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Final Report: Feasibility Study for a Provincial Environmental Performance Index in Viet Nam

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1. Executive Summary

While environmental protection strategy, laws and policies are developed at the national level in Viet Nam, the primary responsibility for implementation is at the provincial authorities level. Provincial authorities, therefore, play a critical role in enabling Viet Nam to achieve national and international environmental protection goals. But how are these governments performing in terms of meeting benchmarks, and how do they compare against each other? The lack of provincial environmental performance metrics by which to evaluate sub-national results has been identified as a critical gap in Viet Nam.

Building on 15 years of experience ranking environmental performance in countries around the world, the global Environmental Performance Index (EPI) is a proven tool in bringing a much needed, data-driven approach to environmental management. Applying the EPI methodology at the sub-national level allows for a more fine-grained assessment of baseline data and trends on key environmental issues related to ecosystem management and human health. Conducting a sub-national EPI in Viet Nam is an important diagnostic and assessment tool to help improve future environmental performance that is tailored to fit local contexts and reflect data realities on the ground.

Currently there are various efforts underway to think critically and carefully about how to develop indicators on environmental management in Viet Nam - the multiplicity of efforts is a positive sign and demonstrates the demand for scientific rigor and quantitative tools in this area. These initiatives, including the Environmental Sustainability Index (ESI) under the General Statistics Office and Environmental Ranking Index (ERI) by the Institute of Strategy and Policy on Natural Resources and Environment (ISPONRE) and Ministry of Nature Resources and Environment (MONRE), are distinct in scope and can be advanced simultaneously with a complementary approach.

To complete the Viet Nam EPI feasibility study, a team of national and international consultants closely followed the steps in *Measuring Progress: A Practical Guide from the Developers of the Environmental Performance Index* (2013). The first step was to jointly develop a concept note to define the goals, guiding principles, and audiences for the EPI. The second step was to identify key environmental challenges at the provincial level to design an indicator framework for a Viet Nam EPI. The third step, in conjunction with step two, was to conduct a data gap analysis of the identified policy issues to understand the availability of data at the provincial level. Based on the policy issues and data gap analysis, the team determined the preliminary Viet Nam EPI framework (*see Figure 1*). The fourth step was to collect data contained within the framework and to conduct a preliminary analysis. Though these steps are presented in a linear fashion, it is important to note that they are interconnected and iterative with each step informing past and future EPI development.

High-level findings from the Viet Nam EPI feasibility study are outlined below. Recommended next steps to complement this study include determining performance targets, weights for indicators, and the index construction. Filling gaps in provincial data is a key priority for the realization and implementation of a Viet Nam EPI. As a starting point, as demonstrated in the Water and Air Quality categories, data modeling, estimation and imputation methods can be used to approximate baseline values for provinces

missing data. Pilot studies in provinces on specific policy issues would strengthen the application of the Viet Nam EPI to improve environmental management and data at the provincial level.

The Viet Nam EPI framework is set according two main objectives: human health and ecosystem vitality (*Figure 1*). The eight policy categories represent priority issues selected by the EPI team based on important environmental concerns in-country including water (both under the human and ecosystem objectives), air quality, sanitation, waste, land, biodiversity and habitat, and forests. Though there are numerous environmental challenges in Viet Nam, this core group of issues was selected to highlight priorities and also create a manageable and clear set of indicators to inspire improved performance. As such, they serve as a litmus test to understand environmental performance in-country that helps to establish baselines and targets, and ultimately a roadmap for improvement.

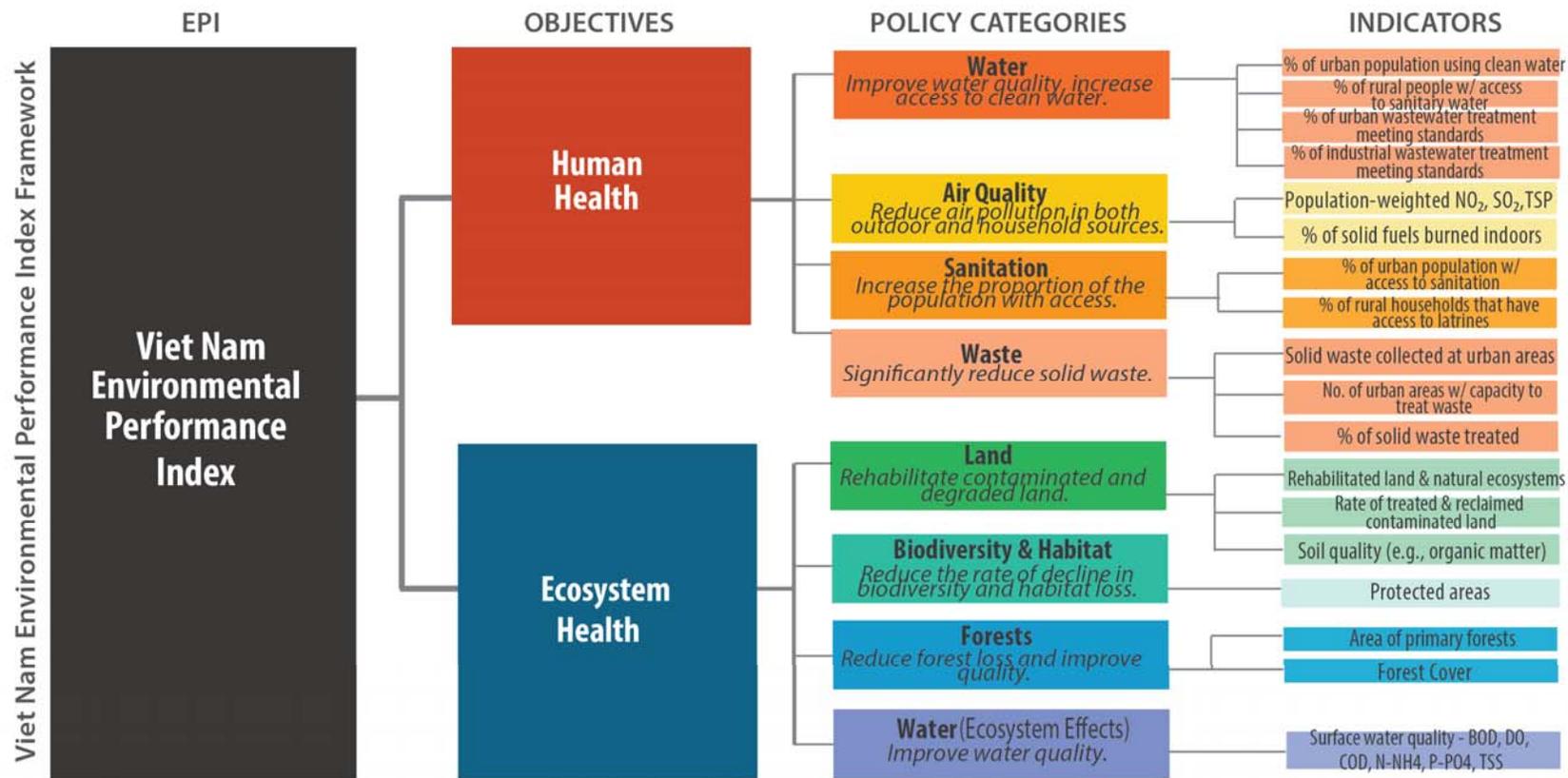
Findings and recommendations from the Viet Nam EPI feasibility study:

Filling data gaps; improving data quality. A mismatch exists between national policy specifications and actual data availability. This result signals that implementation of policy is relatively weak in Viet Nam. The process of defining the Viet Nam EPI framework and gap analysis exercise consistently revealed identification of indicators approved by national government ministries and Parliamentary bodies, but a lack of implementation demonstrated through the unavailability of data at the provincial level. Where environmental data is available, there is a bias around data collection for large cities and data at the provincial level greatly varies depending on issue area. Alternative data sources, including satellite and low-cost sensors, could help fill data gaps and provide independent assessments around air quality, water quality, and forests. Additional research is needed for data on agriculture, food safety, fisheries, solid waste, and climate change.

Coordinating and implementing across institutions. Though the presence of multiple initiatives to integrate environmental indicators is promising (i.e., EPI, ESI, ERI), the lack of coordination among these efforts could serve to limit their usefulness and uptake by provinces, especially those with limited capacity. Although the National Statistical Indicators System (NSIS) of the General Statistics Office (GSO) provides coordination for data collection between provinces and the national government, implementation of systems between agencies is still limited. One concrete step to assist with coordination is to develop mechanisms and platforms for simple and low-cost data sharing.

Developing strong social support for statistical policy tools. Before selecting which indicators and indices to adopt, it is important to understand the social and institutional contexts that influence how these statistical tools will be received by policymakers and target audiences. Moreover, which institution develops such tools and from what sources of data can also influence how indicators and composite indices are ultimately received. There are a number of ways to design data-driven tools to motivate action and qualitative, social science research can help refine indicators to make the EPI most effective for the Viet Nam context.

Figure 1 - Viet Nam Environmental Performance Index Framework



For a full description of the indicators, possible data sources, and proposed policy targets, see the Annex.

Improving analytical capacity. As sources of data improve and diversify, it is important that officials have sufficient training to manage, transform, and analyze the data. Among the national team, there was a strong signal for the need for additional statistical training to improve local analytical capacity.

Need for independent evaluation. A major contributor to the global EPI's success is the fact that Yale and Columbia universities are independent academic entities and not government or intergovernmental organizations. In Viet Nam, the potential for a provincial EPI to drive change could be strengthened if a Viet Nam EPI were developed by an independent entity. For example, other quantitative ranking efforts, like the Viet Nam Chamber of Commerce and Industry's (VCCI) Provincial Competitiveness Index (PCI) has seen much success in achieving its goals primarily because of the "third-party" or outside nature of the VCCI in evaluating provincial authorities.

Building momentum. Viet Nam's successful economic growth rates make the country an important case for understanding and improving the linkages between environmental growth and sustainable development. With the onset of the Sustainable Development Goals and Paris climate change agreement, it is important to build on national- and international-level momentum to ensure environmental data and performance systems can accurately and reliably capture the state of the environment in Viet Nam.

Overall, we assess that Viet Nam has an emerging foundation for designing sub-national indicators to track environmental performance. Top-level political leadership and directives for more sub-national indicators to track environmental performance are clear. How provinces may respond and utilize statistical tools like the Viet Nam EPI to implement policy or management changes on the ground is yet to be determined, primarily due to the gaps in data availability that this feasibility assessment has revealed.

To address these gaps, we recommend the implementation of pilot case studies that can help assess practical challenges to the adoption of the Viet Nam EPI. These pilot case studies can be designed to: 1) deepen social and political support for policy-based indicators at the provincial level; 2) identify where capacity for certain types of data collection may be particularly weak and priority areas where capacity may be built; and/or 3) test new methods for data collection that engage low-cost technologies and community-based methods. Furthermore, expert consultation is needed to inform the adoption of policy targets and appropriate weightings.

The report that follows builds upon these findings by detailing the process of the feasibility study, preliminary data findings, and areas for improvement. Though the regulatory framework for environmental policy and management in Viet Nam is developing, additional work is needed to improve data collection for the monitoring and measurement of environmental quality outputs.

2. Acronyms

AQI	Air Quality Index
BOD	Biochemical oxygen demand
COD	Chemical oxygen demand
CSS	Centralized Statistics System
DPSIR	Driving Forces - Pressures - States - Impacts - and Response
DONRE	Department of Natural Resources and the Environment
DSO	District Statistics Offices
FAO	Food and Agriculture Organization of the United Nations
EEZ	Exclusive economic zone
EPI	Environmental Performance Index
ERI	Environmental Ranking Index
ESI	Environmental Sustainability Index
GDP	Gross Domestic Product
GSO	General Statistics Office
ISPONRE	Institute of Strategy and Policy on Natural Resources and Environment
JICA	Japanese International Cooperation Agency
LDC	Least-Developed Country
LULUCF	Land Use and Land Use Change and Forestry
MARD	Ministry of Agriculture and Rural Development
MDG	Millennium Development Goals
MOC	Ministry of Construction
MOF	Ministry of Finance
MOH	Ministry of Health
MOIT	Ministry of Industry and Trade
MONRE	Ministry of Natural Resources and Environment
NBAP	National Biodiversity Action Plan
NTP	National Target Program
OECD	Organisation for Economic Co-operation and Development
PAPI	Provincial Governance and Administration Performance Index
PCI	Provincial Competitiveness Index
PEPI	Provincial Environmental Performance Index
PM	Particulate matter
PSO	Provincial Statistics Office
QCVN	National Technical Standards
SDG	Sustainable Development Goals
SID	Small Island Development State
SSM	Statistics systems of the line ministries
TSS	Toxic Shock Syndrome
UNDP	United Nations Development Programme
UNFCCC	United Nations Framework Convention on Climate Changes
UNICEF	United Nations Children's Fund
UNSD	United Nations Statistical Division

VCCI	Viet Nam Chamber of Commerce and Industry
VEA	Viet Nam Environment Administration
VHLSS	Viet Nam Household Living Standards Survey
VSIS	Viet Nam Statistical Information System

3. Introduction

Building on experience developing sub-national EPIs in other countries, including China and Malaysia, a primary focus of this project was to assess the feasibility of conducting a provincial EPI in Viet Nam. As a result, the process and approach to evaluating feasibility centered on ensuring that the framework was appropriate for the Viet Nam context, taking into consideration local environmental priorities and challenges. The study also sought to raise ambition by integrating international best practices to set aspirational goals and help build capacity in Viet Nam to measure and monitor the impacts of national policies on provincial-level environmental quality output. Over a period of nine months, national and international teams worked together to conduct a series of exercises to develop the Viet Nam EPI framework and assess data availability (*see Table 1*).

a. Process and Approach to Evaluate Feasibility

Table 1: Timeline of EPI feasibility study activities and deliverables

<i>Preliminary preparations</i> October 2014	Exchange of documents between national and international EPI teams Training on global EPI and sub-national EPI development process Webinars to plan for Mission I and scope of work Development of work plan, deliverables, and timeline
<i>Mission I</i> 10 - 14 November 2014	Workshop on EPI and ERI Development of goals, and audiences Meetings with external experts (General Statistics Office, Center for Environmental Monitoring, Hazardous Waste Management Department of MONRE, and UNDP's PAPI Index) Field trip to Thai Nguyen province PSO, DONRE, and water monitoring station
<i>Interim</i> December 2014 - February 2015	Finalization of the concept note Development of background documents on key policy issues on: 1) the state of play; 2) current measurement and management practices; 3) critical gaps in their area of expertise. English-language scholarly literature review by International Consultants Preliminary data gap analysis by National Consultants
<i>Mission II</i> 16 - 20 March 2015	Lessons learned from Malaysia EPI (MyEPI) colleague Dr. Choong Wei Wang Data gap analysis review Finalization of EPI Framework Training on methodology for data grading, cleaning, and basic statistical analysis. Meetings with external experts (Vietnam Academy of Agricultural Sciences, Ministry of Construction, Institute of Environmental Science & Engineering, United Nations Industrial Development Organization)
<i>Interim</i> April 2015 - June 2015	Data collection by National Consultants Drafting of policy issue chapters by National Consultants Drafting of draft Final Report Preliminary display of data collected

<i>Mission III</i> 24-26 June 2015	Presentation of findings from feasibility report Workshop to solicit expert feedback on framework and data
<i>Project Wrap-up</i> July 2015	Complete Final Report for Feasibility study Recommendations on next steps for index development and pilot studies Close out project

i. Concept Note – Laying the foundation of a Viet Nam EPI

A major outcome of Mission I was the completion of a concept note that outlines the conceptual foundation, goals and objectives, guiding principles, key audiences, and draft indicator framework for the Viet Nam EPI. Working in conjunction with ISPONRE, UNDP, and the team of national consultants, the Yale EPI team drafted a concept note that was reviewed and agreed upon by all project partners. Because it was jointly written, it serves as a basis and guiding document for the design and selection of indicators for the Viet Nam EPI framework. We include the key elements of the concept note in the following paragraphs.

Defining the Goal of the Viet Nam EPI

The team identified a high-level goal for a Viet Nam EPI to **provide a tool for provinces to track environmental quality outputs and progress on national-level requirements, strategies and policies on the environment.**

Adopting the Organisation for Economic Co-operation and Development (OECD, 1994) conceptual DPSIR framework, where *Driving Forces - Pressures - States - Impacts and Responses* reflect causal links between the environment and society, the team decided that the Viet Nam EPI will focus primarily on measures of environmental quality to place an emphasis on observable results and outcomes. In other words, indicators that reflect “outputs” or the “states” stage of the Driving Forces - Pressures - States - Impacts - and Responses (DPSIR) model will be prioritized in the design of the Viet Nam EPI framework. Where data for quality may not be available, the EPI could incorporate alternative indicators that reflect other measures in the DPSIR framework, including “response” variables.

Other goals identified for a provincial Viet Nam EPI include:

The establishment of data standards and baselines that can be used to track environmental performance over time as well as provide a measure of comparison between provinces. As part of this process, the EPI will identify data gaps and determine future projects for additional data gathering

The design of a sub-national EPI that is sensitive to regional differences and takes into consideration the diversity of drivers and risks related to environmental performance as well as socioeconomic and geographic factors.

A tool that can inspire and motivate better environmental performance in provinces by building capacity and creating the proper incentives. For example, as a diagnostic tool, the

EPI can motivate better data collection by helping provinces to identify where data is missing and produce a “road map” to improve data and address critical areas of concern. Additionally, the EPI has potential to improve capacity to measure key concepts of green economy and green growth.

Building demand and aspiration for better environmental performance that is based on data-driven outcomes and measurable outputs. By rewarding provinces for doing well, the aim of the EPI is to link to positive environmental performance with real incentives, such as increases in business, investment, tourism, and enhanced quality of life for residents. To do so, it is important that the EPI generates political attention on priority environmental issues that leads to specific political actions to improve environmental quality.

Alignment of a provincial EPI with international best practices. Linking the Viet Nam assessment to the Global EPI framework can help create comparison to trigger better environmental performance through healthy competition spurring a “race to the top” to improve environmental quality.

Identifying Guiding Principles and Key Audiences

A core set of six guiding principles based on the global EPI framework was also determined. They include:

- ***Accuracy.*** To build a credible and objective reputation, the EPI design and data must meet high standards of quality that are scientifically sound and reflect accurately the situation on the ground.
- ***Transparency.*** The Viet Nam EPI will provide a clear and detailed report on the chosen datasets, methodology, framework, and indicators.
- ***Relevance.*** The Viet Nam EPI shall be designed to reflect the local context and specific needs of Viet Nam.
- ***Independence.*** Building on best practices for data collection, analysis and verification, the Viet Nam EPI will maintain strict standards adhering to accepted objective, scientific practices. While seeking to complement other indicator efforts and to integrate relevant government policies, the Viet Nam EPI will strive to serve as an independent review of provincial environmental performance in a “third-party” capacity.
- ***Timeliness.*** To be relevant for policy processes and decision-makers, the Viet Nam EPI will provide up to date information and be ready in a timely manner so that the tool can be best utilized by target audiences detailed below.
- ***Actionable.*** With all these principles in mind, the EPI should reflect practical, on-the-ground realities within Viet Nam, particularly with respect to data availability and relevance. The EPI should be designed to be put into action as soon as possible, with an eye towards the development and improvement of future indicators.

From these principles, the team identified a set of key audiences that the Viet Nam EPI should target as primary and secondary stakeholders to influence. Primary audiences include relevant national and sub-national governments. With the recently updated Law on Environmental Protection (revised in 2014) transferring responsibility for environmental performance to the provinces, the results of a Viet Nam EPI should be integrated into national and sub-national processes, such as the biannual meeting of the

National Assembly and the national development strategies for 2020. The General Statistics Office (GSO) is another primary audience, which is mandated to produce a yearly Environmental Sustainability Index (ESI) beginning in 2015. Other target groups include the MONRE, Viet Nam Environment Administration (VEA), Departments of Natural Resources and the Environment (DONRE), Tourism related agencies, and the People's' Councils.

Secondary audiences for the EPI include media, donors, civil society, and academics. Engaging a wide range of stakeholders is important in building awareness about environmental performance and adhering to principles of transparency. Additionally, these audiences will be central to advancing the goal of improved environmental performance and transforming results into action on the ground.

ii. Framework Development

A key priority in developing the Viet Nam EPI was ensuring that the framework represented priority environmental challenges and issues in the country. The jointly developed framework consists of two (2) objectives, eight (8) policy categories, and eighteen (18) indicators. Determination of the framework was based on priority environmental issues in country, data availability at the provincial scale, and on environmental quality -or “outputs” based on the DPSIR model (*see Figure 1*).

To determine which environmental issues to include in the EPI, the Viet Nam EPI team consulted subject-area, policy, and external experts. Policy documents, including the National Strategy on Environmental Protection to 2020, with Vision to 2030 , were consulted to aid in the identification of priority issues, indicators and potential targets to include in the Viet Nam EPI framework. After the international and national Viet Nam EPI teams drafted the framework, it was presented to the UNDP and ISPONRE leadership for additional feedback and vetting. This process allowed the Viet Nam EPI team to further refine the policy categories and indicators ultimately selected for the Viet Nam EPI framework.

