

Technical Report

Green Growth Action Plan for Lam Dong Province for the Period of 2021 – 2030, Vision to 2050

A project funded by:



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List of Acronyms

ADB	Asian Development Bank
BAU	Business as usual
C	Carbon
CSA	Climate-smart agriculture
CSB	Central State Budget, Vietnam
CSO	Civil society organizations
DARD	Department of Agriculture and Rural Development, Lam Dong province
DOC	Department of Construction, Lam Dong province
DOCST	Department of Sport, Culture and Tourism, Lam Dong province
DOF	Department of Finance, Lam Dong province
DOH	Department of Health, Lam Dong province
DOIT	Department of Industry and Trade, Lam Dong province
DONRE	Department of Natural Resources and Environment, Lam Dong province
DOST	Department of Science and Technology, Lam Dong province
DOT	Department of Transportation, Lam Dong province
DPI	Department of Planning and Investment, Lam Dong province
DPIIn	Domestic Private Investment
ES	Ecosystem Services
FDI	Foreign Direct Investment
GG	Green Growth
GGAP	Green Growth Action Plan
GHGs	Greenhouse gases
GDP	Gross Domestic Product
GRDP	Gross Regional Domestic Product
LEAP	Long-range Energy Alternatives Planning
LUMENS	Land Use Planning for Multiple Environmental Services
MACC	Marginal Abatement Cost Curve
MCP	Measure-Correlate-Predict
MONRE	Ministry of Natural Resources and Environment, Vietnam
MPI	Ministry of Planning and Investment, Vietnam
NGO	Non-governmental organisation
ODA	Official Development Aid
OECD	Organisation for Economic Co-operation and Development
PFES	Payment for Forest Ecosystem Services
PPC	Province People's Committee
PPI	Production, Protection and Inclusion
PPP	Public-Private Partnership
PRAP	Provincial REDD+ Action Plan of Lam Dong province for 2015-2020
PSB	Provincial State Budget, Lam Dong province
PSO	Provincial Statistics Office, Lam Dong province
REF	Reference scenario
SAO	State Audit Office
SDGs	Sustainable Development Goals
SEDP	Socio-Economic Development Plan
SFM	Sustainable Forest Management
SFE	State Forest Enterprise
SI	Social investment
SWOT	Strength, Weakness, Opportunity, Threats
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change
USAID	The United States Agency for International Development
VGGAP	Vietnam National Green Growth Action Plan
VGGs	Vietnam National Green Growth Strategy
VSA	Verified Sourcing Area

Executive Summary

The Green Growth Action Plan (GGAP) of Lam Dong province for 2021-2030 vision to 2050 is a blueprint for the province to become the frontrunner, particularly among provinces in Central Highlands region, in green economy in which a strong economy grows within sustainable environment. The GGAP is developed partly as compliance to the 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 enhancing resilience to economic and environmental shocks which happen more frequently in the past decades due to intensified impact of global market competition and climate change.

The province has an annual growth rate of 9.32% of gross regional domestic product (GRDP) in 2010–2016 (according to the comparative price in 2010). The agricultural sector which includes forestry, livestock and fisheries shared about 46.33% to the GRDP; service sector about 36.99%; and industry and construction about 16.68%. The province expected a GRDP annual growth rate of 8-9% until 2030, in which agriculture and service are still two dominant sectors over industry. The service and industry are expected to prevail over agriculture after 2030, along with the on-going structural transformation in the province which will gradually lead to a decline in the share from agriculture to the GRDP due to growth in the other two sectors. The province’s economic restructuring will be strengthened by the regional economic development trends in Central Highlands and by a stronger connection with the main economic and urban centres (for example Ho Chi Minh City) which accelerate the growth in industry and service sector. The province’s industry sector will need to focus on the development of processing and downstream industries using local raw materials from agriculture, forestry and livestock including fisheries, and development of handicraft industry for tourism. The service sector needs to support the production and market value chain of agricultural products which meet standard for export strengthened by product branding. Furthermore, the sector should strive to develop Lam Dong as a major tourist centre in the region and in the country, through optimal yet responsible use of natural resources for sustainable tourism. The agricultural sector needs to focus on the development towards hi-tech, sustainable practice, quality products ensuring food safety, and provision of quality inputs for export-oriented processing and downstream industry.

The data has shown that remarkable economic growth in the province has recently led to negative impacts on the environment and safeguards of natural resources. If further impacts are not properly anticipated, the economic growth will be seriously affected due to the absence of supporting quality resources. The environmental issues are resultants of activities in the main economic sectors of the province. For example, in agriculture and forestry sector, the rapid expansion of commercial crops has been associated with conversion of different types of forests. As the result, in 1990-2010, the emission 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 emission 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. The forest degradation and deforestation substantially affect the provision of ecosystem services including biodiversity.

In tourism sector, issues such as increasing threats to biodiversity as an impact of tourist activities exploiting rare and precious wildlife species, and serious impact from untreated waste, have come up. These issues will aggravate when the provincial targets to welcome 6.5 million tourists by 2020 and 15 million tourists by 2030, are implemented without impact mitigation measures. By assuming that each tourist will generate solid waste of 1.5 kg/person/day, the estimated volume of solid waste reaches 16,500 tons/day by 2025 and 24,000 tons/day by 2035. The volume of wastewater from tourist activities is estimated to increase by nearly 1.45 times compared to the current condition. The province needs to be equipped with adequate waste collection and treatment facilities to avoid a severe contamination to environment.

There has been increasing incidence of serious water pollution observed in the main rivers of the province, contaminating both surface and underground water, due to various activities in agriculture, industry and service sector. Various pollutants such as TSS, coliform, COD, N-NH₄⁺, and Fe have contaminated main rivers owing to agricultural and mining activities. In agriculture sector, solid wastes from chemical inputs which are mostly toxic, contained in glass bottles, plastic bottles, or plastic bags, are difficult to decompose. Due to lack of awareness, people often released them into the environment, become residues in the soil, contaminating the environment, and affecting the productivity of the soils. Furthermore, residues washed away by rainfall or irrigation into the river cause a serious water pollution, which further can affect health of people who use and consume the water. Water pollution is also driven by poor manure management of livestock which discharges the manure directly into the environment.

The GGAP contains nine orientations to ensure provincial economy grows within 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 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) emission from all sectors
- (3) Control waste production and improve waste treatment
- (4) Promote 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 lifestyle and sustainable urban consumption
- (9) Create enabling conditions for transitioning towards a green economy

The nine orientations complement the priorities in the existing environment and economic policy in the province. They cover the whole nature-economy cycle. 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 system such as pollution and untreated waste can be minimized by implementation of orientation 3, while maintaining sustainable supply of raw materials, energy and other resources to the economy supported by orientation 2. The service functions of natural system (i.e. ecosystem services) to provincial economy are supported through implementing orientation 5, with conservation of forest, biodiversity and water. Orientation 9 is to enable green growth process in general and it plays a very important role in harmonizing economic and natural systems through policies which stimulate innovation, technologies, 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 a clear and credible guidance to investors.

To facilitate implementation purpose, the nine orientations and their potential measures are classified into the six sectors with respective activities, targeted locations, estimated investment costs, expected funding sources and leading agencies. Furthermore, to help ensuring effective allocation of available resources, prioritized measures within each sector are proposed. For example, the prioritised measures of agricultural sector are: (1) reducing the expansion rate of greenhouse through implementing strict enforcement of regulatory and economic instruments, raising farmer's awareness on the needs of complying the norms of fertilizers and pesticide use in greenhouse, and providing alternative agricultural options which are economically viable yet putting a great concern on the preservation of ecological values; (2) promoting agroforestry as a climate-smart agriculture which can contribute in stabilizing farmer's income through product diversification, maintaining soil fertility, increasing water and nutrient use efficiency, and enhancing farmer's resilience to uncertainty in market and environmental condition including climate change; and (3) strengthen sustainable and higher quality production of agriculture products with innovative schemes such as Production, Protection and Inclusion (PPI) and Verified Sourcing Area (VSA) that aim to secure supply side with a competitive price and scale, through strengthening public-private partnership at relevant jurisdiction level, and ensuring sustainable production within sustainable environment.

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. 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. GENRIVER (Generic River) hydrology model was used to assess the impact of land-based measures into watershed functions.

Based on the projection with the assessment tools, the province's GRDP by 2030 will reach 85,019 billion VND (around 3,700 billion USD¹) through the implementation of GG measures. In a reference condition, in which economic growth in 2021-2030 is driven by impact of current (2016-2020) provincial planning, the GRDP reaches 81,167 billion VND, or about 3,850 billion VND less than that obtained with the GG measures. In terms of benefits to ecosystem services, related to provisioning service, promoting sustainable farming systems such as agroforestry will bring higher product diversification per unit land, through integrating different crop species in 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 GG scenario will reach 37,000 hectares by 2030 compared to 8,700 hectares in

¹ With an exchange rate of 23,000 VND per USD

the reference condition. Related to regulating service, the GG measures produces lower GHG emission by about 19% compared to reference condition. This is achieved through reducing emission from all sectors including waste treatment. Consequently, GHG emission per capita is also less by about 19% from 4.92 tons CO₂ eq. in reference condition to 3.98 tons CO₂ eq. per capita in GG scenario. Related to the supporting service, halting forest conversion into other landuses and supporting the new biodiversity conservation areas and ecological corridor as considered in GG scenario will make the province to have a better capacity in conserving biodiversity compared to the reference condition. In addition, this forest protection and increased tree cover outside forests through agroforestry, will improve the watershed functions in the province including by reducing the risk of soil erosion.

The implementation of Lam Dong's GGAP with all potential measures is estimated to require 63,919 billion VND (around 2,800 billion USD) as investment cost. By putting aside mega-cost measures in transportation and energy sector such as the construction of monorail and wind energy plant, the total investment cost reduces to 21,361 billion VND or 67% lower than the total investment cost for all measures. If all measures are included, energy sector has the largest share to total investment cost (48%), followed by transport (36%). In the more sparing option, energy sector still has the largest share (52%), followed by agriculture (23%), and forestry (12%).

The current investment structure of the province highly prioritizes other sectors especially agriculture (including forestry, livestock and fishery) over energy. In addition, although in the past decade the province has set priority projects to improve the development of agriculture, service and industry and their supporting sectors, the scopes of the priority projects were often not inclusive for GG objectives. Therefore, the province will need very large investments to move to a trajectory of inclusive GG. The financing of green economic growth should rely on different sources: national and regional government budget, investments and partnerships with the private sectors, and grants from various sources including global investors through multilateral cooperation. Integrating GG into upstream development planning is the best entry point for promoting the transition. Development and application of economic instruments, where and when appropriate, are also important options to support GG activities by mobilizing "untapped" social resources to achieve GG targets.

A set of 43 indicators for monitoring and evaluating the implementation Lam Dong's GGAP are proposed, in which twelve are considered as main indicators. They were developed based on indicators suggested by the United Nations Environment Programme (UNEP), Organisation for Economic Co-operation and Development (OECD), Vietnam's Ministry of Planning and Investment (MPI), Indonesia South Sumatra's Masterplan for Renewable Resources-Driven Green Growth 2017-2030, and Sustainable Development Goals (SDGs). The indicators capture impacts on economy, employment, resource intensity, emissions, natural assets, and ecological impacts. They will help raise the profile of GGAP in the public debate and reflect how current policies synergize with GG.

I. Introduction

I.1 Definition and scope of green growth

According to the Organisation for Economic Co-operation and Development (OECD 2011), green growth (GG) means “fostering economic growth and development, while ensuring that natural assets continue to provide the resources and environmental services on which human well-being relies.” Therefore, GG includes efforts in ensuring effective use of natural resources, use of low-carbon energy sources and links economic growth with sustainable environment. GG aims to provide economic benefits, and concurrently restoring and preserving ecosystems, and mitigate the impacts of climate change.

In Vietnam, the Government approved the National Green Growth Strategy (VGGS)² in 2012 and the National Green Growth Action Plan (VGGAP) in 2014 for the implementation of the VGGS in the period of 2014 -2020³. In the VGGS, GG is deemed as an important part of sustainable development, which ensures rapid, effective, and sustainable economic development and substantially 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, and implementation of economic instruments, thereby contributes to respond to climate change, reduce poverty and ensure sustainable economic development.”

I.2 Rationale of setting up GGAP for Lam Dong province

In the VGGAP, there are eight activities which provide relevance to implementation and responsibility of the provinces/cities to develop their own GGAP, and other seven activities (activity 6, 19, 23, 55, 60, 63 and 65) set under direct lead or coordination role of provincial authorities. Furthermore, the task “formulation of local GGAP in provinces and cities by synthesizing and scaling up best practices” is one of priority activities for VGGAP implementation in the period of 2014-2020.⁴

Main strength of the province

Lam Dong is endowed with highly favourable natural conditions for development, with a strategic political and economic setting, temperate climate, large potentials of land, forest, water resources and with beautiful landscapes. The province has relatively young and productive population, rich in ethnic cultures, and diverse historical and religious heritages. A large network of important transportation axes is connecting Lam Dong with other provinces in the Southeast, South-Central Coast regions, Ho Chi Minh city, and other provinces in Central Highlands. The province is one of main attractions of tourist destination in Central Highlands and in the country due to its natural reserves. With a relatively large population size of about 1,298,000 people in 2017 accounting for about 23% of the population in the Central Highlands, and productive young population, Lam Dong has an advantage for the development of agriculture, service and industry sector and for economic restructuring towards hi-tech, green and modern province.

Main weakness

The province’s economic structure and contribution of main economic sectors to gross regional domestic product (GRDP) are still dominated by agriculture sector, with a low contribution from industries. The large dependence on agriculture sector makes the province vulnerable to uncertainty in global agricultural market and climate change. In terms of investment structure to boost economic growth, low share of both public and private investment has been allocated to development of energy especially renewable energy, water resource management and waste sector. This clearly shows a gap between the province’s ambition in boosting economic growth, and concern on safeguard of natural resources, environmental protection and climate change mitigation. In the agriculture sector, despite its large contribution to the province’s GRDP, weak processing industry and product branding substantially hampers the province in escalating the competitiveness of their products in both national and international market.

² Decision N-1393/QĐ-TTg dated September 25/2012, by the Prime Minister

³ Decision N- 403/2014/QĐ-TTg, dated March 20/2014, by the Prime Minister

⁴ Decision N- 403/2014/QĐ-TTg, dated March 20/2014, by the Prime Minister

Opportunities

By taking advantage of favourable natural and climate conditions, relatively young and productive labor force, and connection with economic and urban centers (for example Ho Chi Minh City), the province has a capacity to further develop its three main sectors (service, agriculture and industry) and restructure its economy.

The industry sector can focus on development of processing and downstream industries using local raw materials from agriculture, forestry and livestock, and development of handicraft industry for tourism. The service sector can support the production and market value chain of agricultural products which meet the standard quality for export. In addition, the sector can strive to develop the province as a major tourist center of the region and the country, optimizing the natural resources and the beauty of provincial landscape for sustainable tourism. The agricultural sector can focus on development towards hi-tech, sustainable farming systems, food safety, and quality outputs for both national and international market.

To support the development, the province has renewable energy (water, wind, solar) sources to serve an increasing demand for cheap and safe energy for urban and industrial development. Furthermore, thanks to available access by land and air to main urban and economic centres, the province has ample opportunities to increase economy of scale, strengthen a regional collaboration and attract investment and development resources from national and international partners.

Threat

Climate change and unpredictable weather patterns will create a challenge especially for the agriculture, forestry and livestock sectors. According to several climate projections, including from the Ministry of Natural Resources and Environment (MONRE), for the next decades the Central Highland region including Lam Dong will likely have longer droughts during the dry season and heavier flash floods during the wet season. These extreme weather conditions may damage agriculture, and threaten the livelihood of smallholder farmers, especially those in poor communities. Furthermore, as the mountainous terrain is fragmented and partly difficult to access, the province faces additional challenges in building a water supply infrastructure which will require a big investment. This comes on top of the predicted risk of longer droughts during the dry season.

In upland areas, dominated by ethnic minorities, the extreme weather events will potentially lead to soil erosion and degradation, which not only endangers soil conservation, but threatens nearby villages with landslides. Climate change and variability also have the potential to bring pest and disease outbreaks. Consequently, fewer natural resources could become available to support the economic development and human livelihood in the province.

The development of the agricultural sector will be challenged by unstable market prices. For example, in early 2019, the price of coffee, one of the main commodities of the province, dropped to a 10-year low due to global competition. The total area of existing coffee plantations in the province has exceeded the total area targeted in the 2016-2020 provincial agricultural planning, therefore further encroachment of forest lands becomes a risk. Furthermore, most of the existing coffee plantations are old, with low productivity, and need rejuvenation.

The promising development of a tourism sector will be hampered by the lack of skills needed in the service sector such as communication skill, including in foreign languages. In addition, local people are not sufficiently aware of the need to integrate environmental protection into the tourism programmes. This is a major challenge when involving local communities, including ethnic minorities, in tourism activities. Furthermore, the tourism sector attracts migrants, and this could gradually narrow the living area for the local community.

The expanded tourist activities, when not properly managed, can potentially generate several issues such as water pollution and water exploitation, air pollution due to more vehicles and higher population density, over-exploitation of natural resources for example for food and souvenirs, soil pollution due to untreated waste, and deforestation due to the building of new tourism centres.

Lam Dong faces several environmental issues related to a lack of infrastructure for waste treatment and insufficient knowledge of the local population. For example, farmers use fresh manure for trees and fish in ponds and lakes, polluting the water resources used for daily activities; some have applied chemical fertilizers and pesticides without following the norm, further polluting water and soil; local inhabitants and some industries dump wastewater into the environment without any processing, causing pollution of water resources; currently, most of the urban areas lack appropriate sewage systems and industrial establishments lack wastewater treatment systems that meet environmental standards.

In terms of the public transportation system, the challenges include improving the system of bus terminals and increasing the number of bus stops and bus shelters, especially in the suburbs. There is a need to improve the quality of

vehicles as well, since most are old and not equipped with air conditioning. The improved public transportation system should be able to limit personal vehicles and must be low emission for example using a clean compressed natural gas as a fuel.

Based on all these evidences, there is a strong need to develop GGAP for Lam Dong province, not only to fulfil the tasks and priority set in the VGGAP, but most importantly, to ensure a sustainable socio-economic development and to contribute to the achievement of development and conservation targets set in other plans. For example, the province's Master Plan for Socio-Economic Development to 2020 has identified as a main task "to develop Lam Dong towards a mid-developed province of the Central Highlands with a larger share of service sector to the province's economy, reaching synchronous and modernized infrastructure system by 2020". The province's Landuse Master Plan towards 2020 clearly indicates the task of improving management of land resources, ensuring effective and productive land use in accordance with the law and needs described in the province's Socio-economic Development Plan. The province's Master Plan for Agricultural and Rural Development towards 2020 specifies the requirement of "developing agriculture sector towards modernized, sustainable, highly competitive commodity industry, linking agricultural production process with post-harvest preservation and processing to enhance the product value, environment and biodiversity protection, reduce risks of diseases, natural disasters and climate change impacts".

These are the main rationales of developing GGAP for Lam Dong province, especially for the context of green economic development in the next decade (2021-2030) with vision to 2050.

I.3 Economic growth and structure of Lam Dong province

According to the 2017 province's statistic book and as reported in the province's Construction Planning until 2035 vision to 2050⁵, the province's GRDP at current prices reached about 63.4 trillion VND (equivalent to about 2.76 billion USD) in 2016 and had a steady increase from 2006 in all sectors. The GRDP in 2016 accounted for about 29% of the GRDP in the Central Highlands and 1.4% of the total GDP nationwide. The GRDP per capita (at current prices) reaches 49.3 million VND (equivalent to about 2,143 USD) in 2016, about 3.2 times compared to 2005, and higher than the average GRDP per capita of Central Highlands (37.05 million VND) and the whole country (48.6 million VND). The GRDP growth rate of the province in 2016 (at 2010 comparative prices) is 7.93%, higher than the GRDP growth rate of the Central Highlands (7.06%) and the GDP's of whole country (6.21%).

The average growth rate of the province's GRDP in 2006-2009 (at 1994 constant prices) was 13.57% per year, and in 2010-2016 (according to the comparative price in 2010) was 9.32% per year. The GRDP growth rate by sector in 2010-2016 (according to 2010 comparative prices) was 7.92% for agriculture (include forestry, livestock, and fisheries); 12.2% for industry and construction; and 9.67% for services sector. The agriculture shared about 46.33% to the province's GRDP; service sector about 36.99%; and industry and construction about 16.68%.

As informed by the province's Construction Planning, the growth rate of GRDP until 2020 is expected at 8-9% per year⁶. By 2020, the share to GRDP is targeted at 46-46.5% from agriculture, 19.5 - 20% from industry and construction, and 33.5 - 34% from service sector. The GRDP per capita is expected to reach 70-73 million VND by 2020.

The Construction Planning highlighted that the economic growth and development in the province is not sustainable, with production sector largely emphasizes on quantity rather than quality, inefficient in resource utilization, and economic restructuring is slow. In addition, there is disparity in economic development among districts, with more advance in Da Lat city, Bao Loc city, Lam Ha and Bao Lam district.

I.4 Main environmental issues in Lam Dong province

In the past decades, increasing evidences on negative consequences from the province's impressive economic growth and production and consumption systems have been reported.

⁵ Decision No. 1848/QĐ-TTg

⁶ In the consultation workshop with provincial authorities, the province's People's Committee expected a GRDP growth rate of at least 8% until 2030.

1.4.1 Emission from landuse change

In 1990-2010, the area of forested lands declined by about 134,950 ha, with an average annual loss of 6,747 ha (USAID 2013)⁷. A sharp decline occurred in 1990-1995 with a gradual decline in 1995-2005. However, the decline became more dramatic again in 2005-2010 particularly due to the loss of broadleaf evergreen forest by a total of 91,744 ha. In the same period, the expansion of crop plantation increased by 50,100 ha. The main driver of forest loss during the two decades (1990-2010) was the expansion of industrial and food crops.

The total greenhouse gas (GHG) emission from deforestation in 1990-2010 was 49.2 million tons CO₂ eq. with an average of 2.5 million tons CO₂ eq. per year. In the same time, total emission from forest degradation was 20.3 million tons CO₂ eq. with an average of 1.01 million tons CO₂ eq. per year. The GHG removal (i.e. carbon sequestration) from afforestation and reforestation accounted for 9.0 million tons CO₂ eq. during the two decades, with an average of 0.45 million tons CO₂ eq. per year. The total net emission over the two decades was therefore 60.5 million tons CO₂ eq. with an average of 3.02 million tons CO₂ eq. per year. In line with the trend in forest loss, the net emission was high in 1900-1995, lower in the subsequent decade, and rose again in 2005-2010. The areas with high forest loss include Dam Rong, Cat Tien, Da Teh, Da Hoai, Lam Ha, Lac Duong and Bao Lam districts. Those with serious forest degradation include Bao Lam, Da Teh, Da Hoai and Lam Ha.

In 2010-2015, there was a remarkable increase in the area of plantation forest, perennial crops and settlement, and in the same time, a sharp decline in poor and restored broadleaf, coniferous and bamboo forest (Figure 1). From 2015 onwards, the projection of landcover area by LUMENS⁸ shows that, if the historical trend continues, the area of plantation forest, perennial crops and settlement will steadily increase, and the total area of perennial crops will reach about 320,000 ha by 2030 (Figure 1). Based on the project areas, the total accumulated emission from landuse change for two decades (2010-2030) reaches 92.1 million tons CO₂ eq. with an average of 4.6 million tons CO₂ eq. per year. If emission from agricultural practices such as fertilizer application, rice field irrigation, and crop residue burning were considered, the total accumulated emission will reach about 108 million tons CO₂ eq. In the same time, the potential GHG removal from afforestation and reforestation equals 95.1 million tons CO₂ eq. over the two decades with an average of 4.75 million tons CO₂ eq. per year.

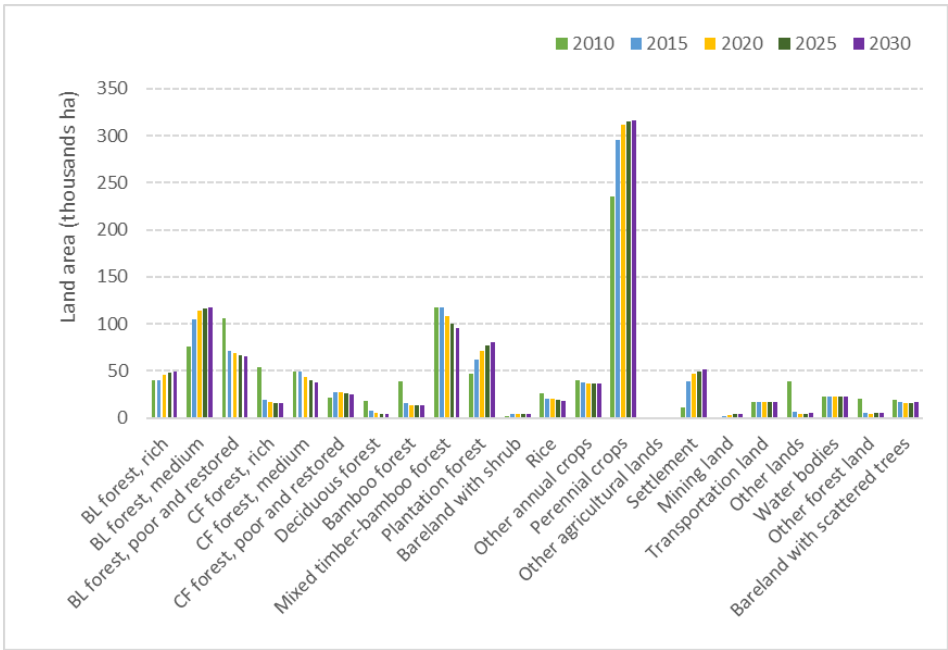


Figure 1 Projected landcover area by LUMENS for 2010-2030 based on historical trend (BL: broadleaf, CF: coniferous)

⁷ USAID. 2013. Land use, forest cover change and historical GHG emission from 1990 to 2010 in Lam Dong province, Vietnam. Project report. USAID-funded Lowering Emissions in Asia's Forests. Ha Noi Viet Nam.

⁸ Land Use Planning for Multiple Environmental Services as the main assessment tool used in the development of Lam Dong's GGAP

1.4.2 Emission from energy production and consumption

Emission from the energy sector includes both direct and indirect emission. Direct emission is generated from several sources such as the use of fossil fuels to produce goods and services; the use of gas, coal and oil in residential areas; and the use of petrol and fuel oil for transportation. For indirect emission, an example is when electricity use by consumers corresponds to a certain level of emission generated by the hydro-electric plant which generates the electricity. According to the convention on GHG inventory for emission from energy sector, such emission should be considered as indirect emission from the electricity use. The share of energy consumption and associated GHG emission from five sectors (agriculture, commerce/service, industry, transportation, household) in 2016 are shown in Figure 2.

In 2010, energy consumption in Lam Dong equalled 290 ktce, including 164 ktce of fossil fuel and 51 ktce of electricity. Firewood is the most utilised fuel, accounting for 25.3% from the total energy consumption; gasoline 24%; electricity 17.6%; diesel 17.3%, and coal 9%. Other fuels such as fuel oils, LPG and biogas account for 6.7%. Total GHG emission from energy consumption in 2010 was 804 thousand tons CO₂ eq., of which 65% was direct emission and 35% was indirect emission. In 2016, the province's energy consumption was 511.6 ktce, or an increase by 76% compared to 2010. The structure of energy consumption has changed. Coal became the most utilised fuel (29%), followed by gasoline (22.6%), electricity (16.9%), and diesel (14.1%). Other fuels such as fuel oils, LPG and biogas accounted for 5.7%. The total GHG emission from energy consumption in 2016 was 1.84 million tons CO₂ eq. or an increase by 129% compared to 2010.

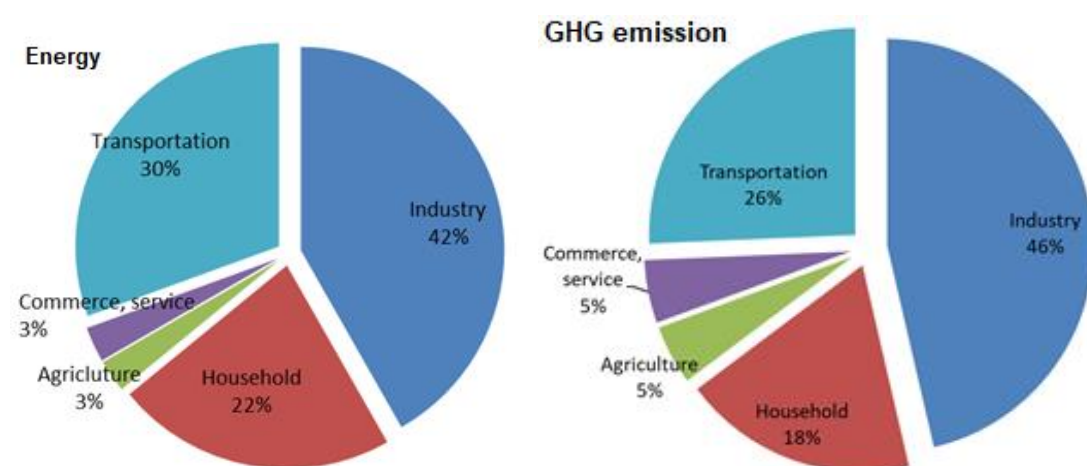


Figure 2 Share of energy consumption and associated GHG emission in Lam Dong in 2016

The detail of GHG emission from energy consumption by sector and sub-sector for 2010-2016 is given in Table 1. In the industry sector, alumina is the highest emitter, accounting for 53% of the total emission owing to its large coal and electricity consumption. In average, producing 1 ton of alumina requires 230 kg of coal and 250 kWh of electricity. In Lam Dong, alumina is a new industry. The Bao Loc alumina factory, operating since October 1st, 2013, has a capacity of 600,000 ton per year. The production in 2013 was about 219,000 ton. By 2016, the production was 560,000 ton, nearly the maximum capacity. To meet the electricity demand for alumina production, a 100 MW coal-fired power station was built. Solely used for alumina factory, total emission from this power station is fully assigned to alumina production, and this makes the total emission from alumina production is much higher than the emission when only grid electricity is used.

The second largest emitter in industry sector is burnt brick, which accounts for 19% of total emission, due to large coal burning. Tunnel kilns use on average 190 kg of coal per 10,000 bricks, while traditional kilns use fewer coal, namely 50 kg per 10,000 bricks but they use a lot of firewood leading to many environmental problems. The Government and the Ministry of Construction have banned the operation of traditional brick kilns. On January 12th, 2017, the Provincial People's Committee issued Plan No. 204/KH-UBND for halting the production of baked clay bricks with kilns using outdated technology.

Furthermore, alumina and burnt brick manufacture are two sub-sectors with a relatively high increase in GHG emission. For example, in 2013-2016, GHG emission increased by 2.6 times from the alumina. In other sub-sectors, the increase in emission from water pumping, agriculture plot management practices, and public lighting were also remarkable.

In terms of emission per capita, emission from the energy sector increased doubly from 0.67 ton of CO₂ eq. in 2010 to about 1.43 ton CO₂ eq. in 2016. By GRDP, the emission increased from 0.031 ton of CO₂ eq. per million VND in 2010 to 0.045 ton CO₂ eq. per million VND in 2016. Although Lam Dong's GHG emission per capita in 2016 was lower compared

to, for example 1.62 ton of CO₂ eq. in Thanh Hoa's estimated in 2014 or 1.81 ton of CO₂ eq. in Da Nang city estimated in 2010, however the emission in Lam Dong increased remarkably across year. Therefore, the province needs to mitigate GHG emission from energy sector, especially from industry, transportation and residential areas.

Table 1 GHG emission by sector and sub-sector in Lam Dong from 2010-2016

Field	GHG emission (TCO ₂ e)							Trends
	2010	2011	2012	2013	2014	2015	2016	
Industry	269,428	236,595	251,270	444,124	709,475	790,384	853,556	
Alumin	-	-	-	178,056	385,458	412,928	455,253	
Coffee bean	2,426	2,600	2,369	2,746	3,213	3,747	4,218	
Tea	8,854	8,403	7,539	7,338	8,020	8,460	8,899	
Timber	4,347	6,699	7,411	4,522	3,798	4,793	5,143	
Textile	8,843	9,063	8,058	9,658	10,691	10,678	11,218	
Brick	104,695	56,417	73,346	74,682	118,249	156,838	165,049	
Water exploitation, filtration and distribution	6,724	6,458	5,924	6,929	7,752	8,814	10,380	
Tiles	476	231	242	315	374	272	387	
NPK fertilizer	1,717	2,472	2,949	2,874	3,260	4,689	4,441	
Other	131,347	144,253	143,432	157,005	168,660	179,165	188,568	
Residential	196,444	202,237	191,736	220,277	254,720	301,551	338,949	
Urban	155,083	158,735	147,024	169,207	195,238	229,503	243,257	
Rural	41,361	43,502	44,712	51,069	59,482	72,048	95,692	
Agriculture	20,022	29,167	34,327	41,154	52,910	68,480	85,178	
Irrigation	18,302	27,369	32,518	39,329	51,051	66,562	83,332	
Land preparation	684	719	727	737	754	782	755	
Harvest	266	288	298	310	323	341	336	
Paddy Threshing	769	791	783	778	781	795	755	
Commerce, service	32,514	38,996	37,530	43,068	53,590	69,727	90,706	
Hospitals	8,002	8,613	7,924	8,274	9,727	12,565	15,631	
restaurants	1,752	1,720	2,021	2,267	2,919	3,873	4,582	
State agencies	2,502	2,013	1,745	3,183	4,033	5,376	6,447	
Schools	1,252	1,423	1,400	1,991	2,384	2,850	3,700	
Offices	1,024	902	776	1,116	1,662	2,460	3,437	
Public lightings	2,752	3,551	3,004	3,723	5,055	7,961	10,072	
Other commercial, services	15,230	20,774	20,659	22,514	27,811	34,641	46,838	
Transportation	285,670	308,350	333,039	357,627	389,945	430,067	472,484	
Passengers transportation	83,270	91,622	99,767	106,647	117,757	134,864	152,592	
Freight transportation	202,400	216,729	233,272	250,980	272,188	295,203	319,891	
Total	804,078	815,345	847,902	1,106,250	1,460,640	1,660,209	1,840,874	

1.4.3 Emission from waste sector

The GHG emission from waste sector comes from three sources: 1) landfill of solid waste; 2) wastewater treatment; and 3) waste incineration.

Emission from landfill of solid waste includes three sources: (i) municipal solid waste (mainly domestic waste), (ii) tourism waste, and (iii) industrial waste; in which, domestic waste is the largest source of solid waste and the largest emitter, accounting for 96.6% of total emission in 2010. The emission from tourism activities accounted for 3.3% and from industry accounted for less than 0.1%. In 2015, the emission from domestic, tourism, and industrial waste were 86%, 10% and 4% respectively. In 2016, the rates were 81%, 15%, and 4%, respectively. The total emission was 149 thousand tons CO₂ eq. in 2010 and 240 thousand tons CO₂ eq. in 2016, with an average annual increase of 8.2%.

The emission from industrial waste is projected to increase dramatically along with the expansion of industrial parks and industrial clusters in the province. The waste and associated emission from tourism activities is also projected to increase remarkable along with the province's ambition to be one of the most attractive sites in the region and in the country. According to the Plan for Lam Dong's Tourism Development to 2020, vision to 2030⁹, the province has targeted

⁹ Decision No. 673/QĐ-UBND





6.5 million tourists by 2020 and 15 million by 2030. According to the province's Construction Planning, by assuming that the solid waste from each tourist is 1.5 kg/person/day, the estimated amount of solid waste generated by the province's tourism activities will reach 16,500 tons/day by 2025 and 24,000 tons/day by 2035. Therefore, within 10 years, the amount of solid waste is estimated to increase by 1.45 times. Furthermore, the domestic wastewater from tourist activities is also projected to increase by nearly 1.45 times compared to the current condition. The Construction Planning emphasizes that although the volume of solid waste and wastewater from tourist activities accounts for a small percentage compared to the total volume of solid waste and domestic wastewater in the province, the annual increase is high and hence, associated emission.

Emission from wastewater treatment came from domestic wastewater (including effluent from septic toilets) and industrial wastewater (mainly from the alcohol and wine production and fertilizer production). The major emission compounds are CH₄ and N₂O. Total emission from wastewater was 126 thousand tons CO₂ eq. in 2010 and 135 thousand tons CO₂ eq. in 2016, with an average annual increase of 1.1%. About 80% of total emission came from domestic wastewater.

Emission from waste incineration includes incineration of medical waste in hospitals and solid waste at integrated waste disposal centers. Currently, there are two general waste treatment facilities in Lam Dong province. The one in Da Lat City has a handling capacity of 400 tons of waste per day. This facility has been operating since 2015 and is currently handling an average of 80 tons of waste per day. Another in Bao Lam has a capacity to handle 150 tons of waste per day. It has been operating since 2017 and currently handling about 40-50 tons of waste per day. The facilities can do composting, recycling and burning. In 2016, about 8,900 tons of solid waste were burned at Da Lat waste treatment center, emitted approximately 7,440 tons of CO₂ eq. Regarding medical waste, in 2016, about 105.8 tons of waste were burned, emitted 88.5 tons of CO₂ eq.

The total GHG emission from the waste sector was about 276 thousand tons CO₂ eq. in 2010 and 357 thousand tons CO₂ eq. in 2016, namely an increase by 29% (Table 2). In 2010, the waste from landfill contributed 54% to the total emission from waste, wastewater treatment 46%, and burning solid waste 0.03%. By 2016, the share from landfill waste increased to 60%, solid waste incineration to 2.1% while from wastewater treatment reduced to 37.8%. The increase in total GHG emission in 2015-2016 was 1.6%, lower than the increases in previous years due to the commissioning of the general waste treatment center in Da Lat.

Table 2 GHG emission from waste sector in 2010-2016

Sub-sector	GHG emission (TCO2e)							Trend	Rate (%)
	2010	2011	2012	2013	2014	2015	2016	2010-2016	2010-2016
Solid waste landfill	149,140	158,599	165,751	175,179	192,204	217,618	214,399		6.2%
Waste water treatment	126,457	127,985	129,382	130,804	132,248	133,701	135,053		1.1%
Waste incineration	84	84	84	84	84	84	7,527		111.6%
Total	275,681	286,668	295,218	306,067	324,536	351,404	356,980		4.4%

1.4.4 Fragmentation of rich forest and biodiversity

The fragmentation and loss of forest will generate pressure on biodiversity. Therefore, there is a need to ensure long-term maintenance of forest resources and connectivity between patches of intact forest. In the past decades, the total forested land in Lam Dong province has increased, however forest degradation occurred in the same time driven by the expansion of plantation forest, agriculture and infrastructure¹⁰. The population growth has driven illegal deforestation for new settlements and agricultural lands. The expansion of commercial plantations contributed to the large conversion of forested lands to coffee, tea, or rubber plantations. The area of coffee plantations rose by 200% in 1990-2000. In addition, the deforestation in the province was driven by illegal forest clearing, infrastructure developments such as for road establishment and hydropower plants, and due to inadequate forest patrolling efforts¹¹. The decline in area also took place in natural bamboo forests due to conversion to other landuses driven by low market value for raw bamboo material. Other important drivers of deforestation and forest degradation include illegal logging in remote mountainous areas beyond an effective control of forest rangers and forest fires.

¹⁰ Enright A. 2013. REDD+ compensation packages in Lam Dong province, Vietnam: assessing the preferences of forest communities, IIED, London.

¹¹ Forest Resources and Environment Center (FREC). 2013. Establishment of forest status map during the period from 1990-2010, Lam Dong Province. Prepared for the LEAF project.

Dewi et al. (2013)¹² developed Total Edge Contrast Index (TECI) to measure the fragmentation of habitat such as forests and their contrast with surrounding landuses, and Degree of Integration of Focal Area (DIFA) to measure the capacity of a landscape to conserve biodiversity based on the TECI index (i.e. connectivity of the habitat). The habitat with more fragmented area over the landscape will have lower DIFA index and lower contribution to the landscape's capacity in conserving biodiversity. The LUMENS tool calculated both indexes for 2010 and 2015 for three types of forests namely rich broadleaf forest, rich coniferous forest, and deciduous forest¹³; and made projection until 2030 based on historical trend. The DIFA index of rich broadleaf forest increases gradually from 2010 to 2030 which indicates a maintained connectivity of this type of forest across the province during that period (Figure 3). The DIFA index of deciduous forest declines dramatically over the two decades indicating that this type of forest is highly fragmented across the province. Therefore, without any intervention, among the three types of forest, only rich broadleaf forest will contribute to enhance the capacity of Lam Dong province in conserving biodiversity.

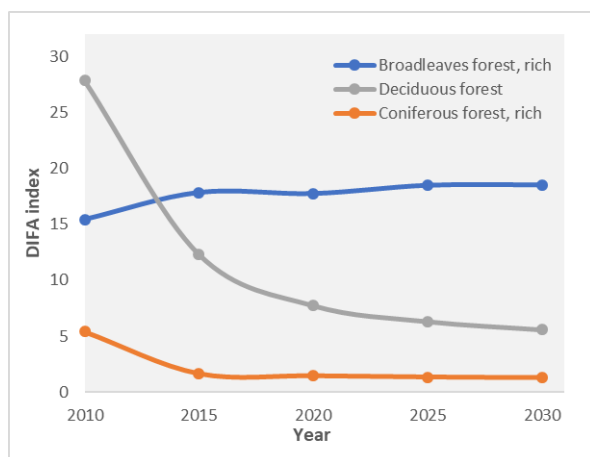


Figure 3 DIFA index of three types of forest in Lam Dong for 2010-2030

1.4.5 Water pollution and water shortage

There has been increasing incidence and more serious water pollution observed in the main rivers of the province including to underground water due to various activities related to agricultural, industrial and service sector¹⁴. Different pollutants such as TSS, coliform, COD, N-NH₄⁺, and Fe have contaminated main rivers due to agricultural and mining activities.¹⁵ In agricultural sector, solid waste can come from chemical inputs which are mostly toxic, contained in glass bottles, plastic bottles, or plastic bags, and these types of packaging are difficult to decompose and to process. Due to a lack of awareness, local people released many of these solid wastes into the environment, which become residues in the soil, affecting the environment and the productivity of the soils. Furthermore, residues that are washed away by rainfall or irrigation cause a serious water pollution and can further affect the health of people who used and consumed the water. In addition, due to lack of appropriate treatment for hospital's wastewater, this waste also becomes an important source of water pollution.

According to JICA (2018)¹⁶, the total water demand from different sectors in the province such as agriculture for irrigation, domestic use, livestock, fishery, and industry reaches about 1,138 million m³ per year. The highest demand comes from agriculture namely 87% of total demand followed by 8% from aquaculture. Due to the high demand, in the past decade, the province has more frequently experienced a serious shortage. For example, in 2015-2016, the water shortage accounted for about 130 million m³. The southern part of Da Lat City, Lam Ha and Duc Trong districts were areas with serious surface water shortages. The water shortage was also driven by climate change and more contrasting rainfall gradient between wet and dry season. The climate change's projection by MONRE until 2050 informs a high possibility of stronger gradient in rainfall between wet and dry season in Lam Dong.

¹² Dewi S, van Noordwijk M, Ekadinata A, Pfund J-L. 2013. Protected areas within multifunctional landscapes: squeezing out intermediate land use intensities in the tropics? *Land Use Policy* 30: 38– 56.

¹³ Due to their limited area, three categories of deciduous forest (rich, medium, and poor and restored) are lumped.

¹⁴ <https://tintaynguyen.com/lam-dong-thuc-trang-tai-nguyen-nuoc/302668/>; Resolution No. 104/2018/NQ-HDND

¹⁵ <https://tintaynguyen.com/lam-dong-thuc-trang-tai-nguyen-nuoc/302668/>;

¹⁶ JICA. 2018. Data collection survey on water resources management in Central Highlands. Final Technical Report. Retrieved at: http://open_jicareport.jica.go.jp/pdf/12306296_01.pdf June 2018.

1.4.6 Environmental issue from greenhouse expansion

The expansion of greenhouses especially for vegetable and flower production has been concentrated in Da Lat and Lac Duong district (Figure 4). The expansion rate in 2016-2017 was about 113 ha per month. The rate was lower in 2017-2018 namely 36 ha per month. The total area of greenhouse in Da Lat by end of 2018 was about 4,400 ha¹⁷. Without any intervention, and if the areas for construction are available, the total area of greenhouse will reach 4,520 ha by 2020, 4,771 ha by 2025, and 4,912 ha by 2030. There has been a report linking the recent flood in Da Lat city with the massive expansion of greenhouse¹⁸. In addition, the emission from greenhouse lighting and the use of chemical inputs are also high. For example, without any intervention, the emission from fertilizer application in greenhouses can reach 8 thousand tons CO₂ eq. by 2030. Furthermore, massive greenhouse expansion will reduce the beauty of the province's landscape, especially in Da Lat and Duc Trong district, which may affect the attractiveness of the province for tourist's destination.

1.4.7 Other environmental issues

The province's Construction Planning describes impacts from infrastructure developments to environment in general, not limited to emission, biodiversity and water limitation. The impacts include potential impacts from future development of urban-rural infrastructure, transport and tourist development, and other infrastructures.

¹⁷ <http://cucthongke.lamdong.gov.vn/Default.aspx?Act=10&IDNews=813>

¹⁸ <http://www.thanhniennews.com/society/experts-blame-mushrooming-of-greenhouses-for-da-lat-floods-46178.html>

II. Scope and approaches for developing Lam Dong's GGAP

II.1 Sectoral and temporal scope for developing orientations

The Lam Dong's GGAP covers six sectors namely agriculture, forestry, tourism as main economic sectors; and infrastructure (mainly transport), water resource management, and energy as supporting sectors. The energy sector considers production and consumption of energy in the other five sectors, including in industry, buildings, residential areas, and power generation.

The VGGs specifies three main aspects of GG namely reducing GHG emission 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 addressed only the three main aspects and lacks conceptual and methodological framework for an integrated assessment of impacts of GG measures on provincial economy and ecosystem services. The Lam Dong's GGAP also addressed several social issues which relate to e.g. land tenure, gender, poor communities and ethnic minorities, when participatorily developed the GG orientations and measures with relevant stakeholders in the province.

The impact assessment on ecosystem services considered provisioning, regulating, and supporting services including biodiversity. Some measures aim to enhance cultural service such as aesthetic value of the province's landscape, but not assessed.

The province's GGAP was developed for the time period of 2021-2030 to support the achievement of international and national commitments such as the Sustainable Development Goals and relevant national targets. All these commitments emphasise the need for substantial progress in different development and conservation aspects during the decade, with clear achievement targets by 2030. Furthermore, the Lam Dong's GGAP has a vision until 2050, which aims, for instance, to enhance the use of renewable energies.

