Data Article

Data on Indicators used in Southeast Asian nations’ 4th and 5th National Reports to the Convention on Biological Diversity

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A B S T R A C T

The data presented in this article are related to the research article entitled “Progress on National Biodiversity Indicator Reporting and Prospects for Filling Indicator Gaps in Southeast Asia ” (Han et al., 2020). We examined quantifiable information about biodiversity indicators from the most recent two national reports (i.e., 4th in 2010 and 5th in 2015) to the United Nation’s Convention on Biological Diversity (CBD) by the 10-member countries of the Association of Southeast Asian Nations (ASEAN): Brunei Darussalam, Cambodia, Indonesia, Laos, Malaysia, Myanmar, Philippines, Singapore, Thailand and Vietnam. This article presents the number of indicators, their level of development, and detailed lists of indicators for each country, and demonstrates general improvement in indicator use by the highest level of government reporting about implementation of the CBD at the national scale.

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Specifications Table

| Subject                      | Environmental Science (General) |
|------------------------------|---------------------------------|
| Specific subject area        | 1. Management, Monitoring, Policy and Law  
2. Nature and Landscape Conservation |
| Type of data                 | Table                           |
| How data were acquired       | Literature review and document analysis |
| Data format                  | Raw                             |
| Parameters for data collection | Parties to the United Nations' Convention on Biological Diversity (CBD) are required to report every 5 years on both the actions implementing the Convention and the effectiveness of these actions (CBD Article 26). These reports represent the highest level of national government reporting on biodiversity. We chose 10 ASEAN Member States to examine their national reports for this study. |
| Description of data collection | We reviewed the 4th and 5th national reports presented in 2010 and 2015, respectively, to the CBD from the governments of 10 ASEAN Member States (one Southeast Asian country, Timor Leste, is not an ASEAN Member State and is excluded from our analysis), and extracted quantifiable information regarding the use of biodiversity. We identified indicators, counted their numbers, evaluated their level of development, and presented the detailed list of these indicators for each country by Tables included in this paper. |
| Data source location         | Ten member countries of the Association of Southeast Asian Nations (ASEAN): Brunei Darussalam, Cambodia, Indonesia, Laos, Malaysia, Myanmar, Philippines, Singapore, Thailand and Vietnam |
| Data accessibility           | With the article                |
| Related research article     | Xuemei Han, Michael J.Gill, Healy Hamilton, Sheila G.Vergara, Bruce E.Young. 2020. Progress on national biodiversity indicator reporting and prospects for filling indicator gaps in Southeast Asia. Environmental and Sustainability Indicators, https://doi.org/10.1016/j.indic.2019.100017 [1] |

Value of the data

- The Convention on Biological Diversity's (CBD's) adoption of the 2020 Aichi Targets called for the use of indicators to monitor biodiversity and report conservation progress. Unfortunately, appropriate indicators are hard to find in many countries due to a lack of underlying data and limited capacity to generate indicators. National Reports to the CBD represent the highest level of government reporting about implementation of the CBD and contain the most comprehensive biodiversity information available at national scales. As such, they are potentially valuable sources for biodiversity indicators. However, these reports are written by Parties independently, in varying formats, and with extensive contextual information associated in which indicators are presented in different ways. Extracting biodiversity indicators from the National Reports requires delicate data-mining, proper information categorizing, and understanding linkages between indicators and conservation targets; performing this exercise would be a time-consuming activity for general conservation practitioners. The data presented in this article provide complete and explicit lists of indicators used in the 10 Southeast Asian's ASEAN members' two most recent national reports to the CBD.
- These data can serve as a reference and benchmark for these 10 CBD parties, as well as their neighboring countries while compiling their future national reports.
- These data enable evaluation of biodiversity indicator use, demonstrate the change as well as commonality of indicator uses in Southeast Asia, and thus will assist further research identifying existing indicator gaps and opportunities for indicator use in the region.
Table 1 summarizes the type (i.e., level of development) and number of biodiversity indicators used in 10 ASEAN nations’ 4th (2010) and 5th (2015) National Reports to the Convention on Biological Diversity.

Table 2 is the detailed list of biodiversity indicators used in Brunei Darussalam’s 4th and 5th National Reports and the type of these indicators.

Table 3 is the detailed list of biodiversity Indicators used in Cambodia’s 4th and 5th National Reports and the type of these indicators.

1. Data Description

- These data can catalyze further measures to improve national-level data coverage and monitoring capacity to generate indicators, facilitating evidence-based policy-making.
Table 2
List of Indicators used in Brunei Darussalam’s 4th and 5th National Reports [4,5].

| Brunei, 4th National Report | Indicator |
|-----------------------------|-----------|
| Type                        | Indicator                                         |
| Baseline 2.                  | Area and percent coverage of functional forest classes |
| Baseline 2.                  | Bio-ecotypes in different types of forest          |
| Baseline 2.                  | Total area, species richness of coral reefs on the coastline |
| Baseline 2.                  | Species diversity (number of species and endemic species) of plants, mammals, birds, reptiles, amphibians, and fishes |
| Trend                        | Law, regulations, and their enactment years         |
| Descriptive 2.               | Invasive species                                   |
| Descriptive 2.               | ASEAN Heritage sites                               |
| Brunei, 5th National Report  | Indicator                                         |
| Type                        | Indicator                                         |
| Baseline 4.                  | Area and percent coverage of functional forest classes |
| Baseline 4.                  | Distribution of gazetted and proposed forest reserves |
| Baseline 4.                  | Bio-ecotypes in different types of forest          |
| Baseline 4.                  | Marine protected areas                             |
| Baseline 4.                  | Species diversity: number of species recorded during Belait Peat swamp forests survey, including critically endangered and endemic for plants, dragonflies, fishes, amphibians, reptiles, birds, bats, and some mammals (not all categories for all taxa) |
| Baseline 4.                  | Total area, species number, and distribution of coral reefs on the coastline |
| Baseline 4.                  | Community distribution, number of species, families, genera, and endemism of marine and coastal species, including coral, reef mollusks, seagrasses, shrimp, demersal fishes, marine mammals, and marine turtles |
| Baseline 4.                  | Species diversity (number of species and endemic species) of plants, mammals, birds, reptiles, amphibians, and fishes |
| Trend                        | Distribution and identification of critical priority forest habitats for conservation |
| Descriptive 4.               | Laws, regulations, and their enactment years       |
| Descriptive 4.               | Invasive species                                   |
| Descriptive 4.               | Agriculture diversity                              |

Table 4 is the detailed list of biodiversity Indicators used in Indonesia’s 4th and 5th National Reports and the type of these indicators.

