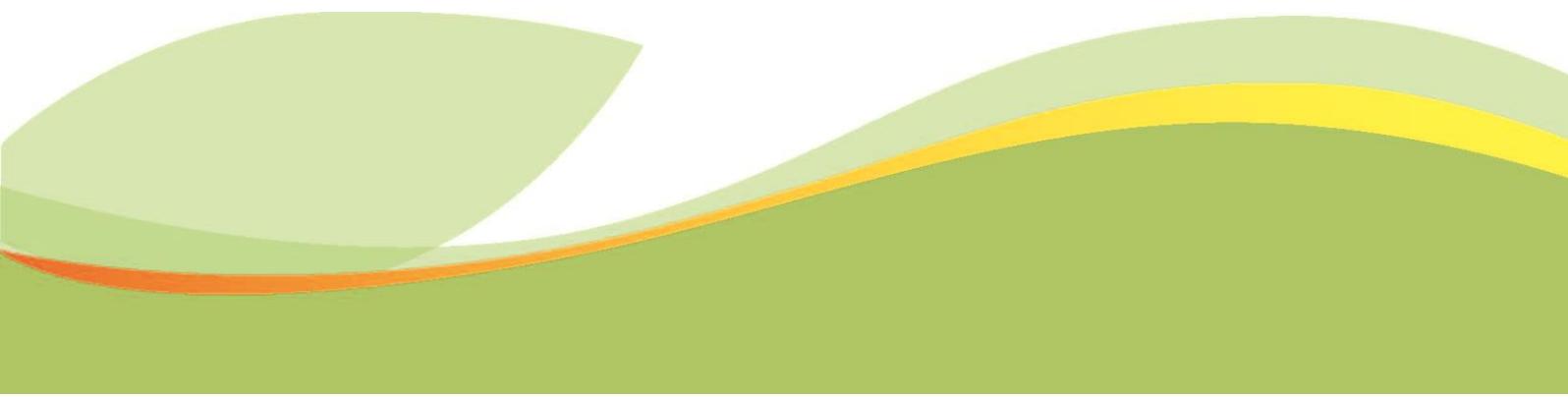




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Project Proposal: Integrating Green Growth Action Plan into Master Plan in Lam Dong Province of Viet Nam



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On behalf of the

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RATIONALE

The new Law on Planning promulgated in 2017 is targeting the integration of multi-sector development plannings, as compared to previous practice of individual sectoral master plans, to lead towards environmental-sensitive and sustainable national and sub-national economic growth. Based on this Law, each province must develop an integrated Master Plan (MP) to formulate and harmonize targets related to different sectors including pathways to achieve the targets. The MP should have orientation towards Green Growth (GG) characterized particularly by low-emission economic development, and how to achieve sustainable growth of multi especially economic-related sectors, while safeguarding natural resources such as water, forest, and soils and ecosystem services including biodiversity, and enhanced adaptation to climate change.

Meanwhile, the Government of Viet Nam is also targeting the development of Green Growth Action Plan (GGAP) that should subsequently be integrated into the MP. This GGAP provides the overview, strategies, and investment plan for green economy, that reconcile the economic growth of multi sectors in the province with climate change mitigation and efficient use of natural resources including energy sector that supports the economic development. Currently, at national level, Viet Nam has national green growth strategy for the period of 2011-2020. The development of provincial GGAP can follow the outline and format of the national green growth strategy, and can also help the province to attract both national and international donors and institutions to contribute achieving the targets formulated in the GGAP.

The low-emission economic development is the central element of the provincial GGAP and MP towards GG, and at national level, the country is now in the process of reviewing and updating the target of national carbon emission to better comply with the Paris agreement on climate change mitigation¹. A number of International partners also show commitment to assist the country in the review and updating process. Viet Nam has started its Nationally Determined Contribution (NDC) programs since June 2017 and the greenhouse gas (GHG) mitigation efforts have been focusing primarily on energy-related sectors, industrial and agricultural production, land use, land use change and forestry (LULUCF), and waste². The formulated target is for the country to reduce the GHG emission by 8% by 2030, and by 25% with international supports. Related to ecosystem services such as biodiversity, the national biodiversity strategy to 2020, vision to 2030, issued by MONRE emphasizes the need for preservation and the synergy with economic development by declaring that “by 2030, 25% of degraded ecosystems of national and international significance will be restored. Biodiversity

¹ <http://vietnamnews.vn/environment/426751/viet-nam-is-updating-its-emission-target-in-paris-climate-deal.html#mySchXhLZgW2p8jO.99>

² <http://vietnamnews.vn/environment/426751/viet-nam-is-updating-its-emission-target-in-paris-climate-deal.html#mySchXhLZgW2p8jO.99>

shall be conserved and used sustainably, bringing major benefits to the citizenry and contributing significantly to the country's socio-economic development.”

The Central Highlands region of Viet Nam is a power house of quality agricultural production, for example coffee (mainly Robusta) that provides up to 95% of the national production for domestic consumption and export purpose. Other important cash crops include pepper, tea, and cashew. The region also accommodates a number of hydropower plants that supply over 20 percent of national hydropower production. All of these remarkable performances were supported by favourable natural resources including water and land, and forests that help to regulate climate, water, and energy cycle. Since the past decades, however, the multi-sector economic growth including agricultural sector that has provided a great contribution to local livelihood and regional income, reveals an unfavourable impact to forest coverage and quality, as well as water and land quality. Lack of preventive and remedial interventions will put future economic and environmental services that can be derived from the landscapes in the region, in an alarming level.

IDH, UN-REDD, GIZ and their development partners will contribute to the development of 2019-2030 GGAP for Lam Dong, and the integration of the GGAP into 2020-2030 provincial MP towards GG, vision to 2050, and Lam Dong will become the pilot province for the GGAP integration into MP towards GG. Lam Dong is also one of IDH pilot province in developing pathways for sustainable agricultural production whilst safeguarding natural resources. For this initiative, IDH, UN-REDD, GIZ and their development partners will conduct a close interaction with the province's management board (PMB) that consists of key provincial authorities such Department of Planning and Investment (DPI), Department of Natural Resources and Environment (DONRE), and Department of Agriculture and Rural Development (DARD) who has a responsibility to develop the provincial GGAP and MP towards GG, as well as private sectors, and other relevant stakeholders. The collaboration is expected to provide a direction for GGAP and MP towards GG development in other provinces as well, including in other IDH's pilot provinces.