Similar to the global EPI, the Viet Nam EPI framework is organized under two main objectives: human health and ecosystem health. Human health assesses how people are impacted by environmental quality issues. Ecosystem health assesses the impact of environmental policies and management on ecosystem quality. The reason for this distinction is due to the different ways data are collected to evaluate impacts on human versus and ecosystem health. For example, water quality and sanitation indicators under the human health objective look at the percentage of people with access to clean water and sanitation facilities. Whereas, water quality under the ecosystem health objectives, measures environmental quality in terms of pollution levels, coliform content, and hypoxia. Since data collection methods differ significantly for these objectives, they require different approaches to developing targets and indicators that link to policy.

Issues and indicators not included in the Viet Nam EPI Framework

1. Climate Change Mitigation and Adaptation

The global EPI contains four climate change indicators; 1) trend in carbon intensity; 2) change of trend in carbon intensity, 3) trend in CO₂ Emissions per kilowatt hour (kWh) of electricity produced, and 4) access to electricity. Given that there are no internationally agreed upon CO₂ reduction targets, the first two

indicators are weighted accordingly to a country's GDP. Countries that are wealthier (e.g., Annex I countries in the UN Framework Convention on Climate Change or UNFCCC) receive greater weight on the trend in carbon intensity indicator, while emerging economies and those not considered a least-developed country (LDC) or small-island developing states (SIDs) receive greater weight on the change of trend in carbon intensity. These blended weightings reflect international climate obligations in the UNFCCC, which currently does not require absolute emission reductions from developing or non-Annex I countries. Emphasizing a change in trend of carbon intensity indicator allows for developing countries to continue to grow emissions while their economies develop, recognizing the pace of growth must slow. These data come from several sources including the World Resources Institute's Climate Analysis Indicators Tool, the World Bank and International Energy Agency.

Acknowledging climate change as an issue of global importance, the Viet Nam EPI initially sought to include it as a priority issue for the framework, considering Viet Nam is one of the countries most vulnerable to climate change impacts (UNEP, 2009; see Box 1 for a high-level overview of Viet Nam's biennial report to the UNFCCC). At the time of this feasibility study, however, climate change policies were primarily oriented at the national scale. Because only national policies to address climate change exist in Viet Nam, the national team and experts advised the exclusion of climate change as an issue for provincial governments to track initially as part of the Viet Nam EPI. Data availability, and the lack of sub-national energy and climate change data (see Box 2 for further discussion), was also a determining factor in the Viet Nam EPI team's decision to leave climate change out of the framework.

Box 1: Viet Nam Biennial Report to the UNFCCC

Climate and climate change scenarios for Viet Nam

"Viet Nam has a tropical monsoon climate. The highest annual mean temperature is 27.7° C and the lowest is 12.8° C. Average annual rainfall usually ranges from 1.400 to 2.400 mm. According to climate change and sea level rise scenarios for Viet Nam" published in 2012, in the medium emission scenario, by the end of the 21st century, annual mean temperature would increase by from 2° C to 3° C; annual rainfall would increase by from 2% to 7%; and average sea level would rise by from 57 cm to 73 cm."

2010 National Greenhouse Gas Inventory

"In 2010, the total greenhouse gas (GHG) emissions including Land Use, Land-Use Change and Forestry (LULUCF) sector in Viet Nam were 246.8 million tonnes of CO₂ equivalent and 266 million tonnes of CO₂ equivalent without LULUCF. GHG emissions from the energy sector accounted for the largest proportion of 53.05% of total GHG emissions without LULUCF sector, followed by the agriculture sector with 33.20%. GHG emissions from industrial processes and waste sectors were 7.97% and 5.78% respectively..."

In the period of 1994-2010, total GHG emissions in Viet Nam (including LULUCF) increased from 103.8 to 246.8 million tonnes of CO₂ equivalent, including the energy sector with highest increase from 25.6 to 141.1 million tonnes of CO₂ equivalent, which was the largest emission sector in 2010...

Total GHG emissions from energy, agriculture, LULUCF and waste sectors are projected at 466 million tonnes of CO₂ equivalent in 2020, increasing to 760.5 million tonnes of CO₂ equivalent in 2030. The energy sector is projected to remain the largest source of GHG emissions."

Currently, there does not exist any greenhouse gas emissions data at the provincial level in Viet Nam and future plans include additional sector breakdowns in the national inventory. As of early July 2015, Viet Nam has not submitted an Intended Nationally Determined Contribution for the upcoming UNFCCC negotiations in December 2015.

(Source: The Initial Updated Biennial Report of Viet Nam to the United Nations Framework Convention on Climate Change (UNFCCC). 2014. Ministry of Natural Resources and the Environment. Available online: <http://unfccc.int/resource/docs/natc/vnmbur1.pdf>).

Adaptation to climate change, however, was identified as a key concern for provincial governments. Consultants identified a climate change adaptation plan indicator as relevant and important, but it is unclear what the structure of such an indicator would be and what the relevant target is (the simple existence of a plan does not necessarily mean it is effective or robust). Provinces have been required since 2010 to develop Climate Action Plans. At the time of Mission II (March 2015), 61 provinces had plans prepared, but to date there is no available analysis on the content and strength of these reports. Such an analysis might prove useful in developing a sub-national climate change indicator to assess provincial adaptive capacity for the Viet Nam EPI framework. In terms of the content, many of the plans primarily refer to climate change adaptation strategies, including disaster management and integration of climate change response into other socio-economic plans. Most international funding for climate change response is invested in the South Mekong River Delta and some provinces in the central region.

Box 2: Recommended Climate and Energy Indicators

Viet Nam currently does not have enough information at the provincial level to include indicators that assess performance on climate and energy. Many countries also do not monitor greenhouse gas emissions (GHGs) or have detailed energy or activity data at the sub-national scale to estimate emissions. A first step to evaluate performance on climate mitigation, therefore, would be for provincial entities in Viet Nam to collect industrial and sector-level energy data. Greenhouse gas emissions data could then be calculated from the energy activity (e.g., from mobile combustion) or fossil fuel consumption (IPCC, 2006).

In the 2014 EPI, Viet Nam had the following scores in Climate and Energy:

Indicator	Score (out of 100)	Rank (out of 129 countries)
Trend in Carbon Intensity	3.03	123
Change of Trend in Carbon Intensity	46.08	42
Trend in CO ₂ emissions per	41.43	92

KWH of electricity production		
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At the national level, Viet Nam faces several challenges with respect to climate change and energy. The country has traditionally relied on biomass, which has comprised a significant share of its primary energy mix. The high use of biomass as a primary energy source has significant human health consequences. Viet Nam also used to generate a nearly 75 percent of its electricity from hydropower, but this percentage decreased to less than a quarter (SE4ALL, 2012). Viet Nam has also been developing its fossil fuel industry, emerging as an oil and natural gas producer in Southeast Asia (EIA, 2015).

Adaptation to the impacts of climate change is a key consideration in Viet Nam. With rapid growth and development, a significant coastline, and a primarily agrarian economy, Viet Nam is one of the countries most vulnerable to climate change, according to the DARA Climate Vulnerability Monitor. In terms of ability to adapt to the effects of climate change, Viet Nam ranks 97 out of 180 countries in the ND GAIN Index (ND-GAIN, 2014). The ability to adapt, as defined by the ND-GAIN Index, looks at Viet Nam's readiness in terms of governance, social, and economic/fiscal structures at a country scale.

2. Gender

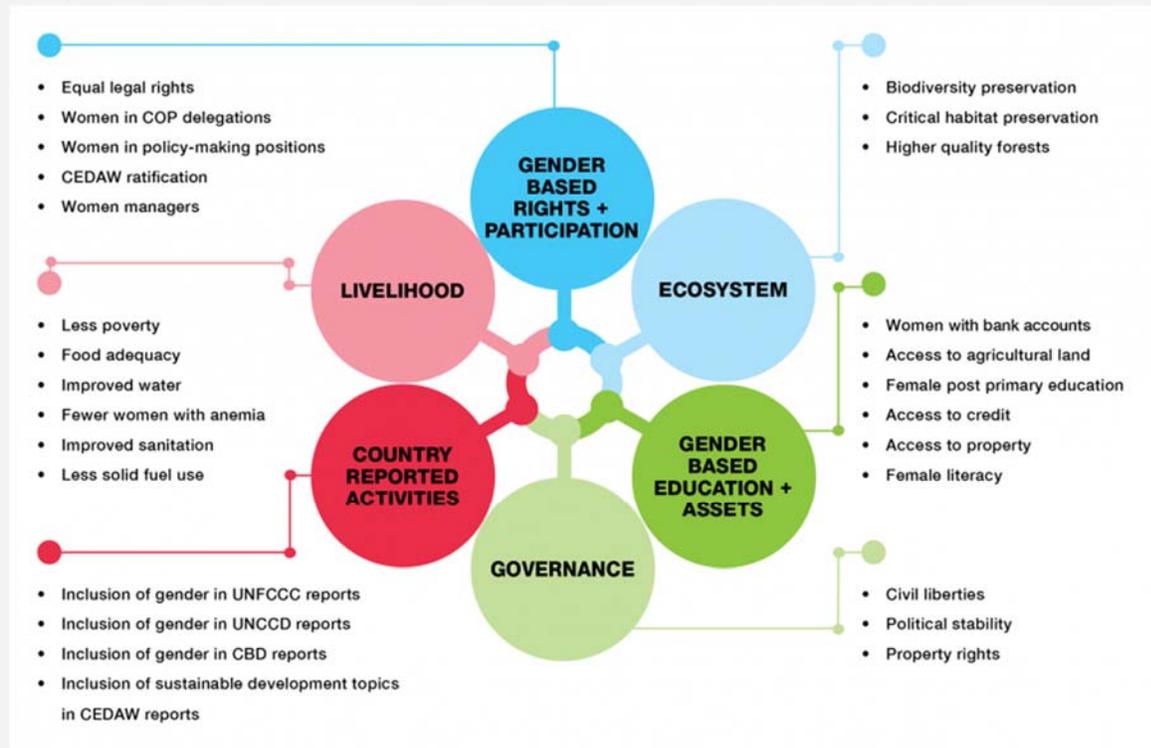
Another important issue that was discussed but not integrated into the overall EPI framework is gender, as it relates to environmental management. While gender is not an environmental priority, per se, it is one lens from which to understand resource challenges and how to design appropriate management strategies. Data disaggregated by sex can help to inform environmental management policies. For this reason, several proposed indicators for the Sustainable Development Goals, including land tenure, have recommendations for disaggregated sex data. Box 3 below provides an overview of gender and environmental management issues in Viet Nam.

Box 3: Gender and the Environment in Viet Nam

The links between gender equality and strong sustainable development are clear. To varying degrees, women across the globe have been excluded from environmental decision-making, despite the fact that they are more likely than men to depend on land and natural resources for their livelihoods (IUCN, 2013). In many countries, this combination of dependency and disempowerment has heightened women's vulnerability to environmental degradation and climate change (Haigh & Vallely, 2010). At the same time, there is a growing consensus that the sustainability policymaking community needs more women in positions of leadership, especially in light of the important role that gender imbalances play in mediating and constraining the effectiveness of environmental policymaking (UNDP, 2012). As a result, state and global leaders alike have made the elimination of gender discrimination a priority objective of sustainable development (UN Women, 2014).

Like much of the world, Viet Nam is publicly committed to gender equality. In fact, in many respects, the country leads its regional and economic peers on matters of female empowerment in natural resource planning. According to the International Union for Conservation of Nature's 2013

Environment and Gender Index (EGI), which broadly tracks government performance in addressing environment-related gender issues, Viet Nam ranks in the top quarter of Asian countries and in the top fifth of lower middle income countries. The country’s relatively strong performance is driven, in part, by its low rates of anemia in women and its increasingly robust set of gender equality laws (IUCN, 2013).



(Source: Environment and Gender Index framework: <http://genderandenvironment.org/egi/>.)

While Viet Nam’s scores on the EGI are promising, significant obstacles to gender equality remain. For example, although Vietnamese law protects women’s rights to acquire, administer, and inherit land, a variety of factors – including lineage practices, lack of enforcement by government officials, and ingrained traditions and customary practices that favor men – have limited the realization of these rights (Menon et al., 2013). Making matters worse, court rulings tend to reaffirm existing patriarchal hierarchies, in part because cultural gender stereotypes and complex bureaucratic processes can discourage and prevent women from accessing legal services (USAID, 2013). As a result, by the year 2000, less than 15 percent of the 12 million farmers that received land from the government were women (USAID, 2013).

This de facto exclusion of women from land ownership has important implications for both female livelihood security and natural resource management in Viet Nam. Without property titles, women who are single, divorced, or widowed are vulnerable to land grabs by male relatives (Scott et al., 2010). Meanwhile, since state recognition of land-use rights is a prerequisite for accessing formal credit, many women are unable to improve farming practices or invest in land improvements without permission from their husbands. Suggestively, research from other countries indicates that women are less likely to

practice sustainable agriculture or land use when their future access to the land is uncertain (New Course, 2010).

These gender imbalances are not limited to issues of land tenure, but, rather, have been observed across a variety of natural resource contexts. For example, although Viet Nam's 2008 National Target Program (NTP) on Responding to Climate Change underscores the high vulnerability of women and children to global warming impacts, the program itself was developed with little input from Vietnamese women (ICIMOD, 2009). This oversight likely stems from the limited numbers of female officials working in the country's environment ministries and, more generally, in policymaking positions (IUCN, 2013; ICIMOD, 2009). Case in point: women made up only a quarter of Viet Nam's National Assembly in 2015 (Inter-Parliamentary Union, 2015)

Importantly, these gender asymmetries may be even more pronounced at the community and household level. For example, several case studies have found that men largely dominate decisions regarding local natural resource management (Sen & An, 2006; Van, 2008). Gender-based divisions of labor are also responsible for women's heightened exposure to indoor air pollution. Viet Nam ranks low on the global EPI's metric of household air quality due to its widespread reliance on solid fuels for indoor cooking. However, since women are the primary cooks for the vast majority of Vietnamese households, they disproportionately bear the health risks that are associated with these dangerous air contaminants. Given that the average Vietnamese cook spends nearly three hours a day preparing meals, the cumulative damage to women's health is likely to be quite severe (Accenture, 2012).

Advancing Viet Nam's gender equality and sustainable development agendas will therefore require greater focus on the enforcement of existing anti-discrimination laws. This includes creating new mechanisms to help women access key legal services and to directly encourage their participation in natural resource decision-making at all levels of society. Setting gender-specific goals that will be monitored with sex-disaggregated data is another important step towards transforming Viet Nam's passive support for gender equality into active promotion of female empowerment. At the same time, expanding the numbers of women in high level leadership positions in government will be critical to ensuring the enactment of gender-sensitive environmental policies. Ultimately, if Viet Nam hopes to build a more sustainable and more climate resilient nation, it will need to do a better job at supporting and expanding the decision-making power of its female citizens.

3. Agriculture and Food Safety

Agriculture indicators, such as whether countries apply agricultural subsidies that could lead to inefficient use of resources like fertilizer and water, are important measures of environmental performance in the ecosystem category of the global EPI. The Viet Nam EPI team consulted with agricultural experts, but it was unclear what particular aspect of agriculture might be assessed at the provincial level in Viet Nam. While some data on crop yields and fertilizer use were identified as potentially available, these measures have been rejected as strong indicators of environmental performance in the global EPI. High crop yields, for example, can be achieved through unsustainable intensification practices or the application of environmentally-damaging pesticides. The use of fertilizer is also not a clear-cut performance indicator.

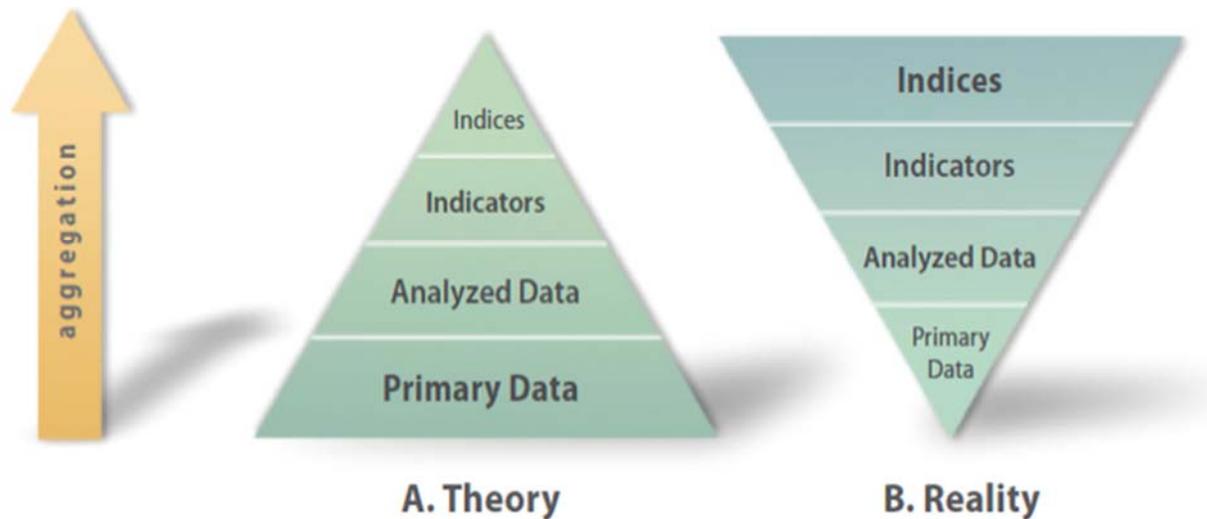
In some particularly nutrient-poor soils that may have been depleted for a variety of reasons, some fertilizer use may be advised or even necessary to achieve any crop yield. Without data available to assess provincial agriculture environmental performance, the Viet Nam EPI team chose to exclude agriculture from the framework.

Food safety, however, did emerge as a critical issue related to agriculture. In the case of the Malaysia sub-national EPI (MyEPI), an indicator of food safety measures potentially harmful chemical residues on agricultural products. The Viet Nam EPI team did consider food safety as a potential indicator for the framework, but agricultural experts advised the team that no consistent data were available at the provincial level. Due to these data availability concerns, the Viet Nam EPI team chose to exclude agriculture and food indicators from the framework.

iii. Data Gap Analysis

A data gap analysis - investigation of what data are available to measure a given set of indicators - was conducted to understand data availability at the provincial level in Viet Nam. Such an exercise is critical to identify data sources at the provincial level and whether an identified indicator framework is practically feasible to implement. The results of a gap analysis can also help spot particular gaps in monitoring and data collection, and help identify where investments in data are needed. This exercise is particularly useful to understand the likelihood of implementing an index once an indicator framework is constructed that represents an “ideal” perspective (*Figure 2*).

Figure 2: Index and data aggregation in theory and reality



In theory, a large base of primary data would exist by which to construct indicators and indices (left). The reality is that a narrow base of primary data is usually available (right). Source: Hsu et al., 2013; Adapted from Segnestam, 2002.

The data gap analysis was an important step in this feasibility study to understand baseline data availability at the provincial level in Viet Nam. The national consultant team was instructed to evaluate each policy issue and search for any available data pertinent to the proposed indicators, from both official (i.e., government sources) and unofficial (e.g., academic studies) sources. The consultants evaluated each data source according to the following criteria:

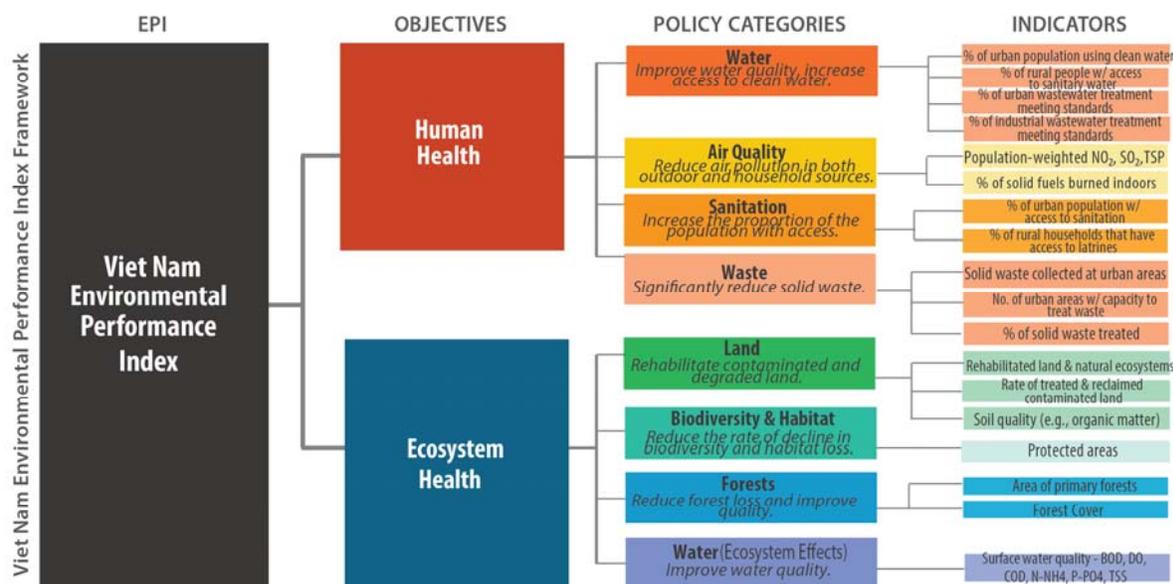
- Spatial coverage (e.g., how many provinces are included in the dataset)
- Temporal coverage (e.g., what years the data source covers)
- Current policy use (e.g., whether the dataset is being used in policy)
- Policy target (e.g., whether there clear performance orientation, either according to an existing policy or scientific basis)
- Policy target source (e.g., existing policy that defines a target for the indicator)

Overall, the data gap analysis revealed incomplete data for nine of 18 indicators identified in the Viet Nam EPI framework. Two indicators - population weighted air pollutants (nitrogen dioxide or NO₂, sulfur dioxide or SO₂, and total suspended particulates) and surface water quality - were not directly measured or monitored at the provincial level, but the consultants were able to identify datasets that interpolated missing data points for provinces that lack direct monitoring stations (*see Figure 13* in the Air Quality section).