Table 5 is the detailed list of biodiversity Indicators used in Laos’ 4th and 5th National Reports and the type of these indicators.

Table 6 is the detailed list of biodiversity Indicators used in Malaysia’s 4th and 5th National Reports and the type of these indicators.

Table 7 is the detailed list of Indicators used in Myanmar’s 4th and 5th National Reports and the type of these indicators.

Table 8 is the detailed list of biodiversity Indicators used in Philippines’ 4th and 5th National Reports and the type of these indicators.

Table 9 is the detailed list of biodiversity Indicators used in Singapore’s 4th and 5th National Reports and the type of these indicators.

Table 10 is the detailed list of biodiversity Indicators used in Thailand’s 4th and 5th National Reports and the type of these indicators.

Table 11 is the detailed list of biodiversity Indicators used in Vietnam’s 4th and 5th National Reports and the type of these indicators.

2. Experimental Design, Materials, and Methods

Parties to the CBD are required to report every 5 years on both the actions taken toward implementation of the Convention and the effectiveness of these actions (CBD Article 26). These
Table 3
List of Indicators used in Cambodia’s 4th and 5th National Reports [6,7].

Cambodia, 4th National Report

| Type          | Indicator                                                                                                                                                                                                 |
|---------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Baseline      | Area, number and IUCN category of protected area by major ecosystems                                                                                                                                 |
| Baseline      | Species diversity: number of known species of mammals, birds, reptiles, fishes, amphibians, vascular plants, hard corals, soft corals, and seagrasses                                                      |
| Baseline      | IUCN Red List species number and status by taxon (mammal, bird, reptile, amphibian, fish, and plant)                                                                                                      |
| Baseline      | Agriculture: number of rice strains                                                                                                                                                                       |
| Baseline      | Agriculture: percent area of different rice ecosystems                                                                                                                                                   |
| Trend         | Forest cover by type (2002, 2006)                                                                                                                                                                          |
| Trend         | Forest cover (1969, 1993, 1997, 2002, 2005)                                                                                                                                                              |
| Trend         | Agriculture: rice production (2003-2007)                                                                                                                                                                  |
| Trend         | Law and policy enactment years                                                                                                                                                                           |
| Trend         | Area of aquatic habitats by type (1985-87, 1992-93)                                                                                                                                                      |
| Trend         | Mangrove forest area (1993, 1997)                                                                                                                                                                          |
| Descriptive   | Climate change                                                                                                                                                                                            |
| Descriptive   | Hydrological regime                                                                                                                                                                                       |
| Descriptive   | Invasive species                                                                                                                                                                                          |
| Descriptive   | Genetic erosion issues                                                                                                                                                                                     |

Cambodia, 5th National Report

| Type          | Indicator                                                                                                                                                                                                 |
|---------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Baseline      | Area, number and category of protected area by major ecosystems                                                                                                                                          |
| Baseline      | IUCN Red List species number and status by taxon (mammals, birds, reptiles, amphibians, fishes, and plants)                                                                                         |
| Trend         | Protected coverage in 1925, 1957, 1993 and 2014                                                                                                                                                         |
| Trend         | Species diversity: number of known species of mammals, birds, reptiles, fishes, amphibians, vascular plants, hard corals, soft corals, and seagrasses in 4th and 5th biodiversity report (2010, 2013) |
| Trend         | Forest cover by type (2002, 2006, 2010)                                                                                                                                                                  |
| Trend         | Forest cover (1965, 1992, 1996, 2002, 2006, 2010)                                                                                                                                                        |
| Trend         | Agriculture: rice production (2008-2012)                                                                                                                                                                |
| Trend         | Agriculture: four main crop cultivated area (2003-2012)                                                                                                                                                 |
| Trend         | Agriculture: family livestock production (2008-2012)                                                                                                                                                   |
| Trend         | Agriculture: family poultry production (2008-2012)                                                                                                                                                     |
| Trend         | Aquaculture: Inland and marine capture and aquaculture production (2009-2013)                                                                                                                         |
| Trend         | Forestry rubber development (2008-2012)                                                                                                                                                                 |
| Trend         | Forestry: production of logs and processed forest products (2007-2011)                                                                                                                                  |
| Trend         | Laws, regulations, and their enactment years                                                                                                                                                             |
| Trend         | International tourist arrivals (1993-2011)                                                                                                                                                              |
| Trend         | Tourism monthly trend (2008-2013)                                                                                                                                                                        |
| Descriptive   | Climate change                                                                                                                                                                                            |
| Descriptive   | Hydrological regime                                                                                                                                                                                       |
| Descriptive   | Invasive species                                                                                                                                                                                           |
| Descriptive   | Genetic erosion issues                                                                                                                                                                                    |
| Subnational   | Water bird species status in Prek Toal Area (2004-2012)                                                                                                                                                   |

The national reports represent the highest level of government reporting about implementation of the CBD at the national scale.

We extracted quantifiable information regarding the use of biodiversity indicator by the governments of 10 ASEAN Member States (one Southeast Asian country, Timor Leste, is not an ASEAN Member State and is excluded from our analysis) in their 4th and 5th national reports to the CBD, presented in 2010 and 2015, respectively. We identified indicators, counted their numbers, evaluated their level of development, and presented the detailed list of these indicators for each country.
Table 4
List of Indicators used Indonesia’s 4th and 5th National Reports [8,9].