II.2 Principles and conceptual framework

II.2.1 Principles

The process of developing the integrated planning like the Lam Dong's GGAP requires an inclusive, integrative and harmonious aspect of multi-sectoral planning, including their respective targets and multi-dimensional issues. In developing countries, the development of such planning and assessment of its potential impacts usually face three major challenges (Dewi et al. 2015)¹⁹: lack of consented spatial planning among sectors, lack of communication among provincial planners during the planning development, and lack of framework and tools for conducting ex-ante assessment with different scenarios. The conceptual and methodological framework used in developing the Lam Dong's GGAP are expected to provide example on how such integrated planning and assessment are possible and can be applied for in other provinces.

The methods and assessment process for Lam Dong's GGAP adhered to the following principles:

- *Inclusive, integrative and informed*: they are inclusive in terms of stakeholders and sectors involved; they integrated inputs from different stakeholders and sectors into the planning; they used sound scientific approach with assessment results informed to the stakeholders and different sectors.
- *Participatory*: inputs from all stakeholders were respected and considered, to ensure that the planning was not dominated by views from certain stakeholder only. In addition, the participatory process will enhance feeling of ownership from all stakeholders to the GGAP, strengthen connectivity among the stakeholders, help ensure the smoothness of development process and effectiveness of implementation of the GGAP, enhance the sensitivity of the GGAP to local condition and therefore more applicable, provide opportunities for any stakeholder to share socio-economic and environmental issues in their respective sites, and support capacity development by involving the stakeholders in every stage of the GGAP development.
- *Spatially explicit*: spatial data in maps help checking consistency among land-based planning from different departments, at least in terms of implementation sites; they are inputs of many assessment tools; allow comparison

¹⁹ Dewi S, Ekadinata A, Indarto D, Nugraha A and van Noordwijk M. 2015. Negotiation support tools to enhance multifunctioning landscapes. In: Minang PA, van Noordwijk M, Freeman OE, Mbow C, de Leeuw J, and Catacutan D. (Eds.) Climate-Smart Landscapes: Multifunctionality In Practice. Nairobi, Kenya: World Agroforestry Centre (ICRAF). <http://goo.gl/ohIU74>

between current and future planning easily; and improve planning development process through the availability of spatial data that can be used to check consistency with other plans within or between departments.

During the development of Lam Dong’s GGAP, three consultation workshops to share and obtain feedback on conceptual and methodological framework for developing GGAP and results of impact assessment, two write-shops to formulate the draft of provincial Decision on GGAP, and numerous consultation meetings were conducted. The consultation workshops invited representatives from government agencies, private sectors, civil society organizations (CSOs), Father’s Front, Women’s Union, Farmers’ Union, Ethnic Minorities Board, Youth Union, and local communities. As part of the consultation workshops and consultation meetings, specific sessions for scenario building were organized for participatory development of GG orientations and measures. In these scenario building sessions, several social issues were discussed to ensure that the GGAP is devoid of any orientation and measure which e.g. potentially generate land tenure or gender issue or lack of attention to poor communities and ethnic minorities.

II.2.2 Conceptual framework

We adapted the GG conceptual framework by OECD (2011)²⁰ which covers the whole nature-economy cycle wherein economic activities are divided into two subsets namely production and consumption and linked by trading (Figure 4). Impacts of economic activities on nature system such as pollution and untreated waste should be minimized, while maintaining sustainable supply of raw materials, energy and other resources to the economy. The service functions of natural system (i.e. ecosystem services) to provincial economy should maintained and enhanced, through e.g. forest, biodiversity and water conservation. We added innovative policies and measures as a component to the framework. They will enable green growth process in general and will play a very important role in harmonizing economic and natural systems which stimulate innovation, technologies, capacity, and economic opportunities in general. Figure 4 also illustrates how the nine GG orientations described later below, can fit and link within the framework.

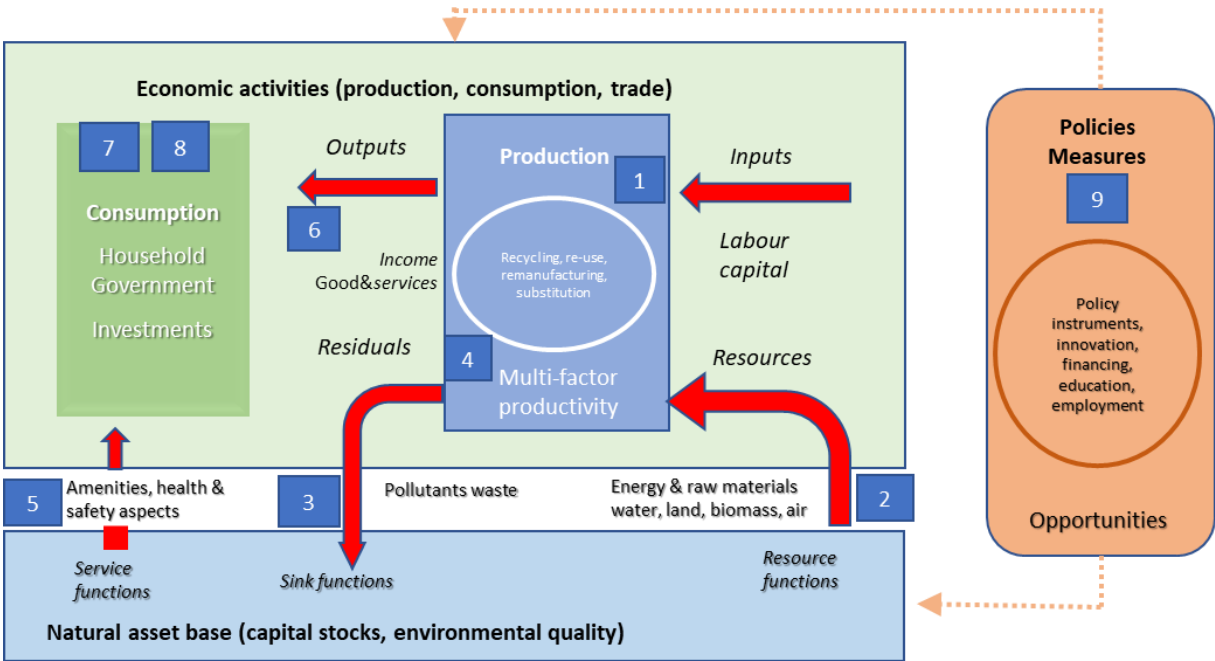


Figure 4 Adapted OECD’s conceptual framework for Lam Dong’s GGAP

²⁰ OECD (Organisation for Economic Co-operation and Development). 2011. Towards Green Growth. www.oecd.org/greengrowth

II.3 Methodological framework and assessment tools

II.3.1 Land Use Planning for Multiple Environmental Services (LUMENS)

Compared to other tools which can be used to assess the impact of landuse planning on economic and ecological benefits, LUMENS (Dewi et al. 2015)²¹ is more inclusive in terms of ecosystem services considered and has an economic module which can estimate impact of economic activities into provincial GRDP. For provisioning service, it can estimate total production from different types of landuse practices at province level. For regulating service, it can estimate both GHG emission and removal from spatial and temporal changes of various landcover types. For supporting service represented by biodiversity, it can assess the impact of habitat connectivity on the capacity of a landscape in conserving biodiversity. For economy, it can link the level of provisioning service and economic activities outside land-based sectors, for example tourism, to provincial income and GRDP with a Leontief²² (inter-sector economy) table. In Lam Dong's GGAP, LUMENS was used to assess the impact of GG measures in the four sectors except transport and energy. LUMENS has been used to develop GGAP in several provinces in Indonesia. In Vietnam, Lam Dong is likely the first province using this tool for developing GGAP. Steps for assessment with LUMENS are as follow:

1. *Data preparation: spatial and non-spatial input data*

LUMENS is a spatially explicit tool which can handle spatial inputs such as landcover maps and boundary of agricultural or forestry measures. All input maps should be in the form of raster and have consistent projection systems. For Lam Dong's GGAP, all maps have international-standard geographic coordinate system namely WGS_1984_UTM_Zone_48N, and GCS_WGS_1984. This will ensure that all maps will be readily available for future use, with any software of geographical information system. Non-spatial inputs include economic and biophysical parameters such as landuse profitability and carbon (C) stock of each landcover. Appendix I provides a detail list of input data for LUMENS.

2. *Analysis of landcover change with scenarios*

The spatial and temporal landcover change will determine the provision and regulating service, and furthermore the provincial income and GRDP. The results from different landuse planning scenarios are usually compared with baseline condition. In LUMENS, the trend of landcover change within a certain time interval, is summarized in a landcover transition matrix which can be used to calculate the probability of landcover change in the subsequent time interval. Through this approach, future landcover distribution based on historical trend can be produced. The scenarios built in Lam Dong's GGAP are described below.

3. *Analysis of habitat connectivity and biodiversity*

As elaborated earlier, LUMENS calculates the TECI and DIFA index to measure the capacity of a landscape in conserving biodiversity. The indexes largely depend on the connectivity of landcovers known to have high biodiversity level, for example undisturbed forests, over the landscape. In Lam Dong's GGAP, such landcovers were represented by rich broadleaf and coniferous forests, and deciduous forests.

4. *Estimating impact of economic activities on GRDP*

The key component of economic estimation within LUMENS is the Leontief table. The table shows an economic flow (input-output) among numerous sectors in the province which makes the estimation of impact of sectoral economic activities on the province's GRDP is possible. Some sectors produce outputs which become inputs to other sectors and vice versa. This input-output dependence among sectors can be summarized in a two-way matrix of economic values. In Lam Dong's GGAP, the province's Leontief table for year 2016 was used which contains 48 categories which can further classified into agriculture, industry or service sectors.

5. *Estimating GG indicators*

The results obtained in the earlier steps can be used to estimate the GG indicators such as the GHG emission per capita or per GRDP. Part IV provides a summary table of GG indicators for Lam Dong's GGAP.

II.3.2 Long-range Energy Alternatives Planning (LEAP)

LEAP is developed by the Stockholm Environment Institute and widely used worldwide, including in Vietnam, for energy policy analysis and assessment of climate change mitigation from energy sector. Energy sector planners at national level in Vietnam are more familiar with LEAP than any other energy assessment tool. It was used in the 1st and 2nd National Communication to UNFCCC to produce GHG emission projections and assessed the mitigation options. In the recent study "Support for the National Target Program on Climate Change with a Focus on Energy and Transport" by

²¹ Dewi S, Ekadinata A, Indarto D, Nugraha A and van Noordwijk M. 2015. Negotiation support tools to enhance multifunctioning landscapes. In: Minang PA, van Noordwijk M, Freeman OE, Mbow C, de Leeuw J, and Catacutan D. (Eds.) Climate-Smart Landscapes: Multifunctionality In Practice. Nairobi, Kenya: World Agroforestry Centre (ICRAF). <http://goo.gl/ohIU74>

²² Please see e.g. <http://www.rri.wvu.edu/WebBook/Schaffer/chap04.html> on Leontief table.

the Asian Development Bank, LEAP was also used for similar purposes at national and provincial levels. In Lam Dong's GGAP, LEAP was used to develop GHG baseline scenario, while the identification and analysis of mitigation options from different energy sources were conducted with the Marginal Abatement Cost Curve (MACC) and Measure-Relate-Predict (MRP) approach.

LEAP can be used to track energy consumption, production and resource extraction in all sectors of an economy. There are three main modules in LEAP namely demand, transformation and resources. The demand for energy is a derivative demand since energy is not consumed by the society as a final product, but as an input into goods and services. This is the modelling concept in LEAP. For example, residential consumers use appliances such as rice cookers, lighting, refrigeration and air conditioning. In consuming the services of those appliances, energy is used. Similarly, industrial energy demand can be related to the output of the industry measured in physical or monetary units. Electricity, petroleum, natural gas, coal and other energy products are then supplied to meet the final through transformation. Macro-economic, demographic data and physical outputs, together with data on appliances, household characteristics, industrial technology and energy policy are inputs for LEAP to derive final demand for energy.

Energy resources need to be transformed and transported to final users. The LEAP transformation module transforms primary energy resources for further use by consumers, wherein fuels are imported. The energy resource module represents the availability of primary resources, including fossil and renewable energy resources, as well as the cost of local production, import and export both primary resources and secondary fuels. The resources are always subdivided into two categories: primary resources and secondary fuels, and other resources are derivative and automatically generated and updated by LEAP to reflect the individual fuels consumed and produced in the area. Appendix I provides a detail list of input data for LEAP.

II.3.3 GENRIVER hydrology model

In Lam Dong's GGAP, another regulating service assessed was the capacity of the province's watersheds in controlling soil erosion. This is important since soil erosion is one of serious watershed issues in the province. For example, Pham et al. (2017)²³ conducted a study in Da Dang river basin and found incidence of high erosion in about 14.41% of the basin area which generated at least 10 tons/ha/year of eroded soils. The hydrology model used for the assessment was GENRIVER (van Noordwijk et al. 2011)²⁴. GENRIVER considers the impact of landcover change on watershed functions through changes in water balance within the watershed.

The model operates in daily timestep and water balance is driven by local rainfall and affected by landcover types and landcover change, and soil properties of the plot. Furthermore, canopy interception, stemflow, infiltration into soil, rapid percolation into subsoil, surface flow of water and rapid lateral subsurface flow into streams are also considered affecting the water balance. The outputs of the water balance are three types of stream flow namely surface run-off on the day of the rainfall event which determines the rate of soil erosion, subsoil flow on the next day and base flow, via the gradual release of groundwater. Compared to GENRIVER, other hydrology models are either too complex or more parameter demanding yet lack of consideration on the impact of landuse change on soil and water balance.

In Vietnam, the model has been used to assess the impact of landuse change and different forest protection and intensification scenarios in North-²⁵ and South-Central Coast²⁶ eco-region. The projected river flow is divided into surface run-off, sub-surface and base flow. Appendix I provides a detail list of input data for GENRIVER.

²³ Pham H, Vo P, Le VT. 2017. Mapping soil erosion in the Da Dang river basin, Lam Dong province. *Science & Technology Development Journal - Science of The Earth & Environment* (1): 47-56

²⁴ van Noordwijk M, Widodo RH, Farida A, Suyanto D, Lusiana B, Tanika L, Khasanah N. 2011. *GenRiver and FlowPer: Generic River Flow Persistence Models. User Manual Version 2.0*. Bogor, Indonesia: World Agroforestry Centre (ICRAF) Southeast Asia Regional Program. 119 p.

²⁵ Pham TV, Mulia R, Dam VB. 2018. Hydrological assessment of forest cover change and intensification orientations in Ho Ho sub-watershed, Northcentral Coast Viet Nam. In: Mulia R, Simelton E, eds. 2018. *Towards low-emissions landscapes in Viet Nam*. World Agroforestry (ICRAF) Viet Nam, World Agroforestry (ICRAF) Southeast Asia Regional Program, Bogor, Indonesia.

²⁶ Catacutan DC, Do TH, Simelton E, Hanh VT, Hoang TL, Patton I, Hairiah K, Le TT, van Noordwijk M, Nguyen MP, Nguyen TA, Khasanah N, Mulia R, Pham TV. 2017. *Assessment of the livelihoods and ecological conditions of buffer zone communes in Song Thanh National Reserve, Quang Nam Province, and Phong Dien Natural Reserve, Thua Thien Hue Province*. Technical report. USAID-ICRAF Partnership for the Green Annamites project. Ha Noi, Viet Nam: World Agroforestry Centre Viet Nam.

II.4 Scenarios and scope of impact assessment

II.4.1 Scenarios

To assess the potential benefits of implementing GG measures in Lam Dong's GGAP (elaborated in part III) on the provincial economy and ecosystem services, two scenarios were built and compared, namely the Reference (REF) and GG scenario. The REF scenario for LUMENS is built based on the current (2016-2020) provincial planning of the four assessed sectors beside transport and energy. The REF scenario for LEAP is based on 2010-2015 provincial planning of the two other sectors. This is the main reason we use the term Reference than Business-as-usual (BAU) to compare with the GG scenario, because the term BAU should refer to the same time period both for LUMENS and LEAP. Consequently, for LUMENS, the comparison between REF and GG scenario was done 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 were also conducted. We use the term 'projection based on historical trend' for the latter. The main reason we used the period 2016-2020 as reference for LUMENS, because the province has forestry and landuse planning maps until 2020²⁷, and we used as inputs for the assessment. For LEAP, the comparison between REF and GG scenario was done for the period of 2016-2030. Both LUMENS and LEAP were used to make projection until 2030.

(1) REF scenario

This scenario is built based on a review of about 43 provincial planning from the six sectors. Most have a vision until 2030. For example, related to agriculture sector, the province has planned to expand coffee-macadamia system, tea-macadamia, safe-tea plantation, safe-vegetable cultivation, and monoculture coffee plantation. The province also aims to strengthen processing industries for eight commodities namely tea, coffee, vegetable and flower, milk, macadamia, cold water fish, wine and fruit juice, and timber. The targeted inputs of raw materials and production of these industries by 2025 and 2030 are specified in the planning.

(2) GG scenario

This scenario is based on GG measures in the six sectors of Lam Dong's GGAP. For example, some measures related to the agriculture and forestry sectors are:

- Establishment of new ecological corridor connecting the Bidoup Nui Ba and Cat Tien national parks.
- Establishment of four new biodiversity conservation areas as described in the provincial Decision No. 169/QĐ-UBND on planning for biodiversity conservation vision until 2030.
- Conversion of existing monoculture coffee plantations into coffee-based agroforestry and existing monoculture tea plantations into tea-based agroforestry for more climate-smart and sustainable farming practice.
- Conversion of encroached forest lands into timber-based agroforestry and enrichment of barren lands with tree planting
- Improving market value chain for fruit trees. According to the provincial Resolution No. 104/2018/NQ-HĐND, the markets of fruit trees are currently controlled by middlemen. The improved market value chain with increasing participation of farmers as cooperatives, is expected to provide a higher and more stable income.
- Increasing participation of smallholder farmers and relevant stakeholders involved in the production and market value chain of main agricultural commodities, in innovative certification schemes such as those based on the product standard set by qualified private sectors as buyers for a relevant jurisdiction level, or when resources are available, based on the global export standard.
- Introducing better management and technology in production and processing, and better market access through product branding²⁸.
- Strengthen sustainable production of agriculture and forestry products with innovative schemes such as Production-Protection-Inclusion (PPI) and Verified Sourcing Area (VSA) that aim to secure supply side with a competitive price and scale through strengthening public-private partnership at relevant jurisdiction level and prioritize sustainable production within sustainable environment²⁹.

²⁷ These maps have integrated the Provincial REDD+ Action Plan of Lam Dong province for 2015-2020 (PRAP) and road development planning

²⁸ The provincial Resolution No. 104/2018/NQ-HĐND mentions "Da Lat - Miracle from the good earth" as product branding. Please also see: <https://en.nhandan.org.vn/politics/item/7732202-further-promoting-the-brand-image-of-lam-dong-agricultural-products.html>

²⁹ PPI and VSA are promoted by IDH. Please see: <https://www.idhsustainabletrade.com/uploaded/2018/08/VSA-concept-note.pdf>

II.4.2 Scope of impact assessment and data limitation

The assessment of impact of the two scenarios on ecosystem services and provincial economy considered several sources which generate the services and economy as listed below.

II.4.2.1 Assessment of provisioning services

From agricultural lands, the sources include production of food crops such as paddy and vegetables, production of main commercial crops such as coffee and tea including nuts and fruits from the trees integrated into the coffee-based and tea-based agroforestry. From forest lands, the source is timber production in production forests.

II.4.2.2 Assessment of regulating services

GHG emission and removal

This assessment considered the following sources:

- *Landcover change*: there are 30 landcover types considered in the landcover analysis with their associated C storage (Appendix II). Landcover changes will have consequence in the total GHG emission or removal of the province. The province's road development planning was included as a factor of landcover change. Only aboveground emission and removal were considered in the assessment.
- *Agriculture and agricultural practices*: emission from plot management practices such as the use of chemical inputs (e.g. fertiliser and pesticide) for commodities cultivated inside and outside greenhouse and both for annual and perennial crops, from irrigation of paddy field, from crop residue burning practice, mechanical use in plot establishment and harvesting, and from livestock feeding and manure. The GHG removal comes from promoting agroforestry which integrates trees on agriculture lands.
- *Forest conversion*: emission from conversion of forest into other landuses. The GHG removal comes from forest protection measures, enriching barren lands with tree plantation, and introducing tree-based systems in encroached forest lands.
- *Tourism activities*: fuels burned for transportation and facilities such as accommodation related to tourism activities.
- *Transport*: fuels burned for road transportation
- *Waste*: from landfill solid waste, wastewater treatment, and waste incineration.
- *Energy production and consumption*: burning of coal, natural gas, and fuel oil for electricity and heat generation in industry, buildings, residential areas, and power generation, and from grid-connected and independent power generation.

Hydrology of watershed

Several climate projections including from Ministry of Natural Resource and Environment (MONRE) reported a possibility of more contrasting precipitation condition between dry and wet season in the region of Central Highlands including Lam Dong province³⁰. A longer drought is more likely to take place during dry season, with a heavier flash flood during wet season. In terms of air temperature, the temperature in the province in the past 25 years has increased by 0.3-0.5 °C³¹. The assessment by the project "Develop response plan for climate change in Lam Dong province", conducted by Lam Dong's DONRE, which developed three scenarios of regional average temperature of Lam Dong province in the period of 2020 – 2100 namely a low emission scenario (B1), average emission (B2) and high emission (A1F1), predicted a steady increase in air temperature in the province across year until 2100.

The hydrology assessment with GENRIVER model was carried out under current and future climate condition. The former is represented by precipitation and air temperature condition from year 2013-2018 collected from the four main weather stations in the province namely in Da Lat, Bao Loc, Lien Khuong, and Cat Tien. The future climate is represented by the RCP4.5 and RCP8.5 scenarios from MONRE. RCP4.5 predicts higher precipitation across month and RCP8.5 predicts more contrasting rainfall condition between wet and dry season, in which higher rainfall will occur in wet season but lower in dry season, compared to the current condition (Figure 5a). In terms of air temperature, both RCP scenarios predict higher air temperature compare to current air temperature condition (Figure 5b).

³⁰ Please also see: Grosjean G, Monteils F, Hamilton SD, Blaustein-Rejto D, Gatto M, Talsma T, Bourgoin C, Sebastian LS, Catacutan D, Mulia R, Bui Y, Tran DN, Nguyen KG, Pham MT, Lan LN, Läderach P. 2016. Increasing resilience to droughts in Vietnam; The role of forests, agroforests and climate smart agriculture. CCAFS-CIAT-UN-REDD Position Paper n. 1, Hanoi, Vietnam

³¹ <http://www.lamdong.gov.vn/vi-VN/home/news/tin-trong-tinh/Pages/bien-doi-khi-hau-va-ung-pho.aspx>

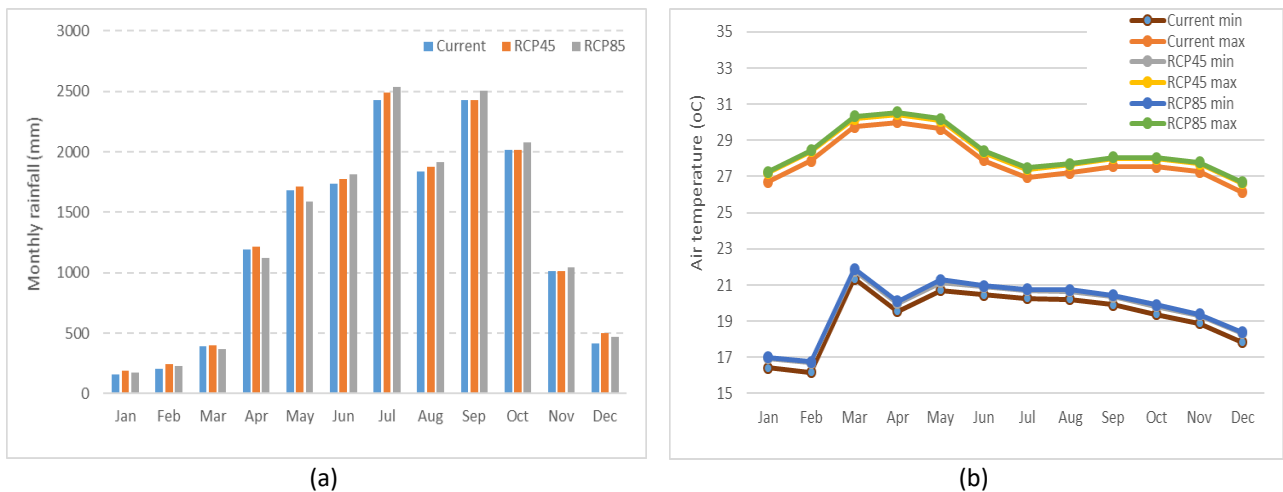


Figure 5 Projection of (a) precipitation and (b) air temperature in RCP4.5 and RCP8.5 for Lam Dong province, compared to current condition

Lam Dong is part of the large Dong Nai watershed which covers surrounding provinces both in upstream and downstream part, and the province is host of seven sub-watersheds (Figure 6) in which some are only partial areas. The assessment of water balance was conducted for each sub-watershed. In addition, the assessment will compare water flow between GG and REF scenario. In the context of this assessment, the difference between the two scenarios is only in tree cover, in which tree cover in GG scenario is higher due to promotion of agroforestry in coffee and tea plantations and in encroached forest lands, and thanks to enrichment of barren lands with forest trees.

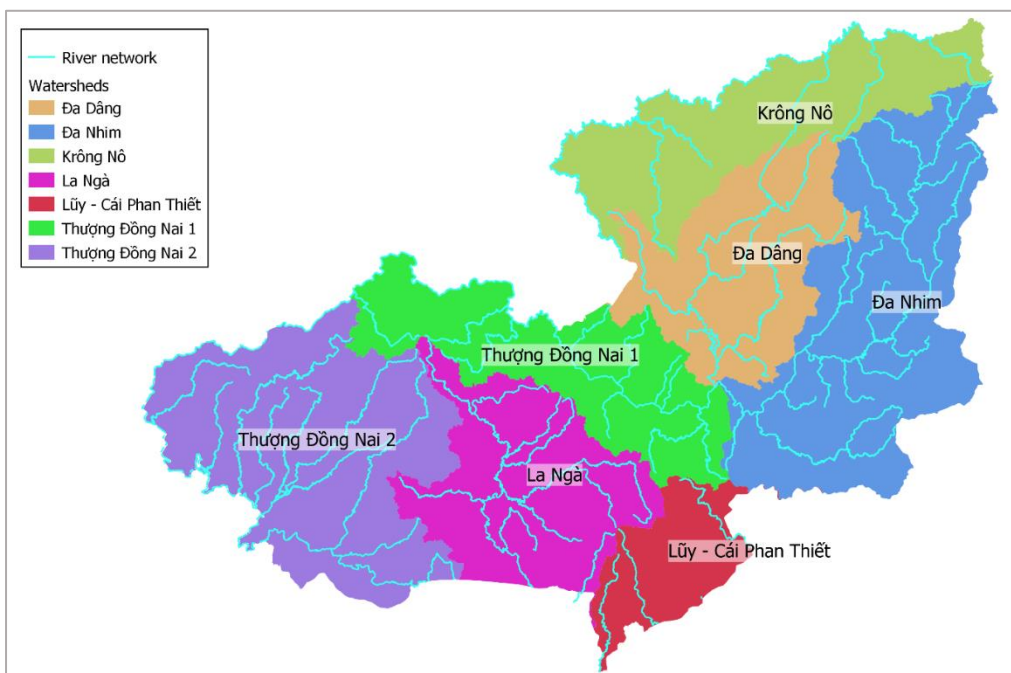


Figure 6 Boundary of seven sub-watersheds in Lam Dong province with stream network

II.4.2.3 Assessment of supporting service

Generally, biodiversity is not considered as an ecosystem service, but biodiversity and ecosystems are closely related concepts. There is a strong evidence on the linkages between changes in biodiversity and the way ecosystems function

(DEFRA 2017)³². Biodiversity is also considered to have insurance value by providing resilience in the face of current or future shocks to ecosystems and the services they provide. Therefore, we herein consider biodiversity as an ecosystem service both in the broad sense that it underpins all ecosystem services and in specific cases where it is itself a service (e.g. the existence value of a species under cultural services). It represents the supporting service. The LUMENS model was used to calculate TECI and DIFA index under the two scenarios for the case of rich broadleaf, rich coniferous, and deciduous forests.

II.4.2.4 Assessment of provincial economy

There were several sources of income considered in this assessment, to include: income from agricultural and forestry products; from processing industries of eight commodities namely tea, coffee, vegetable and flower, milk, macadamia, cold water fish, wine and fruit juice, and timber; from the increase in number of tourists; and from improving market access through product branding.

The income from agricultural and forestry products were calculated based on the total area and production of these products at province level. The incomes from processing industries, tourism activities, and improved market access, were assumed to follow the expected increase in income set in related provincial documents. For example, the provincial Resolution No. 104/2018/NQ-HDND on market value chain describes the potential implementation of product branding for vegetables, flowers, and coffee, with an expectation of increase in trading value by 15% compared to products without branding. Another example, the provincial Decision No. 673-QĐ/UBND on the development strategy plan for tourism until 2020 vision to 2030, has set a target of 30% increase in income from tourism activities by 2020 compared to 2015, and 100% by 2030 compared to 2015. The measures to boost the income include diversifying tourism products, attracting investment both local and foreign investment, enhancing the promotion of tourism programs and facilities to domestic and international markets, and improving skills of workers and stakeholders involved in the tourism sector. These expected increases in income were considered and their impact on provincial income and GRDP were calculated using the Leontief table.

II.4.2.5 Social inclusiveness

Social inclusion will help to achieve various other objectives for GG, including but not limited to the followings³³:

- *Social justice*: Inclusion improves recognition of poor and marginalized groups and their rights, offering them access to services, consultation and decision-making procedures. Biases in the distribution of costs and benefits against them can be avoided and the economies will serve people, not the other way around.
- *Effectiveness*: inclusion can help improve the effectiveness through improved market size (inclusion increases the number and type of people involved in green activity), real livelihoods (inclusion focuses on jobs for the many, and on the informal economy), and addressing root causes of exclusion (inclusion bring many players into a process that complements and challenges elites).
- *Economic efficiency*: inclusion helps improve economic efficiency through healthy competition (shifting from privileged suppliers to others who can assure long-term, pro-poor green outcomes), and improved productivity and total welfare (by means of diversifying the economy and optimizing the social co-benefits of GG).
- *Sustainability*: inclusion contributes to sustainability through enhanced economic and social resilience, strengthened safety and security and public support for GG.

In Vietnam, implementation of social inclusion in development and implementation of national and local policies and programs is guided by specific legal documents, the key ones are:

- Constitution (November 28, 2013): Article 3, Article 5, Article 14, Article 15, and Article 16
- Law on Promulgation of Legal Documents (Law No. 80/2015/QH13, June 22, 2015): Article 6 (Contributing opinions to draft legal documents), Article 9 (Translation of legal documents into ethnic minority and foreign languages), Article 127 (Proposal for preparing decisions of Provincial-level People's Committees), Article 128 (Drafting decisions of Provincial-level People's Committees) and Article 129 (Getting comments on draft decisions of Provincial-level People's Committees).
- Grassroots Democracy Ordinance (No. 34/2007/PL-UBTVQH11, April 20, 2007): whole document

³² DEFRA (Department for Environment, Food and Rural Affairs of the United Kingdom). 2017. An introductory guide to valuing ecosystem services. Defra Publications, London.

³³ Bass S, Steele P, Toulmin C, Greenfield O, Hopkins C, Chung I and Nielsen T. 2016. Pro-poor, inclusive green growth: experience and a new agenda. GGGI, IIED and GEC.

- Planning Law (Law No. 21/2017/QH14, November 24, 2017): Article 4 (Basic principles in planning), Article 12 (Rights and responsibilities of agencies, organizations, communities and individuals in commenting and supervising planning activities), Article 13 (Prohibited acts in planning activities), Article 19 (Getting opinions in planning process), Article 21 (Compulsory contents of the planning work), Article 31 (Dossiers for appraisal of planning work), and Article 35 (Application for approval of master plan)
- Gender Equality Law (Law No. 73/2006/QH11 dated November 29, 2006): whole document
- In addition, Vietnam has also ratified the United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP). However, Vietnam does not have any specific legal regulations on the participation of ethnic minorities.

In the development of Lam Dong's GGAP, social inclusion was addressed through several ways including three consultation workshops. In the workshops, invited participants include diverse groups of people/representatives such as from governmental agencies, social organizations, Father's Front, Women's Union, Farmers' Union, Ethnic Minorities Board, Youth Union, and local communities. The feedbacks obtained from these representatives were attentively recorded and used to enhance the quality of the draft GGAP. It was consented that the province's Department of Planning and Investment (DPI) would support for broadened social inclusion during the GGAP development by consulting and transmitting feedbacks from larger social groups to the GGAP working group, and it was expected that after receiving the draft of GGAP from the working group, DPI would continue to implement social inclusion measures.

II.4.2.5 Data limitation

Lam Dong's GGAP demonstrated a possibility of developing provincial GGAP in Vietnam using an integrated, spatially explicit and quantitative approaches, which provide scientific-based information for developing measures and setting the targets. For these approaches to be effective, quality spatial and non-spatial inputs data need to be prepared and available in specific formats according to the those required by the assessment tools. During the development of the province's GGAP, we faced serious challenges in obtaining these data:

(1) Spatial data in the form of maps

In Vietnam, provincial forestry and landuse planning maps are produced by two different agencies, namely Department of Agriculture and Rural Development (DARD) for forestry and Department of Natural Resource and Environment (DONRE) for landuse map. For assessment tools like LUMENS, the two maps often need to combine to produce provincial landcover map. However, some inconsistencies when overlaying the boundary of forestry and landuse planning often occur. During the development of Lam Dong's GGAP, such inconsistencies were highlighted and discussed with the province's DARD and DONRE to arrive at consented boundaries by the two departments. In addition, some differences between the forestry and landuse maps are found in the level of detail of land classification, in the format of maps produced, and in geometry projection. The landuse map by DONRE has a more detail classification of land type compared to forest maps produced by DARD. Therefore, combining the two maps for producing landcover map needs to pay a lot of attentions to these different land classifications. In terms of map format, DARD usually produces forestry maps in Mapinfo format (.TAB), while DONRE produces landuse map in Microstation format. In addition, some maps are not available in digital format, only in image format. This lack of input maps in digital format also occurs for development planning of other sectors such as transportation and tourism planning. Some provincial authorities claimed that a lot of digital maps lost during the office reallocation in 2014-2015. The spatial coordinate system of some forestry and landuse maps are different likely because of different approaches applied by different consultants who produced the maps. All these inconsistencies and limitations made the process of preparing spatial input data for the assessment took a lot of time.

(2) C stock data

To assess the impact of GG measures on GHG emission, reliable C stock data for different landcover types are necessary, especially for different types of forest, annual and perennial crops. In Lam Dong's GGAP, 30 landcover types were considered, and the input C data for these landcovers were obtained from literature. For some landcovers such as forests, the data were obtained from studies conducted in Lam Dong³⁴, while for other landcovers, relevant data from studies in other sites were used. For assessment with LUMENS, since the age of perennial crop systems in the input landcover maps are unknown, time-average C stock data were used for these systems. The province needs to find or

³⁴ For example, from: USAID. 2013. Land use, forest cover change and historical GHG emission from 1990 to 2010 in Lam Dong province, Viet Nam. Project report. USAID-funded Lowering Emissions in Asia's Forests. Ha Noi, Vietnam.

allocate resource for collecting primary data of C stock for main landcover types. Non-destructive and rapid methods for C measurement are available in the literature³⁵.

(3) Inter-sector economic table

The use of Leontief table is one of reliable method for assessing impact of economic activities on provincial GRDP. In addition, the table can inform which economic sectors have stronger 'backward' (when the sectors receive inputs from other sectors) and 'forward' (when the sectors provide inputs to other sectors) contribution. For Lam Dong's GGAP, since such table is not available for any year as input for LUMENS, a table for year 2016 was produced by an expert using data from General Statistics Office (GSO). No data were available to produce more recent table. It is important that relevant authorities in Lam Dong and other provinces have a capacity in producing inter-sector economic table for estimating GRDP and other purpose. The country has experts who can provide guidance on how to construct such table and input data collected by GSO.

(4) Input data for estimating investment cost

In Lam Dong's GGAP, the investment cost of each GG measure was estimated. However, compared to energy sector, input data to estimate the investment cost of measures in other five sectors are much more limited. During the series of consultation meetings, the province's authorities repeatedly confirmed this limitation. Therefore, for the five sectors other than energy, the input data for investment cost were largely obtained from literature and not necessary literature on Lam Dong. Consequently, the provided investment costs for the five sectors should be considered as coarse estimates only.

³⁵ For example: Hairiah K, Sitompul SM, van Noordwijk M, Palm C. 2001. Methods for sampling carbon stocks above and below ground. ASB Lecture Note. Bogor, Indonesia.

III. Green Growth Orientations for Lam Dong

III.1 Nine orientations

The Lam Dong’s GGAP consists of nine orientations. The orientations are further elaborated into measures and activities.

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

This orientation aims to promote the development and use of renewable energy, such as solar and wind power, as well as biogas with advanced technology, to support livelihood, production and economic growth in the province. A wide use of these endless and clean sources of energy can potentially contribute to the reduction of GHG emission. In addition, the sources of non-renewable energies in the province have been gradually depleted, demanding an exploration of new and more sustainable energy sources. Furthermore, the use of renewable energy is suitable in rural and upland areas, since providing infrastructure for non-renewable energy sources in remote areas presents a challenge. The sources of biogas as a type of renewable energy are also plenty in rural areas, taken from the remnants of crops or livestock. Figure 7 shows the list of measures as part of this orientation, classified into three categories namely those for enhancing energy efficiency, promoting the shift of energy and fuel demand into more renewable energies, and promoting the development of renewable energy plants.

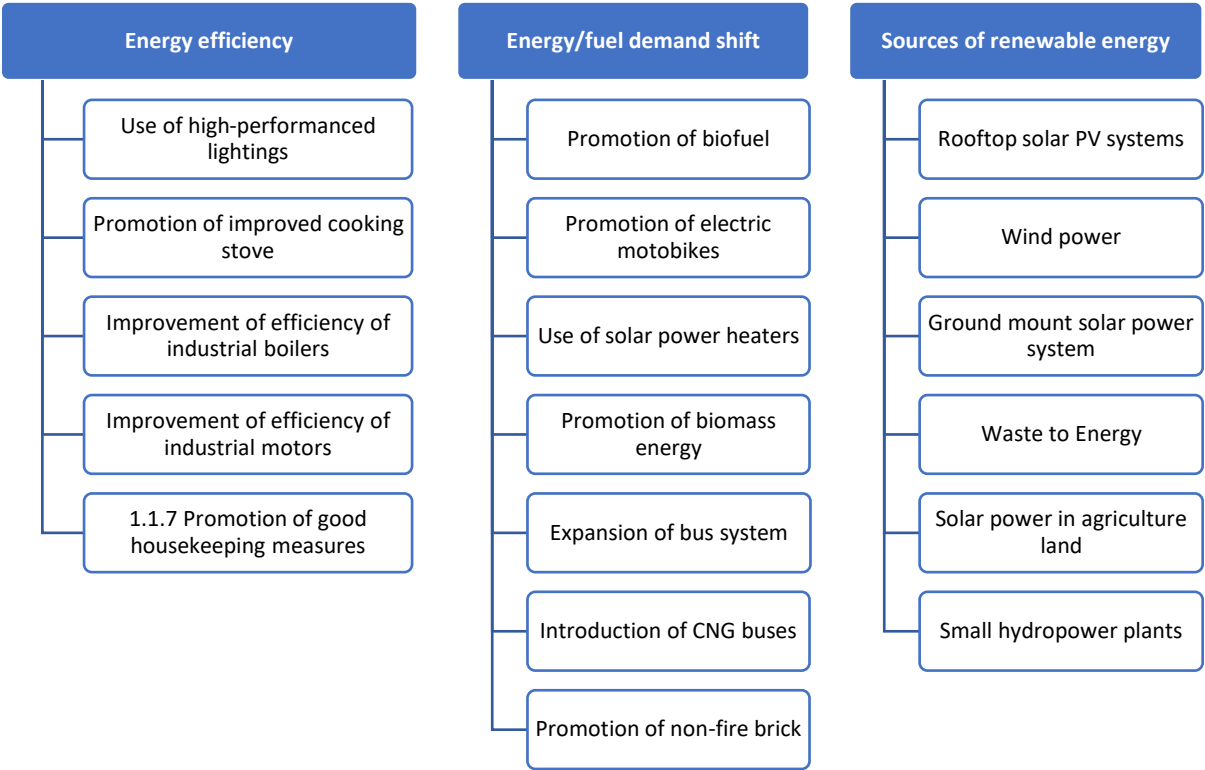


Figure 7 Mitigation measures for energy sector

(2) Reduce GHG emissions from all sectors

Emissions from the three main sectors (agriculture, industry, and service) must be controlled and reduced. The agriculture sector contributes through the expansion of greenhouses and plot management practices such as fertiliser and pesticide application, livestock raising and from conversion of forest lands. Deforestation is predicted to continue to occur in the province, due to lack of awareness from local communities and infrastructure development. The industry and service sector contribute through emission from operating industries, commercial buildings, accommodation, and power generation. The emission from solid waste landfill, wastewater and waste incineration are also high. This orientation promotes several measures to reduce the GHG emission. For example, in agricultural sector, the greenhouse expansion rate is expected to reduce by half compared to the baseline rate through imposing higher tax for building greenhouse; lower emission from plot management practice is expected through the promotion of

agroforestry which integrates nitrogen-fixing trees into the systems; and lower emission from livestock raising is expected through innovative manure management and improved quality of livestock feeds.

(3) Control waste production and improve waste treatment

To develop its industry sector, the province has plans to expand and innovate in the industrial zone during the period of 2020-2025. This development will produce waste, both solid waste and wastewater, which, if not controlled and treated, will lead to soil and environmental pollution, and become a threat to human health. In the agricultural sector, the uncontrolled use of chemicals, such as fertilizers and pesticides, leave solid waste such as plastic bottles which are not recyclable and difficult to process. Livestock raising can also lead to water pollution from improper manure management. The mitigation options and targets from waste sector are mainly based on the Decision No. 2149/QĐ-TTg on the national strategy on integrated solid waste management by 2025 vision to 2050 and Decision No. 1930/QĐ-TTg on orientation for development of urban and industrial drainage in Vietnam up to 2025 vision to 2050. According to the Decisions, by 2025 Vietnam should build solid waste management facilities in most of the main cities. Solid wastes should be classified at source, collected, reused, recycled and thoroughly treated with appropriate and advanced technologies, minimizing the amount of burial solid waste in order to save land resources and limiting environmental pollution. Hazardous solid waste should be managed and treated appropriately. For wastewater, concentrated sewage treatment facilities should be gradually built in most of the main cities. Industrial wastewater must be treated before being discharged into municipal sewers or discharged into the environment. As mentioned earlier, Lam Dong currently has two general waste treatment facilities, located in Da Lat and Bao Lam. These two facilities apply waste treatment systems including: composting, solid waste recycling, and waste incinerating without recovering heat for electricity, therefore waste has been processed but GHG emission is not necessarily reduced, partly transformed from one form of emission into another. Moreover, with their current capacity, these two facilities can only handle up to 30% of the generated solid waste. In line with the national policy, the GG scenario targets facilities that can handle 60% of solid waste generated in the province by 2030. One feasible solution is building a new solid waste treatment facility in Duc Trong district with a processing capacity of 400 tons/day, in which the technologies applied will be composting, recycling solid waste and burning garbage to generate electricity with a capacity of 5 MW. In addition, the scenario also targets an increase in the capacity of the facility in Bao Lam to handle 300 tons of waste per day. Proposed solutions introduced in GG scenario include strengthening organic fertilizer manufacturing, solid waste recycling, and incineration of flammable waste for electricity.

(4) Promote climate-smart and sustainable landuse systems

There is a need to develop more resilient and sustainable farming practices in the province, to ensure production and enhance farmer's resilience to potential economic and environmental risks. Agroforestry can become a feasible option due to its resource-use efficiency, product diversification, and potential to generate higher and more stable income. According to the province's statistic book, in 2017, the total area of coffee plantation reached about 170 thousand ha and tea plantation about 13 thousand ha, spread across the province (Figure 8). Coffee and tea agroforestry existed but the area is not reported in the statistic book, and likely very limited. This orientation promotes the conversion of at least 30% of existing coffee and tea plantation into agroforestry by 2030. Coffee- and tea-fruit tree system can be developed, in addition to coffee- and tea-macadamia. According to the provincial Resolution No. 104/2018/NQ-HĐND, many farmers are converting their tea plantation into fruit tree plantation for pursuing higher economic return. The conversion has limited the supply of raw materials for tea processing industries. The tea-fruit tree agroforestry can potentially reconcile the economic pressure and the need to maintain supply for the processing industry. A massive conversion of coffee monoculture to agroforestry will undoubtedly decrease the total production of coffee at province level, however production of other products from the agroforestry systems such as nuts and fruits will increase and provide high economic benefits for smallholder farmers. There have been several guidelines on how to establish coffee agroforestry in Vietnam³⁶.

³⁶ For example: the 'Good Agricultural Practices for Robusta Coffee production' by MONRE and National Agriculture Extension Centre for Robusta; and Kuit M, Jansen JM, Nguyen VT. 2004. Manual for Arabica cultivation. Tan Lam Agricultural Product Joint Stock Company and PPP project "Improvement of Coffee Quality and Sustainability of Coffee Production in Viet Nam", Quang Tri, Vietnam, for Arabica.

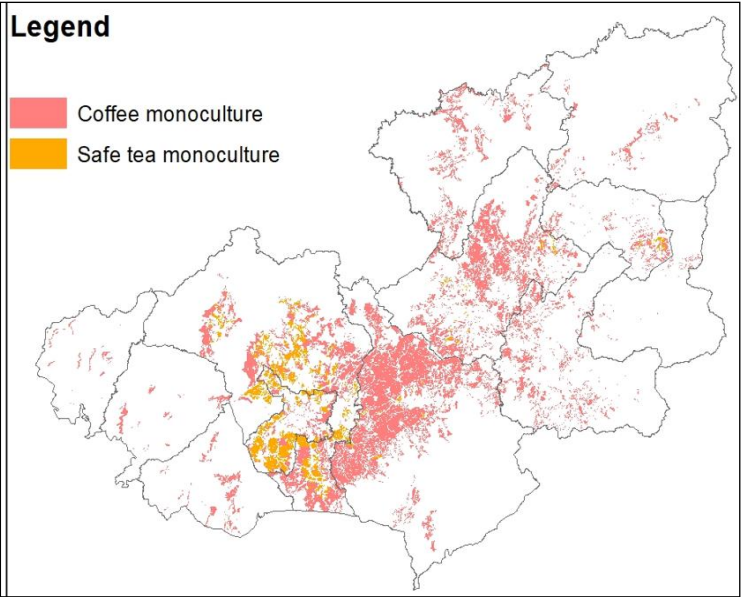


Figure 8 Potential expansion areas of coffee and tea agroforestry

In addition, agroforestry in the form of timber-based system is feasible option to develop in encroached forest lands that have been illegally converted into crop cultivations by local people living in the forest margins. The total area of such encroached forest lands was estimated to reach 45 thousand ha and spread across the province (Figure 9). A thorough conversion of these lands by 2030 into timber-based agroforestry can be targeted.

