Report on Japan's Supplementary Information on LULUCF activities

under Article 3, Paragraphs 3 and 4 of the Kyoto Protocol

The Government of Japan

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CONTENTS

Chapter 1 General information

1.1. Definition of forest and any other criteria

1.1.1. Definitions of forest for activities under Article 3, paragraph 3 and 4

The Japan's definitions of forest are identified as the following, in accordance with decision 16/CMP.1 adopted by the Conference of the Parties serving as the meeting of the Parties to the Kyoto Protocol.

Minimum value for forest area:	0.3 [ha]
Minimum value for tree crown cover:	30 [%]
Minimum value for tree height:	5 [m]
Minimum value for forest width:	20 [m]

1.1.2. Consistency of the definitions

Minimum values for forest area, tree crown cover and forest width (mentioned above) are consistent with forests under the exsisting forest planning system in Japan. Minimum value for tree height is not defined under the exsisting system. However, it could be assumed that these forests usually reach tree height 5m at maturity in situ under the tree species and climate condition in Japan. Each prefecture has surveyed and compiled information on resources of forests under forest planning in Forest Register primary intended to establish forest planning. Therefore, Japan considered that forests under forest planning meet Kyoto Protocol requirements and Forest register is available as fundamental data for reporting.

Definitions of forest mentioned above are consisitent with definitions of forest reported in the Global Forest Resources Assessment 2005 (FRA2005) coordinated by Food and Agriculture Organization of the United Nation (FAO) in 2005 (Table 1-1).

Table 1-1 Japan's forest category and definition used in reporting to FAO

Category		Definition
Forest		Land on which trees and/or bamboo grow collectively, together with those trees and bamboo, or any other land that is provided for collective growth of trees and/or bamboo which are 0.3 hectares or more. Lands that are utilized mainly for agriculture, residential use or other similar purposes, and trees and bamboo on these lands are not included.
	Forest with standing trees	Forest that has tree crown cover of 30 percent or higher (including young stands).
	Forest without standing trees (Cut-over forests, lesser stocked forests)	Forest that does not fall under "forest with standing trees" or "bamboo forest".
	Bamboo forest	Forest that does not fall under "forest with standing trees" and is mainly dominated by bamboo (excluding bamboo grass).

Before 1996, Japan classified forests (with standing trees) into two sub-categories, "Intensively managed forest" and "Semi-natural forest" in Forestry Status Survey based on Forest Register. In 2002 or later, Japan introduced new sub-categories which are "Ikusei-rin forest" and "Tennensei-rin

forest". In these new sub-categories, degrees of human-inductivity in forest management and layer structure have been taken in account. In ikusei-rin forests, intensively managed forests regenerated mainly by planting after felling and some semi-natural forests regenerated by supplementary works such as site preparation are included. Definitions of intensively managed forest, semi-natural forest, ikusei-rin forest and tennensei-rin forest are shown below.

Table 1-2 Definitions of intensively managed forest, semi-natural forest, ikusei-rin forest and tennensei-rin forest

Sub-categories by regeneration method		Sub-categories by management types	
Intensively managed forest	Forest regenered by planting and so on.	Ikusei-rin forest	Forest where practices for establishment and maintenance of single-storied forests ("Ikusei-tansou-rin" practices) have been carried out after clear cutting ,or where forest practices for establishment and maintenance of multi-storied forests ("Ikusei-fukusou-rin" practices) have been carried out after selection cutting(including temporally single-storied forest in practice).
Semi-natural forest	Forest which is not classified as intensively managed forest.	Tennensei-rin forest	Forest where practices which establishment and maintenance of forests mainly depending on natural power are carried out. These practices include logging prohibition for land and natural environment conservation and preservation of the species.

1.2. Elected activities under Article 3.4

1.2.1. Election of activities under Article 3, paragraph 4 of the Kyoto Protocol

Japan elects Forest Management and Revegetation defined by decision 16/CMP.1 annex paragpaph 6, as "additional human activities related to changes in greenhouse gas by source and removals by sinks in the agricultural soils and the land-use change and forestry categories" (hereafter "additional removal activities") defined by Article 3, paragraph 4 of the Kyoto Protocol.

1.2.2. Lands identification method under the Japan's national system in accordance with Article 5, paragraph 1 of Kyoto Protocol

LULUCF-GPG, page 4.24, Section 4.2.2.2 shows the two methods for identifying and reporting lands subject to Article 3.4 activities. Reporting Method 1 entails delineating areas that include multiple land units subject to Article 3.4 activities by using legal, administrative, or ecosystem boundaries. Reporting Method 2 is based on the spatially explicit and complete geographical identification of all lands subject to Article 3.4 activities.

Japan elects Reporting Method 1 in accordance with the decision tree indicated in Figure 4.2.4 in chapter 4 of LULUCF-GPG, which means that the entire national land is stratified by using the geographic boundary between prefectures, and total area of each "lands" subject to properly each Article 3.4 activity will be reported within each boundary.

1.2.3. Interpretation of elected activities under Article 3, paragraph 4 of the Kyoto Protocol

1.2.3.1. Forest Management

Forest Management is defined by decision 16/CMP.1 ANNEX paragraph 1(f) as "a system of practices for stewardship and use of forest land aimed at fulfilling relevant ecological (including biological diversity), economic and social functions of the forest in a sustainable manner". Japan interprets the definition of "Forest Management" as the following with recalling the LULUCF-GPG that is requested to use for the party in accordance with the decision 16/CMP.1 paragraph 2

- In "Ikusei-rin forest", activities for "Forest Management" are appropriate forest practices including regeneration (land preparation, soil scarification, planting and etc.), tending (weeding, pre-commercial cutting and etc.), thinning and harvesting which have been carried out since 1990.

- In "Tennensei-rin forest", activities for "Forest Management" are practices for protection or conservation of forests including controlling logging activities and land-use change which have been carried out by laws.

1.2.3.2. Revegetation

Revegetation is defined by decision 16/CMP.1 ANNEX paragraph 1(e) as "a direct human-induced activity to increase carbon stocks on sites through the establishment of vegetation that covers a minimum area of 0.05 hectares and does not meet the definitions of afforestation and reforestation".

Japan interprets the definition of "Revegetation" as the following with recalling the LULUCF-GPG.

- Practices for creation of "park and green space", "public green space", and "private green space guaranteed by administration" have been carried out in settlements since 1990[1].

Japan identifies and reports areas which meet the definition for each sub-division ("Urban parks", "Green area on road", "Green area on port", "Green area around sewage treatment facility", "Green area by greenery promoting system for private green space", "Green area along river and erosion control site", "Green area around public rental housing" and "Green area around government buildings"). All areas excluding "Urban parks" and "Green area along river and erosion control site" are located in Settlements, while some "Urban parks" and all "Green area along river and erosion control site" are located in Wetlands (in some cases, urban parks occupy the river zone [= Wetlands]).

1.3. Description of how the definitions of each activity under Article 3.3 and each elected activity under article 3.4 have been implemented and applied consistently over time

1.3.1. Afforestation/Reforestation, Deforestation

Afforestation/Reforestation and Deforestation (ARD) land area is calculated based on sampling surveys with orthophotos at the end of 1989 and satellite images which cover the entire country. Japan

[1] Land which area is less than 0.05 ha or meets the definition of Afforestation/Reforestation is not qualified as Revegetation.

updates satellite data every two years and monitors continuously.

1.3.2. Forest Management

Forest management (FM) land area is calculated by subtracting ARD land area from forest land area stored in the National Forest Resources Database and multiplying by ratio of forest maintained and managed appropriately (FM ratio) for each region and tree type. The change of FM land during the first commitment period will be surveyed every year in sample survey of FM ratio.

1.3.3. Revegetation

Information on developing a consistent time series of definition for each sub-division qualified as revegetation is shown below.

Table 1-3 Consistent time series for definition of Revegetation (for each sub-division)

Sub-division	Consistent time series for definition of Revegetation
Urban parks	The Urban Park Act and the Ordinance for Enforcement of the Urban Park Act require compilation of "Register of city parks". Ministry of Land, Infrastructure, Transport and Tourism (MLITT) has collected relevant data (name, location, notificated year and land area) from "Urban Parks Status Survey" based on "Register of city parks". MLITT will implement this survey continuously and update land area data annually. However, area of land which subjected to land-use conversion is calculated based on the ratio of land-use conversion for whole country because it is difficult to collect converted land data individually.
Green area on road	MLITT has implemented "Road Tree Planting Status Survey" every 5 years and has collected data on the number of tall trees which had been planted since 1990 for green area on road which had been established since 1990 (extrapolation and interpolation are applied for data blank years). RV land area for green area on road is calculated by multiplying land area per tall tree (ha/tree) by the number of tall trees. After 2007, MLITT will implement this survey every year and update tall trees data. However, area of land which subjected to land-use conversion is calculated based on the ratio of land-use conversion for whole country because it is difficult to collect converted land data individually.
Green area on port	MLITT has implemented complete census every year since 2006 and has collected relevant data (established year and service area) for green area on port which had been established since 1990. MLITT will implement this survey continuously and update land area data annually. However, area of land which subjected to land-use conversion is calculated based on the ratio of land-use conversion for whole country because it is difficult to collect converted land data individually.
Green area around sewage treatment facility	MLITT has implemented "Sewage treatment Facility Status Survey" every year since 2006 and has collected relevant data (established year, greening area and the number of tall trees [for only some green area]) for green area around sewage treatment facility which had been established since 1990. MLITT will implement this survey continuously and update land area data annually. However, area of land which subjected to land-use conversion is calculated based on the ratio of land-use conversion for whole country because it is difficult to collect converted land data individually.

Green area by greenery promoting system for private green space	Green area by greenery promoting system for private green space is managed under recognition system by local authority mayor under the Urban Park Act (Article 60). When this area is established or modified, notification is required. MLITT has collected relevant data (name, location, certificated year and planted land area) from "Urban Greening Status Survey" based on the notification system. MLITT will implement this survey continuously and collect and update land area data annually. All green area by greenery promoting system for private green space to be reported was not qualified as Forest land on 31st December 1989 and located in "Settlements remaining settlements".
Green area along river and erosion control site	MLITT has implemented "Survey on carbon dioxide absorption at source in river works" since 2007 and has collected relevant data (name, location, established year, planted land area and the number of tall trees) for river works and erosion and sediment control works which had been implemented since 1990. MLITT will implement this survey continuously and update land area data annualy. However, area of land which subjected to land-use conversion is calculated based on the ratio of land-use conversion for whole country because it is difficult to collect converted land data individually.
Green area around government buildings	MLITT has implemented complete census since 2007 and has collected relevant data (name, location, established year, land area and building area) for government buildings which had been established since 1990. MLITT will implement this survey continuously and collect and update land area data annualy. However, area of land which subjected to land-use conversion is calculated based on the ratio of land-use conversion for whole country because it is difficult to collect converted land data individually.
Green area around public rental housing	MLITT has implemented "Progress survey on tree planting for public rental housing" since 2007 and has collected relevant data (name, location, established year, land area and building area) for public rental housing which had been established since 1990. MLITT will implement this survey continuously and update land area data annualy. However, area of land which subjected to land-use conversion is calculated based on the ratio of land-use conversion for whole country because it is difficult to collect converted land data individually.

1.4. Description of precedence condition and/or hierarchy among Article 3.4 activities, and how they have been consistently applied in determining how land was classified

Japan interprets that forest management activities are occurred in only forest land and revegetation activities are occurred in only settlements and wetlands. Therefore, overlapping is nonexistent between forest management and revegetation.

Chapter 2 Land-related information

2.1. Spacial assessment unit used for determining the area of the units of land under Article 3.3

In accordance with the definition of forest indicated in Chapter 1, 1,1,1,, Japan determines spacial assessment unit used for determining the area of the units of land under Article 3.3 as 0.3 [ha].

2.2. Methodology used to develop the land transition matrix in table NIR2

2.2.1. Afforestation/Reforestation and Deforestation

2.2.1.1. Procedure

Japan identifies change of forest cover in each sample plot by using orthophotos at the end of 1989 and satellite images (taking into account spatial assessment unit [0.3 ha]). Interpretation of satellite images at 2005 has been implemented for FY 2005-2006 because these images have been compiled for FY 2005-2006. Japan calculates ARD land area based on such satellite image data. Detailed procedures are as follows.

1. Locate sample plots in a reticular pattern with 500 meters distance between the plots for the entire country (approximately 1,400 thousand plots setting).
2. Estimation of AR rate for 1990-2006: Calculate the number of AR plots for 2006 by dividing the number for 1990-2005 (15 years) by 15 (assume that 2006 value is equal to the annual average for 15 years). The number of AR plots for 1990-2006 is estimated based on data for 1990-2005 and for 2006. AR rate is estimated by dividing the number of AR plots for 1990-2006 by the number of available sample plots for 1990-2006.
3. Estimation of D rate for 1990-2006: Calculate the number of D plots for 2005 by multiplying the number of them for 1990-2005 by conversion ratio for 2005 (= area of land converted from forest land in 2005 / total area of land converted from forest land in 1990-2005) and assume that 2006 value is equal to 2005. The number of D plots for 1990-2006 is estimated based on data for 1990-2005 and for 2006. D rate is estimated by dividing the number of D plots for 1990-2006 by the number of available sample plots for 1990-2006.
4. Calculate AR land area for each prefecture during 1990-2006 by multiplying land area for each prefecture by AR rate. In the same way, calculate D land area for each prefecture during 1990-2006 by multiplying land area for each prefecture by D rate.

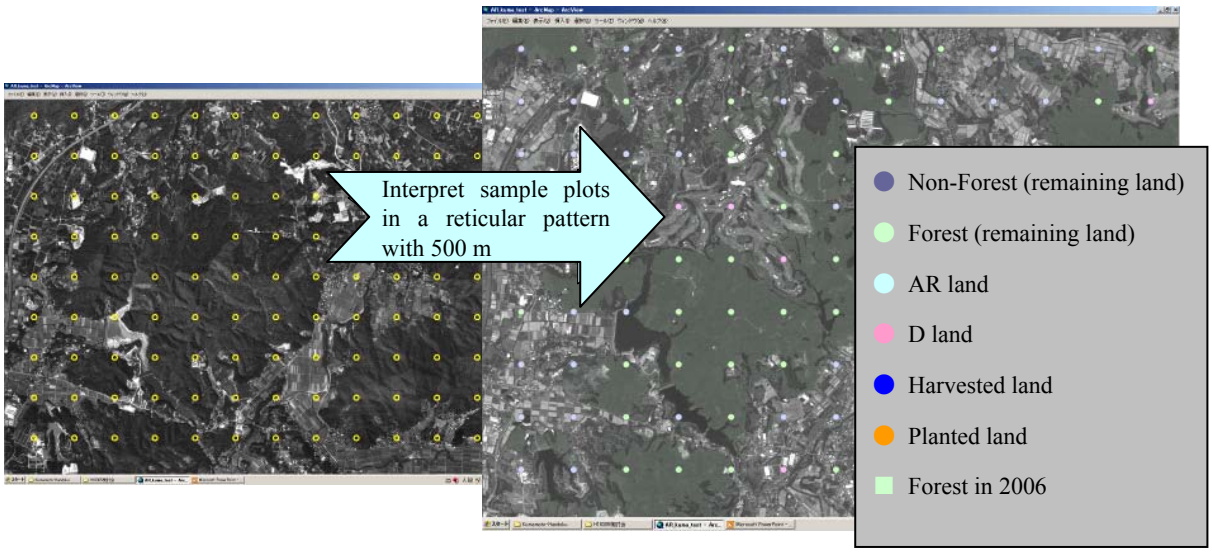

Figure 2-1 ARD land identification by interpreting remote sensing images

2.2.1.2. Data

Japan calculated the ARD land area by using the following data.

Table 2-1 Data used in ARD land detection

	Resolution	Data format
Ortho air-photo (at the end of 1989)	1 [m]	raster
SPOT-5/HRV-P(2005)	2.5 [m]	raster

2.2.2. Forest Management

2.2.2.1. Procedure

Japan estimated FM land area for ikusei-rin forests and tennensei-rin forests according to the following procedures.

a) Ikusei-rin forests

1. Implement field survey in private forests and national forests (at 4,500 sample plots located around the country in 2007) to identify lands which have been subject to forest management activities (sample plots are systematically distributed by tree species and regions, while they are selected randomly from the National Forest Resource Database).

