

# I-GEM: Measuring Indonesia's Transition Towards a Green Economy



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The Ministry of National Development Planning/National Development Planning Agency (BAPPENAS)  
of the Republic of Indonesia

The Presidential Working Unit for Development Monitoring and Oversight (UKP-PPP)  
of the Republic of Indonesia

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# 1. Executive Summary

“I-GEM” (Indonesia Green Economy Model) is a flexible and easy-to-learn System Dynamics Model, which is currently being piloted in a few Indonesian Provinces. Under the overall leadership of the Presidential Working Unit for Development Monitoring and Oversight (UKP-PPP) and the National Development Planning Agency (BAPPENAS) it has been developed as part of a capacity building programme of the United Nations Development Programme (UNDP) with support from the United Nations Environment Programme (UNEP) and in collaboration with the United Nations Office for REDD+ Coordination in Indonesia (UNORCID).

I-GEM aims to evaluate trade-offs and test the sustainability dimensions of policy interventions. The first such model, which is also tailored to incorporate an additional set of three ‘Green Economy’ outcome indicators, namely Green GDP, GDP of the Poor and Decent Green Jobs, has been developed for Central Kalimantan (KT-GEM) province in Indonesia. The replication of KT-GEM type of models in other countries can have significant value added for local officials who are seeking to assess the impacts of policy interventions that they are planning, to increase employment opportunities, reduce rural poverty and ensure economic growth in the long-term by maintaining their region’s natural capital.

## 2. Indonesia Green Economy Model (I-GEM) to contribute to Global Green Economy Transitions

The development of Indonesia's Green Economy Model comes at a critical time when several countries are taking steps to put in place green economy strategies and where the latter exist, to implement them at the national and sub-national levels. Indonesia's interest in developing sustainably is evident through its efforts to incorporate environmentally friendly policies and activities into its national plans and targets. For such a Green Economy transition to take place it is important for Indonesia to have the right macro indicators that will help it measure progress towards all four of its development goals (*pro-growth, pro-jobs, pro-poor, pro-environment*). Supported by the UNDP-Low Emission Capacity Building (LECB) global programme and the United Nations Environment Programme (UNEP) the Indonesian government has developed the Indonesia Green Economy Model (I-GEM) as a tool to inform the policy making processes.

I-GEM is Indonesia's tailor-made model based on a system dynamic approach that has integrated cross-sectoral variables, thus enabling simultaneous analysis of socio-economic and environmental impacts of policy interventions. I-GEM introduces three green economy macro indicators, namely **Green GDP**, **GDP of the Poor** and decent **Green Jobs**. By providing policymakers with the right indicators I-GEM enables them to simulate development scenarios and measure the impacts of planned interventions on the economy as well as the environment

and equity. Thus, I-GEM provides the international green economy discourse with an approach that has been vetted by policymakers and with the potential for replication in other regions.

Development of I-GEM is highly in line with the United Nations Environment Programme (UNEP) Partnership for Action on a Green Economy (PAGE), in which 30 countries, including Indonesia, are being supported in establishing national green economy strategies by 2020<sup>1</sup>. A number of regional initiatives are underway that seek to translate the goals of PAGE by developing broadly applicable green economy national toolkits, which can be customized for usage by countries. I-GEM can serve as a part of these toolkits for Indonesia.

Furthermore, prevailing development agendas tend to focus investments in primary and secondary sectors with a singular target to encourage economic growth. There is less allocation of fiscal resources towards tertiary sectors or equity and environmental health as primary agendas for development (see Figure 1). I-GEM is a step towards recognizing the role of small-scale industries and typically considered non-mainstream sectors in improving the well-being of the poor and ensuring that policies and planned interventions maximize on the growth opportunities existing in these sectors.

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<sup>1</sup> PAGE (2014) Supporting change for The Future We Want Brochure, UNEP.

**Figure 1: Investments typically focused in Secondary and Primary Sectors and targeting GDP growth objectives, need to be better distributed to cover Tertiary Sectors and to target other sustainable development objectives as well**

Recent Focus Investments

<b>Objectives/ Investments</b>	<b>Economic Growth</b>	<b>Social Equity</b>	<b>Environmental Health</b>
Tertiary Sectors	- Healthcare - Tourism - Education - Recreation - Cities	- Public Education - National Health - A.B.S. - Microfinance	- Eco-Tourism - Waste Management - Public Transport
Secondary Sectors	- Manufacturing - Construction - Power	- Cottage Industry	- Renewable Energy - Energy Efficiency - Material Efficiency
Primary Sectors	- Agriculture - Timber - Pelagic Fishing - Mining	- Small Farms - Artisanal Fishing - Silvopasture	- Sustainable Forestry - REDD+

Focus Investments that need to be distributed

<b>Objectives/ Investments</b>	<b>Economic Growth</b>	<b>Social Equity</b>	<b>Environmental Health</b>
Tertiary Sectors	- Healthcare - Tourism - Education - Recreation - Cities	- Public Education - National Health - A.B.S. - Microfinance	- Eco-Tourism - Waste Management - Public Transport
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Primary Sectors	- Agriculture - Timber - Pelagic Fishing - Mining	- Small Farms - Artisanal Fishing - Silvopasture	- Sustainable Forestry - REDD+



# 3. Introduction to Indonesia Green Economy Model (I-GEM)

It is found that conventional macroeconomic indicators (such as GDP growth, per-capita GDP growth) are not fit for measuring sustainable development<sup>2</sup>. What Indonesia needs are *three* new outcome indicators - “Green GDP” or “Inclusive Wealth”, “GDP of the Poor” and “Decent Green Jobs” These three indicators built into a System Dynamic Model makeup “I-GEM”. Whilst other experts may recommend using much larger banks of sustainability indicators (we have sighted recommendations of up to 250 indicators) we consider such approaches are at risk of being counter-productive as they create excessive data collection loads and diminish the utility of analysis if it generates too many messages.