THE AIM OF THE PROJECT

The overall aim of the project is for the World Agroforestry Centre (ICRAF) Viet Nam to support the IDH, UN-REDD, and GIZ in their collaboration with the Lam Dong province to develop 2019-2030 GGAP to integrate into 2020 -2030, vision to 2050, MP towards GG, related to the six sectors namely agriculture, forestry, tourism³, water resource management, infrastructure

³ Mainly 'land-based' tourism plans that influence land use distribution and allocation in the province.

mainly road construction and road network, and energy sector, which are the main economic-related and supporting sectors in the province. Assessment to other sectors such as waste management etc. that are not related to the six sectors mentioned above, will be conducted by the provincial authorities or other consultant groups that have collaboration with them, and ICRAF can be involved in reviewing, commenting, and/or improving the results of their assessment, especially to be in line with the GG context formulated by ICRAF related to the six sectors. The 2019-2030 GGAP related to the six sectors formulated by ICRAF will be integrated with the contents of GGAP related to other sectors that the provincial authorities developed, to constitute the final version of provincial 2019-2030 GGAP, and subsequently the latter will be integrated into the provincial 2020-2030, vision 2050, MP towards GG. In case the provincial authorities lack of knowledge and capacity on how to formulate the contents of GGAP related to sectors other than the six sectors mentioned above, ICRAF can provide guidance on the outline/format or typical contents of GGAP, that are in line with contents of GGAP related to the six sectors formulated by ICRAF. Specific objectives are for ICRAF to lead:

- The interaction with the PMB that consists of key provincial authorities such as DPI, DONRE, and DARD, to develop the GGAP related to the six sectors, for integration into provincial MP towards GG, including for gathering secondary data for analysis and impact assessment of development plannings.
- The review of current development plannings in the six economic-related sectors, especially those that relate to landuse and land allocation; identify related stakeholders (i.e. stakeholder mapping) including private sectors, and the current roadmap for the plannings' implementation pathways including the investment plan.
- The development of business as usual (BAU) that reflects the current plannings and GG scenarios that have orientation to green economy and prioritize low-emission development as well as the safeguard of natural resource and ecosystem services including biodiversity, as well as adaptation to climate change. The GG scenarios will be derived from the close interaction with the PMB, and bottom-up and participatory approach with other relevant provincial planners, private sectors and other relevant stakeholders.
- The data collection and impact assessment of the different scenarios with a number of biophysical, socio-economic and environmental indicators as the outputs of the assessment (see Table 1), using a landuse planning model called LUMENS (Land Use Planning for Multiple Environmental Services) .
- The formulation of 2019-2030 provincial GGAP related to the six sectors, according to the provincial or national GGAP format (e.g. the 2011-2020 national GG strategies),

with possible improvement in the format or outline content when necessary, and integration of this GGAP with the contents of GGAP related to other sectors provided by the provincial authorities to constitute a final draft of 2019-2030 GGAP, and subsequently to integrate this final GGAP to the provincial MP towards GG, including the roadmap for implementation and investment plan, according to the outline and/or format of provincial MP towards GG provided by the consultant groups engaged by the provincial authorities to develop the outline/format, or other relevant provincial authorities.

- Capacity building for relevant provincial partners and staffs, particularly from the key provincial authorities that are members of the PMB and consultation groups engaged by the provincial authorities to develop the MP, and documentation of the process to develop the GGAP and integration of the GGAP into the MP towards GG, including steps and methodology for impact assessment of development plannings, as well as lessons learned. This documentation can provide guidance for the development of GGAP and MP towards GG in other provinces.

SITE DESCRIPTION

Lam Dong is a mountainous province in the Central Highlands region (110 12' 47" to 120 19' 01"N, 107° 16' 23" to 108° 42' 11"E) with elevation ranges mostly from 800 to 1,000 masl. The province covers a total area of 9,764.8 km² with a population of 1,284,394 persons in 2016, and the population density of 131 people km⁻² (Viet Nam National Living Standard Survey 2016). The province area is bordered by Khanh Hoa and Ninh Thuan provinces in the east, Dong Nai province in the southwest, Binh Thuan province in the south and southeast, and Dak Lak province in the north. It has terrain with mountains, plateaus, and also small valleys, creating pleasant climate, rich biodiversity, and a beautiful landscape that becomes the main attraction for tourists worldwide (Vu et al. 2013). Lam Dong is also considered as one of key economic provinces in the Central Highlands region, with a high economic growth and large potential markets.



Figure 1. Location of Lam Dong province in Central Highlands region of Viet Nam

The province has a vast suitable area for agricultural production. The lands in Bao Loc-Di Nguyen plateau are suitable for perennial plants with high economic value such as coffee, tea and mulberry. The vegetable growing areas are mainly located in Da Lat, Don Duong and Duc Trong districts. The province currently has nearly 60,000 ha vegetable lands, 8,400 ha flower plantation, 21,000 ha tea plantation, and over 150,000 ha coffee plantation either in monoculture or agroforestry forms. Coffee areas can be basically subdivided into two specific zones, namely the high altitude zone (1,000-1,800 masl) where Arabica is suitably cultivated on over 15,000 ha in the province and the lower altitude zone (<1,000 masl) where Robusta coffee is exclusively cultivated. Eco-friendly managed Arabica coffee has the potential to become a niche-market, gourmet coffee with high added value for the local stakeholders of this value chain, including coffee farmers. Robusta coffee managed under best practices, including agroforestry, can also be eco-certified and fetch a premium price on the international market. Adoption of environmentally sound management of the coffee sector of Lam Dong province could greatly contribute to Viet Nam NDC via good practices widely adopted from field to processing.

In 2015, the total forest area of Lam Dong was 539,667 ha, in which protection forest was 148,902 ha (or 16% from the province's area), specially-used forest 83,665 ha (0.9%), and production forest 307,100 ha (32%). The total area of forest lands has been continuously decreasing from 2005 until 2015, especially due to the conversion of specially-used forests and protection forests into production forests. The provincial government is targeting the increase of forest cover by 11% by 2020, in which the area of protection forest is expectedly to increase by 16%. In another hand, the province will also continue allocating production forest lands to smallholders and strengthening the Payment for Forest Ecosystem Services (PFES) implementation in the province.