Survey item: current status of forests (tree types, stand age, the number of trees, etc), status and contents of practices since 1990, etc.

2. Estimate ratio of these FM land area (FM ratio) according to the survey findings.

Table 2-2 FM ratio for Ikusei-rin forests (private forests / national forests)

Sub-category / Tree species		Region	Private forest	National forest
Intensively managed forest	Japanese ceder	Tohoku, Kita-kanto, Hokuriku, Tosan	0.53	0.77
		Minami-kanto, Tokai	0.33	0.72
		Kinki, Chugoku, Shikoku, Kyusyu	0.41	0.72
	Hinoki cypress	Tohoku, Kanto, Chubu	0.58	0.72
		Kinki, Chugoku, Shikoku, Kyusyu	0.45	0.70
	Japanese larch	All	0.42	0.61
	Other	All	0.50	0.74
Semi-natural forest / All		All	0.43	0.45

3. Subtract AR land area for each prefecture from total forest area and estimate FM land area by multiplying remained forest area for each prefecture by FM ratio for each tree species, regions and age class.

b) Tennensei-rin forests

For Tennensei-rin forests, identify forest lands subject to practices for protection or conservation of forests including controlling logging activities and land-use change which have been carried out by laws by using the National Forest Resources Database.

Table 2-3 Area of protected/conserved tennensei-rin forests

Protected / Conserved forest type	Private forest	National forest	Total
Protection Forest	2,414	4,184	6,598
Area for Conservation facility installation project	1	0	1
Protected Forest	-	638	638
Special Protected Zones in National Parks	40	102	143
Class I Special Zones in National Parks	35	142	177
Class II Special Zones in National Parks	118	183	301
Special Protected Zones in Quasi-National Parks	10	38	47
Class I Special Zones in Quasi-National Parks	31	104	136
Class II Special Zones in Quasi-National Parks	98	84	182
Special Zone in National Environment Conservation Area	0	9	9
Special Seed Forest	1	1	1
Total	2,747 (2,563)	5,486 (4,231)	8,233 (6,793)

* National Forest Resource Database (1st April 2006)
* This table includes forest without standing trees.
* This table summarises land area by management type.
* () means total land area excluding overlaps

2.2.2.2. Data

a） Yield tables developed by prefectures or Regional Forest Offices, and Forest register

When private forests or national forests establish forest planning (all forest lands are divided into 158 planning areas and regional forest planning is established by 1/5 [about 30 planning areas] each year), field survey are implemented in these forests to develop Forest Register which includes data on area, age, volume by tree species and so on.

When forest planning is established (private forests: each prefecture, national forests: Regional Forest Offices of National forests), Forest Register is updated to reflect change in volume due to growth, cutting and disturbances.

In general, volume data described in the Forest Register is estimated based on land area data and yield tables which provide stand growth including effects of typical practices implemented for each regions, tree species and site classes (yield tables show relationship between stand age or age class and volume per area).

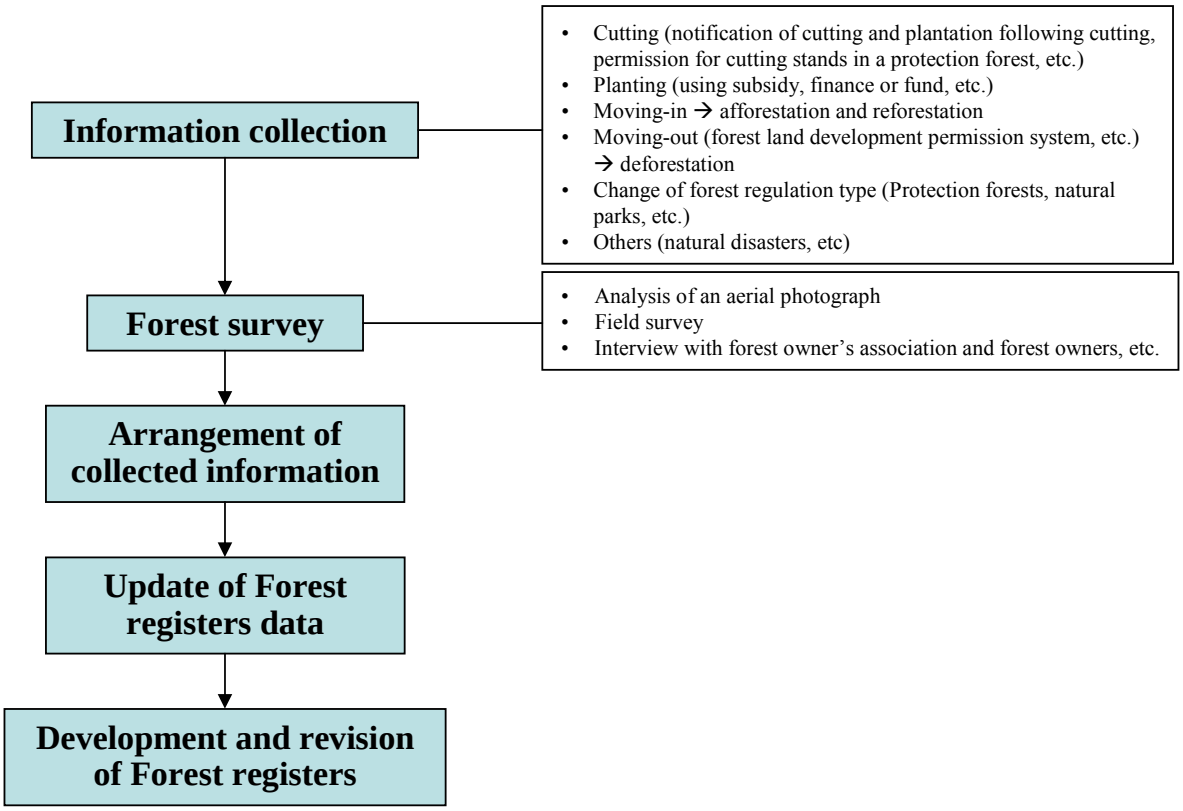

Figure 2-2 Procedures of Forest register development

b） Development of the National Forest Resources Database

To estimate emissions/removals from forest, Forestry Agency has developed National Forest Resources Database (NFRDB). In the NFRDB, Forest Registers which are the base data for estimating and reporting, administrative information including Forest Planning Map, Forest Resource Monitoring survey as forest stand information and geographical location information including ortho-photo and satellite image from Landsat-TM and SPOT are archived.

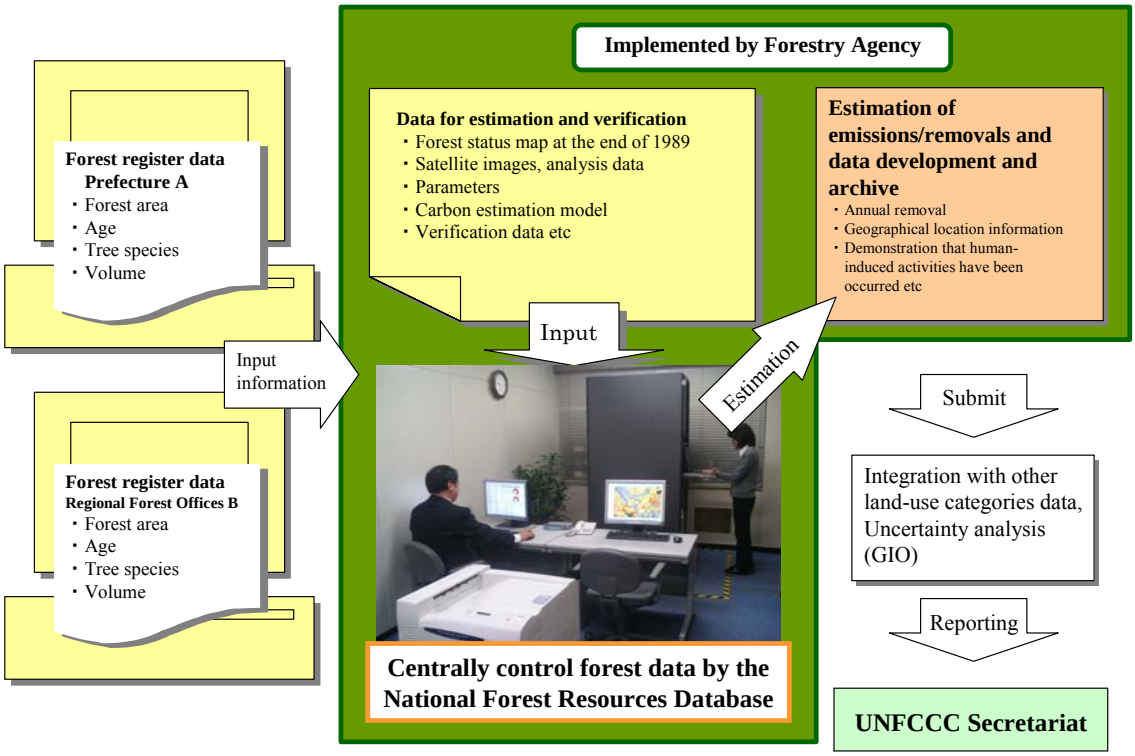

Figure 2-3 Summary of the National Forest Resources Database

2.2.3. Revegetation

2.2.3.1. Procedure

a) Urban parks

1. Rearrange the information on the notification date and the establishment area as of 31st March 2007 for all urban parks which are installed in our country.
2. Extract urban parks which have been notified since 1st January 1990 and its establishment area is 500 m^2 or more.
3. Rearrange urban parks extracted in Step 2 depending upon the address and count the establishment area depending upon geographical boundary (prefecture).
4. Separate establishment area into settlements and wetlands by using area ratio of urban parks occupied in river zone [wetlands].
5. Calculate area of land which was qualified as forest land on 31st December 1989 by multiplying establishment area estimated in Step 4 by "area ratio of land has been converted from forest land to settlements or wetlands for the past 20 years". This area is excluded from establishment area because it qualified as deforestation. Remaining area is considered as RV land area (Accurately, it means that RV land area in 1986 is estimated (not 31st December 1989) because calculation is based on 2006 data. However, it is considered to be conservative because it does not lead over-estimation of RV land area).

6. Calculate area of "Remaining land (Settlements remaining Settlements, Wetlands remaining Wetlands)" and "Land converted to other land-use category (Cropland / Grassland / Wetlands / Other land converted to Settlements, Cropland / Grassland / Settlements / Other land converted to Wetlands) by multiplying land area estimated in Step 5 by "area ratio of land converted to Settlements or Wetlands in the single year (2005-2006)".

b) Green area on road

1. Calculate the number of tall trees for each geographic boundary (prefecture) on 31st March 2006 based on "Road Tree Planting Status Survey" which was implemented in 2007.
2. Calculate the number of tall trees on 31st March 1990 by using linear interpolations of two surveyed data (1986 and 1991) from "Road Tree Planting Status Survey". Then, calculate the number of tall trees for each prefecture on 31st March 1990 by multiplying these values by the ratio of the number of tall trees for each prefecture on 31st March 2006 (which is estimated in Step 1).
3. Calculate the number of tall trees which have been planted since 1st April 1990 by subtracting value estimated in Step 1 from one in Step 2 (Revegetation is considered to be an activity which takes place after 1st January 1990. However, Japan considers revegetation as an activity after 1st April 1990 because "Road Tree Planting Status Survey" has been implemented on fiscal year basis).
4. Estimate the ratio of the number of tall trees planted on the road which planted area is less than 500 m^2 by using data (general road: 1.00%, expreeway: 0.00%, significant level: 95%) from sampling survey implemented in 2006.
5. Estimate land area per tall tree by using data (general road: 0.0062 [ha/tree], expreeway: 0.0008 [ha/tree], significant level: 95%) from sampling survey implemented in 2006 (Extract RV land randomly and calculate by dividing this land area by the number of tall trees planted on the land).
6. Calculate area of tall tree planted land which is 500 m^2 or more by multiplying values estimated in Step 4 & 5 by the number of tall trees for each geographical boundary (prefecture) estimated in Step 3.

Area of land which have been planted since 1st April 1990 and its area is 500 m^2 or more (ha) = 3. the number of tall trees which have been planted since 1st April 1990 (tree) * 4. Ratio of the number of tall trees planted on the land which is 500 m^2 or more (%) * 5. Land area per tall tree (ha/tree)

7. Calculate area of land which was qualified as forest land on 31st December 1989 by multiplying area estimated in Step 6 by "area ratio of land has been converted from Forest land to Settlements or Wetlands for the past 20 years". This area is excluded because it qualified as deforestation. Remaining area is considered as RV land area (Accurately, it means that RV land area in 1986 is estimated (not 31st December 1989) because calculation is based on 2006 data. However, it is considered to be conservative because it does not lead over-estimation of RV land area).

8. Calculate area of "Remaining land (Settlements remaining Settlements)" and "Land converted to other land-use category (Cropland / Grassland / Wetlands / Other land converted to Settlements) by multiplying land area estimated in Step 7 by "area ratio of land converted to Settlements in the single year (2005-2006)".

c) Green area on port

1. Extract green area on port which have been established since 1st January 1990 and its service area is 500 m^2 or more. Then, rearrange its area depending on geographic boundaries (All green area on port could be reported because it is considered not to be qualified as forest land on 31st December 1989).
2. Calculate area of "Remaining land (Settlements remaining Settlements)" and "Land converted to other land-use category (Cropland / Grassland / Wetlands / Other land converted to Settlements) by multiplying land area estimated in Step 1 by "area ratio of land converted to Settlements in the single year (2005-2006)".

d) Green area around sewage treatment facility

1. Extract green area around sewage treatment facility which have been established since 1st January 1990 and its greening area is 500 m^2 or more. Then, rearrange its area depending on geographic boundaries.
2. Calculate area of land which was qualified as forest land on 31st December 1989 by multiplying greening area estimated in Step 1 by "area ratio of land has been converted from Forest land to Settlements for the past 20 years". This area is excluded because it qualified as deforestation. Remaining area is considered as RV land area (Accurately, it means that RV land area in 1986 is estimated (not 31st December 1989) because calculation is based on 2006 data. However, it is considered to be conservative because it does not lead over-estimation of RV land area).
3. Calculate area of "Remaining land (Settlements remaining Settlements)" and "Land converted to other land-use category (Cropland / Grassland / Wetlands / Other land converted to Settlements) by multiplying land area estimated in Step 2 by "area ratio of land converted to Settlements in the single year (2005-2006)".

e) Green area by greenery promoting system for private green space

1. Extract green area by greenery promoting system for private green space which greening area is 500 m^2 or more and rearrange their area depending on geographic boundaries. All of them are activities which takes place after 1st January 1990 because greenery promoting system has implemented since May 2001.
2. All green areas by greenery promoting system for private green space to be reported are "Remaining land" because they were not qualified as Forest land on 31st December 1989 and qualified as Settlements in recent year.

f) Green area along river and erosion control site

1. Extract greening works and erosion and sediment control works including hillside works in river zone which has been established since 1st January 1990 and which greening area is 500 m^2 or more (greening works: (1) – (8) in the following table, erosion and sediment control works: (9) – (11) in the following table). All works described in the following table are human-induced.

Table 2-4 RV projects in green area along river and erosion control site and definition of planted land area

RV works in green area along river and erosion control site	definition of planted land area
(1) Planting in inspection passage of excavated channel	Area of land from levee wall shoulder to private land
(2) Planting in face of river bank of excavated channel	Area of land from levee wall shoulder to private land
(3) Planting in backslope banquette	Area of embanked land
(4) Planting in levee marginal strip (second-class and third-class)	Area of marginal strip which is subject to greening works
(5) Planting in high water channel	Area of land from low-flow channel shoulder to foot of levee slope
(6) Planting in retarding basin	Area of retarding basin
(7) Planting in lake foreshore	Area of land from low-flow channel shoulder to foot of levee slope
(8) Planting in super levee	(Same as planting in excavated channel)
(9) Greening under erosion and sediment control works	Area of land which is subject to hillside works
(10) Greening under landslide control works	Area of land which is subject to hillside works
(11) Greening under steep slope failure prevension works	Area of land which is subject to hillside works

2. Calculate planted land area in green area along river and erosion control site for each geographic boundary (prefecture) extracted in Step 1. Double-counting between RV land and D land is prevented because forested land (on 1st January 1990) is not included in Step 1.