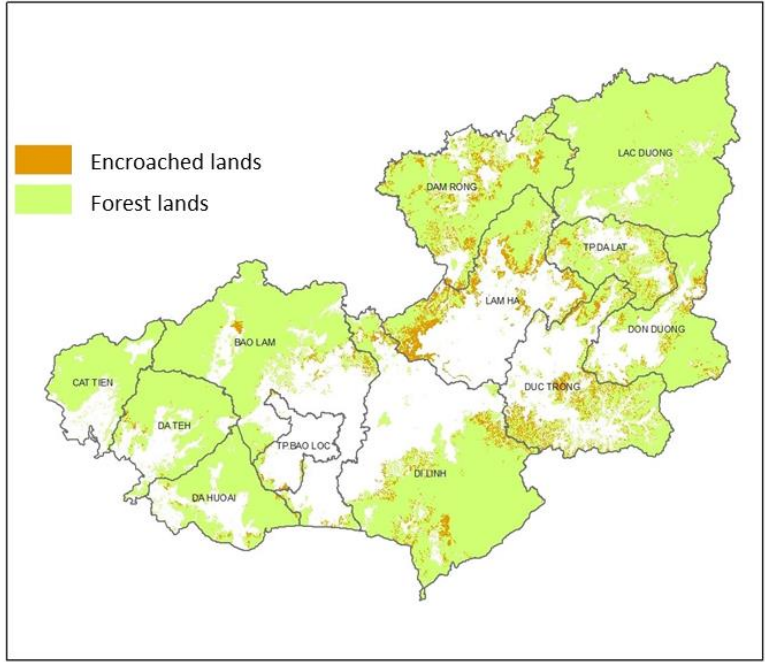


Figure 9 Encroached forest lands for crop cultivation in Lam Dong province

(5) Conserve water, natural resources and biodiversity

This orientation largely emphasizes the need of halting forest conversion into other landuses, especially for crop plantation and residential areas. In addition, it promotes enrichment of barren lands inside forest protection zones (Figure 10) with forest trees. This will lead to a substantial reduction in GHG emission and more sustainable conservation of natural resources especially water, and biodiversity. This orientation supports the two biodiversity conservation programs planned by the province, namely the biodiversity corridor connecting the Bidoup Nuiba and Cat

Tien national parks, and the four new biodiversity conservation areas, as described in the provincial Decision No. 169/QĐ-UBND (Figure 11).

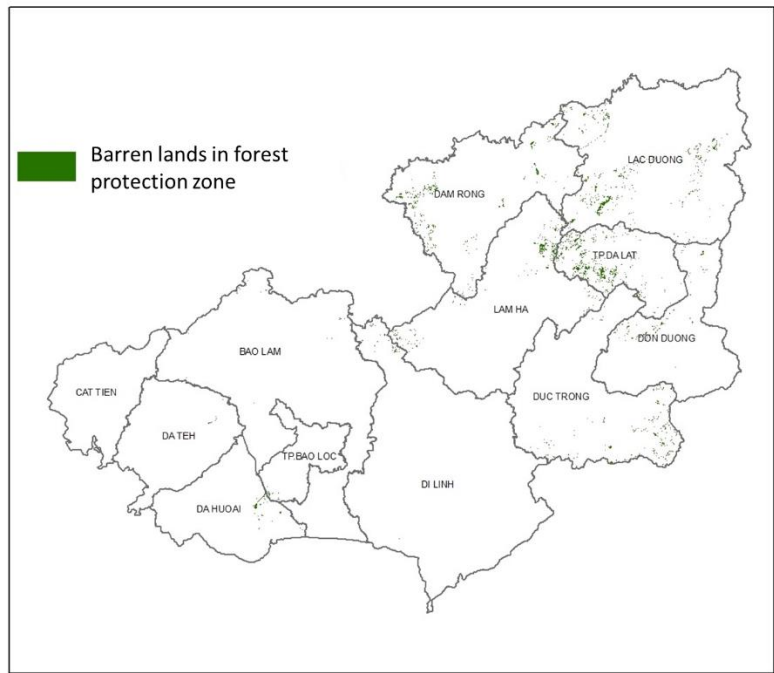


Figure 10 Distribution of barren lands within Lam Dong’s forest protection zone

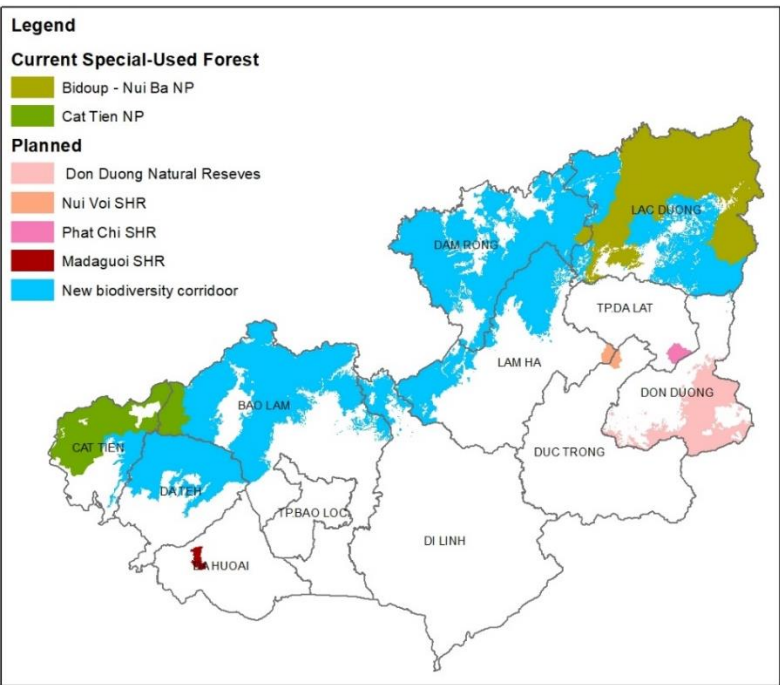


Figure 11 Plan of ecological corridor and new conservation areas in Lam Dong province

In addition, this orientation encourages the state forest enterprise (SFE) of Lam Dong province to participate in the sustainable forest management (SFM) standard. The areas associated with these SFEs are shown in Figure 12.

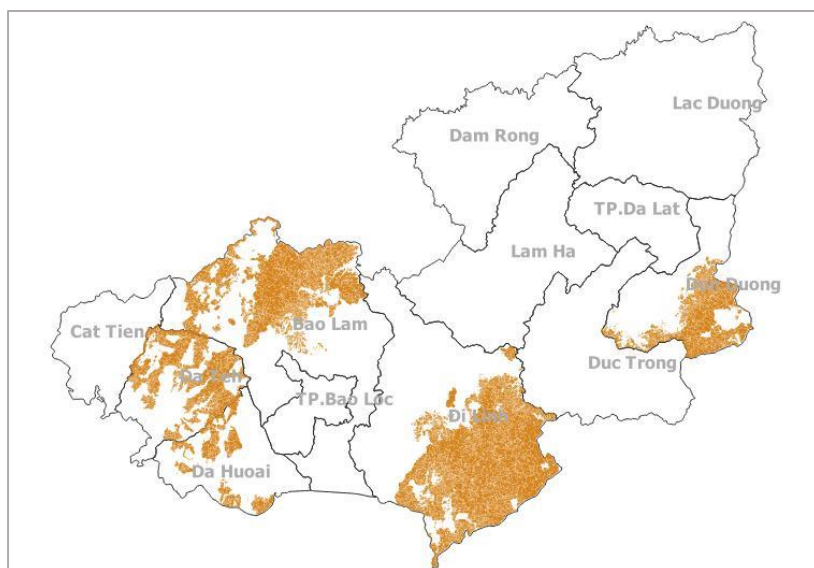


Figure 12 Forest areas of state forest enterprise in Lam Dong province encouraged to participate in sustainable forest management standard

The main challenge for the forestry sector is how to reconcile the forest protection and the pressure from rapid population growth, agricultural expansion, and infrastructure development in the province. Therefore, there is a need to ensure the participation of all relevant stakeholders in the process of developing and implementing the forest planning, and in the monitoring and evaluation of the plans. Furthermore, a reconciliation can be achieved when the following factors are adequately addressed in the forest development planning: (1) demand for land from other sectors, particularly agriculture, infrastructure and tourism; (2) social demand for products derived from forests (natural wood, non-timber forest products etc.), and (3) the livelihoods of local communities living in and in the forest edge. The promotion of agroforestry in agricultural lands and in encroached forest lands can reduce further pressure to the remaining forests. This orientation also promotes the enrichment of home gardens with trees for households living in the forest margins.

(6) Enhance market access and export of main commodities

According to the province's Resolution No. 104/2018/NQ-HDND, the agriculture and forestry production in the province are largely quantity- rather than quality oriented, with low added value due to weak processing industries. This leads to a low competitiveness both in the national and international market. The province's agro-processing industries, although develop rapidly, are mostly for preliminary process of raw materials without attributing added value. In addition to the need of more advanced technology in the production and processing industry, this orientation emphasizes the need of enhancing participation of stakeholders and industries involved in the production and market value chain in innovative product certification schemes. The scheme can be based on the deal between farmer's cooperative as producers and private sectors as buyers at relevant jurisdiction level such as promoted by IDH through their PPI program, or if resources are available, for the producers to meet an international product standard for export market. This orientation also supports the province's planning to create product branding for better market access and increasing trading value.

(7) Develop green and sustainable tourism

The province has an ambition to become one of main tourist attractions in Central Highland region and in the country. It has a targeted number of domestic and international tourists by 2025 and 2030 and a plan to develop accommodation and other facilities. This orientation aims to maintain Lam Dong as a green-clean-beautiful province and to keep it attractive for tourists without compromising environmental values. As part of achieving this objective, it emphasizes the need of developing a 'code of conduct' for all stakeholders involved in tourism business, including the tourists themselves, as a guidance for 'responsible' tourism which highly respects environmental protection and local heritages. Furthermore, involvement of local communities, including ethnic minorities, in the tourism activities with fair profit sharing is deemed as necessary to develop a sustainable tourist sector. This orientation also encourages the tourism business to strive to meet the international criteria of sustainable tourism such as those developed by the Global Standard Tourism Council, which consist of four main criteria namely sustainable management of tourism

activities; ability to provide favourable impacts to socio-economy; not compromising preservation of cultural values; and not compromising preservation of environmental services and instead providing favourable impacts to environment through reasonable and responsible consumption of available resources, avoiding activities which lead to environmental pollution, and supporting the conservation of biodiversity and landscapes. Furthermore, this orientation highlights the need to link sustainable tourism with other efforts recommended in other orientations such as forest conservation and waste control.

(8) Promote green lifestyle and sustainable urban consumption

This orientation emphasizes the need of adopting a green lifestyle and sustainable consumption by all communities in the province, to include all stakeholders involved in the agriculture, industry and service sectors. These are achieved mainly through increasing awareness of all communities on the importance of protecting environment, mainstreaming the need of responsible use of natural resources, the importance of controlling waste, developing green technologies, and applying sustainable consumption models. Law enforcement and strict sanction are also deemed necessary.

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

This orientation highlights that the transition towards a green economy needs a strengthened investment in green economic sectors with attractive incentive 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. In addition, any initiatives to attract investment should be cost-effective with a clear and credible guidance to investors.

The nine orientations complement the priorities in the existing environment and economic policy in the province. Linking with the GG conceptual framework described earlier, they cover the whole nature-economy cycle. Production is supported by orientation 1 and 4, and consumption by orientation 7 and 8, linked by trading supported by orientation 6. Impacts of economic activities on nature system are minimized by implementation of orientation 3, while maintaining sustainable supply of raw materials, energy and other resources to the low-emission economy supported by orientation 2. The service functions of natural system to provincial economy are supported through implementing orientation 5, with conservation of forest, biodiversity and water. Orientation 9 is enabling condition for effective GG implementation.

Linking with the three pillars of GG, reducing GHG emission relates to orientation 1-4 and 7-8; greening production relates to orientation 1-3 and 7-8; green lifestyle and sustainable urban consumption relate to orientation 1, 3, 7-8. The preservation of ecosystem services and enhancing market access are explicitly addressed in Lam Dong's GGAP through orientation 5 and 6 respectively. The need of enabling condition for effective GG implementation is explicitly addressed through orientation 9.

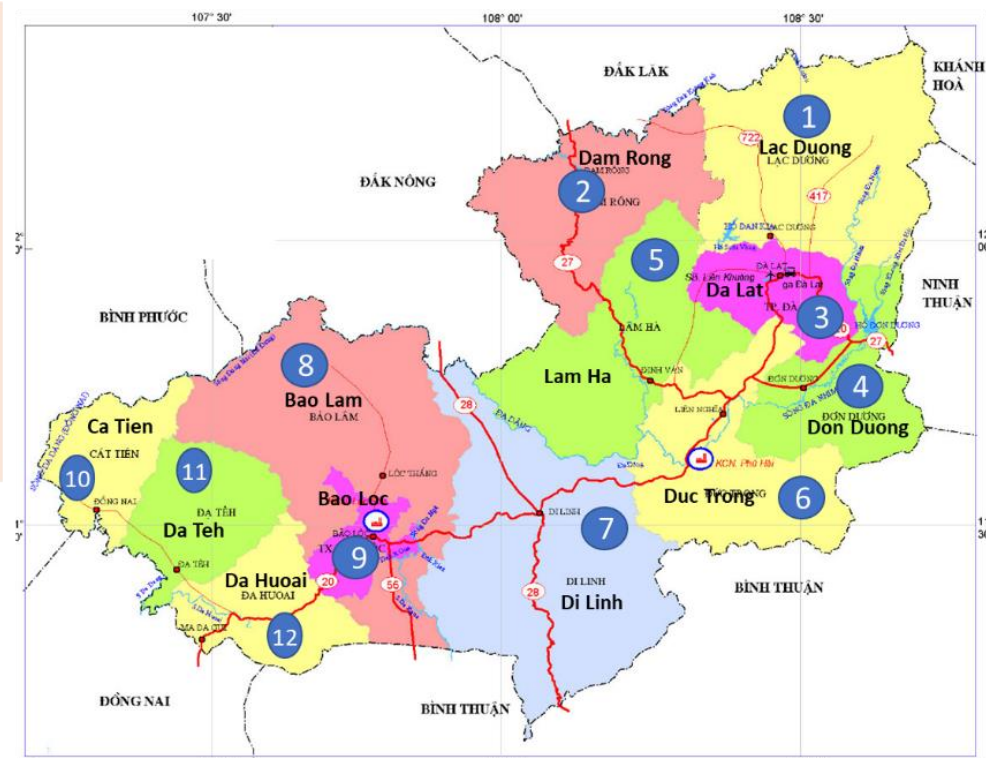
Each orientation is elaborated into potential measures with targeted districts and related policies (Appendix III), desired outcomes and targets to achieve by 2030 (Appendix IV). Furthermore, to facilitate operational purpose, the measures are classified into the six assessed sectors with estimated investment cost (Appendix VIII). The section on Roadmap below describes further elaboration of each measure into e.g. activities and implementation time plan.

III.2 Main measures by district

The GG measures as part of the nine orientations cover all districts in the province. Figure 13 describes main measures by district, considering the intensity of economic and environmental issues in the districts which are potentially solved through the measures. For example, control of solid waste and wastewater target all districts due to its importance and urgency to implement across the province, however in terms of quantity of waste produced and the risk of environmental pollution caused by uncontrolled and untreated waste, the priority can be given to the two big cities namely Da Lat and Bao Loc. The promotion of climate-smart and sustainable farming system such as agroforestry, also target the whole province; however, it can prioritize districts with large areas of coffee and tea such as Di Linh, Don Duong, Lam Ha, Duc Trong, and Bao Lam districts. The biodiversity conservation efforts can focus on districts under the planning of biodiversity corridor and the four new conservation areas.

- Deforestation-free district [all districts]
- Climate-smart and sustainable agriculture practice [4,5,6,7,8]
- Sustainable Forest management [4,7,8,11]
- Biodiversity conservation [1,2,4,5,8,10,11]
- Reduce greenhouse expansion [1,3,6]
- Innovative PFES policy [all districts as part of watershed]

- Farmer's cooperative and market value chain [1,3,4,5,6,7,8,12]
- Certification scheme [all districts especially 1,2,5,7]
- Branding [all districts especially 1,2,5,7]



- Renewable energy [all especially 3,9]
- Control solid waste and wastewater especially hazardous from agriculture, industry and service sector [all especially 3,9]

- Green and sustainable tourism with unique, diverse and high value-added tourist services, that promote local cultures and products [all especially 3,9]
- Green and sustainable tourism with environmental-friendly tourist packages and products [all especially 3,9]

- Green lifestyle and sustainable consumption in all sectors, both by local community and industries [all especially 3,9]

Figure 13 Main green growth measures by district

IV. Potential benefits from implementing Lam Dong's GGAP

IV.1 Lower GHG emission from all sectors

IV.1.1 Emission from landuse change

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 (Figure 14). The area of other perennial crops decreases across year due to conversion into coffee, safe tea, safe vegetables and other landuses. Due to the conversion of coffee and tea monoculture into agroforestry, the areas of the monoculture systems are lower in GG compared with REF scenario, while the areas of agroforestry systems are higher. The conversion of encroached forest lands into timber-based system, makes the area of timber agroforestry is apparent in GG scenario. Furthermore, the enriched barren lands with trees are classified into broadleaf forests which made the area of this forest category is higher in GG compared to REF scenario by 2030. The spatial distribution of landcovers in GG scenario by 2030 is shown in Figure 15.

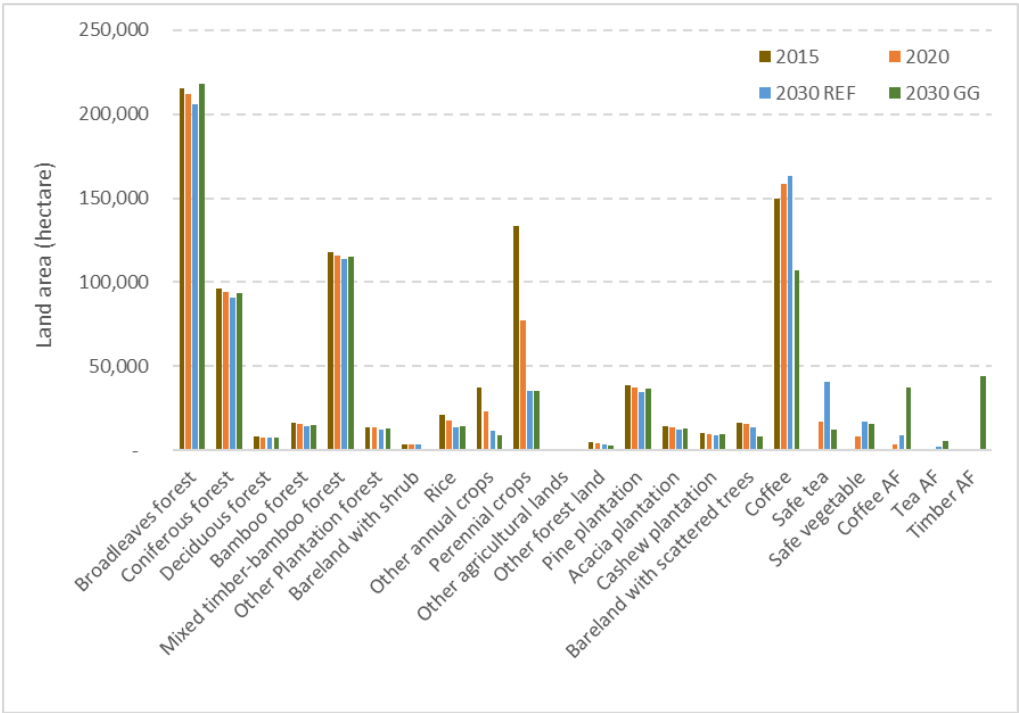


Figure 14 Area of different landcovers in Lam Dong province across year (AF: agroforestry)

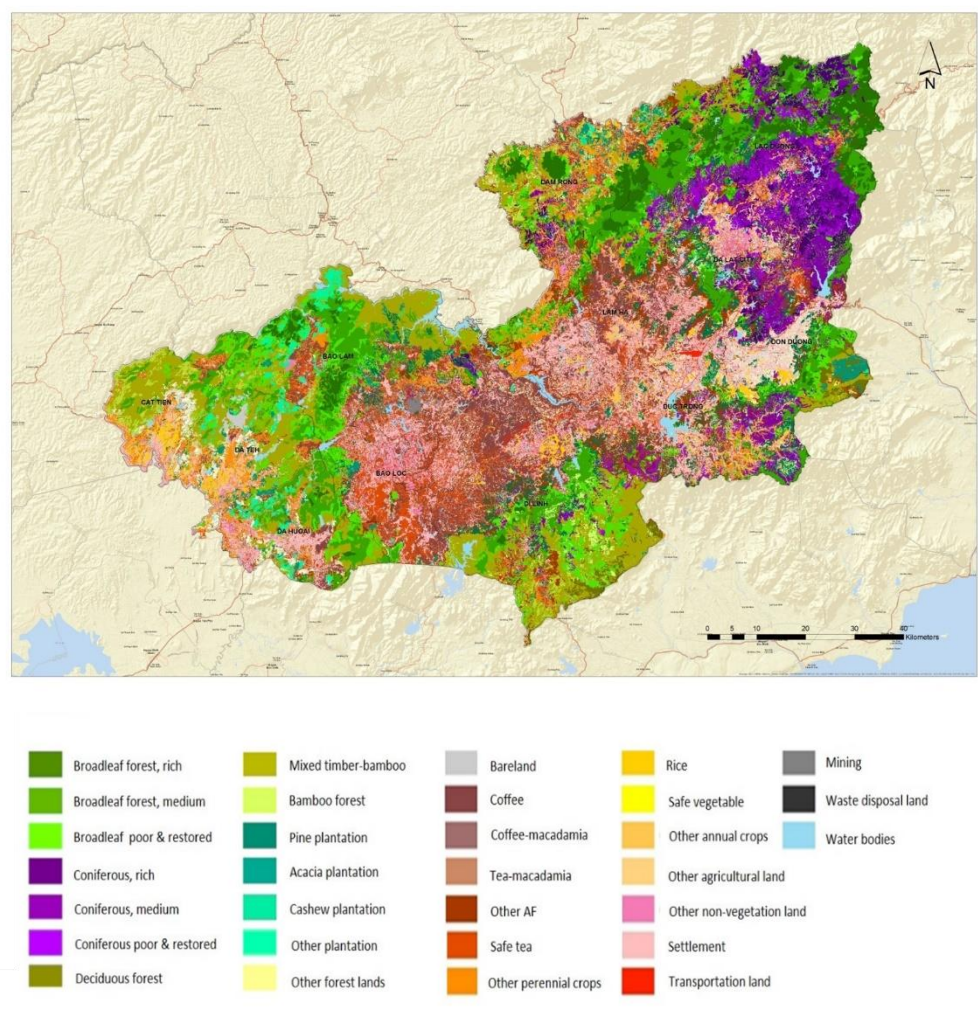


Figure 15 Projected landcover distribution in Lam Dong province in 2030 with GG scenario ('other AF' includes coffee- and tea-based agroforestry with fruit trees)

Mainly due to measures which promote agroforestry, timber-based systems in encroached forest lands, and enrichment of barren lands with forest trees, the total GHG removal in GG scenario from 2021 to 2030 is projected to be higher than GHG emission (Table 3). In this scenario, the total net emission in 2021-2030 is projected to be -0.2 million CO₂ eq., while in REF scenario reaches 3.4 million CO₂ eq. Figure 16 shows the locations of sources of GHG emission across the province.

Table 3 GHG emission from landuse change in Lam Dong province from 2015 to 2030

	Unit	2015-2020	2021-2025 REF	2026-2030 REF	2021-2030 REF	2021-2025 GG	2026-2030 GG	2021-2030 GG
GHG emission	million CO ₂ eq.	4.4	2.8	2.3	5.1	1.5	1.2	2.7
GHG removal	million CO ₂ eq.	0.98	0.9	0.8	1.7	0.8	2.1	2.9
Net emission	million CO ₂ eq.	3.4	1.9	1.5	3.4	0.7	-0.9	-0.2

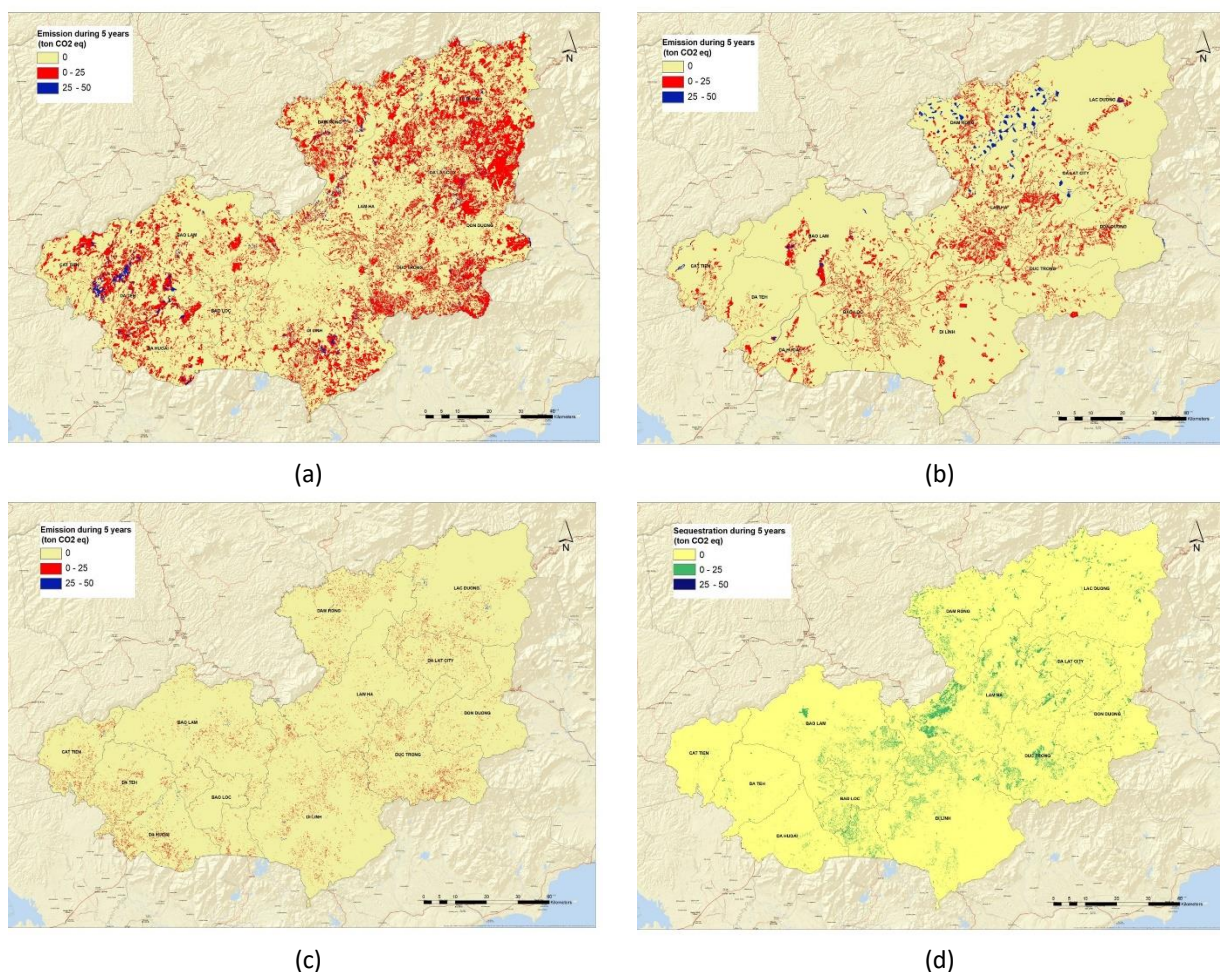


Figure 16 GHG emission from landuse change in (a) 2010-2015, (b) 2015-2020, (c) 2025-2030 REF, (d) and 2025-2030 GHG removal in GG scenario

IV.1.2 Emission from agricultural practice

The GHG emission from agricultural practices were considered to come from different sources namely fertilizer application, burning of crop residue, paddy irrigation, and greenhouse. For the residue burning, it comes from residue of annual crops and paddy. The total emission in GG scenario in 2030 is projected to be lower than the emission in the same year in REF condition (Table 4), mainly due to expansion of coffee and tea agroforestry which require less chemical inputs than monoculture plantations, and lower expansion rate of greenhouse. According to Nestle coffee company in Central Highlands, coffee agroforestry can potentially save fertilizer input by 20% compared to monoculture. All emission factors were based on IPCC guidance.

Table 4 Total emission from agricultural practices in Lam Dong province

Landuse	2015	2020	2030 REF	2030 GG
Rice	609,987	523,089	388,440	407,947
Other annual crops	575,895	350,849	105,073	75,347
Other agricultural lands	2,138	1,726	815	797
Perennial crops	70,238	40,629	18,613	18,710
Coffee	78,970	83,461	85,861	56,323
Safe tea	-	13,611	32,791	9,994
Safe vegetable	-	1,343	2,859	2,629
Coffee AF	-	1,308	3,626	15,573
Tea AF	-	446	1,162	446

Other AF systems	-	-	-	18,556
Greenhouse	977	4,434	7,999	5,827
Total	1,338,205	1,020,897	647,238	612,150

IV.1.3 Emission from livestock raising

The reduced emission from livestock raising was considered to come from two sources namely improved feeding and manure management. In GG scenario, an innovative management for pig manure that can reduce emission by about 80% per pig head compared to traditional manure management which directly discharges to environment is promoted³⁷. Furthermore, the emission from cattle raising can be expectedly reduced by around 15% through improved diets³⁸. No specific measure was introduced to improve feeding and manure management of other livestock. The population of livestock in 2021-2030 was linearly projected based historical population obtained from the province's statistic book. For the pig population, no consideration on the impact of the outbreak of African swine fever which hit Vietnam in 2019 including Lam Dong province was considered in the assessment. The innovative manure management and improved quality of feeds result in lower GHG emission in GG compared to REF (Table 5). All emission factors were based on IPCC guidance.

Table 5 Emission from different types of livestock

Livestock	Year	Projected population (thousand head)	Total emission (ton CO ₂ eq.)	
			REF	GG
Cattle	2020	140	245,375	216,981
	2025	226	395,179	349,451
	2030	364	636,439	562,794
Buffalo	2020	13	18,498	18,498
	2025	11	15,297	15,297
	2030	9	12,650	12,650
Pig	2020	537	107,473	79,262
	2025	808	161,603	119,182
	2030	1,215	242,996	179,209
Poultry*	2020	7,105	3,553	3,553
	2025	9,965	4,983	4,983
	2030	13,977	6,989	6,989

*only emission from manure not feeding

IV.1.4 Emission from energy production and consumption

In REF scenario, the province's energy demand in 2016-2030 is estimated to increase by 6.4% per year, from 512 ktoe to 1,226 ktoe. In addition, the structure of energy consumption will change substantially. The share of energy consumption from industry, commerce and service, and agriculture sectors increase from 41.8%, 2.8% and 2.6% in 2016 to 50.9%, 4.4% and 3.9% in 2030 respectively. The share from transportation and residential areas decrease from 30.6% and 22.3% to 25.6% and 15.2% respectively. In terms of fuel consumption, in 2016, coal was the most utilized, followed by gasoline and electricity (Figure 17). In 2030, diesel is estimated to be the most utilised, followed by coal, electricity and gasoline. The increase in energy demand leads to an increase in GHG emission, estimated by 7.5% per year over 2016-2030, from 1.84 million tons CO₂ eq. to 5.07 million tons CO₂ eq. In terms of sector, industry is estimated to be the main GHG emitter by 2030, followed by transportation and residential areas (Table 6).

³⁷ Please see Nguyen et al. (2017). Assessment of greenhouse gas emissions from the pig production in Lam Dong. <http://stdjsee.scienceandtechnology.com.vn/index.php/stdjsee/article/view/439>

³⁸ Please see e.g. <https://academic.oup.com/af/article/9/1/69/5173494>

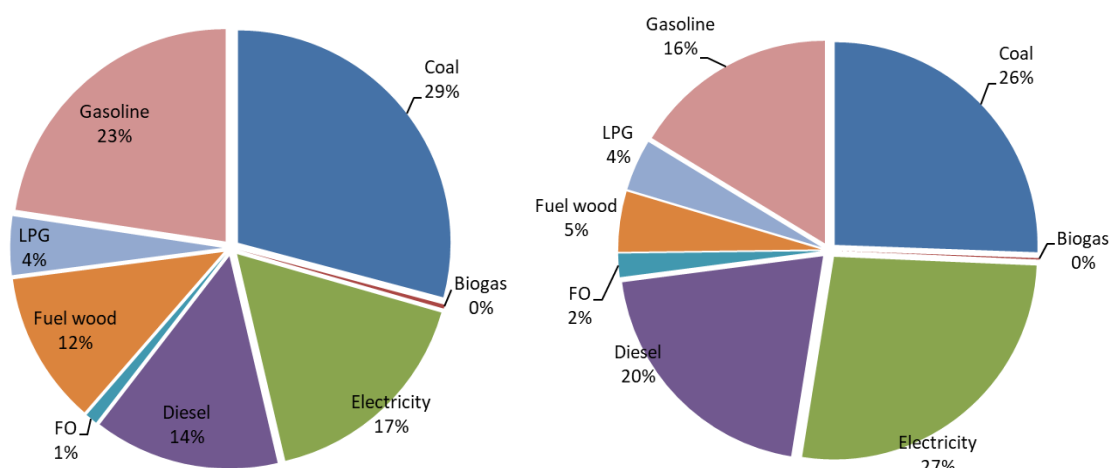


Figure 17 Fuel consumption in 2016 and 2030 in Lam Dong's province in REF scenario

Table 6 Emission from energy consumption by sector in Lam Dong in REF scenario

Sectors	GHG emission (ton CO2 eq)			
	2016	2020	2025	2030
Industrial	853,830	1,125,259	1,803,451	2,537,372
Residential	339,253	465,963	668,353	920,545
Agriculture	85,178	118,713	203,919	314,392
Commercial	90,708	131,851	218,366	341,530
Transport	472,506	603,965	766,296	956,055
Total	1,841,475	2,445,752	3,660,385	5,069,894

Through several measures promoted in GG scenario (please see the appendixes for detailed measures of energy sector), a 7.7% lower in energy demand is expected, compared to REF condition. In terms of fuel type, demand for coal will decrease substantially (by 24.9%) due to improved technology in industrial boilers and brick production. Electricity consumption is expected to reduce by 6.7%, and similar expectation for gasoline as the result of promoting E5 gasoline. In terms of sector, the highest reduction occurs in agriculture (25%), followed by industry sector (10.5%) and residential areas (5.5%). The lower energy demand results in lower GHG emission from GG compared to REF scenario. The reduction is estimated to reach 3.9%, 9.3% and 14.9% in 2020, 2025 and 2030 respectively, compared to the REF condition (Table 7).

Table 7 GHG emission in REF and GG scenario

Scenarios	Unit	2016	2020	2025	2030
GHG emission REF scenario	mil tons CO ₂ eq.	1.84	2.45	3.66	5.07
GHG emission GG scenario	mil tons CO ₂ eq.	1.84	2.35	3.32	4.32
GHG reduction (REF)-(GG)	mil tons CO ₂ eq.		96.5	0.34	0.75
GHG reduction rate	%		-3.9	-9.3	-14.9

Most of the solutions introduced in GG scenario have negative marginal abatement costs (namely 19 from 23 solutions) (Figure 18), indicating that the benefits from implementing those measures are greater than the costs. Improved technology for public lighting and unburnt brick production are the most cost-efficient measures. Other effective measures include efficient lighting for floriculture in greenhouses and boiler efficiency improvement. The marginal cost for monorail is positive indicating that it is not effective in terms of reducing GHG emission.

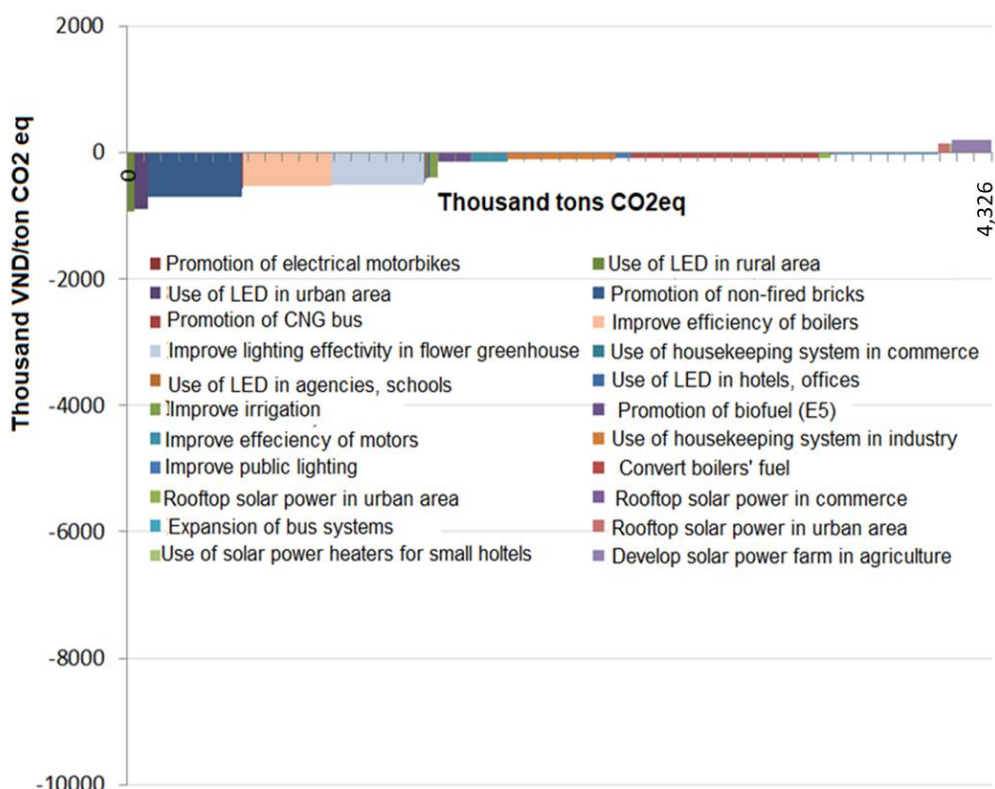


Figure 18 Marginal abatement cost for GG measures of energy sector

IV.1.5 Emission from waste

Projection of GHG emission in waste sector used the waste norm per capita in urban and rural areas, medical waste, and waste norm in industrial parks and complexes in the province. The wastewater norm from industry and emission factors of various types of GHG from waste followed IPCC guidance. In REF scenario, the GHG emission from waste sector increases by 4.2% per year over the period of 2016-2030, from 357 thousand tons CO₂ eq. in 2016 to 633 thousand tons CO₂ eq. in 2030. The main emitter is solid waste, estimated to account for 71.5% from total GHG emission from waste by 2030, followed by domestic and industrial wastewater (Table 8).

Table 8 GHG emission from waste sector under REF scenario

Sub-sector	GHG emission (TCO2e)					Proportion (%)				
	2010	2016	2020	2025	2030	2010	2016	2020	2025	2030
Landfill	149,140	214,399	290,680	364,506	452,519	54.10	60.06	64.69	68.32	71.47
Wastewater treatment	126,457	135,053	139,941	150,293	161,920	45.87	37.83	31.15	28.17	25.57
Incineration	84	7,527	18,690	18,698	18,705	0.03	2.11	4.16	3.50	2.95
Total	275,681	356,980	449,311	533,497	633,144	100	100	100	100	100

Through proposed mitigation measures in GG scenario, the reduction in GHG emission in 2020, 2025 and 2030 through this scenario can reach 14.9%, 17.4% and 27.1% respectively, compared to REF scenario (Table 9). The marginal cost for all proposed measures for mitigating emission from waste sector have negative results, indicating that those measures are economically efficient, and consistent with national calculations described in the INDC Report.

Table 9 Comparison of GHG emissions in the waste sector between GG and REF scenarios

Scenario	Unit	2016	2020	2025	2030
GHG emission REF scenario	mil tons CO ₂ eq.	0.36	0.45	0.53	0.63
GHG emission GG scenario	mil tons CO ₂ eq.	0.36	0.38	0.44	0.46
GHG reduction (REF)-(GG)	mil tons CO ₂ eq.		0.07	0.09	0.17
GHG reduction rate	%		14.9	17.9	27.1

IV.2 Higher product diversification per unit land

The resilience of the province and smallholder farmers to economic shock depends on product diversification and quality, not on higher production of limited crop species. The latter can lead to a high economic risk under market uncertainty. In GG scenario, higher product diversification is targeted through land sparing by integrating different plant components into the same land, for example by promoting tea and coffee agroforestry. Table 10 describes the annual production of different commodities and shows a higher level of product diversification and land sparing in GG compared to REF scenario.

Table 10 Area and annual production of main commodities in the province

Commodities	Area (thousand ha)				Annual production (thousand ton)			
	2015	2020	2030 REF	2030 GG	2015	2020	2021- 2030 REF	2021-2030 GG
Rice	20.9	17.9	17.8	17.7	299	256	255	256
Other annual crops	37.6	23.1	22.4	18.1	193	118	115	118
Acacia plantation [#]	14.1	13.5	13.4	13.3	3,809	3,647	3,642	3,591
Coffee	103.0	113.5	116.0	49.1	284	312	319	129
Safe tea		16.9	17.5	16.5		183	190	90
Safe vegetable		8.1	8.2	7.9		250	255	250
Coffee in CM*		3.1	3.1	3.1		7.1	7.2	7.1
Macadamia in CM		3.1	3.1	3.1		5.6	5.7	5.6
Tea in TM		0.7	0.7	0.7		3.4	3.4	3.4
Macadamia in TM		0.7	0.7	0.7		1.3	1.3	1.3
Coffee in CF				57.9				131
Fruit in CF				57.9				111
Pepper in CF				57.9				22
Tea in TF				10.1				67
Fruit in TF				10.1				17

[#]The unit for acacia timber is thousand m³ and the production is the volume at harvesting time, not per year, *CM = coffee – macadamia, TM = tea – macadamia, CF = coffee – fruit tree, TF = tea – fruit tree

IV.3 Lower risk of soil erosion within watershed

For simplification, the comparison among REF and GG scenario will not be done at sub-watershed level, but by taking the total of water flow from all sub-watersheds. The connections of stream network among the seven sub-watersheds are complex, which influence the input-output water flow among the sub-watersheds. Due to the great complexity, these connections were not considered in the assessment with GENRIVER, which becomes a limitation and needs to improve in further assessment. For the purpose of comparison between REF and GG scenario, in which both differ only in terms of landcover distribution, we considered that comparison by total water flow from all watersheds is acceptable.

Assessment with GENRIVER for the REF and GG scenario used the same precipitation data as inputs. This resulted in similar levels of estimated total water flow (total of surface, sub-surface, and base flow) in both scenarios (Figure 19). In GENRIVER as in most, if not all, hydrology models which simulate water balance at watershed-level, the process of transformation of evapotranspiration into clouds and rainfall is not considered, because this process usually depends on complex atmospheric condition at much larger such as continent scale. Consequently, although total transpiration

from tree canopies is higher in GG than REF due to higher tree cover, this difference in transpiration will not affect the input precipitation to the model. This is the main reason the cumulative water flow in REF and GG scenario are the same.

In REF condition, surface flow is higher due to less tree cover and lower canopy interception to the rainfall. Consequently, more rainfall drops directly on the ground. This and the water holding capacity of the soil determine the intensity of the surface flow and the risk of soil erosion. Due to higher tree cover, the one-year cumulative surface flow in GG scenario can be potentially lower by 18% compared to REF condition. In contrast, the cumulative sub-surface and base flow are higher in GG compared to REF scenario. These indicate that the risk of soil erosion is lower in GG compared to REF, and furthermore, due to higher base flow, GG scenario is potential to provide cleaner water and higher water provision during dry season.

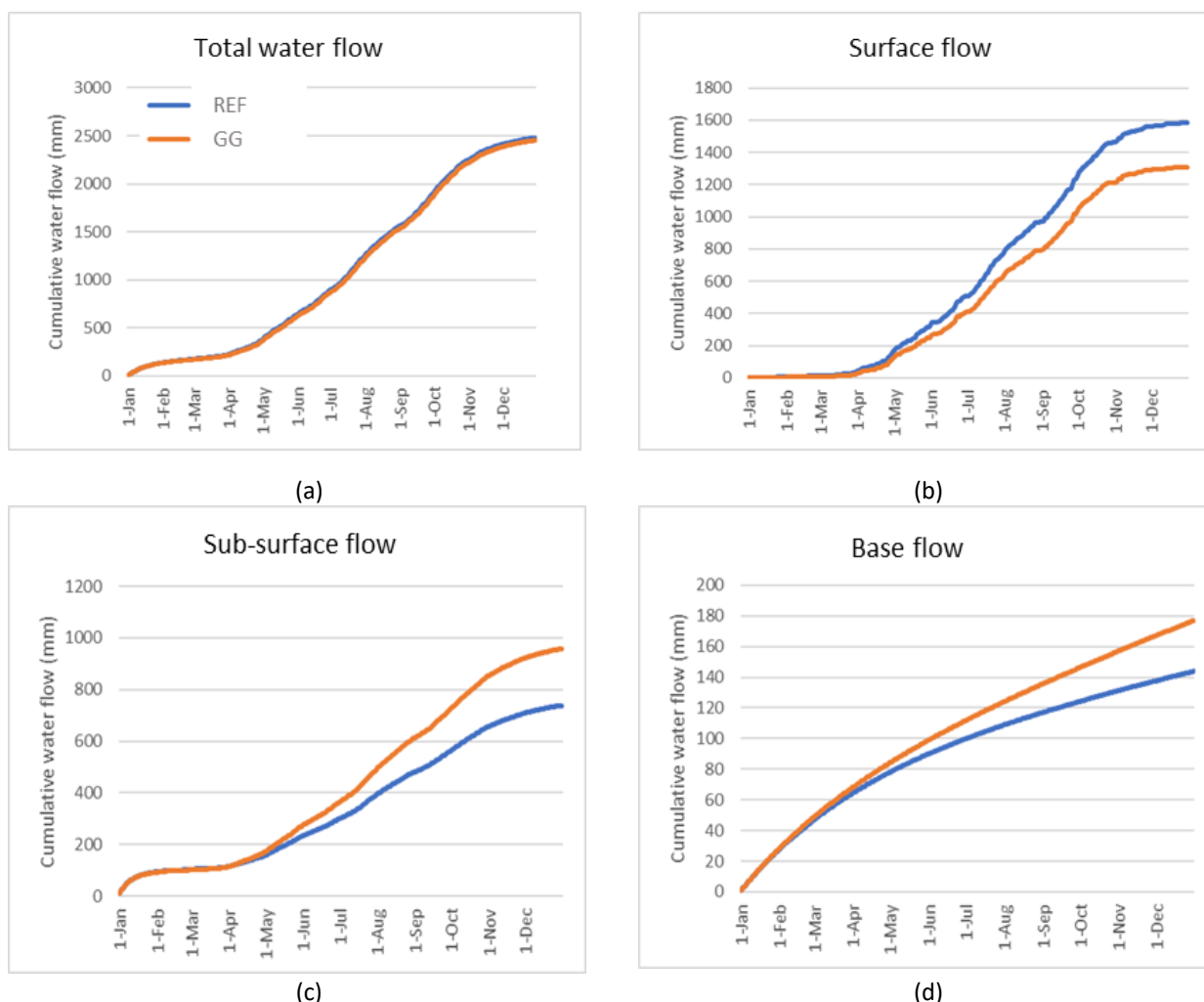


Figure 19 Water flow in Lam Dong's watershed in REF and GG scenario

Compared to REF condition, the GG scenario under RCP4.5 and RCP8.5 still produces less surface flow and higher sub-surface and base flow (Figure 20a). In addition, the GG scenario can potentially reduce surface flow across month, including in the rainy season from June to October (Figure 20b).