In terms of hydrological network, the province is situated within the Dong Nai river system, with abundant water supplies, relatively dense stream network and large hydropower plant potential. Most rivers and streams run from the northeast to southwest part of the province. Due to the mountainous and partitioned terrain, most river basins in the province are relatively small with many quick upstream (Vu et al. 2013). The three major rivers as part of Dong Nai river system are Da Dang river, La Nga river, and Nhim river. The main water supply systems in the province includes those for Da Lat hydropower plant, those in Bao Loc town, Duc Trong district, Di Linh district, and Lam Ha district. Recently in 2017, the provincial government inaugurated the Krong No 2 Hydropower Plant that has a capacity to generate 106 million kWh of electricity annually⁴.

Due to a beautiful landscape, agricultural production and pleasant climate as main attraction, the province has a promising future in tourism sector. It has Da Lat as capital with a number of touristic sites. The city received 5.4 million visitors in 2016, including 270,000 foreigners⁵. The province's tourism sector plans to develop a range of activities like eco-tourism, rest and recreation, sightseeing, amusement and entertainment, culture and sports, education and agro-tourism. The provincial government also plans to promote more intensively the landscape and pleasant climate in the province, with a priority given to the development of high-quality eco-tourism, conference tourism, agricultural tourism, developing special products and brands, and developing Da Lat into a superior eco-tourism center. To strengthen its access through establishing transport infrastructure for economic growth, the province plans to build Dau Giay–Lien Khuong Expressway and restore 84 km Da Lat-Thap Cham rail route⁶. As investment figures by 2016, the total domestic investor in the province reached USD 4.8 billion in 756 projects while foreign investors USD 477 million in 101 projects.

METHODOLOGY

The objectives and the assessment process in the project adhere to three principles:

1. *Inclusive*: the process will involve current development plannings including roadmap and investment plan from the six sectors, and perspectives from different local partners and authorities, private sectors as well as other relevant stakeholders. The assessment of feasible and prioritised development plannings that will become components of GG scenarios, will also involve issues on land tenure and management regimes, as well as human rights and gender.

⁴ <http://en.nhandan.com.vn/society/item/4923102-hanoi-launches-online-air-quality-index.html>

⁵ <https://en.vietnamplus.vn/lam-dong-solicits-green-investment-at-conference/120156.vnp>

⁶ <https://en.vietnamplus.vn/lam-dong-solicits-green-investment-at-conference/120156.vnp>

2. *Integrative*: the GGAP formulation and integration into provincial MP towards GG, will integrate the process of secondary data collection, scenario building, development of spatially-explicit landuse planning maps, impact assessment of different scenarios with landuse planning model, linking the assessment results with the formulation of the provincial GGAP and integration into MP, as well as capacity building for relevant local partners/staffs.
3. *Informed*: the results of ex-ante socio-economic and environmental impact assessment of different scenarios (see Table 1) as well as issues related to different factors such as land tenure, human right, gender, the safeguard of natural resources and ecosystem services including biodiversity, and adaptation to climate change, will form the basis of negotiating options with the PMB and other provincial planners as well as private sectors and other relevant stakeholders for the formulation of GGAP, and integration into MP towards GG, with its related roadmap and investment plan.

For the development of GGAP and its integration into provincial MP towards GG, the impact assessment of BAU and GG scenarios is one of essential parts, and as mentioned earlier, ICRAF will use LUMENS as a negotiation-support tool (Dewi et al. 2014; Dewi et al. 2015; ICRAF 2017), since other models such as FALLOW landuse change model (van Noordwijk 2002) can only make assessment and projection on limited economic and environmental indicators such as income per capita and carbon stock respectively, while LUMENS provides much more indicators related to the economic and environment, as well as e.g. hydrology (see Table 1). Furthermore, the model has been tested in several regions in Indonesia, and it is ready for further application worldwide. The recent application of the model was to develop the provincial GGAP related to renewable resources in South Sumatra province, Indonesia.⁷

The process of GGAP formulation and its integration into MP towards GG related to the six sectors in Lam Dong province are classified into four activity packages (AP):

AP1: Diagnostic process and data collection

This package consists of the following activities:

1. Under close interaction with the PMB, will conduct stakeholder mapping and compilation of current development plannings in the six sectors through consultation meetings and/or key

⁷ <http://blog.worldagroforestry.org/index.php/2017/05/16/green-growth-indonesia-meets-bonn-challenge/>

informant interviews (KIIs), especially those related to 'land-based' plans that affect the province's land use distribution and land allocation⁸.

2. Collection of secondary dataset for the scenario assessment (see Annex 2), including existing studies/documents that relate to e.g. the following issues in Lam Dong province:
 - The current status, evolution of the quality of the environment, natural landscapes, ecosystems including biodiversity.
 - The dependency and impacts of human activities on ecosystems and the impacts of the planning objectives.
 - The impacts of climate change and the potential of natural ecosystems to strengthen climate change adaptation and mitigation.
 - The potential impacts of climate change on the planning objectives and needs to adapt to or mitigate these effects.

In case no secondary data of certain variables such as carbon stock or biodiversity index by land use type is available from the provincial stakeholders for the scenario assessment, then secondary data from other provinces or other regions will be considered. Furthermore, in case the secondary data for those variables are not available from other provinces or regions, then they will be represented by proxy variables, for example biodiversity level will be represented by percentage of vegetation cover, by assuming that the two variables positively correlate each other. No primary data collection for measuring ecosystem service level directly in the field such as measuring carbon stock, soil water storage, or biodiversity, will be conducted in this project.

3. Reviewing the provincial process for developing the GGAP including available outline and format of GGAP from other provinces as well as national GG strategies, and propose additional aspects to integrate into the current format or content of provincial GGAP, when necessary.
4. The Vietnam national GGAP 2011-2020 and the ToR for Mekong Delta MP developed by GIZ, mention the need of central data repository at national and sub-national level for collecting, structuring and the retrieval of data and information related to multi-sectors, and to support integrated analyses of key issues. Therefore, this activity also includes scrutinizing further about this need of data repository as well as harmonization of

⁸ The land-based multi-sector development plans involve either land use expansion, conversion, intensification or mix among these, which can be translated into a spatially-explicit land use planning through land allocation that takes into consideration different factors such as land availability, infrastructure, tenure regimes and human resources.

parameters, so the data gathered for the assessment in this project will also be useful for other and future proposes.