3. Calculate land area of "Wetlands remaining wetlands" and "Land converted to Wetlands (excluding Forest land converted to Wetlands)" by multiplying land area estimated in Step 2 by "area ratio of land converted to Wetlands (excluding Forest land converted to Wetlands) in the single year (2005-2006)".

g) Green area around government buildings

1. Extract green area around government buildings which has been established since 1st January 1990 and which RV land area (= total land area - building area) is 500 m^2 or more.

2. Calculate RV land area for each geographic boundary (prefecture) extracted in Step 1.

3. Calculate area of land which was qualified as forest land on 31st December 1989 by multiplying land area estimated in Step 2 by "area ratio of land has been converted from Forest land to Settlements for the past 20 years". This area is excluded because it qualified as deforestation. Remaining area is considered as RV land area (Accurately, it means that RV land area in 1986 is estimated (not 31st December 1989) because calculation is based on 2006 data.

However, it is considered to be conservative because it does not lead over-estimation of RV land area).

4. Calculate area of "Remaining land (Settlements remaining Settlements)" and "Land converted to other land-use category (Cropland / Grassland / Wetlands / Other land converted to Settlements) by multiplying land area estimated in Step 3 by "area ratio of land converted to Settlements in the single year (2005-2006)".

h) Green area around public rental housing

1. Extract green area around public rental housing which has been established since 1st January 1990 and which RV land area (= total land area - building area) is 500 m2 or more.
2. Calculate RV land area for each geographic boundary (prefecture) extracted in Step 1.
3. Calculate area of land which was qualified as forest land on 31st December 1989 by multiplying land area estimated in Step 2 by "area ratio of land has been converted from Forest land to Settlements for the past 20 years". This area is excluded because it qualified as deforestation. Remaining area is considered as RV land area (Accurately, it means that RV land area in 1986 is estimated (not 31st December 1989) because calculation is based on 2006 data. However, it is considered to be conservative because it does not lead over-estimation of RV land area).
4. Calculate area of "Remaining land (Settlements remaining Settlements)" and "Land converted to other land-use category (Cropland / Grassland / Wetlands / Other land converted to Settlements) by multiplying land area estimated in Step 3 by "area ratio of land converted to Settlements in the single year (2005-2006)".

2.2.3.2. Data

Data applied in estimating RV land area is shown below.

Table 2-5 Data applied in estimating RV land area

Sub-division	Data type	Method for data collection
Urban parks	・Area for each urban park	・Urban Parks Status Survey (2006)
Green area on road	・Number of tall trees	・Road Tree Planting Status Survey (1987, 1992, 1997, 2002, 2007)
	・Land area per tall tree	・Basic Data Collection Survey on Tall Tree Planting on the Road (February, 2007)
Green area on port	・Service area	・Complete census for 2006
Green area around sewage treatment facility	・Green area	・Sewage treatment Facility Status Survey (2006)
Green area by greenery promoting system for private green space	・Greening area ・Wall greening area ・The number of tall trees	・Application form for greenery promoting system for private green space ・Urban Greening Status Survey (2006)
Green area along river and erosion control site	・Planted land area	・Survey on carbon dioxide absorption at source in river works (2006)
Green area around government buildings	・Total land area and building area	・Complete census for 2006
Green area around public rental housing	・Total land area and building area	・Progress survey on tree planting for public rental housing (2006)

2.3. Maps and/or database to identify the geographical locations, and the system of identification codes for the geographical locations

Japan decides to elect Reporting Method 1 and report for each prefecture. Therefore, identification codes are determined for each prefecture in accordance with the following map.

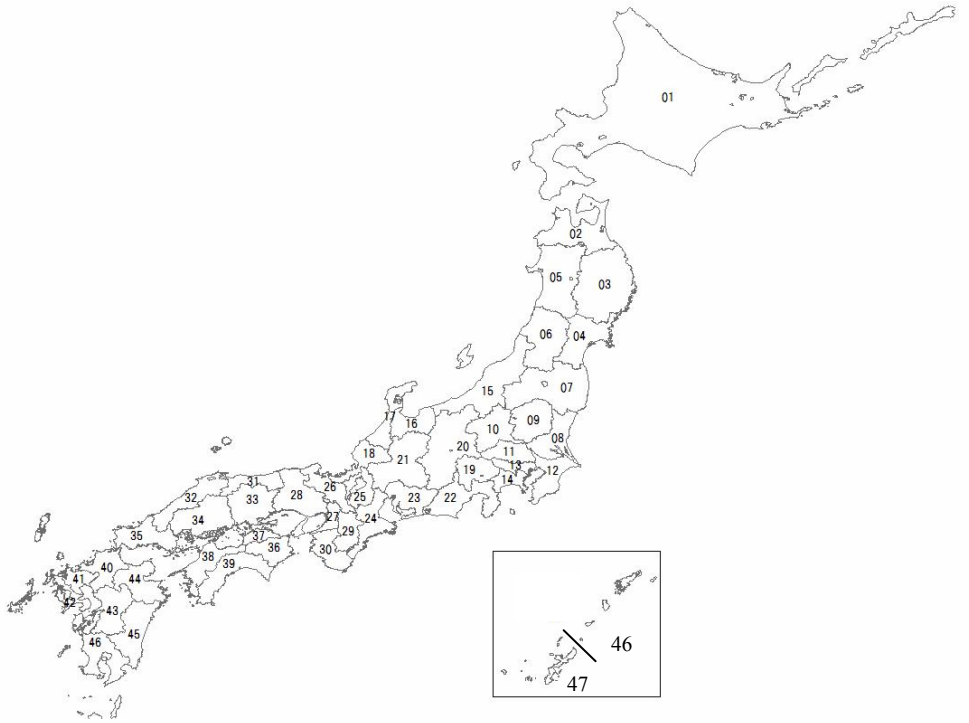

Figure 2-4 Japan's determination of identification codes

Table 2-6 Relation between identification codes detemined and prefectures

ID code	Prefecture	ID code	Prefecture	ID code	Prefecture
01	Hokkaido	17	Ishikawa	33	Okayama
02	Aomori	18	Fukui	34	Hiroshima
03	Iwate	19	Yamanashi	35	Yamaguchi
04	Miyagi	20	Nagano	36	Tokushima
05	Akita	21	Gifu	37	Kagawa
06	Yamagata	22	Shizuoka	38	Ehime
07	Fukushima	23	Aichi	39	Kochi
08	Ibaraki	24	Mie	40	Fukuoka
09	Tochigi	25	Shiga	41	Saga
10	Gunma	26	Kyoto	42	Nagasaki
11	Saitama	27	Osaka	43	Kumamoto
12	Chiba	28	Hyogo	44	Oita
13	Tokyo	29	Nara	45	Miyazaki
14	Kanagawa	30	Wakayama	46	Kagoshima
15	Niigata	31	Tottori	47	Okinawa
16	Toyama	32	Shimane		

Chapter 3 Activity-specific information

3.1. Method for estimating carbon stock change and GHG emissions/removals

3.1.1. Method

3.1.1.1. Afforestation/Reforestation

a） Above-ground biomass, Below-ground biomass

■ Methodology

Carbon stock change in living biomass in ARD land is calculated, using Tier 3 stock change method in accordance with the LULUCF-GPG. In this method, biomass stock change is estimated by the difference between the absolute amount biomass at two times, additionally subtracted biomass stock change due to land conversion.

$$\Delta C_{LB} = \Delta C_{SC} - \Delta C_{L}$$

ΔC_{LB} : Carbon stock changes in living biomass [t-C/yr]
ΔC_{SC} : Carbon stock changes due to biomass growth, fellings, fuelwood gathering, disturbance after land conversion [t-C/yr]
ΔC_{L} : Carbon stock changes due to land conversion [t-C/yr]

Carbon stock change due to biomass growth, fellings, fuelwood gathering and disturbance after land conversion

$$\Delta C_{SC} = \sum_{k} \left\{ (C_{t2} - C_{t1}) / (t_2 - t_1) \right\}_k$$

ΔC_{SC} : Annual change in carbon stocks in living biomass [t-C/yr]
t_1, t_2 : Time point of carbon stock measurement
C_{t1} : Total carbon in biomass calculated at time t_1 [t-C]
C_{t2} : Total carbon in biomass calculated at time t_2 [t-C]
k : Type of forest management

The carbon stocks in living biomass is calculated from the volume for tree species multiplied by wood density, biomass expansion factor, root-to-shoot ratio and carbon fraction.

$$C = \sum_{j} \left\{ [V_j \cdot D_j \cdot BEF_j] \cdot (1 + R_j) \cdot CF \right\}$$

C : Carbon stock in living biomass [t-C]
V : Volume [m^3]
D : Wood density [t-dm/m^3]
BEF : Biomass expansion factor [dimensionless]
R : Root-to-shoot ratio [dimensionless]
CF : Carbon fraction (= 0.5[t-C/t-dm])
j : Tree species

Carbon stock change due to land conversion

Carbon stock change due to land conversion has been calculated as below, using method in accordance with the LULUCF-GPG.

$$\Delta C_L = \sum_i \left\{ A_i \times (B_a - B_{b,i}) \times CF \right\}$$

ΔC_L : annual biomass carbon stock change in land that has been converted from other land use type to forest [t-C/yr]

A_i : annual land area that has been converted from land use type *i* to forest [ha/yr]

Ba : dry matter weight immediately following conversion to forest [t-dm/ha]

Bb,i : dry matter weight before land converted from land use type *i* to forest [t-dm/ha]

CF : carbon fraction of dry matter [t-C/t-dm]

i : Type of land use

■ Parameters

○ Volume

To estimate GHG emissions/removals from forest, Forest Agency has developed National Forest Resources Database (NFRDB) that makes a database of "Forest registers" information (area, tree species, age, etc.).

With respect to the volume of Japanese cedar, Hinoki cypress and Japanese larch which are major tree species of intensively managed forests, Japan surveyed the consistency between site data and existing yield tables in private forest in FY 2003-2005 and identified systematic errors. Therefore, it prepared new yield tables and calculated the volume by applying the new yield tables of each region and tree type to forest areas of each tree type and forest age stored in the NFRDB.

$$V = \sum_{m,j} (A_{m,j} \cdot v)$$

V : Volume [m^3]

A : Area [ha]

v : Volume per area [m^3/ha]

m : Age

j : Tree species

Table 3-1 Yield tables used to estimate merchantable volume

Tree species			Yield tables	
			Private Forest	National Forest
Intensively managed forests	Conifer	Japanese cedar Hinoki cypress Japanese larch	New Yield Tables	Yield tables developed by Regional Forest Offices
		Japanese pine Sakhalin fir Yezo spruce other conifer	Yield tables developed by prefectures	
	Broad leaf (Quercus acutissima, Japanese oak, other broad leaf)			
Semi-natural forests				

○ Biomass expansion factor and Root-to-shoot ratio

Biomass expansion factor (BEF) and root-to-shoot ratio data are updated based on the results from biomass survey on dominant tree species and existing research reports which were implemented by the Forestry and Forest Products Research Institute.

BEFs are calculated for two age classes (20 years and below / 21 years and above), because it was identified that BEFs differ between young forests and mature forests.

Table 3-2 BEF, Root-Shoot ratio, wood density for tree species provided in Forest register

		BEF		R	D	Carbon fraction	Note
		≦20	＞20				
Conifer trees	Japanese cedar	1.57	1.23	0.25	0.314	0.5	
	Hinoki cypress	1.55	1.24	0.26	0.407		
	Sawara cypress	1.55	1.24	0.26	0.287		
	Japanese red pine	1.63	1.23	0.27	0.416		
	Japanese black pine	1.39	1.36	0.34	0.464		
	Hiba arborvitae	2.43	1.38	0.18	0.429		
	Japanese larch	1.50	1.15	0.29	0.404		
	Momi fir	1.40	1.40	0.40	0.423		
	Sakhalin fir	1.88	1.38	0.21	0.319		
	Japanese hemlock	1.40	1.40	0.40	0.464		
	Yezo spruce	1.92	1.46	0.22	0.348		
	Sakhalin spruce	2.15	1.67	0.21	0.364		
	Japanese umbrella pine	1.39	1.23	0.18	0.455		
	Japanese yew	1.39	1.23	0.18	0.454		
	Ginkgo	1.51	1.15	0.18	0.451		
	Exotic conifer trees	1.41	1.41	0.17	0.320		
	Other conifer trees	2.55	1.32	0.34	0.352		Hokkaido, Tohoku, Tochigi, Gunma, Saitama, Niigata, Toyama, Yamanashi, Nagano, Gifu, Shizuoka
		1.39	1.36	0.34	0.464		Okinawa
		1.40	1.40	0.40	0.423		Other prefectures
Broad leaf trees	Japanese beech	1.58	1.32	0.25	0.573		
	Oak (evergreen tree)	1.52	1.33	0.25	0.629		
	Japanese chestnut	1.50	1.17	0.25	0.426		
	Japanese chestnut oak	1.36	1.33	0.25	0.668		
	Oak (deciduous tree)	1.40	1.26	0.25	0.619		
	Japanese popular	1.33	1.17	0.25	0.291		
	Alder	1.33	1.19	0.25	0.382		
	Japanese elm	1.33	1.17	0.25	0.494		
	Japanese zelkova	1.58	1.28	0.25	0.611		
	Cercidiphyllum	1.33	1.17	0.25	0.446		
	Japanese big-leaf	1.33	1.17	0.25	0.386		
	Maple tree	1.33	1.17	0.25	0.519		
	Amur cork	1.33	1.17	0.25	0.344		
	Linden	1.33	1.17	0.25	0.369		
	Kalopanax	1.33	1.17	0.25	0.398		
	Paulownia	1.33	1.17	0.25	0.234		
	Exotic broad leaf trees	1.41	1.41	0.25	0.660		
	Japanese birch	1.31	1.20	0.25	0.619		
	Other broad leaf trees	1.37	1.37	0.25	0.473		Chiba, Tokyo, Kochi, Fukuoka, Nagasaki, Kagoshima, Okinawa
		1.52	1.33	0.25	0.629		Mie, Wakayama, Oita, Kumamoto, Miyazaki, Saga
		1.40	1.26	0.25	0.619		Othe prefectures

BEF: Biomass expansion factor
R: Root-to-shoot ratio
D: Wood density

○ Biomass stock data for each land use category

Table 3-3 Biomass stock data for each land use category

Land use category			Biomass stocks [t-dm/ha]	Note
Before conversion	Cropland	Rice field	6.31	Use annual growth rate value given in Naoto Owa "*Nutrient Balance in Japan's Crops*".
		Crop field	3.30	Use annual growth rate value given in Naoto Owa "*Nutrient Balance in Japan's Crops*".
		Orchard	30.63	Calculate by multiplying average age and growth rate which are given in Daiyu Ito *et al* "*Estimating the Annual Carbon Balance in Warm-Temperature Deciduous Orchards in Japan*"
	Grassland		13.5	*LULUCF-GPG* Table3.4.2 warm temperate wet *LULUCF-GPG* Table3.4.3 warm temperate wet
	Wetlands, Settlements and Other land		0.0	Assume that biomass stocks are "0".
After immediately conversion	Forest		0.00	Assume that biomass stocks immediately after conversion are "0".

■ Activity data

AR land area by tree species and age were calculated by procedure 2.2.1.1.

b） Dead wood, Litter and Soils

■ Methodology

Carbon stock change in dead wood and litter in AR land was calculated under the assumption that initial values (= 0 [t-C/ha]) have changed linearly to average carbon stocks in dead wood and litter for each prefecture during 20 years.

$$\Delta C_{DOM} = A \cdot (C_{LT\,20} + C_{DW\,20}) / 20$$

ΔC_{DOM} : Annual change in carbon stocks in dead wood and litter [t-C/yr]
A : Area [ha]
C_{LT20} : Average carbon stocks in litter within 20-year-old forests [t-C/ha]
C_{DW20} : Average carbon stocks in dead wood within 20-year-old forests [t-C/ha]

Carbon stock change in soils was calculated under the assumption that forest soil carbon stocks have changed linearly to soil carbon stocks for non-forest land during 20 years.

$$\Delta C_{SOIL} = A \cdot (C_{Forest} - C_{non-Forest}) / 20$$

ΔC_{SOIL} : Annual change in carbon stocks in soils [t-C/yr]
A : Area [ha]
C_{Forest} : Carbon stocks in forests [t-C/ha]
$C_{non\text{-}Forest}$: Carbon stocks in non-forest areas [t-C/ha]

■ Parameters

Parameters were determined based on CENTURY-jfos (see 3.1.1.3.b.) model and relevant literature.