The results of the data gap analysis, however, should be caveated, as the national team primarily evaluated provincial data availability from national-level sources (e.g., MONRE). Moreover, some issue areas were evaluated more completely than others. The waste and water-human health effects categories were the most complete; while the land, agriculture and fisheries categories were the most incomplete.

The latter issue areas did not originally have expert consultants assigned to them, so they may not be entirely investigated.

Figure 3: Viet Nam EPI framework with data gap analysis



Results of the data gap analysis revealed missing data for many of the indicators identified in the Viet Nam EPI framework.

Figure 3 illustrates the results of the data gap analysis, as gauged according to the Viet Nam EPI framework. Identification of “No Data” means that complete data for all 63 provinces in Viet Nam are not available. Some provinces or cities may have data for these indicators, but data for all provinces is missing for indicators that are designated “No Data” in Figure 3. These specific gaps are discussed in more detail in Section 4 of this report. In the cases of population-weighted air pollution and surface water quality indicators, the GSO has used interpolation methods to estimate data points for provinces that are missing data. Such modeling and estimation techniques could be useful in providing a starting point for provinces to understand baseline data, although the global EPI has moved away from the use of modeled data because of the at times mismatch between imputed values and on-the-ground realities.

There were a few key policy issues for which the data gap analysis yielded very little information, including fisheries and agriculture and land management. Although fisheries were originally excluded from the data gap analysis exercise, Viet Nam’s poor performance on the fisheries component of the global EPI (a score of 20, ranking 76th out of 98 countries) warranted additional attention to understand whether they are a management issue at the provincial level. Box 4 below discusses general information on fisheries management, data, and performance in Viet Nam.

Box 4: Fisheries Management in Viet Nam

The Global EPI has two indicators to assess fisheries: 1) coastal shelf fishing pressure, which looks at the intensity of gears such as trawlers used for fishing, and 2) fish stocks, which counts fish by species to determine whether they are being fished beyond recovery capacity. Globally, countries score very low on these two indicators, with only 2 percent of countries meeting the target for coastal shelf fishing pressure, which identifies the top 5th-percentile of countries as the performance benchmark. For fish stocks, no countries meet the performance target of 0 percent fish species overexploited or collapsed. At the global level, data is taken from the Sea Around Us Project, which reconstructs fish catch data from several sources including the Food and Agriculture Organization (FAO), International Council for the Exploration of the Seas, the STATLANT database, the Northwest Atlantic Fisheries Organization, and select government data.

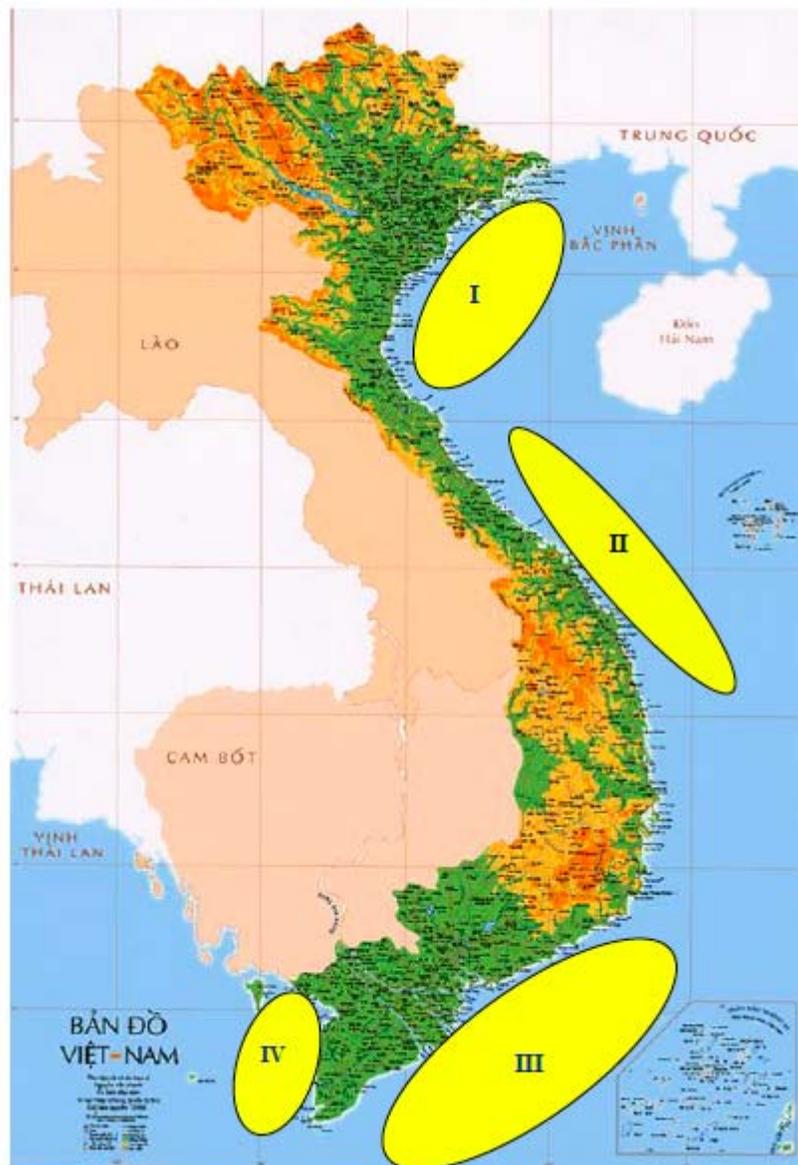
Figure 4. Location of trawling sites off-shore in Viet Nam

Viet Nam, which ranks 136 overall out of 178 countries scored on the global EPI, shows declining trends on both fisheries indicators. According to the FAO, fisheries made up 4% percent of Viet Nam's Gross Domestic Product (GDP) with a gross value of USD 1.7 billion in 2003. Fisheries data was characterized by a weak monitoring system (van Zwieten et al., 2002) and existing data from international institutions are aggregated at the national scale and on average over a decade old (World Bank, 2005; FAO, 2003).

In 2007, the government agency responsible for fisheries was reorganized into the Ministry of Agriculture and Rural Development (MARD). According to fisheries experts in Viet Nam, regulation and management of fisheries is very poor at the national level and virtually non-existent at the provincial scale. Viet Nam's

Exclusive Economic Zone (EEZ) was established in 1982 (UN, 1982), and permits and management of fishing fleets occurs at the provincial level. The country has had a national fisheries law enacted since 2003, based largely on Norway's precedent.

Despite these provisions, fishing is largely still an open-access activity in Viet Nam and there are no limits on catch, and implementation of the fisheries law is weak, according to experts. The law mandates data collection on fish catch, but experts report that data are not actually being collected or reported, largely due to the lack of enforcement. Experts further report that fish stocks are decreasing,



Source: Nguyen and Thi, 2010.

and the use of intensive trawling gears (*see Figure 4*) results in high percentages of “trash fish” (i.e., marine fish having little or no commercial value, but may be of ecological importance) that are caught and disposed.

In terms of what data that do exist to assess fisheries, it is largely aggregated at the country level and over a decade old. Given recent activities over illegal Vietnamese fishing boats near Palau (*Washington Post*, 2015) and disputes in the South China / East Sea (*Guardian*, 2015), a clearer picture of the fisheries sector is important not only for environmental management but also for international relations.

iv. Data Collection and Analysis

Based on the data gap analysis, the national and international consultant teams worked together to collect available data at the provincial level in Viet Nam. A majority of the datasets were taken from environmental data in the GSO 2014 Statistical yearbook. During Mission II, a training was provided on data grading to assess the quality of these data sets by evaluating transparency, methodology, format, and time series availability of the given data (*see Chapter 5: Evaluating Data Quality* in Hsu et al., 2013). Data grading can be used to evaluate the quality of datasets and to determine steps necessary for additional data collection (*see Figure 5 below*).

Figure 5: Environmental Sustainability Index data grading rubric

Component	Indicator Number	Indicator	Variable Number	Variable	Variable Description	Match between variable and issue	Reliability of data source	Variable methodology	Cross-check criteria	Most recent data set	Frequency of update	Spatial coverage	Consistent time series
Environmental Systems	1	Air Quality	1	NO ₂	NO ₂ Urban population weighted NO ₂ concentration	A	A	B	C	A-	A-	D	B-
			2	SO ₂	Urban population weighted SO ₂ concentration	A	A	B	B-	A-	A-	D	B-
			3	TSP	Urban population weighted TSP concentration	A	A	B	B-	A-	A-	D	C-
			4	INDOOR	Indoor air pollution from solid fuel use	B	B-	C	D+	A	U	B	F
	2	Biodiversity	5	ECORISK	Percentage of country's territory in threatened ecoregions	B	B	C	D	A	A	A	F
			6	PRTBRD	Threatened bird species as percentage of known breeding bird species in each country	B	A-	B+	B-	A	A-	A	A-
			7	PRTMAM	Threatened mammal species as percentage of known mammal species in each country	B	A-	B+	B-	A	A-	A	A-
			8	PRTAMPH	Threatened amphibian species as percentage of known amphibian species in each country	B	A-	A-	B-	A	B	A	B
			9	NBI	National Biodiversity Index	A	A-	B	B	A	U	B	D
	3	Land	10	ANTH10	Percentage of total land area (including inland waters) having very low anthropogenic impact	A-	B	B-	B-	A-	D	A	C-
			11	ANTH40	Percentage of total land area (including inland waters) having very high anthropogenic impact	A-	B-	B-	B-	A-	D	A	C-
	4	Water Quality	12	WQ_DO	Dissolved oxygen concentration	A	B+	B-	B	A	A	D	C+
			13	WQ_EC	Electrical conductivity	A-	B+	B-	B	A	A	D	C+
			14	WQ_PH	Phosphorus concentration	A	B+	B-	B	A	A	D	C+
			15	WQ_SS	Suspended solids	A	B+	B-	B	A	A	D	C+
	5	Water Quantity	16	WATAVL	Freshwater availability per capita	A	B	A-	B	C	A	B	A
			17	GRDAVL	Internal groundwater availability per capita	A-	B	C-	C	A	C	B	D

An example expert data-grading exercise from the Environmental Sustainability Index (ESI). Source: Hsu et al., (2013). Data are graded according on a scale from A to D, with A being the highest quality data and D the worst. U means unsatisfactory and warrants a closer consideration of a dataset and whether it may be suitable for use in an EPI.

An essential component of data collection is robust management practice. Where the data come from, who collects the data, when the data are published, how often data is updated, and also what format the data comes in (i.e., is data in an accessible, downloadable format such as Excel or CSV files versus PDF or images which are static and more difficult to analyze, *see Figure 6*) are critical metadata that should be recorded alongside data points. Clear and transparent metadata is important not just for internal management purposes, in the event that questions arise regarding the source of a particular dataset, but also for external purposes (*Figure 7*). Other researchers and data users require metadata to understand the source of the data for replication and verification processes. As part of the data gap analysis and collection exercises, national consultants received training on good practices for data management.

Figure 6. Metadata for datasets

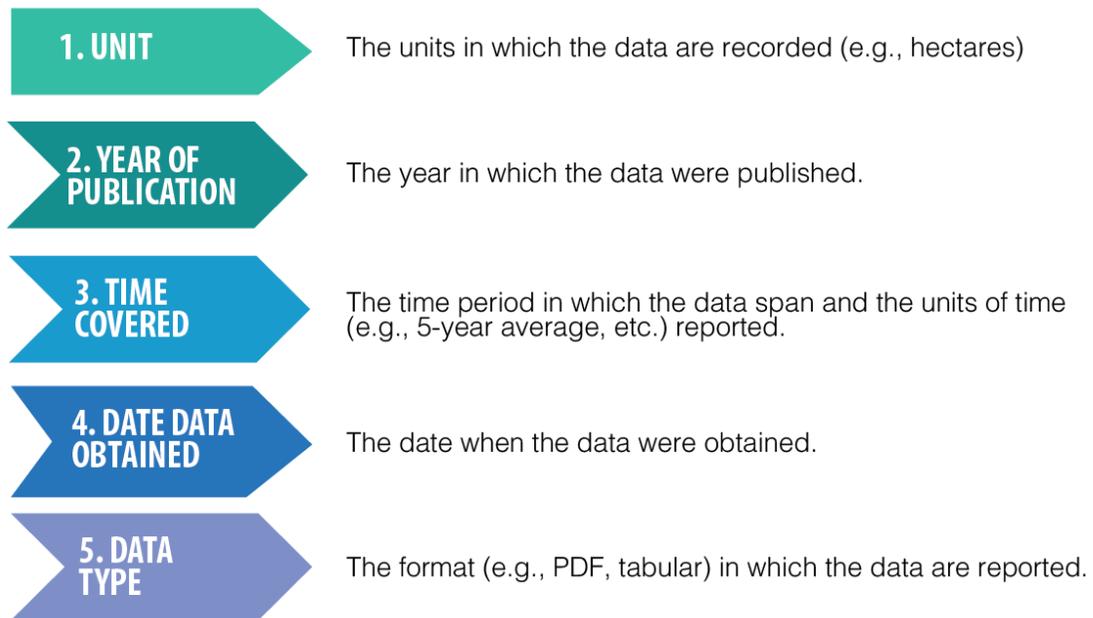


Figure 7. Example metadata for an indicator.

Issue Category:	Biodiversity & Habitat
Indicator:	<i>Percentage of protected areas (Terrestrial and Marine)</i>
Indicator Short-Name:	PAS
Method/ Description	The proportion of nature conservation land against the total area of natural land. Nature conservation areas in Viet Nam include national parks, nature reserves, protected species areas, cultural, historical and environment forest, scientific experiment research forest. The nature conservation areas cover terrestrial, coastal and island areas.
Source:	GSO, MONRE
Unit	Percentage (%)
Year of Publication:	2014
Covered Time:	2010
URL:	
Date Data Obtained:	
Data type:	Tabular
Related Publications	Table 2.5.2, page 116, the “Viet Nam Environmental Statistics Book 2001-2013” by GSO

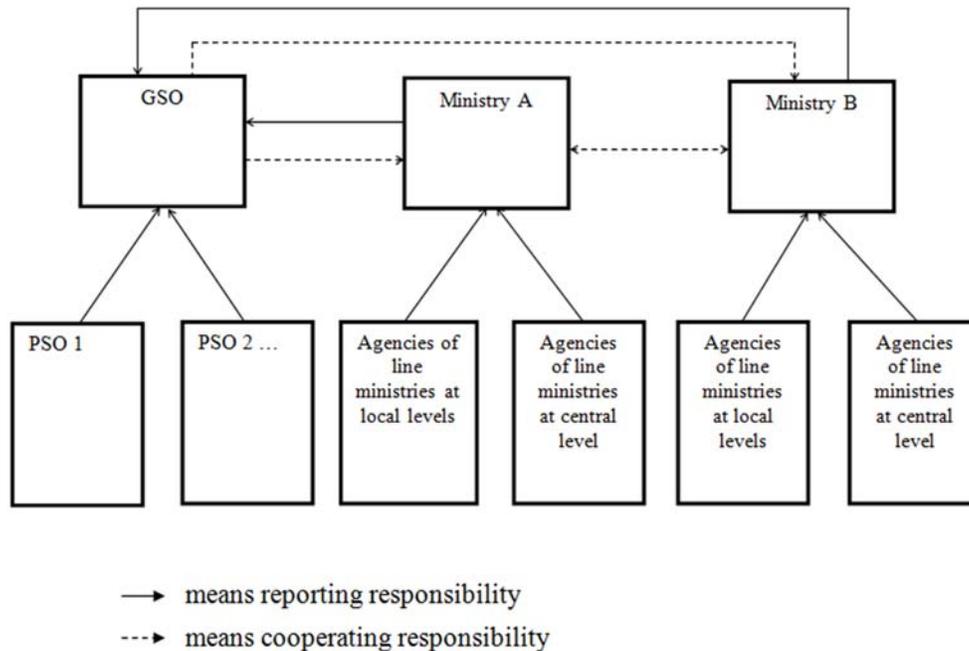
The format of data is important to note because human error increases when data is transferred from different formats and also when data undergoes statistical analysis. As a result saving data in its original format is a critical step to documentation. Additional good practices for data management include notating the exact processes for statistical analysis and data transformation so that results are translatable and replicable. Strict naming protocols and organization of data is helpful in making sure data is not altered in error.

b. Environmental Monitoring and Statistical Reporting in Viet Nam

The Vietnamese government collects, manages, and disseminates data through two systems: the Centralized Statistics System (CSS) and the statistics systems of the line ministries (SSM). CSS is vertically organized with the General Statistics Office (GSO) at the central level, Provincial Statistics Offices (PSOs) at the provincial level, and District Statistics Offices (DSOs) at the district level. In contrast, SSM consists of a variety of data reporting government entities, including ministries, agencies that are equivalent to ministries, the Supreme People’s Court, and the Supreme People’s Procuratorate. Together, CSS and SSM form the Viet Nam Statistical Information System (VSIS), which is supposed to provide officials with the information necessary for state management.

The chart below illustrates how information flows between CSS and SSM entities. In particular, note that data collected or compiled by SSM must be sent to GSO for verification for indicators in the National Statistical Indicator System (NSIS) only.

Figure 8: Information flows within Viet Nam Statistical Information System



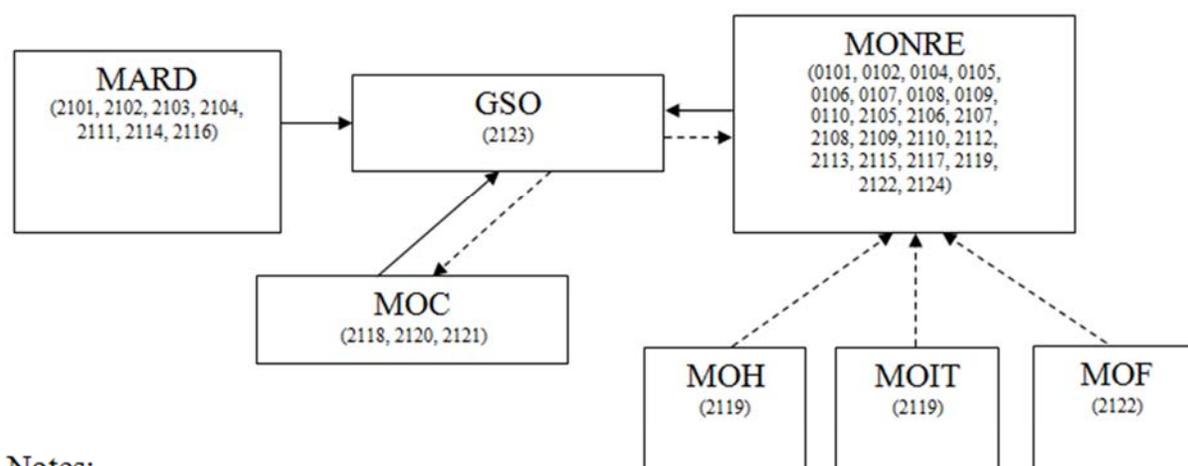
Environmental Data Collection and Reporting

According to Decision #43 issued by Prime Minister, CSS is responsible for publishing statistical indicators collected through the NSIS (see Figure 9). NSIS is a list of indicators issued by the Prime Minister with names and indicator identification codes, main data disaggregation, frequency of dissemination, road map for implementation, and agency in charge of data collection and aggregation. NSIS is used by Party and State institutions at all levels in evaluating and forecasting situations, planning policies and strategies, constructing socio-economic development plans for each period, and monitoring their implementation. The NSIS is used as a basis for constructing the National Statistical Survey Programme and the integrated statistical reporting systems. Through the NSIS, the GSO has the authority

to implement grassroots-level statistical reporting systems and has the authority of disseminating statistical information.

55 of these indicators pertain to environmental issues, including 33 indicators on hydrometeorology and environment protection, and 22 socio-economic indicators related to the environment. Data for 23 of these indicators are collected directly by the GSO, PSOs and DSOs through surveys and censuses, while the remaining 32 are first collected and compiled by SSM and then sent to GSO for verification and publication.

Figure 9: Environmental data collection through National Statistical Indicator System



Notes:

- means data collection, data compilation, and reporting responsibility.
- .-> means cooperating responsibility.
- () numbers in parentheses are indicator codes in the NSIS.