**Indonesia, 4th National Report**

| Type          | Indicator                                                                                                                                 |
|---------------|-------------------------------------------------------------------------------------------------------------------------------------------|
| Baseline      | Species diversity: number of total and endemic plant, mammal, bird, reptile, amphibian and fish species                                      |
| Baseline      | Genetic diversity: number of accessions, species, and collector institutions in food, agriculture, and livestock sectors                   |
| Baseline      | Export of forest products (first quarter 2008)                                                                                             |
| Baseline      | Species and number of breeds of wild plants and animals in captivity (2008)                                                                |
| Baseline      | Area and coverage of forests (2007)                                                                                                       |
| Baseline      | Coverage of coral reefs, mangroves and seagrasses (2008)                                                                                   |
| Baseline      | Number of invasive plant species                                                                                                           |
| Baseline      | Number of lakes, rivers, and watersheds                                                                                                   |
| Baseline      | River regimes coefficient value (KRS) of several rivers in Indonesia (2005)                                                                |
| Trend         | Area of wetland by type (2000, 2007)                                                                                                       |
| Trend         | Deforestation rate (1982-2005)                                                                                                             |
| Trend         | Emission of CO2 due to forest fires (1997-2007)                                                                                            |
| Trend         | Number and status changes of threatened bird species in 2004, 2007, and 2008                                                              |
| Trend         | Coverage of conservation areas and number of conservation management units established (1981-2007)                                          |
| Trend         | Number of breeding activities for protected and unprotected flora and fauna ex-situ conservation (2006-2008)                               |
| Trend         | Number and size of marine conservation areas (2006, 2007)                                                                                   |
| Trend         | Number and condition of coral reefs (2004-2007)                                                                                            |
| Trend         | Area of mangrove rehabilitation projects (2002-2004)                                                                                         |
| Subnational   | Number and area of swamps in several islands (2007)                                                                                         |
| Subnational   | Condition and area of mangroves in several provinces (2006/7)                                                                             |
| Subnational   | Burnt area of reported forest fires in several provinces (2004-2008)                                                                     |
| Subnational   | Number of detected early fire (hot spot) in several areas in Indonesia (2004-2008)                                                         |
| Subnational   | Existing and planned botanical gardens in several provinces through 2010                                                                  |

**Indonesia, 5th National Report**

| Type          | Indicator                                                                                                                                 |
|---------------|-------------------------------------------------------------------------------------------------------------------------------------------|
| Baseline      | Species diversity: number and endemic number of plant, mammal, bird, reptile, amphibian and fish species                                      |
| Baseline      | Genetic diversity: number of accessions, species and collector institutions in food, agriculture, and livestock sectors                   |
| Baseline      | Number of families and species of marine flora: seagrasses, algae, mangroves, and mangrove associates                                      |
| Baseline      | Number of families and species of marine fauna: Echinodermata, Polychaeta, Crustacea, corals, and fishes                                    |
| Baseline      | Condition and number of species in karst ecosystems                                                                                       |
| Baseline      | Condition and number of species in mangrove ecosystems                                                                                     |
| Baseline      | Location and area of mangrove forests for wildlife protection                                                                                |
| Baseline      | Location, number, and area of lakes                                                                                                       |
| Baseline      | Distribution and area of peatlands                                                                                                         |
| Baseline      | Number of plant species in peat forests                                                                                                    |
| Baseline      | Condition of major lake ecosystems                                                                                                        |
| Baseline      | Area and coverage of forests                                                                                                              |
| Baseline      | Population of valuable microbes in studied forest ecosystem                                                                                |
| Baseline      | Number of invasive species in agriculture, forestry, and fisheries sectors                                                               |
| Baseline      | Units and total area of terrestrial and marine nature reserves, wildlife sanctuaries, national parks, nature recreation parks, grand forest parks game reserves, and conservation area management areas (2013) |
| Baseline      | Number of breeding units of wild plants and animals (2013)                                                                                 |
| Baseline      | Number of marine conservation areas by management effectiveness status (2013)                                                             |
| Baseline      | Number, location, theme and area of botanical gardens (2014)                                                                               |
| Baseline      | Protected area and coverage of mangrove forests in each province (2012)                                                                   |
| Baseline      | Number of elephants, trained elephants, utilized elephants, and elephant users in the Elephant Training Center (2013)                      |
| Trend         | Extinction rate for local ciliwung and cisadane fish, and crustaceans (1890-2010)                                                         |

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Table 4
(continued)

| Type               | Indicator                                                                 |
|--------------------|---------------------------------------------------------------------------|
| Trend              | Number of locations and condition of coral reefs (2008-2013)              |
| Trend              | Implementation area of forest and land rehabilitation (2010-2013)         |
| Trend              | Documented distribution area of peatlands in Indonesia by region (1978-2005) |
| Trend              | Area of dry primary forest (2000-2009)                                    |
| Trend              | Laws protecting peatland                                                  |
| Trend              | Area of forest types (2000, 2009)                                         |
| Trend              | Total conservation area (2011-2007, 2012)                                 |
| Trend              | Number of botanical garden additions and represented ecosystems           |
| Trend              | New forest area (2010-2012)                                               |
| Trend              | Marine conservation area (2003-2013)                                      |
| Trend              | Number of orangutans rehabilitated and released by center location (2011-2013) |
| Trend              | Number and trees produced by community nurseries (2010-2013)             |
| Trend              | Reforested area by province (2009-2013)                                   |
| Descriptive        | Reforested area of mangrove peat swamps by province (2009-2013)          |
| Descriptive        | Population change and habitat loss for several species                    |
| Descriptive        | Pollution of air, water and soil                                          |
| Descriptive        | Over-exploited bird and plant species                                     |
| Descriptive        | Climate change                                                            |
| Descriptive        | Biodiversity information system                                           |

Table 5
List of Indicators used in Laos' 4th and 5th National Reports [10,11].