■ Activity data

AR land area by tree species was calculated by using procedure 2.2.1.1.

c） Other gases: Biomass burning

■ Methodology

For CH_4 and N_2O emissions due to biomass burning, Tier 1 method is used.

$$bbGHG_f = L_{forestfires} \times ER \qquad (CH_4)$$

$$bbGHG_f = L_{forestfires} \times ER \times 1/N : Cratio \qquad (N_2O)$$

$bbGHG_f$: GHG emissions due to biomass burning by forest
$L_{forest\ fires}$: Carbon released due to forest fires [t-C/yr]
ER : Emission ratio
$N:Cratio$: Nitrogen / Carbon ratio (1/CN ratio)

■ Parameters

○ Emission ratio
The following values are applied to emission ratios for non-CO_2 gases due to biomass burning.
CH_4: 0.012, N_2O: 0.007 (default value stated in LULUCF-GPG, Table 3A.1.15)

○ N:C ratio
The following values are applied to N/C ratio.
N:C ratio: 0.01 (default value stated in LULUCF-GPG, Page 3.50)

■ Activity data

Activity data is calculated by dividing proportionally carbon released by fire for all forest land by AR land area. Carbon released by fire for all forest land (national forest and private forest) is estimated by the Tier 3 method in LULUCF-GPG (multiplying the fire damaged timber volume by wood density, biomass expansion factor and carbon fraction of dry matter).

With regard to national forests, volume of standing timbers damaged due to fires in national forests

in Handbook of Forestry Statistics is used.

With regard to private forests, the activity data is damaged timber volume due to fires which is estimated by using actual damaged area and damaged timber volume by age class (inquiry survey for prefectural government by Forestry Agency). Damaged timber volume for age class equal to or less than 4 is estimated by multiplying the cumulative volume of age class equal to or under 4 per area estimated by the Survey on Current Status of Forest Resources by loss ratio of age class equal to or over 5 in private forests (ratio of damaged timber volume to cumulative volume). The loss ratio is assumed to be constant regardless of age classes.

$$L_{forestfires} = \Delta C_{fn} + \Delta C_{fp}$$

$L_{forest\ fires}$: Carbon released due to fires [t-C/yr]
ΔC_{fn} : Carbon released due to national forest fires [t-C/yr]
ΔC_{fP} : Carbon released due to private forest fires [t-C/yr]

○ National forest

$$\Delta C_{fn} = Vf_n \times D_n \times BEF_n \times CF$$

ΔC_{fn} : Carbon released due to national forest fires [t-C/yr]
Vf_{fn} : Damaged timber volume due to fire in national forest [m^3]
D_n : Wood density for national forest [t-dm/m^3]
BEF_n : Biomass expansion factor for national forest
CF : Carbon fraction of dry matter [t-C/t-dm]

○ Private forest

$$\Delta C_{fP} = Vf_p \times D_P \times BEF_P \times CF$$

ΔC_{fp} : Carbon released due to private forest fires [t-C/yr]
Vf_p : Damaged timber volume due to fire in private forest [m^3]
D_p : Wood density for private forest [t-dm/m^3]
BEF_p : Biomass expansion factor for private forest
CF : Carbon fraction for dry matter [tC/t-dm]

The values for wood density and biomass expansion factors on national and private forest land are determined as weighted averages using the ratios of intensively managed forest and semi-natural forests.

Table 3-4 Wood density and BEF for national forest and private forest

Type	Wood density [t-dm/m^3]	BEF
National forest	0.49	1.61
Private forest	0.47	1.61

Source: Based on Forestry Agency data

d） Results

		2006	
		［Gg-CO2］	［Gg-C］
AR		-385.51	105.14
	Above-ground buiomass	-212.84	58.05
	Below-ground biomass	-55.19	15.05
	Dead wood	-63.06	17.20
	Litter	-26.08	7.11
	Soils	-28.35	7.73
	Other gases	0.00	0.00

* CO2）+: Emission, -: Removal
C…+: Removal, -: Emission

3.1.1.2. Deforestation

a） Above-ground biomass, Below-ground biomass

■ Methodology

Methdology for estimating carbon stock change due to D activity is similar to AR activity. In accordance with the LULUCF-GPG, methodology for estimating carbon stock change due to growth of living biomass is as follow.

$$\Delta C = A \times CR \times CF$$

ΔC : annual carbon stock change due to living biomass growth after D activity [t-C/yr]
A : D land area [ha/yr]
CR : dry matter biomass weight accumulated after D activity [t-dm/ha]
CF : carbon fraction of dry matter (= 0.5) [t-C/t-dm]

■ Parameters

The following parameters are used for estimating carbon stock change due to living biomass growth after D activity. The other parameters are similar to AR activity.

Table 3-5 Biomass stock data for each land use category

Land use category		Biomass stocks [t-dm/ha]	Note
Cropland	Rice field	6.31	Use annual growth rate value given in Naoto Owa "*Nutrient Balance in Japan's Crops*".
	Crop field	3.30	Use annual growth rate value given in Naoto Owa "*Nutrient Balance in Japan's Crops*".
	Orchard	30.63	Calculate by multiplying average age and growth rate which are given in Daiyu Ito *et al* "*Estimating the Annual Carbon Balance in Warm-Temperature Deciduous Orchards in Japan*"
Grassland		13.5	*LULUCF-GPG* Table3.4.2 warm temperate wet *LULUCF-GPG* Table3.4.3 warm temperate wet
Wetlands Settlements Other land		0.0	Assume that biomass stocks are "0".

■ Activity data

Land area on which D activity was occurred in 2006 was calculated by the method described in 2.2.1.

b） Dead wood, Litter and Soils

■ Methodology

Japan assumed that all carbon stocks in dead wood, litter and soils were emitted when deforestation activities were occurred. Carbon stock change in soils was calculated under the assumption that soil carbon stocks have changed linearly to carbon stocks for non-forest land during 20 years.

c） Other gases

➢ N_2O emissions from disturbance associated with land-use conversion to cropland

■ Methodology

According to LULUCF-GPG, Tier 1 method is used.

$$N_2O - N_{conv} = N_2O_{net-\min} - N = EF \times N_{net-\min}$$
$$N_{net-\min} = C_{released} \times 1/C : N_{ratio}$$

N_2O-N_conv	: N_2O emission due to land-use conversion to cropland (kgN_2O-N)
N_2O_net-min-N	: N_2O emission due to land-use conversion to cropland (kgN_2O-N/ha/yr)
N_net-min	: annual N emission from soil disturbance associated with mineralization of soil organic matter (kgN/ha/yr)
EF	: emission factor
C:Nratio	: Nitrogen / Carbon ratio (1/CN ratio)
C_released	: soil carbon stock that has been mineralized within 20 years

■ Parameters

- C:N ratio for soils: 11.3 (Country specific data [Undisclosed])
- N-N_2O emission factor for soils: 0.0125 [kg-N_2O-N/kg-N] (default value stated in LULUCF-GPG, Page 3.94)

■ Activity Data

Area of land converted from Forest land to Cropland and carbon emissions from soils due to this conversion are used.

➢ Biomass burning

Japan reported this category as “NO”.

d） Results

		2006	
		［Gg-CO2］	［Gg-C］
D		2,688.62	-733.26
	Above-ground buiomass	1,250.47	-341.04
	Below-ground biomass	375.71	-102.47
	Dead wood	561.35	-153.09
	Litter	201.20	-54.87
	Soils	294.43	-80.30
	Other gases	5.46	-1.49

* CO2）+: Emission, -: Removal
C…+: Removal, -: Emission

3.1.1.3. Fortest Management

a） Above-ground biomass, Below-ground biomass

■ Methodology

It is similar to used in AR.

■ Parameters

It is similar to used in AR.

■ Activity data

1. Estimate emissions/removals in all forest lands by using biomass stock data stored in the National Forest Resources Database (based on stock change method).
2. Subtract emissions/removals relating to ARD activities from emissions/removals in all forest lands. For Ikusei-rin forest, estimate emissions/removals in FM land by applying FM ratio for each tree type, region and age class. For Tennensei-rin forest, identify area of forest land (with standing trees) subject to practices for protection or conservation of forests including controlling logging activities and land-use change which have been implemented under laws by using the National Forest Resources Database and estimate emissions/removals.

b） Dead wood, Litter and Soils

■ Methodology

In accordance with a decision tree provided in the LULUCF-GPG, Carbon stock change in each pool is estimated by Tier 3 model method.

Carbon emissions/removals for each pool and forest management type are estimated by using CENTURY-jfos model and are multiplied by land area for forest management type.

$$\Delta C_{dls} = \sum_{k} (A_k \bullet (d_k + l_k + s_k))$$

$\triangle C_{dls}$: Change in carbon stocks in dead wood, litter and soil [t-C/yr]
A : Area [ha]
D : Average carbon stock change in dead wood per area [t-C/yr]
L : Average carbon stock change in litter per area [t-C/yr]
S : Average carbon stock change in soil per area [t-C/yr]
k : Type of forest management

■ Parameters

Average carbon stock changes per unit area for dead wood, litter and soils are calculated by CENTURY-jfos model, which was modified from the CENTURY model (Colorado State University) to follow Japanese climate, soil, and vegetation conditions.

Forestry and Forest Products Research Institute adjusted CENTURY model to Japanese forest environment. That is, the forest was classified by the predominant tree species (classification before 2004 in Table 7-5) and the distribution of the tree species and soil types underneath was identified for each prefecture. Climate conditions to run the model were collected from the mesh climate data provided by the Meteorological Agency. Tuning of parameters in CENTURY model was evaluated by the condition that result of tree growth pattern in CENTURY was comparable to the result obtained by the accounting method for carbon stock in living biomass using yield table (5.A.1.-) and also by the condition that soil and litter carbon stocks in the steady state in CENTURY was comparable to the actual carbon stock estimates based on field observation. After these modifications, the CENTURY was renamed to CENTURY-jfos. Then, carbon stocks in dead wood, litter and soil, and their stock changes were calculated by CENTURY-jfos for different forest management types such as management with thinning and without thinning.

In each forest management type total carbon stock changes in deed wood, litter, and soil during 0 - 19 age classes (for 100 years), calculated by CENTURY-jfos, were averaged, which allow us to use the same activity data for living biomass accounting.

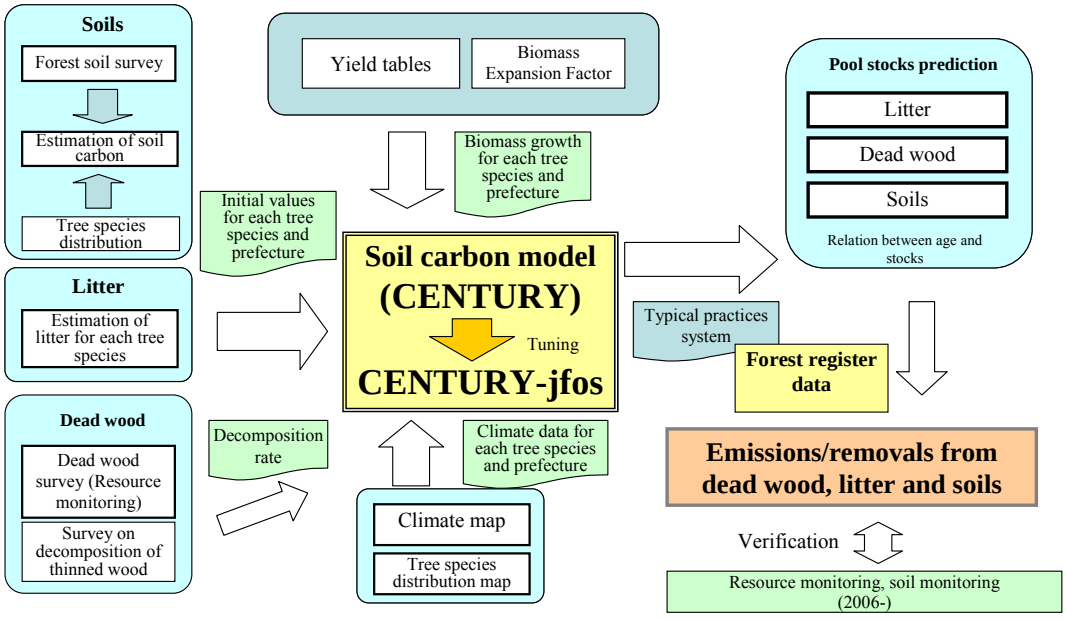

Figure 3-1 Estimation of removals in dead wood, litter and soils

c） Other gases: Biomass burning

It is similar to AR activity.

d） Results

		2006	
		［Gg-CO2］	［Gg-C］
FM		-39,515.90	10,777.06
	Above-ground buioma	-31,002.70	8,455.28
	Below-ground biomass	-7,699.41	2,099.84
	Dead wood	422.40	-115.20
	Litter	-432.87	118.06
	Soils	-804.79	219.49
	Other gases	1.48	-0.40

* CO2）+: Emission, -: Removal
C…+: Removal, -: Emission

3.1.1.4. Revegetation

a） Remaining land: Above-ground biomass, Below-ground biomass

■ Methodology

$$\Delta C_{RVLB} = \Sigma (\Delta C_{LBGi} - \Delta C_{LBLi})$$
$$\Delta C_{LBGi} = \Delta B_{LBGi}$$
$$\Delta B_{LBGi} = \Sigma NT_{i,j} * C_{Ratei,j}$$

ΔC_{RVLB} : Annual change in carbon stocks in living biomass in remaining revegetation land [t-C/yr]
ΔC_{LBG} : Annual change in carbon stocks due to growth in living biomass in remaining revegetation land [t-C/yr]
ΔC_{LBL} : Annual change in carbon stocks due to loss of living biomass in remaining revegetation land [t-C/yr]
ΔB_{LBG} : Annual biomass growth in revegetation land [t-C/yr]
C_{Rate} : Annual biomass growth per tree [t-C/tree/yr]
NT : number of trees
i : Land use type (urban parks, green area on road, green area on port, green area around sewage treatment facility and green area by greenery promoting system for private green space, Green area along river and erosion control site, green area around public rental housing and green area around government buildings)
j : Tree species

■ Parameters[2]

○ Urban parks

As a result of tree survey for sample urban parks[3], it could be assumed that the average age of tree population is less than or equal to 20 years and carbon stock change due to living biomass loss in urban parks is determined to be zero.

Annual biomass growth in urban parks is calculated by using default values (0.0084-0.0142[t-C/tree/yr]) provide in the LULUCF-GPG (Page 3.297, Table 3A.4.1) and distribution ratio of tree types in sample urban parks[4].

For ratio of above-ground biomass/below-ground biomass, default value provided in the 2006 IPCC Guidelines (root-to-shoot ratio: 0.26) is applied (see Page 8.9).

○ Green area on road

Japan calculated the average age of tree population by using data on the age of planted trees in sample roads which had been extracted randomly. As a result of its calculation, it could be assumed that the average age of tree population is less than or equal to 20 years and carbon stock change due to living biomass loss in green area on road is determined to be zero.

Annual biomass growth and ratio of above-ground biomass/below-ground biomass are calculated by using the same parameters as urban parks.

○ Green area on port, Green area around sewage treatment facility, Green area along river and erosion control site, Green area around public rental housing and Green area around government buildings

As in the case of urban parks, it could be assumed that carbon stock change due to living biomass loss in these green areas is zero because standard of planted trees, tree types and their distribution are applied in the same manner as urban parks.

Annual biomass growth and ratio of above-ground biomass/below-ground biomass are calculated by using the same parameters as urban parks.

○ Green area by greenery promoting system for private green space

It could be assumed that the average age of tree population is less than or equal to 20 years and carbon stock change due to living biomass loss in green area by greenery promoting system for private green space is determined to be zero because standard of planted trees is selected in the same manner as urban parks and all facilities has been certified since 2002.

Annual biomass growth and ratio of above-ground biomass/below-ground biomass are calculated by using the same parameters as urban parks.

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[2] In this reporting, Japan applied Tier 1b described in LULUCF-GPG. In estimating carbon stock change from RV activities, higher tier should be applied because RV activity was qualified as key. However, Japan used default value because country specific data on biomass growth has not been established. In next submission, Japan will apply Tier 2 method.

[3] Kanagawa Prefecture is located in Japan's typical climate zone and has many types of urban parks. Japan determined randomly 129 sample urban parks in Kanagawa which have been notified since 1st January 1990. In addition, Japan implemented same survey in 3 urban parks in Chiba Prefecture which park type is not exsited in Kanagawa.

