

**Supporting Report C**

**Flood Damage  
and Inundation Survey Results**

## **Supporting Report C Flood Damage and Inundation Survey Results**

### **C.1 General Information**

#### **C.1.1 Introduction**

Flood is a common characteristic feature in Sri Lanka due to its geographic location and nature. The main rivers in Sri Lanka originate from the central highland at an altitude of 2,000m m.s.l. or above. It passes through the steep slope at upstream and quite mild slope at downstream before meeting the sea on the coast of the island. Some areas in the central highland receive annual rainfall in excess of 5,000mm. The flood disaster and damage survey was conducted as a part of the Comprehensive Study on Disaster Management in Sri Lanka, under Japan International Cooperation Agency (JICA) at selected river basins namely, Kelani, Kalu, Gin and Nilwala. The catchment areas of these rivers are 2,292, 2,719, 932 and 971 sq. km respectively. Being located in the wet zone, these river basins experience some of the highest annual rainfall depths received in the island. During the two major rainy seasons; the south-west monsoon from April to June and inter monsoon from September to October, tropical storms pass over the basins and bring down rains with high intensity.

These storms often cause floods in the river basins resulting damages to property and lives. In some of river basins, especially Kalu River, flood damages are almost an annual feature during the major rainy seasons. In case of large magnitude floods, the damages are heavy and widespread and affect rural agricultural lands as well as highly built up urban centers. In June 1989, flood occurred in Kelani river basin is the biggest flood in recent history after 1947. In May 2003, flood experienced in Kalu, Gin and Nilwala river basins in the southwest of the island due to the action of low pressure weather system prevailed for several days during the middle of southwest monsoon. The heavy rains that followed caused heavy floods inundating vast area at the downstream reach of rivers. It is reported that heavy damages to life and property occurred while disrupting the day-to-day activities of the communities. The location map of the target four river basins is shown in the figure in next page.

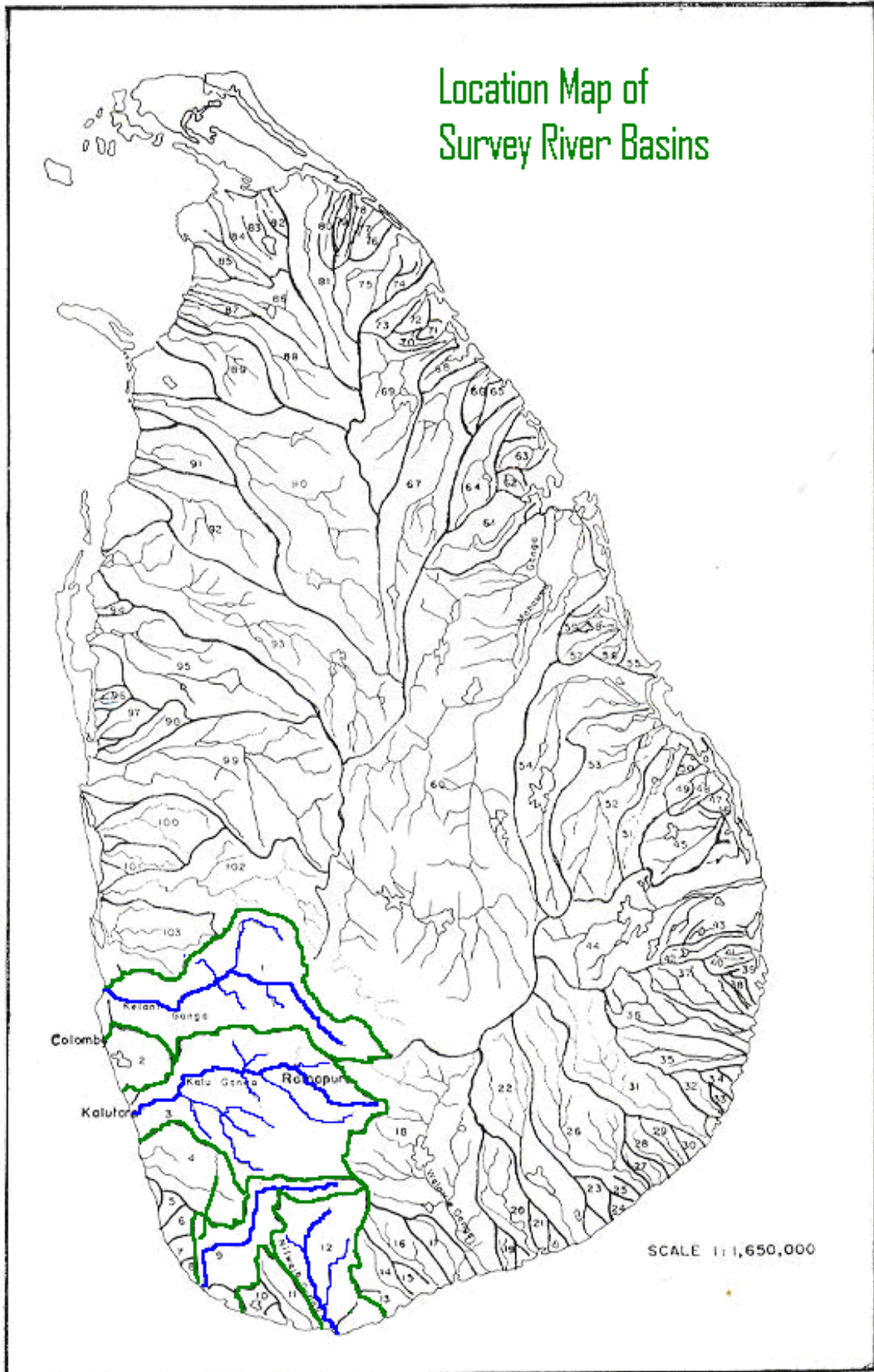


Figure C.1.1 Location Map of Target River Basins for Survey

### **C.1.2 Objective**

The objective of the Questionnaire Survey is to clarify flood and inundation conditions and people's awareness against flood disaster in the Kelani, Gin, Kalu and Nilwala River basins, which can be referred to elaborate hydrologic and hydraulic analyses and flood management plan. Further the results will be effectively utilized for early warning system planning and community-based disaster management activities in the pilot areas.

### **C.1.3 Methodology of the Survey**

The survey was conducted using a questionnaire prepared by the JICA Study Team. Two sets of questionnaires were prepared. One set is for use in interviews for organizations and another set is for residents.

Target respondents for questionnaire survey including selected organizations and local residents are given in Table C.1.1. The details of target villages in each river basin and number of families interviewed are given in Table C.1.2.

The Survey Team consists of ten (10) members divided into four survey groups headed by a Team Leader and a data entry operator. A group of two members carried out the survey at each river basin simultaneously for all four river basins. At each location of flood interview survey, in addition to the data collection, global coordinate was also recorded. The results of the survey interview were encoded using MS Excel and analyzed.

### **C.1.4 Study Time Frame**

The study time period is from 16th November 2006 to 20th January 2007.

### **C.1.5 Modification of Original Specifications**

The target villages were selected according to the instructions of the JICA Study Team. However, some of the villages which did not have flooding experience were removed from the list and instead included several new villages with flooding experience. In remote areas, number of families living in some villages is a few and those who experienced the flood disaster are also limited. Every effort was made to collect the accurate information from residents and organizations too. However, the survey interview encountered several problems in the course of the study, especially to collect information from some of District Secretariats and Divisional Secretariats Offices. Mostly, they don't have detailed information individually, of budget allocated or expenditure incurred on flood mitigation and welfare. In order to make ease for them to fill the questionnaire, sufficient number of days were given and collected them at a later date. As it seems that data received from the District Secretariats and Divisional Secretariats was not sufficient, supplementary data was collected also from National Disaster Management Center (NDMC) to cover the damage analysis.

### C.1.6 Survey Team

The survey team is composed of the following staff:

Mr. S. D. Mohotty	Team Leader
Mr. V. K. Premawardena	Team member for Kelani River Basin
Mr. G.Arunajith	- do -
Mr. G. H. C. Sampath	Team member for Kalu River Basin
Mr. H. Wickramasinghe	- do -
Mr. Madusha Jayaweera	Team member for Gin River Basin
Mr. N. S.Kumarasiri	- do -
Mr. J.H.M.S,Q. Jayaweera	Team member for Nilwala River Basin
Mr. Molitha Weralupitiya	- do -
Mrs. H. G. Priyantha	Data Processing

### C.1.7 Organizations and Target Villages interviewed

The organizations and villages for target respondents interviewed are given in Table C.1.1 and C.1.2.

Table C.1.1 Target Respondents for Questionnaire Survey

Item	Description	No.
Local Residents	A1 Kelani River basin (20)	177
	A2 Kalu River basin (19)	171
	A3 Gin River basin (12)	89
	A4 Nilwala River basin (10)	80
Sub-total		517
Central Governmental Agencies (Department of Irrigation) – Regional Offices	B1 Colombo(Kelani and Kalu)	1
	B2 Galle (Gin and Nilwala)	1
Local Governmental Agencies - (District Secretaries' Office)	C1 Colombo	1
	C2 Gampaha	1
	C3 Kalutara	1
	C4 Ratnapura	1
	C5 Galle	1
	C6 Matara	1
Local Governmental Agencies - (Divisional Secretaries' Office)	D1 ~ D22 (as given in Table C.1.2)	22
Sub-total		30
<b>Total</b>		<b>517 people and 30 agencies</b>

Note: Figures in parenthesis for “Local Residents” show number of villages

Table C.1.2 Target Villages and Number of Respondents in Each River Basin

River Basin	Code No.	District	Division	Village	Number of Sampling
<b>A. Residents</b>					
A1 Kelani River	A1-1	Colombo	D1-Colombo	Totalanga	10
	A1-2			Kotuwila	10
	A1-3			Wennawatta	10
	A1-4			Wellampitiya	11
	A1-5			Kohilawatta	10
	A1-6			Brandiyawatta	5
	A1-7			Mulleriyawa	10
	A1-8		D2-Kaduwela	Ambatale	10
	A1-9			Kaduwela	10
	A1-10			Ranala	10
	A1-11			Bomiriya	8
	A1-12		D3-Hanwella	Hanwella	10
	A1-13			Kosgama	8
	A1-14			Avissawera	8
	A1-15			Glencourse	8
	A1-16	Gampaha	D4-Kelaniya	Kelaniya	8
	A1-17		D5-Biyagama	Biyagama	8
	A1-18			Walgama	7
	A1-19		D6-Dompe	Malwana	8
	A1-20			Mapitigama	8
Sub-total	20				177
A2 Kalu River	A2-1	Kalutara	D7-Kalutara	Kalutara	8
	A2-2			Kaholana	8
	A2-3			Diyagama	8
	A2-4			Yatawara	8
	A2-5		D8-Koholana	Tebuwana	8
	A2-6			Narthupana	8
	A2-7			Ukwatta	8
	A2-8		D9-Horana	Anguruwatota	8
	A2-9			Naragala	8
	A2-10	Ratnapura	D10-Ratnapura	Ellagawa	8
	A2-11			Nambapana	8
	A2-12			Idangoda	8
	A2-13			Kiriella	8
	A2-14			Dodampe	8
	A2-15			Kahangama	8
	A2-16			Ratnapura	30
	A2-17			Malwala	6
	A2-18			Marapana	7
	A2-19	D11-Elapatha	Radella	8	
Sub-total	19				171
A3 Gin River	A3-1	Galle	D12-Galle	Gintota	4
	A3-2		D13-Bope-Poddala	Wakwella	2
	A3-3		D14-Baddegama	Telikada	8
	A3-4			Baddegama	8
	A3-5			Agaliya	9
	A3-6			Majuana	10
	A3-7		D15-Nagoda	Nagoda	8

River Basin	Code No.	District	Division	Village	Number of Sampling
	A3-8			Udugama	8
	A3-9			Panangala	8
	A3-10		D16-Tawalama	Hiniduma	8
	A3-11			Tawalama	8
	A3-12		D17-Neluwa	Neluwa	8
Sub-total	12				89
A4 Nilwala River	A4-1	Matara	D18-Matara	Matara	9
	A4-2			Tudawa	8
	A4-3		D19-Malimbada	Telijjawila	7
	A4-4			Bandattara	8
	A4-5		D20-Thihagoda	Kadduwa	8
	A4-6		D21-Akuressa	Akuressa	8
	A4-7			Bopagada	8
	A4-8		D22-Pitabeddara	Hulandawa	8
	A4-9			Pitabeddara	8
	A4-10			Dankoluwa	8
Sub-total	10				80
Total	61	6	22		517

## C.2 Organizations

### C.2.1 Introduction

The operations and maintenance works of rivers are generally carried out by Regional Directors' Office of Irrigation. The O & M works of Kelani & Kalu Rivers are mainly under Colombo Regional office whereas Galle Regional office handles the Gin and Nilwala rivers.

