The activity database of Bangladesh for the Land Use, Land-Use Change and Forestry (LULUCF) sector

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Contents

1. Executive summary

Article 4, paragraph 1, and Article 12, paragraph 1, of the United Nations Framework Convention on Climate Change (UNFCCC) provide for each Party to report to the Conference of Parties (COP), information on its emissions by sources and removals by sinks of all greenhouse gases (GHGs), not controlled by the Montreal Protocol (GHG inventories), as a component of national communications. As a signatory to the UNFCCC convention, Bangladesh needs to submit National communication (NC) (decision 9/CP.16) of GHG emission and sinks, Biannual Update Report (BUR) (decision 2/CP.17), Intended Nationally Determined Contributions (INDCs) (decisions 1/CP.19 and 1/CP.20), Nationally Appropriate Mitigation Actions (NAMAs) (decision 1/CP.13), Forest Reference Emission Level (FREL)/Forest Reference Level (FRL) (decision 1/CP.16; decision 12/CP.17; decision 13/CP.19).

In order to ensure transparency, accuracy, completeness, consistency and comparability between countries greenhouse has inventory (GHGI) estimates the IPCC task force on national greenhouse gas inventories (TFI) develop guidelines on compiling estimates of national greenhouse gas emissions and removals in a standardized way. A number of guidelines are published by IPCC such as, the Revised 1996 Guidelines for National Greenhouse Gas Inventories, IPCC (1997), known as the "1996 IPCC Guidelines", Good Practice Guidance and Uncertainty Management, IPCC (2000), known as the "GPG2000", Good Practice Guidance for Land-Use, Land-Use Change and Forestry, IPCC (2003) known as the "GPG-LULUCF", and the 2006 IPCC Guidelines for National Greenhouse Gas Inventories, IPCC (2006) known as the "2006 IPCC Guidelines".

The methodological approach followed in the IPCC Guidelines mentioned above is basically the multiplication of the information on the extent of anthropogenic activity within a given period, technically termed as activity data with the emissions/removals per unit activity technically termed as emission factor. This report provides a complete description and background information of the activity database developed for the year 1976, 1996, 2004, 2005, 2000, and 2010 for the Land Use, Land-Use Change and Forestry (LULUCF) sector of Bangladesh. The report compiles and harmonizes the land use change data reported in different land use maps and report published by different national entities. All the national land use class are harmonized based on the IPCC land use class and presented following the approach 1 of Good Practice Guidance for Land-Use, Land-Use Change and Forestry, IPCC (2003).

2. Introduction

United Nations Framework Convention on Climate Change (UNFCCC) calls for avoiding dangerous anthropogenic interference with the global climate system by stabilizing greenhouse gas concentrations (GHGs) in the atmosphere [1]. To stabilize GHGs concentration in the atmosphere it require GHGs emission reduction covering all relevant sources, sinks and reservoirs of greenhouse gases, including land use, land-use change and forestry (LULUCF) [2]. As a Party to the UNFCCC, signatory country has the obligation to design and make operational a system for reporting of greenhouse gases (GHG) (Article 5 of the UNFCCC), as well as prepare and submit national communication (NC) on greenhouse gas inventories (GHGI) of emissions and removals covering five economic sectors such as-energy, industrial processes, agriculture, LULUCF and waste. The GHGI contains estimates of GHG emissions and CO_2 removals reported in the Common Reporting Format (CRF) tables, and a description of methods and data used in the NC [3]. It is matter of fact that, GHG removals from the atmosphere occur only in LULUCF, because of biomass growth. So, LULUCF is the only sector with sink and sources of GHGs emission [4].

The approach for calculating GHGs emissions and removals from LULUCF in the mentioned guidelines are GHG emissions =AD×EF, where AD means activity data, referring to the land use change like forest converted to cropland or removals of trees from the forests or damage of trees by forest fire, and EF means emission factor per unit of activity [5]. Bangladesh with 0.35% of global greenhouse gases (GHGs) emission contribution is one of the most climate vulnerable countries in the world. At the same time Bangladesh wants to ensure lower carbon emitting development as a signatory country to the UNFCCC convention [6]. Since, among the five economic sectors for which a country should submit GHG inventory, LULUCF is the only sector with sink and sources of GHGs emission, developing a well-documented and referenced activity data base for the LULUCF sector in Bangladesh is tremendously important[4].

This report provides a description and background information of the activity data base of Bangladesh for GHGs reporting of the LULUCF sector. It includes descriptions of the methodologies used to develop the activity data base, as well as a description choices and motivations.

3. LULUCF activity database

The methods provided in the IPCC Guidelines vary in their degree of complexity from the simplest to more complex one. Based on the best available data a country select their approach for the GHG inventory estimation. The simplest approach known as Tier 1 approach based on the global or regional default values of EFs provided in the IPCC Guidelines mentioned above, and activity data available locally or from global data sets. This Tier 1 approach is characterized by large uncertainties and sometimes with methods involving several simplifying assumptions. Tier 2 approach uses country or region specific values instead of general defaults, and use disaggregated activity data derived from national statistics characterized by relatively smaller uncertainties. Tier 3 approach is more complex methods consisting of detailed field based measurements, accompanied with detailed modelling using sub-national data at much finer resolution [3, 4].

IPCC encourages the non-annex countries to use the best available data for the GHG emission and removals by sources from LULUCF based on the national circumstances [7]. Basically a country assess activity data, that means changes in land management or land use from national statistics, and apply emission factors from known studies or the IPCC default emission factor to estimate emissions from that activity[4].

To develop the activity database on the changes in land management or land use, IPCC guidelines use six broad land-use categories for reporting GHG emissions and removals by LULUCF sector, such as- forest land, cropland, grassland, wetlands, settlements, and other land[4]. The definition of each IPCC land category is presented in the appendix section. This IPCC land category can be further stratified based on national circumstances to portrait the differences between climate, soil, ecological zones or management practices etc. The signatory countries can adopt different ways to obtain land use change data, like annual census, periodic surveys, national land use maps, and remote sensing. The IPCC guidelines suggested three approaches to obtain and represents land use change for LULUCF sector for national GHG inventory estimation. Approach 1 basically identifies the total land area under each IPCC land category, but not address the conversions of land use between different land uses. Approach 2 is based on tracking of land use conversions between different categories. Approach 3 tracks the land use change on a spatial basis. These approaches are not hierarchical in nature, hence for different regions over time one country can use mix of approaches[3, 4]. The

development of the activity data base for the LULUCF sector of Bangladesh, and corresponding land use change table are elaborated in section 4 (methodology).

4. Objectives

The specific objective of the activity database of Bangladesh are as follows:

1. To serve as a well-documented and referenced library of activity data suitable to be use in the GHG inventory compilation for the LULUCF sector;
2. To portrait the national circumstances of LULUCF through proper documentation, and harmonization of available land use data;
3. To ensure availability of harmonized historical land use and land use data, and their regular update based on the availability of updated land use data.

