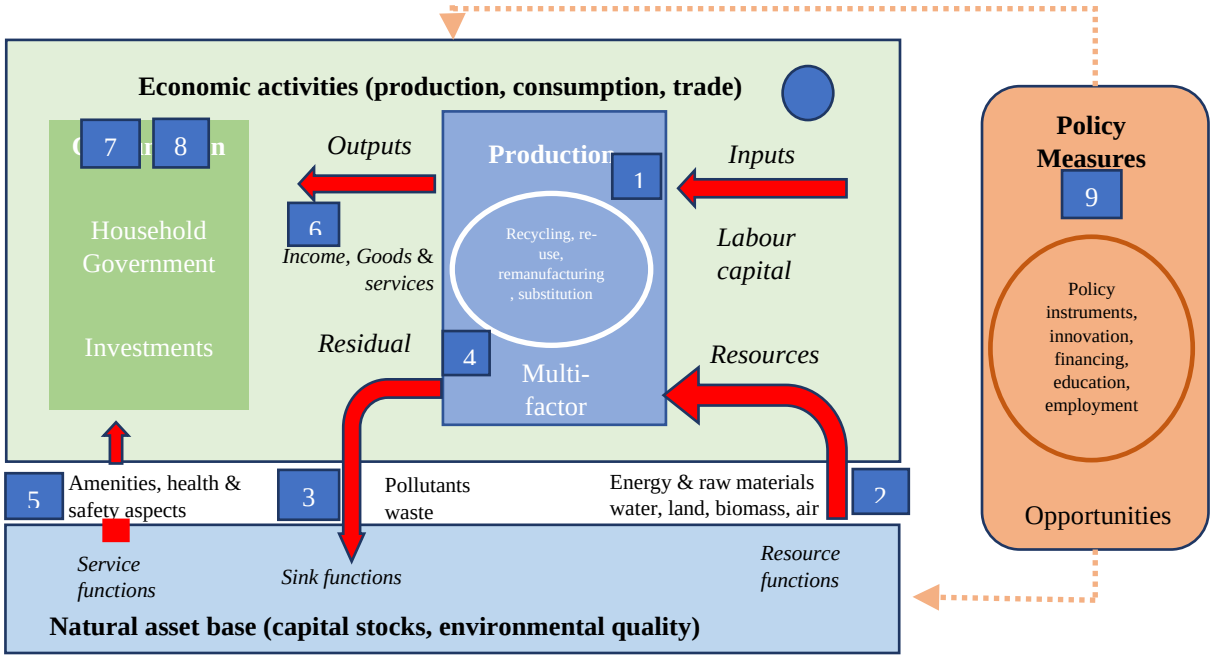
(7) Develop green and sustainable tourism

(8) Promote green lifestyles and sustainable urban consumption

(9) Create enabling conditions for transitioning towards a green economy

The nine orientations complement the priorities of the existing environment and economic policy in the province. They cover the whole nature-economy cycle as shown in Figure 2. Therein economic activities are divided into two subsets: production (supported by orientation 1 and 4) and consumption (supported by orientation 7 and 8) which are linked by trading (supported by orientation 6). Impacts of economic activities on nature such as pollution and untreated waste can be minimized by implementation of orientation 3, while maintaining a sustainable supply of raw materials, energy and other resources for the economy is supported by orientation 2. The service functions of natural systems (i.e. ecosystem services) to the provincial economy are supported through implementing orientation 5. Orientation 9 enables a green growth process in general and plays a very important role in harmonizing economic and natural systems through policies which stimulate innovation, technology, capacity, and economic opportunities in general. The transition towards a green economy needs to strengthen the investment in green economic sectors with attractive initiatives to various stakeholders, including public and private actors. The right mix of fiscal measures, regulations, norms, know-how and infrastructure is needed. Some of these measures can only be addressed at national level and others can be addressed at provincial level. Furthermore, the initiatives should be cost-effective with clear and credible guidance to investors.

Figure 2: Green Growth Strategies of Lam Dong Province that support and harmonize the economy-nature cycle



Source: Adapted from OECD, 2011

1.4. Assessment tools

Several tools were used to assess potential economic and environmental benefits from implementing the measures compared with a reference condition. LUMENS (Land-Use Planning for Multiple Environmental Services), which can model ecological and economic processes, was used to assess impacts of measures in all assessed sectors except energy. The LEAP (Long-range Energy Alternatives Planning) model was used to track energy consumption and production in all sectors, with identification and analysis of mitigation options using the Marginal Abatement Cost Curve (MACC) and Measure-Correlate-Predict (MCP) models. The GENRIVER (Generic River) hydrology model was used to assess the impact of land-based measures into watershed functions.

The impact of interventions in all sectors on the economy is estimated with an input-output (I/O) or Leontief table2. Economic analysis with I/O tables is a powerful tool for estimating GDP at provincial level. An I/O table shows a relationship among different sectors in the province in terms of economic value. The I/O table describes a simplified view of an economy and has the goal of estimating the proper level of production and economic value for each of several types of commodities or goods and services. The proper level of production is achieved when the supply meets the demand with no "leftovers" or unused goods. In a real economy, there are a lot of different commodities/goods and services, but they can often be simplified and grouped into categories. Some categories will produce outputs that can provide inputs/supply for other categories to function and vice versa. An I/O table presents a static image of the whole economy: it captures the interconnections between four of the most basic and fundamental economic activities: the production, consumption, accumulation, and trading of goods; and it highlights inter-industrial relationships covering all sectors of the economy. An IO table indicates how much of an industry's output is used by other industries, consumed by households or government, invested by the private sector or government, or exported. The structure of the input–output model has been incorporated into national accounting and can be used to calculate important measures such as national GDP, macro-economic management, economic analysis and projection. It can also be used as a tool for national and regional economic planning.

[2] Please see http://www.rri.wvu.edu/WebBook/Schaffer/chap04.html as a reference to the Leontief table

For the case of Lam Dong Province, 48 categories were included in the table as a basis for estimating provincial GDP. The categories include three main sectors in the province: agriculture, industry and services, divided into categories. Table 2 below, which lists the 48 categories and I/O table for 2016 obtained from the Viet Nam's General Statistics Office (GSO), was used as the basis for analysis.

Table 2: The 48 categories/commodities of the three sectors included in the I/O table for Lam Dong Province

No	Commodities	Sector		No	Commodities	Sector
1	Paddy (all kinds)	Agriculture		33	Sewerage services; waste collection, treatment and disposal services, material recovery services; remediation services and other waste management services	Service
2	Vegetables and beans of all kinds	Agriculture		34	Construction services	Service
3	Flowers and bonsais	Agriculture		35	Wholesale and retail trade and repair of motor vehicles and motorcycles	Service
4	Other non-perennial crops	Agriculture		36	Wholesale and retail trade of other goods	Service
5	Fruits (all kinds)	Agriculture		37	Land transport, transport via railways, via pipeline	Service
6	Cashew nuts	Agriculture		38	Water transport	Service
7	Pepper nuts	Agriculture		39	Air transport	Service
8	Raw rubber	Agriculture		40	Accommodation services	Service
9	Coffee beans	Agriculture		41	Food and beverage serving services	Service
10	Tea leaves	Agriculture		42	Telecommunications services	Service
11	Products of pigs	Agriculture		43	Financial services	Service
12	Other agriculture products	Agriculture		44	Services of the communist party, social-political organizations, public administration and defence services; compulsory social security services	Service
13	Forestry products	Agriculture		45	Education services	Service
14	Fishery products	Agriculture		46	Human health and social work activities	Service
15	Other mining and quarrying products	Industry		47	Art, entertainment and creation	Service
16	Processed and preserved vegetables and fruits	Industry		48	Other services	Service
17	Processed coffee	Industry				
18	Processed tea	Industry				
19	Wine, beer and alcohol of all kinds	Industry				
20	Textiles of all kinds	Industry				
21	Clothing apparel	Industry				
22	Wood, wood products and cork, except furniture; articles of straw and plaiting materials	Industry				

23	Chemical products of all kinds	Industry				
24	Basic pharmaceutical products, pharmaceutical preparations	Industry				
25	Rubber and plastic products	Industry				
26	Other non-metallic mineral products	Industry				
27	Metal products of all kinds	Industry				
28	Furniture	Industry				
29	Other manufactured products	Industry				
30	Electricity generation and distribution	Industry				
31	Gas, steam and air conditioning supply	Industry				
32	Natural water; treatment, distribution and trade services of water through mains	Industry				