I-GEM can be utilized for specific circumstances (e.g. measure and integrate traffic congestion levels as a driver of urban labour productivity) in specific provinces (e.g. Jakarta) but it also has the integrated structure that enables effects to be calculated in economy-wide aggregates (productivity, output, emissions, etc) as well as connected sectors.

## Green GDP Indicator

Green GDP or Inclusive Wealth capture and estimate the invisible economic benefits from ecosystem services, and account for *depreciation* of natural capital (i.e. degradation and depletion of ecosystems and their services over time). Green GDP also includes accounting for changes in the value of Human Capital (education, skills, health).

## GDP of the Poor Indicator

The GDP of the Poor indicator measures the value of household incomes of rural and forest dependent communities including economically invisible - but critical and valuable - ecosystem services. Figure 3 shows the inability of conventional metrics like GDP to capture the dependence of rural households on nature. Measuring and modeling how the aggregate and per-household “GDP of the poor” can be improved - by interventions for better ecosystem management, greater and more equitable access to markets, better provision of public health and education, and additional employment opportunity - is a useful way of evaluating policy impacts on the populations whose development is at the heart of Indonesia national planning.

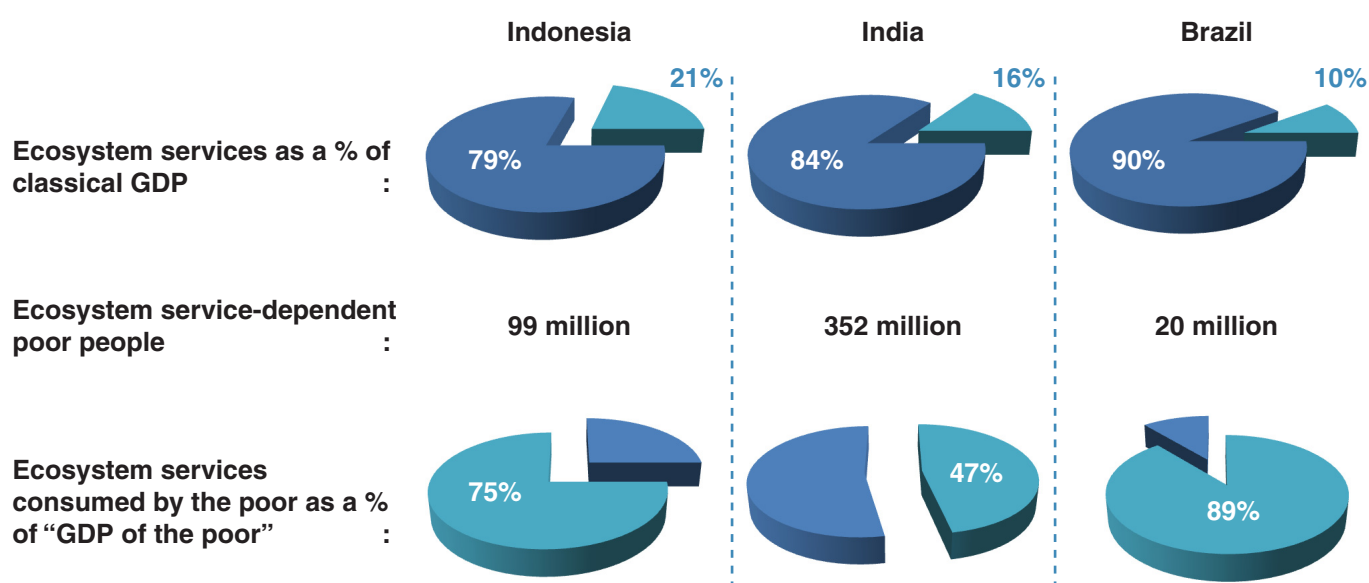
## Decent Green Jobs Indicator

The Decent Green Jobs indicator measures the impact of policy interventions on the nature and number of new jobs created or old jobs lost due to green economic transition. Decent Green Jobs are defined by the International Labour Organisation (ILO) as direct employment created in different sectors of the economy and through related activities that reduces the environmental impact of those sectors and activities, and ultimately brings it down to sustainable levels. Jobs also have to meet the “decency” criteria where they empower employees.

<sup>2</sup> See the following papers for further analyses on the inability of conventional indicators to measure sustainability.

- Repetto et. al., 1989, Wasting Assets: Natural Resources in the National Accounts, World Resources Institute, Washington D.C. Pg. 16.
- Kirk Hamilton and Michael Clemens, 1998, Creating and Maintaining Wealth. In Expanding the Measure of Wealth: Indicators of Environmentally Sustainable Development, Environmentally Sustainable Development Studies and Monographs Series, No. 17. World Bank, Washington D.C. Pg. 8.
- Armida Alisjahbana and Arief Anshory Yusuf, 2003, To What Extent Green Accounting Measure Sustainable Development, Working Paper in Economics and Development Studies, Department of Economics, Padjadjaran University. Pg. 1.

**Figure 2: Nature makes up a critical portion of the incomes of the poor**



Source: Gundimeda and Sukhdev, *The Economic of Environment and Biodiversity (TEEB) for National & International Policy*, 2010

## 4. Snapshot of I-GEM Scenarios<sup>3</sup> for National Level

The impacts of business as usual are projected for GDP, agriculture, fisheries, forests, mining and energy by I-GEM for Indonesia. In business as usual scenario, effects on households, natural capital and carbon sequestration are projected under continued deforestation. The effects when reforestation activities and sustainable agriculture are invested in are also assessed as green economy intervention scenario.