### C.2.2 Mandated Functions and office Employees

Table C.2.1 Institutions and Relevant Mandated Functions

Institution	Mandated Functions
Regional Offices (Department of Irrigation)	<ul style="list-style-type: none"> <li>- Operation and maintenance of flood protection scheme</li> <li>- Planning and designing of small scale irrigation and drainage works</li> <li>- Development, management and maintenance of irrigation and drainage schemes</li> </ul>
District Secretaries' Office	<ul style="list-style-type: none"> <li>- Being, the chief administrator of district, safeguard the peoples living in the district</li> <li>- Coordination of all development activities in the district with all government agencies</li> <li>- Decision to issuance / Issuance of warnings and evacuation orders during disasters</li> <li>- Approval for disaster preparedness and relief activities</li> <li>- Instructions to Divisional Secretaries on relevant matters</li> <li>- Chair various District Committees</li> <li>- Fund allocation for welfare activities and equipment</li> </ul>
Divisional Secretaries' Office	<ul style="list-style-type: none"> <li>- Data acquisition and preparation</li> <li>- Provide the information to relevant Agencies</li> <li>- Rescue and Relief activities, distribution of welfare goods.</li> <li>- Conduct of flood awareness programmes</li> <li>- Issuance of early warnings of disaster through G.N., police etc.</li> <li>- Guide people to evacuate to safe places</li> <li>- Distribution of foods and dry rations in a disaster</li> </ul>

In each District Secretaries' Office, a coordination unit of Disaster Management Centre has been attached to take the necessary measures to mitigate the disasters such as improvement of canals etc. and also to provide relief activities during a disaster (evacuation, provision of basic needs etc.).

In District Secretaries' Office, basically there are several divisions such as administrative, accounts, social service, engineering, etc. However, in main District Offices (eg. Colombo), in addition to those divisions, officers are assigned to function under various categories as District Sports Officer, Assistant Director – Small Enterprises, District Register General, Assistant Director – Cultural Affairs, Assistant Director – Youth Affairs, Census / Statistics Officer, District Officer – Media, etc.

In Division Secretariats' Office, generally seven main divisions are functioned as follows:

#### Organizational Division

- 1) Accounts Division
- 2) Social Services Division
- 3) Registrar Division
- 4) Planning Division
- 5) Welfare (Samurdi) Division
- 6) Pensions Division

### C.2.3 Disaster Preparedness and Relief Activities

Table C.2.2 Disaster Preparedness and Relief Activities and Problems in Disaster Management

Institution	Disaster Preparedness	Relief Activities	Problems in Disaster Management
Regional Offices (Department of Irrigation)	<ul style="list-style-type: none"> <li>- Flood mitigation infrastructure development and maintenance</li> <li>- Flood release by pumping and gate operation</li> </ul>	<ul style="list-style-type: none"> <li>- Not responsible</li> </ul>	<ul style="list-style-type: none"> <li>- Inadequacy of infrastructure / maintenance funds / transport facilities</li> <li>- Encroachment of river</li> </ul>
District Secretaries' Office	<ul style="list-style-type: none"> <li>- Establishment of disaster management committee, early warning sub committees</li> </ul>	<ul style="list-style-type: none"> <li>- Establishment of relief distribution sub committees</li> </ul>	<ul style="list-style-type: none"> <li>- Lack of flood early warning systems</li> <li>- Unavailability of lands for resettlement</li> <li>- Encroachment of river and other water reservations</li> <li>- Poor standard of reconstruction of damaged infrastructure</li> </ul>
Divisional Secretaries' Office	<ul style="list-style-type: none"> <li>- Establishment of early warning committees and disaster management committees at divisional and village levels</li> <li>- Awareness programmes for GNs and thereby educates communities.</li> <li>- First aid training programmes</li> <li>- Preparation of hazard maps</li> </ul>	<ul style="list-style-type: none"> <li>- Welfare, first aid</li> <li>- Quick evacuation where necessary</li> <li>- Distribution of foods, dry rations, kitchen utensils and compensation for damaged assets</li> </ul>	<ul style="list-style-type: none"> <li>- Illegal sand mining</li> <li>- Filling of lowlands</li> <li>- Construction of houses at lowlands, along the riverbank etc.</li> <li>- Sedimentation of river mouth</li> <li>- Obstructions at ditches/canals etc.</li> <li>- Poor response of public for awareness programmes</li> <li>- Inadequacy of training for flood disaster management</li> </ul>



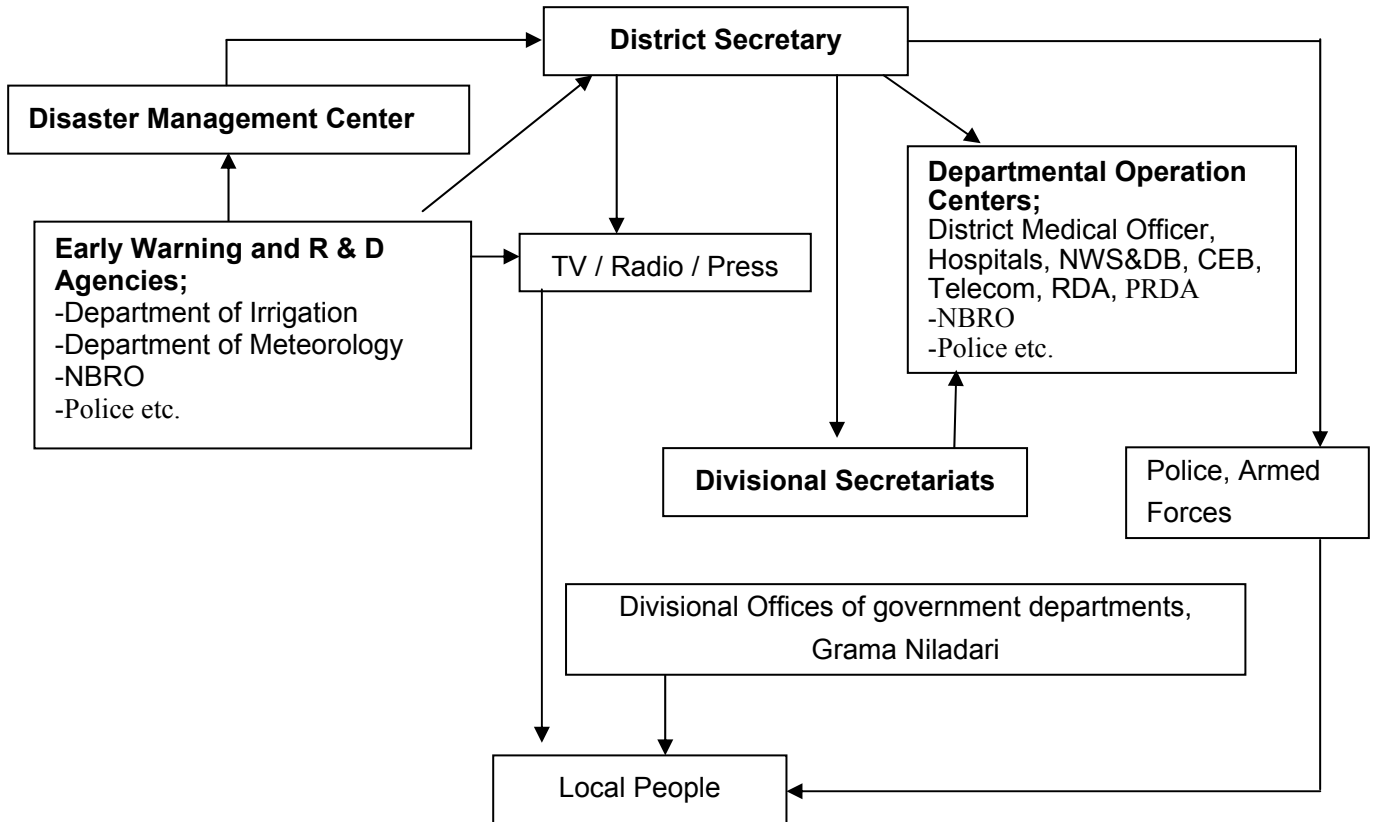


Figure C.2.1 Information Flow of Warning and Evacuation Orders

#### C.2.4 On-going Programs and Projects in the Study Area

Table C.2.3 Organizations and On-going Programs and Projects in the Study Area

Organization	On-going Projects
Irrigation Department , Regional Director's office, Colombo	- Improvements to flood protection infrastructure (e.g. Kelani North Bund under <b>SIRUP</b> project)
Irrigation Department , Regional Director's office, Galle	- Improvements to flood protection infrastructure (e.g. Drainage and flood protection works, river training management, Flood damage repairs)
District Secretariats' Office	(1) District Secretariats' Offices undertake the regular programmes as; - Cleaning and dredging of canals (e.g. Colombo District Secretariats' Office conducts drainage projects such as Kittampahuwa Ela, Passenna Ela, Weras Ganaga, Main canals in Kotikawatta) - Public awareness programs - First aid training programs - Rescue training programs - Preparation of flood hazard maps (2) Coordination to disaster management and mitigation programmes organized by DMC (3) Matara District Secretariats' Office undertakes Nilwala river basin management plan preparation

Organization	On-going Projects
Divisional Secretariats' Office	Committees have been appointed at Grama Niladari level to take necessary measures at disasters - Training programmes for disaster preparedness - Improvements to drainage canals eg. Biyagama office - Natha Ela Development, Cleaning of Gegahawatta Ela Kelaniya office - Cleaning of Supugahawella Ela, Iiri Ela, Kumbal Oya - Identification of unprotected areas for floods, problems and solutions, preparation of hazard maps. (eg. Galle, Tawalama) - Awareness programmes to officers (eg. Thihagoda)

### C.2.5 Budget

Most of the organizations did not provide the annual budget for construction of flood management structures and disaster mitigation activities. However, there is no specific allocation for these activities. According to the data provided by Irrigation Department, District Secretariat Offices and Divisional Secretariat Offices, total annual expenditure is as follows. The budget is allocated from local and central Government.