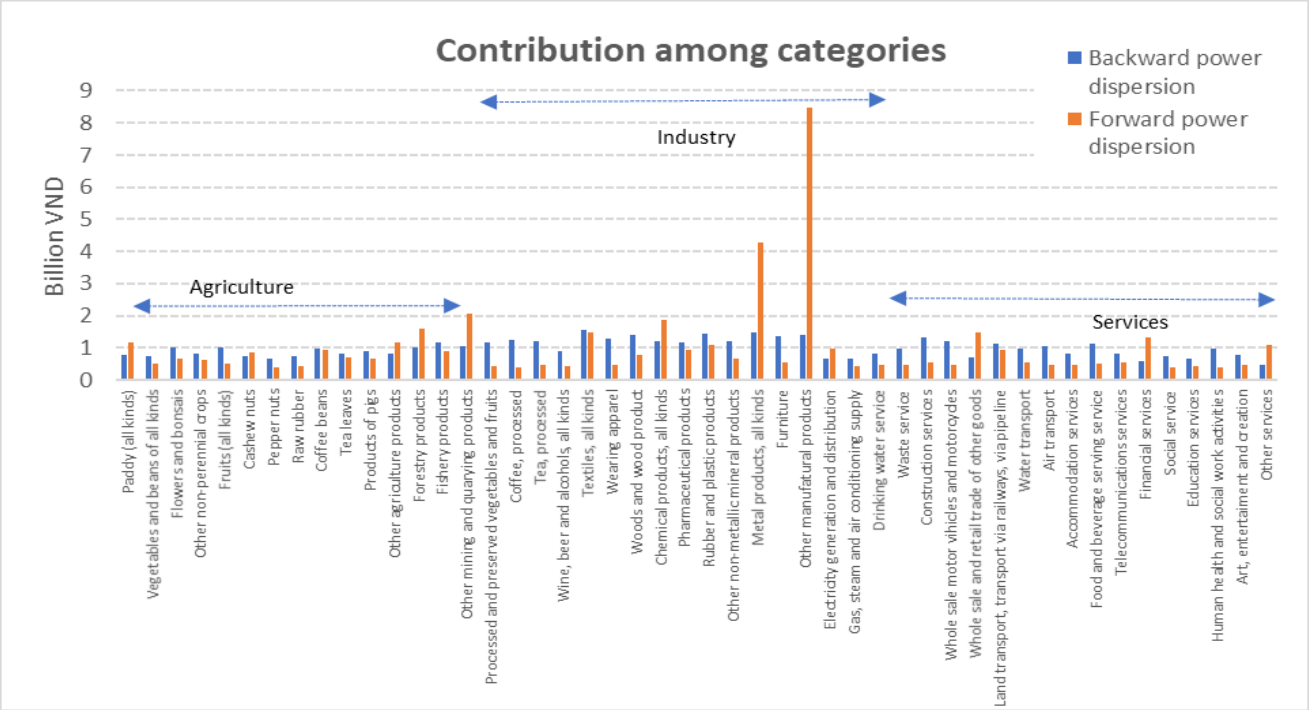
To assess the potential benefits of implementing GG measures in Lam Dong's GGAP on the provincial economy and ecosystem services, two scenarios were built and compared, namely the Reference (REF) and GG scenarios. The comparison between REF and GG scenarios was made for the period of 2021-2030 because the GG scenario was assumed to apply since 2021. In some relevant cases, the comparison between the two scenarios and the future projection based on the 2010-2015 condition was also conducted.

1.5. Results of GG impact assessments

1.5.1. Economic impacts

If all GG interventions achieved their targets by 2030, there is a potential increase of VND 6,562 billion from 2021 to 2025 and VND 7,992 billion from 2026 to 2030. These increases are equivalent to a GRDP growth rate of between 2.3-2.5% per year. Like in the REF condition, it needs to be emphasized that annual GRDP growth is the result of interventions from the agriculture and tourism sectors only. Compared to the REF condition, the projected GRDP under GG is VND 1,111 billion or 1.5% higher compared to REF by 2025 and VND 3,552 billion or 4.3% higher by 2030. A more contrasting difference between REF and GG can be expected with a more ambitious target of interventions such as larger conversion of monoculture coffee or tea to mixed systems or the conversion of 42,000 ha of 'illegal crops' into agroforestry. In the assessment, the conversion provides no contribution to the economy since the types of agroforestry system replacing the 'illegal crops' were not specified.

Figure 3: Backward Dispersion Power (BDP) and Forward Dispersion Power (FDP) of different sectors



The extent of the impact of REF and GG interventions potentially affecting the provincial economy on other categories, including those in the industry and service sectors, were determined by the pattern of backward and forward power of dispersion (BPD and FPD respectively) observed in the 2016 I-O table. The former (BPD) indicates the dependency of one category to inputs from other categories. The latter (FPD) indicates the contribution of one category to provide inputs to other categories. This dependency and contribution power are measured as indexes of BPD and FPD respectively, with higher index values indicating higher level of dependence or contribution. Figure 3 shows that all categories in the 2016 1-O table link to each other. In terms of FPD, two categories in the industry sector (metal products of all kinds and other manufactural products) have the highest values. This indicates that products from these two categories are largely required as inputs for other categories. In the agriculture sector, the category of forestry products and different types of agricultural products have higher FPD compared to other categories in that sector. In terms of BPD, there is no major differences among categories as found in FPD. As there is not a single account for ecosystem services (generated mainly by forestry sector), the FPD for the forestry sector to other industries is very low. In the future, awareness on the contribution of the forestry sector and ES to the provincial economy can be enhanced by applying green accounting in macro-economic management.

1.5.2. Land use

A more sustainable and multi-functional landscape is usually characterised by a high tree cover which includes forest and tree-based systems outside forests. In this assessment, the tree cover is represented by the total area of forest and tree-based systems outside forests. The latter includes different types of agroforestry such as macadamia and fruit tree intercropping with tea and coffee. The total area of forest land in 2015 and 2020, and in 2030 under REF and GG, are comparable at between 55-57%. These include both natural and plantation forests. The projected 2030 land cover under GG has the highest tree cover at 77% due to the expansion of the coffee and tea AF system, and the conversion of ‘illegal crops’ into AF. The increase of tree cover outside forests will not only enhance the provisioning service through production but other services such as regulating services through biomass sequestration.

The province’s landscape was dominated by several types of forests such as broadleaf, coniferous and mixed timber bamboo forest, and perennial crops, especially coffee. The area of

other perennial crops decreases over years due to conversion into coffee, safe tea, safe vegetables and other land uses. Due to the conversion of coffee and tea monoculture into agroforestry, the areas of the monoculture systems are lower in GG compared with the REF scenario, while the areas of agroforestry systems are higher. The conversion of encroached forest land into timber-based systems makes the area of timber agroforestry apparent in the GG scenario. Furthermore, the enriched barren lands with trees are classified into broadleaf forests, which made the area of this forest category higher in GG compared to REF by 2030.

1.5.3. Key ecosystem services

In terms of benefits to ecosystem services related to provisioning services, promoting sustainable farming systems such as agroforestry will bring higher product diversification per unit of land through integrating different crop species on the same land. For example, in addition to coffee, coffee agroforestry can offer macadamia nuts, fruits such as durian and avocado, and black pepper. The estimated area of coffee agroforestry in the GG scenario will reach 37,000 hectares by 2030 compared to 8,700 hectares in the REF condition. Related to regulating services, the GG measures produce lower GHG emissions by about 19% compared to REF. This is achieved through reducing emissions from all sectors, including waste treatment. Consequently, GHG emissions per capita are also reduced by about 19% from 4.92 tons CO2 eq. in REF to 3.98 tons CO2 eq. per capita in the GG scenario. Related to supporting services, halting forest conversion into other land uses and supporting the new biodiversity conservation areas and ecological corridor as considered in the GG scenario, will bring the province better capacity in conserving biodiversity compared to the REF as indicated by TECI and DIFA indexes. In addition, forest protection and increased tree cover outside forests through agroforestry will improve watershed functions in the province, including through a reduction in risk of soil erosion.

Table 3 summarizes 19 performance indicators of the GG scenario compared to REF. The indicator values for both scenarios were calculated using the results of the impact assessment. There is no trade-off between GHG emissions and the province's GRDP when comparing GG and REF scenarios: total GHG emissions are 19% less and the province's GRDP is 4.8% higher in GG compared to REF. Therefore, implementation of GG measures will help the province to develop a greener economy by generating higher GRDP with less GHG emissions in agriculture, services and industry sectors, including through less demand of non-renewable energy and better support to biodiversity. These ecosystem services can be quantified and therefore can be expressed in economic metrics for accounting in the national account system.

Table 3: Performance indicators for REF and GG scenarios

	Indicators	Unit	GG	REF	Benefit (%)*
1	Total GHG emissions#	million tons CO_2 eq.	6.13	7.59	-19.2
2	GHG emissions per capita	ton CO_2 eq.	3.98	4.92	-19.2
3	Total energy demand	*ktoe*	1,169	1,266	-7.7
4	Province's GRDP	billion VND	85,019	81,167	4.8
5	Income from main agricultural production	billion VND	17,042	13,288	28.3
6	Total labour demand	people	1,530,339	1,385,648	10.4
7	Area of cultivated land under sustainable practices	ha	37,680**	10,400	262.3

8	Area of greenhouses	ha	7,031	9,663	-27.2
9	Forest cover	%	56	54	3.7
10	Area of trees outside forest	%	3.85***	1.07	260
11	Area of forest for conservation and research##	ha	84,119	84,119	0.0
12	Area of forest under sustainable management	ha	169,977	67,131	153.2
13	DIFA index (broadleaf forest)	[]	17.58	15.29	14.9
14	DIFA index coniferous forest	[]	1.55	1.5	3.3
15	DIFA index deciduous forest	[]	11.84	11.29	4.9
16	Water use for irrigation	million m^3/year	917	983	-6.7
17	Total surface flow for all sub- watersheds	mm/year	1,307	1,584	-17.5
18	Total base flow for all sub-watersheds	mm/year	176.9	143.8	23.1

#Including emission from land-use, agricultural practices, greenhouses, livestock, energy and waste, ##Excluding new conservation areas and biodiversity corridors under Lam Dong Province's Biodiversity Conservation Plan to 2020 , *calculated as (GG-REF)/REF x 100%, **if including timber-based systems in the encroached forest area: 81,700 ha, ***calculated as % of agroforestry area from total provincial area. If the timber-based system in the encroached forest area is included: 8.37%

3. A NOVEL APPROACH FOR GGAP DEVELOPMENT

The Vietnam National Green Growth Strategy (VGGS) specifies three main aspects of GG namely: reducing GHG emissions from all sectors, green production, and green lifestyle to include sustainable consumption. In Lam Dong's GGAP, important aspects such as preserving natural resources and ecosystem services including biodiversity, and increasing income from main economic sectors, are included. A set of GG orientations and measures which relate to all these aspects was developed and their impacts on the provincial economy and ecosystem services are quantitatively assessed using reliable assessment frameworks and tools. This likely constitutes a novel approach as the current approach for developing provincial GGAPs in the country only address the three main aspects and lack conceptual and methodological frameworks for an integrated assessment of GG impacts on provincial economies and ecosystem services.