5. Methodology

The adopted methodology for the development of activity data base for the LULUCF sector are as follows:

a) The activity database is based on the land use map or report presented in the table 1.
b) Unadjusted area represent the area reported in the national land use map/published report. The unadjusted area are adjusted based on the total land area of Bangladesh 14840000 ha [8].
c) Different land use are classified to the IPCC land classes based on the criteria mentioned in the section 2.2 of chapter 2 (Basis for Consistent Representation of Land Areas) of IPCC 2003 GPG for Land Use, Land-Use Change and Forestry (LULUCF). The activity data base is developed is based on approach 1[4]. The definition of each land use class, and the national land use class of the available land use maps or reports based on which this database is developed is presented in the appendix section (Appendix 1 to 5).
d) Each IPCC land classes are further subdivided based on climate[9], ecology[10], and soil type [11, 12]. The classification scheme used in this activity data base is presented in table 2. Each IPCC land use classes are represented as percentage of total land area.

e) Based on the intersection of land use map of SRDI (1996), SRDI (2004) and BFD (2005) with Climate, ecology, and soil type zonal statistics are developed. Zonal statistics percentage of SRDI (2004)[13] land use map is used to derive the area under each climate, ecology and soil type for IPCC land use class cropland, settlement, wetland, and other land. For IPCC land use class forest land, zonal statistics percentage of National Forest and Tree Resources Assessment (2005-2007) [14] land use map is used to derive the forest area under each climate, ecology and soil type.

f) Under each climate, ecology and soil type category national land use class are represented as follows:

   i. Forest land are classified to general class of Hill forest, Sundarban Mangrove Forest, Sal forest and Plantation. Under the hill forest along with evergreen and deciduous forests in terrace and hilly areas, bamboo and rubber plantation are included. Coastal plantation, and other social forestry plantation considered as one class Plantation.

   ii. Cropland includes all the land used for rice, jute, pineapple, sugarcane, fallow land, rabi and other cash crops growing land. Orchard includes the mango plantation and land utilized for fruit production. Tea garden includes the land area growing tea-a perennial shrub grown as a cash crop.

   iii. Lake, Beel and haor, Mudflat, Pond and excavated wetlands for aquaculture considered as inland water bodies. River represent the all the river and their tributaries area.

   iv. Urban and Rural Settlement includes city, urban and industrial area, highways, and rural settlement.

   v. Otherland includes land used for saltpan, accreted land consisting of beach, char land, sand and sandbar.

g) As per the expert judgement of RIMS unit of FD, sundarbans mangrove area (only forest without water) reported as around 400000 ha. Sal forest area reported for the year 2000 as per Sal forest inventory (2000) as 46000 ha.

h) "Other land with tree cover" is defined as "land that is predominantly agricultural or urban lands use and has patches of tree cover that span more than 0.5 hectares with a canopy cover of more than 10 percent of trees able to reach a height of 5 meters at maturity. It includes both

the forest and non-forest tree species, and groups of trees and scattered trees (e.g.- trees outside forest) in agricultural landscapes, parks [15]. Other wooded land defined as "Land not classified as Forest spanning more than 0.5 hectares with trees higher than 5 meters and a canopy cover of 5-10 percent or trees able to reach these thresholds ; or with a combined cover of shrubs bushes and trees above 10 percent. It does not include land that is predominantly under agricultural or urban land use"[15]. In Bangladesh, other land with tress mostly located in surrounding home and adjacent to the agricultural land in the village area, urban areas, along the road and embankment. So, under settlement 'other land with tree cover' is considered. According to the trend reported in the "Global Forest Resources Assessment-2015: Country Report-Bangladesh" from 1990 to 2015 for "Other land with tree cover" and "other wooded land"[15], other land with tree cover under settlement is estimated for different year, and, and allocated equally for each climate, ecology and soil type.

Table 1: Characteristics of the land use maps/report used to develop the activity data base of LULUCF sector.

Name of the map/report	Author	Land use reported year	Total land area (ha)	Satellite image	Projection type	Reference
Agricultural land availability in Bangladesh.	Soil Resources Development Institute (SRDI).	1976	14,487,259.00	Landsat, MSS/TM/ETM	-----------	[16]
Land use map of Bangladesh	Soil Resources Development Institute (SRDI).	1996	14,487,259.00	-----------	Bangladesh Transverse Mercator (BTM)	[17]
Land use map of Bangladesh	Soil Resources Development Institute (SRDI).	2004	16,389,967.00	-----------	Bangladesh Transverse Mercator (BTM)	[13]
National Forest and Tree Resources Assessment 2005-2007 Bangladesh.	Bangladesh Forest Department (BFD)	2005	14,757,000.00	-----------	Bangladesh Transverse Mercator (BTM)	[14]
Agricultural land availability in Bangladesh.	Soil Resources Development Institute (SRDI).	2000	14,530,581.00	Landsat, MSS/TM/ETM	-----------	[16]
Agricultural land	Soil Resources Development	2010	14,577,771.00	Landsat, MSS/TM/ETM	-----------	[16]

availability in Bangladesh.	Institute (SRDI).

Note:

1. All the reported total land area adjusted for the total land area of Bangladesh 14840000 ha [8]

Table 2: Classification system adopted for the activity data base of LULUCF sector.

Criteria	Classification system	Reference	Classes for Bangladesh
Climate	Koppen climate classification system.	[9]	Tropical dry Tropical moist Tropical wet
Soils	FAO-UNDP 1988 soil map using the FAO-UNESCO 1974 soil classification. This classification has been further harmonised with the IPCC soil classes (Bridges et al., 1993).	[11, 12]	Low activity clay High activity clay
Ecological zones	FAO classification of Global ecological zones for forest reporting.	[10]	Tropical moist forest Tropical rain forest

6. IPCC land classes

Figure 1 shows the change in IPCC land use class for the year 1976, 1996, 2000, 2004, 2005 and 2010. During 1976 the forest land was 15.24% of the total land area, which is decreased to 9.64% during 2005, and 9.60% during 2010. The cropland also showed decreasing trend with 68.21% of total land area during 1976 to 63.30% during 2005, and 60.05% during 2010. Wetland showed increasing trend with 8.31% share of total land area during 1976 to 9.62% during 2010. The increasing trend of wetland may be attributed to growing popularity of inland aquaculture in Bangladesh.

Settlement area was 6.30% of total land area during 1976, and increased to 16.77% during 2010. Otherland also increased from the year 1976 to 2010. During 1976 the share of other land to the total

land area was 1.95%, which increased to 3.96% during 2010. This increasing trend may be attributed to newly accreted land and char land.

	1976	1996	2000	2004	2005	2010
■ Forestland	15.24%	11.40%	10.64%	9.84%	9.64%	9.60%
■ Cropland	68.21%	66.30%	65.92%	63.83%	63.30%	60.05%
■ Wetland	8.31%	9.08%	9.24%	9.43%	9.48%	9.62%
■ Settlement	6.30%	11.13%	12.09%	14.04%	14.52%	16.77%
■ Otherland	1.95%	2.09%	2.11%	2.87%	3.06%	3.96%