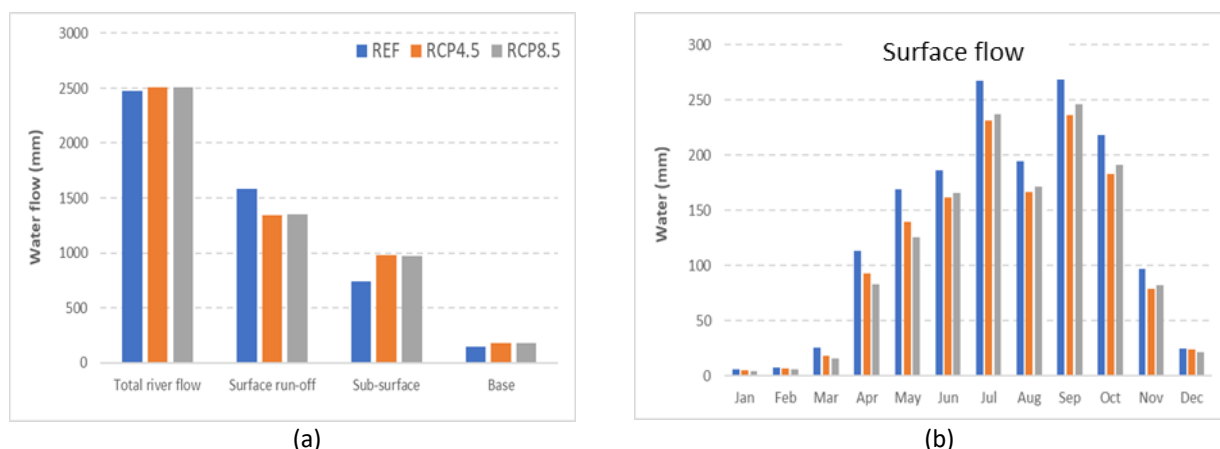


Figure 20 (a) Total water flow and (b) surface flow in GG with two climate change scenarios and in REF condition

IV.4 Lower risk of water shortage

The agricultural area in Lam Dong province reaches about 340 thousand hectares in total and generates water demand of about 990 million m³ per year. Assuming equal rate per hectare for annual and perennial crops, the water demand equals 2,900 m³ per hectare per year. From the total agriculture area, about 82% are cultivated by different perennial crops such as coffee and tea. Therefore, water demand for perennial crops reaches about 814 million m³ per year. If 30% of areas of perennial crops were converted into agroforestry with a potential water saving of 15-40% compared to monoculture, there is a potential of reducing water inputs by 36-97 million m³ per year or 129-346 m³ per hectare per year. The potential water saving is greater if larger area of current perennial crops were converted into agroforestry.

IV.5 Higher capacity to conserve biodiversity

Based on the 2015 and 2020 forest planning maps from the province, the DIFA index of rich broadleaf, rich coniferous and deciduous forest will slightly decrease in 2015-2020. If this trend continues until 2030, the DIFA index of these three types of forest especially rich broadleaf and deciduous forest will steadily decrease across years (Figure 21a). The GG measures in forestry sector, when implemented from 2021, can slightly increase the DIFA index of the three types of forest in 2021-2030. Some measures such as enriching barren lands within forest protection zone with forest trees, will take longer affect to improve the DIFA index because we assumed the enriched barren lands will 'only' reach the "poor and restored" category of broadleaf forest by 2030.

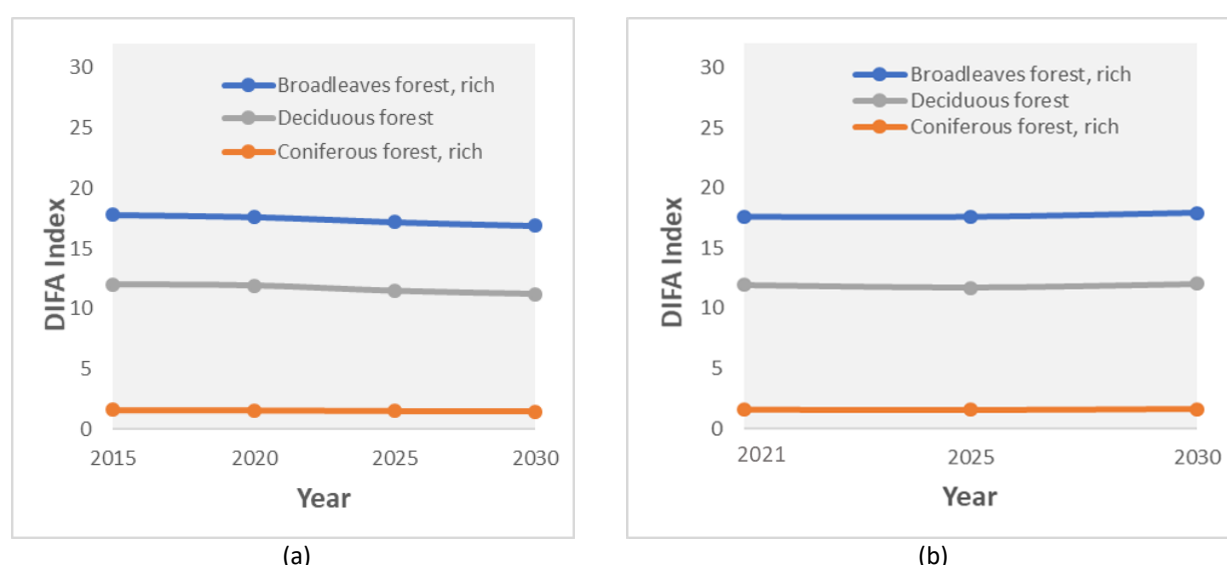


Figure 21 DIFA index for three types of forest in Lam Dong province in (a) REF and (b) GG scenario

For deciduous forest, as described earlier in Figure 3, the decline in DIFA index of this forest type based on historical trend is sharp. In REF condition, the DIFA index still decreases across year until 2030. These show the importance of establishment of a natural reserve to protect the remaining deciduous forest of Lam Dong, i.e. Don Duong Natural Reserve (described earlier in Figure 11) as indicated by the province’s Biodiversity Conservation Plan to 2020, vision to 2030. The Reserve will help to protect habitat of over 110 rare and endangered species of flora and about 68 rare and endangered fauna species, e.g. Marbled jewel orchids (*Anoectochilus annamensis*), Fujian Cypress (*Fokienia hodginsii*), Gaur (*Bos gaurus*), Large-antlered Muntjac (*Muntiacus vuquangensis*), and Grey-crowned Crocias (*Crocias langbianis* Gyldentolpe).

IV.6 Higher contribution to province’s GRDP

According to the province’s 2016 Leontief table, among the three sectors, the largest share to GRDP comes from agriculture (47%), followed by service (42%), and industry sector (11%). This is in line with the shares reported by the province’s statistic yearbook. Figure 22 describes the economic contribution of 48 categories in the province’s inter-sector economic table to GRDP.

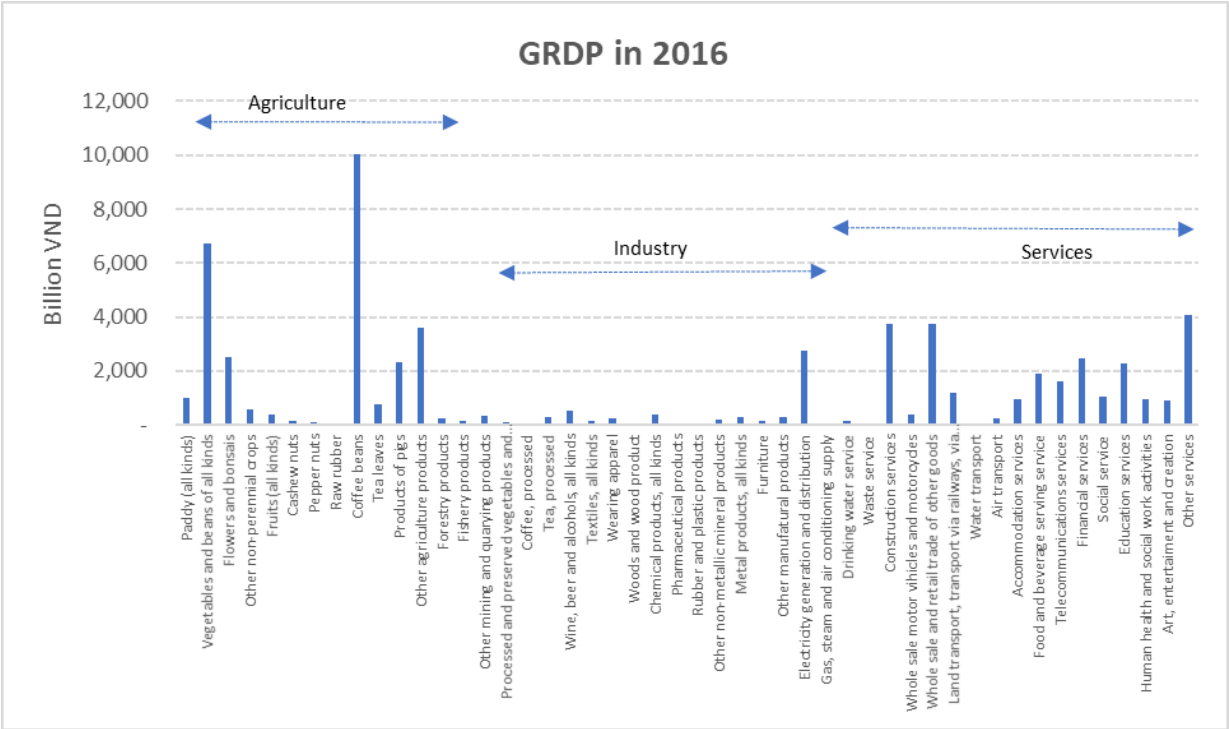


Figure 22 Economic contribution of 48 categories within agriculture, service and industry sector to 2016 GRDP of Lam Dong province

The backward and forward contribution of each category calculated using the province’s Leontief table are described in Figure 23. All categories connect each other and two categories in the industry sector namely metal products (all kind) and other manufacturing products have the highest forward contributions. This indicates that outputs from these two categories are largely required as inputs by other categories. No contrasting difference in backward contribution exists among categories.

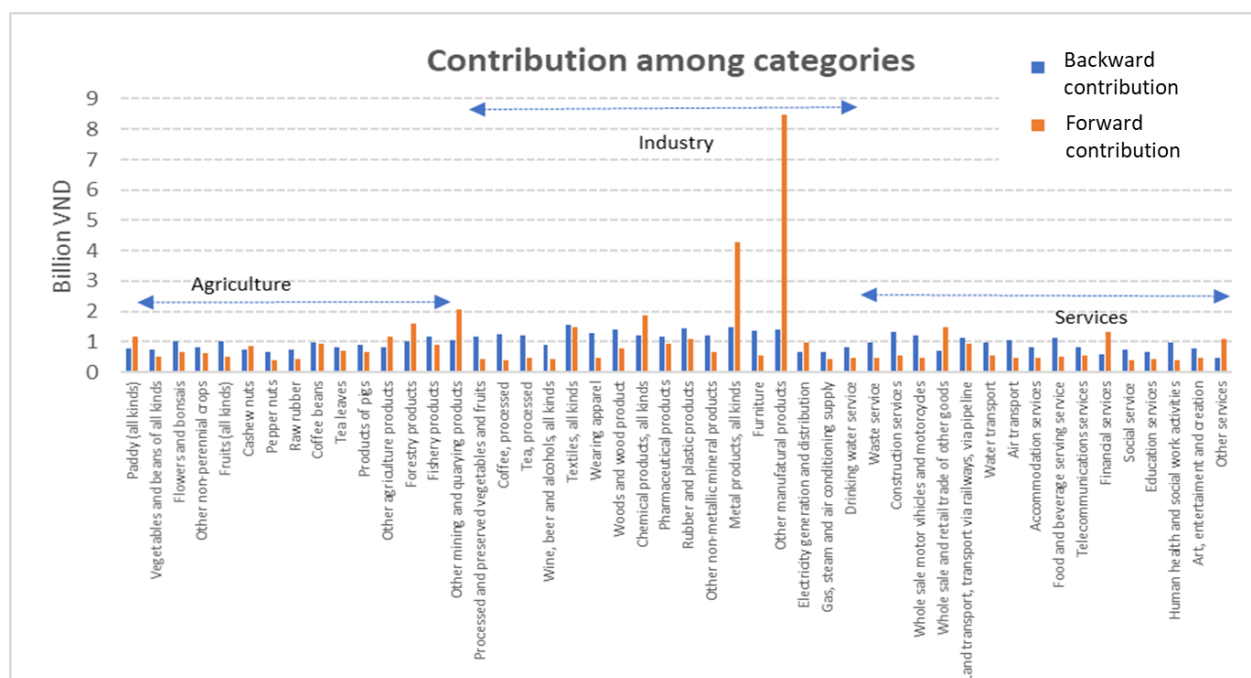


Figure 23 Backward and forward contribution of 48 categories within agriculture, service and industry sector of Lam Dong province

In the REF condition, in which economic growth in 2021-2030 is driven by economic activities in the current provincial planning of the six assessed sectors, the GRDP will potentially reach 81,467 billion VND by 2030. In GG scenario, the province's GRDP by 2030 will reach 85,019 billion VND, or about 3,850 billion VND higher than that obtained REF scenario. If the province's GRDP in 2030 is estimated using the historical trend (by assuming a constant annual growth of 8.3% from 2021 to 2030), the GG scenario can contribute to attain up to 46% of the projected GRDP. If the 2030 GRDP is projected using a lower rate, for example a constant annual growth of 6% for 2021-2030, the GG scenario can contribute up to 62%. With a more ambitious rate, for example a constant annual growth of 10% for 2021-2030, the GG scenario can contribute up to 45%. In all cases, the remaining share to the projected GRDP can be provided by economic activities in other sectors of the province.

According to the 2017 province's statistic book, the total number of workers involved in the agriculture, service and industry sector, was 735,021 people accounting for 98.9% of population in working age. Furthermore, the share of agriculture sector (including forestry, livestock and fishery) to the total labour was 66%; industry and construction 8.1%; and service sector 25.9%. For the assessment, we however used the 2016 data from the GSO which informs the total labour involved in the 48 categories of Leontief table. According to this data, the total labour involved in the 48 categories was 786,415 people, or slightly higher than reported in the province's statistic book. According to our assessment, to meet all targets in the 2016-2020 provincial planning, the province will need 377,096 additional workers, namely from 786,415 to 1,163,511 people, or an increase by 48%. The projected population of the province by 2020 is 1.3 million people, and by assuming that the proportion of labour force in the province is about 60% from the total population (like in 2016), the total labour force in 2020 will reach 793 thousand people. Therefore, the province needs to import labour to meet the targets. In REF scenario, the estimated labour demand by 2030 is about 1.38 million people. In GG scenario, the estimate is about 1.53 million people or 10.4% higher than the demand in REF condition. Therefore, the implementation of Lam Dong's GGAP will create further employment opportunities, and with the province's population in 2030 estimated to equal 1.54 million people and labour force of 952 thousand people, the province will need to import labour from other provinces to meet the labour demand.

IV.7 Summary of potential benefits

Table 11 summarizes 19 performance indicators of GG scenario compared to REF condition. The indicator values for both scenarios were calculated using the results of the impact assessment. There is no trade-off between e.g. GHG emission and province's GRDP when comparing GG and REF scenario: the total GHG emission is 19% less and province's GRDP is 4.8% higher in GG compared to REF scenario. Therefore, the implementation of GG measures will help the

province developing a greener economy by generating higher GRDP with less GHG emission in agriculture, service and industry sector, including through less demand of non-renewable energy and less emission from waste.

Table 11 Performance indicators for REF and green growth scenarios

	Indicators	Unit	GG	REF	Benefit (%)*
1	Total GHG emission [#]	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 productions	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 lands under sustainable practices	ha	37,680**	10,400	262.3
8	Area of green house	ha	7,031	9,663	-27.2
9	Forest cover	%	56	54	3.7
10	Area of tree 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 landuse, agricultural practice, greenhouse, livestock, energy and waste, ^{##}Excluding new conservation areas and biodiversity corridors under the Biodiversity Conservation Plan to 2020 of Lam Dong Province, *calculated as (GG-REF)/REF x 100%, **if including timber-based system in the encroached forest area: 81,700 ha, ***calculated as % of agroforestry area from total province's area. If the timber-based system in the encroached forest area is included: 8.37%

V. Investment cost and roadmap

V.1 Prioritization

To help in allocating available resources for implementation, prioritization of potential measures within each sector can be made. Higher priority should be given to potential measures that can be undertaken immediately and which yield immediate economic, environmental and social benefits. The prioritised measures of agricultural sector include: (1) reducing the expansion rate of greenhouse by half compared to the baseline through implementing strict enforcement of regulatory and economic instruments such as eco-fee, raising farmer's awareness on the needs of complying the norms of fertilizers and pesticide use in greenhouse, and providing alternative agricultural options with are economically viable yet putting a great concern on the preservation of ecological values; (2) promoting agroforestry as a climate-smart agriculture which can contribute in stabilizing farmer's income through product diversification, maintaining soil fertility, increasing water and nutrient use efficiency, and enhancing farmer's resilience to uncertainty in market and environmental condition including climate change; (3) strengthen sustainable and higher quality production of agriculture products with innovative schemes such as PPI and VSA that aim to secure supply side with a competitive price and scale, through strengthening public-private partnership at relevant jurisdiction level and ensuring sustainable production within sustainable environment. In addition, in the PPI and VSA scheme, the product standard can be determined based on the deal between farmer's cooperative as producers and private sectors as buyers at relevant jurisdiction level. If resources are available, participation and the use of international product standard for export market are recommended.

For the forestry sector, the prioritised measures include (1) strictly enforcing the provision and implementation of the law and the planning of the three types of forests in the province, to minimize degradation and deforestation; and support the planning with evidence- and scientific-based information to ensure effective implementation and explore innovative economic instruments and incentives for forest conservation; (2) support new biodiversity conservation areas and link with the innovative economic instruments and incentives for forest conservation as potential funding source; (3) strengthen sustainable forest production with innovative schemes such as PPI and VSA, and sustainable SFM.

The prioritised measures of the tourism sector include (1) planning and investing in the development of local tourism products, with priority on eco-tourism, agro-tourism and cultural tourism; (2) minimize the negative impacts of tourism activities on the environment and natural resources through generating awareness of all stakeholders involved in the tourism activities, law enforcement, and strict sanctions; (3) striving to meet the international standard of sustainable tourism.

The prioritized measures related to water resources management include (1) develop planning for effective allocation and use of surface and underground water resources to support economic sectors underpinned by law enforcement and strict sanction, (2) ensures an efficient and equitable use of the surface and underground water for all communities including the poor and ethnic minorities, (3) adopt high-technology, and increase capital and investment to ensure the provision of clean and safe water supply for all communities.

For the transport and energy sector, some potential measures require considerable investment cost. For example, the estimated cost for developing wind power plant accounts for 12,000 billion VND, and the cost for establishing monorail is estimated to reach 23,000 billion VND. Based on their urgency for implementation and investment cost, the potential measures in the energy and transport sectors were classified into three levels of priority (high, medium, and low) (Table 12). This prioritization in the two sectors determines three levels of investment cost for the implementation of Lam Dong's GGAP (section below) and will help the province and relevant stakeholders including investors to make priority of resource allocation.

Table 12 Priority of measures in transport and energy sector

Measure	Priority
Transportation	
Development of CNG buses	High
Promote the use of electric motorcycles	High
Development of monorail	Low
Energy sector	
Using LEDs in urban households	High
Using LEDs in rural households	High
Strengthen the internal management and equipment maintenance	High
Improve boiler efficiency	High
Improve engine performance	High

Measure	Priority
Boiler fuel conversion	High
Producing unburnt bricks	High
Using LEDS for hotel, office lighting	High
Using LEDS for school, government offices lighting	High
Using LEDS for public lighting	High
Using LEDS for lighting in flower production	High
Development of waste treatment plant	High
Development of small hydropower	High
Use of improved cookstoves	High
Promote the use of E5	High
Building internal management system	Medium
Using solar water heater for small hotels	Medium
Development of solar power plant	Medium
Development of wind power plant	Medium
Installation of solar roof panels systems in buildings (hotel, office buildings and government office building)	Medium
Improve irrigation systems	Medium
Using solar water heater in urban households	Medium
Installation of solar roof panels systems in urban households	Medium
Development of solar power combined with agriculture	Low

V.2 Estimated investment cost by sector

The total investment cost for all potential measures is estimated to reach 63,919 billion VND (\approx 2,800 billion USD³⁹). The total cost for only high-priority measures in transport and energy sector and all measures in other sectors accounts for 21,361 billion VND or 33% of the total investment for all measures. The total cost for high- and medium-priority measures in transport and energy sector and all measures in other sectors reaches 31,228 billion VND or about 49% of the total investment for all measures.

If all potential measures were included, two sectors with the largest share to total investment cost are energy (about 48%) and transport (about 36%) (Figure 24a). In the more sparing option, the sectors with the largest share are energy (about 52%), agriculture (23%), and forestry (12%) (Figure 24b).

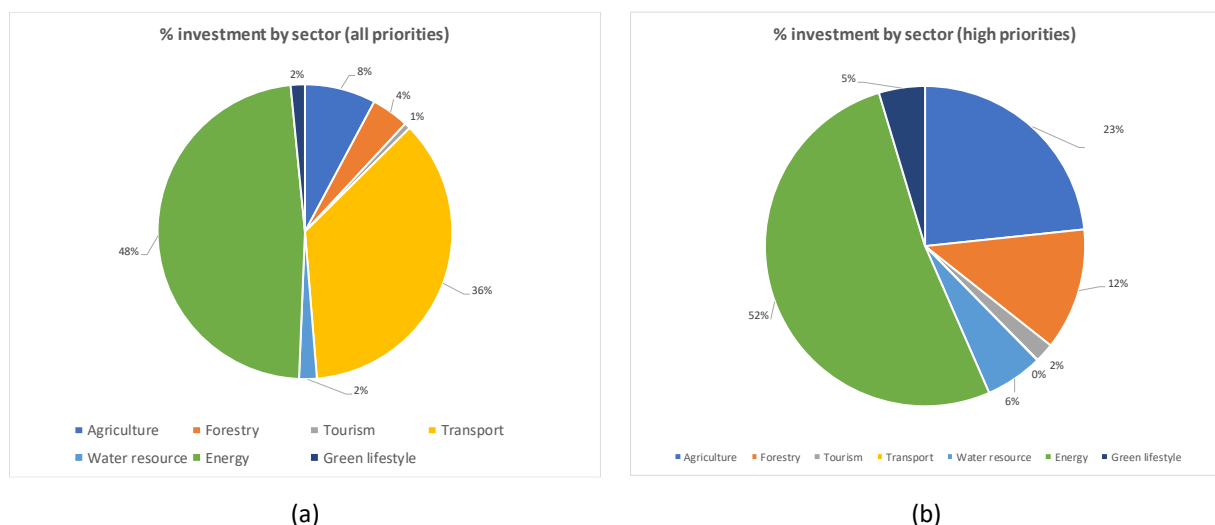


Figure 24 Share to total investment cost by sector with (a) all GG measures and (b) high priority measures

³⁹ With a currency rate of 23,000 VND for 1 USD

V.3 Comparison with province’s investment structure

The public investment in Lam Dong province had to rely partly on Central State’s budget (Figure 25a). The total investment in the province in 2016 was 83,159 billion VND, and public investment accounted for only 17% while investment from private sectors accounted for more than 80% (Figure 25b).

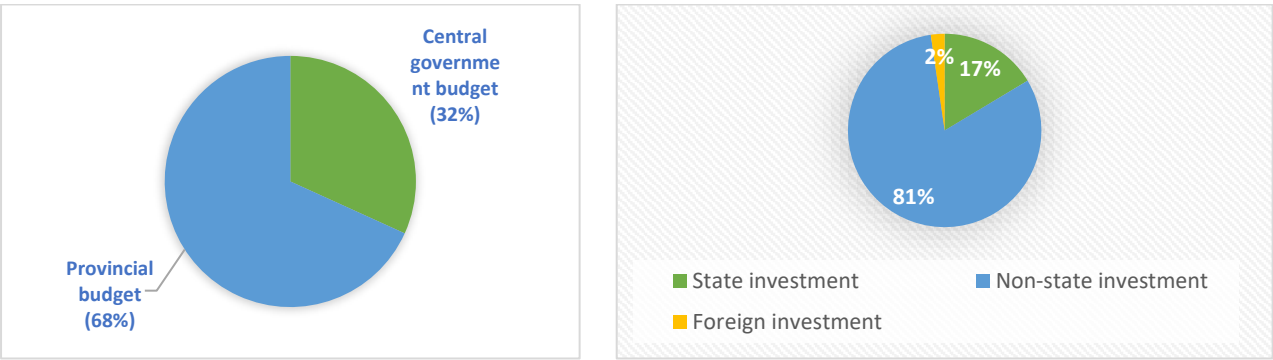


Figure 25 a) Public investment sources in Lam Dong province (2010-2016), and b) Share of total investment in Lam Dong in 2016 by sources

Based on the data of annual investment in the province from 2010 to 2016, the highest investment was allocated to agriculture (including forestry, livestock and fishery), followed by infrastructure and transport, and tourism (Figure 26a). In 2016, the share of total investment to agriculture sector reached 43% (Figure 26b). The lowest shares were for energy (6%) and water resource management (1%).

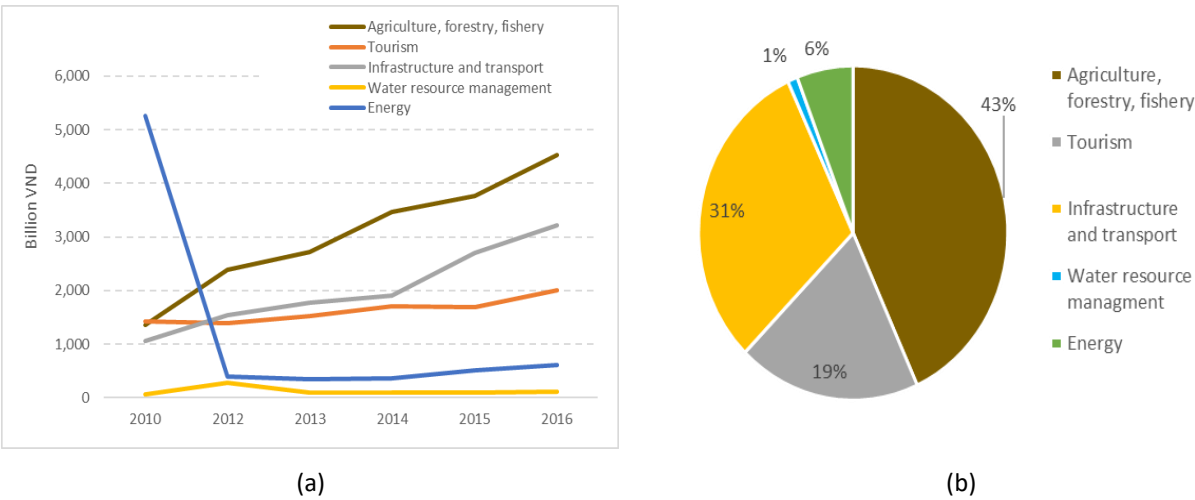


Figure 26 (a) Investment for five sectors of Lam Dong province in 2010-2016, (b) Share of investment by sector in 2016

Compared with the GGAP’s investment structure, the main differences were found in the allocation to energy sector and water resource management, in which in the GGAP both sectors receive substantial share of investment. The highest share of investment is allocated to the energy sector, especially to promote the use and production of renewable energy. The substantial investment for water resource management is to develop infrastructure for an advanced technology for provision of clean and safe water for all people in the province.

In 2011-2016, the province has set priority projects to improve e.g. infrastructure (road, electricity, urban and rural water supply and drainages), living standard of people, agriculture and industry development, water supply, flood protection, road, industry, and electricity; however, the scopes of priority projects were often not inclusive for GG objectives as guided by MPI and OECD (Figure 27).

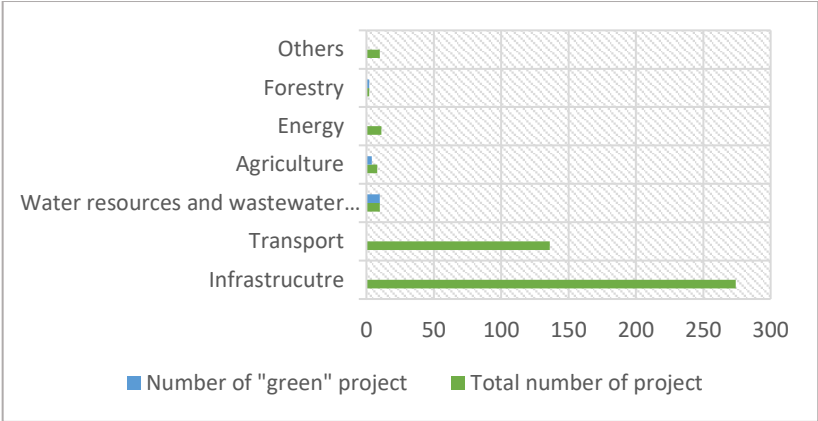


Figure 27 Number of public investment projects of Lam Dong (2011-2016) and number of projects that have “green” objectives

If such prioritization continues, the province will need very large investments if it is to move to a trajectory of inclusive GG. The financing of green economic growth should rely on different sources: national and regional government budget, investments and partnerships with the private sectors, and grants from various sources including global investors through multilateral cooperation. This often requires strong partnerships between stakeholders connected along commodity value chains (e.g. producers, intermediaries, managers, traders, and end consumers) or by ecosystem services flows (e.g. services users and providers). Integrating GG into upstream development planning is the best entry point for promoting the transition. Funding for research is needed as GG concepts and practices are relatively new to local stakeholders. Development and application of economic instruments, where and when appropriate, are also important options to support GG activities by mobilizing “untapped” social resources for the province to achieve GG targets.

V.4 Roadmap

To facilitate the implementation, each potential measure is further elaborated into activities and implementation time plan for the period of 2021-2030 (Appendix V). Expected funding sources for each potential measure are also identified (Appendix VI). Six different funding sources are considered namely central state budget (CSB), provincial state budget (PSB), official development aid (ODA), foreign direct investment (FDI), domestic private investment (DPI), and social investment (SI) through application of economic instruments and fund-based mechanisms. Furthermore, the proposed leading and supporting agencies (Appendix VII) are also listed for each potential measure which involve relevant departments of the six assessed sectors of Lam Dong province namely DARD, DONRE, Department of Construction (DOC), Department of Sport, Culture and Tourism (DOCST), Department of Finance (DOF), Department of Health (DOH), Department of Industry and Trade (DOIT), Department of Science and Technology (DOST), and Department of Transportation (DOT), including Department of Planning and Investment (DPI), State Audit Office (SAO), and Province People’s Committee (PPC). The estimated investment cost for each measure are provided including their investment code according to the Decision No. 1085/Decision-MPI on “Guideline for classifying public investment for climate change and green growth” (Appendix VIII).

VI. Monitoring and evaluation

In order to evaluate GG progress and performance in Lam Dong province, there is a need to set up a baseline and collect data for periodical monitoring. While conventional economic indicators, such as GRDP, provide a distorted lens for economic performance particularly since such measures fail to reflect the extent to which production and consumption activities may be drawing down natural capital, there is an urgent need of a new set of indicators that can capture impacts on employment, resource intensity, emissions, natural assets, and ecological impacts. Indicators also help raise the profile of GG issues in the public debate and gauge how well policies are performing with respect to GG.

Herein we propose a preliminary set of indicators based on existing works and experience by UNEP⁴⁰, OECD⁴¹, MPI (draft proposal on national level GG indicators, 2018), and other international and national organisations. The selection of indicators has considered the balance between the desire to be exhaustive and the need for simplicity, and the need to be flexible so that the province's indicators can be later adapted to national context. The three generic criteria (policy relevance, analytical soundness, and measurability) of OECD for selecting GG indicators were found relevant and explained as follows:

- *Policy relevance*: the set of indicators should have a clear policy relevance, best if it can be aligned with existing socio-economic and development monitoring and reporting system at the province. The indicator must be easily understood, and the results must be easily interpreted by policy makers.
- *Analytical soundness*: the indicators should be analytically sound and benefit from a consensus about their validity. They should further lend themselves to being linked to economic and environmental modelling and forecasting.
- *Measurability*: many indicators are important, but their measurement is difficult, complex or would involve costs that cannot be sustained in the framework of a regular monitoring exercise. The selected indicators should be based on data that are available or that can be made available at a reasonable cost, and that are of known quality and regularly updated.

Five areas have been chosen to capture the main features of GG: (1) Environmental and natural resources productivity, to capture the need for cleaner production, efficient use of non-renewable energy and natural resources, and promote the use of renewable ones; (2) Economic and environmental assets to reflect the fact that a declining asset base presents risks to growth and because sustained growth requires the asset base to be maintained; (3) Green lifestyle and sustainable consumption capturing the direct impacts human activities on environment and the ways that the society responds to environmental pressures through trading and consumption behaviours; (4) Economic opportunities and policy responses, which can be used to help discern the effectiveness of policy in delivering GG and human development in GG context; and (5) Social sustainability encompassing social dimension of GG such as labour, labour market, education, and inclusion.

A complete list of indicators proposed for monitoring and evaluation of GGAP of Lam Dong province is provided in Appendix IX. The indicators have been selected according to their policy relevance, analytical soundness, and measurability. This list serves as an entry point for further discussions among provincial authorities and other stakeholders to come up with the final set of GGAP indicators. Each indicator is described by name, definition and measurement/calculation methods, proposed responsible agencies who are in charge for monitoring and reporting, current readiness in terms of data and information (I: the indicator has been used and announced in the government reporting system; II: Sufficient data to calculate the indicator has been collected but not yet announced; III: Data collection by respective agencies is on-going or the data set is not sufficient for the indicator; and IV: No data collection for the indicator), and the data sources. It is also important to note that not all issues of importance to GG can be measured in quantitative terms, and therefore some relevant issues may not be captured by the list. In addition to the province's department of the six assessed sectors, provincial statistics office (PSO) is key institution for the monitoring and reporting.

A monitoring system needs to be jointly developed by provincial government agencies and relevant stakeholders including NGOs, companies, communities, etc. referring to the national system in order to maintain consistency. Policies on the development of primary and key performance indicators should be made as reference in order to mainstream green economic growth achievement indicators into existing systems rather than letting them to be separated. A data collection period should be determined for each indicator, and a measuring instrument and a data collection methodology should be developed in a coordinated manner vertically and horizontally between government agencies. Involvement of NGOs, CSOs, private sector and other civil organizations in monitoring and evaluation of Lam

⁴⁰ UNEP.2014. Using Indicators for Green Economy Policymaking. <https://www.unenvironment.org/resources/report/using-indicators-green-economy-policymaking>

⁴¹ OECD (Organisation for Economic Co-operation and Development). 2011. Towards Green Growth. www.oecd.org/greengrowth

Dong's GGAP should be greatly encouraged. Budget allocation for monitoring and evaluation activities needs to be estimated and mainstreamed.

Appendix I List of input data for assessment tools

SPATIAL DATA

No	Input data	Sources	Assessment tools
<i>Basic maps</i>			
1	Administrative boundary	DARD/DONRE	LUMENS
2	DEM		LUMENS
3	Soil map	DARD	GenRiver
4	Stream network map	DONRE	GenRiver
<i>Landuse maps</i>			
1	Landuse map 2010	DONRE	LUMENS, GenRiver
2	Landuse map 2015	DONRE	LUMENS, GenRiver
3	Landuse planning map 2020	DONRE	LUMENS, GenRiver
4	Forest inventory 2010	DARD	LUMENS, GenRiver
5	Forest inventory 2015	DARD	LUMENS, GenRiver
6	Forest protection and development planning map 2020	DARD	LUMENS, GenRiver
7	Planning map of three forest types	DARD	LUMENS
8	Land suitability map	DARD	LUMENS, GenRiver
9	Agricultural map 2010	DARD	LUMENS, GenRiver
10	Agricultural map 2015	DARD	LUMENS, GenRiver
11	Agricultural planning map 2020	DARD	LUMENS, GenRiver
<i>Other thematic maps</i>			
1	Map of natural reserves	DARD	LUMENS
2	Map of biodiversity corridor	DONRE	LUMENS
3	Map of new conservation areas	DONRE	LUMENS
4	Map of State Forest Enterprise	DARD	LUMENS
5	Map of provincial REDD+ place (PRAP)	DONRE	LUMENS
6	Map of current transportation system	DOT	LEAP
7	Maps of road construction planning	DOT	LUMENS, LEAP
8	Map of tourism planning	DOCST	LUMENS
9	Map of planning of water resource	DONRE	LUMENS
10	Maps of current and planned hydropower plants	DOIT	LEAP

NON-SPATIAL DATA

No	Input data	Source	Assessment tools
<i>Tables</i>			
1	Landcover and carbon stock	MARD, MONRE	LUMENS
2	Production of each landuse	MARD, Department of Statistic	LUMENS
3	Price of agricultural product	MARD	LUMENS
4	Production cost of agricultural systems	MARD	LUMENS
5	Biodiversity indicator (if any)	MARD, MONRE	LUMENS
6	Hydrological data	Hydrological station in the province	GenRiver
7	Climate data	MONRE	GenRiver
8	Cross-sectoral economic data (if any)	Provincial Statistic Office	LUMENS
9	Statistic book year 2017, 2018	Provincial Statistic Office	LUMENS, LEAP
10	Electricity consumption	DOIT	LEAP
11	Commercial units and industrial large energy consumption (consumption of 1,000 TOE or more per year for industrial and 500 TOE for buildings)	DOIT	LEAP
12	Electricity consumption of SME	Department of Statistic	LEAP
13	Electricity consumption of SME: hotel, restaurant, including external electrical energy	Enerteam	LEAP

14	Number of vehicles by type: motorcycles and others	DOT	LEAP
15	Annual distance travelled per vehicle	DOT	LEAP
16	Passenger of freight load per vehicle	DOT	LEAP
17	Fuel economy (MJ/passenger-km or MJ/ton-km)	DOT	LEAP
18	Agriculture: energy consumption for agriculture including irrigation, cultivation, harvesting and aquaculture	MARD, energy survey	LEAP
19	Residential areas: energy consumption in residential areas of urban and rural areas, including energy other than electricity	Household Living Survey from GSO	LEAP
20	Population 2010-2016 period	Department of Statistic	LUMENS, LEAP
21	The main industrial products period 2010-2016	Department of Statistic	LEAP
22	Public lighting data (number of bulbs by type and capacity, energy consumption, hours of operation per year)	Public lighting company	LEAP
23	Main agricultural production in 2010-2016	Department of Statistic	LUMENS
24	GRDP by sector for the period 2016-2020	Department of Statistic	LUMENS, LEAP
25	Projected GRDP by sector	DPI	LUMENS
26	Projected population	DPI	LUMENS, LEAP
27	Agricultural products and primary industry	DOIT, DPI	LUMENS
28	The renewable energy projects proposed and planned	DOIT	LEAP

Appendix II Input biophysical and economic data for LUMENS

Landcover types and aboveground carbon storage

No	Landcover name	AGC stock* (ton/ha)	Reference for AGC stock
1	Broadleaves, rich	124	USAID report (2013) ⁴²
2	Broadleaves, medium	97	USAID report (2013)
3	Broadleaves, poor and restored	51	USAID report (2013)
4	Coniferous, rich	81	USAID report (2013)
5	Coniferous, medium	68	USAID report (2013)
6	Coniferous, poor and restored	36	USAID report (2013)
7	Deciduous	40	USAID report (2013)
8	Bamboo	2	USAID report (2013)
9	Mixed timber-bamboo	40	USAID report (2013)
Plantation			
10	Acacia	25	Mulia et al (2018a) ⁴³
11	Rubber	25	Mulia et al (2018b) ⁴⁴
12	Pines	50	The density in Lam Dong is about 800 trees/ha, estimation with Kettering et al. (2011) ⁴⁵ allometric equation with wood density of cashew from World Agroforestry database of wood density
13	Bareland	5	Mainly shrubs and grasses, IPCC document
14	Bareland with scattered trees	10	Assumed as twice of bareland
15	Rice	1-2	Common range of C stock for rice
16	Other annual crops	2-5	Common range of C-stock for annual crops
Perennial crops			
17	Coffee monoculture	5.5	Calculated from Pham et al (2018) ⁴⁶
18	Coffee agroforestry	16	Calculated from Pham et al (2018)
19	Cashew	16	Usually mixed with coffee with 12 m x 12 m spacing, estimation with Kettering et al. (2011) allometric equation with wood density of cashew from World Agroforestry database of wood density
20	Macadamia agroforest	16	Mixed with coffee, similar with coffee agroforestry
21	Tea monoculture	17.5	Tran et al (2011) ⁴⁷
22	Tea agroforest	25	Mulia et al (2018b)
23	Other agricultural lands	2-5	Assumed to equal annual crop
24	Settlement	-	
25	Waste disposal land	-	
26	Mining land	-	
27	Transportation land	-	
28	Other lands	-	
29	Water bodies	-	
30	Other forest land	10	Assumed to equal bareland with scattered trees

*time-average aboveground C stock

⁴² USAID. 2013. Land use, forest cover change and historical GHG emission from 1990 to 2010 in Lam Dong province, Viet Nam. Project report. USAID-funded Lowering Emissions in Asia’s Forests. Ha Noi Viet Nam.

⁴³ Mulia R, Khasanah N, Catacutan DC. 2018. Alternative forest plantation systems for Southcentral Coast of Viet Nam: projections of growth and production using the WaNuLCAS model. In: Mulia R, Simelton E, eds. 2018. Towards low-emissions landscapes in Viet Nam. World Agroforestry (ICRAF) Viet Nam, World Agroforestry (ICRAF) Southeast Asia Regional Program, Bogor, Indonesia

⁴⁴ Mulia R, Nguyen MP, Do TH. 2018. Forest and crop-land intensification in the four agro-ecological regions of Viet Nam: impact assessment with the FALLOW model. In: Mulia R, Simelton E, eds. 2018. Towards low-emissions landscapes in Viet Nam. World Agroforestry (ICRAF) Viet Nam, World Agroforestry (ICRAF) Southeast Asia Regional Program, Bogor, Indonesia

⁴⁵ Kettering, Q.M., Coe, R., van Noordwijk, M., Ambagau, Y., Palm, C.E., 2011. Reducing uncertainty in the use of allometric biomass equation for predicting above-ground tree biomass in mixed secondary forests. Forest Ecology and Management 146, 199-209.

⁴⁶ Pham TV, Mulia R, Dinh TH. 2018. Potential mitigation contribution from coffee agroforestry in three regions of Viet Nam. Project report. Ha Noi, Viet Nam.

⁴⁷ Tran BD, Le QD, Le TNH. 2011. Study carbon stock of tea production system to suggest approach of clean development mechanism. Science and Technology Journal of Agriculture and Rural Development. MARD, Ha Noi. Viet Nam. (Article in Vietnamese language)

Economic data of commodities averaged for the period of 2010-2017

	Commodities	Average productivity ¹ (ton/ha/year)	Average price at farm-gate ² (mil VND/ton)	Average production cost ³ (mil VND/ha/year)	Average net income (mil VND/ha/year)	Average net income (USD/ha/year)	Remarks
	Plantation						
1	Acacia	271	2.00	1066	23.64	1,028	Plantation 3 x 3 m, 8-year rotation cycle
2	Rubber	1.38	58.51	53.72	6.75	293	Processed/clean products
	Annual crops						
1	Rice	14.32	2.64	20.52	17.25	750	Unpeeled rice
2	Other annual crops	5.13	6.45	22.10	10.82	470	Represented by maize
3	Vegetables	30.97	6.63	125.5	76.19	3,312	Different types of vegetables
	Perennial crops						
1	Coffee monoculture	2.75	35.44	60.05	35.95	1,793	This is mainly for Robusta. Not separated between Robusta and Arabica
2	Tea monoculture	10.82	6.67	57.9	16.57	720	Not separated for different varieties of tea
3	Cashew	0.65	19.54	14.7	3.30	143	Mostly integrated with coffee

¹The productivity of each commodity was obtained from the production and harvested area of the corresponding commodity in 2016 and 2017 statistic year book of Lam Dong province, ²The price data were collected from the literature on Lam Dong province or from other relevant provinces, ³The data of production cost were collected from the literature on Lam Dong province or from other relevant provinces. For the price and production cost, when the data from literature are missing for certain years within the period of 2010-2017, the price and production cost were estimated using the known price and production cost data, and the inflation rate. It was assumed that the volatility of the price and production cost is proportional to the volatility of inflation rate across years.