[4] For Hokkaido, distribution ratio of tree types is calculated by using tree registers and plantation maps for all urban parks in Kushiro city and Yubari city. For other prefectures, distribution ratio of tree types is calculated by using tree registers and plantation maps for 321 urban parks extracted randomly.

■ Activity data

○ Urban parks

Area of land remaining urban parks is calculated by multiplying area of urban parks by area ratio of land conversion for the whole country. Activity data for carbon stock change in living biomass in urban parks is the number of tall trees planted in urban parks which is calculated by multiplying area of urban parks obtained from "Urban Parks Status Survey" by the number of tall trees per area (Hokkaido: 340.1[tree/ha], the other prefectures: 203.3[tree/ha]).

In addition, the number of tall trees per area is calculated by using the number of tall trees and land area in sampling urban parks which significant level is 95%.[5]

Table 3-6 Area of urban parks for eachland use

	Percentage[6]	Area (ha)
Urban parks which have been notified since 1st January 1990 and its establishment area is 500 m^2 or more	100.00%	47,610.74
Urban parks located in Settlements	90.85%	43,254.36
Urban parks located in Wetlands (they occupy the river section)	9.15%	4,356.38

Table 3-7 Area of land which was not qualified as forest land on 31st December 1989

	Land-use category	Area ratio of land has been converted for the past 20 years	Area (ha)	RV Qualification
Urban parks which have been notified since 1st January 1990 and its establishment area is 500 m^2 or more	Forest	8.73%	4,157.35	No
	Non-forest	91.27%	43,453.39	Yes
Urban parks located in Settlements	Forest	9.41%	4,070.24	No
	Non-forest	90.59%	39,184.12	Yes
Urban parks located in Wetlands (they occupy the river section)	Forest	2.00%	87.11	No
	Non-forest	98.00%	4,269.27	Yes

[5] The number of tall trees per area in urban parks was calculated by using data from tree register and planting map which was measured in some urban parks (Hokkaido: 176, other prefectures: 321). For Hokkaido, sample data was not sufficient because tree register has not been developed completely.

[6] Measured value on 31 March 2006 from "Urban Parks Status Survey"(2005)

Table 3-8 Area of urban parks (remaining land / converted land)

	Land-use Category	Area ratio of land has been converted for the current year	Area (ha)	Activity data (tree) [the number of tall trees]
Urban parks which have been notified since 1st January 1990 and its establishment area is 500 m^2 or more	Converted (except land converted from forest land)	0.37%	161.54	35,445
	Remaining	99.63%	43,291.85	9,498,807
Urban parks located in Settlements	Converted (except land converted from forest land)	0.39%	154.19	33,832
	Remaining	99.61%	39,029.93	8,563,685
Urban parks located in Wetlands (they occupy the river section)	Converted (except land converted from forest land)	0.17%	7.35	1,613
	Remaining	99.83%	4,261.92	935,122

○ Green area on road

Activity data (the number of tall trees) in "Remaining green area on road" is calculated by the following procedures.

1. Calculate the number of tall trees in all green area on road in 31 March 1990 and 31 March 2006 by using data from "Road Tree Planting Status Survey" which had been implemented in 1987, 1992 and 2007.
2. Calculate the number of tall trees which have been planted since 1st April 1990 by subtracting the number for 1989 from one for 2006 (Revegetation is a activity which takes place after 1st January 1990. However, Japan considers it a activity after 1st April 1990 because it is impossible to estimate the number of tall trees which have been planted between 1st April 1990 and 31st March 1990).
3. Multiply the number of tall trees calculated in Step 2 by the ratio of the number of tall trees planted on the road which planted area is less than 500 m^2.
4. Multiply the number of tall trees calculated in Step 3 by the area ratio of green area on road which was qualified as Forest land in 31th December 1989.
5. Multiply the number of tall trees calculated in Step 4 by the area ratio of land remaining Settlements.

Table 3-9 Area of green area on road which has been qualified as RV

	Area of green area on road per tall tree [ha/tree]	The number of planted tall tree [tree]			Area ratio of planted land which is 500 m^2 or more [%]	Area ratio of land which was qualified as forest land on 31st December 1989[7] [%]	Area of green area on road which was qualified as RV [ha]
		31th March 1990	31th March 2007	1990 - 2006			
	A	b	c	c-b	d	e	a*(c-b)*d/ 100*(100-e)/100
General road (managed by Ministry of Land, Infrastructure and Transport, Prefectures, local authority, public corporation)	0.006237	4,342,070	6,692,598	2,350,528	99.00%	9.41%	13,147
Highway (managed by now-defunct public corporation)	0.000830	1,096,380	7,909,999	6,813,619	100.00%	9.41%	5,123

Table 3-10 The number of tall trees qualifies as RV (Activity data)

	The number of tall trees which have been planted since 1990 [tree]	Area ratio of planted land which is 500 m^2 or more [%]	Area ratio of land has been converted from Forest land for the past 20 years [%]	Activity data (The number of tall trees) [tree]
	c-b	d	e	(c-b)*d/100* (100-e)/100
General road (managed by Ministry of Land, Infrastructure and Transport, Prefectures, local authority, public corporation)	2,350,528	99.00%	9.41%	2,107,978
Highway (managed by now-defunct public corporation)	6,813,619	100.00%	9.41%	6,172,457

[7] Apply area ratio of land has been converted from Forest land to Settlements for the past 20 years.

Table 3-11 Area of green area on road and activity data [the number of tall trees] (remaining land / converted land)

		Land-use category	Area ratio of land has been converted for the current year	Activity data (the number of tall trees)	Area (ha)
Greenarea on road which have been notified since 1st January 1990 and its establishment area is 500 m^2 or more		Converted	0.39%	32,584	71.89
		Remaining	99.61%	8,247,851	18,198.11
	General road	Converted	0.39%	8,295	51.74
		Remaining	99.61%	2,099,683	13,095.73
	Highway	Converted	0.39%	24,289	20.16
		Remaining	99.61%	6,148,168	5,102.38

○ Green area on port

Activity data for carbon stock change in living biomass in green area on port is the number of tall trees planted in green area on port, which is calculated by multiplying service area obtained from complete census by the number of tall trees per urban parks (Hokkaido: 340.1[tree/ha], the other prefectures: 203.3[tree/ha], these values are applied because of the similarities between urban parks and green area on port as mentioned above).

In addition, it has been assumed that all green area on port has been located in Settlements and not qualified as Forest land in 31 December 1989.

Table 3-12 Area of green area on port and activity data (remaining land / converted land)

Land-use Category	Area ratio of land has been converted for the current year	Area (ha)	Activity data (the number of tall trees)
Converted	0.39%	4.57	968
Remaining	99.61%	1,157.47	244,956

○ Green area around sewage treatment facility

Area of land remaining green area around sewage treatment facility is calculated in the same manner as urban parks. Activity data for carbon stock change in living biomass in green area around sewage treatment facility is obtained from "Sewage treatment Facility Status Survey" implemented in January 2007. The number of tall trees planted in green area around sewage treatment facility is calculated by multiplying greening area by the number of tall trees per greening area (Hokkaido: 129.8[tree/ha], the other prefectures: 429.1[tree/ha]). The number of tall trees per greening area is determined from the number of tall trees and greening area for 59 facilities.[8]

In addition, all green area around sewage treatment facility has been located in Settlements.

Table 3-13 Green area around sewage treatment facility which was not qualified as Forest land in 31th December 1989

Land-use category	Area ratio of land has been converted for the past 20 years	Area (ha) (green area)	RV Qualification
Forest	9.41%	103.55	No
Non-forest	90.59%	996.86	Yes

[8] The number of tall trees per area for green area around sewage treatment facility was established by using data on the number of tall trees and greening area measured in 59 green areas.

Table 3-14 Area and activity data [the number of tall trees] (remaining land / converted land)

Land-use category	Area ratio of land has been converted for the current year	Area (ha) (green area)	Activity data (the numbet of tall trees)
Converted	0.39%	3.92	1,544
Remaining	99.61%	992.94	390,949

○ Green area by greenery promoting system for private green space

Activity data (the number of tall trees) is available for each facility. Therefore, total number of tall trees is used as activity data.

Table 3-15 Activity data and area of green area by greenery promoting system for private green space

Certification Year	Location	Area (m^2)	Breakdown of area (m^2)			Area	Activity data
			Ground	Roof	Wall	Wall green area by greenery promoting system for private green space (m^2)	The number of tall trees (tree)
2002	Minato-ku Tokyo	17,244	1,314	2,042	106	3,356	335
2002	Minato-ku Tokyo	19,708	3,285	736		4,021	147
2002	Minato-ku Tokyo	52,766	10,679			10,679	672
2002	Minato-ku Tokyo	84,780	8,846	7,493		16,339	813
2003	Minato-ku Tokyo	5,519	1,654			1,654	167
2003	Osaka City	22,282	1,527	3,164	110	4,691	500
2005	Kawaguchi City	1,995	586	164	18	750	153
2006	Kyoto City	3,857	1,271			1,271	90
2006	Hiroshima City	4,453	130	783		913	1
Total		219,192	29,293	14,381	234	43,674	2,878

○ Green area along river and erosion control site

Area of land remaining green area along river and erosion control site is calculated by multiplying area of this green area by area ratio of land conversion for the whole country (all green area along river and erosion control site are assumed to be located in wetlands). Activity data for living biomass (the number of tall trees) is calculated by multiplying this area by the number of tall trees per area (Hokkaido: 1470.8 [tree/ha], the other prefectures: 339.0 [tree/ha]).[9]

Forested lands (at measurement time) are not qualified as green area along river and erosion control site. Therefore, land conversion from Forest land is not included in estimating activity data.

[9] For green area along river and erosion control site, the number of tall trees was measured in approximately 95% land of this green area. Based on this data, the number of planted trees per area was estimated in order to simplify the estimation of the number of tall trees in all green area.

Table 3-16 Area and activity data (remaining land / converted land)

	Land-use category	Area ratio of land has been converted for the current year	Area (ha)	Activity data (the numbet of tall trees)
Green area along river and erosion control site which has been established since 1st January 1990 and its establishment area is 500 m^2 or more	Converted	0.00%	0.00	No
	Remaining	100.00%	1,162.65	Yes

○ Green area around government buildings

Area of land remaining green area around government buildings is calculated by multiplying area of this green area by area ratio of land conversion for the whole country. Activity data for living biomass (the number of tall trees) is calculated by multiplying this area by the number of tall trees per area (all prefecture: 112.1 [tree/ha]).[10]

It is assumed that all green area around government buildings is located in Settlements because these areas are not located in the river zone.

Table 3-17 Green area around government buildings which was not qualified as Forest land in 31th December 1989

	Land-use category	Area ratio of land has been converted for the past 20 years	Area (ha) (green area)	RV Qualification
Green area around government buildings which has been established since 1st January 1990 and its establishment area is 500 m^2 or more	Forest	9.41%	24.88	No
	Non-forest	90.59%	239.56	Yes

Table 3-18 Area and activity data (remaining land / converted land)

	Land-use category	Area ratio of land has been converted for the current year	Area (ha)	Activity data (the numbet of tall trees)
Green area around government buildings which has been established since 1st January 1990 and its establishment area is 500 m^2 or more (qualified as RV)	Converted	0.39%	0.94	106
	Remaining	99.61%	238.61	26,749

○ Green area around public rental housing

Area of land remaining green area around public rental housing is calculated by multiplying area of this green area by area ratio of land conversion for the whole country. Activity data for living biomass (the number of tall trees) is calculated by multiplying this area by the number of tall trees per area (all prefecture: 262.4 [tree/ha]).[11]

[10] For green area around government buildings, the number of tall trees per area was estimated by dividing the number of tall trees by "total land area – building area" (these data were based on 20 facilities [planting maps were available]). Japan established same data for Hokkaido and other prefectures because sample data is no sufficient.

[11] For green area around public rental housing, the number of tall trees per area was estimated by dividing the

It is assumed that all green area around public rental housing is located in Settlements because these areas are not located in the river zone.

Table 3-19 Green area around public rental housing which was not qualified as Forest land in 31th December 1989

	Land-use category	Area ratio of land has been converted for the past 20 years	Area (ha) (green area)	RV Qualification
Green area around public rental housing which has been established since 1st January 1990 and its establishment area is 500 m^2 or more	Forest	9.41%	207.58	No
	Non-forest	90.59%	1,998.35	Yes

Table 3-20 Area and activity data (remaining land / converted land)

	Land-use category	Area ratio of land has been converted for the current year	Area (ha)	Activity data (the numbet of tall trees)
Green area around public rental housing which has been established since 1st January 1990 and its establishment area is 500 m^2 or more (qualified as RV)	Converted	0.39%	7.86	2,063
	remaining	99.61%	1,990.49	522,304

b) Remaining land: Dead wood

○ Urban parks

The number of tall trees per land area used in estimation of activity data for living biomass includes trees which have been died and planted since park establishment, thus carbon stock change in dead wood is included in carbon stock change in living biomass. Therefore, this category is reported as "IE".

○ Green area on road

The number of tall trees used in estimation of activity data for living biomass is surveyed every 5 years. This data includes effects of dead wood and planting, thus carbon stock change in dead wood is included in carbon stock change in living biomass. Therefore, this category is reported as "IE".

○ Green area on port, Green area around sewage treatment facility and Green area by greenery promoting system for private green space, Green area along river and erosion control site, Green area around public rental housing and Green area around government buildings

This category is reported as "IE" based on the same assumption as urban parks.

number of tall trees by "total land area – building area" (these data were based on 28 facilities [planting maps were available]). Japan established same data for Hokkaido and other prefectures because sample data is no sufficient.

c） Remaining land: Litter

Japan estimates carbon stock change in litter in urban parks and green area on port only. In other sub-categories, carbon stock change could not be estimated accurately because it is difficult to obtain detailed information on various managements (such as cleaning). However, it is clear that input of litter and dead roots increases carbon stocks every year. Therefore, these sub-categories are not sources of greenhouse gases and not included in the reporting (exclusion of these sub-categories is assumed to be conservative).

■ Methodology

$$\Delta C_{RVLit} = \Sigma (A_i * L_{iti})$$

ΔC_{RVLit} : Annual change in carbon stocks in litter in remaining revegetation land [t-C/yr]
A : Area of remaing revegetation land [ha]
L_{it} : Annual change in carbon stocks in litter per revegetation land [t-C/ha/yr]
I : Land use type (urban parks and green area on port)

■ Parameters

○ Urban parks and Green area on port

For litter, Japan estimates carbon stock change only in branches and leaves dropped naturally from tall trees. Carbon stock change in litter per urban park area is calculated by using annual accumulation of litter per a tall tree (Hokkaido: 0.0006 [t-C/tree/yr], other prefectures: 0.0009 [t-C/tree/yr]) based on results of field survey in urban parks[12], the number of tall trees per area and ratio of litter moved to off-site due to management including cleaning (92.39%). As a result of calculation, carbon stock change in litter per urban park area is 0.0164 [t-C/ha/yr] for Hokkaido and 0.0139 [t-C/ha/yr] for other prefectures. In addition, carbon fraction in litter is assumed to be 0.05 [t-C/t-dm] which is a default value provided in the LULUCF-GPG[13].

○ Green area on road, Green area around sewage treatment facility, Green area by greenery promoting system for private green space, Green area along river and erosion control site, Green area around public rental housing and Green area around government buildings

Litter in these sub-categories includes branches and leaves dropped naturally and dead roots. A part of litter is remained on-site and leads to increase carbon stocks, although other litter is moved to off-site due to managements such as cleaning (such litter is dropped from trees planted after green area establishment). Dead roots also lead to increase carbon stocks because they are not moved to off-site.

[12] Annual accumulation of litter dropped naturally was measured for some tree types by using litter traps installed in Takino Suzuran Kyuryo National Government Park (Hokkaido) and Showa Kinen National Government Park (Tokyo). Litter is defined as branches and leaves dropped on the surface. In selection of surveyed parks, large-sized and intensively managed national government parks in which continuous monitoring is available and different types trees have been planted are considered to be satisfied with measurement requirements. In addition, it is also considered that tree type distribution differs between Hokkaido and other prefectures. Therefore, Japan selected two surveyed parks, one for Hokkaido and the other for typical climate zone excluding Hokkaido.