%

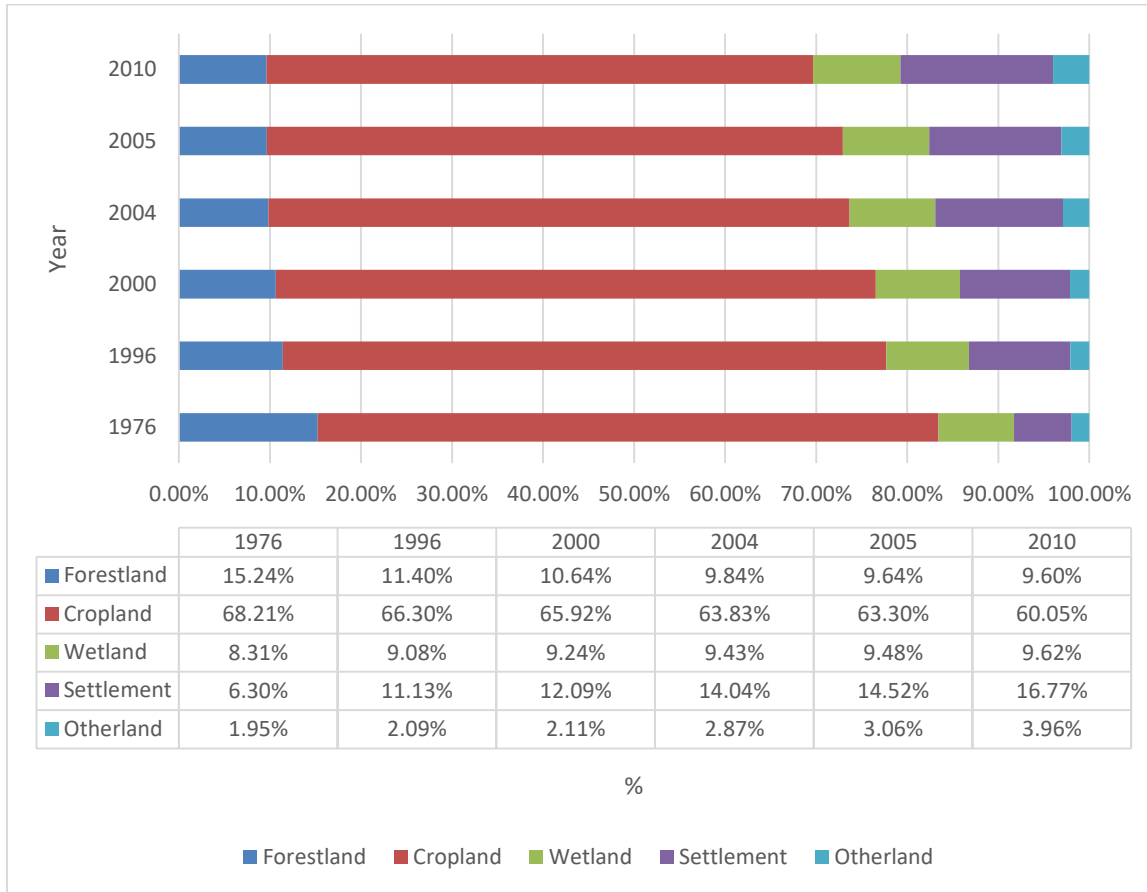■ Forestland ■ Cropland ■ Wetland ■ Settlement ■ Otherland

Figure 1: Proportion of land area estimates according to the IPCC land categories for the years 1976, 1996, 2000, 2004, 2005 and 2010.

The national land use class under each climate, ecology and soil type category and the area of land-use change in each category based on approach 1 are presented in the appendix (Appendix 6 to 10).

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17.   SRDI, *Landuse map of Bangladesh*. 1996, Soil Research Development Institute (SRDI), Ministry of Agriculture, Government of Bangladesh. : Dhaka, Bangladesh

8. Appendixes

Appendix 1

IPCC Land class definition

IPCC land class	Definition	References
Forest land	This category includes all land with woody vegetation consistent with thresholds used to define forest land in the national GHG inventory, sub-divided into managed and unmanaged, and also by ecosystem type	[4]
Cropland	This category includes arable and tillage land, and agro-forestry systems where vegetation falls below the thresholds used for the forest land category, consistent with the selection of national definitions.	[4]
Grassland	This category includes rangelands and pasture land that is not considered as cropland. It also includes systems with vegetation that fall below the threshold used in the forest land category and are not expected to exceed, without human intervention, the threshold used in the forest land category. The category also includes all grassland from wild lands to recreational areas as well as agricultural and silvi-pastural systems, subdivided into managed and unmanaged consistent with national definitions.	[4]
Wetlands	This category includes land that is covered or saturated by water for all or part of the year (e.g., peatland) and that does not fall into the forest land, cropland, grassland or settlements categories. The category can be subdivided into managed and unmanaged according to national definitions. It includes reservoirs as a managed sub-division and natural rivers and lakes as unmanaged sub-divisions.	[4]
Settlements	This category includes all developed land, including transportation infrastructure and human settlements of any size, unless they are already included under other categories. This should be consistent with the selection of national definitions.	[4]
Other land	This category includes bare soil, rock, ice, and all unmanaged land areas that do not fall into any of the other five categories. It allows the total of identified land areas to match the national area, where data are available.	[4]

Appendix 2

National Land use class definition and corresponding IPCC land class of SRDI 1996 land use map

National land use classes	Land use class description	IPCC land class
Beach	Beaches are the pebbly or sandy shore, specifically by the ocean between high- and low-water marks. The area of accumulated sand, stone, or gravel deposited along a shore by the action of waves and tides over time also refer to Beaches. Beaches in Bangladesh are located along the coastline mainly in the districts of Cox's Bazar, Chittagong and Patuakhali.	Other land use
Betelvine and Vegetable	The betel (Piper betle), which local name is "Pan" is the leaf of a vine belonging to the Piperaceae family. In Bangladesh, farmers prepare a garden locally called a "Barouj" in which to grow betel.	Crop land
Boro-Falow-Falow	This land use represents rice cultivation land area. Boro means Rabi season rice grown in December to April. Fallow means the land remain uncultivated for a particular season in a year due to different causes like scarcity of irrigation water, farmer's choice and capability etc. If the farmer's can manage to overcome the situation, to some extent the land goes under cultivation again.	Crop land
Boro-Falow-T. aman	This land use represents rice cultivation land area. Boro means Rabi season rice grown in December to April. T. aman is Transplanted aman paddy rice grown in July to October.	Crop land
Falow-Aus-T.aman	This land use represents rice cultivation land area. Aus is that type of rice grown in April to July.	Crop land
Falow-B.aman	This land use represents rice cultivation land area. B. aman means broadcast aman paddy	Crop land
Falow-Falow-T.aman	This land use represents rice cultivation land area. T. aman is Transplanted aman paddy rice grown in July to October.	Crop land
Falow-Shrim-Taman	Shrimp is A kind of Aquaculture involves cultivating freshwater and saltwater shrimp under controlled conditions. T. aman is Transplanted aman paddy rice grown in July to October.	Crop land
Mangrove forest	This forest land area located in the southern part of Satkhira, Khulna and Bagerhat districts- the southwestern region of Bangladesh. The forest floor lies between 0.9 m to 2.1 m above sea level. The whole area is dissected by large tidal river, with innumerable small channels and creeks. Sundri (*Heritiera fomes*), gewa (*Excoecaria agallocha*), goran (*Ceriops decandra*), passur (*Xylocarpus mekongensis*) and dhandal (*Xylocarpus granatum*) are the dominant species. Leaf type: broad leaved Tree height: 5-20 m Crown cover:70-90%	Forest land
Mud Flat	Mudflat is a flat area of very wet soil near the sea that is covered at high tide. Mudflats refer to a tract of low muddy land, especially near an estuary that is covered at high tide and exposed at low tide.	Wetlands
Orchard	This category includes orchards which are plantation of trees normally devoted to the production of fruit and nuts and any other types of plantations such as sugarcane.	Cropland
R.crop/Fal-Mixed .B. aus & aman	Rabi crops are those crops which are grown on Rabi seasons. Duration of Rabi seasons lies generally from mid-November to end of the March. Rabi crops include- Pulses (Lentil, Gram, Black Gram etc) Oil seeds (Mustard, Soybean, etc) Vegetables (Radish, Carrot, Cabbage, Cauliflower, spinach, Red amaranth, Bean etc) Mixed Broadcast Aus rice and Aman rice are cultivated through broadcasting both rice seeds at the same time.	Crop land
R.crop-Aus-T.aman	Aus is that type of rice grown in April to July.	Crop land
R.crop-B.aus-Falow	B. aus is a broadcast rice grown in April and harvested at July.	Crop land
Sugarcane	It is a perennial crop	Crop land
Tea	Tea is a perennial shrub grown as a cash crop.	Crop land
Upland forest	This includes evergreen and deciduous forests in terrace and hilly areas of Bangladesh.	Forest land
Urban	Urban area is the region surrounding a city. There is a density of human structures such as houses, commercial buildings, roads, bridges, and railways.	Settlement