| Type               | Indicator                                                                 |
|--------------------|---------------------------------------------------------------------------|
| Baseline           | Number of ecoregions, national biodiversity conservation areas, and IBAs  |
| Baseline           | Number of rice samples in IRRI gene bank                                  |
| Baseline           | Land use area as defined by vegetation types in different slope classes (1992) |
| Baseline           | Estimated number of flowering plant species                              |
| Baseline           | Distribution and status of NTFP plants                                    |
| Baseline           | Estimated number of mammal, bird, reptile, amphibian, invertebrate, and fish species |
| Baseline           | Forest area by class (2002)                                               |
| Baseline           | Number and area of forest protection conservation areas (2004)            |
| Baseline           | Estimated carbon sequestration and dollar value by forest type (2004)      |
| Baseline           | Dollar value of industrial products derived from forest resources (2004)   |
| Trend              | Protection of aquatic life in stations in the Mekong River Basin (2000-2006) |
| Trend              | Area and percent coverage of NPAs (1993-2008)                             |
| Trend              | Number of IUCN threatened species as a percentage of global threatened species by taxon (fish, amphibians, birds, mammals, and reptiles) (1996-2004) |
| Trend              | Forest coverage and potential (1943, 1960, 1982, 1992, 2002, 2010, 2020)  |
| Trend              | GDP and sector shares (2004-3007)                                         |
| Trend              | Area of tree plantations (1976-2008)                                      |
| Trend              | Agriculture production area and output volume of various agriculture commodities (2005-2008) |
| Descriptive        | Thirteen species that have become recently extinct                        |
| Subnational        | Types of non-timber forest products                                       |
| Laot, 5th National Report | Percent of agriculture farm area in two villages                         |

| Type               | Indicator                                                                 |
|--------------------|---------------------------------------------------------------------------|
| Baseline           | Number of ecoregions, wetlands, KBAs and their protection                  |
| Baseline           | Number of identified fish, amphibian, crab and shrimp species, and estimated proportion of the identified to total |
Table 5
(continued)

| Type          | Indicator                                                                 |
|---------------|---------------------------------------------------------------------------|
| Baseline      | Number of IUCN threatened, near-threatened, and all species by taxon (plants, amphibians, birds, mammals, and reptiles) |
| Baseline      | Estimated dollar value of biodiversity in sectors                         |
| Baseline      | Fish consumption per capita per year (2013)                               |
| Baseline      | RAMSAR wetland site establishment and the species protected               |
| Baseline      | Number of rice samples in IRRI gene bank                                  |
| Trend         | Area and percent coverage of NPAs (1993-2012)                            |
| Trend         | Forest cover by region and land cover type (1940, 1982, 1995, 2002, 2010, 2015) |
| Trend         | Rubber plantation area (1990, 2007)                                       |
| Trend         | Number of tourists (1990, 2000)                                           |

Table 6
List of Indicators used in Malaysia’s 4th and 5th National Reports [12,13].

Malaysia, 4th National Report

| Type          | Indicator                                                                 |
|---------------|---------------------------------------------------------------------------|
| Baseline      | List and number of World Heritage sites, ASEAN Heritage sites, and RAMSAR sites |
| Baseline      | Species diversity: total, endemic and newly discovered species of mammals, birds, reptiles, amphibians, freshwater fishes, marine fishes, invertebrates, plants, and marine organisms |
| Baseline      | Number of genera and species protected under the Wildlife Conservation Act for Mammals, Birds, Reptiles, Amphibians, Insects and Plants (1972 for peninsular Malaysia, 1997 for Sabah, and 1998 for Sarawak) |
| Baseline      | Area of designated protected PRF/PFE forest (2007)                        |
| Baseline      | Iconic Species: population and locations of tigers                        |
| Baseline      | Iconic Species: population and protected/other areas for Asian elephant    |
| Baseline      | Iconic Species: population and protected /other areas for orangeutan       |
| Baseline      | Iconic Species: population and locations of proboscis monkey              |
| Baseline      | Iconic Species: population and locations of seladang, tapir, and red-banded langgur |
| Baseline      | Number of germplasm collections conserved in seed gene banks              |
| Baseline      | Number and list of breeds and major crossbreeds in farm animals           |
| Trend         | Area of MPAs (2007, 2008)                                                 |
| Trend         | Policies and enactment years (1978, 1998, 2002, 2004, 2005, et al.)       |
| Trend         | Forest area by type and category (1990, 2000, 2005, 2007)                 |
| Trend         | Ecological Footprint (1999-2005)                                          |
| Trend         | Quality of river basins (2000-2007)                                       |
| Trend         | Area of mangrove replanting projects (2005-2008)                         |
| Descriptive   | Examples and names of invasive species                                     |
| Subnational   | Examples of numbers of species and accessions of ex-situ conservation of indigenous fruit species |

Malaysia, 5th National Report

| Type          | Indicator                                                                 |
|---------------|---------------------------------------------------------------------------|
| Baseline      | Area and number of protected areas and marine protected areas            |
| Baseline      | Species diversity: number of wild mammals, birds, reptiles, amphibians, freshwater fishes, invertebrates, fungi, mosse, and hard corals |
| Baseline      | Number of vascular plants and endemism by region                         |
| Baseline      | Number of species assessed by the IUCN and their Red List categories (2009) |
| Baseline      | Forest area and coverage (2012)                                          |
| Baseline      | Area of designated protected PRF/PFE forests (2012)                      |
| Baseline      | Dollar value of timber exports, the forestry sector, and its contribution to GDP; forestry sector employment (2012) |
| Baseline      | Mountain ranges and their vegetation types                                |

(continued on next page)
| Type       | Indicator                                                                                     |
|------------|-----------------------------------------------------------------------------------------------|
| Baseline   | Wetland area, number of RAMSAR sites, and significance of selected sites                      |
| Baseline   | Area, species number, economic value, protection tools for coral reefs                         |
| Baseline   | Distribution, area, and number of species of mangroves; mangrove areas in protection plans     |
| Baseline   | Agricultural genetic resources (number of rice accessions and preserved specimens of insects) |
| Baseline   | Iconic species: population and protection action plans of Asian elephants by region            |
| Baseline   | Iconic species: population and protection action plan of orangutans by park                    |
| Baseline   | Iconic species: population of proboscis monkeys                                               |
| Trend      | Year gazetted for selected parks (1964, 1979, 1984)                                            |
| Trend      | Number of established marine protected areas (1970s-2010s)                                     |
| Trend      | Number of genera and species listed and thereby protected under the Wildlife Conservation Act  |
| Trend      | Laws, policies and their enactment years (1978, 1998, 2002, 2004, 2005, et al.)               |
| Trend      | Forest area and protected forest area by region and type, and their distribution (2009-2012) |
| Trend      | Live coral cover percent (2007-2012)                                                           |
| Trend      | Agriculture GDP and contribution to total GDP (2011, 2012)                                     |
| Trend      | Iconic species: population, habitat size, and action plans for recovery of Malayan tigers      |
| Trend      | Iconic species: populations of turtle species (1990-2012)                                      |
| Subnational| Iconic species: establishment of turtle sanctuaries and hatcheries (1991-2010)                 |
| Subnational| Area and class of permanent reserved forests in Sabah (2009, 2010, 2012)                      |