AP2: Scenario building and impact assessment

Main activities in this package include:

1. Historical landuse change analysis especially during the last decade, to produce landuse transition matrix as an input to the LUMENS model mainly to estimate economic outcomes such as income per capita or GDP based on the six sectors, C sequestration/emission and related GHG emissions, as well as other ecosystem services such as soil water storage and ground flow, and biodiversity.
2. Scenario building for the BAU and GG scenarios, based on the review of development plannings, existing studies/documents related to the six sectors in the province, and perspectives of provincial authorities, private sectors as well as relevant stakeholders on GG, gathered through a series of consultation meetings and/or key informant interviews (KIIs).
3. Assessment of a number of scenarios, that can consist of 3-5 scenarios including the BAU, that results in a series of biophysical, socio-economic and ecological indicators (see Table 1), for trade-off analysis as well as feasibility and prioritisation analysis. This activity includes taking a hierarchical approach of avoiding, minimizing, or offsetting potential negative impacts that might go along with the assessed plannings. A further analysis such as benefit-risk assessment to each scenario can be conducted through the assistant from other partners such as UN-REDD.
4. In close collaboration with the PMB, negotiating best GG strategies over the ex-ante impact analysis, to build a common vision and understanding on GG, through consultation meetings and/or KIIs with provincial planners, private sectors and relevant stakeholders from the six sectors.

AP3: GGAP formulation and capacity building

Activities in this package include:

1. Through a close interaction with the PMB, other relevant provincial planners, private sectors, and other stakeholders, formulate the 2019-2030 GGAP related to the six sectors based on the standard provincial or national GGAP format (see the section below), with a possibility for improvement in the format when necessary, including a roadmap for its implementation and investment plan, as well as the integrated landuse planning map. This

step includes defining the general and specific objectives as well as orientations of the GGAP, and issues related to exploitation and use of natural resources, management of ecosystem services, and climate change adaptation.

2. Integrate this six-sector GGAP formulated by ICRAF with the contents of GGAP related to other sectors formulated by the provincial authorities or the consultant groups engaged by the provincial authorities to develop the contents, to constitute a final draft of provincial 2019-2030 GGAP, that subsequently will be integrated into the provincial MP towards GG.
3. Inform the complete process and approach in developing the GGAP related to the six sectors, to the PMB, other relevant provincial planners and staffs, through provincial consultation workshops, as well as through a training, for generating awareness on the importance of GG in general and the benefits that the province can derive by developing the GGAP, and also for skill capacity building in developing GGAP including implementing the assessment tool as part of the GGAP development. For the latter, to make relevant provincial staffs or partners gain more knowledge and experience in the whole process of GGAP development, ICRAF will propose key relevant provincial staffs from the PMB, to involve in the whole secondary data collection, and will be continuously informed on the assessment process with the LUMENS model. This initiative as a more effective capacity building approach, has been proposed in the meeting on May 22nd in Lam dong province, with DPI and DONRE as the key provincial authorities and members of PMB.
4. Documentation of the complete process of the GGAP development related to the six sectors, including steps, methodology and lessons learned, for potential implementation into other provinces. This also includes providing the manual of LUMENS model in English and Vietnamese language, and a possibility to produce a Vietnamese version of LUMENS software.
5. Providing an assessment report describing assessment approaches and results related to the six sectors, including e.g. historical landuse analysis, socio-economic analysis, and estimation of carbon sequestration and GHG emission from the different sectors. The assessment report will include related documents that become part of the GG scenario building and GGAP development such as provincial REDD+ action plan (PRAP) etc.

AP4: Integration of GGAP into provincial MP towards GG and capacity building

Activities in this package include the followings, with period for implementation until December 31st, 2019, in line with the time context and target of MP development i.e. to develop 2020-2030, vision 2050, MP towards GG:

1. Review documents that provide guidances on how to develop provincial MP such as Law on Planning, the GIZ's approach to integrate ecosystem services into development plannings⁹, and the ToR for Mekong Delta Master Plan developed by GIZ. The knowledge derived from this review is important for commenting and/or providing improvements to the outline or format, or contents of MP formulated by the provincial authorities or consultant groups engaged by the provincial authorities to formulate the MP.
2. Organize a consultation meeting with the consultant groups and/or other relevant provincial planners such as the PMB and other relevant stakeholders, to find an alignment between GGAP and the outline or format of MP that the provincial consultants provide, and furthermore to find the way to integrate the GGAP into the MP, to produce 2020-2030, vision to 2050, MP toward GG.
3. Provide comments and/or improvement to the MP outline, format and/or draft produced by the provincial consultation groups, to ensure that the GGAP is well integrated, and the MP includes issues on ecosystem services such as biodiversity, as well as other aspects such as climate change adaptation, indicated in the Law on Planning as necessary to include in the provincial MP, with references for integration approach include the GIZ's approach to integrate ecosystem services into development plannings¹⁰.
4. Discuss the need for data repository and harmonization of parameter with the provincial consultants, relevant provincial planners and other relevant stakeholder, emphasized in the Viet Nam national GGAP 2011-2020 and the ToR for Mekong Delta MP developed by GIZ.
5. Through a workshop or training, including the plan for a scientific workshop mentioned by the provincial authorities in the consultation workshop on May 21st in Da Lat city, Lam Dong province, ICRAF shares experience and knowledge on the process and methodology in developing the provincial GGAP, including its roadmap and investment plan as well as the integrated landuse planning map, to the provincial authorities and consultant groups that have a responsibility to develop the provincial 2020-2030, vision to 2050, MP.
6. Under a request from the provincial authorities or consultant groups, ICRAF provides training or capacity building on the impact assessment of multi-sector development plannings with LUMENS as the assessment tool, including how to prepare the input

⁹ Kosmus M, Renner I, Ullrich S. 2012. Integrating Ecosystem Services into Development Planning: A stepwise approach for practitioners based on the TEEB approach. GIZ.