The process of developing integrated planning like Lam Dong's GGAP requires inclusive, integrative and harmonious multi-sectoral planning, including respective targets and multi-dimensional issues. Compared to other tools that can be used to assess the impact of land-use planning on economic and ecological benefits, LUMENS (Dewi et al. 2015) is more inclusive in terms of ecosystem services considered and has an economic module which can estimate the impact of economic activities on provincial GRDP. For provisioning services, it can estimate total production from different types of land-use practices at provincial level. For regulating services, it can estimate both GHG emissions and removal from spatial and temporal changes of various land cover types. For supporting services represented by biodiversity, it can assess the impact of habitat connectivity on the capacity of a landscape to conserve biodiversity. For the economy, it can link the level of provisioning services and economic activities outside land-based sectors, for example tourism, to provincial income and GRDP. In Lam Dong's GGAP, LUMENS was used to assess the impact of GG measures in the four sectors except transport and energy (covered by LEAP). Hydrological assessment was done by GenRiver.

Lam Dong's GGAP offers nine orientations that complement priorities in existing environment and economic policy. Linking with the GG conceptual framework they cover the whole nature-economy cycle. Each orientation is elaborated into potential measures with targeted districts and related policies, desired outcomes and targets to achieve by 2030. Furthermore, to facilitate operationalization, the measures are classified into the six assessed sectors with estimated investment costs. This enables the mainstreaming of ecosystem services into provincial plans for an integrated and green economy for Lam Dong.

IV. ECOSYSTEM SERVICES IN THE NATIONAL FORESTRY SECTOR DEVELOPMENT STRATEY 2021-2030, WITH A VISION TO 2045

1. RELEVANT TRENDS AND OPPORTUNITIES

Climate change: Over the last few decades, climate change (CC) has been increasingly recognized as a threat to human life globally. Some of the impacts of climate change include drought and decline in water supplies, reduced carbon sequestration, soil erosion, loss of soil fertility, desertification, increased weather extremes and natural disasters, and a reduction in food production. Forest ecosystems have a close relationship with climate change. Deforestation and forest degradation contribute to increasing CO2 emissions. Besides, deforestation and forest degradation also forest reduce ecosystem services. The conservation and restoration of forest ecosystems will help the forest maintain the provision of ecosystem services.

Natural disasters: Viet Nam is one of the countries most affected by natural disasters. Along with climate change, in recent decades natural disasters have become increasingly serious. Over the past 30 years, natural disasters in Viet Nam have resulted in around 500 people losing their lives each year. Thousands are injured and damages cost around 1.5% of GDP (IMHEN & UNDP 2015). Natural disasters have also wiped out many achievements, slowing down development in many areas and affecting all aspects of people's lives as well as the national economy, security and defence[3].

Restoration of degraded ecosystems: The past decades have witnessed the drastic degradation of many critical ecosystems that provide essential products and services, undermining the well-being of 3.2 billion people and costing about 10% of annual global gross product. In an effort to reverse this process, on 1 March 2019 the UN declared that 2021-2030 would be the UN Decade on Ecosystem Restoration in order to massively scale up the restoration of degraded and destroyed ecosystems as a proven measure to fight the climate crisis and enhance food security, water supply and biodiversity. Ecosystem restoration is defined as a process of reversing the degradation of ecosystems, such as landscapes, lakes and oceans to regain their ecological functionality; in other words, to improve the productivity and capacity of ecosystems to meet the needs of society. This can be done by allowing the natural regeneration of overexploited ecosystems or by planting trees and other plants. Ecosystem restoration is fundamental to achieving Sustainable Development Goals on climate change, poverty eradication, food security, water and biodiversity conservation[4].

Desertification: Desertification is the degradation of arid land that is affected by many factors, including human activities and climate. The extent and intensity of desertification has increased over the last few decades. Currently, desertified land accounts for about 46.2% of the total global land area. Most importantly, the risk of desertification is expected to increase in the future due to the impacts of climate change (Mirzabaev et al. 2019). In Viet Nam, statistical data indicates that the country has more than nine million hectares of desertified land (about 28% of

[3] Source: https://www.sggp.org.vn/thien-tai-gay-thiet-hai-ve-kinh-te-tren-7000-ty-dong-trong-nam-2019-662487.html
[4] Source: http://www.fao.org/news/story/en/item/1182090/icode/

productive land). Over the years, many land areas have been degraded and desertified due to the impact of climate change. Desertified land in Viet Nam is not concentrated in one or two large deserts but is distributed in all regions, mainly concentrated in bare land, coastal sand and degraded forest land extending from Quang Binh, Quang Tri, Thua Thien - Hue to Da Nang, and Binh Thuan (IMHEN & UNDP 2015).

Sustainable Development Goals: In September 2015, all the Member States of the United Nations adopted the 2030 Agenda for Sustainable Development with the aim of providing a shared blueprint for peace and prosperity for people and the planet, now and into the future. At its heart are the 17 Sustainable Development Goals (SDGs). Among others, SDG 13 calls for "urgent action to combat climate change and its impacts", and SDG 15 calls for countries to "sustainably manage forests, combat desertification, halt and reverse land degradation, and halt biodiversity loss". These two SDGs are directly related to ES. Specific targets under these SDGs that are relevant to ES include:

- SDG 13.1. Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries.
- SDG 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.
- SDG 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.
- SDG 15.3. By 2030, combat desertification, restore degraded land and soil, including land affected by desertification, drought and floods, and strive to achieve a land degradation-neutral world.
- SDG 15.4. By 2030, ensure the conservation of mountain ecosystems, including their biodiversity, in order to enhance their capacity to provide benefits that are essential for sustainable development.

Reducing Emissions from Deforestation and Forest Degradation (REDD+): REDD+ is a climate change mitigation initiative that aims to lower emissions from deforestation and forest degradation through payments made to developing countries for their efforts to halt deforestation, forest degradation and to conserve existing forests. REDD+ is related to the function to regulate the climate of forest ecosystems, but implementation of REDD+ can also restore other forest ecosystem services. Viet Nam started implementing REDD+ relatively early with REDD+ readiness activities as early as 2008. The National REDD+ Action Program (NRAP) for the period of 2011-2020 was approved on 27/06/2012 (Decision 799/QĐ-TTg) and the NRAP to 2030 was approved on 05/4/2017 (Decision 419/QĐ-TTg).

Green Growth**:** In Viet Nam, the Government approved the VGGS[5] and the National Green Growth Action Plan (VGGAP) in 2012 and 2014 respectively, for the implementation of the VGGS in the period 2014-2020[6]. In the VGGS, GG is regarded as an important part of sustainable development, which ensures rapid, effective, and sustainable economic development and significantly contributes to the implementation of the national strategy on climate change. The VGGS defines GG as "*A process of boosting the restructuring and improvement of economic development towards more efficient use of natural resources, raising the competitiveness of the economy, through increased investment in technological innovation, natural capital, application of economic instruments, thereby contributing to respond to climate change, reduce poverty and ensure sustainable economic development*. The general objectives of the VGGS are to achieve green growth and a low-carbon economy to ensure that enrichment of natural capital becomes the main component in sustainable economic development, and to ensure the mitigation of greenhouse gas (GHG) emissions as mandatory and important targets in socio-economic development. Three specific objectives of VGGS are: (1) Restructuring and

[5] Decision N-1393/QĐ-TTg dated September 25/2012, by the Prime Minister
[6] Decision N- 403/2014/QĐ-TTg, dated March 20/2014, by the Prime Minister

improving economic institutions towards green economic sectors and encouraging the development of economic sectors through efficient use of energy and natural resources, and with high added value; (2) Exploring and implementing advanced technology for the efficient use of energy and natural resources, and reducing the intensity of GHG emissions to contribute to climate change mitigation; (3) Improving people's living standards, building up an environment-friendly lifestyle and providing jobs in green industry and agriculture, green services, and investing in the conservation of natural capital and green infrastructure development.

On June 2013, the Communist Party's Central Committee promulgated Resolution 24/NQ-TW as "active in response to climate change and improvement of natural resource management and environmental protection" with a key task to restructure the economy towards green growth and sustainable development.

In 2014, the VGGAP for the period 2014-2020 was approved to provide more detailed information on activities and interventions for the effective implementation of the VGGS. The proposed activities are structured into four main themes: setting up institutions and formulation of GGAP at local levels; reducing intensity of GHG and promoting the utilization of clean and renewable sources of energy; greening production, greening lifestyles and the promotion of sustainable consumption.