Appendix 3

National Land use class definition and corresponding IPCC land class of SRDI 2004 land use map

National Land use classes	Land use class description	IPCC land use class
Beach	Beaches are the pebbly or sandy shore, specifically by the ocean between high- and low-water marks. The area of accumulated sand, stone, or gravel deposited along a shore by the action of waves and tides over time also refer to Beaches. Beaches in Bangladesh are located along the coastline mainly in the districts of Cox's Bazar, Chittagong and Patuakhali.	Other land use
Boro -B. aman	This land use represents rice cultivation land area. Boro means Rabi season rice grown in December to April. B. aman means broadcast aman paddy, grown the month of March to November.	Crop land
Boro -Fallow	This land use represents rice cultivation land area. Boro means Rabi season rice grown in December to April. Fallow means the land remain uncultivated for a particular season in a year due to different causes like scarcity of irrigation water, farmer's choice and capability etc. If the farmer's can manage to overcome the situation, to some extent the land goes under cultivation again.	Crop land
Boro-T. aman	This land use represents rice cultivation land area. Boro means Rabi season rice grown in December to April. T. aman is Transplanted aman paddy rice grown in July to October.	Crop land
Boro-T. aus-T. aman	This land use represents rice cultivation land area. Boro means Rabi season rice grown in December to April. T. aman is Transplanted aman paddy rice grown in July to October. T.aus is Transplanted aus paddy rice grown in August to November.	Crop land
City	City area represent a land use consisting of density of human structures such as houses, commercial buildings, roads, bridges, and railways.	Settlement
Fallow (Mud Land)	Mudflat is a flat land area of very wet soil near the sea that is covered at high tide. Mudflats refer to a tract of low muddy land, especially near an estuary that is covered at high tide and exposed at low tide.	Wetland
Fallow -B. aman	This land use represents rice cultivation land area. B. aman means broadcast aman paddy, grown the month of March to November.	Crop land
Fallow-Fallow-T. aman	This land use represents rice cultivation land area. T. aman is Transplanted aman paddy rice grown in July to October.	Crop land
Fallow-T. aus-T. aman	This land use represents rice cultivation land area. T. aman is Transplanted aman paddy rice grown in July to October. T.aus is Transplanted aus paddy rice grown in August to November.	Crop land
Lake	A lake is an area of variable size filled with water, localized in a basin, that is surrounded by land, apart from any river or other outlet that serves to feed or drain the lake.	Wetland
Mangrove	This forest land area located in the southern part of Satkhira, Khulna and Bagerhat districts- the southwestern region of Bangladesh. The forest floor lies between 0.9 m to 2.1 m above sea level. The whole area is dissected by large tidal river, with innumerable small channels and creeks. Sundri (*Heritiera fomes*), gewa (*Excoecaria agallocha*), goran (*Ceriops decandra*), passur (*Xylocarpus mekongensis*) and dhandal (*Xylocarpus granatum*) are the dominant species. Leaf type: broad leaved Tree height: 5-20 m Crown cover:70-90%	Forest land
Mixed Evergreen & Deciduous Forest	Upland low hill forest. Situated mainly in greater Sylhet region, such as-Moulvibazar, Sylhet, and Habiganj district.	Forest land
Mixed Thickets & Forest	Upland high hill forest. Situated mainly in Rangamaki, Bandarban, Khagrachhari district of Bangladesh.	Forest land
Orchard	This category includes orchards which are plantation of trees normally devoted to the production of fruit and nuts and any other types of plantations such as sugarcane.	Crop land
Pineapple	It is a perennial crop land.	Crop land
Planted Mangrove Forest	These are plantations established in newly accreted lands of coastal area of Bangladesh. Mainly located in the district of Barguna, Patuakhali, Bhola, Noakhali, Chittagong, Cox's Bazar, Laxmipur. Leaf type: Broad-leaved Species planted: Keora (*Sonneratia apetalla*), Baen (*Avecinia alba*). Gewa (*Exochorea agalocha*)	Forest land
Potaro- Boro -T. aman	Potato is a tuber crop grown in November to January. Boro means Rabi season rice grown in December to April. T. aman is Transplanted aman paddy rice grown in July to October.	Crop land
Rabi Vegetable-Kharif Vegetable	This land use represents vegetables cultivation land area. Vegetables that are grown in Rabi season, generally in the month of November to February. Vegetables that are grown in Kharif-1 and Kharif-2 seasons generally in the month of March to October.	Crop land
RC -B. aman	Rabi crops (RC) are those crops which are grown on Rabi seasons. Duration of Rabi seasons lies generally from mid-November to end of the March. B. aman means broadcast aman paddy, grown the month of March to November.	Crop land
RC/fallow-Aus/Jute-T. aman	Rabi crops (RC) are those crops which are grown on Rabi seasons. Duration of Rabi seasons lies generally from mid-November to end of the March. Aus is that type of rice grown in April to July. T. aman is Transplanted aman paddy rice grown in July to October.	Crop land
RC/Fallow-Jute/fallow-T. aman	Rabi crops (RC) are those crops which are grown on Rabi seasons. Duration of Rabi seasons lies generally from mid-November to end of the March. Jute is a long, soft, shiny vegetable fibre grown generally in April to July. T. aman is Transplanted aman paddy rice grown in July to October.	Crop land

RC-B.aus/Jute/Fallow	Rabi crops (RC) are those crops which are grown on Rabi seasons. Duration of Rabi seasons lies generally from mid-November to end of the March. Jute is a long, soft, shiny vegetable fibre grown generally in April to July. B.aus means broadcast aman paddy grown in the month of April to July.	Crop land
River	A river is a natural flowing watercourse, usually freshwater, flowing towards an ocean, sea, lake or another river.	Wetlands
Sal	Sal Forest a forest type dominated by a single plant species, commonly known as Sal tree (*Shorea robusta*). Sal forests mostly occurring in Gazipur, Tangail, Mymensingh, Jamalpur, Comilla, Dinajpur, Thakurgaon, Rangpur and Rajshahi districts. Leaf type: borad-leaved Tree height: 5-25m	Forest land
Salt bed	Salt pans are flat expanses of ground covered with salt and other minerals. This types of salt bed are used in Bangladesh to produce salt naturally from the saline water.	Otherland
Shrimp	A kind of Aquaculture involves cultivating freshwater and saltwater shrimp under controlled conditions.	Wetland
Sugarcane	It is a perennial crop.	Crop land
Tea	Tea is a perennial shrub grown as a cash crop.	Crop land

Appendix 4

National Land use class definition and corresponding IPCC land class of National Forest and Tree Resources Assessment 2005-2007 Bangladesh.