Some references used for the production cost data: coffee (Method of calculating the cost of planting 1 ha of coffee <http://lamnong.net/chi-phi-trong-1ha-ca-phe/>), rice (Dang Thi Kim Phuong and Do Van Xe, in Scientific journal 2011:18a 220-227), macadamia (Technical report of planning on Macadamia plantation in Lam Dong province 2016-2020 from DARD of Lam Dong province), tea (technical report for planning on tea in Lam Dong province 2016-2020 from DARD of Lam Dong province), vegetable (Technical report for planning on vegetable in Lam Dong province 2016-2020 from DARD of Lam Dong province), Cashew (Situation of cashew production and consumption in Viet Nam. <http://iasvn.org/chuyen-muc/Tinh-hinh-san-xuat-va-tieu-thu-dieu-o-Viet-Nam-7242.html>), Rubber (Situation of cashew production and consumption in Viet Nam. <http://iasvn.org/chuyen-muc/Tinh-hinh-san-xuat-va-tieu-thu-dieu-o-Viet-Nam-7242.html>), Maize (Some research result on Maize of IAS by Tran Kim Dinh et al 2015). <http://iasvn.org/chuyen-muc/Mot-so-ket-qua-nghien-cuu-ve-cay-ngo-o-Vien-Khoa-Hoc-Ky-Thuat-Nong-Nghiep-mien-Nam-7671.html>

Some references used for the price data: coffee (Technical report of planning on Coffee plantation in Lam Dong province 2015-2020 from DARD of Lam Dong province; Price of coffee in Central Highland 2015. <https://giacaphe.com/46479/thi-truong-ca-phe-ngay-30-10-2015/>), rice (Dang Thi Kim Phuong and Do Van Xe in Scientific journal 2011:18a 220-227), macadamia (Technical report of planning on Macadamia plantation in Lam Dong province 2016-2020 from DARD of Lam Dong province), tea (Technical report for planning on tea in Lam Dong province 2016-2020 from DARD of Lam Dong province), vegetable (Technical report for planning on vegetable in Lam Dong province 2016-2020 from DARD of Lam Dong province), cashew (Situation of cashew production and consumption in Viet Nam. <http://iasvn.org/chuyen-muc/Tinh-hinh-san-xuat-va-tieu-thu-dieu-o-Viet-Nam-7242.html>), rubber (Situation of cashew production and consumption in Viet Nam. <http://iasvn.org/chuyen-muc/Tinh-hinh-san-xuat-va-tieu-thu-dieu-o-Viet-Nam-7242.html>), maize (Some research result on Maize of IAS by Tran Kim Dinh et al 2015). <http://iasvn.org/chuyen-muc/Mot-so-ket-qua-nghien-cuu-ve-cay-ngo-o-Vien-Khoa-Hoc-Ky-Thuat-Nong-Nghiep-mien-Nam-7671.html>

Economic data of coffee and tea agroforestry for the assessment with LUMENS

Profitability analysis of coffee-macadamia system

	Unit	Spacing	Density per ha	Year														
				1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Coffee		3x3 m	1,100															
Productivity	ton ha ⁻¹			0	0.4	0.4	1.15	1.15	1.15	1.15	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3
Production cost	mil VND ha ⁻¹			41	17.5	17.5	13.5	13.5	13.5	13.5	19.5	19.5	19.5	19.5	19.5	19.5	19.5	19.5
Net income	mil VND ha ⁻¹			-41	-3.5	-3.5	26.7	26.75	26.75	26.75	61	61	61	61	61	61	61	61
Macadamia		9x6.5 m	165															
Productivity per tree	kg tree ⁻¹			0	0	0	0	2	3.5	5	7	9.5	11	12.5	14	16	18	20
Productivity	ton ha ⁻¹			0	0	0	0	0.33	0.57	0.825	1.155	1.56	1.815	2.06	2.31	2.64	2.97	3.3
Production cost	mil VND ha ⁻¹			54.54	13.07	12.45	12.5	12.58	13	13	13	13	13	13	13	13	13	13
Net income	mil VND ha ⁻¹			-54.54	-13.07	-12.45	-12.5	13.82	33.2	53	79.4	112.4	132.2	152	171.8	198.2	224.6	251
Total production cost	mil VND ha ⁻¹			95.54	30.57	29.95	26	26.08	26.5	26.5	32.5	32.5	32.5	32.5	32.5	32.5	32.5	32.5
Total net income	mil VND ha ⁻¹			-95.5	-16.5	-15.9	14.25	40.57	59.95	79.75	140.4	173.4	193.2	213	232.8	259.2	285.6	312
Time average of profit during the first 10 year	mil VND ha ⁻¹	57.35																

Source: Technical report of planning on Macadamia plantation in Lam Dong province 2016-2020. Scientific research project by Dak Lak Department of Science and Technology, Viet Nam Soil Science Association and Institute of Soil and Agricultural Chemistry and Tay Nguyen Agriculture and Forestry Science and Technology Institute.

Profitability analysis of coffee-fruit tree system

	Unit	Spacing	Density per ha	Year														
				1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Coffee		3 x 3 m	1,100															
Productivity	ton ha ⁻¹			0	0.4	0.4	1.15	1.15	1.15	1.15	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3
Production cost	mil VND ha ⁻¹			41	17.5	17.5	13.5	13.5	13.5	13.5	19.5	19.5	19.5	19.5	19.5	19.5	19.5	19.5
Net income	mil VND ha ⁻¹			-41	-3.5	-3.5	26.75	26.75	26.75	26.75	61	61	61	61	61	61	61	61
Durian		9 x 18 m	62															
Productivity	ton ha ⁻¹			0	0	0	0	0.9	1.73	1.81	1.87	1.92	1.96	1.98	2.01	2.03	2.047	2.05
Production cost	mil VND ha ⁻¹			15.21	6.92	8.06	9.62	17.83	20.99	23.47	26.13	26.13	26.13	26.13	26.13	26.13	26.13	26.13
Net income	mil VND ha ⁻¹			-15.3	-6.92	-8.07	-9.62	9.163	31.15	30.9	30.03	31.48	32.63	33.54	34.26	34.83	35.27	35.62
Cassia		6 x 100 m	17															
Black pepper		3 x 12 m	278															
Productivity	ton ha ⁻¹			0	0	0	0.111	0.194	0.278	0.333	0.361	0.417	0.389	0.333	0.250	0.222	0.194	0.180
Production cost*	mil VND ha ⁻¹			45.97	6.750	7.297	9.399	9.921	10.18	10.18	10.18	10.18	9.921	9.921	9.921	9.790	9.660	9.660
Net income	mil VND ha ⁻¹			-45.9	-6.75	-7.29	5.056	15.37	25.95	33.18	36.8	44.02	40.67	33.44	22.60	19.12	15.63	13.83
Total production cost	mil VND ha ⁻¹			102.2	31.16	32.86	32.52	41.25	44.67	47.15	55.81	55.81	55.55	55.55	55.55	55.42	55.29	55.29
Total net income	mil VND ha ⁻¹			-102	-17.2	-18.9	22.18	51.29	83.85	90.83	127.8	136.5	134.3	127.9	117.8	114.9	111.9	110.4
Time average of net income during the first 10 years	mil VND ha ⁻¹	50.86																

*Include cost for establishing concrete poles, and for irrigation. Sources for black pepper: Simelton E and Le TT. 2018; for durian: Vu TD and Vo TD. 2011. Tạp chí Khoa học:20b 237-247.

Profitability analysis of tea-fruit tree system

	Unit	Spacing	Density per ha	Year														
				1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Tea																		
Productivity	ton ha ⁻¹			0.0	0.0	0.2	4.7	5.8	6.6	7.1	7.4	7.7	7.8	7.9	7.9	8.0	8.0	8.0
Production cost	mil VND ha ⁻¹			9.9	9.9	9.9	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7
Income	mil VND ha ⁻¹			-9.9	-9.9	-8.1	23.5	35.6	44.2	50.0	53.8	56.1	57.6	58.5	59.0	59.4	59.6	59.7
Durian		9 x 18 m	62															
Productivity	ton ha ⁻¹			0.0	0.0	0.0	0.0	0.9	1.7	1.8	1.9	1.9	2.0	2.0	2.0	2.0	2.0	2.1
Production cost	mil VND ha ⁻¹			15.3	6.9	8.1	9.6	17.8	21.0	23.5	26.1	26.1	26.1	26.1	26.1	26.1	26.1	26.1
Income	mil VND ha ⁻¹			-15.3	-6.9	-8.1	-9.6	9.2	31.2	30.9	30.0	31.5	32.6	33.5	34.3	34.8	35.3	35.6
Total production cost	mil VND ha ⁻¹			25.1	16.8	17.9	38.3	46.5	49.7	52.1	54.8	54.8	54.8	54.8	54.8	54.8	54.8	54.8
Total income	mil VND ha ⁻¹			-25.1	-16.8	-16.2	13.9	44.7	75.4	80.9	83.8	87.6	90.2	92.0	93.3	94.2	94.8	95.3
Time average of net income during the first 10 years	mil VND ha ⁻¹	41.85																

Sources of data for tea production cost: data from Northern mountainous agriculture and forestry science institute (NOMAFSI) for the case of Phu Tho province used as approximation of production in Lam Dong province. The data was published in Mulia et al (2018b).

Profitability analysis of tea-macadamia system

	Unit	Spacing	Density per ha	Year														
				1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Tea																		
Productivity	ton ha ⁻¹			0.00	0.00	0.10	2.94	3.63	4.12	4.44	4.65	4.79	4.87	4.92	4.95	4.97	4.98	4.99
Production cost	mil VND ha ⁻¹			6.16	6.16	6.16	17.92	17.92	17.92	17.92	17.92	17.92	17.92	17.92	17.92	17.92	17.92	17.92
Income	mil VND ha ⁻¹			-6.16	-6.16	-5.06	14.68	22.23	27.64	31.27	33.61	35.08	35.99	36.56	36.90	37.11	37.24	37.31
Macadamia		9 x 6.5 m	165															
Productivity per tree	kg tree ⁻¹			0.00	0.00	0.00	0.00	2.00	3.50	5.00	7.00	9.50	11.00	12.50	14.00	16.00	18.00	20.00
Productivity	ton ha ⁻¹			0.00	0.00	0.00	0.00	0.33	0.58	0.83	1.16	1.57	1.82	2.06	2.31	2.64	2.97	3.30
Production cost	mil VND ha ⁻¹			54.54	13.07	12.45	12.50	12.58	13.00	13.00	13.00	13.00	13.00	13.00	13.00	13.00	13.00	13.00
Income	mil VND ha ⁻¹			-54.5	-13.0	-12.4	-12.5	13.82	33.20	53.00	79.40	112.40	132.20	152.00	171.80	198.20	224.60	251.00
Total production cost	mil VND ha ⁻¹			60.70	19.23	18.61	30.42	30.50	30.92	30.92	30.92	30.92	30.92	30.92	30.92	30.92	30.92	30.92
Total income	mil VND ha ⁻¹			-60.7	-19.2	-17.5	2.18	36.05	60.84	84.27	113.01	147.48	168.19	188.56	208.70	235.31	261.84	288.31
Time average of net income during the first 10 years	mil VND ha ⁻¹	51.45																

Sources of data for tea production cost: data from Northern mountainous agriculture and forestry science institute (NOMAFSI) for the case of Phu Tho province used as approximation of production in Lam Dong province. The data was published in Mulia et al (2018b).

Appendix III Targeted location and related policy

Orientation 1 Enhancing the use of renewable energy and energy efficiency

Groups of measures	Potential measures	Targeted locations	Related/supporting policies
1.1 Energy efficiency	1.1.1 Use of LED lights in urban households	Household in all districts, especially Da Lat and Bao Loc	Law on economical and efficient use of energy No. 50/2010/QH12
	1.1.2 Use of LED lights in rural households	Household in all districts, especially Da Lat and Bao Loc	Law No. 50/2010/ QH12 on economical and efficient use of energy.
	1.1.3 Promotion of improved cooking stoves	Household in all districts, especially Da Lat and Bao Loc	Law No. 50/2010/ QH12 on economical and efficient use of energy
	1.1.4 Promotion of LED lights in hotels and offices	Commerce and service in all districts especially in Da Lat and Bao Loc	Law No. 50/2010/QH12 on economical and efficient use of energy
	1.1.5 Promotion of LED lights in government offices and schools	Commerce and service in all districts especially in Da Lat and Bao Loc	Law No. 50/2010/QH12 on economical and efficient use of energy
	1.1.6 Use of LED lights for public lighting	Commerce and service in all districts especially in Da Lat and Bao Loc	Law No. 50/2010/QH12 on economical and efficient use of energy
	1.1.7 Promotion of good housekeeping measures in buildings	Commerce and service in all districts especially in Da Lat and Bao Loc	Law No. 50/2010/QH12 on economical and efficient use of energy
	1.1.8 Promotion of housekeeping and equipment maintenance	Industry in all districts especially in Da Lat and Bao Loc	<ul style="list-style-type: none"> • Law No. 50/2010/QH12 on economical and efficient use of energy • Circular 02/2014/TT-BCT on solutions for economical and efficient use of energy in industries
	1.1.9 Improvement of efficiency of industrial boilers	Industry in all districts especially in Da Lat and Bao Loc	<ul style="list-style-type: none"> • Law No. 50/2010/QH12 on economical and efficient use of energy • Circular 02/2014/TT-BCT on solutions for economical and efficient use of energy in industries
	1.1.10 Improvement of efficiency of industrial motors	Industry in all districts especially in Da Lat and Bao Loc	<ul style="list-style-type: none"> • Law No. 50/2010/QH12 on economical and efficient use of energy • Circular 02/2014/TT-BCT on solutions for economical and efficient use of energy in industries
	1.1.11 Use of LED lights in flower greenhouses	Agriculture in all districts especially in Da Lat and Lac Duong	Law No. 50/2010/QH12 on economical and efficient use of energy
	1.1.12 Improvement of efficiency in irrigation	Agriculture in all districts	Law No. 50/2010/QH12 on economical and efficient use of energy
	1.1.13 Promotion of non-fired bricks	Industry in all districts especially in Da Lat and Bao Loc	<ul style="list-style-type: none"> • Decision No. 567/QĐ-TTg on the Program for development of unburnt building materials; • Decision No. 1469/QĐ-TTg General planning on development of Viet Nam building materials by 2020 with vision to 2030; • Circular No. 13/2017/TT-BXD regulating the use of unburnt building materials in construction; • Directive No. 10/CT-TTg on strengthening the use of unburnt building materials and restricting the production and use of burnt clay bricks.

Groups of measures	Potential measures	Targeted locations	Related/supporting policies
1.2 Fuel/demand shift	1.2.1 Use of solar water heaters in urban households	Household in all districts, especially Da Lat and Bao Loc	Law No. 50/2010/QH12 on economical and efficient use of energy/
	1.2.2 Use of solar water systems in small hotels	Commerce and service in all districts especially in Da Lat and Bao Loc	Law No. 50/2010/QH12 on economical and efficient use of energy/
	1.2.3 Fuel change to biomass in boilers	Industry in all districts especially in Da Lat and Bao Loc	<ul style="list-style-type: none"> • Law No. 50/2010/QH12 on economical and efficient use of energy • Circular 02/2014/TT-BCT on solutions for economical and efficient use of energy in industries
	1.2.4 Promotion of biofuel	Transportation in all districts especially in Da Lat and Bao Loc	<ul style="list-style-type: none"> • Law No. 50/2010/QH12 on economical and efficient use of energy Decision No. 177/QĐ-TTg • Decision No. 53/2012/QĐ-TTg
	1.2.5 Introduction of CNG buses	Transportation in all districts especially in Da Lat and Bao Loc	<ul style="list-style-type: none"> • Law No. 50/2010/QH12 on economical and efficient use of energy • Decision No. 280/QĐ-TTg • Decision No. 318/QĐ-TTg
	1.2.6 Promotion of electric motorbikes	Transportation in all districts especially in Da Lat and Bao Loc	Law No. 50/2010/QH12 on economical and efficient use of energy
	1.2.7 Expansion of bus systems	Transportation in all districts especially in Da Lat and Bao Loc	<ul style="list-style-type: none"> • Decision No. 280/QĐ-TTg • Decision No. 318/QĐ-TTg
	1.2.8 Development of monorail systems	Transportation in all districts especially in Da Lat and Bao Loc	Decision No. 1202/QĐ-UBND dated June 24, 2013 approving the master plan of transport development in Lam Dong province to 2020 and orientation to 2030
1.3 Renewable Energy Development *	1.3.1. Promotion of rooftop solar PV systems in urban households	Household in all districts, especially Da Lat and Bao Loc	<ul style="list-style-type: none"> • Decision No. 2068/QĐ-TTg dated November 25, 2015 on the strategy for renewable energy development to 2050; • Decision No. 428/QĐ-TTg March 18, 2016 approving the amendment of electricity development planning 7; • Decision No. 5753/KH-UBND dated September 10, 2018 on the Plan for the implementation of the National Program on electricity bridge management for the period 2018-2020, with a vision to 2030 in Lam Dong province.
	1.3.2 Promotion of rooftop solar PV systems in buildings	Commerce and service in all districts especially in Da Lat and Bao Loc	<ul style="list-style-type: none"> • Decision No. 2068/QĐ-TTg dated Nov. 25, 2015 on the strategy for renewable energy development to 2050; • Decision No. 428/QĐ-TTg March 18, 2016 approving the amendment of electricity development planning 7; • Decision No. 5753/KH-UBND dated September 10, 2018 on the Plan for the implementation of the National Program on electricity demand management for 2018-2020, with a vision to 2030 in Lam Dong province
	1.3.3 Development of ground mounted solar PV systems	Industry in all districts especially in Da Lat and Bao Loc	<ul style="list-style-type: none"> • Decision No. 2068/QĐ-TTg dated November 25, 2015 on the strategy for renewable energy development to 2050; • Decision No. 11/QĐ-TTg dated 11 April 2017 on the incentive mechanism for the development of solar power projects in Viet Nam.

Groups of measures	Potential measures	Targeted locations	Related/supporting policies
	1.3.4 Development of wind farms	Industry in all districts especially in Da Lat and Bao Loc	<ul style="list-style-type: none"> Decision No. 2068/QĐ-TTg dated November 25, 2015 on the Strategy for renewable energy development until 2050; Decision No. 428/QĐ-TTg March 18, 2016 approving the amendment of electricity development planning 7; Decision No. 39/QĐ-TTg dated September 10 on amending and supplementing a number of articles of Decision 37/QĐ-TTg dated June 29, 2011 on the mechanism to support the development of wind power projects in Viet Nam;
	1.3.5 Promotion of Waste to Energy	Industry in all districts especially in Da Lat and Bao Loc	<ul style="list-style-type: none"> Decision No. 2068/QĐ-TTg dated November 25, 2015 on the strategy for renewable energy development to 2050; Decision No. 428/QĐ-TTg March 18, 2016 approving the amendment of electricity development planning 7; Decision No. 1900/QĐ-UBND dated September 15, 2014 Decision 31/2014/QĐ-TTg on the mechanism to support the development of power generation projects using solid waste
	1.3.6 Deployment of dual use approach for solar energy and food production	Industry in all districts especially in Da Lat and Bao Loc	<ul style="list-style-type: none"> Law No. 50/2010/QH12 on economical and efficient use of energy Decision No. 2068/QĐ-TTg dated November 25, 2015 on the Strategy for renewable energy development to 2050;
	1.3.7 Promotion of small hydro power	Industry in all districts especially in Da Lat and Bao Loc	<ul style="list-style-type: none"> Decision No. 2068/QĐ-TTg dated Nov. 25th, 2015 on the Strategy for renewable energy development until 2050; Decision No. 428/QĐ-TTg March 18th 2016 approving the amendment of electricity development planning 7; Electricity development planning of Lam Dong province in the period of 2016-2020 with 2035, approved by Decision No. 4175/QĐ-BCT of November 6, 2018.

Orientation 2 Reduce emission from all sectors

Groups of measures	Potential measures	Targeted locations	Related/supporting policies
2.1 Control the expansion and reducing emission from greenhouse	2.1.1 Control the rate of greenhouse's expansion during 2021-2030 as half of condition without intervention (baseline) through a range of potential disincentive regulations and economic instruments.	All districts with priority in Da Lat, Lac Duong, and Duc Trong districts	Need policies that tighten regulations on greenhouse e.g. waste management, wastewater control, landscape management, etc.
	2.1.2 Generate awareness of farmers to follow the norm of fertilizer and pesticide application inside greenhouse		Decision No. 3073/QĐ-BNN-KHCN dated 28/10/2009
2.2 Reducing emission from the cultivation, irrigation and harvesting of agricultural products	2.2.1. Use of LED lights in flower greenhouses	See intervention 1.1.11	See intervention 1.1.11
	2.2.2 Improvement of efficiency in irrigation	See intervention 1.1.12	See intervention 1.1.12
2.3 Halting the transfer of natural forests to other usages (except for e.g. special national security and defence projects as approved by the Prime Minister) to promote deforestation-free landscape	2.3.1 Strictly enforce provincial forest planning (revised in 2018) and forest protection regulations: minimize converting forest to mining, hydropower and other development projects, especially within the biodiversity corridors of the province. Development projects that do not require forest cut and conversion and do not need to establish concrete infrastructure (e.g. eco-tourism) may still be considered with careful impact assessment	All districts, with priority in the biodiversity corridors of the province that connects Bidoup NuiBa and Ca Tien national park and new four conservation areas	Provincial Biodiversity Conservation Planning to 2020 with vision to 2030
2.4 Promote tree-based system such as agroforestry to replace 'illegal' crop cultivation systems on forest lands as a measure of forest restoration	2.4.1 Promoting agroforestry (with timber and/or fruit trees) and other types of agroforestry on forest lands that have been illegally converted to agricultural plantation	All districts but priority should be given to medium and high elevations (less access to ground water for irrigation) e.g. above 500 m	Article 57 of Forestry law 2017, Decision 608/QĐ-UBND dated 03/4/2018 of Lam Dong PPC on approval of outline of proposal on forest restoration on illegally converted forestland by agroforestry in the period of 2018-2020
2.5 Continue to improve policies on the allocation and lease of forests and forestry lands, to be in line with forest conservation, restoration and sustainable use of forests	2.5.1 Conditional forest land allocation/concession to community and individual households where forests have been already converted to agriculture: community and households receives long-term forest land allocation with a clear land delineation if they commit to maintain tree covers above 30%	All districts (prioritize those at medium and high elevations)	Article 57 of Forestry law 2017, Decision 608/QĐ-UBND dated 03/4/2018 of Lam Dong PPC on approval of outline of proposal on forest restoration on illegally converted forestland by agroforestry in the period of 2018-2020
	2.5.2 Assist natural forest regeneration (with or without enrichment planting) with "bareland with scattered trees" as targeted areas	The areas of "bareland with scattered trees" according to the 2016-2020 provincial landuse and forest planning map	Article 57, Forestry Law Decision 608/QĐ-UBND dated April 3, 2018 of the Lam Dong PPC, approving the outline of the proposal to restore forests for areas converted into agricultural cultivation with intercropping systems in 2018- 2020

Groups of measures	Potential measures	Targeted locations	Related/supporting policies
2.6 Collaborate with other sectors to explore and promote carbon sequestration in and relating to forestry sector	2.6.1 Explore and promote scattered tree plantation in urban areas, industrial zones and along roads	All districts but priority should be given to cities and towns	Environmental protection policies
2.7 Expand the scope of PFES as a mean to mobilize resources from the whole society for forest and ecosystem services protection and development	2.7.1 A thorough study to support formulation of an innovative provincial policy that expands the scope of current PFES to air travel/ industrial water use/greenhouse operation/voluntary PFES payment in tourism sector	All districts but prioritize those have not yet received PFES payment	National PFES policy
	2.7.2 Implementing innovative PFES schemes in the province		
2.8 Address threats to forest degradation because of population growth and poverty	2.8.1 Support households in poor districts/communes nearby forest to develop multi-purpose home-garden for food/nutrients safety and thereby reduce pressure to forest resources	Poor communes that are nearby forest	

Orientation 3 Control waste production and improve waste treatment

Groups of measures	Potential measures	Targeted locations	Related/supporting policies
3.1 Reducing, collecting and reusing waste from agricultural lands and practice	3.1.1 Reduce waste from agricultural residues, and promote production of green manure and composting in concentrated areas (especially for flower and vegetable production and processing) to increase the production of organic and locally produced fertilizer that currently can only satisfy 3% of the demand	All districts but priority should be Da Lat, Lac Duong, and Duc Trong districts	Decision No. 756/QD-UBND
	3.1.2 Control agricultural hazardous waste: develop the network of collection points/tanks for agricultural chemical plastic containers (especially those of pesticides)	All districts	Decision No. 756/QD-UBND; Decision 3825/KH-UBND
	3.1.3 Apply innovative manure management especially for pig as the most populated livestock raised in the province, in which manure are managed by current management systems with the gas generated from biogas recovery is converted into electrical energy or manure are managed by biogas recovery system. Compared to the current management system or if manure were directly discharged into the environment, the innovative management is safer to environmental and generate lower emission	Duc Trong, Don Duong, Di Linh, Lam Ha, Da Huoi, Da Teh, Cat Tien, Dam Rong, Bao Lam and Bao Loc City	Decision No. 756/QD-UBND
3.2 By 2030, substantially reduce waste generation and increase the economic value of waste resources through prevention, reduction, recycling, reuse, and recovery of energies from waste treatment	3.2.1 Prepare, issue policies, mechanisms, instruments for prevention, reduction, classification, collection, transportation, reuse, recycling and treatment of waste	All districts	Solid waste management program: Development of a comprehensive waste management master plan for the whole province; Increasing the capacity of landfill sites to sustainably manage non-toxic solid waste; Building a safety system for transportation and storage of hazardous waste.
	3.2.2 Establish province's waste database; develop technical standards, codes on the environment and technical guidelines on how to reduce, classify, reuse and recycle waste	All districts	
	3.2.3 Implement programmes to increase public awareness, strengthen the capacity for integrated management of waste	Whole province with priority given to cities of Da Lat and Bao Loc	
	3.2.4 Strengthen management over waste discharge activities; improve the existing legal system; examine, inspect, oversee the implementation and enforcement of environmental protection legislation relating to waste management	All districts	Sustainable urban program that includes reviewing of planning of urban areas of Da Lat and other important urban areas toward "green city"; Increasing the rate of domestic and hospital waste collected and treated; Enhancing the protection of urban landscapes; Expanding green space in urban areas.

Groups of measures	Potential measures	Targeted locations	Related/supporting policies
	3.2.5 Increase investment in urban environmental quality improvement, technology improvement, modernization of waste collection and treatment equipment.	All districts	
3.3 Prevent and minimize solid waste generation; implement integrated management of solid waste based on market mechanisms; modernize fee collecting mechanisms for the collection and treatment of solid wastes generated; increasingly reduce solid waste from domestic, production, service activities	3.3.1 Classification and treatment of solid waste, especially domestic and medical waste. Apply high technology to waste treatment	All districts	Sustainable urban program that includes reviewing of planning of urban areas of Da Lat and other important urban areas toward "green city"; Increasing the rate of domestic and hospital waste collected and treated; Enhancing the protection of urban landscapes; Expending green space in urban areas.

Orientation 4 Promoting climate-smart and more sustainable landuse system

Groups of measures	Potential measures	Targeted locations	Related/supporting policies
4.1 Introduce and apply sustainable farming practices such as agroforestry with multi-functional trees that promotes sustainable land utilization, minimal use of chemicals, inorganic fertilizers, and combat soil erosion, run-off and soil degradation	4.1.1 Promote coffee agroforestry practices by integrating highly profitable fruit trees such as durian and avocado, commercial crops such as pepper and nitrogen-fixing trees such as <i>Cassia siamea</i> to maintain soil fertility. By 2030 at least 30% of coffee plantations in the province are agroforestry	All districts but priority should be given to Di Linh, Duc Trong, Don Duong, Lam Ha and Bao Lam where tree cover is rather low	Decision of 2261/QD-UBND, VNSAT, ISLA program
	4.1.2 Promote tea-fruit tree agroforestry in which fruit tree provides shading and to stop continuous decline of supply of raw tea material due to the switch of tea into fruit tree plantation which provides higher profitability. By 2030 at least 30% of tea plantations in the province are agroforestry	Research in tea growing areas mainly Da Lat, Bao Loc, Bao Lam and Lam Ha	Decision of 482/QD-UBND
	4.1.3 Support research and development projects that aim to investigate best agroforestry practice and development of sustainable market value chain linking farmers as producers, processing industries and private sectors, and consumers	All districts	Decision of 2897/QD-UBND
	4.1.4 Support the promotion of agroforestry by providing training to relevant stakeholders in the province such as on selecting suitable shading tree species and density, and appropriate management practice in agroforestry systems	All districts	Decision of 2897/QD-UBND
	4.1.5 Support the sustainability of development of climate-smart agriculture system with schemes such as Public-Private Partnership (PPP), and further with Production- Protection-Inclusion (PPI) or Verified Sourcing Area (VSA) that aim to secure livelihood within the frame of sustainable environment especially through forest conservation	Districts with promotion of climate-smart and sustainable agriculture (4.11., 4.1.2) and other districts such as Lac Duong, Di Linh, Don Duong, Bao Loc	Decision of 2261/QD-UBND, Decision of 2897/QD-UBND
4.2 Support the local forest enterprise to participate in sustainable forest management (SFM) scheme	4.2.1 Support forest enterprises, communities and households to develop their sustainable forest management (SFM) plans for production forest and engage in forest certification schemes both internationally and nationally	All districts and cities but priority will be given to those locating and poor districts and communes (e.g. Don Duong, Di Linh, Bao Lam, Da Huoi, Da Teh)	Province's forestry planning, National SFM and forest certification policy

Orientation 5 Conserve water, natural resources and biodiversity

Groups of measures	Potential measures	Targeted locations	Related/supporting policies
5.1 Halting the transfer of natural forests to other usages (except for e.g. special national security and defence projects as approved by the Prime Minister) to promote deforestation-free landscape	5.1.1 Strictly enforce provincial forest planning (revised in 2018) and forest protection regulations: minimize converting forest to agricultural lands, mining, hydropower and other development projects, especially within the biodiversity corridors of the province. Development projects that do not require forest cut and conversion and do not need to establish concrete infrastructure (e.g. eco-tourism) may still be considered with careful impact assessment. This is similar intervention with 2.3.1 with focus on biodiversity conservation rather than emission	All districts, with priority in the biodiversity corridors of the province that connects Bidoup NuiBa and Ca Tien national park and new four conservation areas	Provincial Biodiversity Conservation Planning to 2020, vision to 2030
5.2 Protect important/endangered ecosystems/habitats/species of Lam Dong province	5.2.1 Support the establishment of four new protected areas in accordance with provincial biodiversity planning: Nui Voi, Phat Chi, Don Duong Natural Reserves, and Madaguoi	Targeted protected areas with priority given to Don Duong Natural Reserves (for having deciduous forest ecosystem) and Nui Voi protection area for potential to expand ecotourism	Biodiversity planning of Lam Dong province
	5.2.2 Support biodiversity database development and biodiversity monitoring at provincial and national level	All districts and cities with focus on protected areas	Biodiversity planning of Lam Dong province
	5.2.3. Application of economic instruments to raise and sustain funding for Lam Dong's biodiversity and natural resources conservation	All districts with priority of conservation areas such as the biodiversity corridor and the four new conservation areas	Provincial Biodiversity Conservation Planning to 2020, vision to 2030
5.3 Develop water resource planning, management, and supporting policy for an effective and equitable use by all stakeholders	5.3.1 Develop water resource planning and management for an effective and equitable use of water reserves both surface and ground water reserves	All districts with a priority in flat terrain related to sources of ground water to include Di Linh district	Provincial Construction Planning, Decision 475/QĐ-UBND dated 4/3/2010
	5.3.2 Develop supporting policy to ensure an appropriate use of water resource by different stakeholders according to the planning and management plan	All districts	Decision 475/QĐ-UBND dated 4/3/2010
	5.3.3 Adopt high-technology, and increase capital and investment to ensure the provision of clean and safe water supply	All districts due to increasing water pollution in main rivers to include Cam Ly, Đa Dâng, Đa Nhim, Đồng Nai, La Ngà, Krông Nô	Provincial Construction Planning, Decision 475/QĐ-UBND dated 4/3/2010

Orientation 6 Enhancing market access and export of main commodities

Groups of measures	Potential measures	Targeted locations	Related/supporting policies
6.1 Establishing farmer's cooperative, processing industry and value-chain to facilitate the collection and the selling of commodities	6.1.1 Establish farmer's cooperative and value-chain especially for fruit trees/crops such as durian, avocado, strawberry, jackfruit, passion fruits to better deal with the current markets dominated by middlemen and exporter without fixed contract with farmers	Da Lat, Lac Duong, Duc Trong, Lam Ha, Di Linh, Don Duong and Bao Lam, Da Huoi	Resolution No. 104/2018/NQ-HDND
	6.1.2 Establish processing industries and value chain for other potential commodities of Lam Dong province for example cacao, pepper, and cashew to increase value-added and economic return	Mainly in Bao Lam, Di Linh, Da Huoi	Decision of 774/QĐ-UBND, Resolution No. 104/2018/NQ-HDND
6.2 Ensure product quality through participating in certification scheme and access better market through branding	6.2.1 Increase the percentage of agricultural products, cultivation area and stakeholders in value chain participating in certification scheme; and for coffee such as 4C, UTZ, Rainforest, to ensure standard product quality	All districts especially in northern districts such as Da Lat city and Lac Duong where the vegetable and flower cultivation are dominant, and in the central-southern part such as Lam Ha and Di Linh where perennial crops are dominant	Decision of 2897/QĐ-UBND, Decision of 482/QĐ-UBND), Decision of 1941/QĐ-UBND, Resolution No. 104/2018/NQ-HDND
	6.2.2 Increase the percentage of livestock products and stakeholders in value chain to participate in certification scheme, to ensure standard product quality for domestic and export market	Duc Trong, Don Duong, Di Linh, Lam Ha, Da Huoi, Da Teh, Cat Tien, Dam Rong, Bao Lam and Bao Loc City	Decision of 111/QĐ-UBND, Decision of 08/QĐ-UBND, Decision of 2201/QĐ-UBND
	6.2.3 Building a brand to raise the value of agricultural products in the province along with the improvement in the product quality due to improved management and technology. The current recommended brand "Da Lat - miraculous crystallization from healthy soil" for vegetable products, flowers, and Arabica coffee	All districts to include in the northern part such as Da Lat city and Lac Duong where the vegetable and flower cultivation are dominant, and in the central-southern part such as Lam Ha and Di Linh where perennial crops are dominant	Decision of 2897/QĐ-UBND, Decision of 482/QĐ-UBND), Decision of 1941/QĐ-UBND, Resolution No. 104/2018/NQ-HDND

Orientation 7 Develop green and sustainable tourism

Groups of measures	Potential measures	Targeted locations	Related/supporting policies
7.1 Develop high quality, unique, diverse and high value-added tourist services, that promote local cultures and products	7.1.1 Plan, invest in the development of local tourist products based on the key strengths and attractiveness of tourist resources which give priority to the development of cultural tourism and ecological tourism including visits to national parks to enhance the contribution to provincial economy	Whole province	Development of high - quality tourism in Lam Dong province for the period of 2016-2020 and vision to 2025 (Resolution No. 07-NQTU dated Nov. 16-2016)
	7.1.2 Promote the linkages between regions, provinces, areas, localities, moving towards developing unique area-specific tourist products	Whole province	
7.2 Develop “green” and environmental-friendly tourist services and products, considering natural characteristics and safeguard of natural resources	7.2.1 Minimize negative impacts of tourism on natural environment through promotion of "responsible tourism" and encourage participation of stakeholders involved in tourism business to meet international standard of sustainable tourism	Whole province	Criteria for "Farming tourist routes" and "Tourism Farm" (Decision No. 2291/QĐ_UBND dated Nov. 23/2017 by Lam Dong PPC)
	7.2.2 Application of economic instruments in changing tourists' behaviours towards environment and biodiversity conservation	Whole province	
7.3. Involve communities from different socio-economic backgrounds (poor communities, ethnic minorities)	7.3.1 Develop tourism packages, activities and facilitation which involve communities from different socio-economic background including poor communities and ethnic minorities, with fair and equitable profit sharing, and with proper training to enhance knowledge and skills	Whole province	Master plan for tourism development in Lam Dong Province to 2020 (Decision N. 1369/QĐ-UBND dated June 25/2010)
	7.3.2 Develop mechanism to ensure local living standards which are under pressures of tourism and migrants working in tourism sector in the province	Whole province especially Da Lat and Bao Loc	Decision No. 1369/QĐ-UBND

Orientation 8 Promote green lifestyle and sustainable urban consumption

Groups of measures	Potential measures	Targeted locations	Related/supporting policies
8.1 Strengthening communication, raising awareness of people and business community on the importance of reducing waste and practicing sustainable consumption	8.1.1 Conduct information-communication-advocacy activities to change consumption behaviours, practice sustainable consumption, move towards a low-waste discharge, low-carbon emission society	All districts	The program applies modern, advanced and environmentally friendly technologies in mineral exploitation and processing
	8.1.2 Apply economic incentives to modify unreasonable consumption behaviours	Whole province but priority is given to Da Lat and Bao Loc cities	Cleaner production program: increasing technology transfer, greening, cleaner production for small and medium enterprises and households
	8.1.3 Develop and disseminate sustainable and responsible consumption models	Whole province but priority is given to Da Lat and Bao Loc cities	
8.2 Making amendment of supplement and newly issue mechanisms and policies to encourage development of green growth in all fields, with special attention paid to policies on promotion of cleaner production and development of technical, socio-economic infrastructure and sustainable agricultural production	8.2.1 Issue policies that encourage production and business entities to apply modern environmental management systems, according to ISO 14000 standards	All districts	
	8.2.2 Issue regulations to guide the use of waste discharge quotas and gradually set up a transfer market for waste discharge quotas	All districts	
	8.2.3 Issue regulations on waste auditing and product lifecycle assessment	All districts	
	8.4.2 Implement a rigorous registration regime for chemical operations, especially for hazardous/toxic chemicals	All districts	
	8.4.5 Develop chemical incidents prevention and response capacities	All districts	Program on limitation of usage of plant protection drugs, pesticides and chemical fertilizers.
8.3 Apply technical standards, codes, requirements on chemical safety, in parallel with the monitoring, inspection, punishment of violations to ensure compliance with existing legislation	8.3.1 Transfer green technology, cleaner production processes to small and medium enterprises	All districts	Program on limitation of usage of plant protection drugs, pesticides and chemical fertilizers.
8.4 Review the existing legal framework governing discharge activities, particularly discharge of hazardous chemicals into the environment, to issue adequate, appropriate legal provisions to prevent and control environmental pollution.	8.4.1 Prevent and control environmental pollution sources, and reduce the impacts from environmental pollution on people's health	All districts	

Orientation 9 Create enabling conditions for transitioning towards a green economy

Groups of measures	Potential measures	Targeted locations	Related/supporting policies
9.1 Ensure that demand-side policies are in place for green products and services	9.1.1 Accelerate the shift of governments' expenditure to green public procurements	All districts	State Budget Law, Law on Bidding (2013), Decree 63/2014/ND-CP of the Government, Law on Environmental Protection (2014), National GGS (2011-2020)
9.2 Support development of green products, markets and trade	9.2.1 Initiate a subsidy reform to shift away from subsidizing products and services that negatively impacts environment; and promote the use of environmentally friendly products	All districts	Decree 58/2018 on agricultural insurance policy, Decision 22/2019/QD-TTg of the Prime Minister on supporting agricultural insurance policy, Law on Environmental Protection (2014), National GGS (2011-2020), Provincial' decision on implementation of 135 NTP
	9.2.2 Accelerate certification of sustainable production and trade	All districts	Decree 98/2018/ND-CP Decree 109/2018/ND-CP Decision 1288/2018/QD-TTg
9.3 Mainstream green accounting for key economic sectors to inform policies on pricing environmental externalities; mobilize resources for natural resources conservation and support trade of environmental goods and services	9.3.1 Develop policies that promote accounting for environmental externalities	All districts	Law on Environmental Protection (2014) National GGS (2011-2020) Viet Nam's NDC Law on Mineral Resources (2010)
	9.3.2 Facilitating trade of environmental goods and services	All districts	Law on Environmental Protection (2014) National PFES policies National GGS (2011-2020)
	9.3.3. Investigate policy options to mobilize resources from private sectors and the whole society for natural resources conservation	All districts	Law on Environmental Protection (2014) National PFES policies Decision 247/QD-UBND (2015) of Lam Dong's PPC
9.4 Promoting innovation and accelerating the dissemination of green technologies	9.4.1 Develop local capacity for green technology development and exchange	All districts	Decision 2323/QD-UBND (2016) of Lam Dong's PPC Decision 756/QD-UBND (2017) of Lam Dong's PPC
	9.4.2 Support technology transfer through partnerships and co-investments	All districts	Law on Technology Transfer (2017) and subsequent Decrees Decision 635/QD-UBND of Lam Dong's PPC (2019)

Appendix IV Desired outcomes and targets by 2030

Orientation 1 Enhancing the use of renewable energy and energy efficiency

Potential measures	Desired outcomes	Target by 2030
1.1.1 Use of LED lights in urban households	Urban households are aware of benefits of using LEDs and using LEDs to replace CFLs and tubes.	The proportion of urban households using LED light bulbs reaches 70% by 2030
1.1.2 Use of LED lights in rural households	Rural households are aware of benefits of using LEDs and using LEDs to replace CFLs and tubes or setting up new lighting system.	The proportion of rural households using LED light bulbs reaches 50% by 2030
1.1.3 Promotion of improved cooking stoves	Improved cooking stoves are used to replace traditional stoves	By 2030, 70% of rural households will use improved cooking stoves instead of traditional ones
1.1.4 Promotion of LED lights in hotels and offices	Hotels and offices in Lam Dong use LEDs for lighting instead of CFLs and tubes	By 2030, 70% of hotels and offices use LEDs
1.1.5 Promotion of LED lights in government offices and schools	State agencies and schools in Lam Dong use LEDs for lighting instead of CFLs and tubes	By 2030, 70% of state agencies and schools use LEDs
1.1.6 Use of LED lights for public lighting	LEDs are used in both newly setup and replacement in public lightings	Replace existing Sodium lights with LEDs. Using LEDs in new public lighting setup. The rate of LEDs usage reaches 60% by 2030.
1.1.7 Promotion of good housekeeping measures in buildings	Building owners are aware of the importance of saving energy. Building owners implement in-house management measures including strengthening maintenance to prevent waste and loss of energy	100% of hotels and office buildings apply energy management system
1.1.8 Promotion of housekeeping and equipment maintenance	Enterprises are aware of the importance of energy saving and carry out in-house management, equipment maintenance measures to prevent waste and loss of energy.	100% of enterprises apply
1.1.9 Improvement of efficiency of industrial boilers	Industrial manufacturers implement measures to improve the efficiency of boilers and steam distribution systems	50% of manufacturers apply
1.1.10 Improvement of efficiency of industrial motors	Industrial manufacturers measure the operation of motors, replace in case of under-load motors or use inverters in case of large-fluctuating load motors.	By 2030, the replacement reaches 60%
1.1.11 Use of LED lights in flower greenhouses	Chrysanthemum growers in greenhouse are aware of the effectiveness of using LEDs instead of CFLs when keeping warm, then shift to use LEDs for this purpose.	The rate of using LEDs reaches 70% in 2030
1.1.12 Improvement of efficiency in irrigation	Research on energy efficiency in irrigation is conducted Implementation of energy conservation measures with small investment and easy implementation first	Deploying in the whole province
1.1.13 Promotion of non-fired bricks	Eliminate traditional brick with outdated technology kilns. Implementation of Decision No. 567/QĐ-TTg on development of unburnt materials Promote the implementation of regulations on the use of unburnt materials in construction works	Non-fired brick production reaches 50% of the total brick production in 2030
1.2.1 Use of solar water heaters in urban households	Households are aware of the effectiveness of solar water heaters and use heater to reduce electricity cost. New houses are built with integrated solar water heater	The percentage of households with solar water heaters reaches 40% by 2030
1.2.2 Use of solar water systems in small hotels	Hotels are aware of the effectiveness of solar water heaters and use this heater to reduce electricity costs.	The number of small hotels using solar water heaters reaches 10% by 2030

Potential measures	Desired outcomes	Target by 2030
	New small size hotels are built with integrated solar water heater	
1.2.3 Fuel change to biomass in boilers	Industrial manufacturers with coal fired boilers convert to wood/biomass pellets	Convert 20% of the boilers
1.2.4 Promotion of biofuel	E5 gasoline is used as a substitute for fossil gasoline in state agencies E5 gasoline is used in many transportation activities	E5 gasoline accounts for 70% of total gasoline consumption by 2030
1.2.5 Introduction of CNG buses	The provincial People's Committee and related parties agree on the use of CNG buses in major urban areas of Lam Dong	Newly sponsored buses from 2022 only uses CNG
1.2.6 Promotion of electric motorbikes	The use of electric vehicles is promoted in both urban and rural areas Public charging stations are set up	Electric motorcycles account for 14% of the total number of motorcycles sold in 2030
1.2.7 Expansion of bus systems	More bus routes are opened in Da Lat, Bao Loc and the central areas	Bus transportation accounts for 3% of passenger transport by 2030
1.2.8 Development of monorail systems	Construction of two monorail routes begins before 2030	Route 1: Da Lat City - Lien Khuong Airport. Route 2: Da Lat City - Tuyen Lam Lake
1.3.1. Promotion of rooftop solar PV systems in urban households	Households in urban areas are interested in installing solar PV systems to reduce electricity consumption from the grid	The rate of urban households installing roof top solar PV systems will reach 1% by 2030
1.3.2 Promotion of rooftop solar PV systems in buildings	Several hotels, offices have installed solar PV system to reduce electricity consumption from the grid	90 solar PV systems each 20 kWp can meet 2% electric energy demand
1.3.3 Development of ground mounted solar PV systems	Solar PV system is deployed on water surface of hydropower plan and irrigation reservoirs as well as in inefficient agricultural areas	The capacity of solar power plants reaches 315.8 MW by 2030
1.3.4 Development of wind farms	Wind potential assessment is performed Implementation of wind turbines in potential areas	The capacity of wind turbine will reach 315.8 MW by 2030
1.3.5 Promotion of Waste to Energy	The third centralized waste treatment factory integrates heat recovery technology to generate electricity	Development of a 5 megawatt power plant
1.3.6 Deployment of dual use approach for solar energy and food production	Solar power development combined with agricultural production model is applied for several crops	Achieve a capacity of 30 MW including 20 MW from tea plantation area and 10 MW from flower plantation area
1.3.7 Promotion of small hydro power	Small hydropower projects in electricity development plan have been approved	To reach capacity of 37.1 MW in 2020 and 209.6 MW in 2030