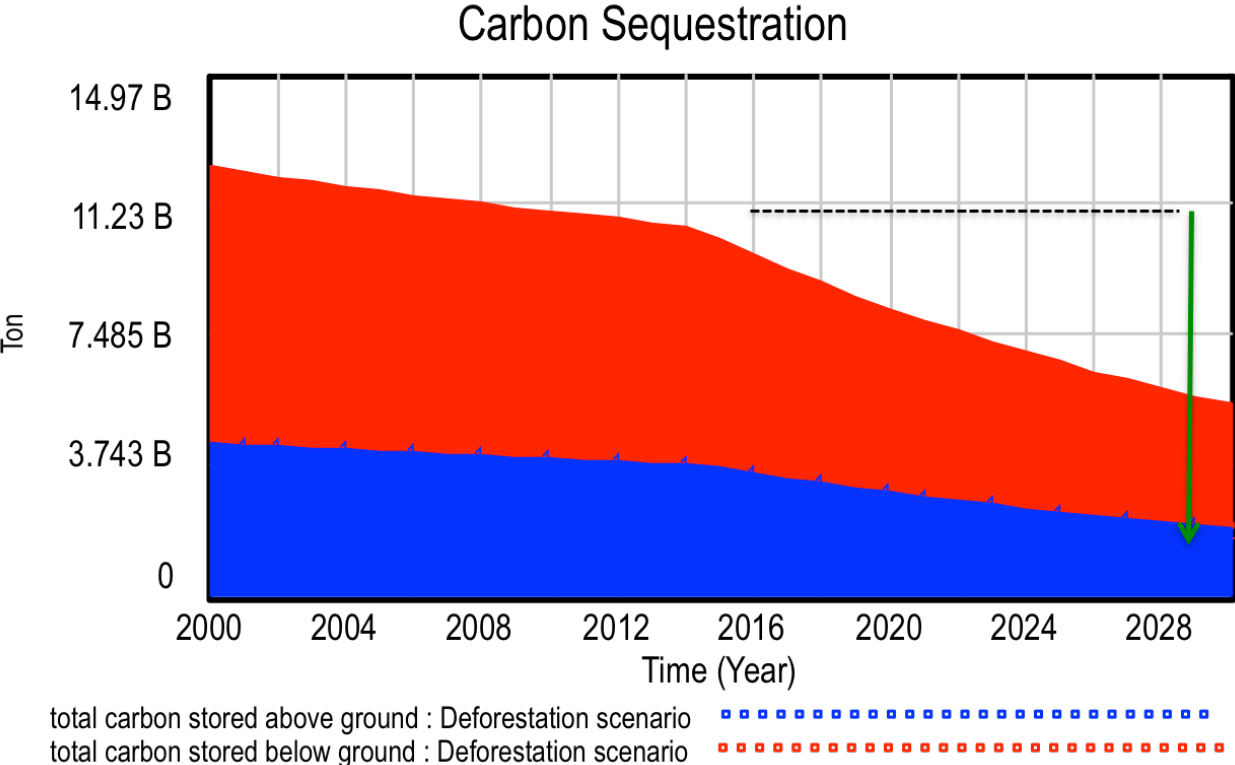
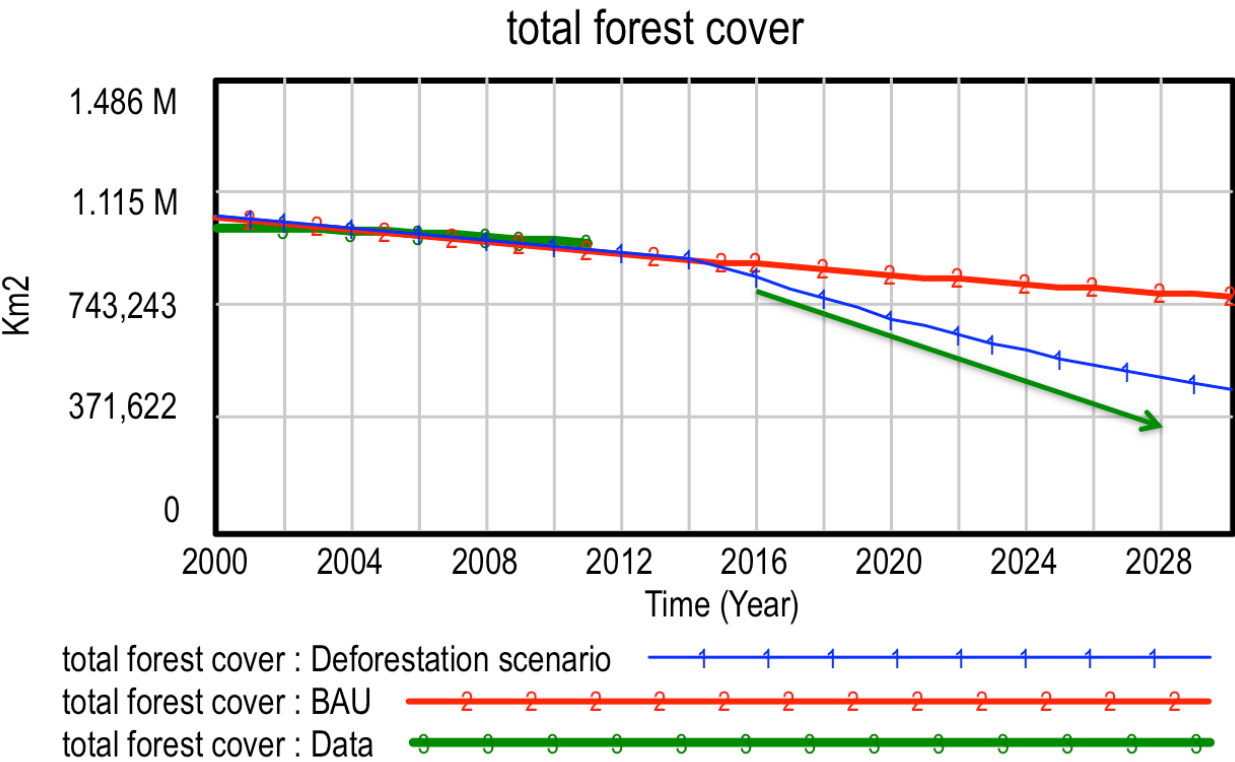
I-GEM simulation shows that a reduction in forest cover lowers natural capital. And while GDP is not affected, carbon sequestration and GDP of the Poor decline (see Figure 3). Such an analysis clearly demonstrates how preserving forests is not only integral for conservation and climate mitigation, two widely recognised dependents on nature, but also for poverty alleviation. Considering rural employment and household well-being enhancement policies within the context of forestry would strengthen