Responsibilities for environmental indicators are allocated along line ministries as follows - Ministry of Natural Resources and Environment (MONRE); Ministry of Agriculture and Rural Development (MARD); Ministry of Construction (MOC); Ministry of Health (MOH); Ministry of Industry and Trade (MOIT); Ministry of Finance (MOF):

- MONRE collects and reports on 22/33 indicators.
- MARD collects and reports on 7/33 indicators.
- MOC collects and reports on 3/33 indicators.
- GSO calculates and reports on 1/33 indicator.
- MOH, MOIT and MOF cooperate to provide MONRE with information for the calculation of 3 out of the 22 indicators in NSIS for which MONRE is responsible.
- MONRE and GSO cooperate to provide MOC with information for the calculation and reporting of 3 indicators in NSIS for which MOC is responsible.

Environment Statistical Indicators Systems in Viet Nam

In Viet Nam, there are two types of statistical indicator systems that include environmental indicators. The first has four indicator systems implemented under GSO: NSIS, provincial statistical indicators system, district statistical indicators system, and commune statistical indicators system. The second type includes statistical indicator systems under line ministries, including MONRE, MARD, MOC, MOH, and MOIT.

While NSIS is issued by the Prime Minister, the line ministers issue statistical indicators systems for their respective bodies. While line ministries are responsible for publishing indicators in the statistical indicators systems of line ministries, the GSO is responsible for publishing indicators in NSIS, including the indicators for which line ministries collect data. For example, greenhouse gas emissions is an indicator of NSIS, but it is assigned to MONRE for data collection, data processing and data compilation, and then MONRE sends the results to GSO for validation and publication. Hence this indicator is located in NSIS and also the statistical indicators system of MONRE for data collection.

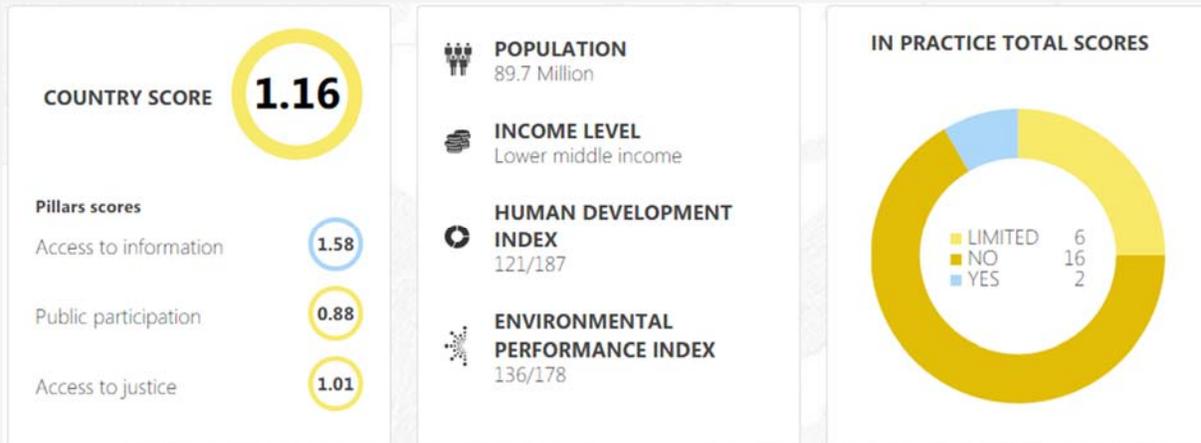
While statistical data are critical to establish baselines, track and monitor environmental performance, qualitative data on institutions and governance are necessary to understand the larger context of environmental management. Box 5 below discusses several methods and evaluations of environmental governance in Viet Nam.

Box 5: Assessing Environmental Governance in Viet Nam

Sound governance is critical to environmental performance, and Viet Nam has recently taken important steps towards promoting transparency, accountability, and citizen engagement in natural resource decision-making. Starting with the Grassroots Democracy Decree of 1998, a number of policies and related legal documents have worked to support and facilitate public participation in local governance at the provincial, communal, and village levels (UNDP, 2006). State efforts to decentralize policymaking authority have included establishing new laws on public access to government information, expanding opportunities for communes to discuss and comment on local planning and development initiatives, and creating legal mechanisms that enable citizens to file complaints against administrative decisions (UNDP, 2006). This trend towards more participatory forms of governance has, in turn, spilled over into the realm of environmental decision-making. For example, Vietnamese law now mandates that relevant ministries at the national and provincial levels proactively disseminate information relating to the environment and public health; it has also created some formal mechanisms for soliciting public input on local environmental policies (WRI, 2015).

Notwithstanding this progress, environmental governance in the country remains underdeveloped. Viet Nam currently ranks in the bottom 30% of lower middle income countries on the Environmental Democracy Index (EDI), a recently launched set of indicators by the World Resources Institute that captures the extent to which countries' national laws facilitate citizen engagement and good governance in environmental decision-making (WRI, 2015). When stacked against all countries surveyed by the EDI, it comes in 49th out of 70.

Viet Nam's relatively poor performance on the EDI is due, in part, to the limited scope of environmental rights that are covered by existing Vietnamese law. In particular, there are no legal requirements for the public to be involved during the early stages of environmental policymaking; nor are there appeal procedures available to citizens whose environmental information requests have been denied (WRI, 2014). Public rights to access information are also noticeably lacking in robustness, as Viet Nam's information laws do not provide details on compliance mechanisms (World Bank, 2009) and government authorities are not required to provide timely information on environmental emergencies (WRI, 2015).



(Source: <http://environmentaldemocracyindex.org/country/vnm>)

Perhaps more importantly, though, those existing laws that do promote informational access and participatory democracy in Viet Nam have yet to translate into meaningful results on the ground. Indeed, civil society's engagement with local policy making remains limited at best, and government officials often fail to implement those legal provisions that are designed to enhance public participation in environmental decision-making (Quitow et al., 2013). Case in point: while Vietnamese law guarantees citizens' rights to environmental information, researchers have reported that quality environmental data is difficult to access – a constraint that ultimately undermines local communities' capacity to engage local officials on natural resource matters (Mol, 2009; Slunge & Tran, 2014). Several other factors have also limited citizen participation in natural resource governance, including the public's general lack of awareness about existing policies and laws; coordination problems between different levels of government; and a strong crowding-out effect that state-run mass organizations (e.g., the Women's and Youth Unions) have had on local organizing efforts (Ingle and Halimi, 2007).

Given this disconnect between *de jure* and *de facto* environmental democracy, one way Viet Nam could improve its environmental performance is through dedicating more resources towards helping communities take advantage of existing local democracy provisions. Specifically, meaningful advancements in environmental governance and performance will require improving the collection and dissemination of environmental data, building up local governments' institutional capacity to implement and enforce Viet Nam's environmental laws, and equipping local communities with the tools needed to effectively engage in environmental policy-making.

4. Environmental Policy Issues¹

The following section describes each of the high priority environmental issues included in the Viet Nam EPI framework. Adopting the same two overarching policy objectives as the global EPI – protecting human health from environmental harm and protecting natural ecosystems – the Viet Nam EPI framework includes eight policy categories. These categories include: for human health – water, sanitation, air quality, and waste; for ecosystem health – land, water quality, biodiversity and habitat, and forests. Each policy category is described according to: 1) the current status of the environmental issue in Viet Nam; 2) the international context for measurement; 3) an overview of available data, information and statistics by which to measure the issue in Viet Nam; and 4) an assessment of gaps and recommendations.

OBJECTIVE: HUMAN HEALTH

a. Water Supply and Sanitation

1. Current Status

Water supply and sanitation are targets under the Millennium Development Goals (MDGs) that are crucial to socio-economic development in Viet Nam. Despite international policy and national-level support, water supply and sanitation in Viet Nam faces numerous challenges that require more attention and resources (*See Figure 10*). There has been investment in dealing with water and sanitation issues, but not many goals have been achieved to date. Certain factors, such as the lack of basic water and sanitation systems, inadequate hygiene education and behavior, in some places have resulted in negative impacts on the living conditions of communities and the environment.

Urban water supply services

There are 68 public water supply companies in Viet Nam in charge of water supply for urban areas (WHO, Viet Nam Water Supply and Sewerage Association, and UNICEF, 2012). Surface water accounts for 70% of total water supply and the rest (30%) is groundwater. There are more than 420 water supply systems with a total capacity of 5.9 million m³ per day. Water supply capacity reaches 4.5 million m³/day, which is equivalent to 77% of the design capacity.

By the end of 2010, 18.15 million urban residents gained access to clean water, accounting for 69% of the total urban population (WHO, Viet Nam Water Supply and Sewerage Association, and UNICEF, 2012). The percentage of people with access to clean water in urban areas is as follows: 70% of populations in special urban areas and urban areas grade I, 45-55% of the population in urban areas grades II and III (*see Box 6*), 30-35 % of the population in urban areas grade IV and 10-15% of population in urban area grade V. Water use and consumption is also a key issue in urban areas. The average amount of water used in

¹ Note: these sections were authored by the national consultant team with framing and input from the international team.

urban areas is 80-90 liters per person per day (WHO, Viet Nam Water Supply and Sewerage Association, and UNICEF, 2012). In bigger cities, the amount of water is 120-130 liters per person per day, which is suboptimal for per capita consumption.

Box 6: Urban Classifications in Viet Nam

Urban centers are classified by six grades, namely special grade, grade I, grade II, grade III, grade IV and grade V, and recognized under decisions of competent state agencies.

1. Special-grade urban centers include centrally run cities with urban districts, rural districts and satellite urban centers;
2. Urban centers of grades I and II include centrally run cities with urban districts and rural districts and possibly attached urban centers; and provincial cities with wards and communes
3. Grade-III urban centers include provincial cities or towns with wards and communes
4. Grade-IV urban centers include provincial towns with wards and communes
5. Urban centers of grades IV and V include district townships with consolidated street quarters and possibly rural residential spots.

(Decree No. 42 on the Grading of Urban Centers, 2009)

Despite more than half of Viet Nam's population having access to piped water, quality of the water is still an issue. According to the Ministry of Health, water quality supplied to urban areas meets technical regulations for drinking water (QCVN 01: 2009/BYT). Regarding rural supply systems, the control of water quality still faces many challenges and shortcomings. In many places, toxic pollution is emerging as a problem (e.g., arsenic pollution, nitrogen compounds, pesticides, and toxic industrial chemicals).

Drainage and urban sewage treatment

Domestic wastewater from households is largely pre-treated in septic tanks, discharged into the sewer system without any treatment process, where it goes directly into water system (e.g., rivers, streams, lakes, and seas). Currently only a number of urban wastewater treatment plants have been built and put into implementation in six cities: Hanoi, Ho Chi Minh City, Da Nang, Da Lat, Buon Ma Thuot, and Ha Long. The amount of treated urban sewage is estimated at 10% of the total generated wastewater. According to Ministry of Construction and Viet Nam Water Supply Association, the total coverage of sewage drainage and treatment systems remains too low compared to the rate of clean water supply services. The proportion of drainage services only accounts for approximately 40-50% on average, with 70% in large urban areas and only 10-20% in urban areas grades IV and V.

According to the WHO-UNICEF Joint Monitoring Program, in 2011 the percentage of the population with access to sanitation services was 75 percent (WHO-UNICEF, 2013). The most popular sanitation facilities used in households are septic tanks, accounts for 80% of households. This rate remains very different in each urban area.

Water supply and sanitation in rural areas

Outputs from implementation of the National Target Program on rural water supply and sanitation Phase 1 (1998-2005) and Phase 2 (2006-2011) have contributed to the construction of clean water and rural sanitation infrastructure. A declining use of latrines has occurred in many areas, especially in the northern

mountainous areas, Red River Delta. Latrine ponds in the Mekong River Delta have been gradually replaced with sanitary latrines.

The proportion of rural residents with access to clean water services and rural environmental sanitation has increased, but exact figures are unavailable. However, the target of 100% rural population with access to clean water supply and sanitary latrines in the National Strategy for Water Supply and Rural Sanitation by 2020 has not been achieved (Ministry of Health, 2011).

Rural water supply

As of 2010, according to the National Target Program on clean water and rural sanitation Phase 3 (NTP3) for the period of 2011-2015, the proportion of rural population with access to clean water increased from 62% to 80%, 5% lower than the target increase of 3.6% per year on average. In particular, the proportion of rural populations with access to water that meets the Drinking Water Standard (QCVN 02/2009 BYT) was about 40% -- 10% lower than the NTP3 target. In the southeast region, the proportion of rural population with access to clean water is 90%, --10% higher than the national average. The lowest is in the highlands (72%) and north central (73%) -- 8% lower than the average (Ministry of Health, 2011).

Sanitation in rural areas

According to the National Target Program Phase 3 about 77% of all households have latrines. Compared with National Target Program Phase 2 (2006-2011), the proportion of rural farm households that have sanitary latrines increased from 40% in 2005 to 55% in 2010.

2. International Best Practices for Management

Access to drinking water and sanitation were central targets of the Millennium Development Goals' (MDGs) aim to eradicate extreme poverty between 2000 and 2015. Both of these indicators are measured by percentage of population with access to "improved" sources. For drinking water, an improved source refers to some sort of infrastructure, a facility or delivery point (e.g., pipe, well, container), that helps to protect drinking water from outside contamination (i.e. contamination from fecal matter). For sanitation, improved sources broadly refer to any system that separates human excreta from human contact. For example, improved sanitation sources range from a simple pit latrine all the way to septic tanks and treated systems connected to sewers.

The global EPI uses both of these indicators under its human health objective and performance targets are set at 100% for both, meaning that all people should have access to drinking water and sanitation. The data for these indicators comes from the World Health Organization, the United Nations Children's Fund (UNICEF), and the Joint Monitoring Programme for Water Supply and Sanitation.

Priorities in policies in water supply and sanitation

In the 1990s, Viet Nam established policies, strategies and programs in response to the MDGs and national goals to improve water supply and rural sanitation. In 2006, Prime Minister approved the national target program on clean water and rural sanitation for 2006-2010 (*Decision No.277/2006/QĐ-TTg*). Environmental sanitation targets include: 70% of rural households have hygienic latrines; all kindergartens, schools, clinics, markets, communal offices and other public buildings in rural areas have clean water and sanitary latrines (*Decision No.277/2006/QĐ-TTg*); and reduce environmental pollution in trade or traditional production villages, especially in food processing villages, although the amount is

unspecified. By 2010, the Government approved the National Target Program on new rural development from 2010 to 2020 with targets on rural sanitation to ensure adequate supply of potable and hygienic clean water to residents, schools, clinics, offices and public services areas; ensure implementation of requirements to protect and improve the environment in the commune (*Decision No.800/QD-TTg*). By 2015, 35% of communes and by 2020, 80% of communes have met the indicated targets.

Most recently, the Strategy for Environmental Protection 2012 includes targets on sanitation and rural development. For example, 50% of communities by 2020 should meet sanitation standard of the New Rural Development Program.

3. Data, Information, and Statistics

Data sources at the provincial level on water and sanitation are mainly from the National Statistical Indicator System (NSIS), issued by the Prime Minister’s Decision No. 43/2010/OD-TTg (2010). Table 2 includes available water and sanitation indicators within the NSIS. The Ministry of Health has also developed a national database system on water and sanitation, but thus far only a common data framework has been developed and actual data have yet to be collected.

In line with international practice, data on access to clean water are collected at the household level. The Ministry of Construction, however, collects data on the percentage of the urban population provided with clean water from a centralized utility. These estimates therefore only provide an understanding of what percentage of the urban population that is using piped water only, excluding the possibility of water supplied from wells, water tanks, or other non-centralized sources.

In terms of rural access to clean water, the Ministry of Agriculture and Rural Development only collects data on the percentage of rural population provided with clean water at the household level. This data is reported through a reporting system from communes. The General Statistics Office (GSO) collects data on the percentage of both rural and urban populations with access to clean water using population censuses. The use of population censuses provides consistent estimates for urban and rural areas for a larger range of water sources, not only piped water.

Household surveys are conducted every 10 years; inter-census population and housing surveys (IPS) are conducted in between two censuses; and household living standard surveys (VHLSS) are conducted every two years.

Table 2: Water and sanitation indicators included in the NSIS.

ID in NSIS	Group, name of indicator	Main disaggregation	Agency in charge of collection and aggregation
1913	Percentage of urban population using clean water	Province/city	Ministry of Construction
1914	Percentage of rural population using clean water	Province/city	Ministry of Agriculture and Rural Development

1915	Percentage of population using clean water	Urban/rural, province/city	General Statistics Office
1916	Percentage of households using electricity, hygienic latrine	Urban/rural, province/city	General Statistics Office

4. Assessment of Gaps and Recommendations

Because of the data available to assess water supply and sanitation – reflected as two separate policy categories in the Viet Nam EPI framework – it is possible at this point to calculate four out of the six indicators proposed. These include:

- Water: 1) the percentage of urban population using clean water; 2) the percentage of rural population using clean water;
- Sanitation: 1) percentage of urban households with access to sanitation; 2) percentage of rural households with access to latrines.

Data available, however, is from 2009, so finding more up to date information is necessary to ensure quality and relevance. The latest 2009 census for indicators on water and sanitation (ID 1915 and 1916 in Table 2 above) is available at the provincial level, but the data now may be considered outdated. The VHLSS is more frequently updated, but only at the national level and would need to be conducted at the provincial level to provide more up to date data. The GSO is currently planning to publish data from the 2014 IPS, which may be a potential source of provincial-level statistics for the Viet Nam EPI.

A pilot Viet Nam EPI may use what existing data may be available, even if it is from 2009, as a starting baseline. Given the pace of growth and industrialization in Viet Nam, more up to date data is required if the Viet Nam EPI indicators are to be used as an appropriate real-time management tool.

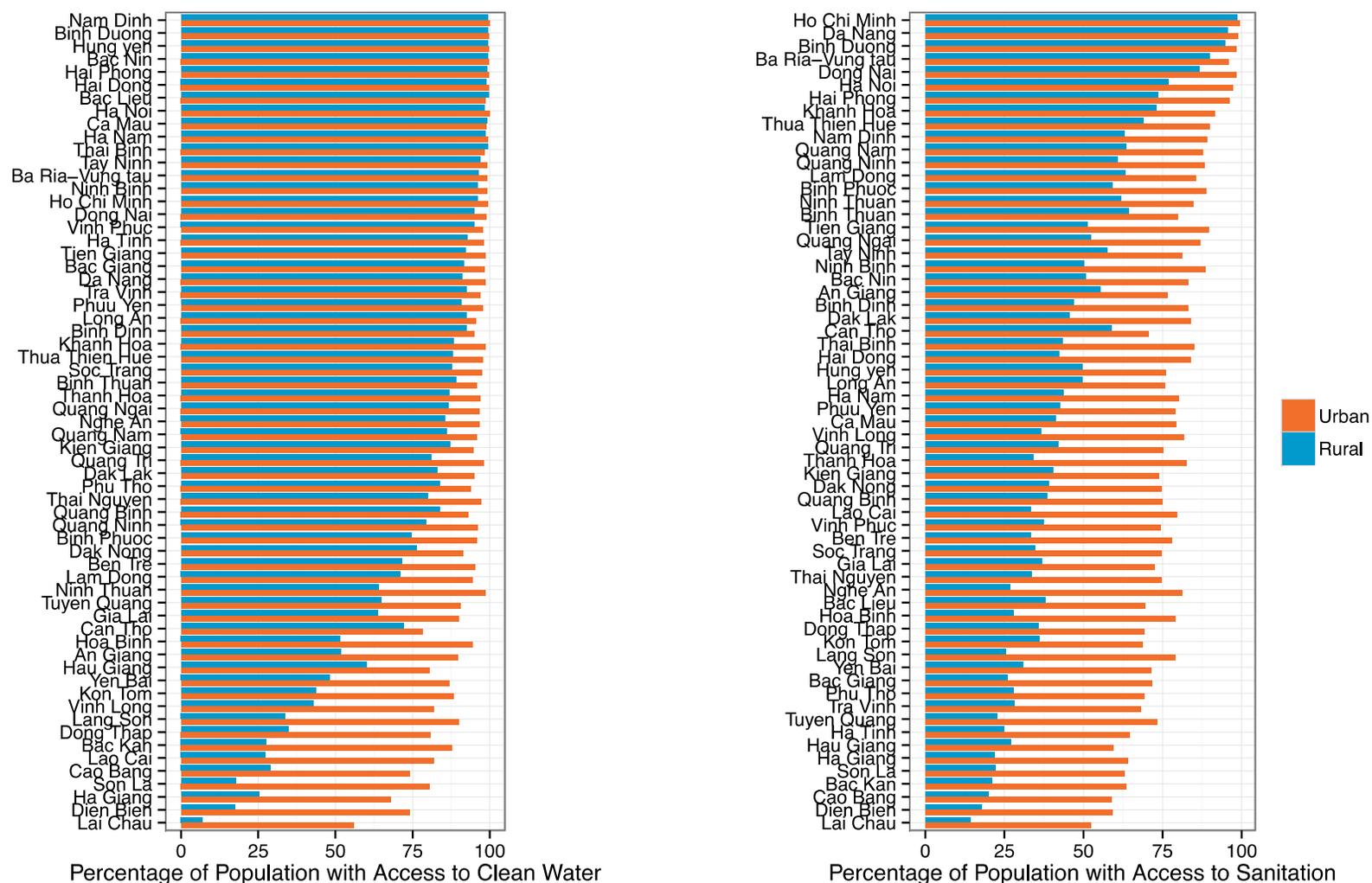
Table 3: Recommended indicators, targets, and data sources to evaluate water and sanitation in Viet Nam.