Orientation 2 Reduce emission from all sectors

Potential measures	Desired outcomes	Target by 2030
2.1.1 Control the rate of greenhouse's expansion during 2021-2030 as half of condition without intervention (baseline) through a range of potential disincentive regulations and economic instruments.	Farmers in the province especially in Da Lat and Lac Duong where the greenhouse is concentrated, have an orientation to improve quality instead of merely quantity, and get training on hi-tech and low-emission agriculture, consider more to participate in certification and branding	The expansion rate of greenhouse in green growth is half of business as usual
2.1.2 Generate awareness of farmers to follow the norm of fertilizer and pesticide application inside greenhouse	Farmers in the province especially in Da Lat and Lac Duong where the greenhouse is concentrated, respect and apply the standard norm of fertilizer and pesticide application	100% farmers have proper awareness on the norm and implement
2.2.1. Use of LED lights in flower green houses	See intervention 1.1.11	See intervention 1.1.11
2.2.2 Improvement of efficiency in irrigation	See intervention 1.1.12	See intervention 1.1.12
2.3.1 Strictly enforce provincial forest planning (revised in 2018) and forest protection regulations: minimize converting forest to mining, hydropower and other development projects, especially within the biodiversity corridors of the province. Development projects that do not require forest cut and conversion and do not need to establish concrete infrastructure (e.g. eco-tourism) may still be considered with careful impact assessment	All stakeholders to include local community, private sectors and development project, highly consider forest protection and conservation, and do not perform activities which lead to forest conversion	Zero deforestation in the province except for a specific task such as provincial or national security/defence
2.4.1 Promoting agroforestry with timber trees on forest lands that have been illegally converted to agricultural plantation ⁴⁸	Reconciliation between the land cultivators and the authorities on tree-based system to replace the illegal cropping system on forest lands	No more illegal cultivation practice in forest lands, and full conversion of current illegal crops (around 42,000 ha) into agroforestry
2.5.1 Conditional forest land allocation/concession to community and individual households where forests have been already converted to agriculture: community and households receives long-term forest land allocation with a clear land delineation if they commit to maintain tree covers above 30%	An agreement between the authorities and households with allocated lands, on longer-term forest land use with a condition of committing to maintain the tree covers above 30% as part as the way to reconcile livelihood and increase in forest cover	Forest lands allocated to households (around 9,243 ha) and to local communities (1,934 ha) with longer-term contract under such a condition
2.5.2. Assist natural forest regeneration (with or without enrichment planting) with "bareland with scattered trees" as targeted areas	Regeneration of bareland will become part of landuse planning for the period of 2021-2035	All barelands within the protection forest zone (around 24,000 ha) naturally evolves towards a higher quality forest ⁴⁹
2.6.1 Explore and promote scattered tree plantation in urban areas, industrial zones and along roads	Greener urban area in Lam Dong province with a more conducive environment for all people and society	Supporting policy which promotes carbon credits and link to urban

⁴⁸ References: Proposal on forest restoration on illegally converted forestland by agroforestry in the period of 2018-2020, Provincial REDD+ Action Plan

⁴⁹ Reference: Provincial forest planning report

Potential measures	Desired outcomes	Target by 2030
	living in especially main cities of the province such as Da Lat and Bao Loc	greening Target 60,000 trees to integrate into the urban areas ⁵⁰
2.7.1 A thorough study to support formulation of an innovative provincial policy that expands the scope of current PFES to air travel/ industrial water use/greenhouse operation/voluntary PFES payment in tourism sector	More responsibilities from different stakeholders to contribute in support environmental protection by participating in innovative PFES scheme developed by the provincial authorities	Formulation of innovative provincial policy to appraise and approved within the period of 2021-2025, and at least one innovative PFES scheme developed
2.7.2 Implementing innovative PFES schemes in the province	More resource for forest and environmental protection through the innovative PFES scheme	At least 50,000 ha of forest/agroforest lands, at least 10,000 households receiving payment, total revenue at least 50 billion VND/year
2.8.1 Support households in poor districts/communes nearby forest to develop multi-purpose home-garden for food/nutrients safety and thereby reduce pressure to forest resources	Under policy support and guidance from relevant department, the households living in forest margin develop multi-strata home-garden system integrating different plant component such as timber and fruit trees, annual and food crops, and understorey	1,000 home-gardens or 500 ha of home-gardens as targeted in the PRAP

⁵⁰ <https://thuvienphapluat.vn/van-ban/Tai-nguyen-Moi-truong/Quy-dinh-2309-QD-UBND-de-an-trong-cay-phan-tan-cay-che-bong-Lam-Dong-2017-2020-2016-328194.aspx>

Orientation 3 Control waste production and improve waste treatment

Potential measures	Desired outcomes	Target by 2030
3.1.1 Reduce waste from agricultural residues, and promote production of green manure and composting in concentrated areas (especially for flower and vegetable production and processing) to increase the production of organic and locally produced fertilizer that currently can only satisfy 3% of the demand	With adequate training, farmers can process organic fertilizer from manure, and increase the portion of organic input in the total input material for the cultivation	At least 50% of the manure production are processed into organic fertilizer
3.1.2 Control agricultural hazardous waste: develop the network of collection points/tanks for agricultural chemical plastic containers (especially those of pesticides)	Accompanied by proper advocacy, farmers are highly aware of the impact of hazardous waste to environment, and avoid dumping the chemical plastic containers indiscriminately to soil or river	80% of hazardous waste are collected and processed by 2020 (Decision 3825/KH-UBND), 100% of hazardous waste are properly collected and processed by 2030
3.1.3 Apply innovative manure management ⁵¹ especially for pig as the most populated livestock raised in the province, in which manure are managed by current management systems with the gas generated from biogas recovery is converted into electrical energy or manure are managed by biogas recovery system. Compared to the current management system or if manure were directly discharged into the environment, the innovative management is safer to environmental and generate lower emission	Stakeholders involved in livestock farming become aware of innovative manure management that can reduce intensity of soil and water pollution from inadequate use or processing of manure, and implement the innovative approach in their farming	At least 50% of the manure production are processed with innovative manure management
3.2.1 Prepare, issue policies, mechanisms, instruments for prevention, reduction, classification, collection, transportation, reuse, recycling and treatment of waste	A well-coordinated collection and processing of waste in the province under a clear guiding policy	Promulgation and implementation of a set of regulations for waste treatment system
3.2.2 Establish province's waste database; develop technical standards, codes on the environment and technical guidelines on how to reduce, classify, reuse and recycle waste	A better waste management system by the authorities and stakeholders in the province with an integrated and standardized database system and a clear guidance	An improved database and guideline for waste treatment system
3.2.3 Implement programmes to increase public awareness, strengthen the capacity for integrated management of waste	Provision of activities to enhance public awareness of local people and stakeholders in the province and their knowledge and capacity in integrated waste management	All local communities especially in urban areas are aware and have capacity for doing integrated waste management
3.2.4 Strengthen management over waste discharge activities; improve the existing legal system; examine, inspect, oversee the implementation and enforcement of environmental protection legislation relating to waste management	An improved control and supervision from the authorities on waste discharge activities by different stakeholders both local communities and industries	A stronger control and supervision, and stronger law enforcement on environmental protection
3.2.5 Increase investment for urban environmental quality improvement, technology improvement, modernization of waste collection and treatment equipment	A supporting investment for improved technology in urban waste collection and treatment	Increased investment by at least 50% compared to 2020
3.3.1 Classification and treatment of solid waste, especially domestic and medical waste. Apply high technology to waste treatment	Improved processing of solid waste with high technology and a more refined classification system	A guidance on classification and treatment of solid waste with a high technology

⁵¹ Nguyen et al (2017). Assessment of greenhouse gas emissions from the pig production in Lam Dong. <http://stdjsee.scienceandtechnology.com.vn/index.php/stdjsee/article/view/439>

Orientation 4 Promoting climate-smart and more sustainable landuse system

Potential measures	Desired outcome	Targets by 2030
4.1.1 Promote coffee agroforestry practices by integrating highly profitable fruit trees such as durian and avocado, commercial crops such as pepper and nitrogen-fixing trees such as <i>Cassia siamea</i> to maintain soil fertility. By 2030 at least 30% of coffee plantations in the province are agroforestry	More crop growers especially smallholder farmers practice agroforestry which promotes product diversification, and when access to market for these diverse products are available, can potentially provide higher income to increase their resilience to economic, as well as environmental shock	By 2030 at least 30% of coffee plantations in the province are agroforestry
4.1.2 Promote tea-fruit tree agroforestry in which fruit tree provides shading and to stop continuous decline of supply of raw tea material due to the switch of tea into fruit tree plantation which provides higher profitability. By 2030 at least 30% of tea plantations in the province are agroforestry	Farmers stop to switch tea into fruit tree plantation driving by market advantage, and instead developing mixed system with tea and fruit tree, to obtain higher benefit and reduce their vulnerability to market volatility through product diversification	By 2030 at least 30% of tea plantations in the province are agroforestry
4.1.3 Support research and development projects that aim to investigate best agroforestry practice and development of sustainable market value chain linking farmers as producers, processing industries and private sectors, and consumers	More research projects investigating the best agroforestry practices adapting to local soil and weather condition, for successful expansion of this more sustainable practice in the province	More researches and demonstration trials of agroforestry in the province
4.1.4 Support the promotion of agroforestry by providing training to relevant stakeholders in the province such as on selecting suitable shading tree species and density, and appropriate management practice in agroforestry systems	Farmers and other stakeholders in the province become more knowledgeable and skilled in different aspects of agroforestry	All farmers in the province cultivating main commodities are aware on the economic and environmental benefits of agroforestry
4.1.5 Support the sustainability of development of climate-smart agriculture system with schemes such as Public-Private Partnership (PPP), and further with Production- Protection-Inclusion (PPI) or Verified Sourcing Area (VSA) that aim to secure livelihood within the frame of sustainable environment especially through forest conservation	Increasing awareness and practice of climate-smart and sustainable agriculture which aim for livelihood improvement within a sustainable environment particularly through forest conservation and safeguard of natural resources	In line with the targets of interventions in Strategy 4 and 5, to achieve in the intervention sites
4.2.1 Support forest enterprises, communities and households to develop their sustainable forest management (SFM) plans for production forest and engage in forest certification schemes both internationally and nationally	More standardized management and forest products from production forests in the province, with better contribution to environmental protection and quality	At least five SFE have SFM plans for production forest, to increase the number of SFE with SFM from 3 to 8, and area from 67,131 ha into 170,000 ha ⁵² Increase certified forest area from 6,275 ha in 2020 into 50,000 ha by 2030 ⁵³

⁵² <http://baolamdong.vn/xahoi/201812/lam-ong-co-ba-cong-ty-dat-chung-chi-rung-fsc-2926272/>

⁵³ <http://baolamdong.vn/xahoi/201812/lam-ong-co-ba-cong-ty-dat-chung-chi-rung-fsc-2926272/>

Orientation 5 Conserve water, natural resources and biodiversity

Potential measures	Desired outcome	Targets by 2030
5.1.1 Strictly enforce provincial forest planning (revised in 2018) and forest protection regulations: minimize converting forest to mining, hydropower and other development projects, especially within the biodiversity corridors of the province. Development projects that do not require forest cut and conversion and do not need to establish concrete infrastructure (e.g. eco-tourism) may still be considered with careful impact assessment ⁵⁴	Fully controlled forest protection and conservation program, supported by policy and strong law enforcement, especially in the areas designated as conservation zones	Lam Dong province becomes a province with a minimized deforestation and controlled forest protection and conservation
5.2.1 Support the establishment of four new protected areas in accordance with provincial biodiversity planning: Nui Voi, Phat Chi, Don Duong Natural Reserves, and Madaguoi	Protection of forest and conservation of rare and endangered species, which can further be main attraction for tourism, and to contribute in developing sustainable eco-tourism program in the province	From 84,119 ha (2 national parks + 1 research centre) in 2020 into 110,747 (2 national parks + 1 natural reserve + 3 habitats conservation areas + 1 research centre) in 2030
5.2.2 Support biodiversity database development and biodiversity monitoring at provincial level	An integrated collaboration between authorities and relevant stakeholders in the province to develop reliable and up-to-date biodiversity database and monitoring framework for different purposes including research and monitoring and evaluation	Reliable and up-to-date biodiversity database and monitoring framework for different purposes including for monitoring and evaluation of conservation programs, at least three biodiversity assessment reports within 2021-2030
5.2.3. Application of economic instruments to raise and sustain funding for Lam Dong's biodiversity and natural resources conservation	Participation and contribution from different stakeholders through economic instruments to support the forest and natural resource conservation programs Local knowledge and experience on evaluation and pricing of ecosystems, ecosystem services and biodiversity enhanced	At least one reliable economic instrument is developed and implement with supporting policy
5.3.1 Develop water resource planning and management for an effective and equitable use of water reserves both surface and ground water reserves	No longer conflicts of water use by different users and more effective use of surface and ground water to support livelihood and development in the province	Promulgation and implementation of provincial water resource planning with a clear and thorough mapping of water resources and related management
5.3.2 Develop supporting policy to ensure an appropriate use of water resource by different stakeholders according to the planning and management plan	No illegal exploitation of surface and ground water reserve for any activity which is not accordance to the water resource planning and management plan, with strong law enforcement and sanctions	Promulgation and implementation of policy to support the implementation of water resource planning and management plan
5.3.3 Adopt high-technology, and increase capital and investment to ensure the provision of clean and safe water supply	The provision of clean and safe water supply for all citizens with full access and equitable use for different purposes and to avoid any health issue related to water contamination	-Completion of establishment of upstream reservoir of Dan Kia reservoir, Biduop - Nui Ba (Lac Duong district) and Prenn lake (Da Lat) -To build water supply systems for Bao Loc city and surrounding areas

⁵⁴ References: Provincial REDD+ Action Plan and provincial forest planning report

Potential measures	Desired outcome	Targets by 2030
		-Adoption of new technology and piloting some models of safe water

Orientation 6 Enhance market access and export of main commodities

Potential measures	Desired outcome	Targets by 2030
6.1.1 Establish farmer's cooperative and value-chain especially for fruit trees/crops such as durian, avocado, strawberry, jackfruit, passion fruits to better deal with the current markets dominated by middlemen and exporter without fixed contract with farmers	Better negotiation power from the farmers' side when dealing with middlemen and building the contract, through the creation of farmer's cooperative, and more stable income through participation in market value chain	All farmers cultivating fruit trees are joined in farmer's cooperative and participate in market value chain
6.1.2 Establish processing industries and value chain for other potential commodities of Lam Dong province for example cacao, pepper, and cashew to increase value-added and economic return	Protection of the development of emerging potential commodities of the province such as cacao, pepper and cashew, by establishing processing industries and market value chain	All farmers and stakeholders involved in the production and business of the emerging potential commodities are participated in market value chain and have access to processing industries
6.2.1 Increase the percentage of agricultural products, cultivation area and stakeholders in value chain participating in certification scheme to ensure standard product quality	Higher and stable product quality of agriculture from Lam Dong province following the standard of certification scheme, that can access better and wider market opportunity	At least 50% of agricultural products, cultivation area and stakeholders in value chain participating in certification scheme
6.2.2 Increase the percentage of livestock products and stakeholders in value chain to participate in certification scheme, to ensure standard product quality for domestic and export market	Higher and stable product quality of livestock from Lam Dong province following the standard of certification scheme, that can access better and wider market opportunity	At least 50% of livestock products and stakeholders in value chain participating in certification scheme
6.2.3 Building a brand to raise the value of agricultural products in the province along with the improvement in the product quality due to improved management and technology. The current recommended brand "Da Lat – miracle from good earth" for vegetable products, flowers, and Arabica coffee	One branding for different quality products from Lam Dong province to facilitate and access better market opportunities both for domestic and international markets	Other commodities in the province such as Robusta coffee and different types of tea products join the branding scheme

Orientation 7 Develop green and sustainable tourism

Potential measures	Desired outcomes	Targets by 2030
7.1.1 Plan, invest in the development of local tourist products based on the key strengths and attractiveness of tourist resources which give priority to the development of cultural tourism and ecological tourism	Locally specific products of higher and stable quality of tourism from Lam Dong province developed and brought to market.	- By 2030, at least 20% of tourism product is of high quality and locally specific. - Study of developing unique tourism production in the province is implemented effectively
7.1.2 Promote the linkages between regions, provinces, areas, localities, moving towards developing unique area-specific tourist products	Close linkage and cooperation between tourism stakeholders in the provinces of Central Highlands, other provinces, and the tourism populated localities nationwide is strengthened.	Some Central Highlands -specific tourism products widely promoted; new tours to Ho Chi Minh city, Da Nang, Nha Trang and other provinces/ cities created.
7.2.1 Minimize negative impacts of tourism on natural environment through promotion of "responsible tourism" and encourage participation of stakeholders involved in tourism business to meet international standard of sustainable tourism	Strategic environmental assessment is prepared and submitted prior to every long-term tourism development planning cycle, and civil society organizations and local communities actively involved in monitoring and evaluation of tourism development orientations and plans. ⁵⁵	-At least 50% of relevant organisations of civil society local communities take part in M&E of the tourism development orientations and plans -By 2030, at least 90% of tourism managers, tour guides and other relevant stakeholders are trained or enhanced in their professionalism and responsibilities in managing environmental-friendly tourism products and activities.
7.2.2 Application of economic instruments in changing tourists' behaviours towards environment and biodiversity conservation	Enhanced awareness and responsibility of tourists and stakeholders involved in the tourism products and activities towards environment and biodiversity conservation, and strong law enforcement and sanctions to any stakeholder ignores environmental protection and biodiversity conservation	-Implementation of at least one economic instrument for this purpose - Sanctioning mechanism for tourism businesses who violate regulations on avoiding over-exploitation of natural resources, especially forest resources, water sources. - By 2030, all tourism activities that violate the regulations on environmental protection and natural resources, depending on the seriousness of the violations, will be subject to administrative, economic or criminal penalties.
7.3.1 Develop tourism packages, activities and facilitation which involve communities from different socio-economic background including poor communities and ethnic minorities, with fair and equitable profit sharing, and with proper training to enhance knowledge and skills	People from different communities, especially from poor and ethnic minority communities, are attracted to participate in and benefit fairly from tourism activities.	By 2030, at least 50% labours in provincial tourism sector will be local, of which 50% will be indigenous ethnic minorities.
7.3.2 Develop mechanism to ensure local living standards which are under pressures of tourism and migrants working in tourism sector in the province	The habitat of indigenous communities in Lam Dong is not narrowed by migrated people looking for jobs in tourism sector.	Provincial regulation on construction management which ensures constructions and infrastructure development will not negatively affect local communities and tourism sector

⁵⁵ Reference: technical report on Decision No. 1369/QĐ-UBND

Orientation 8 Promote green lifestyle and sustainable urban consumption

Potential measures	Desired outcome	Targets by 2030
8.1.1 Conduct information-communication-advocacy activities to change consumption behaviours, practice sustainable consumption, move towards a low-waste discharge, low-carbon emission society	<ul style="list-style-type: none"> - Propaganda programs for sustainable consumption are implemented regularly and actively. - The propaganda content is renewed, and their format are diversified; 	<ul style="list-style-type: none"> - Good practices on sustainable consumption, mitigation of GHG, waste, wastewater, and zero emissions are disseminated to the community and to each citizen. - Laws, knowledge about environmental protection, and sustainable consumption are included in the education.
8.1.2 Apply economic incentives to modify unreasonable consumption behaviours	Appropriate economic incentive mechanisms and policies (e.g. taxes, fees, environmental funds, penalties for violating environmental protection regulations) are effectively applied to promote sustainable consumption.	By 2030, properly and fully collect taxes and environmental protection charges for wastes; Widely apply the tool "Deposit - refund"; environmental fee tool to reduce the generation of wastewater and waste;
8.1.3 Develop and disseminate sustainable and responsible consumption models	<ul style="list-style-type: none"> - Responsible and sustainable consumption models toward saving, recycling, reusing, minimizing waste, are built and widely disseminated; - The role of the community in monitoring sustainable consumption activities is strengthened 	<ul style="list-style-type: none"> - The self-managed models are reviewed and upscaled. - Completely eliminate the use of plastic packaging in shopping activities and daily life compared to 2020.
8.2.1 Issue policies that encourage production and business entities to apply modern environmental management systems, according to ISO 14000 standards	Policies to encourage enterprises and manufacture facilities to apply environmental management system ISO 1400, have been issued and applied.	By 2030, 50% of businesses and businesses will apply ISO 14000 standards
8.2.2. Issue regulations to guide the use of waste discharge quotas and gradually set up a transfer market for waste discharge quotas	<ul style="list-style-type: none"> - The instructions for using emission permits are issued. - The market for emission permits is well established and operated. 	Until 2030, apply effectively the PFES in the whole province
8.2.3. Promulgate regulations on waste auditing and production life cycle assessment	Regulations of waste auditing and guideline of life cycle assessment are issued and operated.	Until 2030, waste auditing is implemented properly.
8.2.4 Implement a rigorous registration regime for chemical operations, especially for hazardous/toxic chemicals	Regulations on the registration of the use of chemicals are strictly applied, especially for toxic chemicals.	Safe use of plant protection chemicals, pesticides, and other managed chemicals; Agriculture chemical packages after use are handled properly.
8.2.5 Develop chemical incidents prevention and response capacities	<ul style="list-style-type: none"> - Training and propaganda of safety in use of plant protection chemicals and pesticides, and properly handle plant protection drug packages. - Limit the use of plant protection chemicals. - Widely applying the program "3 reduction and 3 increase". 	<ul style="list-style-type: none"> - 100% of enterprises and production and business establishments are equipped with knowledge of plant protection chemicals and inorganic fertilizers safety; - 100% of the farms apply high-tech agriculture and organic agriculture.
8.3.1 Transfer green technology, cleaner production processes to small and medium enterprises	By 2030, at least 100% of small and medium enterprises have access and be transferred green technologies	By 2030, at least 100% of small and medium enterprises will adopt cleaner production processes; 50% of them have access to green technologies.
8.4.1 Prevent and control environmental pollution sources, and reduce the impacts from environmental pollution on people's health	Measures to prevent and control environmental pollution are built and operated.	100% of businesses and communities are trained, raising awareness of environmental and production behaviors and practices, especially in the fields of sanitation, management and handling waste, protection and economical use of resources

Orientation 9 Create enabling conditions for transitioning towards a green economy

Potential measures	Desired outcome	Targets by 2030
9.1.1 Accelerate the shift of governments' expenditure to green public procurements	Government's expenditures are redirected towards greener and cleaner products and services, and market for green products are expanded	All governmental agencies have green public procurement plan
9.2.1 Initiate a subsidy reform to shift away from subsidizing products and services that negatively impacts environment; and promote the use of environmentally friendly products	Government's policies on subsidies are reformed to better support green growth and green products	<ul style="list-style-type: none"> - At least 5 subsidies for negative environmental impacts goods/services are reformed/removed - Policies providing subsidies for bio-fuels and uses of renewable energies are in places
9.2.2 Accelerate certification of sustainable production and trade	Most of province's key products are certified by reputational certification schemes, thus enhance their market values and reduce negative impacts on environment	<ul style="list-style-type: none"> - 80% of agriculture and forestry products of the province is certified - Percentage of smallholders obtaining certification for agriculture/forestry products increase 100% compared to 2020
9.3.1 Develop policies that promote accounting for environmental externalities	<ul style="list-style-type: none"> - A green accounting framework for key sectors of the province is in place and well operated - Permit/quota transfer markets are established and well operated 	<ul style="list-style-type: none"> - Guidelines on discharge permit/quota are in place - Green accounting results of key sectors are published annually
9.3.2 Facilitating trade of environmental goods and services	Markets of ecosystem services/goods are expanded, and number of PES initiatives increase	Revenue from PFES and other PES schemes increase 100% compared to 2020
9.3.3. Investigate policy options to mobilize resources from private sectors and the whole society for natural resources conservation	Sustainable and sufficient funding for environmental protection and natural conservation is developed from various sources, including currently "untapped" ones	<ul style="list-style-type: none"> - ODA funding for key green growth areas increase 100% as compared to 2020 - Revenue generated from economic instruments and fund-based mechanisms contributed to 50% of province's biodiversity conservation budget
9.4.1 Develop local capacity for green technology development and exchange	Province's capacity to develop and adopt advanced and environmentally friendly technologies is well developed	<ul style="list-style-type: none"> - Number of registered patents on green growth-related technologies of the province increase 100% as compared to 2020 - At least 80% of hi-tech and green growth-related labor force is locally recruited
9.4.2 Support technology transfer through partnerships and co-investments	Province's SMEs have access to or operate "green" technologies	- At least 50% of province's products is manufactured using environmentally friendly and advanced technologies

Appendix V Activities and time plan

Orientation 1 Enhancing the use of renewable energy and energy efficiency

Potential measures and activities	Year									
	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
1.1.1 Use of LED lights in urban households										
1.1.2 Use of LED lights in rural households										
1.1.3 Promotion of improved cooking stoves										
1.1.4 Promotion of LED lights in hotels and offices										
1.1.5 Promotion of LED lights in government offices and schools										
1.1.5.1 Propose LED into regulation of public procurement										
1.1.6 Use of LED lights for public lighting										
1.1.6.1. Conduct feasibility study on the usage of LED for 2 cases: (1) for new road, and (ii) replace old lights										
1.1.6.2. Pilot ESCO										
1.1.6.3 Develop implementation plan and scheme										
1.1.6.4 Implement										
1.1.7 Promotion of good housekeeping measures in buildings										
1.1.8 Promotion of housekeeping and equipment maintenance										
1.1.9 Improvement of efficiency of industrial boilers										
1.1.10 Improvement of efficiency of industrial motors										
1.1.11 Use of LED lights in flower greenhouses										
1.1.12 Improvement of efficiency in irrigation										
1.1.12.1 Conduct study on effectivity of energy use in irrigation										
1.1.12.2 Develop roadmap for enhancing energy use efficiency in irrigation and supported policies										
1.1.13 Promotion of non-fired bricks										
1.1.13. Develop roadmap for development of non-fired construction materials										
1.1.13.2 Develop supported policies including regulations of the										

Potential measures and activities	Year									
	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
usages of non-fired construction materials in buildings.										
1.2.1 Use of solar water heaters in urban households										
1.2.2 Use of solar water systems in small hotels										
1.2.3 Fuel change to biomass in boilers										
1.2.4 Promotion of biofuel										
1.2.4.1 Develop and implement raising awareness programs about biofuel (E5);										
1.2.4.2 Adding into public procurement regulation about biofuel usage (e.g. the vehicles of stated agencies must use E5)										
1.2.5 Introduction of CNG buses										
1.2.5.1 Conduct feasibility study on CNG buses										
1.2.6 Promotion of electric motorbikes										
1.2.7 Expansion of bus systems										
1.2.7.1 Develop bus system development planning										
1.2.7.2 Conduct feasibility study routes in the planning										
1.2.8 Development of monorail systems										
1.2.8.1 Conduct feasibility study for monorail routes										
1.2.8.2 Invest in construction										
1.2.8.3 Operation										
1.3.1. Promotion of rooftop solar PV systems in urban households										
1.3.2 Promotion of rooftop solar PV systems in buildings										
1.3.3 Development of ground mounted solar PV systems										
1.3.4 Development of wind farms										
1.3.5 Promotion of Waste to Energy										
1.3.6 Deployment of dual use approach for solar energy and food production										
1.3.6.1 Study on the use of solar power in agriculture										
1.3.6.2 Implement performance model										
1.3.6.3 Implement in the province for approved crops and scale.										
1.3.7 Promotion of small hydro power										

Orientation 2 Reduce emission from all sectors

Potential measures and activities	Year									
	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
2.1.1 Control the rate of greenhouse's expansion during 2021-2030 as half of condition without intervention (baseline) through a range of potential disincentive regulations and economic instruments.										
2.1.1.1 A comprehensive assessment of ecological (environment, water, soil, air, landscape aesthetics) and economic impacts of greenhouse farming in Da Lat, Duc Trong, and Lac Duong										
2.1.1.2 Assessing potential of applying dis-incentive regulation/economic instrument (e.g. landscape eco-fee) to control greenhouse farming (this includes reviewing and assessment of legal basis, principle, operation mechanisms, willingness to accept, and potential impacts)										
2.1.1.3. Piloting the selected dis-incentive regulation/economic instrument in one district (preferably Da Lat)										
2.1.1.4. Proposal development for full-scale implementation of the selected dis-incentive regulation/economic instrument in the whole province										
2.1.1.5. Implement greenhouse control policy in the whole province										
2.1.2 Generate awareness of farmers to follow the norm of fertilizer and pesticide application inside greenhouse, and the potential ecological impacts of greenhouse farming										
2.1.2.1. Development awareness raising materials and design awareness raising campaign										
2.1.2.2. Implement awareness raising campaign along with piloting and implementation process										
2.2 Reducing emission from the cultivation, irrigation and harvesting of agricultural products										

Potential measures and activities	Year									
	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
2.3.1 Strictly enforce provincial forest planning (revised in 2018) and forest protection regulations: minimize converting forest to mining, hydropower and other development projects, especially within the biodiversity corridors of the province. Development projects that do not require forest cut and conversion and do not need to establish concrete infrastructure (e.g. eco-tourism) may still be considered with careful impact assessment										
2.3.1.1. Support large-scale forest holders to develop forest management plan, particularly co-management plan with local communities										
2.3.1.2. Review development projects that requires forest conversion and develop a list of eligible projects with a clear public consultation mechanism (i.e. involvement of NGOs, CSOs and research institutions)										
2.3.1.3. Development of projects to support law enforcement activities in forest protection, especially in protected areas and forest inside biodiversity corridors of the province										
2.3.1.4. Development of participatory forest monitoring mechanism and guidelines with involvement of CSOs and forest communities										
2.3.1.5. Support implementation of forest management plan of forest owners by a project-based mechanism										
2.4.1 Promoting agroforestry (with timber and/or fruit trees) and other types of agroforestry on forest lands that have been illegally converted to agricultural plantation										
2.4.1.1. Review the implementation of DARD's proposal on restoring Lam Dong's forest by agroforestry measures (2019-2020)										
2.4.1.2. Upscale implementation of agroforestry measures (~5,000 ha/year) for forest restoration in the remaining area by making use of public-private partnership and social inclusion mechanisms										

Potential measures and activities	Year									
	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
2.5.1 Conditional forest land allocation/concession to community and individual households where forests have been already converted to agriculture: community and households receives long-term forest land allocation with a clear land delineation if they commit to maintain tree covers above 30%										
2.5.1.1. Developing criteria for conditional forest land allocation										
2.5.1.2. Escort the process of proposing for conditional forest allocation										
2.5.1.3. Monitoring and evaluation guidelines for conditional forest allocation										
2.5.1.4. Facilitation of underdeveloped communities/households for land registration										
2.5.2 Assist natural forest regeneration (with or without enrichment planting) with "bareland with scattered trees" as targeted areas										
2.5.2.1 Mapping targeted areas for assisting natural forest regeneration and developing technical-economic proposal for assisting natural forest regeneration in Lam Dong province										
2.5.2.2. Piloting at least three measures of assisting natural forest regeneration										
2.5.2.3. Full-scale implementation of measures to assist natural forest regeneration using socially mobilized funds/investment										
2.6.1 Explore and promote scattered tree plantation in urban areas, industrial zones and along roads										
2.6.1.1 Develop 5-year plans on scattered trees and shading trees plantation of Lam Dong province with inclusion of private sector and the whole society and assess of ecological and ornamental impacts of such plans										
2.6.1.2. Piloting a fund-based mechanism to mobilize resources from private sector and the whole										

Potential measures and activities	Year									
	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
society for implementation of the plan										
2.6.1.3. Implementing such plans annually with due attention to possibilities of mainstreaming with other "Green-growth activities, such as 2.4.1.2 and 2.5.2.3										
2.7.1 A thorough study to support formulation of an innovative provincial policy that expands the scope of current PFES to air travel/ industrial water use/greenhouse operation/voluntary PFES payment in tourism sector										
2.7.1.1. Feasibility studies on expanding scope of PFES in Lam Dong province and piloting voluntary PES mechanisms										
2.7.1.2 Proposal development and public consultation for the expanded PFES scheme										
2.7.2 Implementing innovative PFES schemes in the province										
2.8.1 Support households in poor districts/communes nearby forest to develop multi-purpose home-garden for food/nutrients safety and thereby reduce pressure to forest resources										
2.8.1.1 Scoping study										
2.8.1.2 Technical proposal developed and approved										
2.8.1.3 Facilitation of implementation by mainstreaming into other projects/programs and by socially mobilized funding, e.g. 2.6.1.3										
2.8.1.4 Program monitoring and evaluation										

Orientation 3 Control waste production and improve waste treatment

Potential measures and activities	Year									
	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
3.1.1 Reduce waste from agricultural residues, and promote production of green manure and composting in concentrated areas (especially for flower and vegetable production and processing) to increase the production of organic and locally produced fertilizer that currently can only satisfy 3% of the demand										
3.1.1.1. Scoping study on technical and economic feasibility of agriculture waste reduction and treatment techniques for flower and vegetable sector										
3.1.1.2. Develop and pilot economic instruments to encourage organic fertilizer production such as subsidized programs, raising taxes/fees on production and consumption of agricultural chemicals, applying eco-fee in agricultural sector										
3.1.1.3. Support start-up projects on organic agriculture and organic fertilizer production										
3.1.1.4. Raising awareness of farmers and enterprises on importance of organic fertilizer production										
3.1.2 Control agricultural hazardous waste: develop the network of collection points/tanks for agricultural chemical plastic containers (especially those of pesticides)										
3.1.2.1. Study on agriculture hazardous waste: quality, quantity, sources of discharge, and environmental impacts										
3.1.2.2. Applying economic instruments to reduce hazardous waste discharge and encourage recycle/reuse of such waste in proper manners										
3.1.2.3. Encourage research and technology transfer to reduce cost of hazardous waste treatment										
3.1.2.4. Linked to 3.1.2.2: fund raised will be used to develop a network of collection tanks of										

Potential measures and activities	Year									
	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
agricultural chemical plastic containers										
3.1.3 Apply innovative manure management especially for swine as the most populated livestock raised in the province, in which manure are managed by current management systems with the gas generated from biogas recovery is converted into electrical energy or manure are managed by biogas recovery system. Compared to the current management system or if manure were directly discharged into the environment, the innovative management is safer to environmental and generate lower emission										
3.1.3.1 Awareness raising for farmers on livestock manure management and uses										
3.1.3.2 Tighten standards for livestock farming with regards to hygiene and manure management, including treatment, reduce and reuse										
3.1.3.3 Subsidize biogas construction for swine/livestock farms in remoted, poor areas										
3.1.3.4 Preferential policies and financial mechanisms to support establishment of concentrated livestock manure facilities that can produce energy and organic fertilizers										
3.2.1 Prepare, issue policies, mechanisms, instruments for prevention, reduction, classification, collection, transportation, reuse, recycling and treatment of waste										
3.2.1.1 Feasibility studies (with piloting and experiments) on reuse, reduce and recycling urban solid wastes in Lam Dong province										
3.2.1.2 Pilot preferential credit programs for enterprises active in waste treatment and recycling industries, especially in rural areas										
3.2.2 Establish province's waste database; develop technical standards, codes on the environment and technical										

Potential measures and activities	Year									
	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
guidelines on how to reduce, classify, reuse and recycle waste										
3.2.3 Implement programmes to increase public awareness, strengthen the capacity for integrated management of waste										
3.2.3.1. Propaganda on public awareness on waste reduction and management, especially to youth and school curriculum										
3.2.3.2 Annual training on waste management for relevant staff at district and commune level										
3.2.4 Strengthen management over waste discharge activities; improve the existing legal system; examine, inspect, oversee the implementation and enforcement of environmental protection legislation relating to waste management										
3.2.4.1. Tighten waste discharge and management policies at all levels though policy review and amendment										
3.2.4.2 Development of provincial waste monitoring system										
3.2.4.3 Operate provincial waste monitoring system										
3.2.4.4 Support development and implementation of provincial's waste management planning										
3.2.4.5 Review, adopt a system of consistent technical standards/codes, economic-technical norms on solid waste management.										
3.2.5 Increase investment in urban environmental quality improvement, technology improvement, modernization of waste collection and treatment equipment										
3.2.5.1 Review, adopt a system of consistent technical standards/codes, economic-technical norms on solid waste management.										
3.2.5.2 Issue guidelines on the management of investments in developing domestic solid waste										

Potential measures and activities	Year									
	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
treatment facilities in accordance with approved planning schemes; adopt methods for establishing, managing costs and methods for valuating domestic solid waste treatment services										
3.2.5.3 Issue detailed regulations on the classification, collection, reuse, recycling and treatment of construction waste										
3.2.5.4 Develop and promote public-private partnerships in waste treatment and waste management										
3.3.1 Classification and treatment of solid waste, especially domestic and medical waste. Apply high technology to waste treatment										
3.3.1.1 Development of economic instruments to attract private sector and foreign investment in waste management, especially hazardous waste										
3.3.1.2 Carefully monitor environmental parameters at waste dumping sites, waste treatment facilities, and wastewater discharge points										
3.3.1.3 Closely control the import of waste materials from other provinces/regions										

Orientation 4 Promoting climate-smart and more sustainable landuse system

Potential measures and activities	Year									
	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
4.1.1 Promote coffee agroforestry practices by integrating highly profitable fruit trees such as durian and avocado, commercial crops such as pepper and nitrogen-fixing trees such as <i>Cassia siamea</i> to maintain soil fertility. By 2030 at least 30% of coffee plantations in the province are agroforestry										
4.1.1.1 A characterisation of existing coffee agroforestry system in the province with a thorough economic and environmental benefits of the system compared to monoculture										
4.1.1.2 Explore the preference of local people in the districts on plant components of the agroforestry system, with analysis of access to market for each plant component										
4.1.1.3 Developed improved design of agroforestry with the preferred and marketable plan components with participatory approach among farmers, authorities and researcher, and potential economic and environmental benefits										
4.1.1.4 A growth suitability analysis based on local soil and weather condition to find best environment for all plan components in the system to grow and produce										
4.1.1.5 Build demonstration trials of the improved design with close monitoring on the performance of each plan component										
4.1.1.6 Developing and implementing supporting policy to support the upscaling of the sustainable system										
4.1.2 Promote tea-fruit tree agroforestry in which fruit tree provides shading and to stop continuous decline of supply of raw tea material due to the switch of tea into fruit tree plantation which provides higher profitability. By 2030 at least 30% of tea plantations in the province are agroforestry										
4.1.2.1 – 4.1.2.6 Similar activities with those under 4.1.1 and here the activities mainly relate to tea										
4.1.3 Support research and development projects that aim to investigate best agroforestry practice and development of sustainable market value chain linking farmers as producers, processing industries and private sectors, and consumers										

Potential measures and activities	Year									
	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
4.1.3.1 – 4.1.3.5 in line with 4.1.1.1 – 4.1.1.5 namely for characterising existing systems, exploration of local preference on plan component, developing improved design and estimation of potential economic and environmental benefits, growth suitability analysis, and demonstration trial										
4.1.3.6 Develop a sustainable market value chain by identifying and linking farmers and stakeholders involved in the production and market of commodities from the system, to cooperate under trustable and fair scheme/contract										
4.1.4 Support the promotion of agroforestry by providing training to relevant stakeholders in the province such as on selecting suitable shading tree species and density, and appropriate management practice in agroforestry systems										
4.1.4.1 Develop draft of training materials on agroforestry covering the aspects of recommended design, procedure for plot preparation, plot management practices, harvesting, packaging and marketing, to finalize through process of consultation with farmers and relevant stakeholders										
4.1.4.2 Provide agroforestry training for farmers and relevant stakeholders in order to enhance awareness and skill in developing agroforestry. A study tour as part of the training to areas with successful agroforestry practice is highly recommended										
4.1.5 Support the sustainability of development of climate-smart agriculture system with schemes such as Public-Private Partnership (PPP), and further with Production- Protection-Inclusion (PPI) or Verified Sourcing Area (VSA) that aim to secure livelihood within the frame of sustainable environment especially through forest conservation										
4.1.5.1 This is in line with activity 4.1.3.6 on developing sustainable market value chain with trustable and fair scheme among stakeholders										
4.1.5.2 Link the sustainable value chain with environmental quality, by assessing forest cover, quality and conservation efforts in the sites (likely at district level)										

Potential measures and activities	Year									
	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
4.1.5.3 Develop relevant indicator to measure the advance of PPI and VSA scheme in the district										
4.1.5.4 Promote the PPI and VSA scheme as innovative approaches to other districts in the province or higher administrative level										
4.2.1 Support forest enterprises, communities and households to develop their sustainable forest management (SFM) plans for production forest and engage in forest certification schemes both internationally and nationally										
4.2.1.1 Identify different forest certifications schemes and SFM options and mapping forest lands owned by enterprises, households or individual with suitable certification scheme considering feasibility and available resources										
4.2.1.2 Communicate the SMF/forest certification mapping/plan with related stakeholders with possible improvement depending on the actual resources										
4.2.1.3 Support the preparation by related forest owners and relevant stakeholders for SFM and forest certificate										
4.2.1.4 Develop and implement a reliable system to monitor and evaluate certified forest lands, owners, and their management										

Orientation 5 Conserve water, natural resources and biodiversity

Potential measures and activities	Year									
	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
5.1.1 Strictly enforce provincial forest planning (revised in 2018) and forest protection regulations: minimize converting forest to mining, hydropower and other development projects, especially within the biodiversity corridors of the province. Development projects that do not require forest cut and conversion and do not need to establish concrete infrastructure (e.g. eco-tourism) may still be considered with careful impact assessment (activities are similar to 2.1.1)										
5.2.1 Support establishment of four new protected areas in accordance with provincial biodiversity planning: Nui Voi, Phat Chi, Don Duong Natural Reserves, and Madaguoi										
5.2.1.1. Support the development of detailed proposals on establishment of Don Duong Natural Reserves and Phat Chi Protected Area, especially Don Duong Natural Reserves for its high biodiversity value										
5.2.1.2. Establishment of Don Duong Natural Reserves										
5.2.1.3. Establishment of Phat Chi protected area										
5.2.1.4. Support the development of detailed proposals on establishment of Nui Voi and Madaguoi protected areas, especially Nui Voi protected area that can be combined with eco-tourism development activities										
5.2.2 Support biodiversity database development and biodiversity monitoring at provincial level										
5.2.2.1 Support assessment of Lam Dong's ecosystems and biodiversity status, especially for important ecosystems and biodiversity-rich areas (every 3 years)										
5.2.2.2 Support development and update of Lam Dong's biodiversity database (including biodiversity maps) and a framework for biodiversity monitoring (including specific indicators)										
5.2.2.3 Support activities on capacity building for relevant staff in biodiversity inventory and monitoring as set out in the province's biodiversity conservation planning										

Potential measures and activities	Year									
	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
5.2.2.4 Public awareness raising on biodiversity and wildlife protection										
5.2.2.5 Support the operation of hydrological and environmental monitoring stations for biodiversity conservation purposes										
5.2.3. Application of economic instruments to raise and sustain funding for Lam Dong's biodiversity and natural resources conservation										
5.2.3.1 A feasibility study on application of tourism eco-fee to raise fund for biodiversity and ecosystem services conservation (this includes assessment of tourism's impacts on biodiversity and environment, reviewing and assessment of legal basis, principle, operation mechanisms, willingness to accept, and potential impacts)										
5.2.3.2 Piloting tourism eco-fee in one district (preferably Da Lat)										
5.2.3.3 Apply tourism eco-fee in the whole province										
5.2.3.4 Support researches on valuation and pricing of ecosystems, ecosystem services and biodiversity as a basis for applying economic instruments in biodiversity and environmental protection in the provinces										
5.3.1 Develop water resource planning and management for an effective and equitable use of water reserves both surface and ground water reserves										
5.3.1.1 Develop inventory of water resource both surface and ground water with location, volume and other relevant information, and map stakeholders who use the resources										
5.3.1.2 A comprehensive assessment of water input with projection of climate especially rainfall and temperature in the next decade, to determine maximum threshold of volume of water that can be exploited from the resources, and specify scope of appropriate purposes										
5.3.1.3 Map authorities and agencies with responsibilities in the management of the water resources										
5.3.1.4 Implementation of the planning and management plan with reliable										

Potential measures and activities	Year									
	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
monitoring and evaluation system applied to all water reserves										
5.3.2 Develop supporting policy to ensure an appropriate use of water resource by different stakeholders according to the planning and management plan										
5.3.2.1 Formulating the policy which regulates the use, purpose of use, allowable volume of exploited water, relevant authorities and agencies involved in the management, and sanctions to any stakeholder which violates the regulation										
5.3.2.2 Implementation of the policy with reliable monitoring and evaluation system with specification of provincial department and agencies involved in the monitoring and evaluation system										
5.3.3 Adopt high-technology, and increase capital and investment to ensure the provision of clean and safe water supply										
5.3.3.1 Explore high and innovative technology to produce safe and clean water, including for water purification										
5.3.3.2 Identify areas with lack of safe and clean water, their source of water, and invite both domestic and international partners to invest in high-tech water purification system or any other technology to produce safe and clean water										
5.3.3.3 Pilot the hi-tech and innovative approaches especially in the areas with issue in providing safe and clean water for all citizens and different sectors in the areas, and ensure a full and equitable access of the water including by the poor communities										
5.3.3.4 Monitoring and evaluating the pilot with potential upscaling of the technology application into other areas										

Orientation 6 Enhancing market access and export of main commodities

Potential measures and activities	Year									
	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
6.1.1 Establish farmer's cooperative and value-chain especially for fruit trees/crops such as durian, avocado, strawberry, jackfruit, passion fruits to better deal with the current markets dominated by middlemen and exporter without fixed contract with farmers										
6.1.1.1 Subsidize and technical support to formation of farmers cooperatives specialized in fruits production (at least one cooperatives/district)										
6.1.1.2 Support start-up projects that helps to link farmers to market										
6.1.1.3. Develop a smallholder database to collect information of production and price										
6.1.2 Establish processing industries and value chain for other potential commodities of Lam Dong province for example cacao, pepper, and cashew to increase value-added and economic return										
6.1.2.1 Feasibility study on downstream industry for targeted products										
6.1.2.2 Geographic indication of cacao, pepper, and coffee										
6.1.2.3 Support start-up projects on processing industry and market development for agricultural products										
6.2.1 Increase the percentage of agricultural products, cultivation area and stakeholders in value chain participating in certification scheme to ensure standard product quality										
6.2.1.1 Enable farmers cooperatives to participate in certification schemes through preferential loan and technical supports (e.g. partnership with banks)										
6.2.1.2 Review existing certification schemes in Lam Dong and provide a comprehensive guideline that is available online										

Potential measures and activities	Year									
	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
6.2.1.3 Promote partnerships with NGOs and enterprises working on certified products and new initiatives such as "zero-deforestation coffee"										
6.2.2 Increase the percentage of livestock products and stakeholders in value chain to participate in certification scheme, to ensure standard product quality for domestic and export market										
6.2.2.1 Enable farmers cooperatives and smallholders to participate in certification schemes through preferential loan and technical supports (e.g. partnership with banks)										
6.2.2.2 Tighten regulations and standards of livestock farming in Lam Dong province										
6.2.2.3 Capacity building for smallholders for participating in certification schemes										
6.2.3 Building a brand to raise the value of agricultural products in the province along with the improvement in the product quality due to improved management and technology. The current recommended brand "Da Lat – miracle from good earth" for vegetable products, flowers, and Arabica coffee										
6.2.3.1 A thorough assessment on cost and benefit analysis related to the branding for vegetable products, flowers and Arabica coffee										
6.2.3.2 Start the branding for the three products and develop system to monitor the increase in the sales compared to products without branding										
6.2.3.3 Assessment on the application of the branding to other commodities or all commodities of the province										
6.2.3.4 Implement the branding for other products in the province and prepare related monitoring system in the sales										

Orientation 7 Develop green and sustainable tourism

Potential measures and activities	Year									
	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
7.1.1 Plan, invest in the development of local tourist products based on the key strengths and attractiveness of tourist resources which give priority to the development of cultural tourism and ecological tourism										
7.1.1.1 Re-branding tourism sector of Lam Dong towards greener and more inclusive tourism										
7.1.1.2 Combining tourism product diversification with industrial, agricultural and handicraft activities										
7.1.1.3 Organize outreach programmes for local community stakeholders to create awareness and common interest about green tourism, and thereby increase their sense of belonging, appreciation, and responsibility towards its protection										
7.1.2 Promote the linkages between regions, provinces, areas, localities, moving towards developing unique site-specific tourist products										
7.1.2.1 Identify local leaders that could influence, guide, strengthen, and coordinate local talents/artisans to recognize the tangible and intangible values of tourism sites										
7.1.2.2 Diversify tour packages towards combining ecotourism, agritourism, cultural tourism, and leisure travel										
7.1.2.3 Support best practices within community-based tourism programmes										
7.2.1 Minimize negative impacts of tourism on natural environment through promotion of "responsible tourism" and encourage participation of stakeholders involved in tourism business to meet international standard of sustainable tourism										

Potential measures and activities	Year									
	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
7.2.1.1 Ensure that a strategic environmental assessment is prepared, implemented and overseen during the formulation and implementation of sustainable tourist development orientations and planning										
7.1.1.2 Conduct an Environmental Impact Assessment (EIA) prior to any infrastructure and facility development to prevent negative impacts to Lam Dong's forest and nature										
7.2.1.3 Promote the inclusion of social organizations, individuals and communities in the oversight and evaluation of green and sustainable tourist development orientations and planning schemes, that consider natural characteristics and safeguard of natural resources										
7.2.1.3 Develop awareness raising campaign for tourists and staff of tourism sectors on biodiversity and environmental protection										
7.2.1.4 Conduct four monitoring, evaluation and socialization activities per annum										
7.2.2. Application of economic instruments in changing tourists' behaviours towards environment and biodiversity conservation (linked to 5.2.3)										
7.3.1 Develop tourism packages, activities and facilitation which involve communities from different socio-economic background including poor communities and ethnic minorities, with fair and equitable profit sharing, and with proper training to enhance knowledge and skills										
7.3.1.1 Training and capacity building on tourism services and operation for poor and ethnic minorities										
7.3.1.2 Educate and empower local community to improve their understanding and roles in implementing and promoting sustainable tourism										

Potential measures and activities	Year									
	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
7.3.2 Develop mechanism to ensure local living standards which are under pressures of tourism and migrants working in tourism sector in the province										
7.3.2.1 Create platforms for collaboration between local communities with local and international NGOs to support sustainable tourism										
7.3.2.2 Formulate a holistic visitor management plan										
7.3.2.3 Enact a provincial regulation on construction management that ensure constructions and infrastructure development will not negatively affect tourism sector, and vice versa										
7.3.2.4 Provide support (scholarship, training, subsidies, product development, branding, healthcare, homestay opportunities, etc) to local communities										

Orientation 8 Promote green lifestyle and sustainable urban consumption

Potential measures and activities	Year									
	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
8.1.1 Conduct information-communication-advocacy activities to change consumption behaviours, practice sustainable consumption, move towards a low-waste discharge, low-carbon emission society										
8.1.1.1 Conduct propaganda campaigns to promote good practices and models on sustainable consumption, reduce of GHG emissions, solid waste, wastewater, and zero emissions to businesses, communities and every citizen										
8.1.1.2 Integrate legal regulations, knowledge on environmental protection, sustainable consumption and emission reduction into education										
8.1.2 Apply economic incentives to modify unreasonable consumption behaviours										
8.1.2.1 Application of excise taxes, taxes and/or ecological fees to correct unreasonable consumption behaviours, first of all for products harmful to health, culture and the environment (alcohol, cigarettes, plastic bags, etc.)										
8.1.2.2 Apply deposit –refund tool to reduce some types of solid waste										
8.1.2.3 Apply environmental fee for industrial and domestic wastewater										
8.1.3 Develop and disseminate sustainable and responsible consumption models										
8.1.3.1 – Promote and encourage the implementation of saving, recycling, reusing in businesses and communities.										
8.1.3.2 Tổ chức phong trào xanh hóa nhà ở, khu dân cư và nơi làm việc.										
8.1.3.3 Pilot “green urban village”, review and scale up										
8.1.3.4 Encourage cycling in short distance instead of motorized vehicle; Encourage use of biofuel for cars and motorbikes.										
8.1.3.5 Limit then eliminate the plastic usage in daily purchasing										
8.1.3.6 Implement eco-label and promote the environmental-friendly products.										
8.2.1 Issue policies that encourage production and business entities to apply modern environmental management systems, according to ISO 14000 standards										
8.2.1.1 Develop consulting businesses, support the application of cleaner production, comply with green production standards.										