**Table 7**

List of Indicators used in Myanmar’s 4th and 5th National Reports [14,15].

| Type       | Indicator                                                                                     |
|------------|-----------------------------------------------------------------------------------------------|
| Baseline   | Number, area and percent of total land in declared and proposed protected areas                |
| Baseline   | Species diversity; number of recorded and endemic species of plants, mammals, birds, and reptiles |
| Baseline   | Number of IUCN threatened and total species of mammals, birds, reptiles, invertebrates, and plants |
| Baseline   | Forest cover by type (2008)                                                                    |
| Baseline   | Number of species, genera and families protected under law for mammals, birds, and reptiles   |
| Baseline   | Permanent forest estates (area and coverage) (2008)                                            |
| Baseline   | Number of rice germplasm evaluated for biochemical traits                                      |
| Baseline   | Number of crop accessions evaluated for biotic and abiotic stresses                           |
| Baseline   | Germplasm accession and status in gene banks                                                   |
| Baseline   | Number of wetland sites in different areas                                                     |
| Baseline   | Number and name of domestic animal breeds                                                     |
| Baseline   | Number and name of globally threatened wetland bird species                                   |
| Baseline   | Number and name of exported aquarium fish species                                              |
| Trend      | Forest cover (1990-2005)                                                                       |
| Trend      | Number of established protected areas (1920-2010)                                             |
| Trend      | Laws related to protected areas (1879-2002)                                                    |
| Trend      | Livestock production by type (1990-2006)                                                       |
| Trend      | List of imported exotic breeds of cattle, pigs, and poultry (1958-1992)                      |

(continued on next page)
Table 7 (continued)

Myanmar, 4th National Report

| Type            | Indicator                                                                 |
|-----------------|---------------------------------------------------------------------------|
| Trend           | Marine turtle nesting establishments (1986-2006)                          |
| Trend           | Releasing of olive ridley sea turtle hatchlings (2000-2008)               |
| Descriptive     | Some major endangered wildlife species recorded in NFC                    |
| Subnational     | Land use change in Bago Yoma (1995-2007)                                  |

Myanmar, 5th National Report

| Type            | Indicator                                                                 |
|-----------------|---------------------------------------------------------------------------|
| Baseline        | Number of ecoregions and percent coverage of vegetation types             |
| Baseline        | Number, area and percent of total land in declared and proposed           |
|                 | protected areas                                                           |
| Baseline        | Number of IUCN threatened and total species of mammals, birds,           |
|                 | reptiles, amphibians, fishes, aquatic invertebrates, and plants           |
| Baseline        | Forest cover by type in 2010                                             |
| Trend           | Species diversity: number of recorded and endemic species of plants,      |
|                 | mammals, birds, reptiles, amphibians, and fishes (2009 and 2014)         |
| Trend           | Number of newly discovered species of plants, mammals, birds,             |
|                 | reptiles, amphibians, and fishes (2009 and 2014)                         |
| Trend           | Management activity in protected areas (2009-2013)                       |
| Trend           | Forest cover and average annual deforestation (1990-2010)               |
| Trend           | Mangrove area by region (1980, 2010)                                     |
| Trend           | Number of recorded reptile and amphibian species (1997, 2000,            |
|                 | 2006, 2010)                                                               |
| Trend           | Number of migrating spoon-billed sandpipers (2008-2012)                 |
| Trend           | Crop genetic resources: list of wild crops relatives that have had        |
|                 | their habitat destroyed since 1990                                       |
| Trend           | Marine fauna and flora: Catch Per Unit Effort (1980, 2010)              |
| Trend           | Number of established protected areas (1920-2014)                        |
| Descriptive     | Land use change                                                           |
| Descriptive     | Illegal wildlife hunting and trade                                        |
| Descriptive     | Invasive species                                                          |
| Descriptive     | Climate change vulnerability                                              |
| Subnational     | Number of bird species recorded at selected wetland protected areas      |
|                 | (2012, 2013)                                                             |

The 10 member countries of the Association of Southeast Asian Nations are Brunei Darussalam, Cambodia, Indonesia, Laos, Malaysia, Myanmar, Philippines, Singapore, Thailand and Vietnam. We downloaded the most recent two national reports (i.e., 4th submitted in 2010 and 5th submitted in 2015) to the CBD by these countries’ national government [available at 2 and 3 respectively], and extracted the quantifiable information on biodiversity indicators.

We defined indicators as any descriptive or quantitative metric that was meant to convey information about a biodiversity issue. Some countries reported the trend in gross domestic product and human population as pressures, but we do not count these as specific indicators for this dataset because they provide contextual information and do not necessarily lead to biodiversity threats. In each report we counted the number of indicators presented, as well as their level of development, defined as whether they represent nonquantitative descriptive statements, quantitative baseline (i.e., snapshot data resulting from a single measurement), or quantitative trends measured in multiple years. In some cases, quantitative baseline or trend data were presented for a region of the country or specific sites instead of the entire country; we categorized these cases as subnational indicators.

Table 1 summarizes the type (i.e., level of development) and number of indicators used in the 10 ASEAN nations’ 4th (2010) and 5th (2015) National Reports to the Convention on Biological Diversity. Table 2-11 are the detailed list of Indicators used and their level of development in each country’s 4th and 5th National Reports.
**Table 8**
List of Indicators used in Philippines’ 4th and 5th National Reports [16,17].