Problem Statement	Indicator	Target	Data Source
Improve water quality and increase the population with access to clean water.	Percentage of urban population using clean water	95% access for urban areas by 2015 (National Strategy)	GSO
	Percentage of rural people that have access to sanitary water	At end of 2015, 85% of rural people need to have access to sanitary water; 45% of them can use domestic water that meets standards	MARD, GSO
	The rate of industrial parks, export processing zones have centralized wastewater treatment system that meet standards	75% by 2015; 95% by 2010	MONRE
Increase the proportion of the population with access to water & sanitation.	Percentage of urban population with access to sanitation	Best performers (but MOH/MOC might have separate targets)	GSO
	Percentage of rural households that have access to latrines	65% of rural households have sanitary latrines by end of 2015 (366 (2012) decision from PM and National Strategy)	MARD, GSO
	<i>Drinking water quality</i>		

(Aspirational indicators are identified in italics. For a full list of indicators proposed in the Viet Nam EPI, see the Annex.)

Figure 10: Percentage of urban and rural population with access to clean water and sanitation.

Access to Clean Water and Sanitation in Viet Nam



Data source: General Statistics Office (GSO).

b. Air Quality

1. Current Status

Both outdoor and household air quality are critical concerns in Viet Nam. According to Viet Nam's Center for Environmental Monitoring (CEM), major sources of air pollution include: transport, industry, coal mining and related processes, steel, construction, daily household activities (e.g. cooking with small cook stoves, even within urban areas), and thermal power plants (CEM, 2013). With increasing urbanization and economic development, air quality within Viet Nam is deteriorating rapidly. In the latest 2014 EPI rankings, Viet Nam ranked 170 out of 178 countries. The country also demonstrated worsening trends for exposure to fine particulate pollution (PM_{2.5}), although household air pollution has improved over the last decade, largely due to the decrease in the amount of solid fuels burned indoors for cooking and heating purposes.

Official data in Viet Nam reinforce poor ambient air quality trends, particularly in terms of particulate pollution, which includes dust and total suspended particulates (TSP). From 2003 to 2007, these official data sources from the CEM demonstrate the decline of particulate pollution (CEM, 2011), although concentrations of NO_x, SO₂, and CO still appear to be within allowed threshold limits, according to Viet Nam's Ambient Air Quality standards (QCVN No. 3; QCVN 05:2013/BTNMT No. 5 Ambient Air Quality (2013) new standards). High levels of particulate pollution have resulted in rising incidences of respiratory disease, according to Viet Nam's Ministry of Health, particularly in villages co-located next to industrial production facilities.

While urban air quality is a growing concern in Viet Nam, rural air quality remains an equally important concern. Two-thirds of Viet Nam's population lives in rural areas (World Bank, 2015). Air pollution resulting from household combustion of solid fuels and the proximity to small industrial operations is a critical concern. Official 2011 statistics describe more than 1,300 villages and more than 3,200 accredited craft villages, which refer to small-scale trade and manufacturing centres, that often use outdated technology and equipment that are responsible for significant air pollution to nearby areas. They frequently generate heavy metal pollution, including lead, zinc and aluminium oxides. Because of their relatively unregulated structures, lack of management and supervision, craft villages are often the greatest sources of pollution in rural areas. As such, they are often classified as hotspots of pollution, although the diversity in the production of craft villages means that not every craft village is considered a "pollution hotspot."

In recent years, Viet Nam has become increasingly concerned with transboundary air pollution, which originates from sources beyond its political boundaries. According to the 2014 EPI, eight of the 10 poorest performers on average exposure to PM_{2.5} are countries located in East and Southeast Asia. Air pollution, therefore, has become a regional problem within Southeast Asia that countries, including Viet Nam, are starting to collectively tackle. For example, the Initiatives such as the ASEAN Agreement on Transboundary Haze Pollution, signed into effect in 2003, emphasize the need for countries to collaborate to reduce underlying sources of air pollution that travel beyond national borders.

Policies and regulations

Air quality monitoring in Viet Nam is based on national technical standards for ambient air quality (QCVN05: 2013/BTNMT), which specify thresholds for average pollutant concentrations in hourly, 8-hour, 24-hour and annual averages (CEM, 2013). Targets for air quality management are mainly based on Viet Nam's environmental standards, namely national technical standards for ambient air quality (QCVN05: 2013/BTNMT). This regulation specifies the limits of basic parameters including sulfur dioxide (SO₂); Nitrogen dioxide (NO₂), total suspended dust (TSP), PM10, and lead (Pb) in ambient air. Although these regulations apply to continuous monitoring of ambient air quality, not every province in Viet Nam has ground-based monitors (*see Figure 11*).

Figure 11: Air quality monitoring stations

(*Legend: Red circle: automatic monitoring station. Triangle: location of stations; Open red circle: coral reefs.*)



(Source: CEM 2013)

In recent years, efforts to bolster protection for air quality have increased. The legal framework on the protection of air environment has been improved to include enhanced traffic management activities to control and reduce emissions of pollutants from motor vehicles into the atmosphere; control pollution from village operations and industrial manufacturing; and to maintain and promote automatic air monitoring systems.

The Law on Environmental Protection, revised in 2014, also includes provisions on the protection and control of air pollution. The National Strategy for Environmental Protection to 2020 and Vision to 2030 has set a target to improve air quality in urban and residential areas. Regarding emissions in the transport sector, the Government has issued *Decision No. 249/2005/CT-TTg* for application of emission standards in the transportation sector. *Decision No. 49/2011/QĐ-TTg* (2011) specifies a roadmap to regulate emission standards for cars, two-wheeled motor vehicles, and newly imported, assembled vehicles.

Policies in air quality management at provincial level must comply with those at national level. The development of air quality policies in the province is based on national orientation and goals. There are, however, provincially-specific considerations that require adaptation of national policies at the local level. For example, in some big cities such as Hanoi, Ho Chi Minh City, and Da Nang, serious air pollution is due to heavy transport vehicles and industrial parks, though data on breakdown of sources is unavailable. In some provinces such as Quang Ninh and Thai Nguyen, air pollution occurs mainly due to mining operations. Therefore, policies and regulations in air management within these provinces must focus on the control of air pollution in the mining sector. Each province with different characteristics of socio-economic development may have its own management mechanism to address air pollution.

2. International Best Practices for Management

Air pollution and air quality are issues of rising concern across countries that are rapidly industrializing and urbanizing. The growth of cities, in particular, and the increase in private vehicle use is a contributing factor to poor air quality in developing countries. These factors in combination with weak monitoring systems and regulatory frameworks have resulted in poor management of air pollution. In recent years, however, there has been a growing public awareness due to media coverage on poor air quality, which can result in severe respiratory illnesses, especially impacting vulnerable populations including children, elderly, and the poor (*see Box 4 on Gender and Environment in Viet Nam*). Technological advances, such as low-cost air monitors and smart phone technologies, have further allowed groups to provide localized air quality information and alternatives to official data sources (Hsu et al., 2013).

Based on international best practice and data availability, the global EPI has three indicators to assess country-level air quality: 1) household air quality, 2) PM_{2.5} exceedance, and 3) PM_{2.5} average exposure. PM_{2.5} refers to fine particulate matter that is invisible to the naked eye, but are known to cause serious lung and heart complications. Targets for the two indicators on PM_{2.5} exceedance and exposure are set according to World Health Organization guidelines (0% for PM_{2.5} exceedance and 10 µg/m³ for average exposure). The 2014 global EPI uses satellite derived data from Dalhousie University and the NASA Socioeconomic Data and Applications Center. The indicator on household air quality has a performance target of 0% and measures the percentage of people burning solid fuel (or biomass) for cooking and data comes from the WHO Household Energy Database. While these data focus on national level statistics, the performance targets could be downscaled for the provincial level. The potential application of satellite-derived data depends on the granularity of the data and capacity to analyze at the provincial level. Improvement in ground monitoring technology and low-cost sensors could provide opportunities to improve local monitoring systems and ground-truth satellite data.

3. Data, Information, and Statistics

The information to assess the current state of air quality (MONRE, 2013a) is based on monitoring data through provincial environmental monitoring networks overseen by the Viet Nam Environment Administration (VEA). Current environmental monitoring in Viet Nam primarily consists of manual monitoring, ambient sampling, and laboratory analysis (*see Box 7: General Statistics Office: Imputation Methods to Estimate Provincial Air and Water Quality*). Manual monitoring is only conducted between two to six times a year, which does not provide regular monitoring needed to assess health impacts or whether policy interventions to regulate air pollution are effective.

Where ground-based monitoring stations do exist (*see Figure 10*), they assess total suspended dust (TSP), PM₁₀ dust, fine dust (PM_{2.5} and PM₁₀), SO₂, NO - NO₂ - NO_x, CO, O₃, and lead (Pb).

Air quality is evaluated on the basis of whether the concentration of pollutants exceeds certain thresholds based on 1 hour, 8 hours, 24 hours (day) and yearly averages, according to the national technical regulations *QCVN 05: 2013 / MONRE* - National Technical Standard on ambient air quality. Viet Nam has further established an Air Quality Index (AQI) to communicate the health risks associated with various levels of air quality, based on the U.S. AQI. An AQI is a composite index representing a concentration of a group of basic pollutants in the ambient air. AQI values are calculated based on concentrations of SO₂, CO, NO_x, O₃, PM₁₀. The AQI value of each parameter is then calculated as the ratio between the value of parameters observed in comparison with normative values allowed as a percentage. An AQI aggregate value is the highest value of each parameter and is rated according to 5-color scale (*Figure 12*).

Figure 12. United States Air Quality Index categories (US EPA, 2015).

Air Quality Index (AQI) Values	Levels of Health Concern	Colors
<i>When the AQI is in this range:</i>	<i>...air quality conditions are:</i>	<i>...as symbolized by this color:</i>
0-50	Good	Green
51-100	Moderate	Yellow
101-150	Unhealthy for Sensitive Groups	Orange
151 to 200	Unhealthy	Red
201 to 300	Very Unhealthy	Purple
301 to 500	Hazardous	Maroon

Data on air quality are available from the 2013 GSO Environmental Statistics Book, which includes 19 provinces. The data for year 2010 was extrapolated by GSO for all 63 provinces (*see Box 7: General Statistics Office: Imputation Methods to Estimate Provincial Air and Water Quality*). The accuracy and reliability of extrapolated values for air quality, however, is questionable, given the model yields identical values for many provinces (*see Figure 13*).

Currently, the monitoring system of Viet Nam has not expanded to all provinces. Specifically, there are 10 or 11 air quality monitoring stations under management of Ministry of Natural Resources and Environment (Ha Noi, Hai Phong, Ninh Binh, Vinh, Da Nang, Ho Chi Minh, Pleiku, Can Tho, Son La;

and Dong Nai, Vinh Phuc) and 7 automatic monitoring stations managed by the province (Ha Noi, Da Nang, Khanh Hoa, Hue, Phu Tho, Quang Ninh). The air monitoring stations are located at different locations. Figures of one province may assume to be equal to the neighboring province due to the fact that air monitoring stations are located close to those provinces.

4. Assessment of Gaps and Recommendations

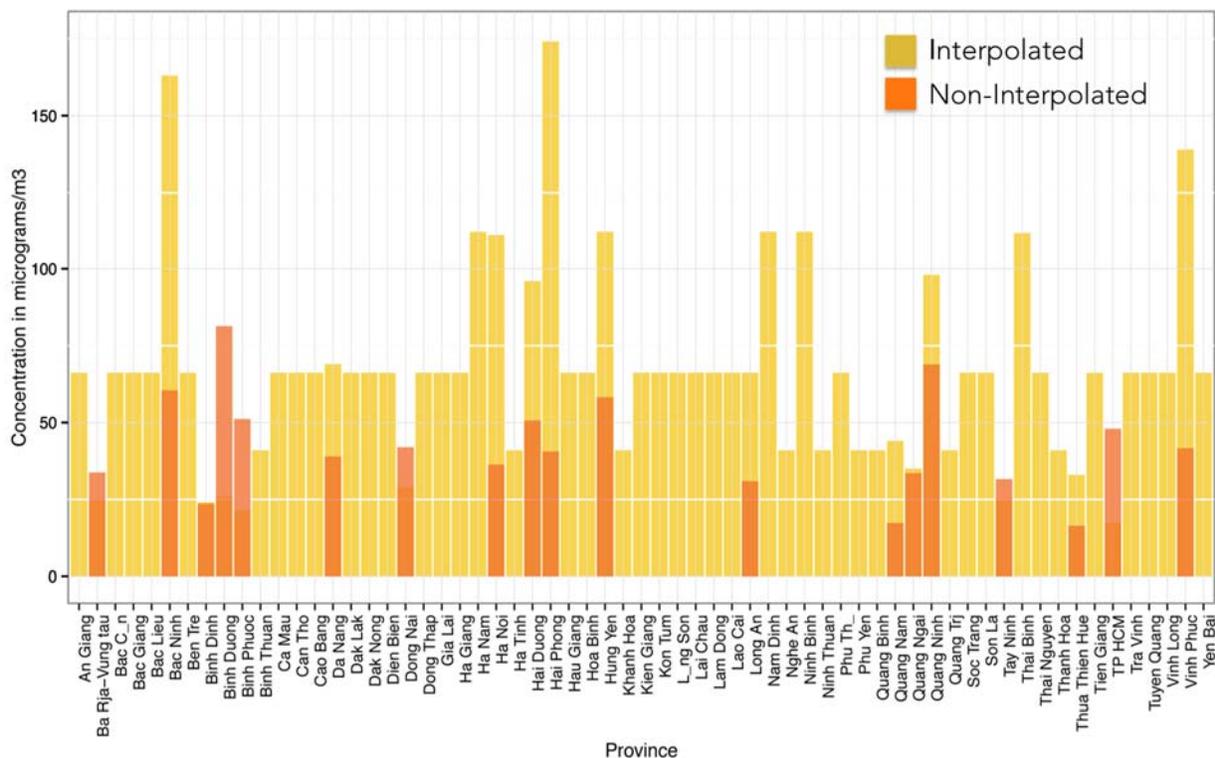
Two indicators to assess air quality have been proposed in the Viet Nam EPI framework:

- 1) Outdoor air quality - population-weighted SO₂, NO₂, and TSP;
- 2) household air quality – the percentage of households burning solid fuels indoors.

Data to assess household air quality at the provincial level currently does not exist, according to the results of the gap analysis. For the population-weighted pollutant indicators, ground-based monitoring data does not exist for all 63 provinces. The gap analysis, however, did reveal data available for all provinces based on the GSO's interpolation of missing data for provinces missing values for SO₂, NO₂, and total suspended particulates (TSP) (*see Box 7*). Because monitoring stations are only found in 19 out of Viet Nam's 63 provinces, more than two-thirds of provinces only have estimated data. As illustrated in Figure 13, interpolation yields around half of all provinces having identical values – a questionable result given different industrialization and urbanization rates in provinces.

We therefore recommend one of three approaches: either the improvement of imputation models to take into account local differences in urban populations, industrialization rates, and fuel mixes, to name a few factors; 2) the use of satellite-derived estimates of air pollution to provide a baseline of long-term exposure trends in provinces; or 3) the use of low-cost, passive air pollution monitoring to collect rapid baseline data. All of these recommendations could be implemented through further piloting phases of the Viet Nam EPI.

Figure 13. Non-interpolated (orange) versus interpolated (yellow) NO₂ data at the provincial level.



Source: GSO National Environmental Statistics, 2013.

Table 4: List of provincial and air monitoring stations

No	Province	Air monitoring stations	No	Province	Air monitoring stations
1	Ha Noi	Residential areas (Ha Dong) ; Streets (Phung Hung, Ha Dong) Industrial areas (Thang Long, Dong Anh)	11	Quang Ngai	Residential areas (Dung Quat, Binh Son); Street (Quang Trung – Hung Vuong, Quang Ngai city); Industrial areas (Quang Phu, Quang Ngai city)
2	Vinh Phuc	Residential areas (Vinh Yen city); Industrial areas (Quang Minh, Me Linh)	12	Binh Dinh	Residential areas(Nhon Hoi, QuyNhon city); Industrial areas (Phu Tai, QuyNhon city)
3	Bac Ninh	Residential areas (Bac Ninh city); Street (Bac Ninh city); Industrial areas (Tien Son, Tu Son)	13	BinhPhuoc	Residential areas (Dong Xoai Town); Industrial areas (Minh Hung, Chon Thanh)
4	Quang Ninh	Residential areas (Ha Tu, Ha Long city) Street Cao Thang Street, Ha Long city); Industrial areas (Cai Lan, Ha Long city)	14	TayNinh	Boader-gate economical areas (Moc Bai, Ben Cau); Industrial areas (Trang Bang)

5	Hai Duong	Residential areas (Trang Hung Dao, Hai Duong city); Street (Dien Bien Phu, Hai Duong city); Industrial areas (Dai An)	15	Binh Duong	Residential areas (Binh An, Di An); Urban industrial areas (My Phuoc, Ben Cat); Industrial areas (Song Than, Di An)
6	Hai Phong	Industrial areas (Nomura, An Duong); Industrial areas (Vat Cach)	16	Dong Nai	Street (City Square, Bien Hoa city)
7	Hung Yen	Residential areas (Pho Noi, My Hao); Industrial areas (Pho Noi A, My Hao)	17	Ba Ria-Vung tau	Street (Vung Tau city); Industrial areas (My Xuan A, Tan Thanh)
8	Thua Thien Hue	Street (Thach Han, Dong Ba, Hue city); Market (Dong Ba); Industrial areas (Chan May, Lang Co)	18	TP HCM	Reserved areas (Can Gio); Street (BinhPhuoc, Thu Duc); Industrial areas (HiepPhuoc, NHa Be)
9	Da Nang	Residential areas (Ly Tu Trong, Hai Chau); Street (Tran BinhTrong, Hai Chau); Residential areas (Hoa Khanh, Lien Chieu)	19	Long An	(Duc Hoa Town); Industrial areas (Thuan Dao, Ben Luc)
10	Quang Nam	Residential areas (Ky Ha, Nui Thanh); Street (Tran Phu, Hoi An town); Industrial areas (Dien Nam, Dien Ngoc, Dien Ban)			

Box 7. General Statistics Office - Imputation Methods to Estimate Provincial Air and Water Quality

Imputation method from GSO for outdoor air quality and water quality:

-Method of data collection: Traditionally, field or ambient samples of air quality are taken from a number of observation stations covering several provinces and analyzed within a laboratory. This sampling technique, however, is limited in that it is not continuous and is only applied at certain times of the year. Some intermittent air pollution events could be missed using this sampling method, and it is no substitute for continuous emissions monitoring. Similarly for water, a sampling method combined with modeled interpolation is used to estimate Biological Oxygen Demand (BOD), a measure of the amount of dissolved oxygen needed by aerobic biological organisms to break down organic material present.

-Method of imputation for provinces lacking observation stations:

GSO imputed 5 indicators for provinces without observation stations:

content of NO₂, SO₂, dust in the air,

content of BOD, total suspended particulates (TSS), of coliform in water.

For each of the indicators, a regression model was developed to estimate concentrations of each pollutant, given a set of independent or explanatory variables. For example, the content of dust in the air in a province without observation station was estimated as follows:

First, a regression model for dust was built in provinces with observation stations based on the correlation between dust and content of SO₂ in the air, content of NO₂ in the air and total amount of solid waste generated (although a model using fossil fuel combustion would be more relevant, considering NO₂ and SO₂ results from the use of fossil fuels):

$$dust = \beta_0 + \beta_1 waste + \beta_2 NO_2 + \beta_3 SO_2 + \delta$$

The model produced regression coefficients β_i as follows:

$$dust = 388.32 + 0.077 waste - 1.52 NO_2 + 1.36 SO_2$$

Table 5: Recommended indicators, targets, and data sources to evaluate air quality in Viet Nam.

Problem Statement	Indicator	Target	Data Source
Reduce air pollution in both outdoor and household sources.	Outdoor air quality – population-weighted SO ₂ , NO ₂ , and Total Suspended Particulates	QCVN - National standard on air quality	CEM, MONRE, MOC, MOIT
	Household air quality - Percentage of Households Burning Solid Fuels Indoors	0%	GSO
	<i>Average Fine Particulate Matter (PM_{2.5})</i>	10 micrograms/m ³	independent, satellite-derived

(Aspirational indicators are identified in italics. For a full list of indicators proposed in the Viet Nam EPI, see the Annex.)

c. Waste

1. Current Status

Waste management first became a concern for the Vietnamese government during the 1970s and 1980s. These early models of waste management were relatively simple and focused primarily on the collection and disposal of waste arising from domestic households. With the industrialization and modernization of the country, waste volumes – both from residential and industrial areas – grew in proportion, driven in large part by the rapid development of Viet Nam’s agriculture, livestock, tourism, and services sectors (CEM, 2011). The rise in waste volumes has been harmful to the country’s environment. Addressing these negative side effects of economic growth will require effectively managing both domestic household solid waste and waste products from industry, the healthcare system, and agriculture. To that end, Viet Nam has developed a detailed system of policies and legal documents to deal with the increasingly complex challenges of waste and wastewater management.