Potential measures and activities	Year									
	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
8.2.1.2 Integrate the standard of "sustainable development enterprises" into the evaluation system of business performance and social responsibility										
8.2.1.3. Technical support for businesses in implementing ISO 14000										
8.2.2 Issue regulations to guide the use of waste discharge quotas and gradually set up a transfer market for waste discharge quotas										
8.2.2.1 Issue guideline on waste quota										
8.2.2.2 Develop and operate waste quota market										
8.2.3 Issue regulations on waste auditing and product lifecycle assessment										
8.2.3.1 Issue regulation of waste accounting										
8.2.3.2 Issue regulation of life cycle assessment										
8.2.4 Implement a rigorous registration regime for chemical operations, especially for hazardous/toxic chemicals										
8.2.4.1 Strictly implement the registration regime of activities that use chemicals, especially toxic chemicals										
8.2.4.2 Proper treatment of the agriculture chemicals packages of chemicals										
8.2.5 Develop chemical incidents prevention and response capacities										
8.2.5.1 Organize diverse communication activities to raise awareness for communities about the harmful effects of inappropriate use of chemicals										
8.2.5.2 Provide technical assistance or advice to businesses to improve their capacity to prevent and respond to chemical incidents										
8.3.1 Transfer green technology, cleaner production processes to small and medium enterprises										
8.3.1.1 Transfer of green technology to small and medium enterprises in the province										
8.3.1.2 Application cleaner production process for small and medium enterprises in the province										
8.4.1 Prevent and control environmental pollution sources, and reduce the impacts from environmental pollution on people's health										
8.4.1.1 Develop and apply measures to prevent and control soil, water and air pollution										

Potential measures and activities	Year									
	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
8.4.1.2 Training and raising the awareness of enterprises and the community about environmentally friendly production and consumption, especially in the fields related to sanitation, waste management and treatment, protect and economically use resources										

Orientation 9 Create enabling conditions for transitioning towards a green economy

Potential measures and activities	Year									
	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
9.1.1 Accelerate the shift of governments' expenditure to green public procurements										
9.1.1.1 Review local government's expenditure process										
9.1.1.2 Set clear targets and develop regulatory policies on green public procurements: all governmental agencies to have green public procurement plans that require spending on eco-labelled and recyclable goods and services										
9.2.1 Initiate a subsidy reform to shift away from subsidizing products and services that negatively impacts environment; and promote the use of environmentally friendly products										
9.2.1.1 Review, reform or remove subsidy policies for products and services that can potentially degrade environmental assets, such as chemical fertilizers and pesticides										
9.2.1.2 Carefully develop and issue subsidy policies to encourage a switch to greener activities such as to support the consumption of bio-fuels in the province										
9.2.2 Accelerate certification of sustainable production and trade										
9.2.2.1 Develop policies that directly support activities 4.2.1, and 6.2.1										
9.2.2.2 Safeguard policies to ensure that smallholders can access and benefit from certification										
9.3.1 Develop policies that promote accounting for environmental externalities										
9.3.1.1 Issue regulations to guide the use of waste discharge quotas and gradually set up a transfer market for waste discharge quotas										
9.3.1.2 Issue regulations on waste auditing and product lifecycle assessment										
9.3.2 Facilitating the trade of environmental goods and services										
9.3.2.1 Issue policies that directly support activities 2.8.1 and 2.8.2										
9.3.3. Investigate policy options to mobilize resources from private sectors and the whole society for natural resources conservation										
9.3.3.1 Issue policies that directly support activities 2.1.1 and 5.2.3										

Potential measures and activities	Year									
	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
9.3.3.2 Develop project proposals to attract ODA into major projects in renewable energy, sustainable agriculture and low-carbon transportation networks, as well as smaller but potentially catalytic efforts such as feasibility studies, pilot projects and technical training										
9.4.1 Develop local capacity for green technology development and exchange										
9.4.1.1 Policies that support public R&D effort more on fostering green innovation, notably on local needs such as hi-tech agriculture, water scarcity, soil loss, organic farming, and post-harvesting technologies										
9.4.1.2 Policies that encourage academic partnership and cross border higher education exchange programs										
9.4.1.3 Policies that strengthening local capabilities to absorb technology from abroad and adapting it to local needs										
9.4.2 Support technology transfer through partnerships and co-investments										
9.4.2.1 Policies that encourage transfer of green technology, cleaner production processes to small and medium enterprises										
9.4.2.2 Policies that facilitate International co-operation to cover licensing fees, and encourage FDI projects that come along with transfers of core-technologies										
9.4.2.3 Policies that call for co-investment for establishment and operation of a Research Center for Green Technologies Development and Transfer										

Appendix VI Expected funding sources

Orientation 1 Enhancing the use of renewable energy and energy efficiency

Potential measures	Expected funding source*					
	CSB	PSB	ODA	FDI	DPIIn	SI
1.1.1 Use of LED lights in urban households					□	
1.1.2 Use of LED lights in rural households					□	
1.1.3 Promotion of improved cooking stoves			●		□	●
1.1.4 Promotion of LED lights in hotels and offices					□	
1.1.5 Promotion of LED lights in government offices and schools					□	
1.1.6 Use of LED lights for public lighting		●				□
1.1.7 Promotion of good housekeeping measures in buildings					□	
1.1.8 Promotion of housekeeping and equipment maintenance					□	
1.1.9 Improvement of efficiency of industrial boilers					□	●
1.1.10 Improvement of efficiency of industrial motors					□	●
1.1.11 Use of LED lights in flower greenhouses					□	
1.1.12 Improvement of efficiency in irrigation		□				
1.1.13 Promotion of non-fired bricks		●			□	
1.2.1 Use of solar water heaters in urban households					□	
1.2.2 Use of solar water systems in small hotels					□	
1.2.3 Fuel change to biomass in boilers					□	●
1.2.4 Promotion of biofuel					□	
1.2.5 Introduction of CNG buses		●			□	
1.2.6 Promotion of electric motorbikes					□	
1.2.7 Expansion of bus systems		●			□	
1.2.8 Development of monorail systems		●	□		●	
1.3.1. Promotion of rooftop solar PV systems in urban households					□	
1.3.2 Promotion of rooftop solar PV systems in buildings		●			□	●
1.3.4 Development of wind farms				●	□	
1.3.5 Promotion of Waste to Energy				●	□	
1.3.6 Deployment of dual use approach for solar energy and food production					□	
1.3.7 Promotion of small hydro power				●	□	

* CSB (Central State Budget), PSB (Provincial State Budget), ODA (Official Development Aid), FDI (Foreign direct investment), DPIIn (Domestic private investment), SI (social investment through application of economic instruments and fund-based mechanisms) □ = main source

Orientation 2 Reduce emission from all sectors

Potential measures	Expected funding source*					
	CSB	PSB	ODA	FDI	DPIIn	SI
2.1.1 Control the rate of greenhouse's expansion during 2021-2030 as half of condition without intervention (baseline) through a range of potential disincentive regulations and economic instruments.					●	□
2.1.2 Generate awareness of farmers to follow the norm of fertilizer and pesticide application inside greenhouse, and the potential ecological impacts of greenhouse farming		●	□		●	
2.3.1 Strictly enforce provincial forest planning (revised in 2018) and forest protection regulations: minimize converting forest to mining, hydropower and other development projects, especially within the biodiversity corridors of the province. Development projects that do not require forest cut and conversion and do not need to establish concrete infrastructure (e.g. eco-tourism) may still be considered with careful impact assessment	●	□	●			●
2.4.1 Promoting agroforestry (with timber and/or fruit trees) and other types of agroforestry on forest lands that have been illegally converted to agricultural plantation		●	□		●	●
2.5.1 Conditional forest land allocation/concession to community and individual households where forests have been already converted to agriculture: community and households receives long-term forest land allocation with a clear land delineation if they commit to maintain tree covers above 30%		□	●			□
2.5.1 Assist natural forest regeneration (with or without enrichment planting) with "bareland with scattered trees" as targeted areas	●	●				□
2.6.1 Explore and promote scattered tree plantation in urban areas, industrial zones and along roads						□
27.1 A thorough study to support formulation of an innovative provincial policy that expands the scope of current PFES to air travel/ industrial water use/greenhouse operation/voluntary PFES payment in tourism sector			□			●
2.7.2 Implementing innovative PFES schemes in the province		□				●
2.8.1 Support households in poor districts/communes nearby forest to develop multi-purpose home-garden for food/nutrients safety and thereby reduce pressure to forest resources		●	□			

* CSB (Central State Budget), PSB (Provincial State Budget), ODA (Official Development Aid), FDI (Foreign direct investment), DPIIn (Domestic private investment), SI (social investment through application of economic instruments and fund-based mechanisms) □ = main source

Orientation 3 Control waste production and improve waste treatment

Potential measures	Expected funding source*					
	CSB	PSB	ODA	FDI	DPIn	SI
3.1.1 Reduce waste from agricultural residues, and promote production of green manure and composting in concentrated areas (especially for flower and vegetable production and processing) to increase the production of organic and locally produced fertilizer that currently can only satisfy 3% of the demand		●			□	
3.1.2 Control agricultural hazardous waste: develop the network of collection points/tanks for agricultural chemical plastic containers (especially those of pesticides)		●				□
3.1.3 Apply innovative manure management ⁵⁶ especially for swine as the most populated livestock raised in the province, in which manure are managed by current management systems with the gas generated from biogas recovery is converted into electrical energy or manure are managed by biogas recovery system. Compared to the current management system or if manure were directly discharged into the environment, the innovative management is safer to environmental and generate lower emission		●			□	
3.2.1 Prepare, issue policies, mechanisms, instruments for prevention, reduction, classification, collection, transportation, reuse, recycling and treatment of waste		□				
3.2.2 Establish province's waste database; develop technical standards, codes on the environment and technical guidelines on how to reduce, classify, reuse and recycle waste		●	□			●
3.2.3 Implement programmes to increase public awareness, strengthen the capacity for integrated management of waste		□	●			
3.2.4 Strengthen management over waste discharge activities; improve the existing legal system; examine, inspect, oversee the implementation and enforcement of environmental protection legislation relating to waste management	●	●	●		□	
3.2.5 Increase investment for urban environmental quality improvement, technology improvement, modernization of waste collection and treatment equipment	●	□				
3.3.1 Classification and treatment of solid waste, especially domestic and medical waste. Apply high technology to waste treatment	●	●		□	●	

* CSB (Central State Budget), PSB (Provincial State Budget), ODA (Official Development Aid), FDI (Foreign direct investment), DPIn (Domestic private investment), SI (social investment through application of economic instruments and fund-based mechanisms), □ = main source

⁵⁶ Nguyen et al (2017). Assessment of greenhouse gas emissions from the pig production in Lam Dong. <http://stdjsee.scienceandtechnology.com.vn/index.php/stdjsee/article/view/439>

Orientation 4 Promoting climate-smart and more sustainable landuse system

Interventions	Expected funding source*					
	CSB	PSB	ODA	FDI	DPIIn	SI
4.1.1 Promote coffee agroforestry practices by integrating highly profitable fruit trees such as durian and avocado, commercial crops such as pepper and nitrogen-fixing trees such as <i>Cassia siamea</i> to maintain soil fertility. By 2030 at least 30% of coffee plantations in the province are agroforestry		●	●	●	□	
4.1.2 Promote tea-fruit tree agroforestry in which fruit tree provides shading and to stop continuous decline of supply of raw tea material due to the switch of tea into fruit tree plantation which provides higher profitability. By 2030 at least 30% of tea plantations in the province are agroforestry		●		●	□	
4.1.3 Support research and development projects that aim to investigate best agroforestry practice and development of sustainable market value chain linking farmers as producers, processing industries and private sectors, and consumers			□	●	●	●
4.1.4 Support the promotion of agroforestry by providing training to relevant stakeholders in the province such as on selecting suitable shading tree species and density, and appropriate management practice in agroforestry systems		●	●	●	□	●
4.1.5 Support the sustainability of development of climate-smart agriculture system with schemes such as Public-Private Partnership (PPP), and further with Production- Protection-Inclusion (PPI) or Verification Sources Area (VSA) that aim to secure livelihood within the frame of sustainable environment especially through forest conservation		●	□		●	●
4.2.1 Support forest enterprises, communities and households to develop their sustainable forest management (SFM) plans for production forest and engage in forest certification schemes both internationally and nationally	●	●	●		□	●

* CSB (Central State Budget), PSB (Provincial State Budget), ODA (Official Development Aid), FDI (Foreign direct investment), DPIIn (Domestic private investment), SI (social investment through application of economic instruments and fund-based mechanisms), □ = main source

Orientation 5 Conserve water, natural resources and biodiversity

Potential measures	Expected funding source*					
	CSB	PSB	ODA	FDI	DPIIn	SI
5.1.1 Strictly enforce provincial forest planning (revised in 2018) and forest protection regulations: minimize converting forest to mining, hydropower and other development projects, especially within the biodiversity corridors of the province. Development projects that do not require forest cut and conversion and do not need to establish concrete infrastructure (e.g. eco-tourism) may still be considered with careful impact assessment		<input type="checkbox"/>	●			●
5.2.1 Support the establishment of four new protected areas in accordance with provincial biodiversity planning: Nui Voi, Phat Chi, Don Duong Natural Reserves, and Madaguoi	●	●			●	<input type="checkbox"/>
5.2.2 Support biodiversity database development and biodiversity monitoring at provincial level		●	<input type="checkbox"/>			●
5.2.3. Application of economic instruments to raise and sustain funding for Lam Dong's biodiversity and natural resources conservation		●	<input type="checkbox"/>			●
5.3.1 Develop water resource planning and management for an effective and equitable use of water reserves both surface and ground water reserves		●	<input type="checkbox"/>		●	●
5.3.2 Develop supporting policy to ensure an appropriate use of water resource by different stakeholders according to the planning and management plan		<input type="checkbox"/>				
5.3.3 Adopt high-technology, and increase capital and investment to ensure the provision of clean and safe water supply	●	●	●		<input type="checkbox"/>	

* CSB (Central State Budget), PSB (Provincial State Budget), ODA (Official Development Aid), FDI (Foreign direct investment), DPIIn (Domestic private investment), SI (social investment through application of economic instruments and fund-based mechanisms), ☐ = main source

Orientation 6 Enhancing market access and export of main commodities

Potential measures	Expected funding source*					
	CSB	PSB	ODA	FDI	DPIIn	SI
6.1.1 Establish farmer's cooperative and value-chain especially for fruit trees/crops such as durian, avocado, strawberry, jackfruit, passion fruits to better deal with the current markets dominated by middlemen and exporter without fixed contract with farmers		●	□	●	●	
6.1.2 Establish processing industries and value chain for other potential commodities of Lam Dong province for example cacao, pepper, and cashew to increase value-added and economic return	●	●		□	●	
6.2.1 Increase the percentage of agricultural products, cultivation area and stakeholders in value chain participating in certification scheme, to ensure standard product quality		●		●	□	
6.2.2 Increase the percentage of livestock products and stakeholders in value chain to participate in certification scheme, to ensure standard product quality for domestic and export market		●		●	□	
6.2.3 Building a brand to raise the value of agricultural products in the province along with the improvement in the product quality due to improved management and technology. The current recommended brand "Da Lat - miraculous crystallization from healthy soil" for vegetable products, flowers, and Arabica coffee		●			□	

* CSB (Central State Budget), PSB (Provincial State Budget), ODA (Official Development Aid), FDI (Foreign direct investment), DPIIn (Domestic private investment), SI (social investment through application of economic instruments and fund-based mechanisms), □ = main source

Orientation 7 Develop green and sustainable tourism

Potential measures	Expected funding source*					
	CSB	PSB	ODA	FDI	DPIIn	SI
7.1.1 Plan, invest in the development of local tourist products based on the key strengths and attractiveness of tourist resources which give priority to the development of cultural tourism and ecological tourism		●			□	●
7.1.2 Promote the linkages between regions, provinces, areas, localities, moving towards developing unique area-specific tourist products	●	□				
7.2.1 Minimize negative impacts of tourism on natural environment through promotion of "responsible tourism" and encourage participation of stakeholders involved in tourism business to meet international standard of sustainable tourism		●				□
7.2.2 Application of economic instruments in changing tourists' behaviours towards environment and biodiversity conservation	●	●				□
7.3.1 Develop tourism packages, activities and facilitation which involve communities from different socio-economic background including poor communities and ethnic minorities, with fair and equitable profit sharing, and with proper training to enhance knowledge and skills		●			□	
7.3.2 Develop mechanism to ensure local living standards which are under pressures of tourism and migrants working in tourism sector in the province		□				

* CSB (Central State Budget), PSB (Provincial State Budget), ODA (Official Development Aid), FDI (Foreign direct investment), DPIIn (Domestic private investment), SI (social investment through application of economic instruments and fund-based mechanisms), □ = main source

Orientation 8 Promote green lifestyle and sustainable urban consumption

Potential measures	Expected funding source*					
	CSB	PSB	ODA	FDI	DPIIn	SI
8.1.1 Conduct information-communication-advocacy activities to change consumption behaviours, practice sustainable consumption, move towards a low-waste discharge, low-carbon emission society		<input type="checkbox"/>				
8.1.2 Apply economic incentives to modify unreasonable consumption behaviours		<input type="checkbox"/>				
8.1.3 Develop and disseminate sustainable and responsible consumption models		●			<input type="checkbox"/>	
8.2.1 Issue policies that encourage production and business entities to apply modern environmental management systems, according to ISO 14000 standards	●		<input type="checkbox"/>			
8.2.2 Issue regulations to guide the use of waste discharge quotas and gradually set up a transfer market for waste discharge quotas	●	<input type="checkbox"/>				
8.2.3 Issue regulations on waste auditing and product lifecycle assessment		<input type="checkbox"/>				
8.2.4 Implement a rigorous registration regime for chemical operations, especially for hazardous/toxic chemicals		●			<input type="checkbox"/>	
8.2.5 Develop chemical incidents prevention and response capacities		●			<input type="checkbox"/>	
8.3.1 Transfer green technology, cleaner production processes to small and medium enterprises	●	<input type="checkbox"/>				
8.4.1 Prevent and control environmental pollution sources, and reduce the impacts from environmental pollution on people's health	●	●			<input type="checkbox"/>	

* CSB (Central State Budget), PSB (Provincial State Budget), ODA (Official Development Aid), FDI (Foreign direct investment), DPIIn (Domestic private investment), SI (social investment through application of economic instruments and fund-based mechanisms), ☐ = main source

Appendix VII Leading agencies

Orientation	Potential measures	Lead agency	Supporting agencies
1. Enhancing the use of renewable energy and energy efficiency	1.1.1 Use of LED lights in urban households	DOIT	Lam Dong EVN, Lam Dong TV, newspaper
	1.1.2 Use of LED lights in rural households	DOIT	Lam Dong EVN, Lam Dong TV, newspaper
	1.1.3 Promotion of improved cooking stoves	DPC	Provincial Women Union
	1.1.4 Promotion of LED lights in hotels and offices	DOC	DOIT, VCCI...
	1.1.5 Promotion of LED lights in government offices and schools	DOC	DOIT, DOF, social-political organizations
	1.1.6 Use of LED lights for public lighting	DOC	DOIT, URENCO
	1.1.7 Promotion of good housekeeping measures in buildings	DOIT	VCCI, Lam Dong TV...
	1.1.8 Promotion of housekeeping and equipment maintenance	DOIT	VCCI, Industrial enterprises
	1.1.9 Improvement of efficiency of industrial boilers	DOIT	VCCI, Industrial enterprises
	1.1.10 Improvement of efficiency of industrial motors	DOIT	VCCI, Industrial enterprises
	1.1.11 Use of LED lights in flower greenhouses	DARD	DOIT, Lam Dong EVN, DPC, Famers' Union, Lam Dong TV
	1.1.12 Improvement of efficiency in irrigation	DARD	DOIT, Lam Dong EVN, DPC, Famers' Union
	1.1.13 Promotion of non-fired bricks	DOC	DOIT
	1.2.1 Use of solar water heaters in urban households	DOIT	Lam Dong EVN, Lam Dong TV, Lam Dong newspaper
	1.2.2 Use of solar water systems in small hotels	DOC	DOIT, VCCI...
	1.2.3 Fuel change to biomass in boilers	DOIT	VCCI, Industrial enterprises
	1.2.4 Promotion of biofuel	DOIT	DOT, VCCI, Lam Dong TV, socio-political organizations
	1.2.5 Introduction of CNG buses	DOT	DOT/DOIT, VCCI
	1.2.6 Promotion of electric motorbikes	DOT	DOT/DOIT, Lam Dong TV
	1.2.7 Expansion of bus systems	DOT	DOT/VCCI, Lam Dong TV
	1.2.8 Development of monorail systems	DOT	DOIT
	1.3.1. Promotion of rooftop solar PV systems in urban households	DOIT	Lam Dong EVN
	1.3.2 Promotion of rooftop solar PV systems in buildings	DOIT	Lam Dong EVN, VCCI
	1.3.3 Development of ground mounted solar PV systems	DOIT	DPC
	1.3.4 Development of wind farms	DOIT	DPC

Orientation	Potential measures	Lead agency	Supporting agencies
	1.3.5 Promotion of Waste to Energy	DONRE	DOIT, DPC
	1.3.6 Deployment of dual use approach for solar energy and food production	DARD	DOIT
	1.3.7 Promotion of small hydro power	DOIT	DPC
2. Reduce emission from all sectors	2.1.1 Control the rate of greenhouse's expansion during 2021-2030 as half of condition without intervention (baseline) through a range of potential disincentive regulations and economic instruments.	DARD	DOIT, DOF
	2.1.2 Generate awareness of farmers to follow the norm of fertilizer and pesticide application inside greenhouse, and the potential ecological impacts of greenhouse farming	DARD	DONRE
	2.3.1 Strictly enforce provincial forest planning (revised in 2018) and forest protection regulations: minimize converting forest to mining, hydropower and other development projects, especially within the biodiversity corridors of the province. Development projects that do not require forest cut and conversion and do not need to establish concrete infrastructure (e.g. eco-tourism) may still be considered with careful impact assessment	DARD	DONRE, DOIT, PPC
	2.4.1 Promoting agroforestry (with timber and/or fruit trees) and other types of agroforestry on forest lands that have been illegally converted to agricultural plantation	DARD	DONRE, DOF
	2.5.1 Conditional forest land allocation/concession to community and individual households where forests have been already converted to agriculture: community and households receives long-term forest land allocation with a clear land delineation if they commit to maintain tree covers above 30%	DPI	DARD, DONRE
	2.5.2 Assist natural forest regeneration (with or without enrichment planting) with "bareland with scattered trees" as targeted areas	DONRE	
	2.6.1 Explore and promote scattered tree plantation in urban areas, industrial zones and along roads	DARD	DOF, Lam Dong's Tourism Association and private sectors
	2.7.1 A thorough study to support formulation of an innovative provincial policy that expands the scope of current PFES to air travel/ industrial water use/greenhouse operation/voluntary PFES payment in tourism sector	DARD	DONRE, DPI, DOF, PPC
	2.7.2 Implementing innovative PFES schemes in the province	DPI	DARD, DONRE, DOF, PPC
	2.8.1 Support households in poor districts/communes nearby forest to develop multi-purpose home-garden for food/nutrients safety and thereby reduce pressure to forest resources	DARD	DONRE, Department of Ethnic Minority
3. Control waste production and improve waste treatment	3.1.1 Reduce waste from agricultural residues, and promote production of green manure and composting in concentrated areas (especially for flower and vegetable production and processing) to increase the production of organic and locally produced fertilizer that currently can only satisfy 3% of the demand	DARD	DOIT, DONRE
	3.1.2 Control agricultural hazardous waste: develop the network of collection points/tanks for agricultural chemical plastic containers (especially those of pesticides)	DARD	DONRE, DOH
	3.1.3 Apply innovative manure management especially for swine as the most populated livestock raised in the	DARD	DONRE

Orientation	Potential measures	Lead agency	Supporting agencies
	province, in which manure are managed by current management systems with the gas generated from biogas recovery is converted into electrical energy or manure are managed by biogas recovery system. Compared to the current management system or if manure were directly discharged into the environment, the innovative management is safer to environmental and generate lower emission		
	3.2.1 Prepare, issue policies, mechanisms, instruments for prevention, reduction, classification, collection, transportation, reuse, recycling and treatment of waste	DONRE	DOIT, DARD
	3.2.2 Establish province's waste database; develop technical standards, codes on the environment and technical guidelines on how to reduce, classify, reuse and recycle waste	DONRE	DARD, DOIT
	3.2.3 Implement programmes to increase public awareness, strengthen the capacity for integrated management of waste	DONRE	DARD, DOIT, DOH
	3.2.4 Strengthen management over waste discharge activities; improve the existing legal system; examine, inspect, oversee the implementation and enforcement of environmental protection legislation relating to waste management	DONRE	DARD, DOIT, DOH
	3.2.5 Increase investment for urban environmental quality improvement, technology improvement, modernization of waste collection and treatment equipment	DONRE	DPI, DARD, DOH
	3.3.1 Classification and treatment of solid waste, especially domestic and medical waste. Apply high technology to waste treatment	DONRE	DARD, DOIT, DOH
4. Promoting climate-smart and more sustainable landuse system	4.1.1 Promote coffee agroforestry practices by integrating highly profitable fruit trees such as durian and avocado, commercial crops such as pepper and nitrogen-fixing trees such as <i>Cassia siamea</i> to maintain soil fertility. By 2030 at least 30% of coffee plantations in the province are agroforestry	DARD	DOIT
	4.1.2 Promote tea-fruit tree agroforestry in which fruit tree provides shading and to stop continuous decline of supply of raw tea material due to the switch of tea into fruit tree plantation which provides higher profitability. By 2030 at least 30% of tea plantations in the province are agroforestry	DARD	DOIT
	4.1.3 Support research and development projects that aim to investigate best agroforestry practice and development of sustainable market value chain linking farmers as producers, processing industries and private sectors, and consumers	DARD	DPI, DOIT
	4.1.4 Support the promotion of agroforestry by providing training to relevant stakeholders in the province such as on selecting suitable shading tree species and density, and appropriate management practice in agroforestry systems	DARD	
	4.1.5 Support the sustainability of development of climate-smart agriculture system with schemes such as Public-Private Partnership (PPP), and further with Production- Protection-Inclusion (PPI) or Verified Sourcing Area (VSA) that aim to secure livelihood within the frame of sustainable environment especially through forest conservation	DARD	DONRE, DPI
	4.2.1 Support forest enterprises, communities and households to develop their sustainable forest	DONRE	DPI

Orientation	Potential measures	Lead agency	Supporting agencies
	management (SFM) plans for production forest and engage in forest certification schemes both internationally and nationally		
5. Conserve water, natural resources and biodiversity	5.1.1 Strictly enforce provincial forest planning (revised in 2018) and forest protection regulations: minimize converting forest to mining, hydropower and other development projects, especially within the biodiversity corridors of the province. Development projects that do not require forest cut and conversion and do not need to establish concrete infrastructure (e.g. eco-tourism) may still be considered with careful impact assessment	DPI	DONRE, DARD, DOIT, PPC
	5.2.1 Support the establishment of four new protected areas in accordance with provincial biodiversity planning: Nui Voi, Phat Chi, Don Duong Natural Reserves, and Magguoil	DONRE	DOCST
	5.2.2 Support biodiversity database development and biodiversity monitoring at provincial level	DONRE	DARD
	5.2.3. Application of economic instruments to raise and sustain funding for Lam Dong's biodiversity and natural resources conservation	DONRE	DOF, DPI
	5.3.1 Develop water resource planning and management for an effective and equitable use of water reserves both surface and ground water reserves	DONRE	DARD, DPI, DOIT, PPC
	5.3.2 Develop supporting policy to ensure an appropriate use of water resource by different stakeholders according to the planning and management plan	DONRE	DARD, DPI, DOIT, PPC
	5.3.3 Adopt high-technology, and increase capital and investment to ensure the provision of clean and safe water supply	DONRE	DARD, DOH, DOIT
6. Enhance market access and export of main commodities	6.1.1 Establish farmer's cooperative and value-chain especially for fruit trees/crops such as durian, avocado, strawberry, jackfruit, passion fruits to better deal with the current markets dominated by middlemen and exporter without fixed contract with farmers	DARD	DOIT
	6.1.2 Establish processing industries and value chain for other potential commodities of Lam Dong province for example cacao, pepper, and cashew to increase value-added and economic return	DOIT	DARD
	6.2.1 Increase the percentage of agricultural products, cultivation area and stakeholders in value chain participating in certification scheme, to ensure standard product quality	DARD	DOIT
	6.2.2 Increase the percentage of livestock products and stakeholders in value chain to participate in certification scheme, to ensure standard product quality for domestic and export market	DARD	DOIT
	6.2.3 Building a brand to raise the value of agricultural products in the province along with the improvement in the product quality due to improved management and technology. The current recommended brand "Da Lat - miraculous crystallization from healthy soil" for vegetable products, flowers, and Arabica coffee	DPI	DARD, DONRE, PPC, DOIT, DOCST
7. Develop green and sustainable tourism	7.1.1 Plan, invest in the development of local tourist products based on the key strengths and attractiveness of tourist resources which give priority to the development of cultural tourism and ecological tourism	DOCST	DOIC, DPI, DOF, DONRE, DOPS, DOND, DOTC, DOC, VCCI, socio-political organizations, social and professional associations, PPC

Orientation	Potential measures	Lead agency	Supporting agencies
	7.1.2 Promote the linkages between regions, provinces, areas, localities, moving towards developing unique area-specific tourist products	DOCST	DOIC, DPI, DOF, DONRE, DOPS, DOND, DOTC, DOC, VCCI, socio-political organizations, social and professional associations, PPC
	7.2.1 Minimize negative impacts of tourism on natural environment through promotion of "responsible tourism" and encourage participation of stakeholders involved in tourism business to meet international standard of sustainable tourism	DOCST	DONRE, DARD
	7.2.2 Application of economic instruments in changing tourists' behaviours towards environment and biodiversity conservation	DOCST	DONRE, DOF
	7.3.1 Develop tourism packages, activities and facilitation which involve communities from different socio-economic background including poor communities and ethnic minorities, with fair and equitable profit sharing, and with proper training to enhance knowledge and skills	DOCST	DOIT, Department of Ethnic Minority, DOLISA
	7.3.2 Develop mechanism to ensure local living standards which are under pressures of tourism and migrants working in tourism sector in the province	DOCST	DPI, DOLISA
8. Promote green lifestyle and sustainable urban consumption	8.1.1 Conduct information-communication-advocacy activities to change consumption behaviours, practice sustainable consumption, move towards a low-waste discharge, low-carbon emission society	DOIT	DONRE, DOST, DPI, PPC
	8.1.2 Apply economic incentives to modify unreasonable consumption behaviours	DOIT	DONRE, DOST, DPI, PPC
	8.1.3 Develop and disseminate sustainable and responsible consumption models	DOIT	DONRE, DOST, DPI, PPC
	8.2.1 Issue policies that encourage production and business entities to apply modern environmental management systems, according to ISO 14000 standards	DOIT	DONRE, DOH, DOC, DOTC, DARD, DPI, DOPS, State Audit Office (SAO), PPC
	8.2.2 Issue regulations to guide the use of waste discharge quotas and gradually set up a transfer market for waste discharge quotas	DOIT	DONRE, DOH, DOC, DOTC, DARD, DPI, DOPS, State Audit Office (SAO), PPC
	8.2.3 Issue regulations on waste auditing and product lifecycle assessment	DOIT	DONRE, DOH, DOC, DOTC, DARD, DPI, DOPS, State Audit Office (SAO), PPC
	8.2.4 Implement a rigorous registration regime for chemical operations, especially for hazardous/toxic chemicals	DOIT	DONRE, DOH, DOC, DOTC, DARD, DPI, DOPS, State Audit Office (SAO), PPC
	8.2.5 Develop chemical incidents prevention and response capacities	DOIT	DONRE, DOH, DOC, DOTC, DARD, DPI, DOPS, State Audit Office (SAO), PPC
	8.4.1 Prevent and control environmental pollution sources, and reduce the impacts from environmental pollution on people's health	DONRE	DOC, DOTC, DOIT, DARD, DOH, SAO, social and political organizations, social and -professional associations, PPC
9. Create enabling conditions for	9.1.1 Accelerate the shift of governments' expenditure to green public procurements	PPC	DOF

Orientation	Potential measures	Lead agency	Supporting agencies
transitioning towards a green economy	9.2.1 Initiate a subsidy reform to shift away from subsidizing products and services that negatively impacts environment; and promote the use of environmentally friendly products	PPC	DONRE, DARD, DOIT, DOT, DOH
	9.2.2 Accelerate certification of sustainable production and trade	DOST	DONRE, DARD, DOIT, DOT, DOC, DOCST
	9.3.1 Develop policies that promote accounting for environmental externalities	DONRE/DOF	DOST, DOIT, DARD, DOT, DOC
	9.3.2 Facilitating trade of environmental goods and services	PPC	DONRE, DARD, DOIT
	9.3.3. Investigate policy options to mobilize resources from private sectors and the whole society for natural resources conservation	DOF	DPI, DARD, DONRE, DOIT, DOCST
	9.4.1 Develop local capacity for green technology development and exchange	DOST	DONRE, DOH, DOC, DOTC, DARD, DPI, DOPS, State Audit Office (SAO), PPC
	9.4.2 Support technology transfer through partnerships and co-investments	DOIT	DONRE, DOH, DOC, DOTC, DARD, DPI, DOPS, State Audit Office (SAO), PPC

Appendix VIII Measures by sector and estimated investment cost

Potential measures	Investment cost (billion VND)	Investment cost (thousand USD)*	Basis/assumption of assessment	Investment code**
Agriculture				
2.1.1 Control the rate of greenhouse's expansion during 2021-2030 as half of condition without intervention (baseline) through a range of potential disincentive regulations and economic instruments.	15.5	674	Decision no. 46/2016/QĐ-UBND ⁵⁷ , Decision no. 1296/2016/QĐ-UBND ⁵⁸	CC-GG D A7.1
2.1.2 Generate awareness of farmers to follow the norm of fertilizer and pesticide application inside greenhouse, and the potential ecological impacts of greenhouse farming	2.5	109	Decision no. 1296/QĐ-UBND	CC-GG D A7.1
3.1.1 Reduce waste from agricultural residues, and promote production of green manure and composting in concentrated areas (especially for flower and vegetable production and processing) to increase the production of organic and locally produced fertilizer that currently can only satisfy 3% of the demand	134	5,826	Supporting 50 start-up projects in 10 years (VND 2 billion/ project), investment in scope research and awareness raising (VND 2.4 billion/year for 10 years	CC-GG D M7.6
3.1.2 Control agricultural hazardous waste: develop the network of collection points/tanks for agricultural chemical plastic containers (especially those of pesticides)	137	5,957	Decision no. 1354/QĐ-BXD dated 29/12/2017 on announcement of investment rate in construction and cost norm for domestic solid waste treatment	CC-GG D A6.2
3.1.3 Apply innovative manure management especially for swine as the most populated livestock raised in the province, in which manure are managed by current management systems with the gas generated from biogas recovery is converted into electrical energy or manure are managed by biogas recovery system. Compared to the current management system or if manure were directly discharged into the environment, the innovative management is safer to environmental and generate lower emission	108	4,696	A biogas tank (composite-made, household size) is about 20 million VND, for a farm cost ~100 mil. VND. Assuming there will be 800 biogas tanks for the whole province. This includes training costs and awareness campaigns.	CC-GG D M7.4
4.1.1 Promote coffee agroforestry practices by integrating highly profitable fruit trees such as durian and avocado, commercial crops such as pepper and nitrogen-fixing trees such as <i>Cassia siamea</i> to maintain soil fertility. By 2030 at least 30% of coffee plantations in the province are agroforestry	3,702	160,991	Area and cost for intercropping as input for assessment	CC-GG D A7.4

⁵⁷ <https://thuvienphapluat.vn/van-ban/Cong-nghe-thong-tin/Quy-dinh-46-2016-QĐ-UBND-dinh-muc-chi-nhiem-vu-khoa-hoc-cong-nghe-co-su-dung-ngan-sach-Lam-Dong-320572.aspx>

⁵⁸ <https://thuvienphapluat.vn/van-ban/Tai-chinh-nha-nuoc/Quy-dinh-1296-QĐ-UBND-phan-bo-kinh-phi-tai-canhh-cai-tao-giong-gan-phat-trien-ca-phe-Lam-Dong-2016-315305.aspx>

Potential measures	Investment cost (billion VND)	Investment cost (thousand USD)*	Basis/assumption of assessment	Investment code**
4.1.2 Promote tea-fruit tree agroforestry in which fruit tree provides shading and to stop continuous decline of supply of raw tea material due to the switch of tea into fruit tree plantation which provides higher profitability. By 2030 at least 30% of tea plantations in the province are agroforestry	248	10,802	Area and cost for intercropping as input for assessment	CC-GG D A7.4
4.1.3 Support research and development projects that aim to investigate best agroforestry practice and development of sustainable market value chain linking farmers as producers, processing industries and private sectors, and consumers	4.6	200	Cost for research and performance model for 3 related commodities	CC-GG D A7.4
4.1.4 Support the promotion of agroforestry by providing training to relevant stakeholders in the province such as on selecting suitable shading tree species and density, and appropriate management practice in agroforestry systems	14.3	620	With 12 districts/cities and 2 training per year, including field trips	CC-GG D A7.7
4.1.5 Support the sustainability of development of climate-smart agriculture system with schemes such as Public-Private Partnership (PPP), and further with Production- Protection-Inclusion (PPI) or Verified Sourcing Area (VSA) that aim to secure livelihood within the frame of sustainable environment especially through forest conservation	8.3	360	VSA application in 3 potential districts	CC-GG D A7.7
6.1.1 Establish farmer's cooperative and value-chain especially for fruit trees/crops such as durian, avocado, strawberry, jackfruit, passion fruits to better deal with the current markets dominated by middlemen and exporter without fixed contract with farmers	31.8	1,385	Each commune 1 cooperation group, 30 households each, total 129 communes	CC-GG D A7.7
6.1.2 Establish processing industries and value chain for other potential commodities of Lam Dong province for example cacao, pepper, and cashew to increase value-added and economic return	14.7	640	Each district one processing factory, small scale first	CC-GG D A7.5
6.2.1 Increase the percentage of agricultural products, cultivation area and stakeholders in value chain participating in certification scheme, to ensure standard product quality	500.9	21,779	Registration fee approx. 1.5-15 mil. VND depending on crops	CC-GG D A7.7
6.2.2 Increase the percentage of livestock products and stakeholders in value chain to participate in certification scheme, to ensure standard product quality for domestic and export market	56.8	2,471	Certification expense including 2 trainings per year, 129 communes	CC-GG D A7.6
6.2.3 Building a brand to raise the value of agricultural products in the province along with the improvement in the product quality due to improved management and technology. The current recommended brand "Da Lat - miraculous crystallization	4.4	189	Including branding campaign for 129 communes	CC-GG D A7.7

Potential measures	Investment cost (billion VND)	Investment cost (thousand USD)*	Basis/assumption of assessment	Investment code**
from healthy soil" for vegetable products, flowers, and Arabica coffee				
Total	4,984	216,697		
Forestry				
2.3.1 Strictly enforce provincial forest planning (revised in 2018) and forest protection regulations: minimize converting forest to mining, hydropower and other development projects, especially within the biodiversity corridors of the province. Development projects that do not require forest cut and conversion and do not need to establish concrete infrastructure (e.g. eco-tourism) may still be considered with careful impact assessment	184.5	8,022	Consultation costs for reviewing projects that require conversion, supporting the development of 13 SFM sustainable forest management mechanisms	CC-GG D M8.4
2.4.1 Promoting agroforestry (with timber and/or fruit trees) and other types of agroforestry on forest lands that have been illegally converted to agricultural plantation	990.3	43,054	Decision No. 608/QĐ-UBND (03/04/2018); including establishment cost	CC-GG D M8.6
2.5.1 Conditional forest land allocation/concession to community and individual households where forests have been already converted to agriculture: community and households receives long-term forest land allocation with a clear land delineation if they commit to maintain tree covers above 30%	122	5,304	Includes consultation and policy advocacy cost; implement with 2.4.1 to save cost	CC-GG D M8.6
2.5.2 Assist natural forest regeneration (with or without enrichment planting) with "bareland with scattered trees" as targeted areas	1,015	44,130	Decree 75/2015/ND-CP; including establishment cost	CC-GG D M8.2
2.6.1 Explore and promote scattered tree plantation in urban areas, industrial zones and along roads	30.3	1,315		CC-GG D M8.6
2.7.1 A thorough study to support formulation of an innovative provincial policy that expands the scope of current PFES to air travel/ industrial water use/greenhouse operation/voluntary PFES payment in tourism sector	3.5	152	Potential cost can reach 6 billion VND/year; in this case 50% of total cost is supported	CC-GG D M8.6
2.7.2 Implementing innovative PFES schemes in the province	No cost	No cost	-	CC-GG D M8.6
2.8.1 Support households in poor districts/communes nearby forest to develop multi-purpose home-garden for food/nutrients safety and thereby reduce pressure to forest resources	6.5	280	According to PRAP, potential cost can reach 9 million VND/ha	CC-GG D M8.6