National Land use classes	Land use class description	IPCC land use class
Haor & Baor	Haor & Baor belongs to inland water class. [2]A Haor is a low-lying area consisted of bowl shaped depressions or succession of depressions. A Baor is an oxbow lake formed in a dead arm of a river and shallow waterlogged areas. Lakes are permanent natural collection of water and ponds are artificial storage of water.	Wet land
Highway	Highways and other artificial areas belongs to Built-Up Areas class.	Settlements
Hill Forest	Belongs to the class natural forest under the major class Forest.	Forest land
Lakes	Lakes belongs to inland water class.	Wet land.
Mango plantation	This belongs to the Cultivated Land	Crop land
Mangrove Forest	Belongs to the class natural forest under the major class Forest.	Forest land
Mangrove Plantation	Belongs to the class forest plantations under the major class Forest.	Forest land
Mixed Bamboo	Belongs to the class natural forest under the major class Forest.	Forest land
Pond	Pond belongs to inland water class.	Wet land
River	River belongs to inland water class.	Wet land
Rubber Plantation	Belongs to the class forest plantations under the major class Forest.	Forest land
Rural Settlement, Agriculture & Others	Belongs to the class Villages under other lands.	Settlements
Sal Forest	Belongs to the class natural forest under the major class Forest.	Forest land
Shifting Cultivation	Belongs to the class Cultivated Land	Crop land
Swamp Forest	Belongs to the class natural forest under the major class Forest.	Forest land
Tea Garden	Belongs to the class Cultivated Land.	Crop land
Urban Settlement	Belongs to the Built-Up Areas class.	Settlements

Appendix 5

National Land use class definition and corresponding IPCC land class of SRDI (2013) report.

National Land cover classes	Land use class description	IPCC land use class
Crop land	Cultivated crops i.e. paddy rice, field grown vegetable and other crops; seasonal (detected by examining seasonal pattern using multitemporal images), orchard, wet meadow or pasture land, fellow land.	Crop land
Forest	Forest land included deciduous/evergreen Hill forest and deciduous Sal forest of the country. Deciduous (seasonal) and evergreen (permanent) forest vegetation located in hilly terrain. Sal forest located in Modhupur tract and Barind tract.	Forest land
Mangrove forest	Located along the coastal belt and tidal flats, and in designated reserved forest.	Forest land
River	Water body generally highly turbid and showing linearity.	Wet land
Lake	Clear deep water body created by drowning of valley; confirmed by shape of mountain valleys.	Wet land
Beel and Haor	Water body surrounding rural settlements and perennial vegetation; seasonal expansion and contraction.	Wet land
Aquaculture	Ponds, ditches, excavated wetlands for traditional fish farming detected by water logging and specific visual patterns.	
Tea estate	Tea garden area is the cash crop Tea growing area.	Crop land
Salt pan	The sea salt extraction area in the southeast coastal region of Bangladesh.	Crop land
Rural settlement	Concentration of perennial vegetation including orchards and trees, homestead gardens, small ponds and occasional rooftops connected by rural networks.	Settlement
Urban & Industrial	Built-up and paved areas characterized by high reflectivity, high surface temperature, very low vegetation and confirmed by geographic locations (cities, districts towns, rural townships). Characteristics similar to urban centers and situated in urban or peri-urban locations detectable by large civil structures; includes EPZs, industrials areas.	Settlement
Accreted land	Recently formed coastal sandbars, mudflats and upstream chars showing active geomorphological changes over time; sometimes succeeded by vegetation.	Other land

Appendix 6

The national land use class and the area of land-use change under each climate, ecology and soil type category based on approach 1 for the year 1976 and 1996.

Land use	Year-1976	Year-1996	Net change in area
Unit	1000 ha	1000 ha	1000 ha
Forestland	2261.1428	1692.4600	-568.68
Tropical moist forest-high activity clay soils	81.5634	54.6277	-26.94
Hill Forest	9.5885	6.0002	-3.59
Sal Forest	71.9748	48.6275	-23.35
Tropical moist forest-low activity clay soils	9.7112	16.1855	6.47
Sundarban Mangrove Forest	0.3740	0.3713	0.00
Plantation	9.2076	15.7269	6.52
Sal Forest	0.1296	0.0873	-0.04
Tropical moist forest-wetland soils	414.0483	409.5579	-4.49
Hill Forest	0.4322	0.2588	-0.17
Sundarban Mangrove Forest	407.9788	404.6441	-3.33
Plantation	0.8334	1.4127	0.58
Sal Forest	4.8039	3.2423	-1.56
Tropical rainforest-high activity clay soils	1544.6303	966.1392	-578.49
Hill Forest	1544.0089	965.0852	-578.92
Plantation	0.6214	1.0541	0.43
Tropical rainforest-low activity clay soils	18.8234	22.0430	3.22
Hill Forest	9.2558	5.7681	-3.49
Plantation	9.5676	16.2749	6.71
Tropical rainforest-wetland soils	192.3662	223.9066	31.54
Hill Forest	96.5230	60.3553	-36.17
Plantation	95.8433	163.5513	67.71
Cropland	10122.0522	9838.9216	-283.13
Tropical moist forest-high activity clay soils	325.2515	315.8300	-9.42
Cropland	325.2515	315.8300	-9.42
Tropical moist forest-low activity clay soils	1095.6171	1064.5733	-31.04
Cropland	1087.1792	1056.3761	-30.80
Orchard	8.4379	8.1972	-0.24
Tropical moist forest-wetland soils	6131.6017	5960.4297	-171.17
Cropland	6094.6105	5924.6671	-169.94

Orchard	36.9911	35.7626	-1.23
Tropical rainforest-high activity clay soils	186.5930	181.0184	-5.57
Cropland	124.4041	120.6970	-3.71
Orchard	3.0679	2.9690	-0.10
Tea Garden	59.1210	57.3524	-1.77
Tropical rainforest-low activity clay soils	201.0879	195.7949	-5.29
Cropland	196.4702	191.2916	-5.18
Orchard	4.6177	4.5033	-0.11
Tropical rainforest-wetland soils	2181.9010	2121.2754	-60.63
Cropland	2156.3558	2096.4565	-59.90
Orchard	4.6098	4.4547	-0.16
Tea Garden	20.9354	20.3642	-0.57
Wetland	1232.5228	1347.5273	115.00
Tropical moist forest-low activity clay soils	364.2265	398.2341	34.01
Inland water body	3.3972	3.7036	0.31
River	360.8293	394.5306	33.70
Tropical moist forest-wetland soils	547.5103	598.6315	51.12
Inland water body	15.1146	16.5222	1.41
River	532.3956	582.1092	49.71
Tropical rainforest-high activity clay soils	125.0322	136.6529	11.62
Inland water body	112.2244	122.6597	10.44
River	12.8079	13.9933	1.19
Tropical rainforest-low activity clay soils	53.8417	58.8928	5.05
Inland water body	1.3718	1.5018	0.13
River	52.4699	57.3911	4.92
Tropical rainforest-wetland soils	141.9121	155.1159	13.20
Inland water body	89.3457	97.6610	8.32
River	52.5664	57.4549	4.89
Settlement	934.4300	1651.4055	716.98
Tropical moist forest-high activity clay soils	9.1372	16.1348	7.00
Urban and Rural Settlement	9.0452	15.9568	6.91
Other land with trees	0.0920	0.1781	0.09
Tropical moist forest-low activity clay	93.9113	165.9579	72.05
Urban and Rural Settlement	93.8193	165.7798	71.96
Other land with trees	0.0920	0.1781	0.09
Tropical moist forest-wetland soils	545.2500	963.6824	418.43
Urban and Rural Settlement	545.1580	963.5043	418.35

Other land with trees	0.0920	0.1781	0.09
Tropical rainforest-high activity clay soils	15.8844	28.0267	12.14
Urban and Rural Settlement	15.7924	27.8486	12.06
Other land with trees	0.0920	0.1781	0.09
Tropical rainforest-low activity clay soils	1.0771	1.9268	0.85
Urban and Rural Settlement	0.9851	1.7487	0.76
Other land with trees	0.0920	0.1781	0.09
Tropical rainforest-wetland soils	269.1699	475.6768	206.51
Urban and Rural Settlement	269.0779	475.4988	206.42
Other land with trees	0.0920	0.1781	0.09
Otherland	289.8522	309.6857	19.83
Tropical rainforest-high activity clay soils	108.9265	116.3799	7.45
Accreted land	98.8578	105.6223	6.76
Saltpan	10.0687	10.7576	0.69
Tropical rainforest-low activity clay soils	177.0208	189.1337	12.11
Accreted land	160.6626	171.6561	10.99
Saltpan	16.3583	17.4776	1.12
Tropical rainforest-wet land soils	3.9049	4.1721	0.27
Saltpan	3.9049	4.1721	0.27
Balancing term			
Total land area	14840.00	14840.00	0.00

Appendix 7

The national land use class and the area of land-use change under each climate, ecology and soil type category based on approach 1 for the year 1996 and 2000.