### Philippines, 4th National Report

| Type            | Indicator                                                                                                                                                                                                 |
|-----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Baseline        | Number and names of new species discovered supporting KBAs and AZEs in past 5 years (2009)                                                                                                                  |
| Baseline        | Number of threatened wildlife species by taxa (mammals, birds, reptiles, amphibians, and plants) (2004, 2007)                                                                                             |
| Baseline        | Area of different forest types, and alienable and disposable land (2003)                                                                                                                                  |
| Baseline        | Number of fish, bird, and terrestrial species, and endemic, and threatened fish species                                                                                                                   |
| Baseline        | Number of species of hard corals, reef fishes, mollusks, seagrasses and algae (2005)                                                                                                                    |
| Baseline        | Number of marine and freshwater protected areas in different regions, and changes in hard coral and fish abundance, and fish biomass                                                                           |
| Trend           | Number and area of KBAs and AZEs (terrestrial, freshwater) and the percentage of their area with formal protection (1996, 2006)                                                                              |
| Trend           | Number and area of terrestrial and marine protected areas (1997, 2008)                                                                                                                                     |
| Trend           | Annual deforestation rate (2000-2005)                                                                                                                                                                     |
| Trend           | Reforested areas (1976-2006)                                                                                                                                                                               |
| Trend           | Production of logs, lumber, plywood and veneer (1997-2007)                                                                                                                                               |
| Trend           | Forest fire disturbance area (1996-2006)                                                                                                                                                                  |
| Trend           | Quantity and value of fish production by type of fishing operation (1996-2007)                                                                                                                           |
| Trend           | Number of classified water bodies (2006, 2007)                                                                                                                                                             |
| Trend           | Pending environment cases in Ph court and law enforcement, green court (2006, 2007)                                                                                                                     |
| Trend           | Area of mangroves (1919, 1995, 2002, 2003, 2008 sources vary)                                                                                                                                             |
| Trend           | Number of existing and proposed marine protected areas (1995, 1997, 2000, 2007)                                                                                                                          |
| Trend           | Names and number of documented indigenous knowledge systems and practices, locations and tribes (2005-2008)                                                                                            |
| Trend           | Department of Environment and Natural Resources budget allocation (1987-1999)                                                                                                                               |
| Trend           | Number of forestry programs and forest management holders (2001-2005)                                                                                                                                    |
| Trend           | Number and areas of approved Certificates of Ancestral Domain Titles and Certificates of Ancestral Land Titles (2002-2008)                                                                                   |
| Subnational     | Population sizes of indicator species in certain areas of – whale sharks, humpback whales, and Irrawaddy dolphins                                                                                           |
| Subnational     | Complete nests and egg production of olive ridley sea turtles in Bataan and Zambales (2004-2009)                                                                                                          |
| Subnational     | Number of complete nesting and egg production per year in the Baguan Island Marine Turtle Sanctuary (1984-2007)                                                                                             |
| Subnational     | User fee income in Gilustongan Island Marine Sanctuary (1998-2008)                                                                                                                                      |
| Subnational     | HIETA Income from ecotours (2007-2008)                                                                                                                                                                   |
| Subnational     | (Ecotourism related) PIDWVO net income (2003-2008)                                                                                                                                                       |

### Philippines, 5th National Report

| Type            | Indicator                                                                                                                                                                                                 |
|-----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Baseline        | Number and area of KBAs (terrestrial, freshwater and marine), and overlap with protected areas                                                                                                          |
| Baseline        | Numbers of all, endemic, and threatened fish species                                                                                                                                                      |
| Baseline        | Numbers of species of hard corals, reef fishes and mangroves                                                                                                                                             |
| Baseline        | Numbers of marine protected areas, and their protection status                                                                                                                                           |
| Baseline        | Number and percent of provinces, cities and municipalities that are located along coastal areas and affected by the changes in coastal and marine ecosystems |
| Baseline        | Number and percent of river basin master plans completed (2013)                                                                                                                                         |
| Baseline        | Integrated Protected Area Fund collection from top-earning protected areas (2012)                                                                                                                         |
| Baseline        | Number of developed national strategies and action plans addressing environmental concerns                                                                                                             |
| Trend           | Number and area of terrestrial and marine protected areas (2008, 2013) (continued on next page)                                                                                                         |
Table 8 (continued)

| Type      | Indicator                                                                 |
|-----------|---------------------------------------------------------------------------|
| Trend     | Number of new species discoveries by taxon (mammals, birds, reptiles,   |
|           | amphibians, and plants) (2005-2012)                                        |
| Trend     | Number of threatened wildlife species by taxon (mammals, birds, reptiles,|
|           | amphibians, and plants) (2006-2013)                                        |
| Trend     | Philippine eagle sightings in the wild from the DENR site monitoring      |
|           | program (2005-2013)                                                       |
| Trend     | Area of forest land classification (2005-2012)                            |
| Trend     | Forest cover by forest types (2003, 2010)                                 |
| Trend     | Reforested areas (2005-2012)                                              |
| Trend     | Forestry revenues from timber harvest and non-timber forest products      |
|           | (2011, 2012)                                                              |
| Trend     | Performance of agricultural industries and subsectors (2012, 2013)        |
| Trend     | Quantity and value of fish production by type of fishing operation        |
|           | (1996-2012)                                                              |
| Trend     | Biochemical oxygen demand for 19 priority rivers (2003, 2005, 2009, 2012)|
| Trend     | Dissolved oxygen for 19 priority rivers (2003, 2005, 2009, 2012)         |
| Trend     | Number, names, and supporting threatened species in proclaimed critical    |
|           | habitats of wetlands, and legal enactment times (2007-2012)               |
| Trend     | Significant Writs of Kalikasan issued by Philippine courts (2010-2014)   |
| Trend     | Area of mangroves (2003-2012)                                             |
| Trend     | Confiscated wildlife and cases filed in court (2009-2013)                |
| Trend     | Extreme weather events related to global warming and their damage in      |
|           | dollar value and people affected (2009-2013)                             |
| Trend     | Number of classified caves for cave management and protection (2012, 2014)|
| Trend     | Number of industries/firms awarded with DENR official seal for           |
|           | environmental performance as protection incentives (2009-2014)           |
| Trend     | Proportion of population with access to safe water supply (1990, 2008,   |
|           | 2011, 2015)                                                              |
| Trend     | Proportion of households with sanitary toilet facilities (1990, 2008,    |
|           | 2011, 2015)                                                              |
| Trend     | Proportion of households with access to secure tenure (1990, 2010)       |
| Descriptive | Lake pollution                                                              |
| Descriptive | Urban biodiversity                                                          |
| Descriptive | Invasive species impact                                                     |
| Descriptive | Awareness of biodiversity                                                  |
| Subnational | Tamaraw population in Mts. Iglit-Baco National Park 2000-2013             |
| Subnational | Species richness change in reef sites                                        |

Table 9

List of Indicators used in Singapore’s 4th and 5th National Reports [18,19].