Integrated land-use planning for multifunctional landscape: In Vietnam it appears that "land sparing" has been used as the key Government strategy during the last 20 years as the landscape has been distinctively zoned for forest preservation and agriculture development activities. In general, forest is preserved in less accessible or protected areas, while agriculture practices are allowed in lowlands near water sources and paved roads. Although highly intensified agriculture practices offer higher productivity, they often come with negative impacts on biodiversity and ecosystem services. This sparing principle is not always complied with, especially in mountainous areas where shifting cultivation is a customary tradition or in areas where highly commercialized crops are competing with forest land uses. The general trend in tropical forest margins, as reported by Pearce (2018), is that the higher yields become a motivation for intensive agriculture to expand into forest, while large protected areas lose species unless surrounding landscapes are managed to provide connectivity among parks.

While the land sparing approach separates land for conservation from land for crops and achieves high productivity of farmland to mitigate agricultural expansion into preserved areas, land sharing integrates conservation and food production on the same land. A more "sharing" approach can be used for reconciling conservation and development through interventions in different components of a landscape matrix. This should be well discussed in the context of green growth strategy development. Many smallholders apply low-intensity techniques that incorporate substantial elements of wild vegetation and rely on bees to pollinate and birds to eat pests – and by doing so, they can provide more biodiversity and ecosystem benefits to the whole landscape. The "sharing" techniques such as agroforestry and growing two or more crops close together, a practice known as "intercropping", could both preserve larger areas and increase food production.

Conventional sectoral planning is perhaps the largest barrier to land sharing. However, the Law on Planning (2017) offers opportunities to develop and practice more integrated land management strategies. Resolution 110/NQ-CP (2019) of the Government requires integration of 257 different sectoral plans, including a land-use plan, a biodiversity conservation plan, agricultural zonation, and market plans, etc. into national and provincial planning, thus creating a basis for multi-sectoral negotiation in developing plans for multifunctional landscapes. In implementing such a planning process and to ensure balanced interests and connectivity between landscape components, the conservation of biodiversity and ecosystem services will be discussed not only at land-use but also landscape level.

2. THE OPTIONS

This section discusses the options for ES in the NFDS 2021-2030, taking into account the review of ES (Chapter 2), the linkages between ES and other economic sectors (Chapter 3) as well as trends and opportunities in Viet Nam and around the world (Section 4.1).

Three options are suggested for ES in NFDS 2021-2030, namely:

Option 1: No additional ES in the NFDS 2021-2030. Instead, it is recommended that a focus is placed on addressing the pending issues and shortfalls of the current PFES policy.

Option 2: Review and assess two new (groups of) ES and undertake field pilots for payment of these two new ES. At the same time, address the pending issues and shortfalls of the current PFES policy.

Option 3: Review and assess the possibility of applying payment for packages of services that the forest ecosystem provides instead of payments per individual services as is currently the case.

The rest of this section goes into detail on rationale and potential impacts of each option. See

Table 4 for a summary of the key discussion points.

Special-use forests (SUF) and protection forests (PF) account for about 46.7% of Viet Nam's forest estate. These categories of forest play a very important role in biodiversity conservation, watershed protection, tourism development, academic research, climate adaptation and mitigation, and also form the traditional homelands of rural, mountainous and ethnic minority communities. According to VNForest, 395 SUF and PF have been established across the country, covering a total of 6.75 million hectares. There are 164 SUF (33 national parks, 57 nature reserves, 12 species and habitat conservation areas, 53 landscape protection areas, and 9 forests for scientific research and experiment), and 231 PF Management Boards7 (MBs).

1.1. Option 1

1.1.1 Summary of Option 1

Under this option, the NFDS 2021-2030 will not include new ES for PES. Instead, it will focus on addressing the issues and shortfalls identified by VNFOREST and other agencies in order to improve the effectiveness of current PFES policy (see discussion in section 2.2 and also (Huynh & Nguyen 2020; Pan Nature 2015; Phạm Hồng Lượng 2018; Phạm Thu Thủy et al. 2013, 2018; Viện Sinh thái Rừng và Môi trường 2018).

Key issues (note this is not a comprehensive review of issues related to current PFES policy) that need to be addressed include:

- Dual payments and free-riding
- Collecting ecotourism fees per level of use or per entry
- Voluntarity in the PES market
- The role of state management agencies in the development of a market for PES
- Direct payment
- Payment for forest carbon sequestration and storage services
- Transparency in PES revenue allocation, monitoring, evaluation, reporting and information disclosure
- Ecosystem Services instead of Forest Environmental Services

[7] http://tongcuclamnghiep.gov.vn/LamNghiep/Index/ca-nuoc-co-54-tinh-co-rung-dac-dung-va-59-tinh-co-rung-phong-ho-4106.

- Social issues such as gender equality, social inclusion, impacts on local cultures, etc.

1.1.2. Justification for Option 1

For more than ten years, the Viet Nam Forestry Sector has been quite successful in piloting and implementing PFES with the total annual revenue and forest area covered by PFES increasing every year. As of 2018, total PFES revenue reached VND 2,923 billion and the forest area covered reached 5,986 million ha (VNFF 2019). However, a number of issues exist and the focus on addressing them will help to improve the sustainability and effectiveness of Viet Nam PFES policy.

First of all is the problem of double payment and free-riding. As discussed in Section 2.2, an ecosystem service is a special good and public good in many contexts. The biggest problem with public goods is that it is difficult to exclude beneficiaries (those who do not pay a fee), although the difficulty can vary by service type and in each policy and social context. For the current PFES policy in Viet Nam, findings from a number of studies suggest the issue of free-riding and double payment. More specifically, most hydropower reservoirs in Viet Nam are multi-purpose. The reservoirs do not only supply water for electricity generation but also water for daily use for people downstream. However, in many cases only hydropower plants (or more specifically electricity consumers) have to pay, while water for other purposes is for free (Do et al 2018). In many cases in Son La and Lam Dong, water users of many water supply companies and hydropower plants have to pay fees for the same watershed protection service (Pham et al. 2013).

With regard to the collection of ecotourism fees, the landscape or ecosystem services for ecotourism are public goods the use of which does not consume or consumes very little of that service. Therefore, the general principle is to collect the fee per entry, not per level of use. The most common example is paying for tickets to a national park or protected area: the fee is fixed for each visitor regardless of the number of visitors visiting the site at the same time. According to PFES policy in Viet Nam, the payment is based on the revenue of the tourist agency (perhaps based on the assumption that if the tourist agency has more visitors the revenue is higher and the impacts on the environment will also be higher and vice versa), not per level of use. Businesses, however, are always looking for ways to reduce payments through falsified financial/technical reports, making it difficult to collect payments from tourism service agencies (Phạm Hồng Lượng 2018; Phạm Thu Thủy et al. 2013).

Regarding the market and the role of state management agencies, the major goal established in initial PFES policy was to create conditions for the integration of the forestry sector into the commodity economy under the market mechanism. Based on that, a FES market can be created, which is separate from the government payment channel through the state budget. Decree 99/ND-CP/2010 laid the foundations for this policy by regulating the PFES provider and user, and at the same time specifying the rate of payment in case of indirect payment. Although the compulsory payment regulation is not a market solution, it is necessary to form the FES market in the future. Even around the world, the public sector (i.e. governments at all levels, international organizations and multilateral organizations such as the World Bank) remains the largest buyer of ecosystem services. This proves that the government's role in regulating and setting markets is essential. However, the question is how the role of state management agencies will change when the FES market is established and all actors have full capacity to participate. A clearly defined roadmap to change the role of state management agencies in relation to PFES policy will be necessary to ensure the stable development of this policy.

As a fund managed by the State but directly involved in collecting and spending revenue outside the state budget, the central role of the Viet Nam Forest Protection and Development Fund (VNFF) in payment policy for ecosystem services needs to be reviewed and evaluated in terms of management effectiveness, staff capacity, and stakeholder engagement in the management process to ensure objectivity and transparency. It is necessary to examine the

possibility of having an independent funding mechanism that does not belong to a state management agency, or of establishing a fund management board consisting of multiple stakeholders (including but not limited to state management agencies, representatives of service providers and consumers, and civil society organizations).

The participation of state forestry authorities (such as VNFOREST at national level and Forest Protection Sub-departments at local level) should be limited to policy design and technical advisory services. These agencies can (and should) concurrently facilitate (play the intermediary role) the direct transactions of ecosystem services among providers and consumers. Thus, VNFF can go beyond its current function of receiving trust money and delivering payment, and become more active in facilitating negotiations between the consumers and providers of ecosystem services, and seek more sources of funding (as per the role of FONAFIFO[8] in Costa Rica (Legrand, Froger, & Le Coq 2012; Muradian & Rival 2015; Pagiola 2008). In its inception, FONAFIFO only focused on co-ordination of payments for ES related to carbon, water, biodiversity and landscape beauty. In 2018, the foundation established a new financial programme called the Sustainable Biodiversity Fund as part of Costa Rica's agro-environmental strategy with the aim of creating more financial mechanisms to help small and medium-sized farmers who were not covered by payment for ecosystem services, especially in areas with the development index below 40%, so they could participate in conservation and receive payment (Wallbott et al., 2019).