[13] According to the LULUCF-GPG, this default value is originally provided for living biomass. However, Japan uses it for litter because Japan measured carbon fraction in litter in the manner which litter was collected and dried within one month from litter dropping in field survey and its measurement showed that carbon fraction in litter is similar to one in living biomass.

Carbon stock change in these sub-categories could not be estimated accurately because it is difficult to obtain detailed information on various managements (such as cleaning). However, it is clear that input of litter and dead roots increases carbon stocks. Therefore, these sub-categories are not sources of greenhouse gases and not included in the reporting (exclusion of these sub-categories is assumed to be conservative).

■ Activity data

It is similar to living biomass.

d） Remaining land: Soils

○ Urban parks

As results of field soil survey implemented in Kanto region, it is demonstrated that carbon stocks in urban parks increase for at least 20 years after their establishment. Therefore, these pools are assumed to be a sink. These results represent whole of country because soil carbon stock change in urban parks depends on land cover and their establishment procedures (regional variations are insignificant).

However, at this time, relevant data is not sufficient. Therefore, soil carbon stock change in urban parks is reported as zero.

【Results of soil survey in urban parks】

（The number of surveyed parks） 10 （in Kanto region）

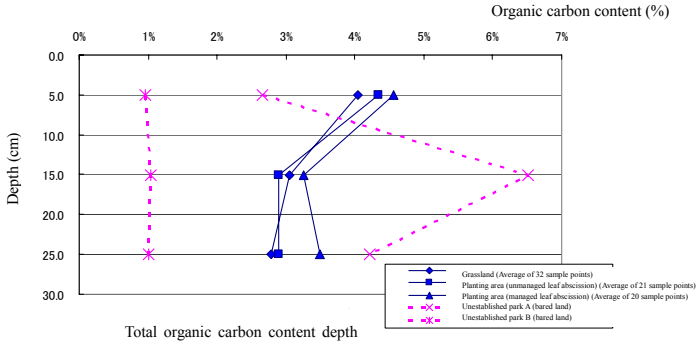
（Period） FY 2007

（Measurement item） organic carbon content of soils（surface-10 cm, 10-20 cm, 20-30 cmm）

It was assumed that organic carbon distribution of soils (0-30 cm depth) in urban parks immediately following new establishment is uniform (carbon is not stored in surface layer) regardless of embankment or cut earth. It was supported by the results of trial pit soil sampling (implemented in 5 parks in 2007) which demonstrate that soil properties for 0-30 cm depth is uniform. Some urban parks (converted from forest land) are covered by soils which have similar properties to forest land. Such parks are qualified as deforestation, not revegetation.

However, this survey demonstrates that input of organic matter (from roots and litter to soils) leads carbon storage after new establishment of urban parks, especially in lands covered by vegetation (see below).

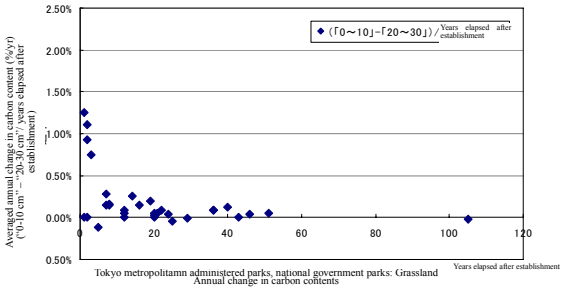
It is also assumed that organic carbon for 10-30 cm depth fluctuate slowly. Most carbon is supplid to surface layer and the amount of carbon supplied to other layers is very few. In addition, organic matter decomposition is not active in other layers because they are subjected to pressure and be under anerobic condition.

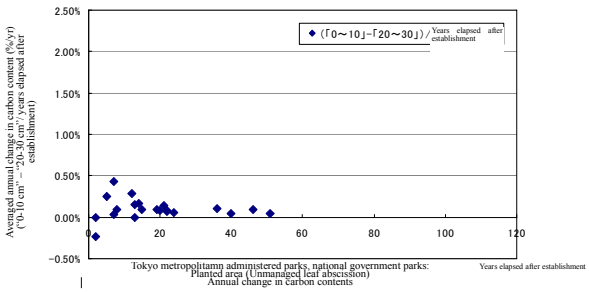


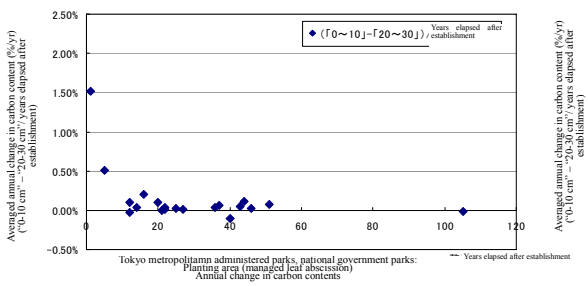
In this context, Japan assumes that organic carbon content for 10-30 cm depth is almost constant and defines “organic carbon content for surface-10 cm depth - organic carbon content for 20-30 cm depth” is equal to soil carbon stock change after establishment of parks. Following graphs show values calculated by dividing soil carbon stock change by years elapsed after establishment of parks.

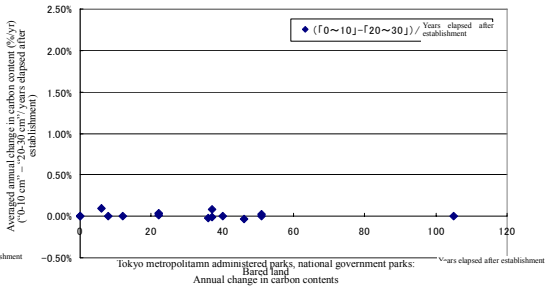
These graphs show annual variation of organic carbon content. They indicate that annual carbon accumulation in parks immediately following new establishment is large and accumulation continues for more than 20 years after establishment regardless of land cover.

Consequently, soils in urban parks which have been established since 1990 and qualified as RV are assumend to be a sink.









○ Green area on road

Green area on general road is established and managed in the same manner as urban parks. Therefore, soil in green area on general road is assumed to be a sink. Expressway slopes are also assumed to be a sink because field survey demonstrates that carbon stocks increase for at least 20 years after establishment, although they are subject to planting in the different manner.

However, at this time, relevant data is not sufficient and soil carbon stock change is reported as zero.

【Results of soil survey in green area on road (Green slopes of expressways)】

（The number of surveyed roads） 5 （in Kanto region）

（Period） 2007

（Measurement item） organic carbon content of soils （surface-10 cm, 10-20 cm, 20-30 cmm）

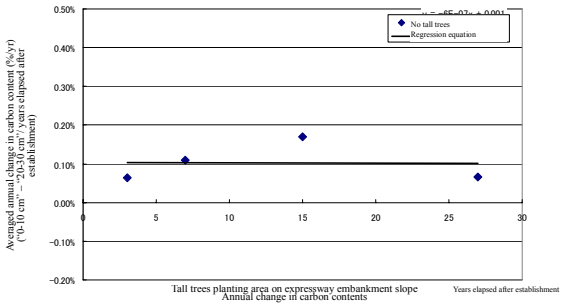
In most cases, embankment structure sections in expressways are qualified as RV (most of cut earth sections are qualified as deforestation). Therefore, surveys were implemented for different embankment structure sections. As in urban parks, it was assumed that organic carbon distribution of soils (0-30 cm depth) in empankment structure sections immediately following new establishment is uniform (carbon is not stored in surface layer).

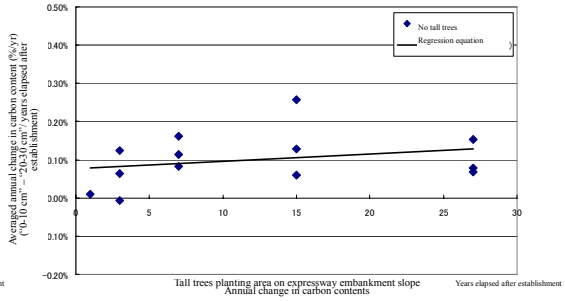
However, this survey also demonstrates that input of organic matter (from roots and litter to soils) leads carbon storage in surface layers after planting and generation of ground cover plants.

In addition, it is assumed that organic carbon for 10-30 cm depth fluctuate slowly for the same reason as urban parks (such as soil compaction).

In this context, Japan assumes that organic carbon content for 10-30 cm depth is almost constant and defines “organic carbon content for surface-10 cm depth - organic carbon content for 20-30 cm depth” is equal to soil carbon stock change after planting. Following graphs show values calculated by dividing soil carbon stock change by years elapsed after planting.

These graphs show annual variation of organic carbon content. They indicate that annual carbon is accumulated continuously regardless of land cover (even if the land is only covered by ground cover plants). Consequently, soils in green slopes of expressways which have been established since 1990 and qualified as RV are assumend to be a sink.





* Deference between urban parks and expressways

Annual carbon stock change in expressway slopes keeps constant in time series, although urban parks accumulate relatively large carbon immediately following thier establishment. Annual carbon stock change depends on balance between carbon supply and its decomposition.

In urban parks immediately following thier establishment, carbon supply may exceed its decomposition because litter supply from planted tall trees is relatively large and urban parks are covered by immature soils. After that, soils reach maturity and decomposition rate overtake carbon supply.

In expressways, little carbon is supplied immediately after seeding. After that, annual carbon stock change keeps constant because soils reach maturity according to increase of litter supply.

○ Green area on port, Green area around sewage treatment facility, Green area by greenery promoting system for private green space, Green area along river and erosion control site, Green area around public rental housing and Green area around government buildings

It is assumed that patterns of soil carbon stocks in these green areas are similar to urban parks because planting, establishment and management in these green areas are implemented in the same manner as urban parks. Therefore, Japan assumes that these pools are not sources and not included in the reporting. If methodorogies on urban parks will be developed in the future, estimating and reporting by using these methodorogies will be considered.

e) Remaining land: Other gases

➢ Direct N_2O emissions from N fertilization

It is assumed that volume of nitrogen-based fertilizer applied to urban parks is included in demand for nitrogen-based fertilizers in Agriculture sector, although fertilization application in urban parks has been conducted in Japan. Therefore, these sources have been reported as "IE".

➢ Carbon emissions from lime application

Japan estimates carbon emissions from lime application in all sub-categories. For urban parks and green area on road (lime application is implemented only in green area on general road), the amount of lime applied per area is estimated. For other sub-categories, the amount of lime applied per area for urban parks is applied.

Estimation of carbon emissions is implemented for all RV land togerther because estimation method is similar regardless of remaining land or converted land.

■ Methodology

$$C_{RVLm} = C_{RVCaCO3} + C_{RVCaMg(CO3)2}$$
$$C_{RVCaCO3} = \Sigma (A_i * \Delta C_{RViCaCO3} * 12.01 / 100.09)$$
$$C_{RVCaMg(CO3)2} = \Sigma (A_i * \Delta C_{RViCaMg(CO3)2} * 12.01 / 184.41)$$

ΔC_{RVLm}	: Annual carbon emissions in RV lands due to lime application [t-C/yr]
$C_{RVCaCO3}$	: Carbon emissions in RV lands due to $CaCO_3$ application
$C_{RVCaMg(CO3)2}$	: Carbon emissions in RV lands due to dolomite application
A	: Land area for RV lands (total of remaining land and converted land)
$\Delta C_{RViCaCO3}$	: Amount of $CaCO_3$ application to RV lands (land type i) per area
$\Delta C_{RViCaMg(CO3)2}$	: Amount of dolomite application to RV lands (land type i) per area
$12.01/100.09$	: Ratio of molecular weight in $CaCO_3$
$12.01/184.41$	: Ratio of molecular weight in dolomite
i	: Land type (urban parks, green area on road [general road])

■ Parameters

○ Urban parks

Amount of $CaCO_3$ application per area is established as 298.4 [g/ha/yr] based on the results of questionnaire survey carried out for 11,274 urban parks. Amount of CaMg(CO3)2 application per area is established as 1,088.4 [g/ha/yr] based on the results of questionnaire survey carried

out for 9,346 urban parks.

In estimating carbon emissions, it is assumed that all carbon included in applied $CaCO_3$ and $CaMg(CO_3)_2$ are released to the atmosphere within the application year.

○ Green are on road

The amount of $CaCO_3$ application per tall tree is established as 0.3311 [g/tree/yr] based on the results of questionnaire survey implemented for 40 road managers. The amount of CaMg(CO3)2 application per tall tree is established as 1.5431 [g/tree/yr] based on the results of questionnaire survey implemented for 40 road managers above-mentioned.

In estimating carbon emissions, it is assumed that all carbon included in applied $CaCO_3$ and $CaMg(CO_3)_2$ are released to the atmosphere within the application year.

○ Green area on port, Green area around sewage treatment facility, Green area by greenery promoting system for private green space, Green area along river and erosion control site, Green area around public rental housing and Green area around government buildings

Parameter values for urban parks are applied because lime application in these green areas is implemented in the same manner as urban parks (application pattern and frequency).

■ Activity data

Area of all RV lands (regardless of remaining land or converted land) is used as activity data.

➢ Biomass burning

In settlements or wetlands subjected to RV activities, burning of residues are essentially prohibited by the Law for waste treatment and cleaning. In addition, wild fires do not usually occur in lands subjected to RV activities because these lands are managed. Therefore, biomass burning activities which lead carbon emissions do not occur and Japan reports this category as "NO".

f) Land converted from other land-use category: Above-ground biomass, Below-ground biomass

■ Methodology

For RV activities, land conversion occurs due to establishment or building of "facilities" and all living biomass are basically replaced for one year (In the case of urban parks converted from cropland, new planting in urban parks are carried out after removal of trees in cropland).

In Japan's basic estimation principles for land converted to RV land, facilities established newly by land conversion in the reporting year are defined as "Land converted to RV land". Estimation methods are shown below.

$$\Delta C_{RVLUC} = \Sigma (A * (C_{AfterLBi} - C_{BeforeLBi}) + (\Delta C_{RVLUCGi} - \Delta C_{RVLUCLi}))$$

$$\Delta C_{RVLUCG} = \Delta B_{RVG}$$

$$\Delta B_{RVG} = \Sigma NT_j * C_{Ratej}$$

ΔC_{RVLUC} : Annual change in carbon stocks in living biomass in converted revegetation land [t-C/yr]
A : Annual area of converted revegetation land [ha/yr]
$C_{AfterLB}$: Carbon stock in living biomass immediately following land conversion [t-C/ha]
$C_{BeforeLB}$: Carbon stock in living biomass immediately before land conversion [t-C/ha]
ΔC_{RVLUCG} : Annual change in carbon stocks in converted revegetation land due to growth in living biomass [t-C/yr]
ΔC_{RVLUCL} : Annual change in carbon stocks in converted revegetation land due to loss of living biomass [t-C/yr]
ΔB_{RVG} : Annual biomass growth in revegetation land [t-C/yr]
C_{Rate} : Annual biomass growth per tree [t-C/tree/yr]
NT : Number of trees
i : Land use type (Urban parks, Green area on road, Green area on port, Green area around sewage treatment facility, Green area by greenery promoting system for private green space, Green area along river and erosion control site, Green area around public rental housing and Green area around government buildings)
j : Tree species

■ Parameters[14]

○ Urban parks

Carbon stocks in living biomass immediately before conversion [t-C/ha] are the same as the one for Grassland, Cropland, Wetlands and Other land. Carbon stocks in living biomass immediately following conversion are assumed to be zero (When urban parks qualified as RV land were established, planting activities have been occurred and living biomass has been stocked. Japan assumes that these biomass stocks are zero because they were carried from other fields and they have not been grown by RV activities). In addition, it is assumed that living biomass before conversion is emitted due to RV land establishment.

The other parameters are assumed to be the same as ones for "Remaining urban parks".

○ Green area on road, Green area on port, Green area around sewage treatment facility, Green area along river and erosion control site, Green area around public rental housing and Green area around government buildings

Carbon stocks in living biomass immediately following and before conversion [t-C/ha] is the same as the one for urban parks converted from other land-use.

The other parameters are assumed to be the same as ones for "Remaining green area on road", "Remaining green area on port", "Remaining green area around sewage treatment facility", "Remaining green area along river and erosion control site", "Remaining green area around public rental housing" and "Remaining green area around government buildings".