Singapore, 4th National Report

| Type      | Indicator                                                                 |
|-----------|---------------------------------------------------------------------------|
| Baseline  | Distribution of 22 nature sites                                            |
| Baseline  | Number of species newly discovered, new records, and rediscoveries from   |
|           | NParks Natural Areas Surveys Project (2007)                               |
| Baseline  | Species diversity: numbers of species of vascular plants, fungi,           |
|           | bryophytes, mammals, birds, reptiles, amphibians, freshwater fishes,      |
|           | butterflies, dragon flies, and hard corals (2009)                        |
| Baseline  | Distribution of mangrove forests                                           |
| Baseline  | Distribution and area of fringing and patch reefs                          |
| Baseline  | Species diversity: number of recorded marine and freshwater species by tax|
|           | a (2009)                                                                  |
| Baseline  | Types and number of managed terrestrial habitats                          |
| Trend     | Distribution of changes in greenery cover from remote sensing images (1986,|
|           | 2007)                                                                     |

Singapore, 5th National Report

| Type      | Indicator                                                                 |
|-----------|---------------------------------------------------------------------------|
| Baseline  | Number and names of invasive/exotic species                               |

(continued on next page)
Table 9  
(continued)

| Type       | Indicator                                                                 |
|------------|---------------------------------------------------------------------------|
| Baseline   | Number of species newly discovered, new records, and rediscoveries since the Comprehensive Marine Biodiversity Survey in 2010 |
| Baseline   | Number and description of possible extirpated species                    |
| Baseline   | Singapore Index on Cities’ Biodiversity (with comprehensive and highly integrated input data) |
| Baseline   | Number and names of native plants propagated since 2010                  |
| Baseline   | Distribution of improved nature areas                                     |
| Baseline   | Number of marine invertebrate species by taxon                            |
| Trend      | Area and percent of Singapore's land requirements by land use type (2010, 2030) |
| Trend      | Species diversity: number of species by taxon and change from the 4th national report (2008, 2015) |
| Trend      | Population of the vulnerable banded leaf monkey (1990, 2008)              |

Table 10
List of Indicators used Thailand’s 4th and 5th National Reports [20,21].

| Type       | Indicator                                                                 |
|------------|---------------------------------------------------------------------------|
| Baseline   | Number of ecoregion and forest types                                       |
| Baseline   | Species diversity: number of plants, vertebrates, invertebrates, fishes, floral species, and seagrasses |
| Baseline   | Number of threatened species and total species of amphibians, birds, fishes, reptiles, mammals, and plants |
| Baseline   | Number of plant species in each IUCN category by taxon                     |
| Baseline   | Poaching and deforestation (2004)                                          |
| Baseline   | Area of agricultural land for rice, rubber, cassava, fruit tree, oil palm and vegetables (2006) |
| Baseline   | Area and coverage of mountain ecosystems                                    |
| Baseline   | Number of Important Plant Areas by type of area (2009)                     |
| Baseline   | Number of Important Plant Areas under various threats (2009)              |
| Baseline   | Number of crop species collected at national crop research institute       |
| Baseline   | Number and names of invasive species by status                             |
| Baseline   | Area of swamp forest and percent in very poor status                       |
| Baseline   | Area, number of communities, distribution, and supported number of fishes, shrimps, crabs, and sea slugs in coral reefs |
| Baseline   | Number of accessions of rice, durian, mango, lichee, and longan            |
| Baseline   | Number of wild animals: elephants, wild buffalos, tigers, guars and bantengs, kuproy, el'd's deer, and Java rhinoceroses (2004) |
| Baseline   | Area and number of plant and animal species in mangrove forest             |
| Baseline   | Area of seagrass beds and number of supported fishes and invertebrate species |
| Baseline   | Estimated number of large marine animals: dugongs, Irrawaddy dolphins, bottlenose dolphins, spotted dolphins, striped dolphins, spinner dolphins, and sharks |
| Trend      | Laws, policies and enactment years                                         |
| Trend      | Coverage of forests (1961, 2005)                                           |
| Trend      | Number of biodiversity-related study and research projects (1997-2008)     |
| Subnational| Number of crop wild relative species in several provinces                 |
| Subnational| Number of plant and animal species found in agricultural ecosystems in 5 regions |
| Subnational| Percent of coral reefs by condition category around Koh Samui and other islands in Suratthani province (2007) |

Table 9  
(continued on next page)
### Table 10
(continued)

| Type          | Indicator                                                                 |
|---------------|--------------------------------------------------------------------------|
| Baseline      | Number of species in each IUCN category by taxon (mammals, birds, reptiles, amphibians, and fishes) (2013) and plants (2014) |
| Baseline      | Number of new, rare and endemic species and new localities that have threatened status |
| Baseline      | Number of plant species listed as medicinal plants used in Thai traditional medicine |
| Baseline      | Illegal cutting of rosewood: number of cases, arrests, and charges, and number of species seized (2014) |
| Baseline      | Area and percentage of wetland types by region                           |
| Trend         | Number of total and threatened species of amphibians, birds, fishes, reptiles, and mammals (1996, 2005, and 2013) |
| Trend         | Area and coverage of forests (1973-2013)                                  |
| Trend         | Forest encroachment by region (2012-2014)                                 |
| Trend         | Agriculture land (1962, 2011)                                             |
| Trend         | Number of fishing vessels and catch per hour (1961, 2011)                 |
| Trend         | Net weight and dollar value of rice export (2007-2013)                   |
| Trend         | Export value of traditional medicines and herbs (2008-2013)              |
| Trend         | Export value of agricultural products, agro-industry products and national GDP (2003-2013) |
| Trend         | Aquaculture area and production of marine shrimp, and area of mangrove forests (1993-2014) |
| Trend         | Percent of wetlands lost (2009, 2013)                                     |
| Trend         | Area of mangroves (2009, 2013)                                            |
| Trend         | Area of coral reefs before and after bleaching (2010, 213)               |
| Trend         | Number of animals in wildlife trafficking (2011-2013)                    |
| Trend         | Weight of illegally traded ivory (2008-2012)                             |
| Trend         | Dalbergia wood smuggling (2006-2013)                                     |
| Trend         | Fish catch capacity by water source (2002-2011)                          |
| Trend         | Fishing effort (catch weight and number of vessels) by water source (2002-2011) |
| Trend         | Pollution: weight of garbage, waste water (2010, 2012)                  |