Potential measures	Investment cost (billion VND)	Investment cost (thousand USD)*	Basis/assumption of assessment	Investment code**
4.2.1 Support forest enterprises, communities and households to develop their sustainable forest management (SFM) plans for production forest and engage in forest certification schemes both internationally and nationally	30	1,304	Decision 38/2015 supports to develop the SFM ⁵⁹ .	CC-GG D M8.2
5.1.1 Strictly enforce provincial forest planning (revised in 2018) and forest protection regulations: minimize converting forest to mining, hydropower and other development projects, especially within the biodiversity corridors of the province. Development projects that do not require forest cut and conversion and do not need to establish concrete infrastructure (e.g. eco-tourism) may still be considered with careful impact assessment	No cost	No cost	-	CC-GG D M8.4
5.2.1 Support establishment of four new protected areas in accordance with provincial biodiversity planning: Nui Voi, Phat Chi, Don Duong Natural Reserves, and Madaguoi	16	696	Provincial biodiversity conservation planning	CC-GG D A13.1
5.2.2 Support biodiversity database development and biodiversity monitoring at provincial level	150	6,522	The development of national biodiversity database is funded, including the data management cost	CC-GG D A13.1
5.2.3. Application of economic instruments to raise and sustain funding for Lam Dong's biodiversity and natural resources conservation	83.3	3,620	Include research and consultation cost	CC-GG D A13.2
Total	2,631	114,400		
Tourism				
7.1.1 Plan, invest in the development of local tourist products based on the key strengths and attractiveness of tourist resources which give priority to the development of cultural tourism and ecological tourism	135	5,870	Includes cost for workshop organization, consultation and other supportive activities	CC-GG D A13.1
7.1.2 Promote the linkages between regions, provinces, areas, localities, moving towards developing unique site-specific tourist products	61	2,652	Includes cost for workshop organization, consultation and support for 10 pilot model	
7.2.1 Minimize negative impacts of tourism on natural environment through promotion of "responsible tourism" and encourage participation of stakeholders involved in tourism business to meet international standard of sustainable tourism	80	3,478	Mostly cost for campaign and support the local communities	CC-GG D A13.1
7.2.2. Application of economic instruments in changing tourists' behaviours towards	5	217	Mostly cost for research and database	CC-GG D A13.1

⁵⁹ <http://baohuy-frem.org/vn/wp-content/uploads/sites/3/2016/07/Ph%C6%B0%C6%A1ng-%C3%A1n-Qu%E1%BA%A3n-l%C3%BD-r%E1%BB%ABng-b%E1%BB%81n-v%E1%BB%AFng-Cty-LN-%C4%90%C6%A1n-D%C6%B0%C6%A1ng.pdf>

Potential measures	Investment cost (billion VND)	Investment cost (thousand USD)*	Basis/assumption of assessment	Investment code**
environment and biodiversity conservation (linked to 5.2.3)				
7.3.1 Develop tourism packages, activities and facilitation which involve communities from different socio-economic background including poor communities and ethnic minorities, with fair and equitable profit sharing, and with proper training to enhance knowledge and skills	17	739	Mostly for training and initiate activities, can be used to organize up to 10 training each year in period 2021-2030	CC-GG D A9.4
7.3.2 Develop mechanism to ensure local living standards which are under pressures of tourism and migrants working in tourism sector in the province	117	5,087	Includes consultation cost and support implementation cost	CC-GG D A9.4
Total	415	18,043		
Transport				
1.2.5 Introduction of CNG buses	31.20	1356	The additional investment cost compared to the plan to use the diesel bus includes the cost for the CNG relay station. Unit prices are presented in the description of the solution	CC-GG D M5.2
1.2.6 Promotion of electric motorbikes	-	-	No additional cost	CC-GG D M5.2
1.2.7 Expansion of bus systems	-	-	No additional cost	CC-GG D M5.2
1.2.8 Development of monorail systems	23,091	1,003,957	Investment cost for 2 monorail routes. Unit prices are presented in the description of the solution	CC-GG D M5.2
Total	23,100	1,004,357		
Water resource				
5.3.1 Develop water resource planning and management for an effective and equitable use of water reserves both surface and ground water reserves	26.3	1,141	The project to build a database funded by the Belgian Development Agency (BTC) for the MONRE ⁶⁰	CC-GG D A11.8
5.3.2 Develop supporting policy to ensure an appropriate use of water resource by different stakeholders according to the planning and management plan	7	304	Includes community consultation cost, expert consultation monitoring cost.	CC-GG D A11.2
5.3.3 Adopt high-technology, and increase capital and investment to ensure the provision of clean and safe water supply	1,207	52,478	Includes cost for improvement of high technology as example in Ho Chi Minh City ⁶¹	CC-GG D A11.2
Total	1,240	53,924		

⁶⁰ http://nawapi.gov.vn/index.php?option=com_content&view=article&id=760%3Ahoi-thao-tham-van-co-so-du-lieu-tai-nguyen-nuoc&catid=5%3Acac-hoat-dong-khac&Itemid=71&lang=vi

⁶¹ <http://www.vjol.info/index.php/JSTD/article/download/16809/15067>

Potential measures	Investment cost (billion VND)	Investment cost (thousand USD)*	Basis/assumption of assessment	Investment code**
Energy				
1.1.1 Use of LED lights in urban households	45,7	1.987	Equipment procurement costs increased compared to the normal plan with tube lights and CFLs	CC-GG D M1.6
1.1.2 Use of LED lights in rural households	12,1	526	Equipment procurement costs increased compared to the normal plan with tube lights and CFLs	CC-GG D M1.6
1.1.3 Promotion of improved cooking stoves	18,6	809	No additional cost due to longer lifetime of improved cooking stoves	
1.1.4 Promotion of LED lights in hotels and offices	9,7	422	Equipment procurement costs increased compared to the normal plan with tube lights and CFLs	CC-GG D M1.6
1.1.5 Promotion of LED lights in government offices and schools	13,4	583	Equipment procurement costs increased compared to the normal plan with tube lights	CC-GG D M1.4
1.1.6 Use of LED lights for public lighting	146	6.348	Equipment procurement costs increased compared to the normal plan	CC-GG D M1.4
1.1.7 Promotion of good housekeeping measures in buildings	5	217	The investment costs incurred, are estimated based on the payback period of the solution - aggregated from Audit reports.	CC-GG D M1.6
1.1.8 Promotion of housekeeping and equipment maintenance	728	31.652	The investment costs incurred, are estimated based on the payback period of the solution - aggregated from Audit reports.	CC-GG D M3.1
1.1.9 Improvement of efficiency of industrial boilers	620	26.957	The investment costs incurred, are estimated based on the payback period of the solution - aggregated from Audit reports.	CC-GG D M3.1
1.1.10 Improvement of efficiency of industrial motors	320	13.913	The investment costs incurred, are estimated based on the payback period of the solution - aggregated from Audit reports.	CC-GG D M3.1
1.1.11 Use of LED lights in flower greenhouses	385	16.739	Equipment procurement costs increased compared to the normal plan with tube lights and CFLs	CC-GG D M1.6
1.1.12 Improvement of efficiency in irrigation	39	1.696	The investment costs incurred, are estimated based on the payback period of the solution - aggregated from Audit reports.	CC-GG D M1.6

Potential measures	Investment cost (billion VND)	Investment cost (thousand USD)*	Basis/assumption of assessment	Investment code**
1.1.13 Promotion of non-fired bricks	153	6.652	Investment cost increased compared to normal plan	CC-GG D M3.3
1.2.1 Use of solar water heaters in urban households	169	7.348	Equipment procurement costs incurred	CC-GG D M1.6
1.2.2 Use of solar water systems in small hotels	39,7	1.726	Equipment procurement costs incurred	CC-GG D M1.6
1.2.3 Fuel change to biomass in boilers	-	-	No additional cost	CC-GG D M5.2
1.2.4 Promotion of biofuel	-	-	No additional cost	CC-GG D M5.2
1.3.1. Promotion of rooftop solar PV systems in urban households	142	6.174	Investment cost for 2400 systems, 3 kWp each. Investment rate to use VND 20 million/kWp	CC-GG D M2.3
1.3.2 Promotion of rooftop solar PV systems in buildings	36,4	1.583	Investment cost for 91 systems, 20 kWp each system. Investment rate VND 20 million / kWp	CC-GG D M2.3
1.3.3 Development of ground mounted solar PV systems	6316	274.609	Investment cost 315.8 MWp. Investment rate: VND 20 Billion /MWp	CC-GG D M2.3
1.3.4 Development of wind farms	12000	521.739	Investment cost for 300 MWp. Investment rate VND 40 billion / MWp	CC-GG D M2.3
1.3.5 Promotion of Waste to Energy	440	19.130	Investment cost for 5 MW. Investment rate VND 88 billion /MWp	CC-GG D M2.3
1.3.6 Deployment of dual use approach for solar energy and food production	720	31.304	Investment cost for 30 MWp. Investment rate VND 24 Billion/ MWp	CC-GG D M2.3
1.3.7 Promotion of small hydro power	8.195	356.304	Investment cost for 209.6 MWp. Investment rate VND 39.1 billion/MWp	CC-GG D M2.4
Total	30,553	1,328,417		
Green lifestyle and sustainable consumption				
3.2.1 Prepare, issue policies, mechanisms, instruments for prevention, reduction, classification, collection, transportation, reuse, recycling and treatment of waste	482	20,956	Credit is provided to businesses to implement at least 4 waste treatment facilities of about VND 100 billion / facility, and other investments ⁶² .	CC-GG D A6.1
3.2.2 Establish province's waste database; develop technical standards, codes on the environment and technical guidelines on how to reduce, classify, reuse and recycle waste	5	217.4	Develop and manage database	CC-GG D A6.2
3.2.3 Implement programmes to increase public awareness, strengthen the capacity for integrated management of waste	72	3,130	Public campaign and annual training for 12 districts in 10 years	CC-GG D A6.2
3.2.4 Strengthen management over waste discharge activities; improve the existing legal system; examine, inspect, oversee the implementation and enforcement of	37	1,608	Decision No. 1354 / QĐ-BXD dated December 29, 2017 announcing construction investment	

⁶² <https://enternews.vn/lan-dau-tien-co-du-an-trieu-usd-ve-xu-ly-chat-thai-ran-theo-hinh-thuc-ppp-153385.html>

Potential measures	Investment cost (billion VND)	Investment cost (thousand USD)*	Basis/assumption of assessment	Investment code**
environmental protection legislation relating to waste management			rate and cost of domestic solid waste treatment ⁶³ .	
3.2.5 Increase investment in urban environmental quality improvement, technology improvement, modernization of waste collection and treatment equipment	58	2,522	Promote PPP model in waste treatment, sponsor about 2-3 projects in 10 years with about VND 15 billion (about 10% of total investment) ⁶⁴	CC-GG D A6.2
3.3.1 Classification and treatment of solid waste, especially domestic and medical waste. Apply high technology to waste treatment	56	2,435	Decision No. 1354 / QD-BXD dated December 29, 2017 announcing construction investment rate and cost of domestic solid waste treatment ⁶⁵ .	CC-GG D A6.2
8.1.3 Develop and disseminate sustainable and responsible consumption models	24	1,045	Assumed cost of VND 200 million/district/year	
8.1.3.3 Pilot "green urban village" model, review for scaling up	194	8,435	Include support to implement green urban village	CC-GG D A4.5
8.2.1.1 Develop the business that consult/support the application of cleaner production, with regards to green production standards	26.5	1,152	Assumed cost of VND 200 million/district/year	CC-GG D M3.4
8.2.3.1 Issue regulation on waste accounting	4	174	Mostly cost for expert consultation and public consultation	CC-GG D A6.2
8.2.4.2 Properly treat agricultural chemical package	12	521	Mostly for awareness raising	CC-GG D A6.2
8.2.5.2 Technical support or consulting for business on capacity building of prevent and respond to chemicals disaster	No cost	No cost	-	CC-GG D A3.1
8.4.1.2 Train and raise businesses' and communities' awareness on environmental-friendly production and consumption, especially in the field related to sanity, waste treatment and management and resource usage	24	1,043	Mostly for awareness raising	CC-GG D A6.2
Total	995	43,239		

*With exchange rate of 1 USD = 23,000 VND, ** Each investment is assigned a code according to the Decision No. 1085/QĐ-BKHDT dated July 16th, 2018 of the Ministry of Planning and Investment.

⁶³ http://www.xaydung.gov.vn/c/document_library/get_file?p_l_id=10499&folderId=29703&name=74015

⁶⁴ http://www.xaydung.gov.vn/c/document_library/get_file?p_l_id=10499&folderId=29703&name=74015

⁶⁵ http://www.xaydung.gov.vn/c/document_library/get_file?p_l_id=10499&folderId=29703&name=74015

Appendix IX Indicators of monitoring and evaluation

Twelve main indicators

No	Name of indicator	Definition/Method to identify and/or measure	Responsible agency	Readiness I: Announced II: Sufficient data collected but not yet announced III: Data collection in progress IV: No data collected	Data source	Respective criteria in National criteria systems
(1)	(2)	(3)	(4)	(5)	(6)	
Environmental and natural resources productivity						
1	GRDP growth rate	Gross Regional Domestic Product (GRDP) is the aggregate of gross value added (GVA) of all resident producer units in the region. <i>Formula</i> GRDP growth rate (%) = $\frac{GRDP_{n1}}{GRDP_{n0}} \times 100 - 100$ In which: GRDP _{n1} is GRDP at nominal price of the period to be report GRDP _{n0} is GRDP at nominal price of the previous period	General Statistics Office (GSO)	I	Report on GRDP and value added (VA) of sectors and sub-sectors, taxes, etc. of the PSO	T0501, T0503 (Decision 54/2016 /QD-TTg by Prime Minister promulgating the statistical indicators system at provincial, district and commune levels)
2	Energy expenditure by GRDP	Energy consumption includes energy for production and energy for domestic uses, which comes from gasoline, fuel oil, gas, coal and electricity. <i>Formula</i> Energy expenditure by GDP (%) = $\frac{\text{Total energy expenditure}}{\text{Total GRDP}} \times 100$	Provincial Statistics Office (PSO), DOIT	II	- Statistics census; - Administrative data	Criteria 63 (Goal 7.3) in accordance with the Decision 681 / QD-TTg by the Prime Minister on Promulgating the roadmap for the implementation of sustainable development goals to Vietnam in 2030
3	Proportion of agricultural area under safe and sustainable agriculture	Productive and sustainable agriculture is considered as agricultural production and management practices that: (1) Minimise the risk for environmental contamination by promoting agro-ecological, organic or conservation agriculture ; (2) Protect and improve the natural resource base (soil, water) in order to ensure sufficient productivity for the foreseeable future; (3) Conserve and enhance biodiversity and wildlife habitat; (4) Maintain other ecosystem services and/or enhance climate adaptation (climate smart agriculture); (5) Reduce or remove GHGs emissions. <i>Formula</i>	DARD in coordination with DONRE	III	- Data collected for SDGs Indicator 2.4.1 - Provincial level/sectoral statistics and reports - Thematic inventory (if possible)	Criteria 10 (Goal 2.4) in accordance with the Decision 681 / QD-TTg by the Prime Minister on Promulgating the roadmap for the implementation of sustainable development goals to Vietnam in 2030

No	Name of indicator	Definition/Method to identify and/or measure	Responsible agency	Readiness I: Announced II: Sufficient data collected but not yet announced III: Data collection in progress IV: No data collected	Data source	Respective criteria in National criteria systems
(1)	(2)	(3)	(4)	(5)	(6)	
		Proportion of agricultural area under productive and sustainable agriculture (%) = Area under productive and sustainable agriculture/Total agriculture land area x100			- Registration and administrative records data	
4	Number of agricultural greenhouse facilities and total area of greenhouse	<p>A greenhouse is a structure with walls and roof made chiefly of transparent material and serves for the purpose of agricultural production.</p> <p><i>Formula</i> Total area of greenhouse (ha) = sum of all land areas covered by greenhouse in the province</p>	DARD	IV This criterion is particular for Lam Dong province	<p>- Provincial level/sectoral statistics and reports</p> <p>- Thematic inventory (if possible)</p>	This criterion is particular For Lam Dong Province
Economic and Environmental assets						
5	Area of perennial trees	<p>An area of agricultural perennial crops which has growth time from planting to first harvest is 1 year or more and can be harvested for many years.</p> <p><i>Formula</i> Area of current perennial trees = area of concentrated planted trees + area of scattered perennial crops In which: - The area of concentrated perennial trees is those planted in consecutive plots of 100 m2 or more, the density of plants basically meets the local technical standards. Formula: Area of concentrated perennial trees = Area of new planted trees + Area of trees in establishment stage + Area of harvesting trees - The area of scattered perennial plants for products: Based on the number of scattered trees for products and concentrated crop density according to local practices to convert to concentrated planting area. Formula:</p>	PSO in coordination with DARD	I	- Inventory of agriculture crops	T0802

No	Name of indicator	Definition/Method to identify and/or measure	Responsible agency	Readiness I: Announced II: Sufficient data collected but not yet announced III: Data collection in progress IV: No data collected	Data source	Respective criteria in National criteria systems
(1)	(2)	(3)	(4)	(5)	(6)	
		The area of scattered perennial trees for products converted to the concentrated planting area = The total number of scattered trees for the product / Average density of plants planted per hectare				
6	Portion of controlled and monitored reservoir to maintain the minimum flow of the river basin	<p>The percentage of large reservoirs which are controlled and monitored to maintain minimum flow of river basins.</p> <p>Large reservoirs include a) Reservoir for electricity generation with an installed capacity of over 50kW, with irrigation function integrated; b) Reservoirs for surface water exploiting with capacity of over 0.1m³/sec for agricultural and aquaculture production purpose; over 100m³/ day night for other purposes. The control and supervision shall comply with the regulations of the Ministry of Natural Resources and Environment.</p> <p>Minimum flow is the flow at the lowest level necessary to maintain a river or a river section in order to ensure the normal development of aquatic ecosystems and to ensure a minimum level for exploitation and use of sources. water for water users.</p> <p><i>Formula:</i> Portion of controlled and monitored reservoir to maintain the minimum flow of the river basin (%) = The number of controlled and monitored large reservoirs / Total large reservoirs × 100</p>	DONRE	II	Administrative data	Criteria 57 (Goal 6.4) in accordance with the Decision 681 / QĐ-TTg by the Prime Minister on Promulgating the roadmap for the implementation of sustainable development goals to Vietnam in 2030
7	Volume of collected urban solid wastes and proportion of urban solid wastes collected for standardized	<p>Collected urban solid wastes are urban solid wastes gathered, sorted, packaged and temporarily stored at many collection points to establishments approved by competent state agencies.</p> <p>Standard waste treatment is the process of using technology solutions to reduce, eliminate and destroy harmful or not useful components in solid waste; recover, recycle and reuse useful components in solid wastes</p> <p><i>Formula</i></p>	DONRE, DOC, and DOH	III	<ul style="list-style-type: none"> - Sectoral statistics and reports - Thematic inventories (if possible) - Cities' reports 	Criteria 98 (Section 12.5) in accordance with the Decision 681 / QĐ-TTg by the Prime Minister on Promulgating the roadmap for the implementation of sustainable development goals to Vietnam in 2030

No	Name of indicator	Definition/Method to identify and/or measure	Responsible agency	Readiness I: Announced II: Sufficient data collected but not yet announced III: Data collection in progress IV: No data collected	Data source	Respective criteria in National criteria systems
(1)	(2)	(3)	(4)	(5)	(6)	
	treatment in total volume of generated solid wastes	Proportion of urban solid wastes properly collected and treated (%) = volume of urban solid wastes properly collected and treated/Total volume of generated urban solid wastes x 100				
8	Revenue from accommodation and food service	<p>The net revenue from accommodation services is the total amount that has been and will be earned by providing short-term accommodation services to customers in a certain period (month/quarter/year). Accommodation service providers include: Villas or business apartments, hotels, guest houses, motels and other accommodation establishments (student halls, students; lodging places) on a vehicle, etc.</p> <p>- Accommodation services include facilities that only provide short-term accommodation services and the ones that provide both short-term accommodation and catering/ entertainment services for tourists and visitors. Facilities that provide these activities include hotels, villas or apartments, guest houses, motels for short-stay; student dormitories; mobile motel accommodation; tents, camps for temporary breaks. Accommodation services also include activities of businesses providing long-term accommodation for students (such as "student villages"), nursing houses.</p> <p>- Catering revenue is the total amount of money that has been and will be earned from providing catering services to customers in a certain period, including sales of self-made food and drinks or purchased ones from outside without additional processing and without additional service of the establishment (shipment).</p> <p>+ Revenue from transferring is the amount that has been and will be earned from the sale of goods not processed by the sale business (i.e. goods purchased for sale, e.g.: alcohol, cigarettes bought from restaurants to serve customers to drink and smoke at a restaurant).</p> <p>- Catering includes business activities of restaurants, bars and canteens providing catering services to on-site customers (customers are served or</p>	PSO	I	<ul style="list-style-type: none"> - Inventory of businesses; - Inventory of private sectors; - Inventory of accommodation, tourism and food services. 	T1002

No	Name of indicator	Definition/Method to identify and/or measure	Responsible agency	Readiness I: Announced II: Sufficient data collected but not yet announced III: Data collection in progress IV: No data collected	Data source	Respective criteria in National criteria systems
(1)	(2)	(3)	(4)	(5)	(6)	
		self-catering) or takeaway, mobile catering; provides occasional contractual catering and others catering services.				
9	Income per capita in rural area	Income per capita in rural area is the total income and artefacts' value after minus production cost that the rural residents received in certain period, usually 1 year. <i>Formula</i> Income per capita in rural area = Total income in rural area/Total population in rural area	DARD and PSO	II	- Census of living condition in Vietnam - Sectoral statistics and reports	Criteria 9 (Section 2.3), Decision 681 /QD-TTg by the Prime Minister on Promulgating the roadmap for the implementation of sustainable development goals to Vietnam in 2030
10	Growth rate in the number of passengers using public transport	The growth in the number of passengers using public transport this year compared to the previous year. Public transport means include buses, fixed-line passenger cars, passenger aircraft, passenger trains (including urban railway vehicles), passenger ships, passenger ferries. <i>Formula:</i> Growth rate of the number of passengers using public transport year t (%) = Number of passengers using public transport year t / (Number of passengers using public transport in year t t-1) × 100 - 100	DOT	II	Administrative data	Target 11.2.1 in Circular 03/2019/ TT-BKHDT of the Ministry of Planning and Investment stipulating Vietnam's statistical indicators of sustainable development
Economic opportunities and policy responses						
11	Ratio of enterprises obtained ISO 14001	Ratio of enterprises obtained ISO 14001 is the percentage (%) of number of enterprises obtained ISO 14001 certification compared with the total number of operating enterprises in the province <i>Formula</i> Ratio of enterprises obtained ISO 14001 (%) = Number of enterprises obtained ISO 14001 certification/Total number of operating enterprises in the province x 100	DOST	II	- Sectoral statistics and reports	Circular 03/2019/ TT-BKHDT of the Ministry of Planning and Investment stipulating Vietnam's statistical indicators of sustainable development
12	Proportion of forest area managed in accordance with SFM principles	SFM (Sustainable forest management) means the stewardship and use of forests and forest lands in a way, and at a rate, that maintains their biodiversity, productivity, regeneration capacity, vitality and their potential to fulfil, now and in the future, relevant ecological, economic and social functions, at local, national and global levels, and that does not cause damage to other ecosystems	DARD	III	- Sectoral statistics and reports - Thematic surveys and inventories (if possible)	Regarding Decision No. 1288 /QD-TTg of the Prime Minister approving the Scheme on Sustainable Forest Management and Forest Certification, which requires all FMBs of protection forests, special-use forests and organizations, businesses who is

No	Name of indicator	Definition/Method to identify and/or measure	Responsible agency	Readiness I: Announced II: Sufficient data collected but not yet announced III: Data collection in progress IV: No data collected	Data source	Respective criteria in National criteria systems
(1)	(2)	(3)	(4)	(5)	(6)	
		Proportion of forest area managed in accordance with SFM principles means the percentage (%) of forest area covered by approved SMF plans compared to the total forest area of the province				managing 7,216,889 ha of forest, to complete the development and implementation of sustainable forest management plan.

Additional indicators

No	Name of indicator	Definition/Method to identify and/or measure	Responsible agency	Readiness I: Announced II: Sufficient data collected but not yet announced III: Data collection in progress IV: No data collected	Data source	Respective criteria in National Criteria System
(1)	(2)	(3)	(4)	(5)	(6)	
Environmental and natural resources productivity						
1	Share of tourism sector in GRDP	Gross Regional Domestic Product (GRDP) from tourism is the aggregate of gross value added (GVA) of all sector to satisfy the domestic tourism consumption, plus net tax of the products and imported produced within this amount according to the buyers' price. <i>Formula</i> Share of tourism sector in GRDP (T) = GRDP from tourism sector/GRDP x 100	PSO, DOSTC	I	Report on GRDP and value added (VA) of sectors and sub-sectors, taxes, etc. of the PSO. Regularly reports from tourism sector	Criteria 73 (Section 8.9), Decision 681 /QD-TTg by the Prime Minister on Promulgating the roadmap for the implementation of sustainable development goals to Vietnam in 2030
2	Gross GHG emissions	Gross GHG emissions is the sum of all emissions into the earth's atmosphere of any of various gases, especially carbon dioxide, that contribute to the greenhouse effect <i>Formula</i>	DONRE in coordination with DOIT, DARD and PSO	III	- National GHGs inventory - Provincial Statistic book	Target related to task 28 of the National Green Growth Action Plan (Decision 403 / QD-TTg by the Prime Minister): Completing the institution on clean air inventory, monitor GHG emissions and

No	Name of indicator	Definition/Method to identify and/or measure	Responsible agency	Readiness I: Announced II: Sufficient data collected but not yet announced III: Data collection in progress IV: No data collected	Data source	Respective criteria in National Criteria System
(1)	(2)	(3)	(4)	(5)	(6)	
		Gross GHGs emission = (CO ₂ +CH ₄ +N ₂ O) emissions expressed as CO ₂ eq (million tons of CO ₂ eq)			- Technical reports (if available) - Provincial level GHGs inventory (if possible)	manage activities to reduce GHG emissions. Mentioned in Circular 03/2019/TT-BKHDT of the Ministry of Planning and Investment.
3	Renewable energy consumption and renewable energy consumption ratio	Renewable energy sources are defined as renewable non-fossil energy sources: hydropower, wind, solar, geothermal, wave, tidal, biomass, landfill gas, sewage treatment plant gas and biogases. Renewable energy consumption is calculated as the sum of the gross inland consumption of energy from renewable sources. Renewable energy consumption ratio is the fraction of renewable energy consumption in total final energy consumption of the province, expressed in percentage (%) <i>Formula</i> Renewable energy consumption ratio (%) = Renewable energy consumption / Total energy consumption x 100	DOIT	III	-Statistics of DOIT -Thematic inventory (if possible) - Registration and administrative records at DPI	Criteria 62(Section 7.2), Decision 681 /QĐ-TTg by the Prime Minister on Promulgating the roadmap for the implementation of sustainable development goals to Vietnam in 2030
4	Renewable installed capacity and power output	Renewable electricity includes: Solar power, wind power, tidal/sea wave power. Installed capacity and power output from them are the power output generated from solar energy, wind power and tidal/sea wave energy calculated on the output meter at the place of production transferred to the consumers in a certain period. Solar energy is light and radiates heat from the sun. Wind energy is the kinetic energy of the air moving in the Earth's atmosphere. Wind energy is an indirect form of solar energy. Tidal power is exploited from the changing of the ebb and flow every day. Renewable electricity capacity is the power generation capacity of a plant based on its installed capacity. Therefore, the unit of calculation also uses the unit as other power sources: W or the multiple of W is kW and MW. Electricity output is the amount of electricity produced in a given period of time in kWh. The electricity output is calculated on the output meter at the place of production transferred to consumption. Produced electricity is measured at the generator's head of each set through the	DOIT	II	Statistic census	Criteria 64 (Goal 7.4), Decision 681 /QĐ-TTg by the Prime Minister on Promulgating the roadmap for the implementation of sustainable development goals to Vietnam in 2030

No	Name of indicator	Definition/Method to identify and/or measure	Responsible agency	Readiness I: Announced II: Sufficient data collected but not yet announced III: Data collection in progress IV: No data collected	Data source	Respective criteria in National Criteria System
(1)	(2)	(3)	(4)	(5)	(6)	
		total meter of the plant, separating the self-consumed electricity and the loss on the remaining transformer is the consumed electricity.				
5	Ores and mineral resources export ratio	<p>Ores and mineral resources export are the total revenue (monetary value) that the province receive by exporting its ores and mineral resources in a given period of time.</p> <p><i>Formula</i></p> <p>Ores and mineral resources export ratio (%) = Ores and mineral resources export /total export of goods and products of the province x100</p>	PSO in coordination with Custom Department, DOIT and DONRE	I	<ul style="list-style-type: none"> - Reports by Custom Department - Statistics and reports by PSO 	Ratio of ores and minerals exported value compared with total explored value
Economic and Environmental assets						
6	Natural land area and land use structure	<p>Natural land area is the total land area of an administrative unit, which is determined to cover the entire area of land categories within the boundaries of each administrative unit already determined according to the laws</p> <p>Land use structure by designated purpose is the proportion of all land area with the same use purpose within the natural area of the administrative unit; These include: the proportion of agricultural land, non-agricultural land and unused land</p> <p><i>Formula</i></p> <p>Land use structure by designated purpose (%) = Area of agricultural land (or area of non-agricultural land)/natural land area x 100</p>	DONRE	I	<ul style="list-style-type: none"> - Land use planning and status reports - Sectoral statistics and reports 	T0101
7	Forest area and forest cover	<p>Forest area is the sum of areas at the time of observation that can be qualified as “forest” based on the definition provided by the Law on Forestry (2017)</p> <p>Forest cover refers to the relative (in percent) land area that is covered by forests</p> <p><i>Formula</i></p> <p>Forest area = sum of all forested land areas</p> <p>Forest cover (%) = Forest area/Total land area x 100</p>	DARD	I	<ul style="list-style-type: none"> - National and provincial forest inventories - Sectoral statistics and reports 	T20001, T2003
8	Area of new concentrated	Area of new concentrated forest plantation is an area of newly planted forest trees that meet technical standards and has an area of at least 0.3 ha; or in case it is a tree strip -it must be at least 20m wide and contains at	DARD	I	<ul style="list-style-type: none"> - National and provincial forest inventories 	T0808

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(1)	(2)	(3)	(4)	(5)	(6)	
	forest plantation	least 3 rows of trees, implemented in a certain period (a quarter, 6-month, 9-month, a year). <i>Formula</i> Area of new concentrated forest plantation = area of newly planted production forest + area of newly planted protection forest + area of newly planted special-use forest			- Sectoral statistics and reports	
9	Deposits of solid minerals and mineral water (excluding liquid mineral and energy minerals)	Solid mineral resources are natural accumulation of solid minerals inside or on the surface of the earth's crust, with morphology, quantity and quality meeting minimum standards that can be exploited and used, or some minerals from these deposits are economically efficient at the present or future. Mineral water is natural underground water or in some cases exposed on the earth's surface exposed surface, has ingredients, properties and some bioactive compounds that meet Vietnamese standards, technical regulations or foreign standards that can be applied in Vietnam (Item 2 Article 2 of Mineral Law).	DONRE in coordination with DOIT	II	- Sectoral statistics and reports - Annual reports and decisions of the Office of Mineral Reserve Assessment Council approving mineral deposits assessments	Related to criteria 12.2.1 in Circular 03/2019/TTBKHDT of the MPI
10	Proportion of land designated for biodiversity conservation	Land designated for biodiversity conservation is defined as special-use forest areas (and marine and wetlands protected area where applicable) as regulated by Law on Forestry (2017) <i>Formula</i> Proportion of land designated for biodiversity conservation (%) = total area of special-use forests/natural land area x100	DARD	I	- Sectoral statistics and reports (DARD) - Provincial biodiversity conservation plan/report	T2005
11	Number of threatened species	"Threatened" species are those species found in the province and determined to be Vulnerable, Endangered or Critically Endangered as categorized by Vietnamese' Red Book <i>Formula</i> Number of threatened species = Number of Vulnerable species + Number of Endangered species + number of Critically Endangered species	DONRE in coordination with DARD	II	- Sectoral statistics and reports - Provincial biodiversity conservation plan/report	

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(1)	(2)	(3)	(4)	(5)	(6)	
12	Area of degraded land	<p>Degraded land is a land that has its original characteristics and properties changed (in a bad way) due to the impact of natural and human conditions. Land degradation is likely to occur on all types of land: agricultural land, forestry land, aquaculture land, unused flat land, unused mountainous land.</p> <p>Degraded land includes the following types: Drought, desertification land; fallow land; landslide; von, laterite; the soil is hardened and squash tight; soil pollution; soil erosion; flooded soil; saline soils; acid sulphate soil.</p> <p>Calculation formula: Total degraded land area = Slightly degraded land area + Medium degraded land area + Severely degraded land area Summarize and classify the classification of soil degradation (severely degraded, medium degraded, Slightly degraded land) according to the technical regulation on land degradation survey of the MONRE.</p>	DONRE	I	Periodic reports of the sector	T2006
Green lifestyle and sustainable consumption						
13	Proportion of population accessed to clean water	<p>Percentage of the population accessed clean water is the ratio between the number of people accessed to water supplies that meet national technical standards for drinking water quality of the Ministry of Health and the total population of the province</p> <p><i>Formula</i> Proportion of population accessed to clean water (%) = Number of people accessed to clean water supplies / Total population of the province x 100</p>	PSO in coordination with DOC and DARD	III	<ul style="list-style-type: none"> - Sectoral statistics and reports - Survey of residents' living condition - Thematic inventories (if possible) 	T1805
14	Average urban green space area per capita	<p>Average urban green space area per capita is the land area used for the purpose of tree plantation in a city compared to the total population in that city</p> <p><i>Formula</i> Average urban green space area per capita (m²/person) = Total green (covered by trees) urban area / Total urban population</p>	DOC	I	- Sectoral statistics and reports (DOC)	Section 2.6.3 Decision 04/2008/QĐ-BXD on the National Technical Procedure of Construction Planning, issued by Minister of MOC.

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(1)	(2)	(3)	(4)	(5)	(6)	
15	Number of planted scattered trees annually	A scattered tree is a canopy tree that does not form part of a remnant patch. Number of planted scattered trees annually is the total number of trees planted in accordance with implementation of the province's decision on scattered trees and shading trees plantation in a given period	DARD and DOC	I	- Sectoral statistics and reports (DARD)	Criteria 51 in Agriculture and Rural Development sector standards system.
16	Rate of properly collected treated urban wastewater	- Waste water is water used and discharged into the surrounding environment. Wastewater treatment is the process of using technical solutions to reduce, eliminate and destroy harmful components in wastewater, ensuring that wastewater discharged into the environment meets standards and regulations according to regulations. - Rate of properly collected and treated urban wastewater is the percentage of urban wastewater collected and treated up to 80% of the total standard. Clean water supply capacity in the locality. Formula: Rate of properly collected and treated urban wastewater (%) = Total urban wastewater treatment capacity / (Total exploitation capacity of water plants x 80%) x 100%	DOC	II	- Sectoral statistics and reports - Thematic inventories (if possible)	Criteria 55 (Goal 6.3), Decision 681 /QD-TTg by the Prime Minister on Promulgating the roadmap for the implementation of sustainable development goals to Vietnam in 2030
17	Proportion of operating industrial and manufactural zone which have centralized wastewater treatment plants meeting the standards	The percentage of operating industrial parks and export processing zones with centralized wastewater treatment plants that meets environmental standards among the total number of industrial and manufactural zones that have been put into operation. Calculation formula: Proportion of operating industrial and manufactural zone which have centralized wastewater treatment plants meeting the standards (%) = Number of operating industrial and manufactural zone which have centralized wastewater treatment plants meeting the standards/total number of industrial parks and export processing zones has been put into operation x 100	DPI	II	Periodic report scheme by MPI	Criteria 6.3.2 in Circular 03/2019/ TT-BKHDT of the Ministry of Planning and Investment stipulating Vietnam's statistical indicators of sustainable development
18	Rate of households equipped with	The percentage of households equipped with hygienic latrines among the total households in the defined year. <i>Formula</i>	GSO PSO in coordinatio	I	- Survey on residents' living condition	T1806

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(1)	(2)	(3)	(4)	(5)	(6)	
	hygienic latrines	Rate of households equipped with hygienic latrines (%) = Number of households equipped with hygienic latrines /Total number of households x 100 Hygienic latrines ensure the criteria: no surface soil pollution, no surface and ground water pollution, no fly, no unpleasant odours and damage sights, prevent untreated faeces from contacting with animals.	n with DOC and DARD		- Sectoral statistics and reports	
19	Portion of collected and treated hazardous waste	Waste is material discharged from production, business, service, daily life or other activities. Hazardous wastes are wastes containing toxic, radioactive, infectious, inflammable, explosive, corrosive, poisoning or other hazardous properties. Portion of hazardous waste treated is the percentage of hazardous waste treated (including recycling, co-treatment, recovery of energy from hazardous waste) to ensure national standards in total volume of hazardous waste.	DONRE coordination with DOF, DOH	I	Periodic reports	T2007
20	Proportion of communes qualified as new-style rural area	Communes qualified as new-style rural area are those meeting 19 criteria as regulated by Decision 1980/QĐ-TTg dated of 17/10/2016 of the Prime Minister <i>Formula</i> Proportion of communes qualified as new-style rural area (%) = Number of communes qualified as new-style rural area /Total number of communes in the province x 100	DARD	I	- Sectoral statistics and reports	T0813
Economic opportunities and policy responses						
21	Proportion provincial public agencies having action plans on green public procurements	Green Public Procurement (GPP) is a process where public authorities seek to source goods, services or works with a reduced environmental impact in their whole life cycle compared to other goods and services for the same purposes. Proportion provincial public agencies having action plans on green public procurements is the percentage (%) of number of public agencies having action plans on green public procurements compared with the total number of public agencies in the province <i>Formula</i>	DPI	II	- Sectoral statistics and reports	Green public procurement is one of the prioritized areas by the Government to use ODA and concessional loans in the coming time according to the Decision 251 / QĐ-TTg dated February 17, 2016 of the Prime Minister on approving the project "Orientation of attracting, managing and using ODA and

No	Name of indicator	Definition/Method to identify and/or measure	Responsible agency	Readiness I: Announced II: Sufficient data collected but not yet announced III: Data collection in progress IV: No data collected	Data source	Respective criteria in National Criteria System
(1)	(2)	(3)	(4)	(5)	(6)	
		Proportion provincial public agencies having action plans on green public procurements (%) = Number of public agencies having action plans on green public procurements/Total number of public agencies in the province x 100				concessional loans of foreign sponsors in the 2016-2020 period".
22	Proportion of expenditure for research and development compared to GRDP	<p>Science and technology expenditure is the total internal expenditure in Lam Dong province in a given period, including expenditures on science and technology (scientific research, research and experimentally deploying, developing technologies, applying technologies and providing scientific and technological services, promoting other initiatives and creative activities to develop science and technology) in Lam Dong province from all sources but exclude expenses for science and technology invested by Vietnamese organizations and individuals outside the province (so-called gross domestic spending on science and technology). The total domestic expenditure on science and technology is measured by sum of internal expenditures of the units making expenditures on science and technology activities (internal spending of scientific research and technology development organizations; higher education institutions; scientific and technological service organizations; administrative agencies and other non-business units; businesses and non-profit sectors).</p> <p><i>Formula:</i> Total domestic expenditure for science and technology = Total internal expenditure scientific and technological in the province of counted units = Total internal expenditure scientific and technological in the province of counted units funded by domestic organizations and individuals + Total internal expenditure scientific and technological in the province of counted units funded by foreign organizations and individuals.</p> <p>The ratio of expenditure on science and technology to the total GDP in the area is calculated by the following formula:</p>	DOST, PSO	iii	<ul style="list-style-type: none"> - Sectoral statistics and reports of science and technology sector - Thematic surveys and inventories (if possible) by PSO 	Criteria 83 (Goal 9.4), Decision 681 /QD-TTg by the Prime Minister on Promulgating the roadmap for the implementation of sustainable development goals to Vietnam in 2030

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(1)	(2)	(3)	(4)	(5)	(6)	
		The ratio of expenditures on science and technology to the total product in the area (%) = Expenditure on science and technology Technology/Gross product in the area × 100				
23	Revenue from PFES and other PES initiatives (e.g. ecological fee for tourists)	<p>PFES is a nation-wide policy that requires users of forest environmental services to make payments to suppliers of these services.</p> <p>Revenue from PFES and other PES initiatives is the total amount of monetary that the payment receivers in Lam Dong province receive from PFES and other PES initiatives in certain time (6 months, 9 months or 1 year)</p>	DARD/Forest protection and development fund (FPDF)	II	<ul style="list-style-type: none"> - Sectoral statistics and reports (DARD) - Report and data from the sector (DOF) 	Related to goal 15.2.1 Decision 681 /QD-TTg by the Prime Minister on Promulgating the roadmap for the implementation of sustainable development goals to Vietnam in 2030
24	Number of innovative small and medium-sized start-ups	Innovative small and medium-sized start-ups are those that meet the criteria specified in Clause 2, Article 3 of the Law on Support for Small and Medium-sized Enterprises (2017): Small and medium-sized innovative start-ups are small and medium (according to the criteria defined in Clause 2, Article 4), established to implement ideas on the basis of exploiting intellectual property, technology, new business models and being capable of rapid growth.	DPI, DOST, DOIT	III	<ul style="list-style-type: none"> - Sectoral statistics and reports - Business inventory - Administrative data and statistics 	Relates to criteria T0304, T0307, T1311, T1401 and T1405 in Decision 54/2016/QD-TTg by the PM; criteria 9.2.1, 9.2.2, 9.2.3, 9.3.1, 9.4.2 in Circular 03/2019/TT-BKHDT by MPI
Social sustainability						
25	Population and population growth rate	<p>Population is all the inhabitants of an administrative unit</p> <p>Population growth rate is the rate at which the number of individuals in a population increases in a given time period, expressed as a fraction of the initial population</p> <p><i>Formula:</i> GR = CBR - CDR + IMR - OMR Of which: GR: Population growth rate; CBR: Crude birth rate; CDR: Crude death rate; IMR: Immigration rate; OMR: Out-migration rate</p>	PSO	I	<ul style="list-style-type: none"> - Statistics and reports from PSO - Demographic surveys and inventories 	T0102, T0107
26	Labour productivity and Labour productivity growth rate	<p>Labour productivity is a measure of worker output used in both business and the economy as a whole. It is the ratio between the output measure and the labour input</p> <p><i>Formula</i></p>	PSO	II	Report on GRDP provided by PSO and Inventories of labour force and job markets	Criteria 67 (Goal 8.2) in Decision 681 /QD-TTg by the Prime Minister on Promulgating the roadmap for the implementation of sustainable development goals to Vietnam in 2030

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(1)	(2)	(3)	(4)	(5)	(6)	
		Labour productivity (VND/labour) = Gross Regional Domestic Product (GRDP)/Total number of labours of the labour force Labour productivity growth rate is the change of labour productivity in a given period Labour productivity growth rate of year i/i-1 = Labour productivity of year i/ Labour productivity of year (i-1)				
27	Employment rate	Employed workers are all persons aged 15 and over, during the reference period, engaged in any activity (not prohibited by law) for 1 hour or more to create goods or products as a mean to generate income for themselves and their family. <i>Formula</i> Employment rate (%) = Number of employed labours/Average total population x 100	PSO	I	- Statistics and reports from PSO - Demographic surveys and inventories	T0202
28	Rate of trained labours (this may include two sub-indicators: rate of trained female labours and rate of trained labours who are ethnic minorities)	Trained labours are persons aged 15 year or older who have a job or unemployed during the reference period, meeting the following criteria: a) Persons who have been trained at a school or a professional, technical and professional training establishment of the national education system for 3 months or more and have graduated, have been granted a certificate/certificate achieve a certain level of professional, technical and professional skills, including elementary, intermediate, vocational, intermediate, professional, tertiary and postgraduate (masters and doctoral) , Doctor of Science) b) Or who has not yet gone through a training school but due to self-study, due to being trained or working as well as studying, they have acquired skills equivalent to level 1 of technical workers with certificate of the same profession and actually did this job for a period of 3 years or more (also known as a technical worker without certificate). Rate of trained labours is the percentage of the total number of trained labours aged 15 and above compared to the labour force (or total population) <i>Formula</i>	PSO	I	- Statistics and reports from PSO - Inventories of labour force and job markets	T0203

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(1)	(2)	(3)	(4)	(5)	(6)	
		$\text{Rate of trained labours (\%)} = \frac{\text{Number of trained labours}}{\text{Labour force}} \times 100$				
29	Number of agricultural, forestry and fishery individual business households	<p>Agricultural, forestry and fishery individual economic households are all households in which all or most of its labours engaged directly or indirectly in self-organizing agricultural, forestry and fishery production, decide for themselves all matters of its production and business.</p> <p>Agricultural, forestry and fishery production households include those conducting activities:</p> <ul style="list-style-type: none"> - Cultivation activities: soil preparation, planting, managing and harvesting agricultural crops; - Breeding activities: Breeding cattle, poultry and other livestock; - Agricultural services: cultivation services, animal husbandry services, post-harvest services ...; - Plant trees and take care of the trees; logging timber and harvesting non-timber forest products; forestry services; - Activities of aquaculture: raising fish, shrimp and other aquatic products (including cage and cage culture) on fresh, salty and brackish water surfaces; - Activities of exploiting aquatic resources: exploiting aquatic resources by mechanical or manual means on fresh, salty and brackish water surfaces. <p>b) Employees in individual economic agricultural, forestry and fishery households are all people in labour age (male 15 to under 60 years old, female 15 to under 55 years) of agricultural, forestry and fishery individual economic households capable of participating in activities production and business (not including people who are disabled, unable to work and do not participate in production and business, pupils and students in labour age) who are still attending school regardless of whether they are currently employed or unemployed.</p>	PSO	I	Mid-term agriculture and rural census	T0303
30	Number of registered	Accommodation service business are pre-described in the Law on Tourism and other forms of accommodation service (hourly and overnight stay)	PSO, DOCST, DPI	II	- Administrative statistics	Relates to criteria T1703 and T1708 in Decision 54/2016/QD-TTg; criterion

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(1)	(2)	(3)	(4)	(5)	(6)	
	accommodation service businesses and individual economic households	<p>operating on land or on accommodated cruises. In other words, accommodation service business is the provision of services to meet the accommodation needs of short-term and long-term tourists accompanied by other services such as dining, entertainment, health, meeting Requirements under Decree No. 96/2016/ND-CP stipulating conditions on security and order for a number of conditional business investment sectors; The 2017 Tourism Law, Decree No. 168/2017/ND-CP details a number of articles of the Law on Tourism.</p> <p>Number of individual business households and enterprises registering for business of lodging services is the number of individual business households and enterprises having dossiers of registration of business of accommodation services/business and registered by the business registration agency. Enterprises are competent to grant business licenses</p>			- Inventory of businesses	8.9.1 in Circular 03/2019/TT-BKHDT by MPI
31	Proportion of land areas managed by communities	Proportion of forest land areas managed by communities is defined as percentage of area of forest lands allocated to communities with Land Use Right Certificate (Red Book) and area of forest land managed following principles of community-based forest management (CBFM) compared to the total forest land area of the province	DONRE in coordination with DARD	III	<ul style="list-style-type: none"> - Sectoral statistics and reports - Thematic surveys and inventories (if possible) 	Relates to criterion 5.7.1 in Circular 03/2019/TT-BKHDT by MPI