Expenditure for construction of flood management structures / disaster mitigation activities:

Table C.2.4 Expenditure for Construction of Flood Management Structures/ Disaster Mitigation Activities

Organization	Year	Description	Amount (Rs.)	
Regional Irrigation Office, Colombo	2005	Drainage & flood protection work	16.5	
		flood damage repairs	2.1	
	2006	Drainage & flood protection work	4.3	
Regional Irrigation Office, Galle	2004	Flood damage repairs	5.9	
		Drainage & flood protection work	7.7	
		River training management	0.03	
		Holuwagoda Drainage Scheme	0.15	
		Kiralakele Sub Basin Development	7.6	
		Drainage & Flood Protection Work	7.3	
	2005	Flood damage repairs	2.0	
		Holuwagoda Drainage Scheme	0.04	
		Kiralakele Sub Basin Development	8.5	
District Secretaries' Office - Colombo	2006 - 2007	Flood Management Activities	15.1	
District Secretaries' Office - Matara	2003	Flood Management Structure	0.02	
	2006	Flood Management Structure	0.1	
Divisional Secretaries' Office - Kaduwela	2002	(On-going activities as mentioned in Chapter C.4)	0.01	
	2003		0.08	
	2004		0.2	
	2005		0.7	
	- Kelaniya		2003	0.15
			2004	0.14
			2005	1.8
	- Baddegama		2005	0.05
	- Thawalama		2003	10
	- Nagoda		2003	30

For relief activities, the expenditure is given below:

Table C.2.5 Expenditure for Relief Activities

Organization	District	Year	Description	Amount (Rs.)
District Secretaries' Office	Colombo	2006	Dry rations	2.2
	Gampaha	2006	Foods	8.5
			Dry rations	12.1
			Welfare	0.2
			Cleaning of polluted wells	0.5
	Kalutara	2006	Welfare	11.3
	Ratnapura	2006	Welfare	0.6
Galle	2003	Relief activities	157.2	
Matara	2005	Relief activities	0.4	
	2006	Relief activities	20.1	
Divisional Secretaries' Office	Colombo	2001	Dry rations	7.3
			Relief activities	0.3
	Kaduwella	2002-2005	Relief activities	1.0
	Gampaha	2007	Relief activities	0.02
		2007	Disaster preparedness	0.01
	Kelaniya	2007	Relief activities (allocated)	0.5
			Disaster preparedness (allocated)	0.1
	Biyagama	2006	Relief activities	0.59
	Kalutara	2003	Relief activities	5.1
		2005	Relief activities	1.9
	Horana	2002	Relief activities	0.2
		2003	Relief activities	0.9
		2005	Relief activities	1.8
	Galle	2003	Relief activities	1.6
	BopePoddala	2003	Relief activities	0.1
	Baddegama	2003	Relief activities	3.6
			Disaster preparedness	0.05
			Relief activities	17.9
	Thawalama	2003	Disaster preparedness	1.0
			Relief activities	73.4
	Nagoda	2003	Relief activities	22.1
	Neluwa	2003	Relief activities	11.1
	Matara	2003	Relief activities	1.5
	Thihagoda	2003	Relief activities	8.6
	Akuressa	2006	Relief activities	0.3
		2004	Relief activities	0.3
		2003	Relief activities	10.9
	Pitabeddara	2003	Relief activities	1.5

\* Relief activities means assistance to victims during a disaster such as distribution of dry rations, cooked foods, reconstruction of houses, funeral activities, compensation for flood damages (crops, boats etc.)

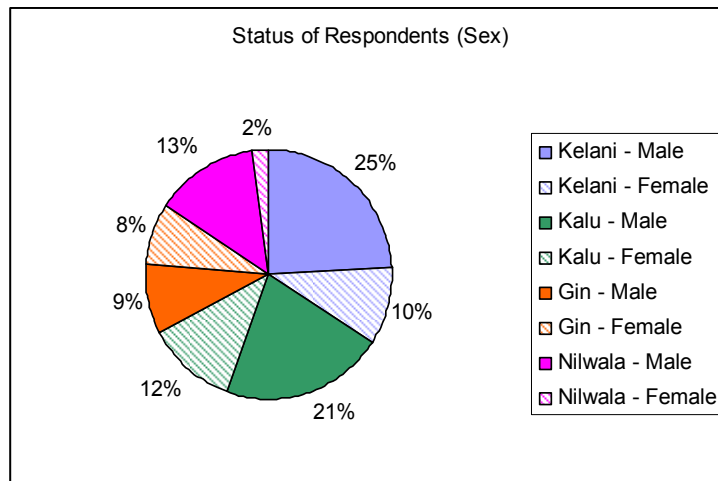
### C.3 Responses from Residences on Flood Damage

#### C.3.1 Introduction

The recent biggest flood occurred in Kelani River basin was in June, 1989. In Kalu, Gin and Nilwala river basins, the flood in 2003 May was heavy and caused substantial damage to human life and their property. The survey on flood disaster and damage was carried out especially focusing these floods at selected villages in the said four river basins which are easily vulnerable to floods. The total number of residents interviewed was 517 in which 177 in Kelani, 171 in Kalu, 89 in Gin and 80 in Nilwala River basins. The target villages and number of residents interviewed are given in Table C.3.1. The households were randomly selected. The details of respondents are summarized below:

Table C.3.1 Details of Respondents and Their Age

River	Sex		Age (Years)			Total
	Male	Female	20 - 40	40 - 60	> 60	
Kelani	125 (71%)	52 (29%)	35 (20%)	83 (47%)	59 (33%)	177 (100%)
Kalu	110 (64%)	61 (36%)	48 (28%)	90 (53%)	33 (19%)	171 (100%)
Gin	47 (53%)	42 (47%)	27 (30%)	50 (56%)	12 (14%)	89 (100%)
Nilwala	69 (86%)	11 (14%)	18 (23%)	44 (55%)	18 (22%)	80 (100%)
Total	351 (68%)	166 (32%)	128 (25%)	267 (52%)	122 (23%)	517 (100%)



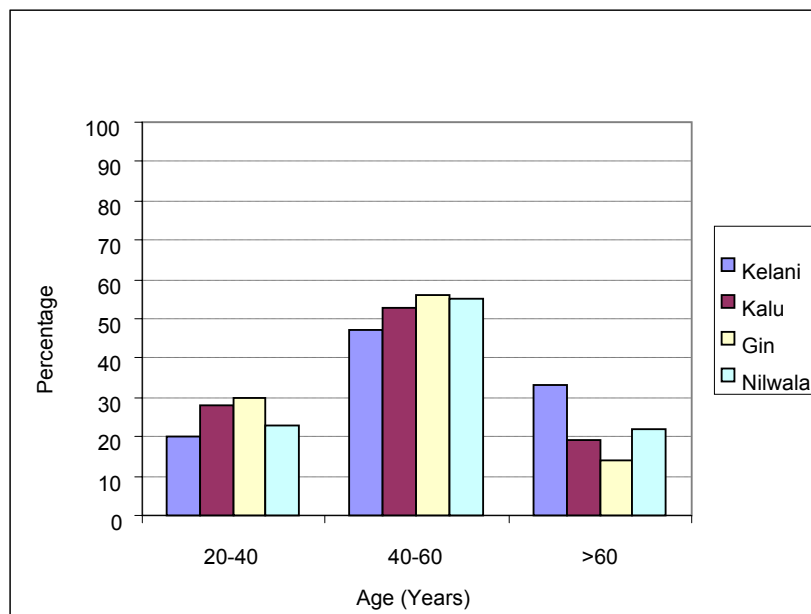


Figure C.3.1 Average Number of Dependents

The average number of dependents for each household in surveyed families of Kelani, Kalu, Gin and Nilwala is 5.14, 4.84, 4.67 and 5.31 respectively.

Major income sources and number of the families are given below. For income sources, majority of the households indicate more than one main income source.

Table C.3.2 Major Income Sources and Number of Families

River	Selling Agricultural Products	Salary & Wage	Remittance from family members	Private Business	Others	Total families
Kelani	14 (08%)	88 (50%)	38 (21%)	116 (65%)	5 (3%)	177 (100%)
Kalu	21 (12%)	102 (60%)	3 (02%)	61 (53%)	25 (36%)	171 (100%)
Gin	62 (70%)	53 (60%)	3 (03%)	17 (19%)	1 (01%)	89 (100%)
Nilwala	13 (16%)	46 (58%)	18 (23%)	46 (58%)	2 (3%)	80 (100%)
Total	110 (21%)	289 (59%)	62 (12%)	240 (46%)	33 (6%)	517 (100%)

\*multiple answers possible

Others mean income from Government welfare, pensions of retired persons.

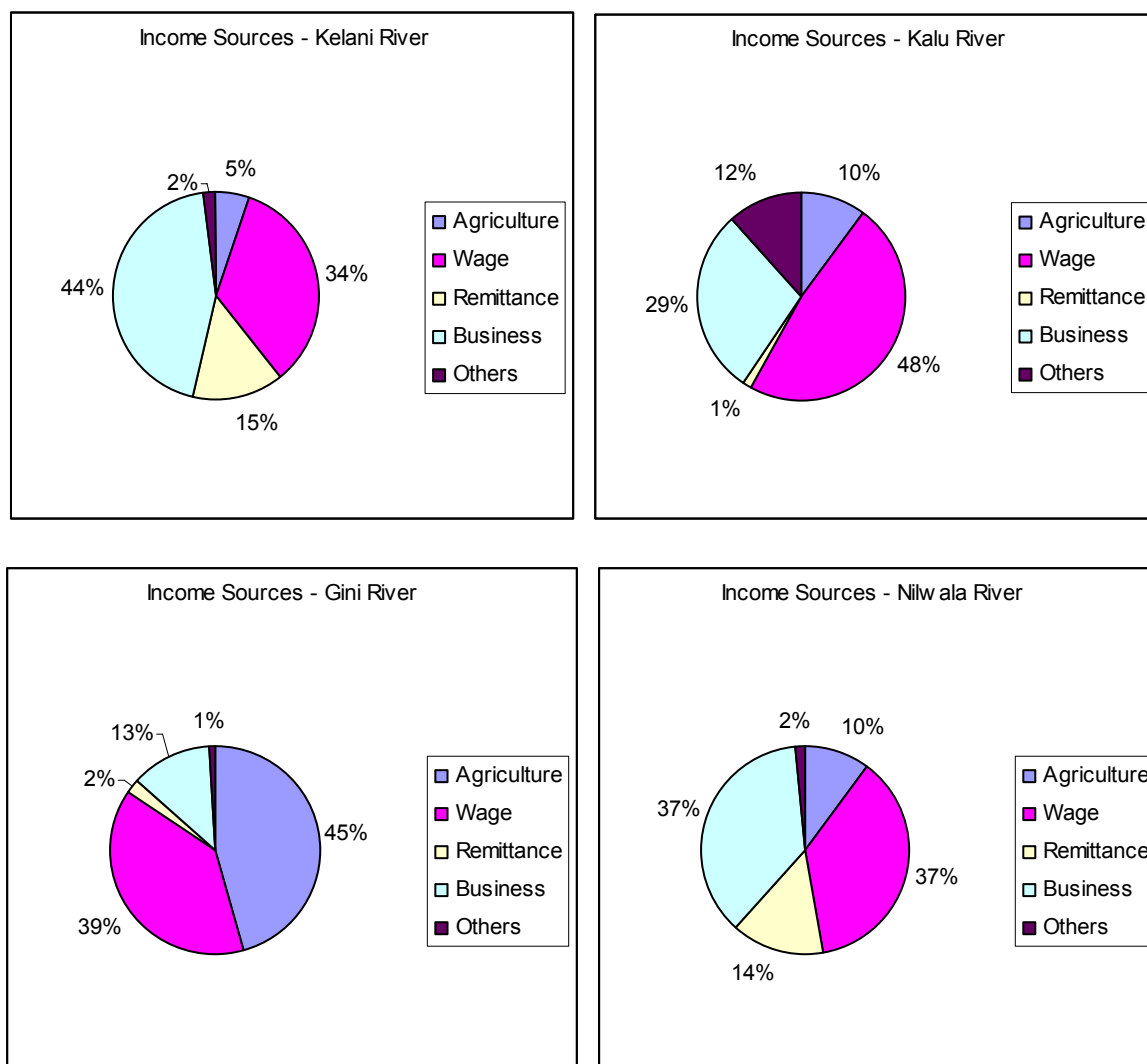


Figure C.3.2 Income Sources

Total annual income of residents and its percentage are given below. During the survey, their annual income was recorded. After analyzing the income levels, it was divided into five categories as given in the Table below, to have a standard distribution.