¹⁰ Kosmus M, Renner I, Ullrich S. 2012. Integrating Ecosystem Services into Development Planning: A stepwise approach for practitioners based on the TEEB approach. GIZ.

data through secondary data collection and historical landuse analysis, and run the model to make projection on a number of biophysic, socio-economic and environmental indicators.

7. Provide a technical report on the complete process of integrating GGAP to provincial MP towards GG, that will be useful for implementation into other provinces. This includes to share the documentation on the complete process of developing GGAP, including the assessment report that includes methodology and analysis to the six sectors, and related documents such as PRAP etc. that become part of scenario building and assessment.

PROVINCIAL GGAP AND MP FORMAT

Different formats of GGAP exist among provinces in Viet Nam, with their common parts and sections presented in Annex 1. The six common parts excluding the appendix are background, goals and orientation, indicators of GG, scenarios with trade-off and prioritisation, action plans, and implementation measures. Each part consists of a number of section. At the national level, the country has also promulgated the 2011-2020, vision to 2050, National Green Growth Strategies, with outline and format can provide as reference for developing the provincial GGAP.

The provincial MPs usually include at least the following components: i) Situation analysis in which for the context of this project is mainly on the review of natural and socio-economic conditions of the province and main environmental concerns such as related to different ecosystem services including biodiversity and adaptation to climate change, related to the five related-economic sectors, ii) Orientation and development goals, iii) Development trends and scenarios: different scenarios with trade-off analysis, iv) Orientation of socio-economic development, v) Orientation of landuse and landuse change, vi) Orientation of spatial planning/zoning and regional linkages, vii) Orientation of rural and urban development, viii) Orientation of infrastructure development, ix) Orientation of environmental protection, biodiversity conservation, and climate change adaptation and mitigation, x) Implementation measures and organizations, and xi) List of prioritized programs/projects.

A more detailed scrutinization of the GGAP and MP outline and contents, will be conducted during the desk study (see section on work and time plan below) that starts the whole process of GGAP and integration into MP towards GG.

TOOL AND INPUT DATA REQUIREMENT

LUMENS is an open-source and download-free software designed for different practitioners either for scientific or development purposes. The model uses a Quantum GIS, R, Python and Visual Basics platform, taking on board SWAT, FragStat and Abacus models. The model contains four basic modules namely PUR (Planning Unit Reconciliation) to determine zonation or planning units; QUES-C (Quantification of Environmental Services for Carbon) to estimate C sequestration or emission in the landscape during a certain time period; TA (Trade-off Analysis Regional Economy) that contains two sub-modules namely Descriptive Analysis used to calculate economic coefficients and indices that become economic indicators of the simulated region, and the sub-module Land Requirement Analysis with input data that inform the land demand and land productivity of each economic sector; and SCIENDO for scenario development and simulation. Annex 2 describes main input data required by each module with the corresponding data types.

In LUMENS, the principle to estimate carbon emission or sequestration, and the related GHG emission, is based on the analysis of landuse and cover trajectory (ALUCT) method proposed by Dewi and Ekadinata (2013); while the estimation of other ecosystem services such as hydrology represented by river water debit and other hydrological functions such as ground water storage uses the principle of water balance in SWAT or GenRiver model (van Noordwijk et al. 2011). The economic flow among sectors is mostly based on a type of Leontief's input/output (I/O) table¹¹, that also becomes the main input economic data to the model (see Annex 2). This I/O table and other economic-related inputs such as landuse profitability and employment demand from each sector, constitute main inputs to make projection on socio-economic indicators such as province's gross domestic product or employment rate by different sectors.

OUTPUTS OF THE MODEL AND GG INDICATORS

The scenario simulation with the LUMENS model will provide projections on a series of biophysical, socio-economic and environmental outputs as green economy indicators. Table 1 below describes important indicators mentioned in Viet Nam's national GGAP 2011-2020¹², vision to 2050, and other indicators that usually need to quantify related to GG scenarios, that *depending on the input data availability and assessed development plannings*, can be provided for the six sectors using the LUMENS model. Based on Table 1, the main ecosystem

¹¹ https://en.wikipedia.org/wiki/Input%E2%80%93output_model

¹² <https://www.giz.de/de/downloads/VietNam-GreenGrowth-Strategy.pdf>

services mentioned in the Viet Nam's national GGAP 2011-2020 are those related to climate change mitigation such as carbon sequestration and those related to hydrology such as river water debit since this variable is important input to hydropower plants. A possibility to integrate other ecosystem services such as biodiversity target into the GGAP and MP will be considered during the project with a guidance from e.g. GIZ's manual on integrating ecosystem services into development planning.

Table 1 GG indicators to assess included those mentioned in the Viet Nam national GGAP 2011-2020

GG related aspects	Main indicators
Sustainable economic growth	<ul style="list-style-type: none"> • Growth of Gross Domestic Product (GDP) • Water consumption per unit GDP • The value of high technology and green technology (%) relative to GDP • Development investment for supporting sectors to protect the environment and enriching natural capital (%) relative to GDP • Commercial manufacturing facilities that meet environment standards (%) relative to GDP • Application of clean technologies (%) relative to GDP • Elasticity of electricity per GDP • Employment rate in urban and rural areas • Income per capita in urban and rural areas, and at provincial level • Poverty rate in urban and rural areas, and at provincial level • Number of new hydropower electric plant by 2030 • Number of new road construction by 2030 to accelerate economic development • Number of eco-tourism and agro-tourism facilities/businesses by 2030 to accelerate economic development • Development of investment for supporting transportation sectors such as water transport, express ways, and railways by 2030 <p>Potential mutual economic benefits with other provinces due to the new transportation network</p>
Social, economic and environmental resilience	<ul style="list-style-type: none"> • Expansion rate of sustainable agriculture system like agroforestry • Linkages between land-based and other sectors • Profitability of smallholder-managed land use system • The rate of large and medium cities gaining green urban standards