Policies and regulations

At the national level, waste management practices are guided by a variety of strategy documents and legal decrees. For example, the National Strategy for Socio-Economic Development mandates that all industries and firms must either be fully equipped with clean technologies or must engage in adequate waste treatment and pollution mitigation practices. It further requires that all industrial parks and export processing zones have centralized wastewater treatment systems.

Meanwhile, the National Strategy on Integrated Management of Solid Waste calls for 85% of household solid waste to be recycled, reused, or recovered for energy – a goal that is reaffirmed in other key strategy documents, such as the National Strategy on Climate Change and the National Strategy on Environmental Protection. Complementing this residential waste management goal, Viet Nam aims to have 95% of the nation’s industrial parks and export-processing zones, as well as 70% of its urban centers (of grade IV or higher), contain “satisfactory” centralized wastewater treatment systems. The country has also outlined some wastewater targets, including a commitment to reuse 20-30% of its wastewater for plant watering, street cleaning, and other needs in urban and industrial areas.

Viet Nam has taken some concrete steps towards achieving the above objectives. For example, the Prime Minister’s Decision No.50/2013 /QD-TTg defined a series of regulations on the collection and processing of waste products. Notably, this legal document made firms responsible for the recovery and handling of waste that arises from the products that they sell on the market. Importantly, this firm mandate covers a variety of potentially hazardous goods, such as batteries; electronic equipment; industrial, agricultural, and medicinal chemicals; and oil, lubricants and vehicles. Other policies and decrees have also worked to facilitate and promote recycling activities (LEP 205, Decree No. 59/2007 / ND CP dated 09/4/2007 of solid waste management and Decree No.04/2009/ND-CP dated 14/01/2009 on incentives and support in environmental protection activities.)

At the same time, the country has focused on improving the management of its landfills. For instance, in 2008 the Prime Minister approved the construction plan of solid waste treatment areas in three key economic zones of northern, southern, and central Viet Nam. More recently, the government announced plans to develop solid waste treatment zones in the Mekong Delta (Decision No.1873/QD-TTg dated October 11, 2010).

Policies and regulations at provincial level

Waste management policies and regulations at the provincial level have been developed to be consistent with national policies. Objectives in waste management at the provincial level tend to be at least as strict as, if not stricter than, national targets. Case in point: while the National Strategy for Environmental Protection has set a target of collecting 90% of urban solid waste by 2020, NinhBinh province has set a 2020 target rate of 90% and the province of Bac Ninh is working towards a target rate of 95%. Due to differences in socio-economic development characteristics and waste volume, each province tends to use different measures of waste management.

At the provincial level, waste management policies have focused mainly on large cities and areas with highly developed industrial parks. For example, urban waste has been a major concern for densely

populated cities such as Hanoi, Ho Chi Minh City, Hai Phong, and Da Nang. In contrast, few policies address issues of rural waste management. As a result, rural waste is typically untreated and disposed of in open dumps.

2. International Best Practices for Management

Waste is not included in the global EPI, largely due to the lack of globally available data. Specifically, the diverse set of local institutions and actors, both public and private, involved in waste management in cities and countries around the world make coherent and comparable datasets unlikely. Additionally, the role of the informal sector in waste and recycling management, particularly in developing countries, makes waste data difficult to measure and track. The informal waste economy, along with the high costs of centralized waste management systems often means that informal settlements and slums are not serviced (UNEP, 2002).

Despite the importance of local context in evaluating waste management, there are several indicators used to evaluate waste management. As a basic indicator, cities might track the percentage of solid waste collected with the goal of having 100% of households serviced. Additional indicators could examine the efficiency of waste collection efforts, in terms of time and expenses, and the percentage of waste treated. Regulations for hazardous and toxic waste removal and treatment, discussed under the international Basel Convention, are of particular concerns as they have great potential impact on human and ecosystem health. International conventions, including Basel, Stockholm, Rotterdam, have specific provisions that deal specifically with cross-boundary waste issues (EPA, 2013).

3. Data, Information, and Statistics

There is currently no data available across all provinces in Viet Nam regarding waste. Data on waste are only available at the national level. In principle, through the NSIS's collection of statistics on water and sanitation, Viet Nam should have indicators on waste, as described in Table 4. In reality, the gap analysis conducted for the Viet Nam EPI revealed that these data are not available. To account for these gaps in data availability, the GSO estimated solid waste generation using data from the 2004 National Report on the Environment and annual population data for waste indicators considered for the Environmental Sustainability Index (ESI) indicators in the NSIS.

These estimates were calculated as follows:

- Hà Nội: 1 kg/person/day in urban areas and 0.9 kg/person/day in rural areas
- Đà Nẵng: 0.9 kg/person/day in urban areas and 0.7 kg/person/day in rural areas
- HCM: 1.3 kg/person/day in urban areas and 1 kg/person/day in rural areas
- Other provinces Cities: 0.7 kg/person/day in urban areas and 0.3 kg/person/day in rural areas

Table 6: Waste indicators proposed in the NSIS.

ID in NSIS	Group, name of indicator	Main disaggregation	Agency in charge of collection and aggregation
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2118	Rate of urban areas, industrial zones, export processing zones disposing solid waste, waste water in accordance with corresponding defined national criteria/standards	Type of urban, province/city	- Leading: Ministry of Construction - Coordinating: Ministry of Natural Resources and Environment
2119	Rate of harmful waste disposed in accordance with corresponding defined national criteria/standards	Type of waste, province/city	- Leading: Ministry of Natural Resources and Environment - Coordinating: Ministry of Industry and Trade, Ministry of Health
2120	Rate of waste water of establishments disposed in accordance with defined standards	Type of waste water, province/city	- Leading: Ministry of Construction - Coordinating: Ministry of Natural Resources and Environment
2121	Rate of collected solid waste treated in accordance with corresponding defined national criteria/standards	Type of solid waste, province/city	- Leading: Ministry of Construction - Coordinating: Ministry of Natural Resources and Environment

4. Assessment of Gaps and Recommendations

There currently does not exist enough data at the provincial level to calculate any of the three indicators included in the Viet Nam EPI framework:

- 1) Solid waste collected at urban areas;
- 2) Number of urban areas with the capacity to treat waste;
- 3) Percentage of solid waste treated.

As such, these three indicators are considered “ideal” measures and provide a roadmap for provinces to aspire towards and understand what systems should be put in place to collect relevant data. Because these three indicators are primarily focused on urban areas, data collection efforts should be targeted towards cities within provinces, although rural waste management is another important environmental issue. Processes to collect information regarding the amount of solid waste collected, the number of urban areas within a province with waste treatment capacity, and ideally, what percentage of solid waste is then treated at each facility, are needed next steps to be able to actualize these waste indicators.

Due to the lack of data available at the provincial level regarding waste, proxies or estimations similar to the GSO’s estimation of solid waste generation could be developed as a first step in a pilot Viet Nam EPI. As a very crude proxy, one could rely on the share of commune health stations that require the collection and treatment of medical waste. The GSO’s Annual Enterprises Survey could also be used to interpolate waste collection and treatment rates at the provincial level.

Table 7: Recommended indicators, targets, and data sources to evaluate solid waste collection and treatment in Viet Nam.

Problem Statement	Indicator	Target	Data Source
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Significantly reduce solid waste	Percentage of solid waste collected at urban areas	90% by 2015; 95% by 2020 (Nat Env Strategy)	MOC
	Number of urban areas w/ capacity to treat waste	No target identified	MOC
	Percentage of solid waste treated	No target identified	MOC

(For a full list of indicators proposed in the Viet Nam EPI, see the Annex.)

OBJECTIVE: ECOSYSTEM HEALTH

d. Land

1. Current Status

While Viet Nam has constructed an extensive legal framework for land ownership, regulation of land use remains relatively underdeveloped. For example, the country's main Land Law (2003) only briefly mentions land use issues when it "prohibits any activities regarding destruction of land, including terrain deforming, causing deterioration of land quality, soil pollution or diminishing the possibility of using land for the determined purposes." Commitments to improving soil and land quality can also be found in the Law on Environmental Protection (Section 3 of Chapter VI), and the National Strategy for Environmental Protection aims to rehabilitate contaminated land, ensure efficiency and sustainability in land use, address the loss of agricultural land due to conversion of land for urbanization or residential purposes, and combat land degradation and desertification. Other land-use planning goals – such as ensuring national food security and maximizing the potential of land resources to meet the nation's modernization needs – are outlined in the National Land Use Planning document. Importantly, while this land use plan provides allocation of land for various purposes, it fails to specify locations for specific land uses. For example, if a province wants to allocate land for an industrial park, spatial considerations are not necessarily taken into account.

The government has also issued a variety of technical regulations regarding soil contamination (mainly from industrial and agricultural production). For example, the country has developed national technical standards on permissible limits of heavy metals in the ground, as well as on residues of in plant protection chemicals soil.

Policies and regulations at provincial level

Land quality management policies at the provincial level are similar to their national counterparts. However, due to regional differences in natural and population characteristics, land policy priorities tend to vary across provinces. For instance, in mountainous areas, land management regulations often focus on the prevention of erosion and landslides, rather than on pollution. In the delta, however, management practices are targeted on slowing the loss of agricultural land to urban or other land-uses and reducing the pollution caused by pesticides. Moreover, in coastal regions, policies and regulations are primarily concerned with preventing salinization, slowing desertification, and maintaining and restoring mangrove forests. Additional research is needed to determine the priorities of specific provinces in regards to agriculture and challenges of erosion and contamination.

2. International Best Practices for Management

Adequately feeding humanity will require a 69% increase of global food calorie availability by 2015 (WRI, 2013). This is putting significant pressure on the agriculture industry to increase its performances through cropland intensification and expansion. Poor agricultural practices are already responsible for a significant amount of land degradation, and the need for increased crop yields may further decrease the amount of arable land available for cultivation. However, means of assessing land degradation are few and far between. In 2010, the Global Land Degradation Assessment attempted to develop an indicator that

measured soil quality using landscape productivity. Unfortunately, the EPI deemed the data and methodological uncertainties inherent in this indicator too great to be of substantial value.

In lieu of a direct measure of soil quality, the global EPI is developing proxy indicators (*see Table 7*). These look at nitrogen and phosphorus use efficiencies and surpluses. Nutrient use efficiency is defined as the proportion of total amount of nutrient (N or P) in crops produced in relation to the total amount of nutrient used to produce those crops. Targets have yet to be explicitly defined, but experts suggest either aiming for an aspirational but biologically impossible goal of 100%, or a more realistic window of 50-70%. Nutrient surplus is simply the amount of nutrients available to escape into the environment after crop harvest. Data for these indicators are compiled from FAO databases and spatially explicit modeling tools developed by Zhang et al. (*in review*). Other indicators that have significant potential if their databases were geographically and temporally expanded include soil management (as a % of arable land under soil conservation practices), salinization (as a % of farmland affected by salinization), and soil organic matter content. Certain OECD countries have begun using these indicators, but their methodologies, targets, and datasets are not yet standardized at a global scale.

Table 7: Draft global indicators for soil quality and agriculture

Indicator	Definition	Target	Source	Notes
Soil management	Share of arable land under soil conservation practices	100%	OECD (2013)	Insufficient data for global use
Salinization	Share of irrigated farmland affected by salinization	0%	FAO - AQUASTAT	Insufficient time series
Soil organic matter	Organic matter content in topsoil	Needs defining	African Soil Information Service (AfSIS); ISRIC - World Soil Information; ICRAF	Insufficient data
Nitrogen use efficiency	N in crop yield / total N inputs	50-70% or 100%	FAOSTAT; Zhang et al. (<i>in review</i>)	Not universally relevant, still requires development
Nitrogen surplus	N not incorporated into crops	0	FAOSTAT; Zhang et al. (<i>in review</i>)	Not universally relevant, still requires development
Phosphorus	P in crop yield /	Needs defining	FAOSTAT;	Not universally

use efficiency	total P inputs		Zhang et al. (in review)	relevant, still requires development
Phosphorus surplus	P not incorporated into crops	Needs defining	FAOSTAT; Zhang et al. (in review)	Not universally relevant, still requires development

3. Data, Information, and Statistics

Data at the provincial level regarding the sustainable use of land is either sparse or unavailable. The National Strategy for Environmental Protection mentions several important measures of land quality use that Viet Nam should track, including:

- The amount of fertilizers and pesticides used per unit of cultivated area;
- Rate of treated and reclaimed areas of land contaminated with dioxin, chemical and pesticide residues and other pollutants;
- The percentage of land area that has been degraded or has been lost to desertification; and
- The ratio of sown area to cultivated area (i.e., the land use ratio).

It is unclear, however, whether these data exist and if they are available at the national level in Viet Nam. In principle, the NSIS has identified the indicators in Table 8 that relate to land. The data gap analysis showed that data for these indicators are not yet available at the provincial level. Their identification in the NSIS signals that the GSO may have data available in the future.

Table 8: Land-related indicators in the NSIS

ID in NSIS	Group, name of indicator	Main disaggregation	Agency in charge of collection and aggregation
0101	Land area and structure	Using purpose, user, status, province/city	Ministry of Natural Resources and Environment
0102	Change in land area	Using purpose, province/city	Ministry of Natural Resources and Environment
2113	Area of degraded land	Type of degradation, type of land, province/city	Ministry of Natural Resources and Environment
2114	Cultivated area without proper irrigation	Province/city	Ministry of Agriculture and Rural Development

The Circular 02/2011/TT-BKH suggests collecting data on the following measure of soil quality:

- Area of degraded land, or land that is either not capable of cultivation or that characterized by low productivity levels;

In theory, provinces are responsible for land inventory and updating land use maps every 5 years. To date, however, most of the data collected focuses on land use purposes and land ownership, rather than on soil quality.

However, at present, there is only some available data related to soil quality including cost of pesticides, fungicides, herbicides and insecticides for the unit area (ha) of land and cost of fertilizer use per unit of area (ha) of land. Data for the cost of fertilizer use per unit of land indicator is available in all provinces in Vietnam. The expenditure for pesticides and fertilizer use per unit of land area partly reflects the amount of chemicals used in agriculture leading to certain impacts on soil quality.

4. Assessment of Gaps and Recommendations

The proposed Viet Nam EPI Framework identifies several indicators to gauge the environmental performance of land and agriculture practices, including:

- 1) Percentage of rehabilitated land and natural ecosystems;
- 2) Rate of treated and reclaimed areas of land contaminated with dioxin, chemical and pesticide residues and other pollutants;
- 3) Soil quality (e.g., organic content matter)

The lack of data available by which to measure these indicators at the provincial level means that these indicators are aspirational and provide a roadmap for future land indicators. As the data gap analysis demonstrates, severe gaps exist in available provincial-level information on land and agricultural sustainability. Data to evaluate both the Viet Nam EPI indicators and those that the NSIS has identified needs to be collected at the provincial level.

In terms of the indicators for the National Environmental Protection Strategy for 2020 and Vision for 2030, provincial governments may want to consider a tiered approach. The ratio of sown area to cultivated land (i.e., the land-use ratio) is, out of the four identified, the easiest indicator to measure. While the amount of fertilizers and pesticides used per unit of cultivated area appears to be one of the most relevant indicators, the developers of the global EPI have rejected it as an environmental performance indicator, as a measure of the amount of fertilizer and pesticide applied can be misleading. It is not necessarily the case that higher levels of fertilizer and pesticide used signal worse environmental performance, given the highly variable nature of landscapes, soil qualities, climate, and crop types grown across provinces. The percentage of contaminated land that has been rehabilitated indicator may only apply to industrial provinces or those that have areas of contaminated land. Last, while the percentage of land area degraded or lost to desertification is an important indicator, global experience has demonstrated that accurate data by which to gauge land degradation and desertification is particularly difficult to obtain.

Table 9: Recommended indicators, targets, and data sources to evaluate land in Viet Nam.

Problem Statement	Indicator	Target	Data Source
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Rehabilitate contaminated and degraded land.	Rate of treated and reclaimed areas of land contaminated with dioxin, chemical and pesticide residues and other pollutants.	Reduced by 20% from 2010 level by 2015; reduced by 50% from the 2010 level. 2010 level: 255,000 m2 polluted w/dioxins; 335 sites of agrochemical residues. (National Strategy)	Rehabilitate contaminated and degraded land.
	Percentage of Rehabilitated land and natural ecosystems	Increase by 30% from 2010 level by 2015; increase by 50% from 2010 level. (National Strategy)	
	<i>Soil quality</i>	No target identified	
	<i>Desertification</i>	No target identified	

(Aspirational indicators are identified in italics. For a full list of indicators proposed in the Viet Nam EPI, see the Annex.)

e. Biodiversity and Habitat

1. Current status

According to Viet Nam's 5th National Report to the United Nations Convention on Biological Diversity (CBD, 2014), main threats to biodiversity include: 1) inappropriate conversion of land from forests and wetlands for urbanization and agricultural purposes; 2) overexploitation of natural resources to meet consumption demands; 3) environmental pollution and climate change, and 4) limited resources for conservation. Additional drivers of habitat loss include mining and hydropower developments and biodiversity is further affected by the illegal extraction, hunting, and trade of wild animals and plants.

The quality of forest habitat is decreasing, despite increases in forest coverage, which is mostly the result of an increase in production forests. Habitat loss is particularly severe in the case of mangroves, which are critical habitats within Vietnam and comprise 4.8% of the global total mangrove habitat. Weak management agencies and fragmented approaches have limited government capacity to address biodiversity and habitat loss. Rapid socioeconomic development has resulted in the failure to prioritize the management of critical natural habitat.

Policies and regulations

Over the past three decades, Viet Nam has taken steps towards conserving its habitat and biodiversity. In 1988, the country joined the Ramsar Convention (1975) for wetland conservation and has since established the Xuan Thuy Wetland Reserve to protect bird migration. In 1993, Viet Nam officially ratified the United Nations Convention on Biological Diversity (1992) and, in the following year, joined the Convention on International Trade in animals of endangered species of wild fauna and flora (CITES, 1973). During this time, the country demonstrated its commitment to conservation goals by establishing nature reserves, recovering degraded ecosystems, protecting endangered species, restricting and managing actions that degrade biodiversity, and developing and implementing national development strategies and action plans for the conservation and sustainable use of resources within and outside of protected areas.

Currently, Viet Nam has created 164 special-use forest reserves, including 30 national parks, 58 natural reserves, 11 protected areas of species and habitats, 45 landscape protected areas, and 20 forests for experiments and scientific research. In total, these special-use forests cover 2.2 million hectares. By 2020, the Prime Minister's Decision No. 1976 has specified a goal to expand the area of special-use forests to 2.4 million hectares and 176 reserves (34 national parks, 58 natural reserves, 14 species and habitats protected areas, 61 landscape protected areas, and 9 forests for scientific research and experiment.)

For other ecosystems, the state has conducted planning for 16 marine protected areas and 45 protected areas in inland waters. In addition, the national system contains 8 biosphere reserves, 2 world natural heritage areas, 5 ASEAN heritage parks and 6 Ramsar wetlands that are internationally recognized (Hung, 2015).

Policies and regulations at the national level

The Biodiversity Action Plan (NBAP) of 1995 stands as the cornerstone of Viet Nam's natural resource and biodiversity conservation efforts. In 2007, the Government approved the National Biodiversity Action Plan through 2010 (vision through 2020). This Plan calls for the implementation of the

Convention on Biological Diversity and Cartagena Protocol on bio-safety to strengthen state management of biodiversity and bio-safety. In general, the Vietnam NBAP targets were consistent with the strategic goals of the CBD. Certain specific targets, however, in NBAP 2007 were not fully compatible with the CBD's targets and vice versa. For example, sub-target 11 of CBD urges developed countries to assist the supporting and developing approaches in relation to financial and technical issues and because this target does not apply to Viet Nam, it is not included in the NBAP. In 2008, Viet Nam adopted its very first Law on Biodiversity, which, among other things, regulates the rights and obligations of individuals and households to protect biodiversity.

On July 31, 2013, the Prime Minister signed Decision No. 1250, which approved a National Biodiversity strategy to 2020 and vision to 2030 (NBSAP, 2013). The overall objectives of the strategy are to:

- conserve important natural ecosystems;
- ensure that endangered, rare and precious species, and genetic resources are preserved and sustainably used;
- contribute to the development of the green economy;
- and actively respond to climate change.

Introduced with the NBSAP were a series of specific conservation strategies, including the creation of a Vietnamese marine protected planning system and a management system of special-use forests and inland waters. Conservation and biodiversity have also surfaced in other environmental plans, such as the National Strategy for Environmental Protection and the National Strategy on Climate Change.