Table C.3.3 Annual Income

Unit: Rs.

River	<50,000	50,000 – 100,000	100,000 – 200,000	200,000 – 400,000	> 400,000	Total families
Kelani	10 (6%)	66 (37%)	75 (42%)	23 (13%)	3 (2%)	177 (100%)
Kalu	2 (01%)	24 (14%)	105 (61%)	33 (19%)	7 (4%)	171 (100%)
Gin	5 (06%)	19 (21%)	28 (31%)	27 (30%)	10 (11%)	89 (100%)
Nilwala	3 (4%)	22 (28%)	26 (33%)	25 (31%)	04 (05%)	80 (100%)
Total	20 (4%)	131 (25%)	234 (46%)	108 (21%)	21 (4%)	517 (100%)

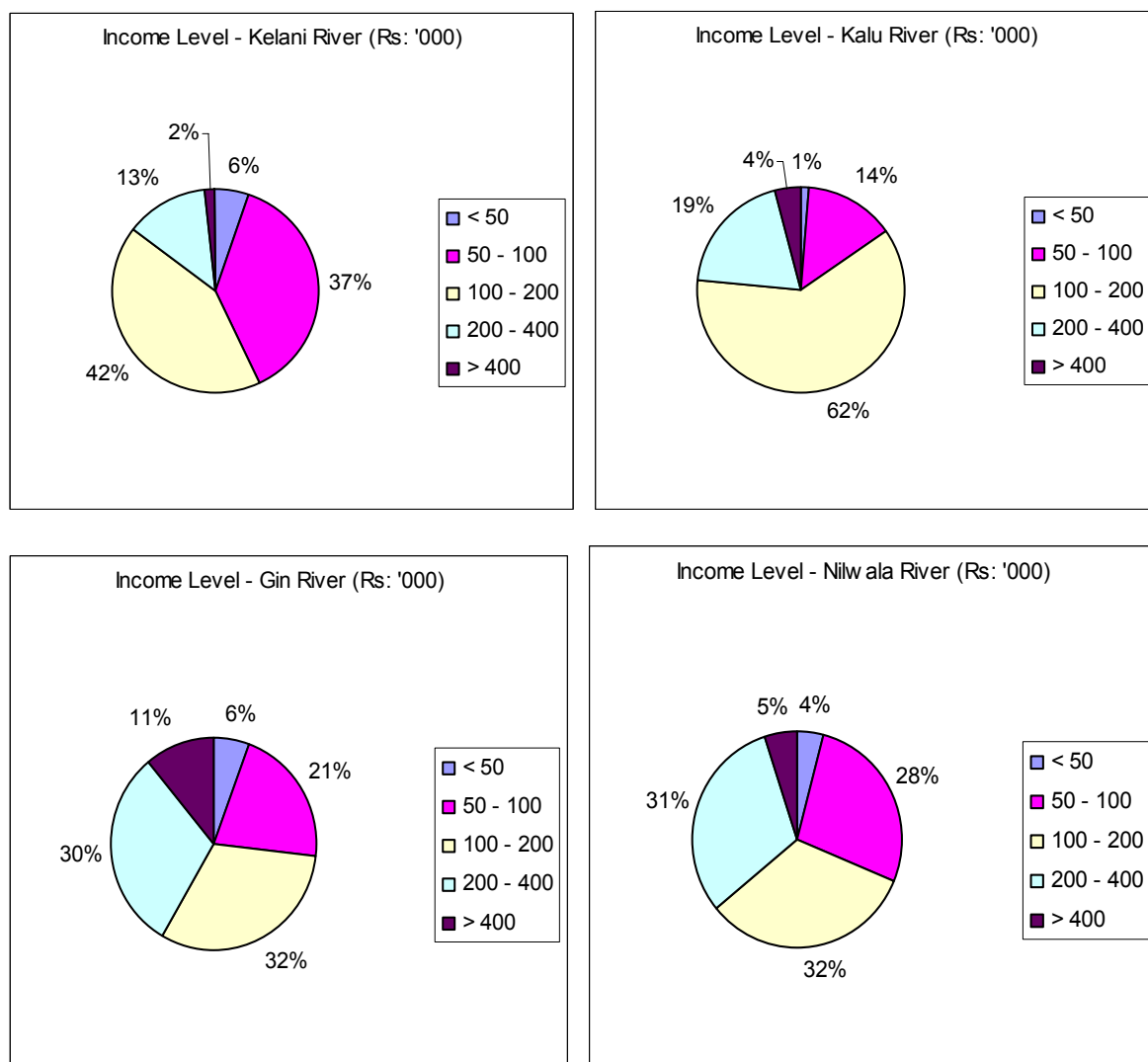


Figure C.3.3 Income Level

The interview was conducted basically within the flooding area. In order to ascertain whether flood was affected on rural/urban as well as lowland/elevated etc., location of each house was sketched. The locations of houses are listed below:

Table C.3.4 Location of Houses by Land Use Category

River	Riverside	Near main road	Town center	Farm land area	Elevated area	Low land area	Total families
Kelani	147 (83%)	132 (74%)	22 (12%)	15 (08%)	18 (10%)	96 (54%)	177 (100%)
Kalu	156 (91%)	148 (86%)	5 (3%)	2 (1%)	12 (7%)	148 (86%)	171 (100%)
Gin	64 (8%)	46 (5%)	4 (4%)	71 (80%)	7 (8%)	76 (85%)	89 (100%)
Nilwala	42 (53%)	35 (44%)	11 (14%)	24 (30%)	1 (1%)	31 (39%)	80 (100%)
Total	409 (79%)	361 (70%)	42 (8%)	117 (23%)	38 (7%)	351 (68%)	517 (100%)

\*multiple answers possible

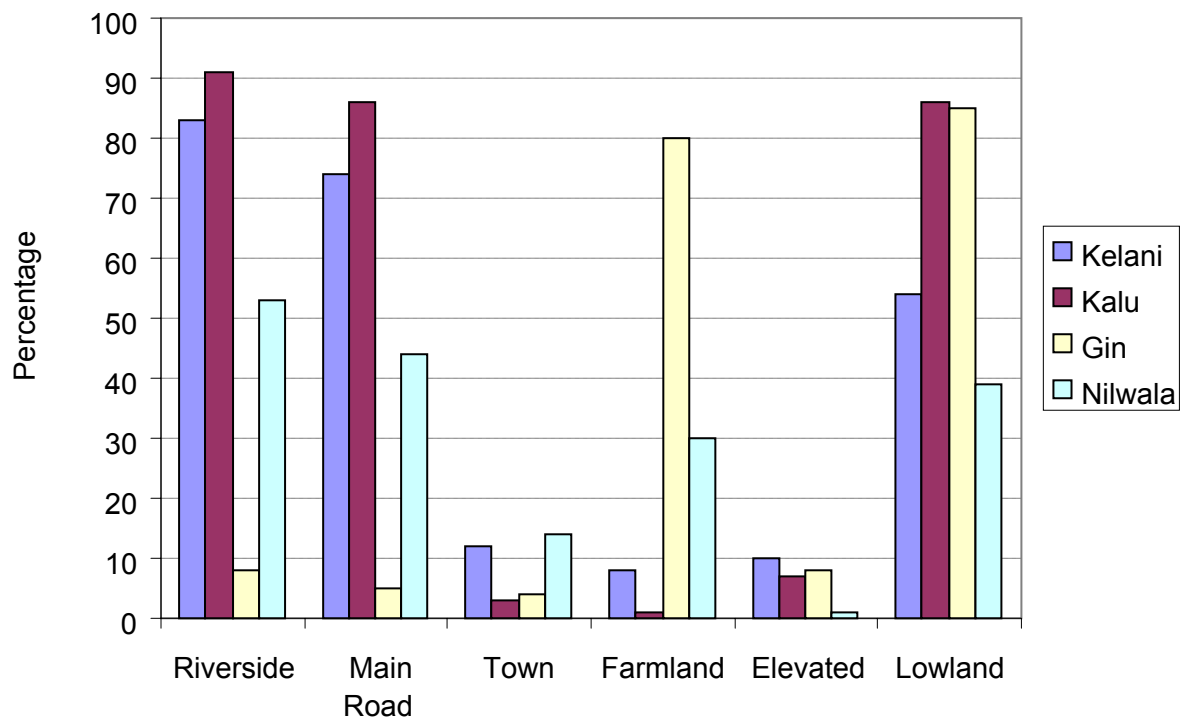


Figure C.3.4 Location of Houses Interviewed

The respondents' period of stay in the same location is given below:

Table C.3.5 Period of Stay at Current Location

River	< 5 Yr	5Yr <T<10Yr	10 Yr<T<20Yr	> 20Yr	Total families
Kelani	1 (1%)	0 (0%)	24 (14%)	152 (85%)	177 (100%)
Kalu	7 (4%)	0 (0%)	24 (13%)	132 (77%)	171 (100%)
Gin	14 (16%)	10 (11%)	20 (22%)	45 (51%)	89 (100%)
Nilwala	5 (6%)	20 (25%)	10 (13%)	45 (56%)	80 (100%)
Total	27 (5%)	38 (7%)	78 (15%)	374 (73%)	517 (100%)