Land use	Year-1996	Year-2000	Net change in area
Unit	1000 ha	1000 ha	1000 ha
Forestland	1692.4600	1578.9737	-113.49
Tropical moist forest-high activity clay soils	54.6277	49.2422	-5.39
Hill Forest	6.0002	5.2761	-0.72
Sal Forest	48.6275	43.9661	-4.66
Tropical moist forest-low activity clay soils	16.1855	17.4531	1.27
Sundarban Mangrove Forest	0.3713	0.3704	0.00
Plantation	15.7269	17.0036	1.28
Sal Forest	0.0873	0.0792	-0.01
Tropical moist forest-wetland soils	409.5579	408.6739	-0.88
Hill Forest	0.2588	0.2378	-0.02
Sundarban Mangrove Forest	404.6441	403.9626	-0.68
Plantation	1.4127	1.5389	0.13
Sal Forest	3.2423	2.9345	-0.31
Tropical rainforest-high activity clay soils	966.1392	850.7379	-115.40
Hill Forest	965.0852	849.5904	-115.49
Plantation	1.0541	1.1475	0.09
Tropical rainforest-low activity clay soils	22.0430	22.7614	0.72
Hill Forest	5.7681	5.0930	-0.68
Plantation	16.2749	17.6684	1.39
Tropical rainforest-wetland soils	223.9066	230.1051	6.20
Hill Forest	60.3553	53.1117	-7.24
Plantation	163.5513	176.9934	13.44
Cropland	9838.9216	9782.0762	-56.85
Tropical moist forest-high activity clay soils	315.8300	314.3271	-1.50
Cropland	315.8300	314.3271	-1.50
Tropical moist forest-low activity clay soils	1064.5733	1058.8179	-5.76
Cropland	1056.3761	1050.6634	-5.71

Orchard	8.1972	8.1545	-0.04
Tropical moist forest-wetland soils	5960.4297	5925.6555	-34.77
Cropland	5924.6671	5889.9068	-34.76
Orchard	35.7626	35.7487	-0.01
Tropical rainforest-high activity clay soils	181.0184	180.3257	-0.69
Cropland	120.6970	120.2257	-0.47
Orchard	2.9690	2.9649	0.00
Tea Garden	57.3524	57.1352	-0.22
Tropical rainforest-low activity clay soils	195.7949	194.3339	-1.46
Cropland	191.2916	189.8712	-1.42
Orchard	4.5033	4.4626	-0.04
Tropical rainforest-wetland soils	2121.2754	2108.6160	-12.66
Cropland	2096.4565	2083.9289	-12.53
Orchard	4.4547	4.4550	0.00
Tea Garden	20.3642	20.2322	-0.13
Wetland	1347.5273	1370.5647	23.04
Tropical moist forest-low activity clay soils	398.2341	405.0197	6.79
Inland water body	3.7036	3.7777	0.07
River	394.5306	401.2420	6.71
Tropical moist forest-wetland soils	598.6315	608.8311	10.20
Inland water body	16.5222	16.8075	0.29
River	582.1092	592.0236	9.91
Tropical rainforest-high activity clay soils	136.6529	139.0358	2.38
Inland water body	122.6597	124.7934	2.13
River	13.9933	14.2424	0.25
Tropical rainforest-low activity clay soils	58.8928	59.8719	0.98
Inland water body	1.5018	1.5254	0.02
River	57.3911	58.3465	0.96
Tropical rainforest-wetland soils	155.1159	157.8062	2.69
Inland water body	97.6610	99.3524	1.69
River	57.4549	58.4539	1.00
Settlement	1651.4055	1794.7578	143.35
Tropical moist forest-high activity clay soils	16.1348	17.6055	1.47
Urban and Rural Settlement	15.9568	17.3700	1.41

Other land with trees	0.1781	0.2355	0.06
Tropical moist forest-low activity clay	165.9579	180.3950	14.44
Urban and Rural Settlement	165.7798	180.1595	14.38
Other land with trees	0.1781	0.2355	0.06
Tropical moist forest-wetland soils	963.6824	1047.1353	83.45
Urban and Rural Settlement	963.5043	1046.8998	83.40
Other land with trees	0.1781	0.2355	0.06
Tropical rainforest-high activity clay soils	28.0267	30.5601	2.53
Urban and Rural Settlement	27.8486	30.3247	2.48
Other land with trees	0.1781	0.2355	0.06
Tropical rainforest-low activity clay soils	1.9268	2.1272	0.20
Urban and Rural Settlement	1.7487	1.8917	0.14
Other land with trees	0.1781	0.2355	0.06
Tropical rainforest-wetland soils	475.6768	516.9348	41.26
Urban and Rural Settlement	475.4988	516.6993	41.20
Other land with trees	0.1781	0.2355	0.06
Otherland	309.6857	313.6276	3.94
Tropical rainforest-high activity clay soils	116.3799	117.8613	1.48
Accreted land	105.6223	106.9667	1.34
Saltpan	10.7576	10.8946	0.14
Tropical rainforest-low activity clay soils	189.1337	191.5412	2.41
Accreted land	171.6561	173.8411	2.18
Saltpan	17.4776	17.7001	0.22
Tropical rainforest-wet land soils	4.1721	4.2252	0.05
Saltpan	4.1721	4.2252	0.05
Balancing term			
Total land area	14840.00	14840.00	0.00

Appendix 8

The national land use class and the area of land-use change under each climate, ecology and soil type category based on approach 1 for the year 2000 and 2004.