the ability of policies to result in reduction in poverty. Such linkages are conventionally not considered by policymakers due to sectoral divisions in responsibilities where the Forestry Ministry singularly looks at forests while the Ministry of Man Power only considers job creation without recognition of the critical natural assets that communities rely upon and how these assets can be utilised to generate incomes.

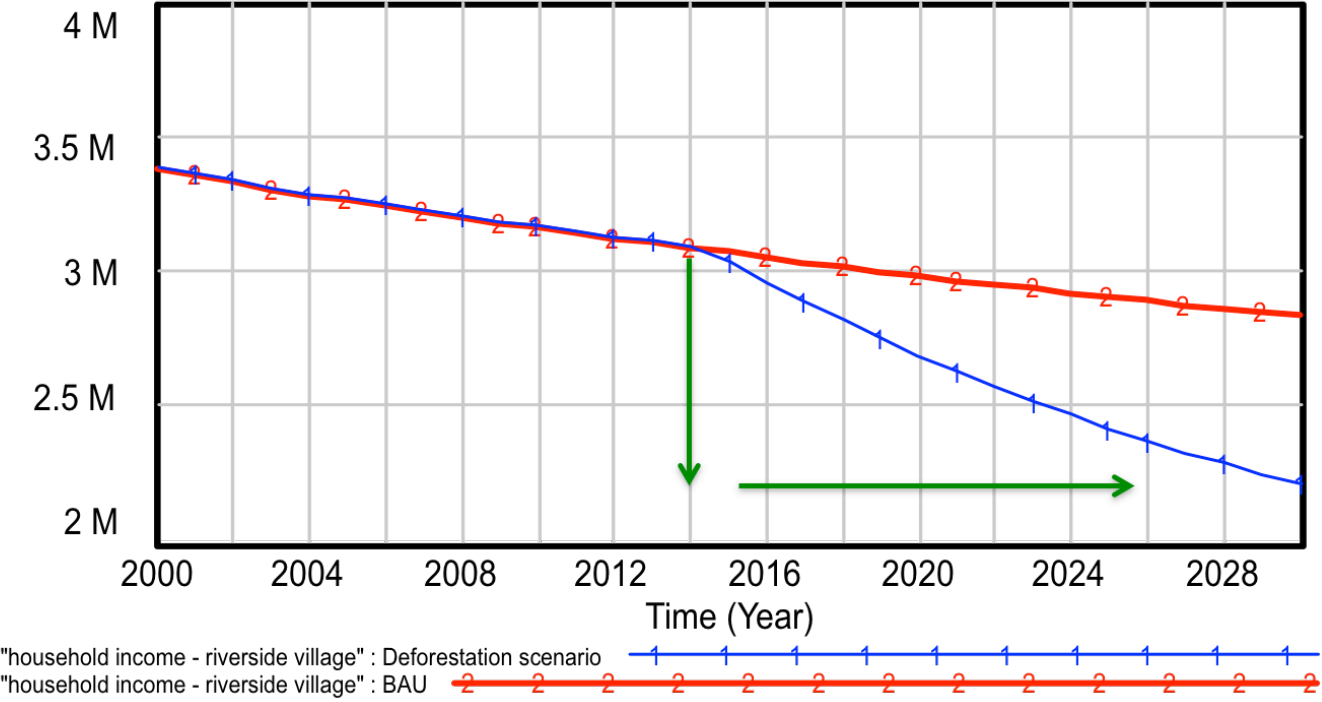
In the reverse scenario, I-GEM demonstrates that stabilization of forest cover and sustainable agriculture result in better food production and thus self-sufficiency. Household incomes also rise due to higher amounts of natural capital (see Figure 4). The significance of nature and its ecosystem services for agriculture is a critical factor for policy development and cross-sectoral consideration, for instance when food security is being targeted.

<sup>3</sup> For the full range of I-GEM results please refer to Sukhdev, P., Bassi, A. Varma, K., Mumbunan, S. (2014) Indonesia Green Economy Model (I-GEM) Final Report, UNDP-LECB Indonesia project to be published online by December 2014 on Bappenas website.