The 2013 NBSAP is an improvement upon the previous 2007 NBAP in that it has been amended to be more responsive to the current situation of biodiversity and habitat protection in Viet Nam (MONRE, 2013b). It includes a focus on the expansion and improved management of terrestrial protected areas (TPAs) and marine protected areas (MPAs). The NBSAP also outlines goals to:

- cooperate with neighboring countries in biodiversity conservation;
- prioritize conservation of ecosystems which are of national and international importance;
- conserve native, rare and precious species;
- sustainably use and implement reasonable mechanisms for sharing the benefits from biodiversity ecosystem services;
- control negative impacts on biodiversity (including land use conversion, unsustainable farming practices, pollution, illegal hunting, trafficking and consumption of wildlife, invasive species control);
- plan for and preserve biological diversity in the context of climate change.

Policies at provincial level

Following the enactment of the 2020 biodiversity master plan, most provinces have developed their own local-level biodiversity conservation plans. While provincial policies on biodiversity and habitat should be derived from national-level policies and strategies, they often differ from each other in terms of priorities and scope. These differences reflect provincial-level variation in natural conditions and socio-economic characteristics. For instance, 40 percent of the Kon Tum province contains resource-rich

forests, much of which are special use forests, meaning forested areas that are under protection according to Viet Nam's Law on Forest Protection and Development (Article 10, Law of the Land, 2013; MOJ, 2004). Reflecting this high natural endowment of forests and special-use forests, the province's Plan for conservation and sustainable development focuses on protecting forest ecosystems and the genetic resources of animals and plants, as well as harnessing the forests' potential to promote economic development and improve the quality of human life. In contrast, hydropower projects have shaped Son La's ecosystems, affecting biodiversity and water resources. Accordingly, Son La's resolution on biodiversity conservation has focused on strategies for increasing biodiversity while simultaneously protecting and securing water storage in Son La's hydropower lake and HoaBinh's hydroelectric lake.

2. International Best Practices

Biodiversity is rapidly declining across the globe. Current rates of species extinction are between 1,000 and 10,000 times greater than the background rate – or the extinction rate that would naturally occur in the absence of humans (Chivian and Bernstein, 2008). In fact, the world has not experienced a species die-off of this magnitude since the loss of the dinosaurs (Kolbert, 2014), and some researchers predict that as many as half of all species could be extinct by 2050 (Thomas et al., 2004).

Habitat destruction (e.g., land conversion for agriculture), exotic species invasions, and climate change are the key drivers of this extreme biodiversity loss (Isbell, 2010). Importantly, while the pressures of economic growth have reduced the richness of life on this planet, declines in biodiversity have likely, in turn, negatively impacted human prosperity. In particular, mounting scientific evidence indicates that the functioning, resilience, and stability of ecosystems often depend critically on species richness and composition (Isbell, 2010).

The EPI uses several indicators to track countries' performance on biodiversity conservation. Specifically, the Critical Habitat Protection indicator measures the share of Alliance of Zero Extinction (AZE) sites – or areas of habitat that have been identified by the AZE as irreplaceable for highly endangered species – that are partially or completely protected by a country. Since AZE sites constitute the last refuge of one or more of the world's most highly threatened species, a target rate of 100% is set for this indicator.

The EPI also includes two broader measures of habitat and biodiversity conservation, namely: Terrestrial and Marine Protected Areas. The first measures a weighted percentage of each terrestrial biome (e.g., forests, grasslands) that is protected within a country. Different weighting schemes are used to assess the national and international significance of conserving a particular biome. For example, tropical forests may represent 5% of a country's land area, but less than 1% of the world's temperate conifer forests. In this case, conserving these forests would constitute a high conservation priority for the country (given their rarity within the country), but less of a conservation concern for the world (given that they represent only a small share of conifer forests worldwide.)

The counterpart to the Terrestrial Protected Areas indicator is the Marine Protected Areas indicator, which estimates the share of a country's exclusive economic zone (EEZ) that is protected. Even though most marine protected areas lie within territorial waters (i.e., 0 to 12 nautical miles from land), this EPI indicator is intentionally constructed using EEZs because a variety of important marine habitats exist only in EEZs, including deep-sea trenches and submarine canyons. Following protection goals established by

the Convention on Biological Diversity, target rates for Terrestrial Protected Areas and Marine Protected Areas are pegged at 17% and 10%, respectively.

In theory, these EPI indicators on habitat and biodiversity can be adapted to measure conservation progress at the local or provincial level. For instance, Terrestrial Protected Areas might measure the share of a province's biome that is under protection, while Marine Protected Areas might capture the percentage of a coastal province's EEZ that is protected. Depending on a country's data collection capacity, more fine-grained measures of local biodiversity, such as number of species or number of endangered species residing in a province, could also be developed to track conservation efforts.

3. Data, Information, and Statistics

Data are available at the provincial level regarding the area protected for biodiversity or habitat conservation. Each reserve or protected area in Viet Nam is responsible for collecting relevant data – such as acreage and the number and protection status of animals and plants – for their jurisdiction. At the provincial level, the Department of Natural Resources and Environment is responsible for collecting data and reporting to the Viet Nam Environment Administration (VEA, under MONRE). In addition, the General Statistics Office is responsible for gathering some relevant conservation data, such as planting forests, including afforestation of Special Use Forests.

MONRE is in charge of collecting data on the share of natural area that is protected to maintain biodiversity. Natural areas are defined to include national parks, species protected areas, forest for cultural and historical conservation, and forest for experiments and scientific research. Importantly, both city- and province-level estimates exist for this indicator. Currently, this measure is used for biodiversity and conservation planning at both the national and provincial level.

Other indicators to gauge biodiversity – such as area of coral reefs or numbers of rare and endangered species -- track progress towards national conservation goals (National strategy for environmental protection till 2020, Vision to 2030). Due to the wide variation of natural conditions among provinces, however, it is difficult to rank local communities according to these indicators. For example, only some coastal provinces have reefs or only some provinces have endangered species of plants or animals. Moreover, data for these statistical indicators are still quite limited.

4. Assessment of Gaps and Recommendations

Based on data availability and relevance, the recommended indicator for inclusion in the Viet Nam EPI is the percentage of protected areas, both terrestrial and marine, in each province. This indicator is also consistent with those used at the national level, globally, to gauge countries' progress towards the Convention on Biological Diversity's goals for terrestrial and marine habitat protection. Because habitat loss is the number one cause of biodiversity loss, conserving habitat and tracking its loss are important goals for countries to adopt. Data are available, reported by the nature reserves themselves and coordinated through MONRE. At the international level, the World Database of Protected Areas (WDPA), coordinated through the UN Environment Programme, also maintains information reported by countries on nature reserves and parks.

Indicators that the Viet Nam EPI may want to consider in the future regard indicators on species loss and whether protected areas established to prevent the loss of critical species are effective. The 2016 global EPI will include first-ever indicators to evaluate countries' ability to prevent the loss of species. These indicators will provide Viet Nam with a national baseline and methods by which to consider the further development of indicators that evaluate the quality and effectiveness of natural parks and habitat protection.

Table 10: Recommended indicator, target, and data source to evaluate provincial biodiversity and habitat protection in Viet Nam

Problem Statement	Indicator	Target	Data Source
Reduce the rate of decline in biodiversity and habitat loss	Percentage of Area protected (Terrestrial and Marine)	10% from 2010 level, which is 2.5 M ha (National Environmental Strategy target)	MONRE; or World Database of Protected Areas (WDPA)

(For a full list of indicators proposed in the Viet Nam EPI, see the Annex.)

f. Forests

1. Current Status

The laws governing state management of Vietnamese forests and forest resources are articulated in three major legal documents: (1) the 1991 Law on Forest Protection and Development, which was later revised in 2004, (2) the Law on Environmental Protection of 2014 (Chapter IV), and (3) the Land Law of 2013. The first, which is considered to be the highest legal document relating to forest resource management in Viet Nam, outlines the government's responsibilities in using, protecting and developing the nation's forested lands, as well as defines the forest rights and obligations of non-State stakeholders. To that end, the Administration of Forestry was created as a sub-unit of the Ministry of Agriculture and Rural Development to manage and oversee Vietnamese forests.

Working within this legal context, the government has outlined several near- and mid-term goals related to forestry management. For example, by 2020, Viet Nam aims to establish and sustainably manage 16.24 million hectares of forested lands and increase the percentage of forest area to 47 percent of total land use, while simultaneously making broad commitments to the conservation of forest biodiversity and to ensuring that the economic benefits of forest resource extraction are widely shared (Viet Nam's National Strategy for Forestry Development 2006-2020). In particular, meeting domestic and export demand for timber and forest products, as well as expanding the livelihood opportunities of forest-dependent communities, are central pillars of Viet Nam's management plan. Finally, under the National Strategy on Climate Change, Viet Nam is taking steps towards accelerating reforestation and afforestation projects.

Policies at provincial level

Forest management policies at the provincial level are largely derived from national forest policies and guidelines created by the Ministry of Agriculture and Rural Development and by the Ministry of Natural Resources and Environment. As such, forest management targets set by provinces tend to be as strict as, or stricter than, those set at the national level. The exception to this rule is national forest coverage rate targets, which are set based on provincial targets.

While province-level forestry management largely take its cue from national policy-setting documents, local forest policies and management targets do vary across provinces to account for differences in forest resources and forest types. For instance, while the Ha Tinh province is aiming for a forest coverage rate of 54%, the Bac Giang province's target is only 43%.

2. International Best Practices for Management

The importance of forests to humans and, more generally, to the environment cannot be overstated. Forest ecosystems are bastions of biodiversity, with tropical forests alone containing as many of half of all known species (CBD, 2001). They also provide a variety of essential ecosystem services, including ameliorating extreme weather events, regulating the hydrological cycle, protecting key watersheds, and mitigating the effects of climate change. At the same time, the direct human benefits of forests are undeniable. Numerous communities across the globe depend directly on forest resources for their livelihoods, and timber production has historically been a critical driver of local and regional economic development.

Despite the critical links between forest vitality, human prosperity, and ecosystem health, unsustainable deforestation is threatening forests around the world. According to one recent study, global forest coverage has fallen, on average, by a startling 11.5 million hectares per year since 2000 (Hansen et al., 2013). This rapid depletion of forests is driven by a number of factors, including urbanization, timber harvesting, agricultural development, and cattle ranching.

The EPI tracks country-level forest management performance using its Change in Forest Cover indicator, which measures the percent change in forest cover between 2000 and 2012 in areas with greater than 50 percent tree cover. Put differently, the indicator captures the net effects of forest loss, reforestation, and afforestation on a country's canopy coverage. Importantly, these estimates of forest change were derived from new satellite remote sensing data (Hansen et al., 2013), meaning that they avoid many of the reporting issues and measurement problems that plague indicators from traditional survey-based datasets, such as the FAO Forest Resource Assessment.

After consulting various experts, it was decided to set the country-level forest performance target at 0 percent, or no net change in forest cover. This no-net deforestation goal, while appropriate for measuring forest management at the national level, may be less applicable at the provincial or local level. For example, in any given year, it may be more efficient for timber-extraction activities and reforestation efforts to occur in geographically distinct regions of a country. That being said, any differentiation of forest cover targets at the local level should be carefully designed so as to not create or exacerbate regional inequalities in tree canopy coverage.

3. Data, Information, and Statistics

Data on provincial-level forest coverage are collected on an annual basis using ground-based surveys and published by the Ministry of Agriculture and Rural Development and the General Statistics Office. This indicator, which specifically measures the share of a province's natural area that is forested, is available for all provinces for the years 2001 through 2012 (Table 2.4.2, page 101, 102, 103, 104; "Environmental statistics in the period 2001-2013 in Vietnam", GSO.)

Data also exist for measuring the percentage of forested areas that are primary forest, or forests with little or no human development.

4. Assessment of Gaps and Recommendations

Data on forests is available at both the national and provincial level, making the calculation of two indicators proposed in the Viet Nam EPI framework possible for all provinces:

- 1) Percentage of forest cover;
- 2) Area of primary forests.

The quality of available data, however, is still an open question. Although data are collected annually using ground-based surveys, the use of satellite data to verify reported data would be a first step in understanding their quality. More research is also needed to clarify how the national target of 40 to 42 percent forest coverage should be allocated appropriately to individual provinces. The Viet Nam EPI team

was not able to fully address the issue of target allocation. One way to address this gap is to survey forestry and policy experts to determine what targets each province should adopt.

Future indicators to evaluate environmental performance in the forestry sector could include measures of forest health and quality. While these indicators have been difficult to define globally, on a smaller, sub-national scale, Viet Nam could pilot collection of novel data to evaluate whether measures to protect forests are leading to improvement or decline in forest health and quality.

Table 11: Recommended indicators, targets, and data sources to evaluate provincial forest protection in Viet Nam.

Problem Statement	Indicator	Target	Data Source
Reduce forest loss and reduction in quality.	Percentage of Forest cover	40% coverage by 2010, 40-42% (2015), 45% (2020) << Target: no loss when allocated to the provincial level. (National strategy)	MARD
	Area of primary forests	no reduction from 0.57 MHa (National strategy)	MARD

(For a full list of indicators proposed in the Viet Nam EPI, see the Annex).

g. Water Quality – Ecosystem Health

1. Current Status

Water resources in Viet Nam are considered diverse and rich (Jolk et al., 2010), including surface water and groundwater in natural water bodies and artificial bodies such as rivers, natural lakes, artificial lakes, wells, and aquifers. There are 16 river basins larger than 2,000 km², 9 of which are considered major rivers, each with a catchment area larger than 10,000 km². The nine major basins represent 80 percent of the country's area and 70 percent of its water resources (FAO). Total renewable water resources are estimated about 891 km³/year. This is higher in comparison with Thailand and Laos, 438.6 km³/year and 333.5 km³/year, respectively (UN Water).

According to recent assessment reports (MONRE, 2013c), surface water suffers from declining water quality, with serious contamination in some areas. Ponds and canals in major cities are used as wastewater dumps and suffer from serious organic pollution that exceeds allowed standards for surface water quality. River sections flow through urban areas, industrial manufacturing sector, mining areas that have been contaminated, and certain water contaminants with concentrations that exceed 1.5 to 3 times compared to the allowed limits. Water quality in all three river basins including Nhue - Day, Cau and Dong Nai river system in Viet Nam has been reduced over the years and pollution parameters are not up to standard, especially for organic pollutants. Underground water quality is mostly adequate, but depletion occurs due to unsustainable exploitation and local pollution in some areas.

Figure 14: Map of water quality monitoring station in Nhue–Day river basin

(Key - *Blue dot*: location of soil quality monitoring; *purple dot*: inland monitoring; *green square*: background monitoring; *red circle*: groundwater; *brown flag*: industrial; *purple triangle*: radioactive.)



(Source: Ha Nam City, <http://hanam.gov.vn/vi-vn/Pages/Article.aspx?ChannelId=64&articleID=241>.)

Policies and regulations

Viet Nam has policies regarding the management, exploitation and use of water resources, including the Law on Water Resources, Law on Environmental Protection, National Strategy for Environmental protection, and National Strategy on Water Resources.

Local authorities have also issued related documents, policies at different levels that depend on the conditions of each region. Recently some provinces announced water resources planning efforts, such as Gia Lai planning till 2025, Quang Ninh planning in the period of 2010-2020 and towards 2030; Dong Nai, Quang Binh planning of water resources by 2020. Plans are under development in other provinces.

Additionally, local authorities enacted related regulations on water resources management (e.g., Quang Ngai, Binh Duong, Ha Tinh, Lao Cai, Da Nang and Bac Giang, Quang Nam, Dak Lak, Ho Chi Minh City, Yen Bai Bac Kan) on mining, extraction costs, use of water resources, discharge of wastewater into water sources in provinces and cities (such as Tuyen Quang and Lam Dong, Hau Giang, Hue, Binh Duong, Tien Giang).

2. *International Best Practices for Management*

As discussed in the framework section, the global EPI distinguishes between water quality issues that affect human and ecosystem health separately. A primary reason behind this is the different ways in which these issues are measured and how indicator design and construction relates to distinct policy actions. Due to the lack of data on freshwater and surface water quality, the global EPI developed the first ever global data set on wastewater treatment as an indicator for water in the ecosystem category. The indicator measures the proportion of wastewater that is collected and treated and sets an ambitious performance target of 100%. The data set synthesized information from a variety of sources including national statistical reports, the OECD, United Nations Statistical Division (UNSD), FAO, as well as inputs from the Pinsert Masons Water Yearbook.

In constructing the data set, the Yale EPI team discovered significant data gaps, which were emphasized by varying definitions on wastewater and treatment. Treatment levels, for example, differed across countries with some making distinction on primary and secondary treatment. The proposed Sustainable Development Goals (SDGs), which are set to replace the MDGs after 2015 include a universal indicator on wastewater treatment. With increased international attention on this issue, the aim is to build consensus around definitions and data collection to improve wastewater treatment.

Although a single global water quality indicator remains elusive, in large part because of the challenge in defining a global “water quality” definition, Srebotnjak et al. (2012) propose an “ideal” water quality metric as part of an effort to develop a Water Quality Index for the 2010 EPI. An ideal water quality indicator would be capable of being defined at multiple levels (e.g., watershed/basin, river, community or national level) that can deliver information and context for decision-makers (e.g., water resource managers, public/private water utilities, policymakers) to:

- identify water quality problems in time and space,

- determine priority areas in water quality and resource management, e.g., the reduction of eutrophication-causing effluents from agriculture into surface water,
- compare water quality at different locations and/or points in time,
- allocate funds and resources more effectively and efficiently to ensure water quality satisfies the requirements dictated by its designated uses,
- enforce water quality standards and regulations,
- inform the public about the status and trends in water quality,
- predict if and how changes in water management are likely to affect water quality, e.g., as a result of land use changes,
- formulate efficient and effective water resource management strategies, and
- supply input to scientific research into the determinants of water quality.

3. Data, Information, and Statistics

Data to evaluate water quality in natural ecosystems faces multiple issues at the provincial level in Viet Nam. Some data are simply unavailable; others may be available at the national level but do not exist at the local level. Other data may be available at the national level and exist for some provinces, but the frequency and timeliness of update are both challenges.

Data on BOD, TSS, and coliform is relatively adequate with 2 data sources from the newly Environmental Statistic Book 2014 (GSO, 2014) and the Environmental Sustainability Index (ESI) GSO's research reports. Twenty-five provinces have reported data on heavy metal concentration in their surface waters, which were below detectable limits or lower than acceptable of national standard for surface water quality (QCVN 08:2008/BTNMT)

According to the Environmental Statistics Book (GSO, 2014), data on BOD, TSS, and coliform is measured from current monitoring stations, but currently only in 25 provinces. In the GSO's ESI research, missing data for the remaining provinces were extrapolated. Because data on chemical oxygen demand (COD) is aggregated from available monitoring stations, it is difficult to disaggregate for provinces.

In terms of heavy metal contamination, a few provinces have reported data. For mercury, seven provinces have data (Ha Noi, Bac Ninh, Ha Nam, Ninh Binh, Thai Nguyen, Binh Duong, and HCM). For Arsenic levels in surface water, the data gap analysis revealed only five provinces have data (Ha Noi, Bac Ninh, Ha Nam, Ninh Binh, Thai Nguyen). For lead in surface water, only seven provinces have data (Ha Noi, Bac Ninh, Ha Nam, Ninh Binh, Thai Nguyen, Da Nang, and Dak Lak).

Table 12: Surface water quality indicators

No.	Indicator	Code	Data source	Targets in related policies

1	Biochemical oxygen demand	BOD	MONRE GSO	National Technical Standard QCVN 08: 2008 on surface water quality: 25 mg/l
2	Total suspended solids	TSS	MONRE / GSO	National Technical Standard QCVN 08: 2008 on surface water quality: 100 mg/l
3	Total coliform	COLI	MONRE / GSO	National Technical Standard QCVN 08: 2008 on surface water quality: 10000 mg/l

4. Assessment of Gaps and Recommendations

With imputation, data for three of the surface-water quality indicators (i.e., BOD, TSS, and Coliform) proposed in the Viet Nam EPI framework are available for all provinces in Viet Nam, although their consistency with actual ambient conditions may not be accurate. Due to limited availability of monitoring stations at the provincial level, most data for these three indicators are estimated. Pilot case studies to collect actual data on BOD, TSS, and Coliform would be valuable to validate the GSO's modeled estimates.

For the heavy metal indicators, similar imputation methods could be used to estimate surface water heavy metal concentrations in other provinces. The Viet Nam EPI should consult water experts within each province to gain a better understanding of factors that affect surface water heavy metal contamination, including relevant parameters like flow rate, distance of water bodies to heavy industry, etc. Given the lack of any data at the provincial level to assess Chemical Oxygen Demand (COD), this indicator can be considered aspirational for future planning purposes.

Table 13: Recommended indicator, target, and data source to evaluate water quality for ecosystem health in Viet Nam.

Problem Statement	Indicator	Target	Data Source
Improve water quality	Surface water quality – Concentration of pollutants (BOD, DO, COD, N-NH ₄ , P-PO ₄ , TSS, heavy metal (mercury, arsenic, lead), coliform)	No targets identified	MONRE

(For a full list of indicators proposed in the Viet Nam EPI, see the Annex.)