In promoting the market for ecosystem services, it is important to facilitate direct transactions through direct agreement between parties because this is a form of payment that is more market-oriented than the current transactions. At the same time, it also helps address the issue of transparency in indirect payments. However, up to now neither of the two government decrees on PFES (Decrees 99 and 147) provide specific regulations or guidelines for direct payment. This makes it difficult to go ahead with direct transactions, even for stakeholders who want it, because of the lack of guidance and more importantly because of the fear of concerned authorities at the lack of legal guidance (Do et al., 2018). It is also important to note that one of the biggest challenges of direct payments is the high transaction costs. Nevertheless, it can also be argued that with the current payment to all forest owners regardless of size, the transaction cost is not small. Such costs are proportionally significant considering the not-so-large contribution of PFES payment to gross income of surveyed households among whom the payment only helps stabilize incomes for a small number (Pan Nature 2015; Phạm Thu Thủy et al. 2018).

It is also important to discuss the pilot on payment for forest environmental services for forest carbon sequestration and storage to be tried out in four provinces: Quang Ninh, Thanh Hoa, Thua Thien – Hue, and Quang Nam. Accordingly, 9 organizations working (producing or trading) in the thermal power industry and 11 organizations working in the cement industry in the four provinces are requested to pay 4 VND/kWh for commercial electricity and 2,100 VND/kWh per ton of clinker produced in the form of indirect payments through the local VNFF. On the policy side, this is a correct move to demonstrate Viet Nam's commitment to implementing the Paris Agreement on Climate Change, its NDC, and the 2017 Forestry Law. However, from a research perspective on GHG emissions reduction regulatory measures, great care should be taken to ensure scientific and governance principles are respected and that consistency in the policy framework is adhered to (as analysis below).

One of the objectives of the PFES policy for forest carbon sequestration and storage services is to encourage thermal power and cement producers and traders to take measures to save energy and improve technologies to reduce GHG emissions. However, the likelihood of this goal being successfully achieved is not very clear. In principle, requesting polluters to pay per unit of emissions will help reduce emissions with high economic efficiency as they can freely decide what to do with the given carbon prices: reduce production, stop production, or pay for the emissions. However, international experience from the US, the European Union and the

[8] FONAFIFO stands for Fondo Nacional de Financiamiento Forestal (Costa Rica)

voluntary carbon market (VCS) shows that the imposition of quotas or collection of fees on GHG emissions in order to pay for measures to enhance carbon sinks rarely work (Pearse & Böhm 2014), because carbon sequestration is by its very nature a freely accessible public service. Businesses will find ways to lobby not to pay, seek to deny responsibility, or accept responsibility to pay but continue to produce emissions instead of improving technology as it is more costly to improve technology than to pay the emissions fee.

For the pilot policy in Viet Nam, VNFOREST also agreed that the emissions fee (equivalent to about 2 USD per ton of CO2eq) would not create significant impact on production activities or competitiveness of companies[9]. This is a clear signal that this goal is not feasible. For the US and the European Union, the fee of 12 USD or even 20 USD per ton of CO2 did not convince enterprises to reduce GHG emissions. Recently, Chinese scholars have mentioned the initial success of the country's carbon credit programme (Cui et al., 2018) but researchers around the world are relatively sceptical. Even if this success is real, the Chinese pilot programme has a very different context from the pilot policy in Vietnam. Chinese enterprises have more resources, its economy is highly dynamic, and China imposes a cap on emissions rather than a fixed fee per unit of emissions as in Viet Nam. Requiring businesses to pay for emissions, though not likely to lead to emissions reductions, conflicts with policies related to sustainable development and green growth in Viet Nam. Considering that the goal is to support Viet Nam to achieve its voluntary emissions reduction targets according to its NDC, the level of success of this pilot policy also depends greatly on the MRV system to ensure additional payment activities as well as identification of the right payees. At the same time, MRV is still a major challenge in both the legal framework and enforcement capacity under the current PFES programme (Lê Mạnh Hùng 2019; Loft, Phạm Thu Thủy, & Luttrell 2014; Phạm Thu Thủy et al. 2013).

Two key questions that remain are how to determine (and differentiate) the impact of PFES from other forest protection and development activities or carbon payment schemes while no baseline or specific MRV plan for CO2 emissions/removals is available; and what the basis is for claiming that the forests planted or protected under this programme are the sources of CO2 sequestration for the emissions from thermal power and cement plants that pay the fee. These issues have been raised in a number of recent studies but have yet to be clarified (Phạm Thu Thủy & Nguyễn Văn Diễn 2019).

Last but not least is ‘environmental services’ or ‘ecosystem services’. The term ‘Forest Environmental Services’ has been used in Viet Nam PFES policy since 2008 to refer to “the production of the use values of the forest environment to meet the needs of society and the daily lives of people” (Decree 99). This concept closely resembles the concept of ecosystem services introduced in 'Ecosystem Millennium Assessment' (MEA 2005a), or the concept of “Nature's contributions to people” (NCP) of IPBES (2019), in which ecological services are defined as benefits that ecosystems bring to humans. However, it is important to note that the FES concept only includes ES provided by forest ecosystems (and therefore depends on the definition of forest in accordance with the legal framework of Viet Nam). This concept thus does not include the ecosystem services provided by “non-forest” ecosystems.

1.1.3. Potential impacts of Option 1

Overcoming the limitations of the current PFES policy in Vietnam will help to improve the efficiency and sustainability of the PFES programme, contributing to the Sustainable Forest Management Programme. Specifically, with the issue of double payment and free riders, the PFES policy did not achieve the goal of "equitable share of responsibility" for users. The PFES policy framework stipulates that the payment rate is calculated based on the amount of electricity produced by hydropower companies or the amount of commercial water supplied by water providers. If a strict scientific principle of PES is applied, hydropower or clean water companies will be required to pay a fee based on the actual amount of water supplied to them

[9] Source: https://baotainguyenmoitruong.vn/thi-diem-chi-tra-dich-vu-hap-thu-va-luu-giu-cac-bon-tu-rung-240767.html

(and as a result of suppliers' efforts), not according to their output production. The first reason is that the water supply service for hydropower or clean water production is a private good – that is, users pay on their actual uses and only payers can utilize the service. The second reason is that the collection of FES fees by output discourages investment in technology to improve the efficiency of electricity production and clean water by both end consumers (electricity and water users) and other utilities. PFES payment calculations on the amount of water supplied will help to achieve equal accountability for hydropower companies and water supply companies and provide incentives for electricity and clean water companies to invest in technological improvements for more efficient use of the supplied water.

Regarding ecotourism fees, a more proper fee-calculation mechanism will help to ensure the scientific principles of PES and will be easier to monitor with the participation of local stakeholders. For example, a pilot of new payments from homestay business households in Pac Ngoi and Bo Lu villages (Nam Mau Commune, Ba Be District, Bac Kan Province) was conducted in 2013-2014 where payment of fees was calculated according to the number of guests (based on the guest register of the police station) rather than the revenue of the business. This way of fee calculation was highly welcomed and well implemented by the participating parties (Do et al 2018).

In terms of direct payments and the role of the State in PFES, Scherr (2011) and Do et al (2018) point out that the roles of the State change over time as the PES market develops. First, the Government was the buyer of PES to meet the urgent requirements of forest protection while the resources of other sectors in society were very limited. Later, when the private sector and the market economy are relatively strong, the Government shifts to the role of regulator, i.e. establishing a compulsory PES market through measures such as setting emissions limits or exploiting natural resources or as in the case of payment for FES in Vietnam, it is a requirement to "pay" for a certain number of subjects. As such, the responsibility to "pay" for ecosystem services is no longer with the Government but with organizations or individuals using the services. At this stage, government agencies' involvement in the PFES payment process as the "trustee" to regulate the payment process when the stakeholders' capacity to monitor and operate the market is still relatively weak. This is the role that VNFF and a number of other public service agencies, such as forest rangers, are playing in PFES.

When the PFES market can operate relatively independently, the Government should consider reducing or even withdrawing from participating directly in the market and transform itself into a "facilitator" of the market, i.e. providing technical consultancy and other guidelines. First of all, this can help reduce the transaction costs of PES (Kolinjivadi & Sunderland 2012). A good example is the National Fund for Forestry Finance (FONAFIFO) in Costa Rica: FONAFIFO was a private entity before being forced to become a public institution in 2008 and after its transformation, Costa Rica's PFES transaction fee is calculated as 40% of the total revenue, compared with 7% before the conversion (Legrand et al 2012; Muradian & Rival 2015; Pagiola 2008). Shifting the role of public service bodies from direct management to indirect assistance also helps to ensure true market rules, avoiding overlaps in duties as is the case of forest rangers and VNFF in PFES (Pan Nature 2015).

Replacing the concept of "forest environmental services" (FES) with "ecosystem services" (ES) should also be considered. In the initial stage of PFES, the concept of FES can help the stakeholders to easily understand the policy language and thereby create favourable conditions for policy implementation. However, over more than 10 years of PFES implementation, such a concept leads to the risk of narrowing the scope of knowledge of the participants about the ecosystem services, and at the same time, limit opportunities for expansion. In the short term, the forestry development strategy needs to provide an update on the definition of ecosystem services in line with the common classification framework (as in the case of MEA and TEEB – see MEA 2005a and TEEB 2010), and then provide further elaborated categories such as CICES (Common International Classification of Services) – see (Haines-young & Potschin 2018). The use of the ES concept can help to expand payment for different types of land use

outside forests but can provide positive impacts on the ecological services such as agroforestry. Agroforestry often supports biodiversity, improves microclimate conditions, reduces soil erosion and surface runoff, and reduces the risk of pests and diseases on economic crops; however, it has not been considered in the current PFES policy.