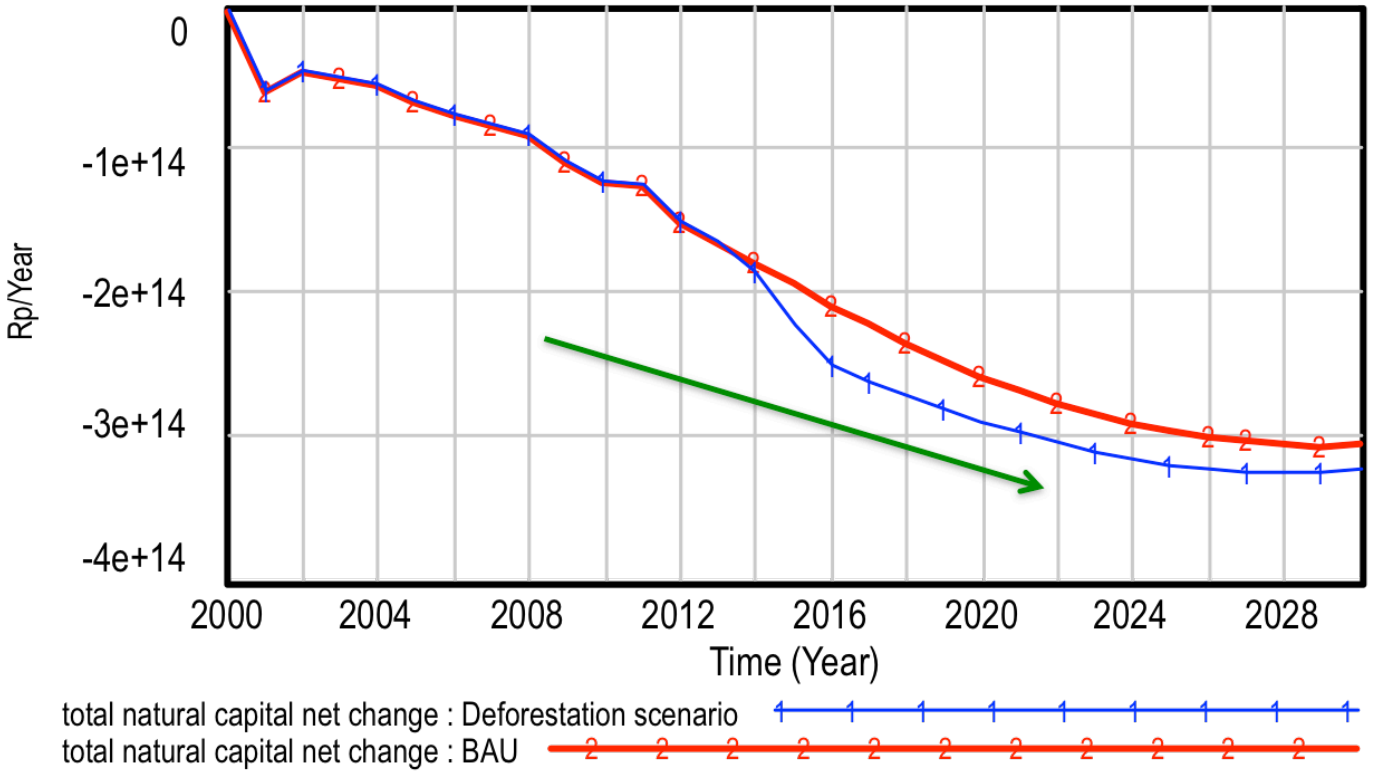
Figure 3: Impacts of deforestation on incomes, carbon and natural capital



household income - riverside village



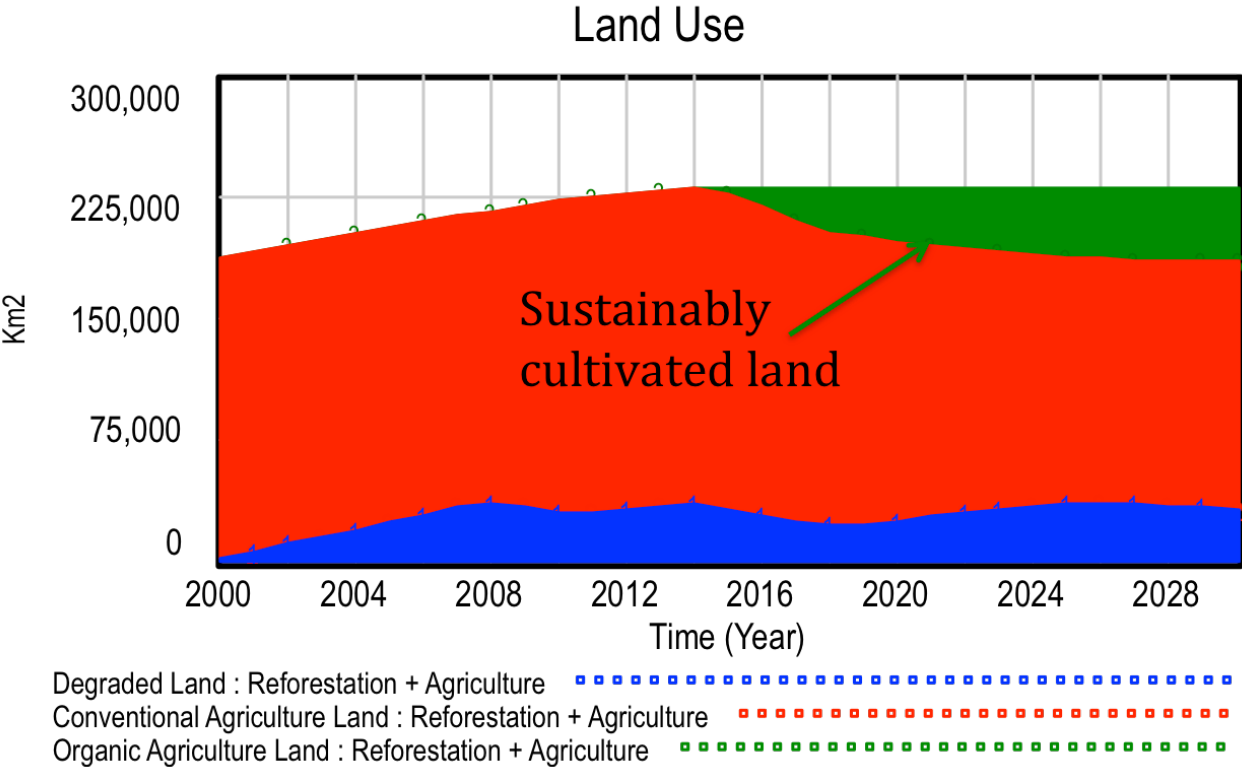
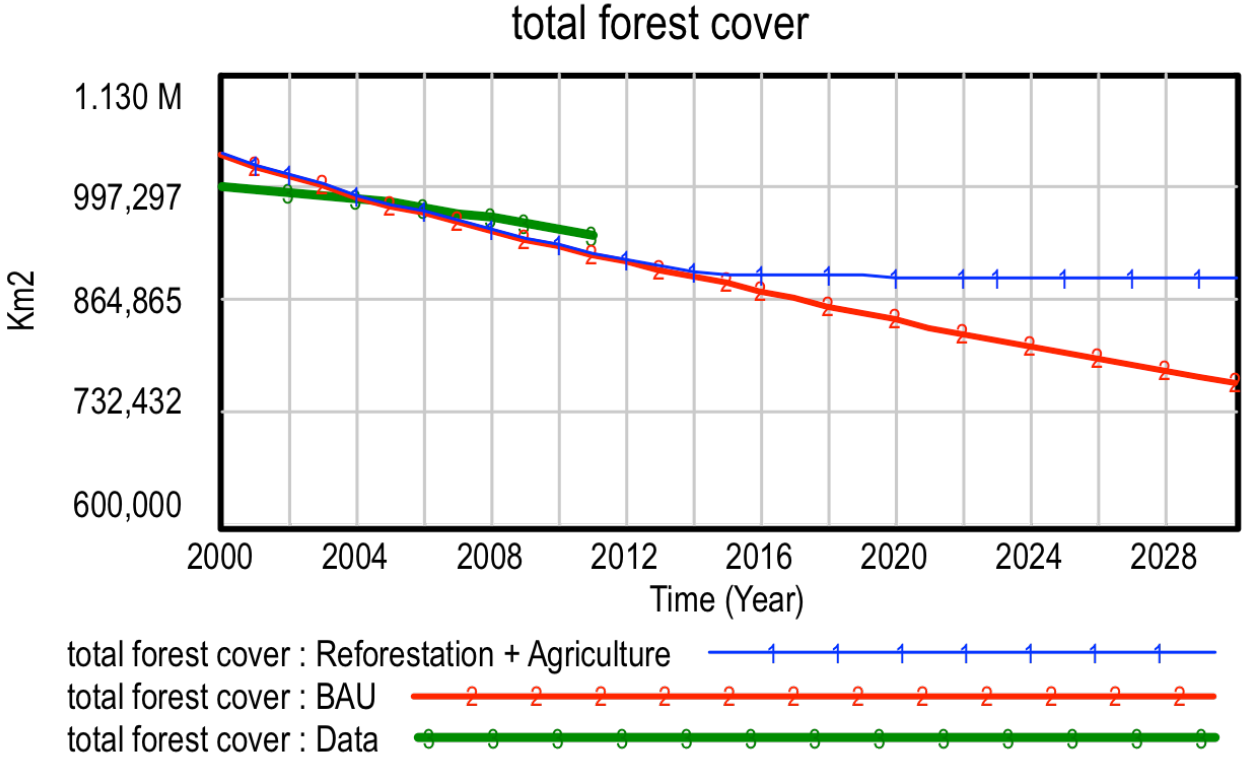
total natural capital net change