Land use	Year-2000	Year-2004	Net change in area
Unit	1000 ha	1000 ha	1000 ha
Forestland	1578.9737	1459.6838	-119.29
Tropical moist forest-high activity clay soils	49.2422	39.3100	-9.93
Hill Forest	5.2761	4.5616	-0.71
Sal Forest	43.9661	34.7484	-9.22
Tropical moist forest-low activity clay soils	17.4531	18.7382	1.29
Sundarban Mangrove Forest	0.3704	0.3698	0.00
Plantation	17.0036	18.3060	1.30
Sal Forest	0.0792	0.0624	-0.02
Tropical moist forest-wetland soils	408.6739	407.1380	-1.54
Hill Forest	0.2378	0.1967	-0.04
Sundarban Mangrove Forest	403.9626	402.9801	-0.98
Plantation	1.5389	1.6443	0.11
Sal Forest	2.9345	2.3169	-0.62
Tropical rainforest-high activity clay soils	850.7379	734.9118	-115.83
Hill Forest	849.5904	733.6849	-115.91
Plantation	1.1475	1.2269	0.08
Tropical rainforest-low activity clay soils	22.7614	23.3290	0.57
Hill Forest	5.0930	4.3851	-0.71
Plantation	17.6684	18.9439	1.28
Tropical rainforest-wetland soils	230.1051	236.2567	6.15
Hill Forest	53.1117	45.8838	-7.23
Plantation	176.9934	190.3729	13.38
Cropland	9782.0762	9471.7081	-310.37
Tropical moist forest-high activity clay soils	314.3271	304.0424	-10.28
Cropland	314.3271	304.0424	-10.28
Tropical moist forest-low activity clay soils	1058.8179	1024.8407	-33.98
Cropland	1050.6634	1016.9494	-33.71
Orchard	8.1545	7.8913	-0.26
Tropical moist forest-wetland soils	5925.6555	5737.9713	-187.68

Cropland	5889.9068	5703.5435	-186.36
Orchard	35.7487	34.4278	-1.32
Tropical rainforest-high activity clay soils	180.3257	174.2623	-6.06
Cropland	120.2257	116.1923	-4.03
Orchard	2.9649	2.8582	-0.11
Tea Garden	57.1352	55.2118	-1.92
Tropical rainforest-low activity clay soils	194.3339	188.4873	-5.85
Cropland	189.8712	184.1521	-5.72
Orchard	4.4626	4.3352	-0.13
Tropical rainforest-wetland soils	2108.6160	2042.1040	-66.51
Cropland	2083.9289	2018.2114	-65.72
Orchard	4.4550	4.2884	-0.17
Tea Garden	20.2322	19.6042	-0.63
Wetland	1370.5647	1399.3602	28.80
Tropical moist forest-low activity clay soils	405.0197	413.5523	8.53
Inland water body	3.7777	3.8460	0.07
River	401.2420	409.7063	8.46
Tropical moist forest-wetland soils	608.8311	621.6580	12.83
Inland water body	16.8075	17.1578	0.35
River	592.0236	604.5002	12.48
Tropical rainforest-high activity clay soils	139.0358	141.9093	2.87
Inland water body	124.7934	127.3778	2.58
River	14.2424	14.5315	0.29
Tropical rainforest-low activity clay soils	59.8719	61.1582	1.29
Inland water body	1.5254	1.5595	0.03
River	58.3465	59.5986	1.25
Tropical rainforest-wetland soils	157.8062	161.0825	3.28
Inland water body	99.3524	101.4175	2.07
River	58.4539	59.6650	1.21
Settlement	1794.7578	2083.3888	288.63
Tropical moist forest-high activity clay soils	17.6055	20.4195	2.81
Urban and Rural Settlement	17.3700	20.1269	2.76
Other land with trees	0.2355	0.2926	0.06
Tropical moist forest-low activity clay	180.3950	209.3971	29.00
Urban and Rural Settlement	180.1595	209.1045	28.94

Other land with trees	0.2355	0.2926	0.06
Tropical moist forest-wetland soils	1047.1353	1215.5975	168.46
Urban and Rural Settlement	1046.8998	1215.3049	168.41
Other land with trees	0.2355	0.2926	0.06
Tropical rainforest-high activity clay soils	30.5601	35.4191	4.86
Urban and Rural Settlement	30.3247	35.1265	4.80
Other land with trees	0.2355	0.2926	0.06
Tropical rainforest-low activity clay soils	2.1272	2.4983	0.37
Urban and Rural Settlement	1.8917	2.2057	0.31
Other land with trees	0.2355	0.2926	0.06
Tropical rainforest-wetland soils	516.9348	600.0574	83.12
Urban and Rural Settlement	516.6993	599.7648	83.07
Other land with trees	0.2355	0.2926	0.06
Otherland	313.6276	425.8590	112.23
Tropical rainforest-high activity clay soils	117.8613	160.0379	42.18
Accreted land	106.9667	145.2447	38.28
Saltpan	10.8946	14.7932	3.90
Tropical rainforest-low activity clay soils	191.5412	260.0840	68.54
Accreted land	173.8411	236.0500	62.21
Saltpan	17.7001	24.0340	6.33
Tropical rainforest-wet land soils	4.2252	5.7371	1.51
Saltpan	4.2252	5.7371	1.51
Balancing term			
Total land area	14840.00	14840.00	0.00

Appendix 9

The national land use class and the area of land-use change under each climate, ecology and soil type category based on approach 1 for the year 2004 and 2005.

Landuse	Year-2004	Year-2005	Net change in area
Unit	1000 ha	1000 ha	1000 ha
Forestland	1459.6838	1429.8996	-29.78
Tropical moist forest-high activity clay soils	39.3100	36.8284	-2.48
Hill Forest	4.5616	4.3817	-0.18
Sal Forest	34.7484	32.4467	-2.30
Tropical moist forest-low activity clay soils	18.7382	19.0534	0.32
Sundarban Mangrove Forest	0.3698	0.3692	0.00
Plantation	18.3060	18.6259	0.32
Sal Forest	0.0624	0.0583	0.00
Tropical moist forest-wetland soils	407.1380	406.7584	-0.38
Hill Forest	0.1967	0.1890	-0.01
Sundarban Mangrove Forest	402.9801	402.7329	-0.25
Plantation	1.6443	1.6731	0.03
Sal Forest	2.3169	2.1634	-0.15
Tropical rainforest-high activity clay soils	734.9118	705.9986	-28.91
Hill Forest	733.6849	704.7502	-28.93
Plantation	1.2269	1.2484	0.02
Tropical rainforest-low activity clay soils	23.3290	23.4871	0.16
Hill Forest	4.3851	4.2121	-0.17
Plantation	18.9439	19.2750	0.33
Tropical rainforest-wetland soils	236.2567	237.7737	1.52
Hill Forest	45.8838	44.0742	-1.81
Plantation	190.3729	193.6995	3.33
Cropland	9471.7081	9394.1918	-77.52
Tropical moist forest-high activity clay soils	304.0424	301.5541	-2.49
Cropland	304.0424	301.5541	-2.49
Tropical moist forest-low activity clay soils	1024.8407	1016.4534	-8.39
Cropland	1016.9494	1008.6267	-8.32
Orchard	7.8913	7.8267	-0.06
Tropical moist forest-wetland soils	5737.9713	5691.0119	-46.96

Cropland	5703.5435	5656.8658	-46.68
Orchard	34.4278	34.1461	-0.28
Tropical rainforest-high activity clay soils	174.2623	172.8362	-1.43
Cropland	116.1923	115.2414	-0.95
Orchard	2.8582	2.8348	-0.02
Tea Garden	55.2118	54.7600	-0.45
Tropical rainforest-low activity clay soils	188.4873	186.9448	-1.54
Cropland	184.1521	182.6450	-1.51
Orchard	4.3352	4.2997	-0.04
Tropical rainforest-wetland soils	2042.1040	2025.3915	-16.71
Cropland	2018.2114	2001.6944	-16.52
Orchard	4.2884	4.2533	-0.04
Tea Garden	19.6042	19.4438	-0.16
Wetland	1399.3602	1406.5739	7.21
Tropical moist forest-low activity clay soils	413.5523	415.6842	2.13
Inland water body	3.8460	3.8659	0.02
River	409.7063	411.8183	2.11
Tropical moist forest-wetland soils	621.6580	624.8626	3.20
Inland water body	17.1578	17.2462	0.09
River	604.5002	607.6164	3.12
Tropical rainforest-high activity clay soils	141.9093	142.6409	0.73
Inland water body	127.3778	128.0344	0.66
River	14.5315	14.6064	0.07
Tropical rainforest-low activity clay soils	61.1582	61.4734	0.32
Inland water body	1.5595	1.5676	0.01
River	59.5986	59.9059	0.31
Tropical rainforest-wetland soils	161.0825	161.9128	0.83
Inland water body	101.4175	101.9403	0.52
River	59.6650	59.9725	0.31
Settlement	2083.3888	2155.4653	72.08
Tropical moist forest-high activity clay soils	20.4195	21.1298	0.71
Urban and Rural Settlement	20.1269	20.8230	0.70
Other land with trees	0.2926	0.3068	0.01
Tropical moist forest-low activity clay	209.3971	216.6430	7.25
Urban and Rural Settlement	209.1045	216.3361	7.23