1.2. Option 2

1.2.1. Summary of Option 2

In this Option, the NFDS 2021-2030 includes two (groups of) new ecosystem services for review and assessment (to identify providers and consumers of the new ES) and piloting of payments in the future. The two new ES are (i) restoration of desertified land (for restoration of forest in moderate to very severe desertification land); and (ii) mitigation of (impacts of) natural disasters and extreme weather events (for forest ecosystems in coastal areas, around residential land and other forest areas). In addition, the pending challenges/issues with current PFES policy will also need to be addressed (as in Option 1).

1.2.2. Justification for Option 2

With regard to the restoration of desertified land, different types of forest ecosystems around the world play an important role in the formation and maintenance of soil fertility. Plants take nutrients from the soil to grow and return nutrients to the soil as they decompose. Forests also support soil stability because the complex system of roots found in a healthy forest will hold the soil in place, even on steep hillsides or during heavy rain (Jenkins & Schaap 2018). Soil formation and soil conservation are major supporting services of dry land ecosystems; the loss of this service is one of the main factors leading to desertification (MEA 2005a). Deforestation makes the land vulnerable to degradation and can lead to desertification, making the land unable to support agricultural or forestry production. Worldwide, 2.6 billion people are directly dependent on agriculture, but 52% of the land used for agriculture is affected moderately to severely by land degradation.

Land degradation affects 1.5 billion people globally, including 74% of the world's poor. The current rate of land degradation and desertification is much faster than the historical average, directly affecting agricultural productivity and people's livelihoods. In Viet Nam, as mentioned in Section 0, there are over nine million hectares of desertified land (about 28% of productive land) and in recent years the degeneration and desertification process has intensified, affecting agricultural production and the daily lives of local people. Prevention and control of land degradation and desertification, as well as restoration of desertified land have been a strategic multi-disciplinary issue, in which ecosystems play an important role. Restoration of ecosystems in arid and desertified areas (through increasing the density of trees, afforestation, forest regeneration ...) helps to limit land degradation and reverse desertification.

Regarding mitigation of (impacts of) natural disasters and extreme weather events, current research indicates that ecosystems play an important role (IMHEN & UNDP 2015; Jenkins & Schaap 2018; Sing et al. 2015). Natural disasters caused by anthropogenic ecosystem disruption cost the world more than USD 300 billion in damage each year (Jenkins & Schaap 2018). Forest ecosystems act as a natural buffer to prevent or mitigate natural disasters that threaten property and people’s lives. By absorbing rainfall and stabilizing the soil, forest ecosystems when intact can prevent floods and landslides. Mangrove ecosystems can help mitigate storms and waves, protect dykes, reduce erosion, and protect coasts thereby reducing the risk of injury or death for coastal residents and mitigating the severity of property damage (IMHEN & UNDP 2015; Jenkins & Schaap 2018). As climate change, population growth and land degradation will cause an exponential increase in the frequency and severity of natural disasters in the years to come, the role of forest ecosystems becomes increasingly important in mitigating the damage caused by the disruption to ecosystems (Jenkins & Schaap 2018).

1.2.3. Potential impacts of Option 2

In addition to the impacts discussed in Option 1 when issues/challenges of the current PFES policy are addressed (see Section 0), the two ecosystem services recommended for further study and piloting under Option 2 have the potential to make positive impacts on people's lives and their social, economic and ecological environment through land restoration and mitigation (and prevention) of disaster impacts. Research from around the world shows that Payment for Ecosystem Services (PES) is linked to land restoration through a Sustainable Land Management (SLM) approach (Mirzabaev et al. 2019). Payment for ecosystem services provides a mechanism through which some of these benefits can be passed on to land users, thereby stimulating additional investment in Sustainable Land Management. The effectiveness of PES programmes with restoration of dry and desertified land depends on a variety of factors, including land tenure security and proper design that takes into account specific local conditions. Equity in the distribution of benefits from PES is seen as the key to the success of the PES programmes in Yunnan, China, although elsewhere PES can still be environmentally effective but not totally fair in the distribution in payments (Mirzabaev et al. 2019).

With disaster risk reduction, PES also has the potential to provide the necessary financing support for rehabilitation of mangrove forest along the coastal line. However, PES programmes for disaster risk reduction are still largely in their infancy and have not been proven in practice. Many challenges need to be overcome if PES is to be implemented in coastal forest areas for the purpose of disaster risk reduction. The first challenge is to quantify ecosystem services, particularly those that contribute to disaster risk reduction. Second, coastal ecosystem services may not be sustainable as the mangroves are affected by many factors beyond the control of the ecosystem service provider. Furthermore, PES often requires clear linkages between service providers and users. However, in the context of disaster risk prevention, ecosystem service providers and users can be one and the same (Renaud et al. 2016). Therefore, it is necessary to have in-depth studies to determine the sources of revenue for these services.

In terms of specific benefits, the two recommended ecosystem services have the potential to bring additional financial resources to service providers in particular and for the forestry sector in general, thereby contributing to an increase in the forestry sector's contribution to the national economy.

1.3. Option 3

1.3.1. Summary of Option 3

In this option, the NFDS 2021-2030 will not consider each individual (group of) ecosystem service but rather as a package (or bundle) of services with various impacts on the economy and society/community. In other words, at least some of the ES will be integrated into the national and provincial accounting system. Further research will be needed to identify the overall contribution of forest ecosystems to the economy (for example, the contribution of ecosystems and forest resources to the development of other industries and the economy in general) for use as one of the bases for determining the payment level for ES. On that basis, the NFDS 2021-2030 needs to include studies and/or pilots on payment for all the ecosystem services provided by forest (as a package/bundle), with the view that ecosystem services are inputs for all socio-economic activities.

1.3.2. Justification for Option 3

While it is necessary to expand the scope of PFES, such expansion should be carefully considered based on scientific evidence on its impacts on the natural and social environment. ES are not limited to regulating or supporting functions, but also provisioning and cultural functions. In many circumstances there are trade-offs among ES. According to IPBES (2019), focusing on one or a group of ecosystem services often leads to other ecosystem services not reaching their optimal level. For example, forests provide both timber (provisioning service) and water regulation (regulation service). If the focus is on water regulation, the timber supply will be

impaired. Even within the same group of ES (e.g. regulatory services), provision of each ES is not always covariate. Therefore, it is important to understand the potential impact of decisions related to land use and land-use management, and then invest strategically in restoring ecosystems and allocating land use to ensure multi-functional landscape.

More importantly, sustainable development cannot be achieved without the intersection of the three pillars: environment, society or community, and economy. More specifically, economic development cannot be sustainable without sustainable communities and sustainable communities cannot be achieved without a sustainable environment. This highlights the need to prioritize the conservation of ecosystem services and ecosystems in support of economic development. Economic development without regard to the environment, ecosystems, and protection of natural resources will only lead to short-term benefits. The consequences of environmental degradation will gradually become apparent and lead to irreparable economic losses. Environmental degradation will directly lead to the degradation of the ecosystem to provide valuable goods and services with negative consequences for the economy and society.

Many studies indicate the need to take into account payment for a bundle of ecosystem services instead of payment for individual ES (Wendland et al. 2009; Jones et al. 2010; Loft et al 2014; Burkhard & Maes, 2017; IPBES, 2019). The first reason is that a land-use type often has positive effects on many ES. Forest protection for biodiversity conservation purposes (such as national parks) causes positive impacts on all regulatory services (such as carbon sequestration, water regulation, water quality, and genetic diversity). From a policy-making perspective, payment for water regulation services (plus carbon sequestration services) can be easily implemented but this does not guarantee “equity” of PES (A national park may provide more services than a protection forest, but the rates of payment for these two types are the same in the same watershed).

The second reason is that paying for more than one service at a time reduces the transaction cost per service, thus helping to enhance competitiveness of forest protection measures compared to forest exploitation for economic purposes.

The third reason is that some ecosystem services such as soil creation, biological control, and pollination, though playing a fundamental role and underpinning all other ecosystem services, are difficult to recognize and quantify because their formation takes a very long time and they cannot be comprehended without knowledge of complex ecological balances. Several studies have shown that pollinators contribute about 36.2% of the average total agricultural production value on crops that depend on those pollinators (Picanco et al., 2017). Pollen by insects contributes USD 15 billion to the production value of US agriculture (USDA, 2014), while bee pollination in the UK alone is worth about GBP 1.77 billion per year according to a survey on households' willingness to pay (Mwebaze et al., 2010). However, studies on such ecosystem services so far are used mainly for reference and comparative purposes – almost no payment scheme for these services exist, mainly due to people's low awareness on the role of ES (Bosselmann and Hansted, 2014). Likewise, compared to water regulation services, the biological control services are difficult to comprehend by the general public and potential payers in particular. As a result, it is very difficult to convince the public to pay for biological control services even though this service is very important to agricultural farming and community health.