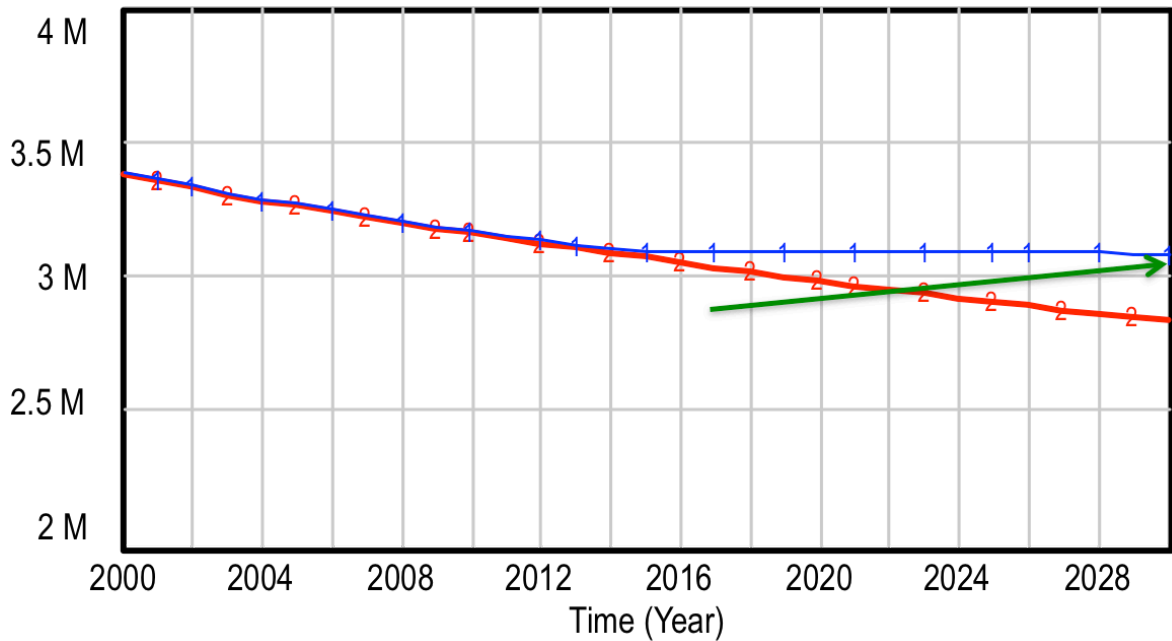
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Figure 4: Impacts of reforestation on incomes and agriculture