### Table 11
List of Indicators used in Vietnam’s 4th and 5th National Reports [22,23].

| Type             | Indicator                                                                 |
|------------------|--------------------------------------------------------------------------|
| Baseline         | Number of plant species in different types of agricultural use (2005)   |
| Baseline         | Number of protected areas by type, and other internationally recognized protected areas (2006) |
| Baseline         | Recently discovered species in past two decades (2005)                  |
| Baseline         | Number of Species in Vietnam and in the world by taxon (terrestrial, freshwater, and marine; plant, microbial, and animal) (2004) |
| Baseline         | Number of livestock breeds                                              |
| Baseline         | Number of proposed and recognized wetland management areas              |
| Baseline         | Number and area of proposed and declared marine protected areas         |
| Baseline         | Number of species and seeds preserved by gene resource conservation activities |
| Baseline         | Number of species in different categories of the Vietnam Red Book 2007 by taxon |
| Baseline         | Percent of coral coverage by status category in investigated sites (2005) |
| Baseline         | Revenue of national and international wildlife trade that transits Vietnam (2002) |
| Baseline         | Number of invasive species by risk type (2005)                          |
| Trend            | Area of mangrove forests and their loss rate (1943, 1990, 2005)         |
| Trend            | Area and coverage of forest by type (natural vs. planted) (1990-2006)   |
| Trend            | Area of agricultural land (1990, 2002)                                  |

(continued on next page)
Table 11 (continued)

**Vietnam, 4th National Report**

| Type       | Indicator                                                                                             |
|------------|-------------------------------------------------------------------------------------------------------|
| Trend      | Percent area and percent indigenous species loss due to introduction of new species and invasive alien species by species group (1970-1999) |
| Trend      | Estimated needs for some wood products (2005-2020)                                                    |
| Trend      | Recent legal documents related to biodiversity (1997-2007)                                           |
| Subnational | Some medicinal herb gardens and numbers of species preserved                                        |
| Subnational | Area of mangrove forests and shrimp farms in Ca Mau and Tra Vinh (1965, 2001)                      |
| Subnational | Number of sites and percent of decrease in coral cover in some coastal marine areas (1993-2002)  |
| Subnational | Distribution of mangrove and cajuput forest coverage in Ngoc Hien district, Ca Mau province in 1965 and 2001 |
| Subnational | Heavy metal waste in the environment and animal tissues in Ha Long Bay-Bai Tu long                  |

**Vietnam, 5th National Report**

| Type       | Indicator                                                                                             |
|------------|-------------------------------------------------------------------------------------------------------|
| Baseline   | Number and area of wetland sites by region (2009)                                                    |
| Baseline   | Number of protected areas by type                                                                      |
| Baseline   | Number and areas of marine protected areas (2010)                                                    |
| Baseline   | Area and coverage of forest by type and region (2010)                                                |
| Baseline   | Number of visitors to national parks (2011)                                                           |
| Baseline   | Income from tourism in national parks (2011)                                                          |
| Baseline   | Estimate of carbon storage in natural forests by region                                               |
| Baseline   | Land conversion: percent of agricultural land lost to urban and industrial sites (2010)              |
| Baseline   | Number of invasive exotic species by taxon (2013)                                                    |
| Baseline   | Distribution of population by region                                                                  |
| Baseline   | Pollution: percent of licensed industrial parks having centralized wastewater treatment systems         |
| Baseline   | Pollution: fertilizer use and pollutants in rivers                                                    |
| Baseline   | Number of natural habitats, protected areas, and KBAs that would be affected by climate change        |
| Trend      | Number of species in each National Red List assessment category by taxon (1996, 2007)                 |
| Trend      | Number of deforestation violations (2008-2012)                                                        |
| Trend      | Area and coverage of forest by type (natural vs. planted) (1990-2012)                                |
| Trend      | Timber volume (2006, 2010)                                                                             |
| Trend      | Dollar value of agricultural production by sector (planting, breeding, and service) (2006-2012)      |
| Trend      | Biomass of pelagic fishery landings (2011-2013)                                                       |
| Trend      | Live coral coverage by monitoring site (1994-2008)                                                    |
| Trend      | Percent decrease of seagrass habitat by site (time varies with site)                                  |
| Trend      | Area of mangroves (1943-2012)                                                                         |
| Trend      | Land conversion: natural forest to rubber plantation by site (2008, 2014)                            |
| Trend      | Area of surface water (salty/brackish and fresh) used for aquaculture 2007-2010                      |
| Trend      | Area of forest land converted for infrastructure development (2007-2012)                             |
| Trend      | Documented and forecasted demand for some major timber products (2005-2020)                          |
| Trend      | Volume of timber confiscated by year for normal timber and valuable timber (2007-2012)              |
| Trend      | Number of wildlife trafficked (2008-2012)                                                            |
| Trend      | Number of flash floods (1990-2010)                                                                    |
| Trend      | Stock of fish by fish type and decline rate (2000-2005)                                              |
| Trend      | Number and names of institutes participating in agricultural genetic resources and their year of foundation (1989-2000) |
| Descriptive | Overexploitation of genetic resources                                                                  |
| Descriptive | Inland water fragmentation                                                                              |
| Subnational | Estimates of mangrove carbon stocks in Kien Giang (2010)                                             |
| Subnational | Land conversion: area of coastal sandy ecosystem loss in Ha Tinh and Ninh Thuan                      |
Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships which have, or could be perceived to have, influenced the work reported in this article.

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Supplementary materials

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