Bundle payments have been tested in places such as Australia, Costa Rica, the Danube basin, Colombia, Ecuador, Peru, Kenya, Madagascar, Mexico and the United States (FAO 2011). In Vietnam, the experience of integrating ecosystem services into Lam Dong Province’s GGAP, as discussed in detail in Chapter 3, shows how the economy depends on ecosystem services, and vice versa, and that restoration and development of ecosystems depend on how we choose the economic development scenario.

It is important to note that accounting ES in the national account system only shows the “portion” of the ecosystem services corresponding to the concept of "products" in the national

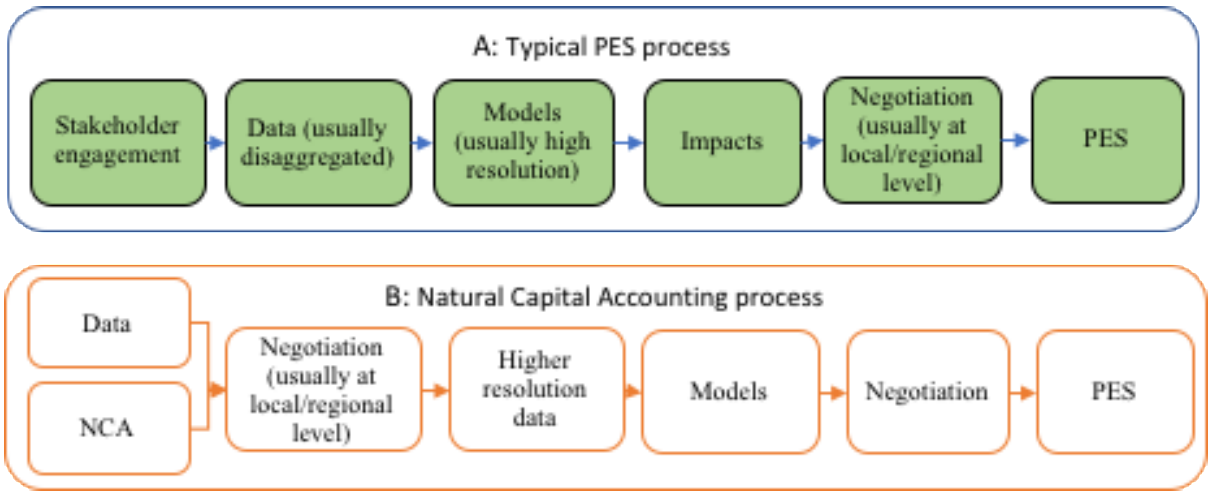
account system, not the entire benefits that ES provides to the whole socio-economic system. This accounting does not mean that ecosystem services can be considered as private goods (and therefore can be traded according to market laws). Most of the ecosystem services are of public goods (as mentioned above) and therefore cannot (and should not) be privatized. Even if all fisheries and other provided ecosystem services are traded in the market, the ecosystems that generate them (such as marine ecosystems) must still be public property.

1.3.3. Potential impacts of Option 3

As discussed above, the most important impact of this option is that contributions of forest (and the forestry sector) to the whole economy can be quantified. The NFDS 2021-2030 should be seen in the context of the green economy and circular economy. Studies have estimated that the value of ecosystem services contributes about 40% to the economic value of Vietnam (Emerton 2013). However, these services have not been fully accounted for in national accounting and their contributions to the entire society and economy are often ignored in development plans and policies. This poses a serious threat in achieving sustainable development.

A key difference using national accounts for ES is that data will be in aggregate form and ensuing models will tend to be more general. Using the national accounts as a filter the information is formatted in a way that directly links natural capital (e.g. forest) to different sectors of the economy represented in traditional accounts (e.g. households, agriculture, industry, exports). It can provide information on how much of the resource is used by a given sector (e.g. hectares, cubic meters), and how it is linked to the revenues reported by the sector (e.g. $/m3 of water). This information is not the value of the ecosystem service, because it includes other costs – for example, the infrastructure required to deliver the water to the user. However, it can provide an initial reference point, or feasibility check, on the dependence of the sector on the resource and whether there could be a liability to pay associated to productivity. It will also flag problems which that require more specific data with higher resolution (Figure 4).

Figure 4: Typical PES process and the Natural Capital Accounting process



A. A typical PES process. Features: Use/requires high precision value of ES, direct engagement, difficult to upscale

B. PES process using natural capital accounting (NCA). Features: less precision models, will likely be more general, useful platform for upscaling, compatible with GDP and other national accounts

Source: (Porras et al. n.d.)

Bundle payment for ES can enhance flexibility of PFES policy, and this largely depends on how soon the national accounting for the environment and ecosystems can be in place (and thus can be used for green GDP estimation). Recently, the Ministry of Planning and Investment (MPI)

provided a set of green growth indicators in which many indicators related to the forestry sector, but the readiness level is only rated as III and IV (i.e., insufficient data and no data available). The forestry sector's strategy should therefore focus on research to provide green technical norms, standards and guidelines, with the aim of asserting the position of the forestry sector and the products/services it provides in the green growth process of Vietnam. This is consistent with the long-term orientation of the Government to transform Vietnam's economy into a green and sustainable economy. Through quantitative research on ecosystem services as inputs for green GDP calculation, the construction of a mechanism to measure, monitor and report on ecosystem services will also be developed and put into practice, and thus can help to address shortcomings in current PFES policy.

Besides the important contribution to the national accounting system, bundle payments for ES instead of payments per individual ES can offer the following specific contribution (Duguma et al. 2017):

- Increase the benefits from ecosystem services: instead of four current ES (not including carbon sequestration and storage, which is under piloting), bundle payment for ES can increase the cash benefits from other ecosystem services that are contribute to the society and economy, such as mitigation of disaster risk, pollination, and climate regulation.
- Reduce transaction costs: instead of collecting fees for each ES from different users, as well as calculating the payment for different groups of ES providers, bundle payment for ES will save transaction costs for both collection of fees from ES users and payment to ES providers.
- Eliminate double counting and mitigate free-riding: bundle payment for ES will eliminate the risk of double counting because these services are included in one payment, accounted for in the national accounting system. In addition, the risk of free-riding will also be minimized as the gross value of contribution from ES is calculated for society as a whole.

Table 4: Summary of key points for each option

	Option 1	Option 2	Option 3
Key contents	No additional ecosystem services recommended for payment scheme. Focus on addressing the challenges and issues in the current PFES policy.	Two (groups) of new ES are recommended for further research and piloting of payments: (i) restoration of desertified land; and (ii) mitigation of natural disasters and extreme weather events. Address the challenges and issues in the current PFES policy.	Instead of (groups of) individual ES, this option recommends focusing on bundle payment of ES with different impacts on the economy and society/community. In other words, the ES will be accounted for in the national and provincial accounting system.
Justification	There are still a number of challenges and issues with the current PFES policy, affecting its effectiveness and sustainability. Some of the key issues to be addressed include	Viet Nam is one of the countries most affected by natural disasters, extreme weather events as well as desertification and land degradation. Meanwhile, forest ecosystems have the potential to regulate	Accounting for ecosystem services in the national accounting system is necessary because sustainable development will not be achieved without the linkages among environment,

	double payments and free-riding, ecotourism fee per entry, the role of state agencies, ES market, direct payments between ES users and providers, payment for forest carbon sequestration and storage, and ecosystem services in lieu of forest environmental services.	climate and natural disasters, which helps mitigate impacts of natural disasters. Likewise, forest ecosystems can slow down and prevent the process of land degradation and desertification, and restore degraded and decertified land.	society/community and economy. To be more specific, economic development cannot be sustainable without sustainable communities and sustainable communities cannot be achieved without a sustainable environment.
Feasibility	This option is considered low-benefit but high-feasibility. To complete this option, it is only necessary to review the current PFES system and improve it to increase its effectiveness and efficiency. However, the limitation of this option is that its impacts on the society are not commensurate with the potential of the ecosystem services currently available in Viet Nam.	This option is considered an intermediate choice. Its feasibility is lower than option 1. The main challenge is to have scientific research to identify and quantify the value of recommended ES, which will be used as a basis for determining the rate of payment for service providers. In addition, there is also a need to develop a policy framework for new ES because there is currently no institutional and legal framework to support this process.	This option is high-benefit but low feasibility. If this option is implemented, it will bring the most benefits (compared to other two options) to society. There are two major challenges, however. One is its scientific basis – it is necessary to undertake a lot of studies to identify and fully quantify the value/role of ES in the national accounting system. The key is to assess the role of natural capital in all economic activities. There is also a need for specific user-friendly tools and methods for application in the field. The second challenge is the required development of supporting policy framework as currently there is a lack of legal basis to promote this process.
Potential impacts	Improve the effectiveness and sustainability of the PFES programme, contributing to the Sustainable Forest Management Programme.	The two recommended ES under Option 2 have the potential to create positive impacts on people's lives, the society and the economy through restoration of desertified land and mitigation of impacts from natural disasters and extreme weather events.	The key benefit of this option is the quantification of the contribution of the forest sector to other economic sectors and the whole of society/community. Besides, successful implementation of this option can also increase revenue from the ES and address the issues in the

			current PFES policy.

V. RECOMMENDATIONS FOR THE NATIONAL FOREST SECTOR DEVELOPMENT STRATEGY 2021 – 2030, WITH A VISION TO 2045

Based on the discussion in Section 4.2, Option 3 is recommended for the NFDS 2021-2030, with a vision to 2045. This option allows Viet Nam to employ a scientific approach to PES, through which the highest economic, social and environmental benefits can be expected. The discussion in this Chapter, therefore, focuses on this recommended option.