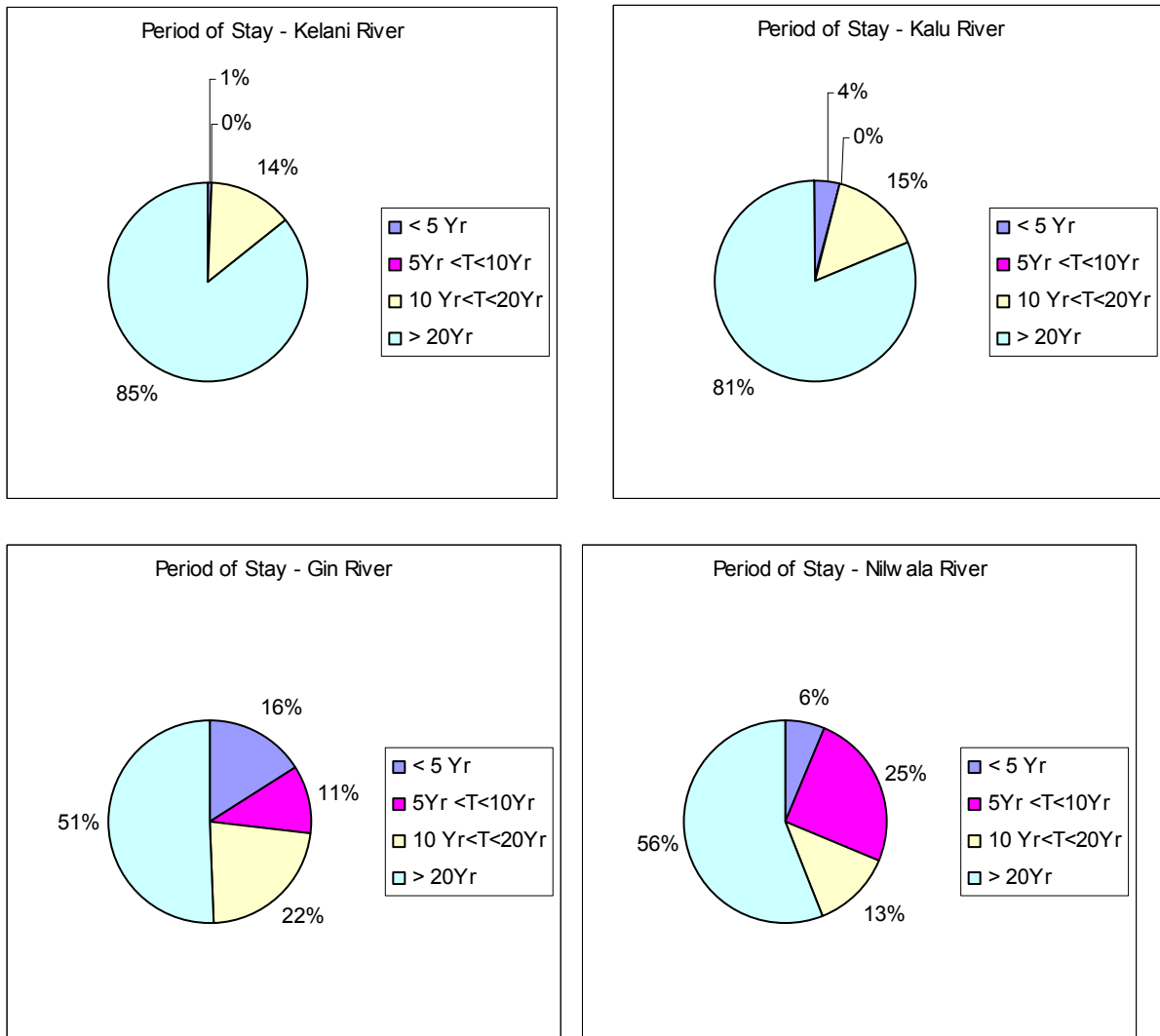


Figure C.3.5 Period of Stay at Current Location

### C.3.2 Inundation Condition

In order to understand the inundation condition, distance to the house from the river or river tributary was recorded and summarized as follows:

Table C.3.6 Distance to House from River or Tributaries

River	< 50m	50m<L<100m	100m<L<200m	200m<L<500m	> 500m	Total families
Kelani	57 (32%)	30 (17%)	19 (11%)	34 (18%)	37 (21%)	177 (100%)
Kalu	55 (32%)	43 (25%)	25 (15%)	25 (15%)	23 (13%)	171 (100%)
Gin	45 (50%)	10 (11%)	7 (8%)	7 (8%)	20 (22%)	89 (100%)
Nilwala	26 (32%)	11 (14%)	11 (14%)	14 (18%)	18 (22%)	80 (100%)
Total	183 (35%)	94 (18%)	62 (12%)	80 (16%)	98 (19%)	517 (100%)

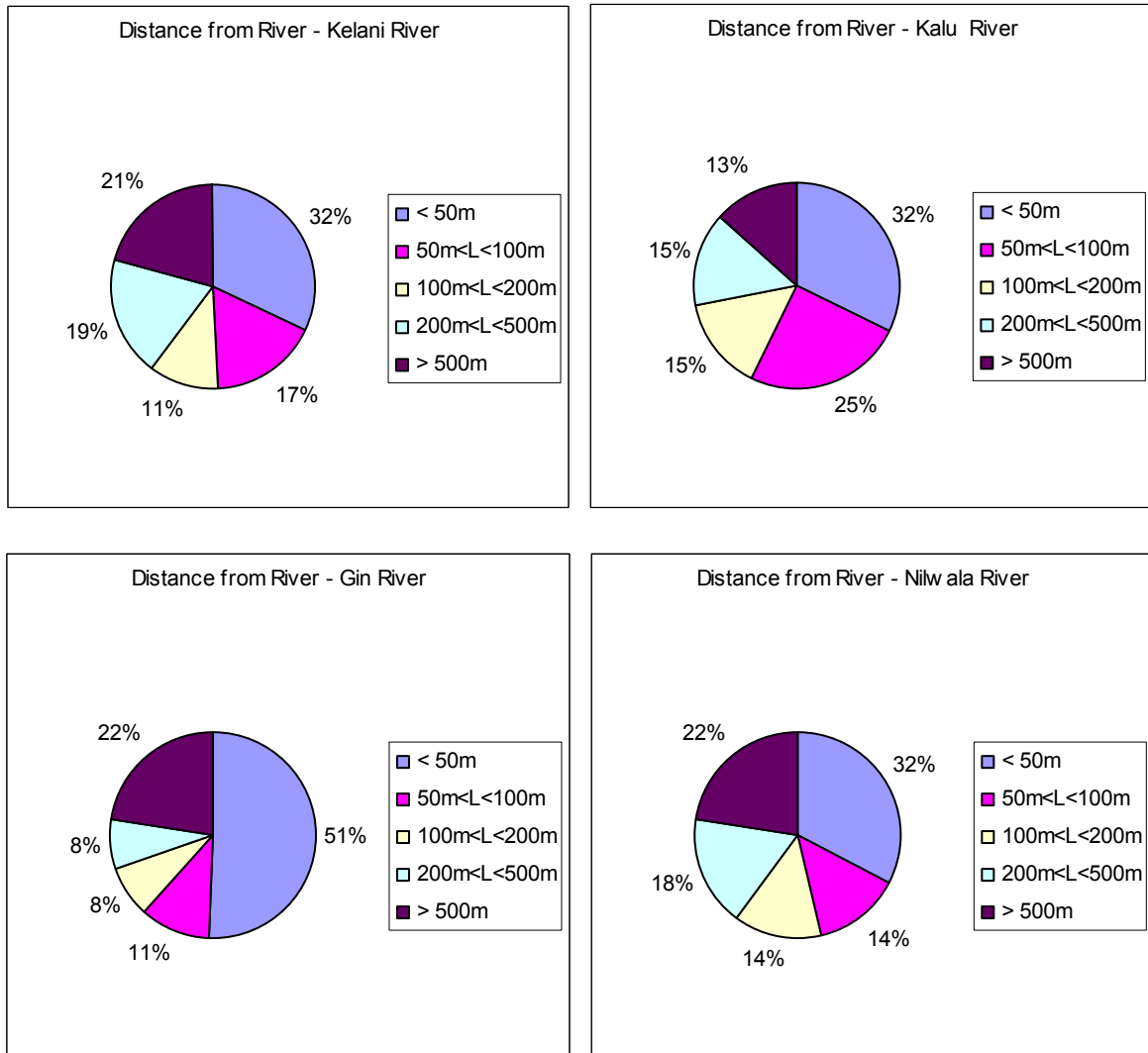


Figure C.3.6 Distance to House from River or Tributaries

The types of houses are as follows:

Table C.3.7 Types of Houses

River	Clay	Brick / Concrete	Wooden	Reinforced concrete	Total families
Kelani	- (0%)	163 (92%)	12 (7%)	2 (1%)	177 (100%)
Kalu	- (0%)	151 (88%)	- (0%)	20 (12%)	171 (100%)
Gin	15 (17%)	71 (80%)	3 (3%)	- (0%)	89 (100%)
Nilwala	1 (1%)	74 (93%)	5 (6%)	- (0%)	80 (100%)
Total	16 (3%)	459 (89%)	20 (4%)	22 (4%)	517 (100%)

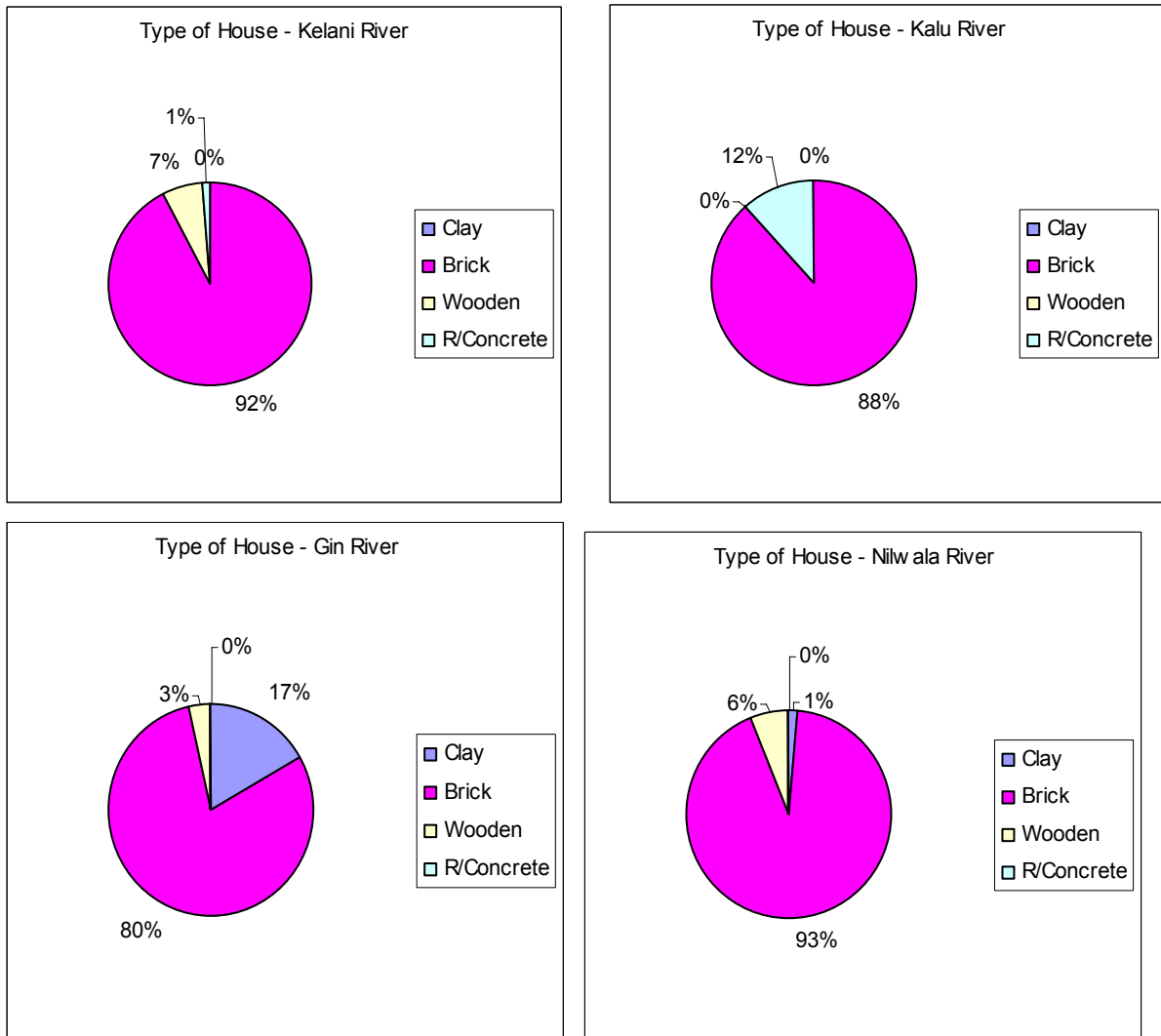


Figure C.3.7 Type of House

According to the survey, number of families vs inundation depth for Kelani (1989 flood), Kalu (2003 flood), Gin (2003 flood) and Nilwala (2003 flood) are as follows:

Table C.3.8 Number of Families by Inundation Depth

River	< 1m	1m<H<3m	3m<H<5m	5m<H<10m	> 10m	No answer	Total families
Kelani	42 (24%)	109 (62%)	18 (10%)	1 (1%)	1 (1%)	6 (2%)	177 (100%)
Kalu	51 (30%)	85 (50%)	20 (12%)	6 (4%)	1 (1%)	8 (4%)	171 (100%)
Gin	16 (18%)	37 (42%)	21 (24%)	12 (13%)	1 (1%)	2 (2%)	89 (100%)
Nilwala	11 (14%)	53 (66%)	13 (16%)	2 (3%)	1 (1%)	0 (0%)	80 (100%)
Total	120 (23%)	284 (55%)	72 (14%)	21 (4%)	4 (1%)	16 (3%)	517 (100%)

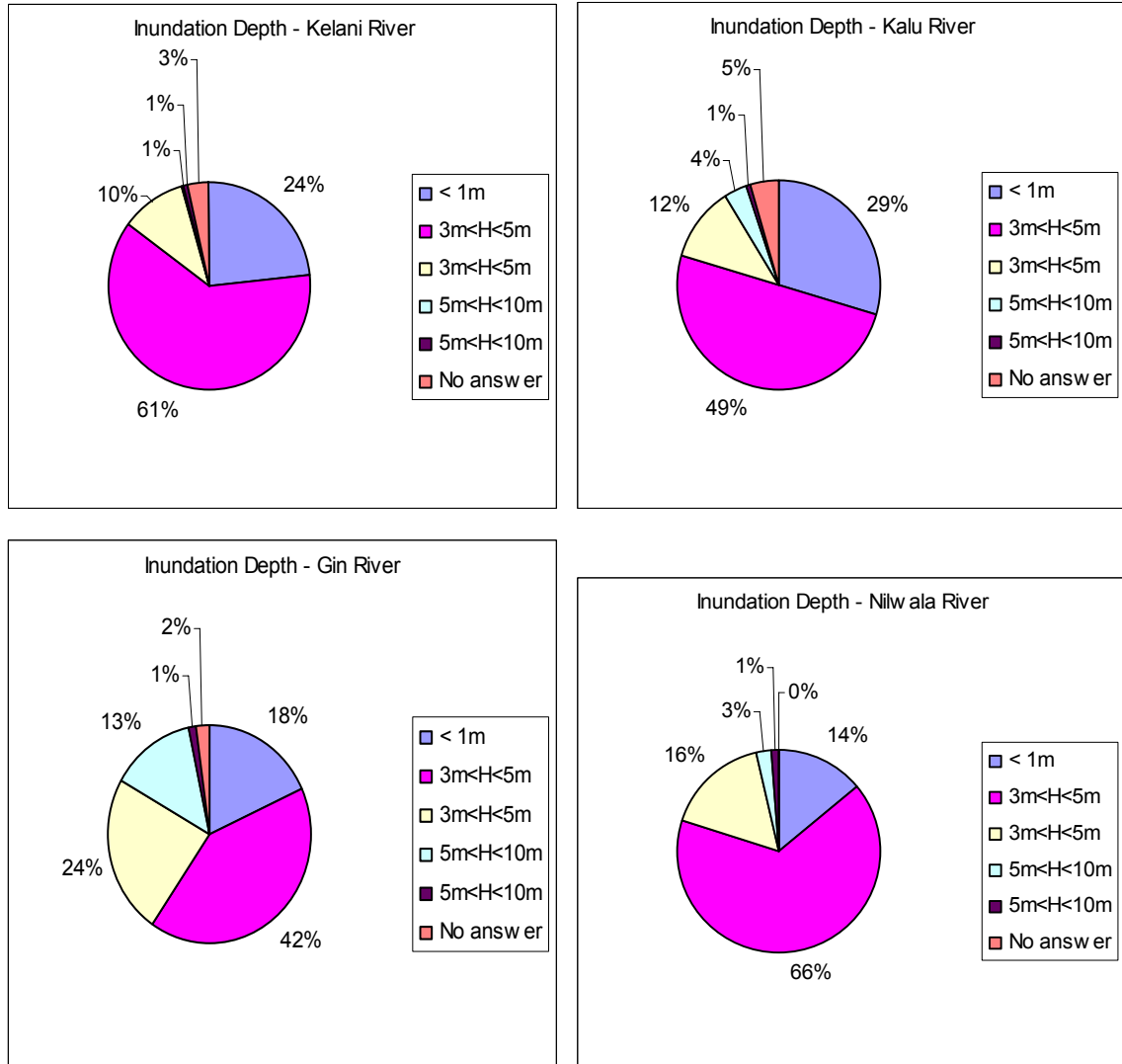


Figure C.3.8 Inundation Depth

Residents' response on inundation period for Kelani (1989 flood), Kalu (2003 flood), Gin (2003 flood) and Nilwala (2003 flood) are as follows:

Table C.3.9 Inundation Period

River	< 1day	1day<T<3days	3days<T<5days	5days<T<10day	> 10days	No answer	Total families
Kelani	6 (3%)	100 (57%)	31 (18%)	36 (20%)	2 (1%)	2 (1%)	177 (100%)
Kalu	2 (1%)	57 (34%)	80 (47%)	32 (18%)	0 (0%)	0 (0%)	171 (100%)
Gin	4 (4%)	43 (48%)	11 (12%)	22 (25%)	9 (10%)	0 (0%)	89 (100%)
Nilwala	23 (29%)	24 (30%)	15 (19%)	12 (15%)	6 (7%)	0 (0%)	80 (100%)
Total	35 (7%)	224 (43%)	137 (26%)	102 (20%)	17 (3%)	2 (1%)	517 (100%)

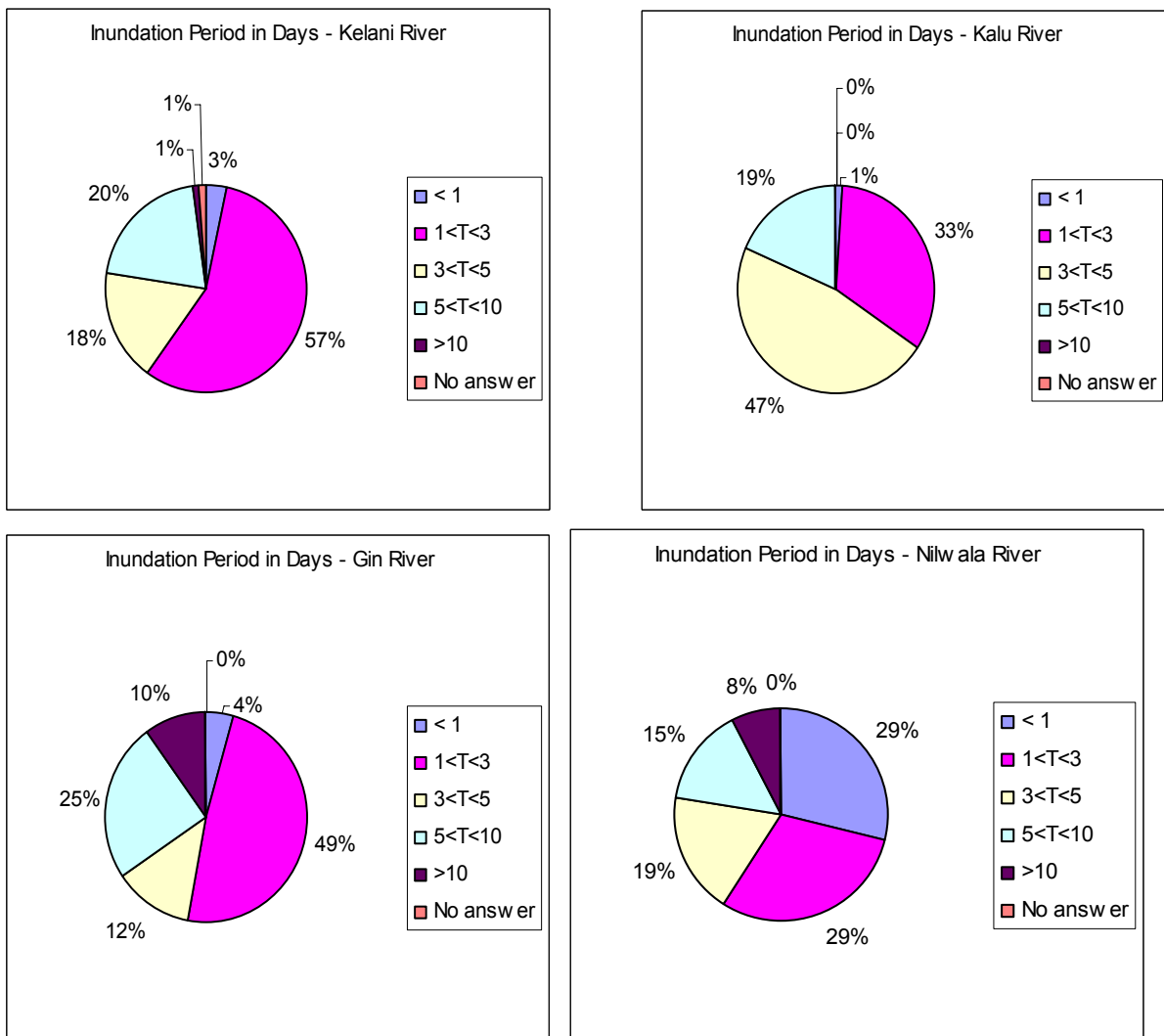


Figure C.3.9 Inundation Period

Duration of inundation depends on location (upstream, downstream, ground elevation etc.). Following Table generally shows the short duration (less than 5 days) and long duration (more than 5 days) even though within the same village, it varies from place to place.