	<ul style="list-style-type: none"> • Number of stakeholders mainly enterprise that invest in production forest • Number of Reducing Emissions from Deforestation and Forest Degradation (REDD) and sustainable forest management program by 2030 • Area of conservation and restored degraded ecological systems by 2030 • Expected electric capacity and reduced power loss by 2030 due to the establishment of new hydropower plants
Healthy and productive ecosystems providing services	<ul style="list-style-type: none"> • Deforestation rate at province level • Tree cover gain and forest coverage at province level • Forest quality in 2030 especially protection and specially-used forests • Timber production from production forests • Timber use at province level • Tree cover at urban area by 2030 • Increase in tree and forest cover, and deforestation rate in watershed areas • Surface run-off, erosion and sedimentation rate in watershed areas • River water debit in watershed areas/main rivers • River water debit as input to hydropower plant
GHG emission mitigation	<ul style="list-style-type: none"> • C stock of different landuse type (agricultural and forestry sectors) at province level by 2030 • C and GHG emission rate of different landuse type (agricultural and forestry sectors) at province level by 2030 • C sequestration rate of different landuse type (agricultural and forestry sectors) at province level by 2030 • C and GHG emission rate from each of the five sectors, and at national level • C sequestration at from each of the five sectors, and at national level • C net emission rate (by taking the difference between potential emission and sequestration) rate from each of the five sectors, and at national level by 2030

WORK AND TIME PLAN

The work and time plan from June 2018 to December 2019 are described in the tables below, according to the four APs.

AP1: Diagnostic process and data collection

Activities	June-18				July-18				Aug-18			
	1	2	3	4	1	2	3	4	1	2	3	4
Week												
Under a close collaboration with the PMB, conduct stakeholder mapping and review of existing documents on current natural resource management and development plannings, related to the six sectors in the province												
Review available formats of provincial and national GGAP, and identify the need of an improvement in the format when necessary												
Identify the need of central data repository and harmonization of parameters as indicated in the national GGAP 2011-2020												
Secondary data collection for LUMENS												
Scenario building, feasibility and prioritisation analysis, identification of current roadmap and investment plan for GGAP, through KILs, or consultation meetings with the PMB, other provincial planners and relevant stakeholders*												

*Part of AP2 but will be conducted as early as activities in AP1

AP2: Scenario building and impact assessment

Activities Week	Aug-18				Sept-18				Oct-18				Nov-18			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Historical land use change analysis and landuse transition matrix for LUMENS	■	■	■	■												
Finalizing 3-5 scenarios including BAU to assess by the LUMENS model	■	■	■	■												
Impact assessment with LUMENS					■	■	■	■	■	■	■	■				
Prepare communication strategies and materials to inform the assessment results to the PMB, other provincial planners and relevant stakeholders through consultation meetings and workshops													■	■	■	■
Inform the ex-ante impact analysis to the PMB, other provincial planners and relevant stakeholders, to build a common vision and understanding on the best GG strategies for the province													■	■	■	■

AP3: GGAP formulation and capacity building

Activities Week	Dec-18				Jan-19				Feb-19				Mar-19				Apr-19			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
GGAP formulation with the PMB and other relevant partners related to the six sectors, including the GGAP roadmap and investment plan																				
Produce a final draft of provincial 2019-2030 GGAP ¹³																				
Provincial consultation workshop to inform the complete process and approaches adopted for developing the GGAP and the GGAP draft																				
Training on LUMENS																				
Possibility of further secondary data collection/analysis and model simulation with revised GG strategies																				

¹³ As explained above, by integrating the six-sector GGAP formulated by ICRAF with the contents of GGAP related to other sectors formulated by the provincial authorities or the consultant groups engaged by the provincial authorities to develop the contents.

outputs of GGAP development	
Training on LUMENS to provincial authorities and/or provincial consultant groups engaged in MP development	Between the 3 rd and 4 th week of February 2019, i.e. similar in time and activity with the training on LUMENS part of AP3
A technical report on the complete process of integrating GGAP to provincial MP towards GG	December 2019

LIST OF DELIVERABLES

Based on the above activity packages, ICRAF will deliver the followings:

1. A **provincial 2019-2030 GGAP**, related to the six sectors, including its road map for implementation and investment plan, aligned with National Strategy on Green Growth and agreed with the PMB, key provincial planners, relevant private sectors and stakeholders in the province.
2. **Maps**: Integrated landuse planning maps, intervention maps which show the spatial focus of each intervention strategy, and investment maps which show existing/on-going investment plans of different stakeholders in each spatial and thematic intervention area. These maps should cover the entire province.
3. An **assessment report** describing assessment approaches, tools and results of data analysis related to the six sectors, including e.g. historical landuse analysis, socio-economic analysis, and estimation of carbon sequestration and GHG emission from the different sectors.
4. A **documentation on the complete process of the GGAP** development related to the six sectors, including steps, methodology and lessons learned, for potential implementation into other provinces.
5. A **technical report on the complete process of integrating GGAP to provincial MP** towards GG, that will be useful for implementation into other provinces.
6. The **manual of LUMENS** model in English and Vietnamese language, and a possibility of **Vietnamese version of LUMENS software**

7. **Communication materials** used to inform the importance of GG and GGAP, as well as the results of development planning assessment with LUMENS, and include slides used in the workshops and trainings.
8. A complete **baseline and GG scenario data** according to the requirement of central data repository and harmonization of parameters, .
9. A set of **key target indicators for GG** related to the six sectors (including carbon emission, deforestation/forest restoration rate, water use, etc.) as the outputs of assessment with LUMENS.
10. **Trainings on GGAP development process and LUMENS** as assessment tool for impact of development plannings.

STAFF AND BUDGET PLAN

The list of ICRAF personals with different expertises and responsibilities who will be involved in the project is provided in Table 2. Qualification of each staff is provided in Annex 3.