5. Conclusions and Recommendations

The process of adapting and designing the EPI framework to fit local contexts is valuable in allowing in-country experts to reflect on priority environmental issues, methods for data collection and management, and the linkages between environmental performance indicators and policy. Combined with lessons learned from the global EPI, this process creates learning opportunities to improve data and metrics by showing what is possible and raising ambition. The global EPI has been replicated and applied at the subnational scale in other places, including China, India, Malaysia, Abu Dhabi, and the Basque Country in Spain.

In the global EPI's 15 years of experience, the developers find that the discussions among policymakers and experts in-country around environmental data and indicators helps move forward environmental management. For example, debates between academics and environmental agencies on global EPI data in New Zealand sparked a country-wide discussion on water quality and the need for more complete monitoring (Hsu, 2013). In Costa Rica and South Korea, media campaigns on EPI data highlighted the importance of environmental issues and need for action. In Egypt and Iraq, environmental agencies used global EPI scores to move other government agencies on environmental data collection, analysis and reporting. Ultimately, the EPI provides a rigorous science-based platform that state and non-state actors can use to advance environmental management and performance. For this reason, the quality and independence of global and sub-national EPIs are of critical importance to building confidence around the EPI process and data.

Overall, this report finds that Viet Nam has an emerging foundation for designing sub-national indicators to track environmental performance. Top-level political leadership and directives for more sub-national indicators to track environmental performance are clear. How provinces may respond and utilize statistical tools like the Viet Nam EPI to implement policy or management changes on the ground is yet to be determined, primarily due to the gaps in data availability that this feasibility assessment has revealed.

Through the Viet Nam feasibility study, the following needs are identified:

Filling data gaps; improving data quality. While environmental data is available, there remains a bias around data collection for large cities. Data at the provincial level greatly varies depending on issue area. In general, data on forests and human health issues are available at the provincial level, though quality is indeterminate, particularly considering much of the provincial-level data for air and water quality are interpolated based on sparse underlying observational data. Alternative data sources, including satellite and low-cost sensors, could help fill data gaps and provide independent assessments around air quality, water quality, and forests. Recommendations for how to address specific gaps for each indicator have been described in each policy category description.

In many cases, gap filling involves implementation of existing national policy directives for provinces to collect data for the National Statistical Indicator System (NSIS) or the National Environmental Strategy. What this mismatch between national policy specifications and actual data availability signals is that implementation of policy is relatively weak in Viet Nam. The process of defining the Viet Nam EPI

framework and gap analysis exercise consistently revealed identification of indicators approved by national government ministries and Parliamentary bodies, but a lack of implementation demonstrated through the unavailability of data at the provincial level. One caveat to note is that the Viet Nam EPI team primarily conducted the gap analysis using national-level sources. Provinces themselves could have additional data for the indicators identified in the Viet Nam EPI. Pilot studies within provinces could bolster the Viet Nam EPI's gap analysis through surveys of data availability within provincial government statistical agencies. Additional research is needed for data on agriculture, food safety, fisheries, solid waste, and climate change.

Coordinating across institutions. A major challenge identified early on in the study is the relationship of a potential provincial EPI to other environmental sub-national indices currently in planning phases in Viet Nam. Aside from ISPONRE's ERI (now Provincial Environmental Performance Index or PEPI, *see Box 8 below*), the GSO also has a mandate to create an annual ESI, the precursor to the EPI, that was also pioneered by Yale and Columbia Universities. While it was agreed that these indices should proceed in parallel but in communication with each other, the proliferation of too many provincial indices could be unwieldy and difficult for governments and authorities to manage.

At worst, a lack of coordination between the various planned indices could result in mixed signals and competing results, particularly if findings are discordant with each other. At best, each could serve a distinct niche to communicate specific findings to provinces. For example, a relationship between a Viet Nam EPI and ERI/PEPI could represent a progression of environmental monitoring and decision-making. Because the ERI/PEPI focuses more on "input"-oriented indicators assessing existing policies, institutions, and financial capacity, while the EPI is primarily interested in assessing environmental quality "outputs," they capture different elements of the policy process. The two indices could therefore serve as natural complements to evaluate how provinces holistically perform on environmental management across different stages of the DPSIR framework. For these initiatives to be successful and complementary, coordination must be prioritized along with the development of mechanisms and platforms for sharing data and results.

Following Mission III, the Yale team and UNDP were asked to write a memo for the General Statistics Office regarding switching from the ESI to the EPI framework. The Viet Nam EPI team recommended that Viet Nam adopt the EPI in favor of the ESI based on the following points:

1. Globally, the ESI has been discontinued since 2005 in favor of the EPI.
2. The EPI identifies clear low and high performance benchmarks, making it easy for provinces to understand what policy goals they should strive for.
3. The EPI's proximity-to-target methodology is a more straightforward, comprehensible approach.
4. The EPI ties more closely to policy solutions than the ESI, which touches on natural resource endowments and background conditions that may or may not relate to environmental performance or policy.
5. SDGs' indicators closely link to policy targets similar to those addressed with the EPI's approach, which makes a strong case for aligning Viet Nam's statistical systems and indicators with the EPI.

The impact of the memo in helping to influence the GSO environmental indicator system has the potential to further raise the profile of the Viet Nam EPI as a useful tool in advancing environmental data and performance in-country.

Box 8: Evolution of the Provincial Environmental Performance Index (PEPI)

At the onset of the provincial-level Viet Nam EPI feasibility study, ISPONRE was nearly two years into the development of the Environmental Reporting Index (ERI). The ERI was mandated to ISPONRE by the MONRE. Initially, the ERI framework presented in November 2014 at the expert workshop during Mission I was focused primarily on management or governance indicators. For example, the number of employees working at provincial DONREs and the budget appropriated for provincial-level environmental management. While this information is important in understanding the capacity and commitment of provincial authorities for environmental management, it does not get at questions of environmental quality or the effectiveness of policies at the local level.

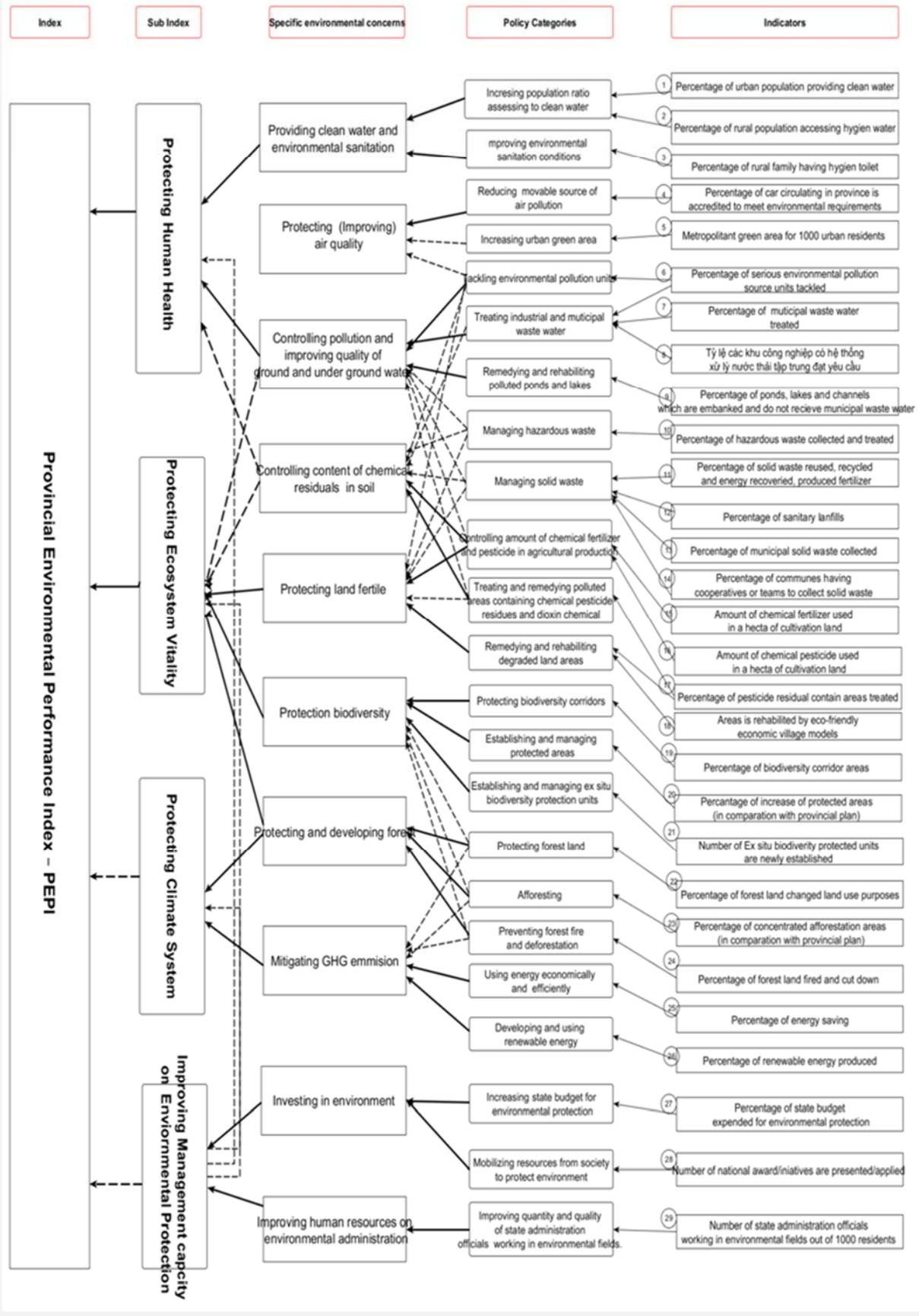
For this reason, the global EPI team recommended that the EPI feasibility study focus on environmental quality or outputs as part of the DPSIR framework. Though there was initial pushback regarding data availability and the feasibility of such quantitative indicators, the global EPI team stressed the need for aspirational goal setting and potential to improve environmental data and management through such an exercise.

During Mission II of the Viet Nam EPI feasibility study in March 2015, a new version of the ERI framework was much closer to the draft EPI framework, with governance indicators removed and an emphasis on quality metrics. This evolution suggests that the Viet Nam EPI process was influential in moving the ERI towards a more quality or output-based metric. The convergence of the ERI with the draft Viet Nam EPI framework was further demonstrated during Mission III in June 2015 when the Provincial Environmental Performance Index (PEPI) was revealed.

The PEPI is the latest iteration of the ERI and has a structure analogous to the EPI, although in addition to the human health and ecosystem vitality objectives, it incorporates two additional categories to assess climate change and environmental governance. It borrows many of the issue areas and indicators from the Viet Nam EPI framework. For example, several PEPI indicators in water, sanitation, and waste are exactly the same as the EPI indicators. PEPI also includes targets on energy, climate change, and pollution hot spots which the EPI initially considered, but did not include because data and policies are aggregated at the national level. Though PEPI does include information on environmental staff and budgets at the provincial levels it remains to see how these metrics will be integrated and transformed into a cumulative ranking or index.

The evolution of the ERI to the PEPI is an encouraging sign that the Viet Nam EPI process has been successful in raising the ambition of environmental management to measure environmental quality more directly. The focus on quality outcomes of environmental policy could help to inspire improved data collection and information disclosure about importance human and ecosystem health priorities in-country.

Figure 1: Indicator framework of provincial Environmental Performance Index



Developing strong social support for statistical policy tools. More research is necessary to more fully explore the social and institutional contexts to answer the why and how of a Viet Nam EPI. Why does Viet Nam need a provincial-level EPI, and how would it work best? For example, is the purpose of the index to promote better management? Is the goal to compare provinces, to name and shame poor performers, or motivate economic competitiveness? Are there political sensitivities that should be taken into consideration when developing tools that will ultimately rank provinces? Different motivations as they relate to indicator design and communication were discussed extensively in relation to the PCI and PAPI.

Before deciding upon indicators and indices, it is important to understand the social and institutional contexts that influence how these statistical tools will be received by policymakers. To implement a Viet Nam Provincial EPI, the following questions need to be answered: 1) what does the national government hope to achieve with so many indices, indicators, and tools; and 2) how will the indicators motivate policy changes. There are a number of ways to design data-driven tools to motivate action. For example, emphasizing information disclosure or market-based mechanisms represent different tools to improve environmental quality outputs. There may also be political sensitivities that need to be taken into consideration when designing the indicators. For example, target identification and ranking were particularly sensitive for Chinese provincial officials in the design of the China EPI framework. Because of these issues, the China EPI developers did not calculate performance indicators for metrics that lacked nationally-defined policy targets, nor were the final indicators assigned weightings or aggregated to produce an overall ranking. Further qualitative analysis is needed to assess the advantages of these different approaches and to determine what policy tools, mechanisms, and which authorities (e.g., government versus non-government) are best suited for the Viet Nam context.

Improving analytical capacity. As sources of data improve and diversify, it is important that officials have sufficient capacity to manage, transform, and analyze the data. Advances in the availability of geospatial tools, including satellite derived, GIS, and open source data, may provide useful for improving technical capacity for mapping and environmental monitoring. Satellite imagery for forests and air pollution can be disaggregated at the provincial scale to provide near real time monitoring of these critical environmental challenges.

Among the national team, there was a strong signal for the need for additional statistical training to improve local analytical capacity. While there were several opportunities during the course of the study for in-person and remote trainings on EPI methodologies, future projects may want to include additional time and workshops for more in-depth trainings. These trainings will be most useful if they are planned in advance and integrated into the objectives and outcomes of the study.

Need for independent evaluation. A major contributor to the global EPI's success is the fact that Yale and Columbia universities are independent academic entities and not government or intergovernmental organizations. If a Viet Nam EPI were developed by an independent entity, data and review can be a powerful tool and potential driver of change in Viet Nam. For example, other quantitative ranking efforts,

like the Viet Nam Chamber of Commerce & Industry's (VCCI) Provincial Competitiveness Index (PCI) has seen much success in achieving its goals primarily because of the “third-party” or outside nature of the VCCI in evaluating provincial government administration. It is important to note that these groups also spend significant time and resources and collecting primary data through surveys and other means. For the Viet Nam EPI to be seen as an independent review, additional resources need to be devoted to new means of data collection, for example low cost sensors and integration of satellite, in order to verify and ground-truth official data sources.

Building momentum. Viet Nam's successful economic growth rates make the country an important case for understanding and improving the linkages between environmental growth and sustainable development. The country has been in the international spotlight for its prioritization of climate change adaptation and green growth strategies. With the onset of the post-2015 development agenda, including the Sustainable Development Goals and Paris climate change agreement, it is important to build on national- and international-level momentum to ensure environmental data and performance systems can accurately and reliably capture the state of the environment in Viet Nam. International, as well as regional developments in these areas may provide opportunities for funding and collaboration. Demonstrating Viet Nam's push towards data-driven environmental monitoring, with projects like the EPI, are a step forward in the country's sustainable development efforts.

Recommendations and Next Steps

To address these findings and build momentum from the Viet Nam EPI feasibility study, this report recommends the following actions:

Developing the Viet Nam EPI: To move beyond the feasibility assessment, next steps to develop the EPI include data grading to assess data quality, identifying appropriate performance targets, determining weightings, and calculate indicators. Prior to and throughout these steps, it is recommended that the framework, data, indicators, and targets be evaluated by a diverse group of environmental experts in-country. Before pilot testing, it is important that the input is received and integrated into the Viet Nam EPI to make it most relevant and useful for the provincial level. Outside expertise can further assist in analyzing key data gaps (i.e., fisheries, agriculture, cities, climate, air pollution) to determine how these environmental challenges will be included in the assessment. Ongoing research efforts, including local case studies and new methodologies, could help inform future data collection.

Implementing pilot studies. Pilot case studies are useful exercises to establish a “proof of concept” and further establish political support for the implementation of the Viet Nam EPI indicator framework. Pilot case studies can be designed to either 1) deepen social and political support for policy-based indicators at the provincial level; and 2) test new methods for data collection that engage low-cost technologies and community-based methods. The study touched upon different options for case or pilots studies for the final report. Ideas proposed included selecting one to two (1-2) provinces to test the framework or testing out one to two (1-2) indicators on key issues areas across all provinces with data. The group seemed to favor the latter option as a way to test the concept of a provincial EPI and better understand environmental outputs across the country, as well as how provinces might receive the framework. Air and water quality were raised as critical issue areas that might be prime candidates to test the indicators because of their importance and attention at a national scale.

Low-cost environmental monitoring to fill data gaps. For other issues that face serious data limitations, the Yale EPI team has identified potential proxy methods to address gaps. Air quality indicators, for example, are particularly lacking for most provinces and cities in Viet Nam. The establishment of fixed ground-based monitors is not only costly but requires continuous maintenance and evaluation. The Viet Nam EPI team therefore has identified alternative, low-cost methods of passive sampling that will allow for a baseline assessment of air pollution exposure in many parts of Viet Nam that do not have any air quality information. Colleagues at the Yale School of Forestry & Environmental Studies and the Yale School of Public Health have developed novel low-cost methods of air quality evaluation for Kathmandu, Nepal, which can be replicated for Viet Nam. Second, satellite data can help fill gaps at the provincial scale. The satellite data used to evaluate forest cover in the 2014 EPI developed by Hansen et al. (2014) can be resampled to evaluate provincial-level forest cover. The Map of Life (www.mol.org) project, also based at Yale University, has species-level protection data that potentially can be scaled to provinces in Viet Nam.

Conclusions

In conclusion, undertaking the Viet Nam EPI feasibility study was a step forward in assessing the state of environmental data at the provincial level. Together, the national and international consultant teams completed a number of exercises to understand the priority issue areas, relevant laws and policies, and available data to assess environmental quality output in Viet Nam. While additional work is needed to fill data gaps and determine performance targets at provincial scale as they link to national policy, significant progress was made.

The Viet Nam EPI team is optimistic that Viet Nam's priority on green growth brings environmental issues and challenges to the forefront of development trajectories. The formalization of the ESI to track environmental sustainability indicators is a strong signal that government has a vested interest in measuring and monitoring environmental performance. Bringing together complementary initiatives on sustainable development and green growth are critical in helping provinces to build capacity around environmental data to ultimately improve their management of environmental resources.

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7. Annex

Table 14: Viet Nam EPI Indicators, Targets, and Data Sources

Viet Nam EPI Indicators, Targets, and Data Sources

Aspirational indicators are identified in italics.

Problem Statement	Indicator	Target	Data Source
Reduce air pollution in both outdoor and household sources.	Outdoor air quality – Population-weighted SO ₂ , NO ₂ , and Total Suspended Particulates (TSP)	QCVN - National standard on air quality	CEM, MONRE, MOC, MOIT
	Household air quality - Percentage of Households Burning Solid Fuels Indoors	0%	GSO
	<i>Average Fine Particulate Matter (PM_{2.5})</i>	10 micrograms/m ³	independent, satellite-derived
Improve water quality and increase the population with access to clean water.	Percentage of urban population using clean water	95% access for urban areas by 2015 (National Strategy)	GSO
	Percentage of rural people that have access to sanitary water	At end of 2015, 85% of rural people need to have access to sanitary water; 45% of them can use domestic water that meets standards	MARD, GSO
	The rate of industrial parks, export processing zones have centralized wastewater treatment system that meet standards	75% by 2015; 95% by 2010	MONRE
Increase the proportion of the population with access to water & sanitation.	Percentage of urban population with access to sanitation	Best performers (but MOH/MOC might have separate targets)	GSO
	Percentage of rural households that have access to latrines	65% of rural households have sanitary latrines by end of 2015 (366 (2012) decision from PM and National Strategy)	MARD, GSO
	<i>Drinking water quality</i>	No target identified	

Significantly reduce solid waste	Percentage of solid waste collected at urban areas	90% by 2015; 95% by 2020 (Nat Env Strategy)	MoC
	Number of urban areas w/ capacity to treat waste	No target identified	MoC
	Percentage of solid waste treated	No target identified	MoC
Reduce the rate of decline in biodiversity and habitat loss	Percentage of Area protected (Terrestrial and Marine)	10% from 2010 level, which is 2.5 M ha (National Environmental Strategy target)	MONRE; or World Database of Protected Areas (WDPA)
Reduce forest loss and reduction in quality.	Percentage of Forest cover	40% coverage by 2010, 40-42% (2015), 45% (2020) << Target: no loss when allocated to the provincial level. (National strategy)	MARD
	Area of primary forests	no reduction from 0.57 MHa (National strategy)	MARD
Rehabilitate contaminated and degraded land.	Rate of treated and reclaimed areas of land contaminated with dioxin, chemical and pesticide residues and other pollutants.	Reduced by 20% from 2010 level by 2015; reduced by 50% from the 2010 level. 2010 level: 255,000 m2 polluted w/dioxins; 335 sites of agrochemical residues. (National Strategy)	MONRE
	Percentage of Rehabilitated land and natural ecosystems	Increase by 30% from 2010 level by 2015; increase by 50% from 2010 level. (National Strategy)	MONRE
	Soil quality (e.g., organic matter)	No target identified	
	<i>Desertification</i>	No target identified	
Improve water quality.	Surface water quality – Concentration of pollutants (BOD, DO, COD, N-NH4, P-PO4, TSS, heavy metal)	No targets identified	MONRE

	(mercury, arsenic, lead), coliform)		
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