1. RECOMMENDATIONS FOR THE TEXT IN NFDS 2021-2030, WITH A VISION TO 2045

The following text is recommended to be included in the NFDS 2021-2030:

- The 'Objectives':
  - … to make forestry a sector that can make a significant contribution to the green economy in Viet Nam....
- The 'Viewpoints/principles':
  - …the implementation of the strategy must comply with the principles of grassroots democracy and of gender equality. It must ensure effective participation and equitable benefits for all stakeholders, particularly ethnic minority communities, women and social-policy groups …
- The 'Tasks':
  - Conduct research and studies to develop a PES programme to pilot bundle payment of ecosystem services to take into account all the contributions that forests provide to society, to clearly show the interaction between forests and other economic sectors and the contribution of ES to the national and local economy, as well as he to conservation of the material and non-material value of forests.
- The 'Orientation':
  - Research to identify the package/bundle of key ecosystem services that contribute to the environment and society at the landscape level, to quantify the overall value of the contribution, and identify the providers and users of the bundle of ES.
  - Research to develop a system to account ES into green GDP (Natural Capital Accounting).
  - Pilot the bundle payment of ES at landscape level in at least three regions, representing the Central Highlands, Mountainous and Coastal regions. Develop a policy and institutional framework (including benefit-sharing policies) to support the pilot implementation of bundle PES. Ensure the principles of grassroots democracy and gender equality, and effective participation and equitable benefits for all stakeholders, particularly ethnic minority communities, women and social-policy groups.
- The 'Solutions':

By the end of 2025, finalize the research to identify the bundle of key ecosystem services that contribute to the environment and society, quantify the value of these contributions, and identify the users and providers of this bundle of ES.

By 2025, finalize the research and development of a system to account ES into a green GDP system.

By 2027, kick-start the pilot programme of payment for bundle of key ES in at least three regions, representing the Central Highlands, Mountainous and Coastal regions.

Finalize forest and land allocation and lease to ensure the security of forest tenure rights for all forest owners;

Make (institutionalize) the identification, quantification, and assessment of impacts on ecosystem services a mandatory requirement in developing conservation and development planning, especially master plans at regional and landscape levels.

Make PES one of the key solutions for sustainable forest management, restoration of land and ecosystems, response to climate change, livelihood development, poverty reduction, and preservation of traditional culture.

Finalize the legal and institutional framework for PES (including benefit-sharing policy) to facilitate the management, coordination and support for piloting bundle payment of key ES nationwide. Ensure the principles of grassroots democracy and gender equality, and effective participation and equitable benefits for all stakeholders, particularly ethnic minority communities, women and social-policy groups in the PES process, from development of policy to implementation, monitoring and evaluation.

2. TARGETS AND INDICATORS

1.1. Research to identify, quantify and value bundle of key ecosystem services

Target: To conduct research to identify the bundle of key ecosystem services that contribute to the environment and society; to quantify and value this contribution for use as the basis for determining the fee to be collected from ES users, and identify users and providers of this bundle of ES.

Indicator 1: By June 2022, the research outline for assessment, quantification and valuation of a bundle of key ecological services contributing to the environment and society has been developed.

Indicator 2: By December 2025, the research that assesses, quantifies and values the bundle of key ecological services contributing to the environment and society; including linkages between ES and local ethnic minorities, women and other social policy groups, has been completed.

1.2. Research to develop a system to account ecosystem services into national GDP

Target: To conduct research to develop a system to account ES into green GDP.

Indicator 1: By June 2023, the research outline for development of a system to account ES into green GDP has been developed.

Indicator 2: By December 2025, research and development of a system to account ES into green GDP has been completed and a recommended roadmap for implementation has been developed.

1.3. Pilot of bundle payment of ecosystem services at landscape level

Target: To pilot the bundle payment of ES at landscape level in at least three regions, representing the Central Highlands, Mountainous and Coastal regions; and to develop a policy and institutional framework to support the pilot implementation of bundle PES.

Indicator 1: By June 2023, the research outline for review of the policy and institutional framework that supports the pilot implementation of bundle PES has been developed.

Indicator 2: By December 2025, the review of policy and institutional framework that supports the pilot implementation of bundle PES at landscape level including policy on programme; policy and mechanism for ensuring grassroots democracy, gender equality, and effective participation for all stakeholders (particularly ethnic minority communities, women and social-policy groups) has been completed.

Indicator 3: By June 2027, a pilot project/programme on bundle payment of ES at landscape level in at least three regions representing the Central Highlands, Mountainous and Coastal regions, including supporting policy and institutional framework, is ready to start.

Indicator 4: By December 2030, the review of the implementation of the pilot project/programme on bundle payment of ES at landscape level and the supporting policy and institutional framework has been completed, and recommendations to scale up at national level are available. The supporting policy and institutional framework (including benefit-sharing policy) needs to ensure the principles of grassroots democracy and gender equality, and effective participation of all stakeholders (particularly ethnic minority communities, women and social-policy groups) in the PES process.

Indicator 5: By January 2031, bundle payment of ecosystem services nationwide commences.

3. LIST OF PRIORITY PROJECTS AND PROGRAMMES

This subsection discusses three priority projects/programmes with regard to PES in the NFDS 2021-2030, with a vision to 2045: (i) Research project to identify, quantify and value the bundle of key ecosystem services; (ii) Research project to develop a system to account ecosystem services into national GDP; and (iii) Programme to pilot bundle payment of ecosystem services at landscape level.

1.1. Research project to identify, quantify and value the bundle of key ecosystem services

Objectives: To identify a bundle of key ecosystem services that contribute to the environment and society; to quantify and value the contribution of bundle of ES for use as a basis for determining the ES fee to be collected; to identify providers and users of the bundle of key ES.

Scale: Provinces with forests.

Estimated budget: XXX billion VND.

Key activities and tentative timeline:

Key activities	Tentative time	In charge	Resources
Develop research outline for assessment, quantification and valuation of a bundle of key ecological services contributing to the environment and society	1-6/2022	VNFF	State budget, contribution from national and international projects
Selection and contracting of research team	6-12/2022	VNFF	State budget, contribution from national and international projects
Collection of data, conduct field	1/2023-	Research	State budget,

assessment	12/2024	team	contribution from national and international projects
Conduct data analysis, prepare report, conduct consultation on preliminary findings	1-10/2025	Research team	State budget, contribution from national and international projects
Report finalization	11-12/ 2025	Research team	State budget, contribution from national and international projects

1.2. Research project to develop a system to account ecosystem services into national GDP

Objectives: To develop a system to account ES into green GDP and to prepare recommendations on roadmap to implement the system.

Scope: National

Estimated budget: XXX billion VND.

Key activities and tentative timeline:

Key activities	Tentative time	In charge	Resources
Develop the research outline for development of a system to account ES into green GDP	1-6/2023	VNFF	State budget, contribution from national and international projects
Selection and contracting of research team	6-12/2023	VNFF	State budget, contribution from national and international projects
Collection of data, conduct field assessment	1-12/2024	Research team	State budget, contribution from national and international projects
Develop the system to account ES into green GDP, prepare report and recommendations for roadmap to implement the system, and conduct stakeholder consultation	1-10/2025	Research team	State budget, contribution from national and international projects

Finalize the report, roadmap and system	11-12/ 2025	Research team	State budget, contribution from national and international projects

1.3. Programme to pilot bundle payment of ecosystem services at landscape level

Overall goal: Make PES one of the key solutions for sustainable forest management, restoration of land and ecosystems, response to climate change, livelihoods development, poverty reduction and preservation of traditional culture.

Specific objectives: (i) to pilot the bundle payment of ES at landscape level in at least three regions, representing the Central Highlands, Mountainous and Coastal regions; (ii) to develop a policy and institution framework to support the pilot implementation of bundle PES; and (iii) to prepare recommendations and roadmap to scale up bundle PES at national level.

Scale: At least three provinces representing three agro-ecological regions: Central Highlands, Mountainous and Coastal areas.

Estimated budget: XXX billion VND.

Key activities and tentative timeline:

Key activities	Tentative time	In charge	Resources
Develop outline for reviewing the policy and institutional framework supporting bundle payment of ecosystem services	1-6/2023	VNFF	State budget, contribution from national and international projects
Selection and contracting of policy review team	6-12/2023	VNFF	State budget, contribution from national and international projects
Collection of data, conduct review and field assessment	1-12/2024	Review team	State budget, contribution from national and international projects
Prepare report, draft policy document for piloting bundle payment of ecosystem services, conduct stakeholder consultation	1-12/2025	Review team	State budget, contribution from national and international projects
Develop programme to pilot bundle payment of ES and conduct stakeholder consultation on the pilot programme	1/2026-6/ 2025	Review team, VNFF	State budget, contribution from national and international projects

Pilot bundle payment of ES in at least three provinces representing Central Highlands, Mountainous and Coastal areas	6/2027-12/2030	VNFF	State budget, contribution from national and international projects
Conduct review of the implementation of the pilot project/programme on bundle payment of ES at landscape level and the supporting policy and institutional framework; develop plan to scale up at national level and refine supporting policy and institutional framework.	1-12/2030	VNFF	State budget, contribution from national and international projects
Commence bundle payment of ecosystem services nationwide	1/2031	VNFF	

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