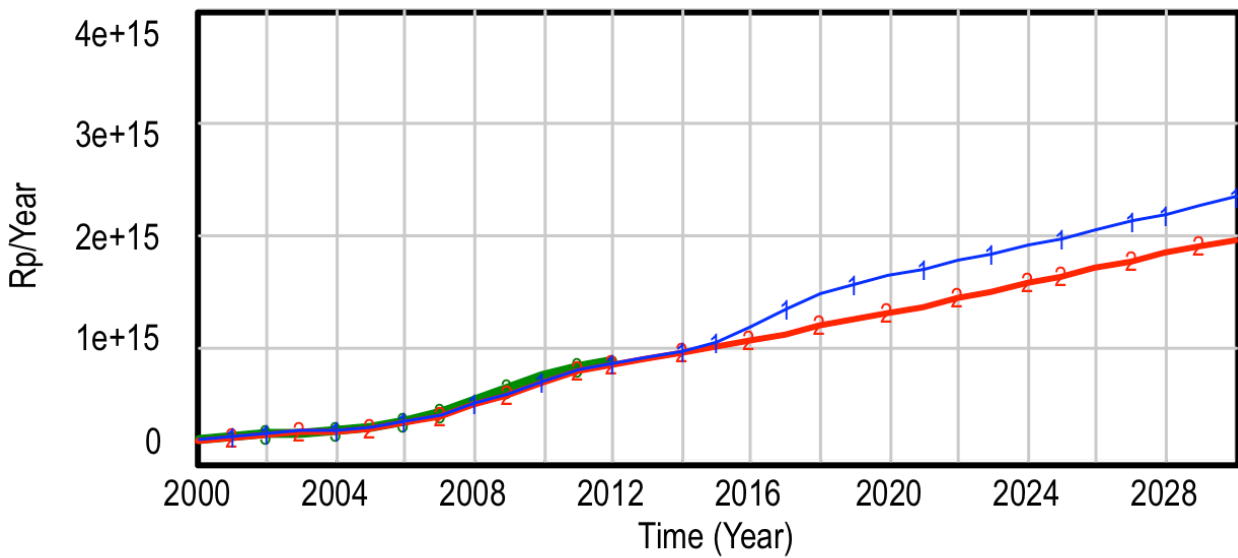


### household income - riverside village



"household income - riverside village" : Reforestation + Agriculture — 1 1 1 1 1 1 1 1 1 1  
"household income - riverside village" : BAU — 2 2 2 2 2 2 2 2 2 2 2 2

### agriculture gdp



agriculture gdp : Reforestation + Agriculture — 1 1 1 1 1 1 1 1 1 1  
agriculture gdp : BAU — 2 2 2 2 2 2 2 2 2 2 2 2  
agriculture gdp : Data — 3 3 3 3 3 3 3 3 3 3 3 3

## 5. Snapshot of I-GEM Scenarios for Provincial Level<sup>4</sup>

The first provincial implementation of I-GEM took place in Central Kalimantan province (Kalimantan Tengah Province). For the Green GDP indicator, information on forests, agriculture, freshwater and human capital was gathered along with sector based employment for the Decent Green Jobs indicator. While for GDP of the Poor indicator, primary data from 119 households across sixteen

villages representing four types of income dependencies (forest, rattan, riverside and coal) was collected (see Image 1). By integrating and analysing this data, the Central Kalimantan I-GEM or KT-GEM revealed that nature comprised a significant portion of the livelihoods of rural households in this province (see Figure 5).

**Image 1: Survey underway in Pulang Pisau and South Barito Districts in Central Kalimantan**



**Figure 5: Percentage of incomes from ecosystem services in Kalteng**

Type of Village	Average ecosystem based Non Cash Income (% of total income)	Average ecosystem based Cash and Non Cash Income (% of total income)
<b>Forest</b> N=31 households (Murung Raya)	51.43%	77.41%
<b>Riverside</b> N=51 households (North Barito, South Barito, Pulang Pisau and Kapuas)	43.55%	86.38%
<b>Rural mixed with rattan</b> N=27 households (Katingan)	44.63%	74.99%
<b>Rural mixed with coal</b> N=12 households (North Barito and South Barito)	21.79%	34.14%
<b>All villages, all types</b> N=119 (16 villages in 6 districts)	43.63%	76.38%

<sup>4</sup> For the full range of Central Kalimantan I-GEM results please refer to Sukhdev, P., Bassi, A. Varma, K., Mumbunan, S. (2014) Indonesia Green Economy Model (I-GEM) Final Report, UNDP-LECB Indonesia project to be published online by December 2014 on Bappenas website.

KT-GEM further showed that even slight improvements in forest cover are important for the province's economy, as positive effects are seen in terms of reduction in emissions, increases in household incomes and more jobs created by the green sector (see Figure 6). For local planners that face the challenge of siding with development or preservation, KT-GEM presents a strong and clear indication of where complementarities between the two exist and where investments should be targeted to result in dual benefits. Furthermore, employment generation is

a key need for provinces and KT-GEM projections justify investments in sustainable sectors for administrators. Additionally, for livelihoods, focusing on the green sector would mean enhancing the resilience capacity of communities, as existing relationships with natural resources are strengthened. The singular establishment of for instance factories, ports and labour opportunities for employment, tend to have a disproportionate impact on the poor when these sectors are adversely affected due to economic downturns.







# 6. Value Addition of I-GEM to support Indonesia's Transition towards Green Economy

## **I-GEM Strengthen Indonesia's Development Plan**

Indonesia has several development planning documents. The most important is the Long-term National Development Plan (RPJPN 2025) and the second most important is the Mid-term National Development Plan (RPJMN, 5 years cycle), that have been kept in mind while developing I-GEM to ensure that the model has real-world utility. The model's scenarios and assumptions have been constructed to allow policymakers the flexibility to input their needed criteria and generate results. In Indonesia, for example, policymakers can simulate relevant growth priorities in I-GEM to deliver dynamic projections of intervention impacts in the short, medium and long-terms, which they can then use to inform the ongoing drafting processes of the Third RPJMN 2015-2019 as well as for informing other milestones such as Post-2015 Sustain-

able Development agenda, National Action Plan for Greenhouse Gases Emission Reduction as well as for sub-national development plan (see Figure 7).