Other land with trees	0.2926	0.3068	0.01
Tropical moist forest-wetland soils	1215.5975	1257.6417	42.04
Urban and Rural Settlement	1215.3049	1257.3348	42.03
Other land with trees	0.2926	0.3068	0.01
Tropical rainforest-high activity clay soils	35.4191	36.6482	1.23
Urban and Rural Settlement	35.1265	36.3413	1.21
Other land with trees	0.2926	0.3068	0.01
Tropical rainforest-low activity clay soils	2.4983	2.5889	0.09
Urban and Rural Settlement	2.2057	2.2820	0.08
Other land with trees	0.2926	0.3068	0.01
Tropical rainforest-wetland soils	600.0574	620.8138	20.76
Urban and Rural Settlement	599.7648	620.5070	20.74
Other land with trees	0.2926	0.3068	0.01
Otherland	425.8590	453.8695	28.01
Tropical rainforest-high activity clay soils	160.0379	170.5642	10.53
Accreted land	145.2447	154.7980	9.55
Saltpan	14.7932	15.7662	0.97
Tropical rainforest-low activity clay soils	260.0840	277.1908	17.11
Accreted land	236.0500	251.5759	15.53
Saltpan	24.0340	25.6148	1.58
Tropical rainforest-wet land soils	5.7371	6.1145	0.38
Saltpan	5.7371	6.1145	0.38
Balancing term			
Total land area	14840.00	14840.00	0.00

Appendix 10

The national land use class and the area of land-use change under each climate, ecology and soil type category based on approach 1 for the year 2005 and 2010.

Land use	Year-2005	Year-2010	Net change in area
Unit	1000 ha	1000 ha	1000 ha
Forestland	1429.8996	1425.2681	-4.63
Tropical moist forest-high activity clay soils	36.8284	36.0327	-0.80
Hill Forest	4.3817	4.2829	-0.10
Sal Forest	32.4467	31.7498	-0.70
Tropical moist forest-low activity clay soils	19.0534	20.4046	1.35
Sundarban Mangrove Forest	0.3692	0.3646	0.00
Plantation	18.6259	19.9828	1.36
Sal Forest	0.0583	0.0572	0.00
Tropical moist forest-wetland soils	406.7584	401.8062	-4.95
Hill Forest	0.1890	0.1931	0.00
Sundarban Mangrove Forest	402.7329	397.6855	-5.05
Plantation	1.6731	1.8086	0.14
Sal Forest	2.1634	2.1191	-0.04
Tropical rainforest-high activity clay soils	705.9986	691.0080	-14.99
Hill Forest	704.7502	689.6595	-15.09
Plantation	1.2484	1.3486	0.10
Tropical rainforest-low activity clay soils	23.4871	24.8984	1.41
Hill Forest	4.2121	4.1343	-0.08
Plantation	19.2750	20.7641	1.49
Tropical rainforest-wetland soils	237.7737	251.1182	13.34
Hill Forest	44.0742	43.1137	-0.96
Plantation	193.6995	208.0045	14.31
Cropland	9394.1918	8911.4493	-482.74
Tropical moist forest-high activity clay soils	301.5541	286.3513	-15.20
Cropland	301.5541	286.3513	-15.20
Tropical moist forest-low activity clay soils	1016.4534	964.5807	-51.87
Cropland	1008.6267	957.1520	-51.47
Orchard	7.8267	7.4288	-0.40

Tropical moist forest-wetland soils	5691.0119	5398.2588	-292.75
Cropland	5656.8658	5365.6918	-291.17
Orchard	34.1461	32.5670	-1.58
Tropical rainforest-high activity clay soils	172.8362	164.2764	-8.56
Cropland	115.2414	109.5253	-5.72
Orchard	2.8348	2.7010	-0.13
Tea Garden	54.7600	52.0501	-2.71
Tropical rainforest-low activity clay soils	186.9448	177.0377	-9.91
Cropland	182.6450	172.9723	-9.67
Orchard	4.2997	4.0654	-0.23
Tropical rainforest-wetland soils	2025.3915	1920.9444	-104.45
Cropland	2001.6944	1898.4545	-103.24
Orchard	4.2533	4.0585	-0.19
Tea Garden	19.4438	18.4315	-1.01
Wetland	1406.5739	1427.3504	20.78
Tropical moist forest-low activity clay soils	415.6842	421.8006	6.12
Inland water body	3.8659	3.9342	0.07
River	411.8183	417.8664	6.05
Tropical moist forest-wetland soils	624.8626	634.0564	9.19
Inland water body	17.2462	17.5038	0.26
River	607.6164	616.5526	8.94
Tropical rainforest-high activity clay soils	142.6409	144.7964	2.16
Inland water body	128.0344	129.9639	1.93
River	14.6064	14.8325	0.23
Tropical rainforest-low activity clay soils	61.4734	62.3526	0.88
Inland water body	1.5676	1.5886	0.02
River	59.9059	60.7640	0.86
Tropical rainforest-wetland soils	161.9128	164.3445	2.43
Inland water body	101.9403	103.4688	1.53
River	59.9725	60.8757	0.90
Settlement	2155.4653	2488.6063	333.14
Tropical moist forest-high activity clay soils	21.1298	24.4564	3.33
Urban and Rural Settlement	20.8230	24.0824	3.26
Other land with trees	0.3068	0.3740	0.07

Tropical moist forest-low activity clay	216.6430	250.1540	33.51
Urban and Rural Settlement	216.3361	249.7801	33.44
Other land with trees	0.3068	0.3740	0.07
Tropical moist forest-wetland soils	1257.6417	1451.8361	194.19
Urban and Rural Settlement	1257.3348	1451.4622	194.13
Other land with trees	0.3068	0.3740	0.07
Tropical rainforest-high activity clay soils	36.6482	42.4172	5.77
Urban and Rural Settlement	36.3413	42.0433	5.70
Other land with trees	0.3068	0.3740	0.07
Tropical rainforest-low activity clay soils	2.5889	2.9966	0.41
Urban and Rural Settlement	2.2820	2.6227	0.34
Other land with trees	0.3068	0.3740	0.07
Tropical rainforest-wetland soils	620.8138	716.7458	95.93
Urban and Rural Settlement	620.5070	716.3719	95.86
Other land with trees	0.3068	0.3740	0.07
Otherland	453.8695	587.3259	133.46
Tropical rainforest-high activity clay soils	170.5642	220.7171	50.15
Accreted land	154.7980	200.3151	45.52
Saltpan	15.7662	20.4021	4.64
Tropical rainforest-low activity clay soils	277.1908	358.6963	81.51
Accreted land	251.5759	325.5497	73.97
Saltpan	25.6148	33.1467	7.53
Tropical rainforest-wet land soils	6.1145	7.9124	1.80
Saltpan	6.1145	7.9124	1.80
Balancing term			
Total land area	14840.00	14840.00	0.00