Interviewees' responses on duration of inundation are given below:

Table C.3.10 Interviewees' Response on Duration of Inundation

River	Short	Long	Remarks
Kelani	Glencourse, Avissawella, Malwana	Kaduwela, Ambatale, Mulleriyawa, Wellampitiya	- It is quite difficult to simply identify the name of the villages where duration of inundation is high or low as it generally depends on local ground elevation too.
Kalu	-	Dodampe, Ratnapura, Anguruwatota, Tebuwana	
Gin	Udugama, Panangala, Hiniduma, Tawalama, Neluwa	Gintota, Telikada, Baddegama, Agaliya, Majuana	
Nilwala	Dankoluwa, Hulandawa, Pitabeddara, Bopagoda	Kadduwa, Bandattara, Tudawa, Tellijawila	

Residents' response on flood velocity is shown below:

Table C.3.11 Flood Velocity

River	Very Slow	Slow	Fast	Very Fast	Total families
Kelani	11 (6%)	93 (53%)	57 (32%)	16 (9%)	177 (100%)
Kalu	1 (0.5%)	10 (6%)	112 (65%)	48 (28%)	171 (100%)
Gin	14 (16%)	31 (35%)	29 (33%)	15 (17%)	89 (100%)
Nilwala	1 (1%)	18 (23%)	21 (26%)	40 (50%)	80 (100%)
Total	27 (5.2%)	152 (29.4%)	219 (42.4%)	119 (23%)	517 (100%)

Note: Very Slow: 0-25 cm/s; Slow: 25-50 cm/s; Fast: 50-150 cm/s; Fast: >150 cm/s

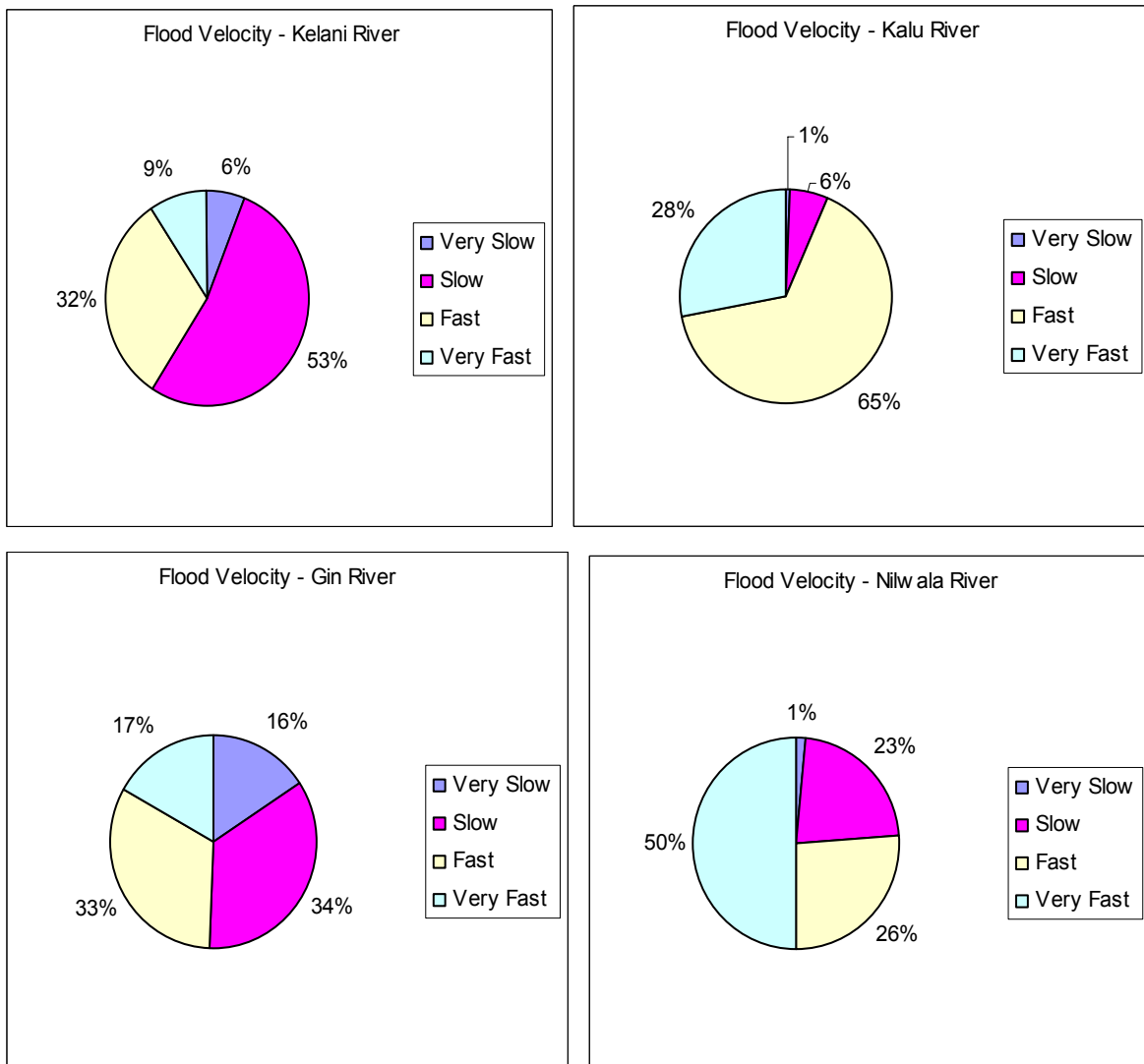


Figure C.3.10 Flood Velocity

According to the survey results, in general, flood velocity is high in close proximity of rivers while it is low in high elevated areas even within the same village. The villages located in flood basins & away from rivers

and highly congested areas (Kelani River), velocity is rather low. Many factors such as location (upstream, downstream), elevation (high, low), distance to river (close, far), passage of flood flow (narrow, wide) influence on velocity.

Interviewees' responses on flood velocity are given below:

Table C.3.12 Flood Velocity

River	Slow	Fast	Remarks
Kelani	Kaduwela, Ambatale, Mulleriya, Wellampitiya, Brandiyawatta	Hanwella, Kosgama, Avissawella, Malwana, Glencourse, Mapitigama	- Velocity in upstream area is rather high subjected to its location
Kalu	Kalutara	Kiriella, Dodampe, Kahangama, Ratnapura, Malwala, Radella	- Velocity is low in downstream flood basins except close to rivers.
Gin	Gintota, Majuana, Nagoda, Udugama	Baddegama, Agaliya, Panangala, Hiniduma, Tawalama, Neluwa	- It is quite difficult to simply identify the name the villages where flood velocity is high or low as it generally depends on many factors
Nilwala	-	Akuressa, Kadduwa, Dankoluwa	

### C.3.3 Inundation Damages

The number of houses totally destroyed / partially destroyed among the respondents is given below:

Table C.3.13 House Damage

River	House totally destroyed (%) of sample	House partially destroyed (%) of sample	Totally safe (%) of sample	Total families
Kelani	27 (15%)	74 (42%)	76 (43%)	177 (100%)
Kalu	23 (13%)	68 (40%)	80 (47%)	171 (100%)
Gin	9 (10%)	72 (35%)	8 (9%)	89 (100%)
Nilwala	14 (17%)	51 (64%)	15 (18%)	80 (100%)

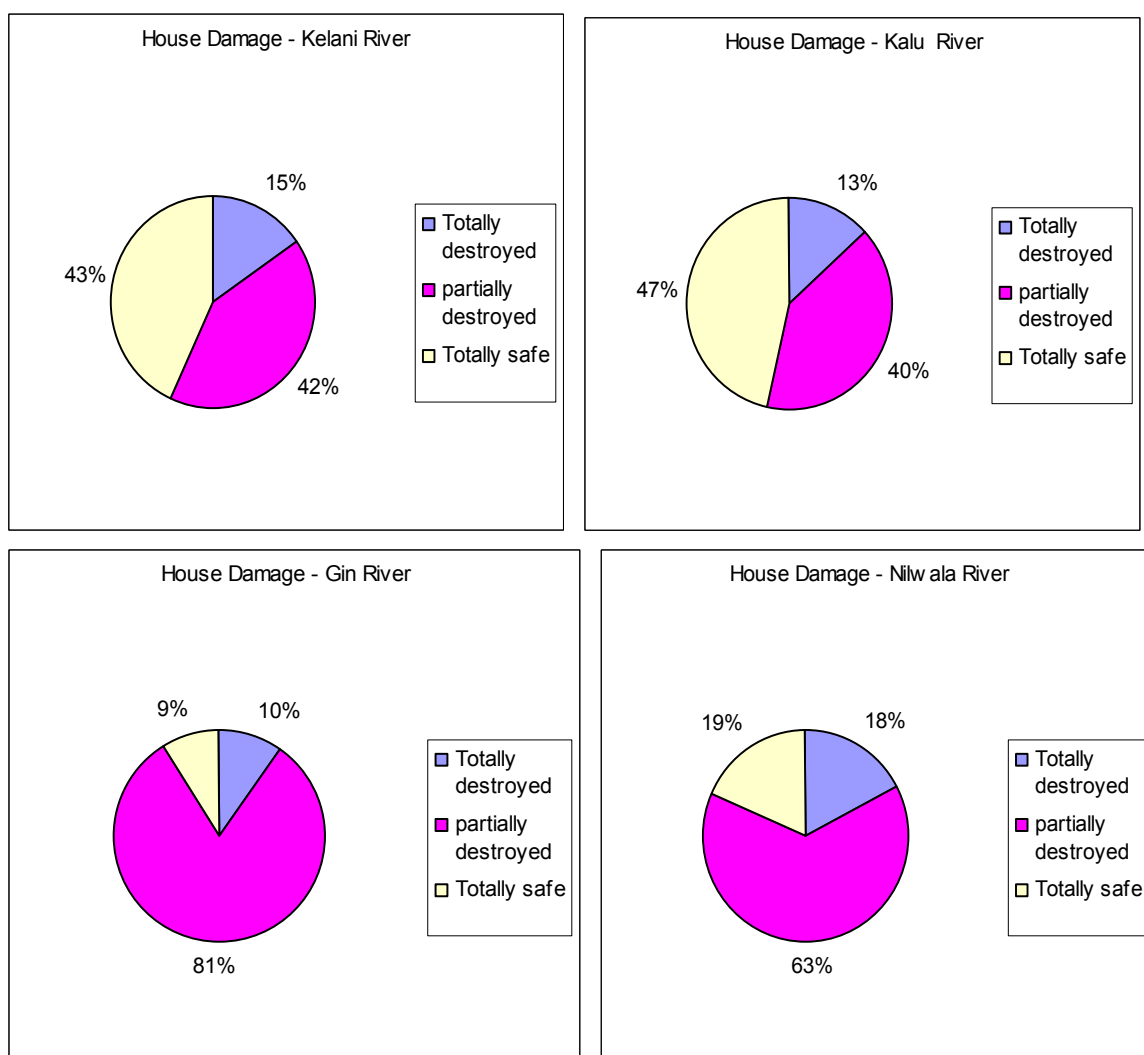


Figure C.3.11 House Damage

Maximum water level above floor level is given below:

Table C.3.14 Minimum Water Level above Floor Level

River	< 1m	1m<H<3m	3m<H<5m	5m<H<10m	> 10m	No inundation	Total families
Kelani	34 (19%)	86 (49%)	6 (03%)	1 (0.5%)	1 (0.5%)	49 (28%)	177 (100%)
Kalu	52 (30%)	86 (50%)	19 (11%)	6 (4%)	1 (1%)	7 (4%)	171 (100%)
Gin	16 (18%)	34 (38%)	14 (16%)	13 (15%)	1 (1%)	11 (12%)	89 (100%)
Nilwala	25 (31%)	40 (50%)	12 (15%)	2 (3%)	1 (1%)	0 (0%)	80 (100%)
Total	127 (24.5%)	246 (47.5%)	51 (9.9%)	22 (43%)	4 (0.8%)	67 (13%)	517 (100%)

The movable assets, crops and livestock damage is given below:



Table C.3.15 Movable Assets, Crops and Livestock Damaged

River	Movable assets	Crops totally lost	Crops partially lost	Livestock totally lost	Livestock partially lost
Kelani	40 (23%)	36 (20%)	13 (7%)	9 (5%)	2 (1%)
Kalu	141 (82%)	14 (8%)	18 (10%)	0 (0%)	0 (0%)
Gin	70 (79%)	51 (57%)	7 (8%)	2 (2%)	0 (0%)
Nilwala	70 (87%)	31 (39%)	1 (1%)	4 (2%)	1 (1%)
Total	321 (62%)	132 (25%)	39 (8%)	15 (3%)	3 (1%)

*\*multiple answers possible*

Number of residents whom their family members died or injured is given below:

Table C.3.16 Number of Residents Whose Family Member died or got injured

River	Family members died	Family members injured
Kelani	0	0
Kalu	1	0
Gin	0	2
Nilwala	1	2

## C.4 Flood Disaster Experiences and Lessons

### C.4.1 Lessons Learnt

Most of the people responded as follows. These comments were given by most of the residents in all four river basins, especially those who had experience in 1989 and 2003 flood, irrespective of the area of inundation.