Table 2. Personals with staff time and responsibility

Personals*	Title	Staff time (month)	Daily salary rate (Euros)	Responsibility
Dr. Rachmat Mulia	Ecological modeler	4	243	Lead overall implementation of project activity. Provide supervision and expertise to contribute to data compilation and analysis, scenario building and assessment by LUMENS, and trade-off analysis. Lead the documentation of the MP development process.
Pham Thanh Van, MSc.	Spatial analyst	4	97	Provide technical expertise on spatial data compilation and analysis including for the historical landuse change analysis and landuse transition matrix for input to LUMENS. Will be involved in scenario building and provincial planners and stakeholder consultations related to scenario building and GGAP & MP formulation.
Mr. Adrian Dwiputra	LUMENS developer	3	41	Parametrizing the LUMENS model for scenario assessment, scenario assessment and recording the outputs related to the

Do Trong Hoan, MSc.	Ecosystem service analyst	3	122	biophysical, socio-economic, and ecological indicators, and trade-off analysis. Lead provincial planners, project partners and stakeholder consultation related to scenario building and GGAP & MP formulation.
Ms. Ha My Tran	Communication specialist	1	41	Provide technical expertise in developing communication strategy and materials that inform the assessment results to provincial planners, project partners and relevant stakeholders through e.g. consultation workshops
Feri Johana, MSc.	Conservation and development planning specialist	1	69	Lead socio-economic data analysis for LUMENS input data, and the trade-off analysis that involve socio-economic indicators. Will be involved in the scenario building mainly related to socio-economic strategies.
Dr. Philippe Vaast	Senior coffee and cocoa agroforestry scientist	0.5	409	Will be involved mainly in GG scenario building and GGAP & MP formulation related to coffee sector as the main agricultural commodity in Lam Dong province.
Dr. Sonya Dewi	Senior landscape ecologist	0.5	426	Provide advice on the use of LUMENS related to the GGAP and MP development in general, including on the scenario building and GG indicators.

Andree Ekadinata, MSc.	Climate change and landuse planning specialist	0.5	122	Provide guidance on spatial analyst including historical landuse change analysis and landuse transition matrix, that can be used as input to the model according to the format required by LUMENS.
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*Ordered by staff time

The budget plan is provided in Table 3 below according to the four activity packages (APs) that covers staff cost, travel cost, and research operation cost. The total proposed budget for all activities within this project is **Euros 160,000** (one hundred sixty thousands euros) with notes that the budget **does not cover**:

- The cost for organizing the provincial and national consultation workshops (except the travel and accomodation cost for ICRAF personals).
- The cost for measuring ecosystem services directly in the field such as measuring carbon stock, soil water storage, and biodiversity, as mentioned before.

Table 3. Budget plan of the project

Cost components	Amount (Euros)
AP 1: Diagnostic process and secondary data collection	41,880
Personnel	19,500
Travel and accommodation	10,000
Key informant interviews and consultation meetings	1,700
Research assistant/local interviewers etc	900
Secondary data provision	9,000
Communication (phone)	180
Communication strategies and materials	600
AP 2: Scenario building and impact assessment	27,750
Personnel	12,800
Travel and accommodation	6,800

Key informant interviews and consultation meetings	1,000
Research assistant/local interviewers etc	600
Secondary data provision	6,000
Communication (phone)	150
Communication strategies and materials	400
Activity 3: GGAP formulation and capacity building	29,500
Personnel	16,000
Travel and accommodation	8,400
Key informant interviews and consultation meetings	1,400
Research assistant/local interviewers etc	550
Secondary data provision	2,500
Communication (phone)	150
Communication strategies and materials	500
AP4: Integration of GGAP into MP and capacity building	40,000
Personnel	28,600
Travel and accommodation	8,600
Key informant interviews and consultation meetings	2,000
Communication (phone)	150
Communication strategies and materials	650
Overhead and management cost	20,870
Grand total	160,000

ABOUT THE WORLD AGROFORESTRY CENTRE

The World Agroforestry Centre (ICRAF) has a global headquarter in Nairobi (Kenya), maintaining programs in Africa, Latin Americas, and Asia with a total of around 650 scientific and supporting staffs. The Centre is one of the 15 members of the CGIAR, a global partnership for a food-secure future. The Centre was founded as the International Centre for Research in Agroforestry (ICRAF), which remains a legal name after rebranding as the World Agroforestry Centre in 2002.

ICRAF Southeast Asia is the region's leading agroforestry research-in-development organization, including assessment on landuse changes and interventions to multi-ecosystem services such as carbon sequestration and mitigation, greenhouse gas emissions, biodiversity both above and belowground, and hydrology. Regionally headquartered in Indonesia since 1993, it maintains offices and programs in Indonesia, the Philippines, Thailand and Viet Nam. With a total of around 150 staffs, it strives to produce the world's best science on the roles of trees in humanised landscapes, with a particular focus on research that benefits smallholding farmers and people who live on forests' margins. The country offices maintain programs specific to their national situation while also crossing regional boundaries to research issues of wider significance.

ICRAF Viet Nam is the country's leading international agroforestry research institution. Registered in Viet Nam in 2007, it generates science-based knowledge about the diverse roles that trees play in the country's rural landscapes, impact of landuse and forest cover change to socio-economic and environmental functions including hydrology, as well as advance policies that benefit the poor and the environment. It hosts 23 researchers including supporting and field staffs and has been involved in various studies in sixteen provinces in the country. Its staffs are also working with national and local partners to achieve inclusive and sustainable growth by developing agroforestry options, promoting climate-smart agriculture and agri-climate information services, and enhancing landscape multi-functionality.

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PART 1	BACKGROUND
1. Introduction	<ul style="list-style-type: none">• Importance of GG• How GG will be a part of local economic restructuring towards sustainable development, climate change mitigation/reducing emission, and other socio-economic targets
2. Legal basis	Outline legal documents backing up GG development
3. Local conditions	<ul style="list-style-type: none">• Natural and demographic features• Outline of local conditions and needs for GG development• Most relevant features to GG• Specific provincial targets and existing strategies in terms of master plans, development strategies in forestry, agriculture, land use and land use change, tourism, transportation, environment, water resources management, including limitations• Current goals and objectives of the province and key sectors, and existing plans and efforts.
	<i>Approach</i> <ul style="list-style-type: none">• GGAP approach as required by the government• Innovative approaches used in this GGAP development
4. Methodology	<i>Methodology</i> <ul style="list-style-type: none">• Literature review, desk review• Key informant interview• Focus group discussion• Mapping and GIS• Statistical analysis• Modelling• Data requirement and data collection methods• Consultation workshops

PART 2	GOALS AND ORIENTATION
	<ul style="list-style-type: none">• Key objectives, milestones, and orientation of GGAP 2020-2030• Justifications of orientation and objectives in international, national, regional and local context (policies, economic

development, environmental protection, climate change, biodiversity conservation, etc.) by reviewing existing master plans, policies, and other economic projection.