From a planning perspective, it is critical for policy-makers to have the ability to compare the impacts of policy interventions within and across sectors. Moreover, it is important for this assessment to be visible in terms of impacts in the short-term, medium-term and long-term. I-GEM can help achieve this through an assessment that accounts for the complexities typically characterizing dynamic systems, i.e.; (a) time delays, whereby policies may lead to instabilities; (b) feedbacks within and across sectors; (c) non-linearity; (d) spatial variability whereby global policies may result in a variety of responses at the local level.

**Figure 7: Forest cover impacts emissions, livelihoods and jobs in Central Kalimantan Province**

### ***Policy formulation and evaluation:***

- More effective knowledge-based green economy policy options, through the use of I-GEM and training materials.
- Improved acceptance of policy considerations, through a multi-stakeholder approach, and also being possible to openly test the results of policy implementation with the free software.
- Higher confidence in scenario trajectories, by tracking historical trends and projecting into the future using validated causal relations.

### ***Technical value addition:***

- True calculation of social, economic and environmental impact of action and inaction (internalizing externalities) through the endogenous calculation of cross-sectoral indicators.

- Incorporation of biophysical variables in the evaluation of the economic performance of the sectors, merging several fields and disciplines to provide information required by policy designers and decision makers when making informed decisions on energy futures, ecological commons, and sustainable communities.

***Policy assessment and knowledge creation:***

- Integrated policy analysis for improved resilience and cross-sectoral results, not only maximization of sectoral results, and prioritization of action.
- Multiple time frames, with policy analysis extending to all planning horizons, with a capacity to forecast over the short, medium, and long term.
- Reduced uncertainty in policy formulation and implementation, resulting in reduced policy-related costs (avoid dead ends and unforeseen negative consequences in other sectors).
- Enhanced development data integrity as the I-GEM requires data availability and quality from different line ministries and agencies both at national and local levels

## **I-GEM's Value Addition to Ministries**

I-GEM can aid the Ministry of Environment and Ministry of Forestry to translate national climate mitigation, conservation and sustainability visions and targets into knowledge within the Ministerial departments and local governments level, so that they can effectively create cohesion in achieving development goals. Alternative economic growth and development scenarios can further be assessed through the system dynamics model for the islands of Indonesia to promote the sustainable use of natural resources, while providing increased livelihood opportunities and revenue for the areas.

The ability of policy-makers to determine the fiscal sustainability of grants is an important capacity of I-GEM that can be extremely beneficial for the Ministry of Finance. Conventionally, only economic flows are included in financial modelling. I-GEM can provide a more coherent analysis of performance for the Ministry of Finance by adding environmental and social indicators to the existing economic ones. This can then be analysed in the

short, medium and long terms allowing government officials to determine how allocation of budgets could impact across environmental and social aspects in addition to economic impacts. For example, if fossil fuel subsidies are removed nationally then investments in power supply can be avoided because demand for these will decrease. Normally such analysis is not considered at a cross sectoral level because subsidies are defined at the economic level while energy supply is defined at the energy and engineering levels. I-GEM can help the Ministry of Finance understand what the cross-sectoral implications are and allocate budgets accordingly resulting in more streamlined and effective use of resources.

## **I-GEM Supports the Achievement of Proposed Sustainable Development Goals (SDGs)<sup>5</sup>**

The value of I-GEM for Indonesia and its provinces is clearly visible through the results of its scenarios. The data collection process for I-GEM's indicators leads to the creation of rigorous databases and fills in existing gaps. It is contributing to the "One-data" initiative that leads to better coordination among national institutions in data provision, ensuring availability of reliable and timely data required for development planning and monitoring<sup>6</sup>. In depth data collection for I-GEM contributes to capacity building for local officials involved in the calculations and results in improved accountability, transparency, inter-agency coordination and potential for equitable impacts. Such impacts of I-GEM can support Indonesia's achievement of the SDGs, which list amongst others poverty alleviation, food security, well-being, inclusive growth, sustainable industrialization and the preservation of natural resources as critical objectives for countries.

1. **End poverty in all its forms everywhere**
2. **End hunger, achieve food security and adequate nutrition for all, and promote sustainable agriculture**
3. **Attain healthy life for all at all ages**
4. Equitable and inclusive quality education and life-long learning opportunities
5. Attain gender equality, empower women and girls everywhere
6. Secure water and sanitation for all for a sustainable world
7. Ensure access to affordable, sustainable, and reliable modern energy services
8. **Promote strong, inclusive and sustainable economic growth and decent work**
9. **Promote sustainable industrialization**
10. **Reduce inequality within and among countries**
11. Build inclusive, safe and sustainable cities and human settlements
12. **Promote sustainable consumption and production patterns**
13. **Promote actions at all levels to address climate change**
14. **Attain conservation and sustainable use of marine resources, oceans and seas**
15. **Protect and restore terrestrial ecosystems and halt all biodiversity loss**
16. Achieve peaceful and inclusive societies, rule of law, effective and capable institutions
17. **Strengthen and enhance the means of implementation and global partnership for sustainable development**

<sup>5</sup> Proposed list of SDGs based on Open Working Group Zero Draft, June 2014.

<sup>6</sup> For the blueprint of One-data initiative, see Cetak Biru Satu Data untuk Pembangunan Berkelanjutan (2014), published by Ministry of National Development Planning/National Planning Agency (BAPPENAS), Indonesia Statistics (BPS), Geospatial Information Agency (BIG) and Presidential Working Unit for Development Monitoring and Oversight (UKP-PPP) of the Republic of Indonesia.

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