■ Activity data

○ Urban parks

Area of land converted to urban parks is calculated by multiplying area of urban parks by area

[14] In this reporting, Japan applied Tier 1b described in LULUCF-GPG. In estimating carbon stock change from RV activities, higher tier should be applied because RV activity was qualified as key. However, Japan used default value because country specific data on biomass growth has not been established. In next submission, Japan will apply Tier 2 method.

ratio of land conversion for the whole country. Activity data for living biomass (the number of tall trees) is estimated in the same manner as "Remaining urban parks".

Table 3-21 Area of urban parks and activity data (remaining land / converted land)

	Land use category befor conversion	Area ratio of land has been converted for the current year	Area [ha]	Activity data [tree] (The number of tall trees)
Urban parks which have been notified since 1st January 1990 and its establishment area is 500 m^2 or more (located in Settlements)	Remaining land	99.61%	39,029.93	8,563,685
	Cropland	0.34%	134.31	29,469
	Grassland	0.05%	19.88	4,362
	Wetlands	IE	IE	IE
	Other land	IE	IE	IE
Urban parks which have been notified since 1st January 1990 and its establishment area is 500 m^2 or more (located in Wetlands [they occupy the river section])	Remaining land	99.83%	4,261.92	935,122
	Cropland	0.04%	1.85	406
	Grassland	0.01%	0.28	61
	Settlements	0.00%	0.10	23
	Other land	0.12%	5.12	1,123

○ Green area on road

Area of land converted to green area on road is calculated by multiplying area of green area on road by area ratio of land conversion for the whole country. Activity data for living biomass (the number of tall trees) is estimated in the same manner as "Remaining green area on road".

Table 3-22 Area of green area on road and activity data for each land-use categry

	Land use category befor conversion	Area ratio of land has been converted for the current year	Area (ha)	Activity data [tree]
Green area on road which have been notified since 1st January 1990 and its establishment area is 500 m^2 or more	Remaining land	99.61%	18,198.11	8,247,851
	Cropland	0.34%	62.62	28,382
	Grassland	0.05%	9.27	4,201
	Wetlands	IE	IE	IE
	Other land	IE	IE	IE

○ Green area on port

Area of land converted to green area on port is calculated by multiplying service area of green area on port by area ratio of land conversion for the whole country. Activity data for living biomass (the number of tall trees) is estimated in the same manner as "Remaining green area on port".

Table 3-23 Area of green area on port and activity data for each land-use categry

Land use category befor conversion	Area ratio of land has been converted for the current year	Area (ha)	Activity data [tree] (the number of tall trees)
Remaining land	99.61%	1,157.47	244,956
Cropland	0.34%	3.98	843
Grassland	0.05%	0.59	125
Wetlands	IE	IE	IE
Other land	IE	IE	IE

○ Green area around sewage treatment facility

Area of land converted to green area around sewage treatment facility is calculated by multiplying green area around sewage treatment facility by area ratio of land conversion for the whole country. Activity data for living biomass (the number of tall trees) is estimated in the same manner as “Remaining green area around sewage treatment facility”.

Table 3-24 Area of green area around sewage treatment facility and activity data for each land-use categry

Land use category befor conversion	Area ratio of land has been converted for the current year	Area (ha)	Activity data [tree] (the number of tall trees)
Remaining land	99.61%	992.94	390,949
Cropland	0.34%	3.42	1,345
Grassland	0.05%	0.51	199
Wetlands	IE	IE	IE
Other land	IE	IE	IE

○ Green area along river and erosion control site

Area of land converted to green area along river and erosion control site is calculated by multiplying planted land area by area ratio of land conversion for the whole country. Activity data for living biomass (the number of tall trees) is estimated in the same manner as “Remaining Green area along river and erosion control site”.

Table 3-25 Area of green area along river and erosion control site and activity data for each land-use categry

Land use category befor conversion	Area ratio of land has been converted for the current year	Area (ha)	Activity data [tree] (the number of tall trees)
Remaining land	99.83%	1,160.65	687,548
Cropland	0.04%	0.50	299
Grassland	0.01%	0.08	45
Wetlands	0.00%	0.03	17
Other land	0.12%	1.39	826

○ Green area around government buildings

Area of land converted to green area around government buildings is calculated by multiplying “total land area – building area” by area ratio of land conversion for the whole country. Activity data for living biomass (the number of tall trees) is estimated in the same manner as “Remaining green area around government buildings”.

Table 3-26 Area of green area around government buildings and activity data for each land-use categry

Land use category befor conversion	Area ratio of land has been converted for the current year	Area (ha)	Activity data [tree] (the number of tall trees)
Remaining land	99.61%	238.61	26,749
Cropland	0.34%	0.82	92
Grassland	0.05%	0.12	14
Wetlands	IE	IE	IE
Other land	IE	IE	IE

○ Green area around public rental housing

Area of land converted to green area around public rental housing is calculated by multiplying "total land area – building area" by area ratio of land conversion for the whole country. Activity data for living biomass (the number of tall trees) is estimated in the same manner as "Remaining green area around public rental housing".

Table 3-27 Area of green area around public rental housing and activity data for each land-use categry

Land use category befor conversion	Area ratio of land has been converted for the current year	Area (ha)	Activity data [tree] (the number of tall trees)
Remaining land	99.61%	1,990.49	522,304
Cropland	0.34%	6.85	1,797
Grassland	0.05%	1.01	266
Wetlands	IE	IE	IE
Other land	IE	IE	IE

g） Land converted from other land use category: Dead wood

When RV activities including land-use conversion are implemented, it is essential that dead wood is moved to off-site and planting is implemented on site because most of lands before conversion (excluding Forest land) are "managed lands" and trees are assumed as "resources". Therefore, carbon stock change in dead wood followed by planting are included in carbon stock change in living biomass before conversion and it looks that dead wood does not occur. In addition, carbon stocks in dead wood immediately following conversion are also assumed to be zero because carbon stocks in living biomass are assumed to be zero. Therefore, carbon stocks in dead wood before and after conversion are assumed to be zero.

Carbon stocks in dead wood accumulated for a year after conversion are reported as "IE" the same as "Remaining land".

h） Land converted from other land use category: Litter

Japan estimates carbon stock change in litter in urban parks and green area on port only (same as remaining land). On the other hand, other sub-categories (Green area on road, Green area around sewage treatment facility, Green area along river and erosion control site, Green area around public rental housing and Green area around government buildings) are not included in the reporting.

■ Methodology

$$\Delta C_{LUCRVLit} = \Sigma (Ai * (C_{AfterLiti} - C_{BeforeLiti}) + Ai * Liti)$$

$C_{AfterLit}$: Carbon stock in litter immediately following land conversion [t-C/ha]
$C_{BeforeLit}$: Carbon stock in litter immediately before land conversion [t-C/ha]
$\Delta C_{LUCRVLit}$: Annual change in carbon stocks in litter in remaining revegetation land [t-C/yr]
A : Area of converted revegetation land [ha/yr]
Lit : Annual change in carbon stocks in litter in revegetation land per area [t-C/ha/yr]
i : Land use type (urban parks and green area on port)

■ Parameters

○ Urban parks and Green area on port

When urban parks are converted from cropland, grassland or wetlands, soils before conversion are not moved to off-site (in general, these soils are used after conversion continuously or covered by additional soils). Therefore, litters and dead roots accumulated before conversion do not decrease due to land conversion.

In addition, litter in urban parks immediately following conversion is very little.

Therefore, carbon stock change in litter due to land conversion is assumed to be zero. The amount of carbon in litter accumulated for a year after conversion is estimated in the same manner as "Remaining urban parks".

○ Green area on road, Green area around sewage treatment facility, Green area along river and erosion control site, Green area around public rental housing and Green area around government buildings

Carbon stock change in litter due to land conversion is assumed to be zero for the same reason as urban parks.

The amount of carbon in litter accumulated for a year after conversion is not included in this reporting (same as "Remaining green area on road", "Remaining green area around sewage treatment facility", "Remaining green area along river and erosion control site", "Remaining green area around public rental housing" and "Remaining green area around government buildings").

Therefore, these sub-categories are not sources of greenhouse gases and not included in the reporting.

■ Activity data

Activity data is same as living biomass.

i) Land converted from other land use category: Soils

○ Urban parks

As mentioned above (in litter section), when urban parks are converted from cropland, grassland or wetlands, soils before conversion almost never been moved to off-site (even if moved to off-site, carbon in these soils are not emitted due to combustion). In general, these soils are used after conversion continuously or covered by additional soils. Therefore, soil carbon stocks do not change due to land conversion (carbon stocks may increase due to additional soils. However, Japan assumes that soil carbon stocks do not change because additional soils do not lead carbon sequestration from atmosphere).

Soil carbon stock change for a year after conversion is not estimated for the same reason as "Remaining urban parks", although soils are assumed to be a sink.

○ Green area on road, Green area on port, Green area around sewage treatment facility, Green area along river and erosion control site, Green area around public rental housing and Green area around government buildings

These sub-categories are not sources of greenhouse gases and not included in the reporting for

the same reason as “Land converted to urban parks”.

j） Land converted from other land use category: Other gases

➢ Direct N_2O emissions from N fertilization

It is assumed that volume of nitrogen-based fertilizer applied to urban parks is included in demand for nitrogen-based fertilizers in Agriculture sector, although fertilization application in urban parks has been conducted in Japan. Therefore, these sources have been reported as “IE”.

➢ Carbon emissions from lime application

Estimation of carbon emissions from lime application is implemented based on methodorogies described in “Remaining land: Oher gases” for all RV land together because estimation method is similar regardless of remaining land or converted land.

➢ Biomass burning

As in the case of “Remaining RV land”, biomass burning activities which release carbon do not occur. Therefore, this category has been reported as “NO”.

k） Results

		2006	
		［Gg-CO2］	［Gg-C］
RV		-657.86	179.42
	Above-ground buioma	-485.12	132.30
	Below-ground biomass	-170.45	46.49
	Dead wood	IE	IE
	Litter	-2.32	0.63
	Soils	NR	NR
	Other gases	0.02	-0.01

* CO2）+: Emission, -: Removal
C…+: Removal, -: Emission

3.1.2. Justification when omitting any carbon pool or GHG emissions/removals from activities under Article 3.3 and elected activities under Article 3.4

Some carbon pools under RV activities (litter: Green area on road, Green area around sewage treatment facility, Green area along river and erosion control site, Green area around public rental housing and Green area around government buildings, soils: all sub-categories) are not included in the reporting. It does not lead over-estimation of removals because these carbon pools are not sources of greenhouse gases.

3.1.3. Information on whether or not indirect and natural GHG emissions and removals have been factored out

Japan does not factor out indirect, natural and pre-1990 effects in estimating emissions/removals from activities under Article 3.3 and 3.4.

3.1.4. Recalculation and Improvements

3.1.4.1. Afforestation/Reforestation, Deforestation and Forest Management

○ In previous reporting, Japan identified 3 sub-categories under AR, D and FM activities (Ikusei-rin forests / Intensively managed forests, Ikusei-rin forests / Semi-natural forests and Tennensei-rin forests). However, Japan changes to 2 sub-categories which include “Ikusei-rin forests” and “Tennensei-rin forests” in order to keeps consistency with Initial Report (2006) which reported FM definition based on such 2 sub-categories. It should be noted that relevant forest data is not changed due to change of sub-categoy.

3.1.4.2. Revegetation

○ In previous reporting, Japan identified 5 sub-categories under RV activities (“Urban parks”, “Green area on road”, “Green area on port”, “Green area around sewage treatment facility” and “Green area by greenery promoting system for private green space”). In this reporting, Japan adds 3 sub-categories (“Green area along river and erosion control site”, “Green area around public rental housing” and “Green area around government buildings”) because new statistical data required for estimating and reporting is available.

○ In previous reporting, carbon stock change in litter in 4 sub-categories (urban parks, green area on port, green area around sewage treatment facility and green area by greenery promoting system for private green space) was estimated. However, uncertainty of relevant data was assessed to be significant. Therefore, Japan implemented additional survey (survey on leaves of tall trees and questionnaire on the amount of litter remained on-site) to improve data and recalculate carbon stock change in urban parks and green area on port in this reporting. Other sub-categories (green area on road, green area around sewage treatment facility, green area by greenery promoting system for private green space, green area along river and erosion control site, green area around public rental housing and green area around government buildings) are not included in the reporting because they are not sources of greenhouse gases.

○ In previous reporting, carbon stock change in soils was reported as “NE”. In this reporting, however, this carbon pool is not included because field survey demonstrated that it is not a source.

3.1.5. Uncertainty estimates

As a result of uncertainty assessment implemented by method provided in National Greenhouse Gases inventory Report of JAPAN, Annex 7, "7.1 Methodology of Uncertainty Assessment", uncertainty of total emissions/removals from activities under Article 3.3 and 3.4 has been assessed at 32%.

Greenhouse gas source and sink activities	GHGs	Emissions/Removals [Gg CO_2eq.]	%	Emissions/Removals Uncertainty [%]	rank	Emissions/Removals Uncertainty as % of toral national emissions [%]	rank
Article 3.3 activities Afforestation and Reforestation	CO_2, N_2O, CH_4	▲ 386	-1%	4%	4	0%	3
Article 3.3 activities Deforestation	CO_2, N_2O, CH_4	2,689	7%	33%	2	-2%	4
Article 3.4 activities Forest management	CO_2, N_2O, CH_4	▲ 39,516	-104%	31%	3	32%	1
Article 3.4 activities Revegetation	CO_2, N_2O, CH_4	▲ 658	-2%	84%	1	1%	2
Total		▲ 37,871	-100%	32%			

3.1.5.1. Afforestation/Reforestation

Uncertainty of emissions/removals from afforestation/reforestation activities in 2006 has been assessed at 4%.

Table 3-28 Uncertainty of emissions/removals from afforestation/reforestation activities

Greenhouse gas source and sink activities			GHGs	Emissions/ Removals [Gg CO2eq.]	AD Uncertainty [%]	EF/RF Uncertainty [%]	Combined Uncertainty [%]	rank	Combined Uncertainty as % of toral national emissions [%]	rank
Article 3.3 activities Afforestation and Reforestation	Change in carbon pool reported									
		Above-ground biomass	CO_2	▲ 213	-	-	5%	4	3%	1
		Below-ground biomass	CO_2	▲ 55	-	-	2%	7	0%	5
		Litter	CO_2	▲ 26	-	-	7%	2	0%	4
		Dead wood	CO_2	▲ 63	-	-	5%	3	1%	3
		Soil	CO_2	▲ 28	-	-	28%	1	2%	2
	Greenhouse gas sources reported									
		Fertilization	N_2O	IE	-	-	-	-	-	-
		Drainage of soils under forest management	N_2O	-	-	-	-	-	-	-
		Disturbance associated with land-use conversion to croplands	N_2O	-	-	-	-	-	-	-
		Liming	CO_2	NE	NE	NE	NE	-	-	-
		Biomass burning	CO_2	IE	IE	IE	IE	-	-	-
			CH_4	0	-	-	5%	5	0%	7
			N_2O	0	-	-	5%	6	0%	6
	Total			▲ 386			4%			

3.1.5.2. Deforestation

Uncertainty of emissions/removals from deforestation activities in 2006 has been assessed at 33%.

Table 3-29 Uncertainty of emissions/removals from deforestation activities

Greenhouse gas source and sink activities			GHGs	Emissions/ Removals [Gg CO2eq.]	AD Uncertainty [%]	EF/RF Uncertainty [%]	Combined Uncertainty [%]	rank	Combined Uncertainty as % of toral national emissions [%]	rank
Article 3.3 activities Dforestation	Change in carbon pool reported									
		Above-ground biomass	CO_2	1,250	-	-	71%	1	33%	1
		Below-ground biomass	CO_2	376	-	-	8%	4	1%	4
		Litter	CO_2	201	-	-	7%	5	1%	5
		Dead wood	CO_2	561	-	-	7%	6	1%	3
		Soil	CO_2	294	-	-	16%	3	2%	2
	Greenhouse gas sources reported									
		Fertilization	N_2O	-	-	-	-	-	-	-
		Drainage of soils under forest management	N_2O	-	-	-	-	-	-	-
		Disturbance associated with land-use conversion to croplands	N_2O	5	-	-	27%	2	0%	6
		Liming	CO_2	NE	NE	NE	NE	-	-	-
		Biomass burning	CO_2	NO	NO	NO	NO	-	-	-
			CH_4	NO	NO	NO	NO	-	-	-
			N_2O	NO	NO	NO	NO	-	-	-
	Total			2,689			33%			

3.1.5.3. Forest Management

Uncertainty of emissions/removals from forest management activities in 2006 has been assessed at 31%.