PART 3**INDICATORS OF GG**

- Current indicators of MP and GGAP, indicators for each sector
- List of indicators used for this GGAP (please see Table 1). Justification for the list of selected indicators with adequate description

PART 4**SCENARIOS, TRADE-OFF ANALYSIS, AND PRIORITISATION**

- Zonation of the province and justification
- Scenario development process and justification
- Describe scenarios (BAU and GG scenarios) with the following information: indicator performance, maps or other visualizations, key figures, and resources required
- A trade-off analysis of different scenarios, with impacts for each sector mentioned. The trade-off analysis includes key economic, ecological and social indicators. Graphs and figures need to be provided.
- Potential impacts assessment
- Prioritisation through participatory methods, selected GG scenarios and justification

PART 5**ACTION PLANS**

- General actions at the province level with clear timeline and resources allocation. These actions can be further divided into sub-categories such as capacity building and awareness raising, sustainable production and consumption, climate change adaptation
 - Specific actions for each sector with clear timeline and resources allocation. Sectors include agriculture, forestry, tourism, infrastructure mainly road establishment and network, and energy mainly water with hydropower plant establishment
 - List of prioritized projects (if any)
-

- An analysis of how these actions is chosen, and how they will contribute to the provincial MP and GG targets.

PART 6**IMPLEMENTATION MEASURES**

- Organizational structure
- Additional resources requirement (funding, technical assistance, labours, etc.)
- Measures to engage local sectors and people, donor community, and private sector
- Specific tasks of departments and localities

PART 7**APPENDIXES**

- List of data, projects, and other information
-

Annex 2. Main input data required by each module of the LUMENS model

Main input data	Data type
PUR module	
- Administration maps and other boundary maps of any concession, protected area, etc.	Vector
- Other boundary maps that can be used as references for integrating development plannings from the five economic-related sectors ¹⁴	Vector
QUES-C module	
- Historical and current provincial landcover map especially in the last decade ¹⁵	Raster
- Planning unit map related to landuse planning	Vector
- C stock of each landcover type ¹⁶	Tabular
- Emission factor of landuse changes	Tabular
TA module (sub-module Descriptive Analysis)	
- Economic links between sectors/sub-sectors	Tabular
- Value added matrix	Tabular
- Final demand matrix	Tabular
- Value added components	Tabular
- Components of final demand	Tabular
- List of economic-related sectors in the province	Tabular
- Labour demand for each economic-related sector	Tabular
- Net Present Value (NPV) of each economic-related sector	Tabular
TA module (sub-module Land Requirement Analysis)	
- Current landcover map	Raster
- Land demand for each sector	Tabular
- Results of TA module (sub-module Description Analysis)	
Additional input data related to hydrological assessment	
- Historical water debit in the river that flows into hydropower plant ¹⁷	Tabular

¹⁴ Includes map of new transportation network etc.

¹⁵ To produce landuse transition matrix as described earlier, as the basis to estimate C sequestration/emission. In Viet Nam, landcover map is usually produced from combining landuse and forestry maps.

¹⁶ Will be based on secondary data, not primary data collection.

¹⁷ This will be used to calibrate the hydrological module in the model

- Weather data (rainfall, air temperature etc)	Tabular
- Elevation and slope map	Raster
- Soil map ¹⁸	Raster
- Sub-catchment boundary	Vector
- Geographical coordinate of weather station	Numerical
- Input data related to water balance e.g. evapotranspiration rate of each landcover type when available, otherwise will be estimated through standard formula	Tabular

¹⁸ Soil type and condition will determine the water balance

Annex 3. Staff qualifications

Name	Position	Qualifications
Rachmat Mulia	Ecological modeler	Obtained a PhD degree from Montpellier University (France) and more than 10 years experience in data analysis and modelling tree-crop interaction in agroforestry system, trade-off analysis on the impact of land use change on environmental services including hydrology, as well as on livelihood and food security.
Philippe Vaast	Senior coffee and cocoa agroforestry scientist	A long-working experience on coffee and cocoa, particularly production, quality and ecosystem services throughout Africa and Central America, as well as in India, Indonesia and China. His research combines agronomical, ecological, and economic approaches with the aim of developing integrated management practices for the benefits of rural communities while enhancing the provision of environmental services in coffee and cocoa-dominated landscapes.
Do Trong Hoan	Ecosystem service analyst	Worked in the Ministry of Natural Resources and Environment (MONRE) before joining ICRAF in 2009 and has a long experience in collaborating with local, national and international stakeholders as key e.g. to the success of agroforestry research in Viet Nam. He holds a Master of Environmental Science and Engineering.
Pham Thanh Van	Spatial analyst	She has a Master degree on Sustainable Resource Management at Technical University Munich (Germany) with research interests including land use change dynamics, landscape planning, spatial analysis and mapping.
Sonya Dewi	Senior landscape ecologist	During her 20 years of professional career as a scientist, she has focused on understanding

		<p>the trade-offs and integration between conservation and development agendas at the landscape level. In the recent years she has been actively promoting landscape approach within the integrated and inclusive spatial landuse planning in rural areas for low emission development and for multiple environmental services through negotiation support tools.</p>
Andree Ekadinata	Climate change and landuse planning specialist	<p>He is a specialist in remote sensing for natural resource management, spatial analysis and geostatistics, and regional planning. He has been involved in the analysis of land-based conservation development planning, building and strengthening interactions with multiple partners, including facilitating multi-stakeholder discussions and consultations using appropriate tools, such as Land-use Planning for Multiple Environmental Services (LUMENS).</p>
Adrian Dwiputra	LUMENS developer	<p>He has been developing various modules related to ecosystem services as well as landscape level biodiversity embedded within the LUMENS model. His other works include the modeling of fire-prone area at major islands of Indonesia, hydrological modeling using Soil and Water Analysis Tools (SWAT), as well as crop species suitability modeling.</p>
Feri Johana	Conservation and development planning specialist	<p>His research focus is on development planning for climate change mitigation, green economic, sustainable development and regional economic. He has been involved in a number of big projects including the Rebuilding Green Infrastructure (ReGreen-EU Funded) and Reduce Emission from Agriculture and Other Land Use REALU (Norad Funded). He also has</p>

		experience in preparing input economic data for LUMENS.
Tran Ha My	Communication specialist	She graduated from the Journalism and Communications University of Viet Nam. Formerly she worked as editor and communications assistant with a national organization. She is currently pursuing a Masters' degree in journalism and communications.

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