Table 3-30 Uncertainty of emissions/removals from forest management activities

Greenhouse gas source and sink activities			GHGs	Emissions/ Removals [Gg CO2eq.]	AD Uncertainty [%]	EF/RF Uncertainty [%]	Combined Uncertainty [%]	rank	Combined Uncertainty as % of toral national emissions [%]	rank
Article 3.4 activities Forest manafement	Change in carbon pool reported									
		Above-ground biomass	CO_2	▲ 31,003	-	-	39%	2	30%	1
		Below-ground biomass	CO_2	▲ 7,699	-	-	16%	3	3%	2
		Litter	CO_2	▲ 433	-	-	10%	4	0%	4
		Dead wood	CO_2	422	-	-	9%	5	0%	7
		Soil	CO_2	▲ 805	-	-	147%	1	3%	3
	Greenhouse gas sources reported									
		Fertilization	N_2O	IE	IE	IE	IE	-	-	-
		Drainage of soils under forest management	N_2O	NE	NE	NE	NE	-	-	-
		Disturbance associated with land-use conversion to croplands	N_2O	-	-	-	-	-	-	-
		Liming	CO_2	NE	NE	NE	NE	-	-	-
		Biomass burning	CO_2	IE	IE	IE	IE	-	-	-
			CH_4	1	-	-	6%	7	0%	6
			N_2O	0	-	-	6%	6	0%	5
	Total			▲ 39,516			31%			

3.1.5.4. Revegetation

Uncertainty of emissions/removals from revegetation activities in 2006 has been assessed at 84%.

Table 3-31 Uncertainty of emissions/removals from revegetation activities

Greenhouse gas source and sink activities			GHGs	Emissions/ Removals [Gg CO2eq.]	AD Uncertainty [%]	EF/RF Uncertainty [%]	Combined Uncertainty [%]	rank	Combined Uncertainty as % of toral national emissions [%]	rank
Article 3.4 activities	Change in carbon pool reported									
		Above-ground biomass	CO_2	▲ 485	84%	60%	103%	3	76%	1
		Below-ground biomass	CO_2	▲ 170	107%	92%	141%	1	37%	2
Revegetation		Litter	CO_2	▲ 2	91%	107%	141%	2	0%	3
		Dead wood	CO_2	IE	IE	IE	IE	-	-	-
		Soil	CO_2	0	-	-	-	-	-	-
	Greenhouse gas sources reported									
		Fertilization	N_2O	IE	IE	IE	IE	-	-	-
		Drainage of soils under forest management	N_2O	-	-	-	-	-	-	-
		Disturbance associated with land-use conversion to croplands	N_2O	-	-	-	-	-	-	-
		Liming	CO_2	0	8%	4%	9%	4	0%	4
		Biomass burning	CO_2	NO	NO	NO	NO	-	-	-
			CH_4	NO	NO	NO	NO	-	-	-
			N_2O	NO	NO	NO	NO	-	-	-
	Total			▲ 658	68%	50%	84%			

3.1.6. Information on other methodological issues (method dealing with effects of natural disturbance[15])

3.1.6.1. Afforestation/Reforestation and Deforestation

Effects of natural disturbance have been reflected in forest resources data at update time of Forest Registers which have been conducted every 5 years in each planning area.

3.1.6.2. Forest Management

Effects of natural disturbance have been reflected in forest resources data at update time of Forest Registers which have been conducted every 5 years in each planning area.

3.1.6.3. Revegetation

It is considered that windstorm, flood and insects are natural disturbance which have a considerable impact on carbon stock change on RV land. However, all land qualified as RV is under human induced management by administration etc. In addition, when disappearance of tall trees and outflow of soils are occurred in RV land located in the Settlements, business budget is often appropriated and urgent restoration measure is administered from viewpoint with respect to safety and view.

Consequently, effects of natural disturbance are not considered in estimation because it looks that carbon stocks do not change. Furthermore, carbon stock change due to post-disaster restoration

[15] Including fire, windthrow, insects, droughts, flooding and ice storms etc,.

practices which are not implemented in the year disaster occur does not lead double-counting because it is not considered in this reporting.

3.1.7. For the purpose of accounting as reqired in paragraph 18 of the annex to draft decision -/CMP.1 (LULUCF) attached to decision 11/CP.7, an indication of the year of the onset of an activity, if after 2008

Area of lands which have been subject to activities until 2006 is shown below.

3.1.7.1. Afforestation/Reforestation and Deforestation

Afforestation/Reforestation (1990-2006)	Deforestation	
	1990-2006	2006
26.2 [kha]	288.2 [kha]	7.8 [kha]

3.1.7.2. Forest Management

Ikusei-rin forest	Tennensei-rin forest	Total
5,794 [kha]	6,793 [kha]	12,588 [kha]

3.1.7.3. Revegetation

Urban parks	Green area on road	Green area on port	Green area around sewage treatment facility	Green area by greenery promoting system for private green space	Green area along river and erosion control site
43,453 [ha]	18,270 [ha]	1,162 [ha]	997 [ha]	4 [ha]	1,163[ha]

Green area around government buildings	Green area around public rental housing	Total
240 [ha]	1,998 [ha]	67,287 [ha]

3.2. Article 3.3

3.2.1. Information that demonstrates that activities under Article 3.3 began on or after 1 January 1990 and are direct human-induced

Japan detected change of the forest cover based on orthophotos at the end of 1989 and satellite images. It can demonstrate that ARD activities have occurred since 1 January 1990 and are directly human-induced.

The following are the results of comparison between ARD land area detected by satellite images and one obtained from administrative information. They are in consistency with each other. It indicates that above-mentioned assumption is appropriate.

Table 3-32 Results of interpretation of ARD land (March 2008)

Area of lands interpreted [km^2]	Available plots (excluding plots which are unavailable in interpretation or lack of image)	Plots qualified as AR (2005)	AR rate % (1990-2006)	Area of lands qualified as AR Total [kha] (1990-2006)	Reference 1: administration information AR land area (1990-2005) Planted land area [kha]
355,533	1,125,688	500	0.074%	26.2	29.7

Area of lands interpreted [km^2]	Available plots (excluding plots which are unavailable in interpretation or lack of image)	Plots qualified as D (2005)	D rate %	Area of lands qualified as D Total [kha] (1990-2006)	Reference 2: administration information D land area (1990-2006) [kha]
355,533	1,125,688	9,503	0.811%	288.2	258.0

Note: As mentioned in section 2.2.1.1., ARD rates are not consistent with ratio of ARD plots to available sample plots because ARD rates for 1990-2006 are calculated based on satellite images at 2005.

Ref 1: "A move and conversion of cropland" (Agriculture, Forestry and Fisheries Ministry, Rural Development Bureau), Total area of land converted from cropland by land use: Total of planted land area for 1990-2005

Ref 2: "World Census of Agriculture and Forestry", Total area of land converted from forest land for 1990-2006 which was calculated based on total forest conversion area for 1990-2000

3.2.2. Information on how harvesting or forest disturbance that is followed by the re-establishment of forest is distinguished from deforestation

When prefectures implement survey to establish forest planning (all forest lands are divided into 158 planning areas and regional forest planning is established by 1/5 [about 30 planning areas] each year), it is determined whether forest lands where tree cover has been removed temporally due to cutting and disturbance (without land conversion) are classified as deforestation or not (taking into account actual land use and circumstances). Forest lands which are removed temporally and not excluded from forest planning can be distinguished from deforested lands which are converted to non-forest land use because they will be replanted and treated as "Forest land".

3.2.3. Information on the size and geographical location of forest areas that have lost forest cover but which are not yet classified as deforested

Forest areas that have lost forest cover but which are not yet classified as deforested are continuously detected as "Forest without standing trees" (cut-over forests,lesser stocked forests) and the size of those areas are about 1.19 million [ha].

3.3. Article 3.4

3.3.1. Information which demonstrates that activities under Article 3.4 have occurred since 1 January 1990 and are human-induced

3.3.1.1. Forest Management

Status of FM activities (which have been implemented since 1 January 1990) was surveyed by sampling implemented for all Ikusei-rin forests in 2007, field survey, interview with forest owner's association, administrative information on subsidized forest practices and so on. Results of survey have been used in estimating FM ratio.

3.3.1.2. Revegetation

Japan demonstrates that revegetation activities have occurred since 1990 and are human induced based on the following reasons.

Table 3-33 Information that demonstrates that revegetation activities have occurred since 1st January 1990 and are human induced

Sub-division	Information that demonstrates that revegetation activities have occurred since 1st January 1990 and are human induced
Urban parks	Extraction of activities which have occurred since 1st January 1990 MLITT has implemented "Urban Parks Status Survey" and has collected data on the notificated year of urban parks. In the reporting, only urban parks which have been notified since 1st January 1990 are included. Although some urban parks have established before the notificated year, Japan considers that RV activities have occurred since the notificated year under "Urban Park Act". Demonstrate that activities are human induced Activity data (the number of tall trees) is calculated based on the number of tall trees per land area (tree/ha) which is developed by using data on tall trees human-induced planted. Its calculation procedure ensures that Japan extracts human induced activities.
Green area on road	Extraction of activities which have occurred since 1st January 1990 MLITT has implemented "Road Tree Planting Status Survey" every 5 years and has collected data on the number of planted tall trees. Activity data after 1990 is calculated by extrapolating or interpolating these data. Demonstrate that activities are human induced In "Road Tree Planting Status Survey", only human-induced planted tall trees have been measured. Its mesurement procedure ensures that Japan extracts human induced activities.
Green area on port	Extraction of activities which have occurred since 1st January 1990 MLITT has implemented complete census since 2006 and has collected relevant data (established year and service area) for green area on port which had been established since 1990. Demonstrate that activities are human induced Activity data (the number of tall trees) is calculated by using parameters of urban parks which are based on human-induced activities data.

Green area around sewage treatment facility	Extraction of activities which have occurred since 1st January 1990 MLITT has implemented "Sewage treatment Facility Status Survey" since 2006 and has collected relevant data (established year and greening area) for green area around sewage treatment facility which had been established since 1990. Demonstrate that activities are human induced Activity data (the number of tall trees) is calculated based on the number of tall trees per land area (tree/ha) which is developed by using data on tall trees human-induced planted. Its calculation procedure ensures that Japan extracts human induced activities.
Green area by greenery promoting system for private green space	Extraction of activities which have occurred since 1st January 1990 It is clear that all green area by greenery promoting system for private green space has been established since 1st January 1990 because greenery promoting system has been implemented since 2001. Existing green area (with tall trees) in some green area are reported when it is notified by local authority mayor. It is excluded from RV land area. Demonstrate that activities are human induced All green area by greenery promoting system for private green space has been human-induced established.
Green area along river and erosion control site	Extraction of activities which have occurred since 1st January 1990 MLITT has implemented "Survey on carbon dioxide absorption at source in river works" since 2007 and has collected relevant data (name, location, established year, planted land area [projected area] and the number of tall trees) for river works and erosion and sediment control works which had been implemented since 1990. Demonstrate that activities are human induced Activity data (the number of tall trees) is calculated based on the number of tall trees per land area (tree/ha) which is developed by using data on tall trees human-induced planted. Its calculation procedure ensures that Japan extracts human induced activities.
Green area around government buildings	Extraction of activities which have occurred since 1st January 1990 MLITT has implemented complete census since 2007 and has collected relevant data (name, location, established year, total land area and building area) for government buildings which had been established since 1990. Demonstrate that activities are human induced Activity data (the number of tall trees) is calculated based on the number of tall trees per land area (tree/ha) which is developed by using data on tall trees human-induced planted. Its calculation procedure ensures that Japan extracts human induced activities.
Green area around public rental housing	Extraction of activities which have occurred since 1st January 1990 MLITT has implemented "Progress survey on tree planting for public rental housing" since 2007 and has collected relevant data (name, location, established year, total land area and building area) for public rental housing which had been established since 1990. Demonstrate that activities are human induced Activity data (the number of tall trees) is calculated based on the number of tall trees per land area (tree/ha) which is developed by using data on tall trees human-induced planted. Its calculation procedure ensures that Japan extracts human induced activities.

3.3.2. Information relating to Revegetation for the base year

Revegetation is a activity which has been occurred since 1990. Therefore, RV land area and emissions/removals from its activity are zero.

3.3.3. Information relating to Forest Management

In Japan, area and carbon stock change on lands subject to forest management activities are estimated by applying FM ratios to data on all forests which meet our country's forest definition. Therefore, lands subject to forest management activities are consistent with our country's forest definition.

In addition, Japan defines that forest management activities should be sustainable system and it is judged depending on whether appropriate forest practices have been carried out in Ikusei-rin forests or whether practices for protection or conservation of forests including controlling logging activities and land-use change have been carried out by laws. Therefore, Japan's definition of forest management is consistent with the definition provided in "Decision 16/CMP.1" (*a system of practices for stewardship and use of forest land aimed at fulfilling relevant ecological, economic and social function of the forest in a sustainable manner*).

Chapter 4 Other information

4.1. Key category analysis

In accordance with LULUCF-GPG, Chapter 5, the activity which meets following requirements is considered as key.

- The associated category under the UNFCCC is identified as key. In addition, Emissions/removals from the activity are greater than the smallest category that is identified as key in the UNFCCC inventory (Tier 1 level assessment).
- Estimation method is changed from previous reporting.

Corresponding with key categories under the UNFCCC

Japan's national inventory report states that LULUCF key categories under the UNFCCC for 2006 are as follows;

- 5.A.1. Forest land remaining Forest land (CO_2)
- 5.A.2. Land converted to Forest land (CO_2)
- 5.B.2. Land converted to Cropland (CO_2)
- 5.C.1. Land converted to Grassland (CO_2)
- 5.E.1. Land converted to Settlements (CO_2)
- 5.F.1. Land converted to Other land (CO_2)

In accordance with LULUCF-GPG, all activities to be reported (AR, D, FM, RV) may be identified as key under the Kyoto Protocol.

UNFCCC category	Kyoto Protocol category
5.A.1. Forest land remaining Forest land	FM、GM、CM
5.A.2. Land converted to Forest land	AR
5.B.1. Cropland remaining Cropland	CM、RV
5.B.2. Land converted to Cropland	D、RV、CM
5.C.1. Grassland remining Grassland	GM、RV
5.C.2. Land converted to Grassland	D、RV、GM
5.D.1. Wetlands remaining Wetlands	RV
5.D.2. Land converted to Wetlands	D、RV
5.E.1. Settlements remaining Settlements	RV
5.E.2. Land converted to Settlements	D、RV
5.F.1. Other land remaining Other land	－
5.F.2. Land converted to Other land	D

※ Refer to LULUCF-GPG, Page 5.39, Table 5.4.4. Yellow shade indicates key categories under the UNFCCC.

Comparison with the smallest key category under the UNFCCC

The smallest category for the UNFCCC (Tier 1 level assessment) for 2006 was 4.A. Enteric Fermentation (CH_4) [7,035 Gg-CO_2]. As a result of comparison, only forest management activity was greater than this category.

Change of estimation method

Estimation method on RV activity is changed from previous reporting (see section 3.1.4.2).

Therefore, FM and RV activity are identified as key for 2006.

4.2. Further Improvements

4.2.1. Afforestation/Reforestation and Deforestation

- ○ Japan will carry out cross-checking of ARD data by comparing administrative information on land use change and satellite images including forest status map (orthophoto) at the end of 1989.
- ○ Japan will discuss on continuous monitoring of carbon dynamics in D land.

4.2.2. Forest Management

- ○ Japan will collect data for estimating carbon dynamics in soils, litter and dead wood.
- ○ Japan will survey on increase of FM ratios in FM land during the first commitment period.

4.2.3. Revegetation

- ○ In this report, a default value of annual biomass growth was used. In the future report, Japan will measure annual biomass growth in a tall tree planted in RV land and determine country-specific value for dominant tree types (a few types).
- ○ Carbon stock change in soils is not included in the reporting because soils are not sources of greenhouse gases. Japan will continue to collect fundamental information on soil carbon and consider about estimation method.
- ○ Japan will continue to collect data on litter pools in urban parks to improve carbon stock change estimation.

Chapter 5 Information relating to Article 6

Japan has not carried out any projects under Article 6 of the Kyoto Protocol. Therefore, a special indication of whether the boundary of the geographical location encompasses land subject to the Article 6 project is not prepared.

Reference

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