- Quick response to flood message
- Expect large floods and ready to face
- To pay more attention to disasters
- To be aware of sudden floods that may occur
- Alert about the river water level
- Listen to daily news broadcast on Radio, T.V.
- Prepare barges to move
- Help each other to evacuate and transport goods etc.
- Establish disaster management committees at village level
- Necessity of clearing blocked drainage and waterways due to dumping of garbage
- Prevent illegal land filling in water retention areas

Some people responded in addition to above factors, to

- Shift from unprotected areas to safe places

- Build two storied houses

A few people responded as,

- Flood is an ordinary event
- Not effective even talking with neighbours

#### **C.4.2 Flood Management Structures / Function**

In most of downstream reaches of rivers, to prevent flooding in lowland areas, generally, flood management structures such as bridges, bunds, flood regulating gates, causeways, anicuts and culverts exist. Though some of them are functioning well, others, due to lack of proper and regular maintenance, are not working properly.

The Operation and Maintenance of river structures are under the preview of Irrigation Department and some minor structures as drainage canals and culverts are maintained by Urban Development Authority, Local Authorities, Road Development Authority etc.

#### **C.4.3 Necessities for Disaster Mitigation**

The residents living in flood prone areas expect certain services from central / local government for disaster mitigation. During the interview survey, the response given by the residents to the following question is tabulated with priority order.

Question: What do you expect from Central/Local Government for disaster mitigation?

- Construction / reinforcement of flood management structures
- Early warning
- Proper instruction for disaster preparedness
- Mobilization of the staff in charge of disaster mitigation
- Supporting services for evacuation
- Others

Interviewees' express their concern as "Others" on following items.

- proper place to evacuate
- special program to evacuation
- aid for two storied buildings
- lands from safe area with good neighborhoods and good for cultivation
- clear the river mouth
- minimize illegal filling
- stop sand mining
- training for a preparation of flood and disaster management
- Interviewees' of Agaliya in Gin River focus their attention to filling of low lands by disposed materials of on-going Southern Highway Transport Project.

Table C.4.1 Priority of Requirement among Respondents

River	Item	Priority Order					
		1	2	3	4	5	6
Kelani	a	59 (33%)	12 (7%)	9 (5%)	10 (6%)	1 (1%)	- (0%)
	b	101 (57%)	58 (33%)	1 (1%)	1 (1%)	0 (0%)	- (0%)
	c	4 (2%)	66 (37%)	58 (33%)	8 (5%)	2 (1%)	- (0%)
	d	0 (0%)	1 (1%)	23 (13%)	10 (6%)	2 (1%)	- (0%)
	e	1 (1%)	17 (10%)	27 (15%)	38 (21%)	5 (3%)	1 (1%)
	f	3 (2%)	9 (5%)	30 (17%)	24 (14%)	17 (10%)	1 (1%)
Kalu	a	12 (7%)	11 (6%)	43 (25%)	3 (2%)	3 (2%)	- (0%)
	b	149 (87%)	12 (7%)	3 (2%)	2 (1%)	- (0%)	- (0%)
	c	1 (5%)	135 (79%)	19 (11%)	5 (3%)	1 (1%)	- (0%)
	d	1 (1%)	1 (1%)	1 (1%)	3 (2%)	4 (2%)	- (0%)
	e	2 (1%)	4 (2%)	12 (7%)	3 (2%)	- (0%)	- (0%)
	f	6 (4%)	7 (4%)	42 (25%)	7 (4%)	1 (1%)	- (0%)
Gin	a	13 (15%)	6 (7%)	0 (0%)	7 (8%)	10 (11%)	- (0%)
	b	30 (34%)	38 (43%)	16 (18%)	2 (2%)	0 (0%)	- (0%)
	c	4 (4%)	19 (21%)	51 (57%)	11 (12%)	1 (1%)	- (0%)
	d	0 (0%)	0 (0%)	0 (0%)	0 (0%)	7 (8%)	- (0%)
	e	5 (6%)	14 (16%)	16 (18%)	38 (43%)	- (0%)	- (0%)
	f	36 (40%)	11 (12%)	3 (3%)	9 (10%)	- (0%)	- (0%)
Nilwala	a	13 (16%)	7 (9%)	4 (5%)	2 (3%)	- (0%)	- (0%)
	b	30 (38%)	37 (46%)	11 (14%)	1 (1%)	- (0%)	- (0%)
	c	- (0%)	6 (8%)	16 (20%)	16 (20%)	7 (9%)	- (0%)
	d	- (0%)	- (0%)	- (0%)	5 (6%)	- (0%)	1 (1%)
	e	- (0%)	9 (11%)	33 (41%)	11 (14%)	6 (7%)	- (0%)
	f	37 (46%)	18 (22%)	4 (5%)	2 (3%)	- (0%)	- (0%)

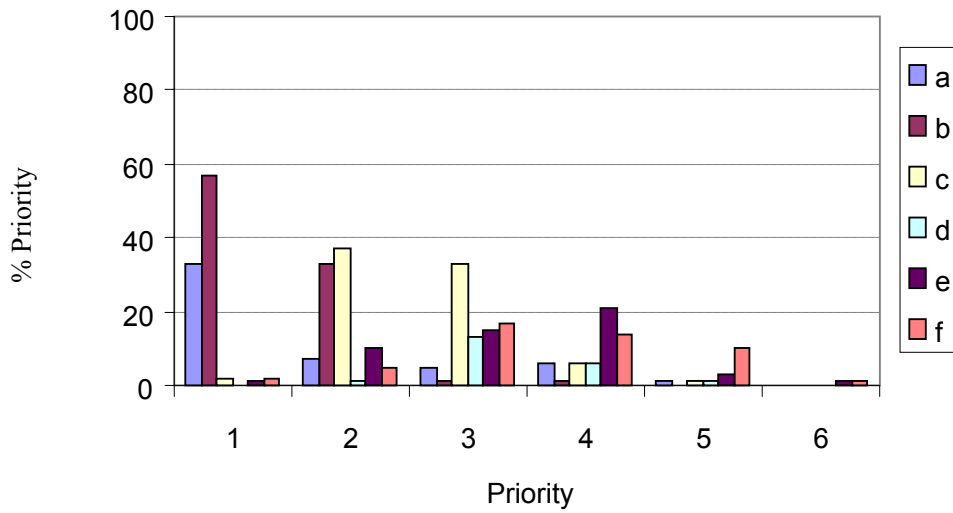


Figure C.4.1 Priority Order for Disaster Mitigation –Kelani River

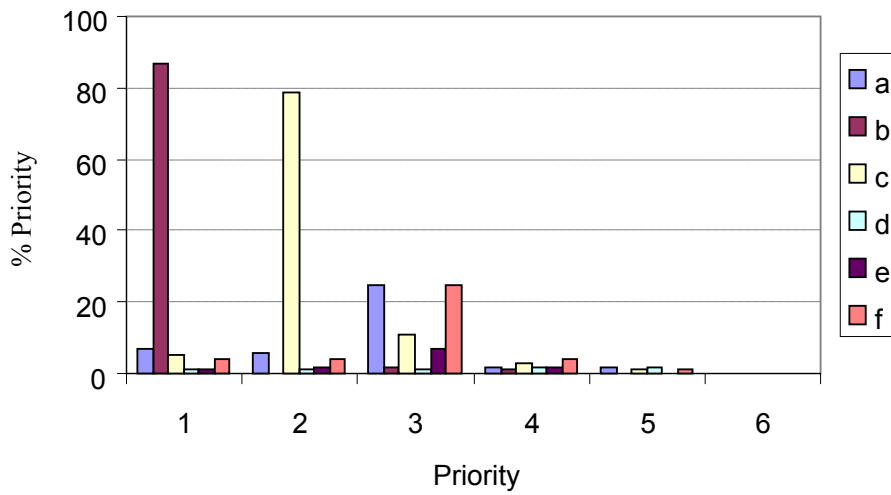


Figure C.4.2 Priority Order for Disaster Mitigation –Kalu River

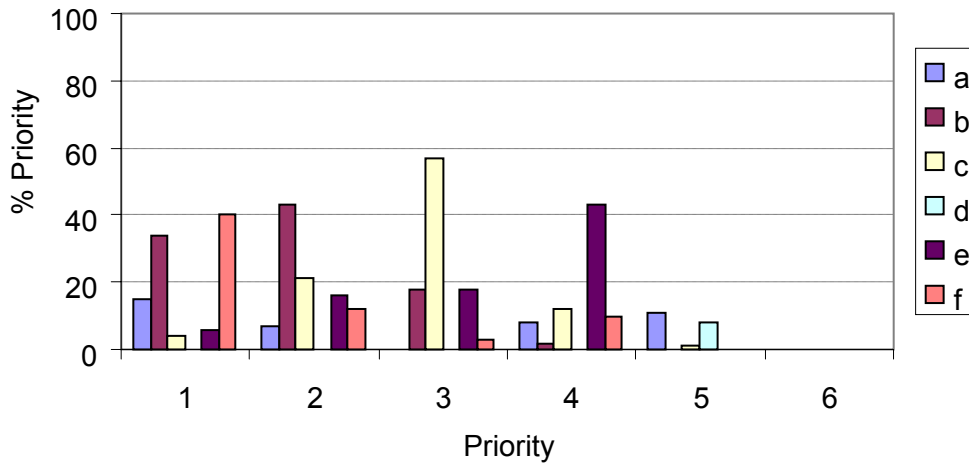


Figure C.4.3 Priority Order for Disaster Mitigation – Gin River

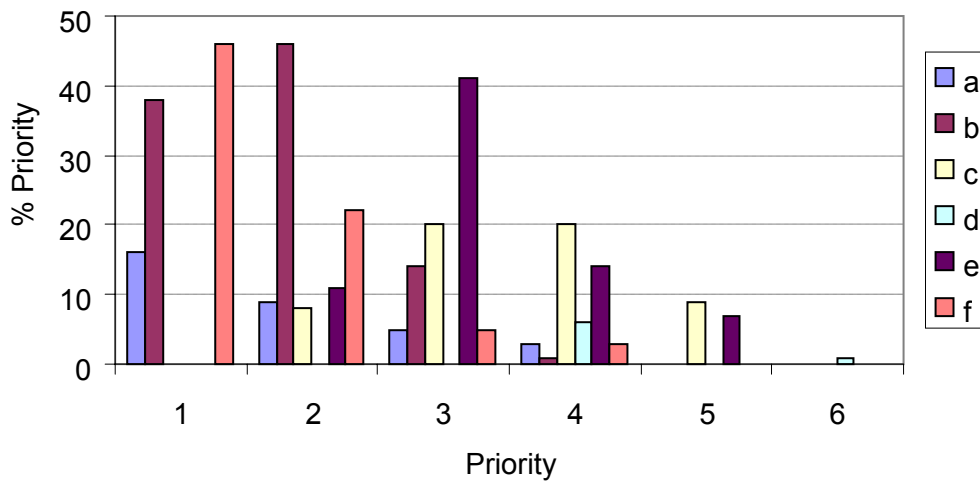


Figure C.4.4 Priority Order for Disaster Mitigation-Nilwala River

## C.5 Evacuation and Early Warning

### C.5.1 Current Status of Evacuation Activities

Residents' response for evacuation from flood is summarized below:

Table C.5.1 Experiences of Evacuation

River	Have you evacuated from floods?		
	Yes	No	Total families
Kelani	134 (76%)	43 (24%)	177 (100%)
Kalu	154 (90%)	17 (10%)	171 (100%)
Gin	81 (91%)	8 (9%)	89 (100%)
Nilwala	77 (96%)	03 (4%)	80 (100%)

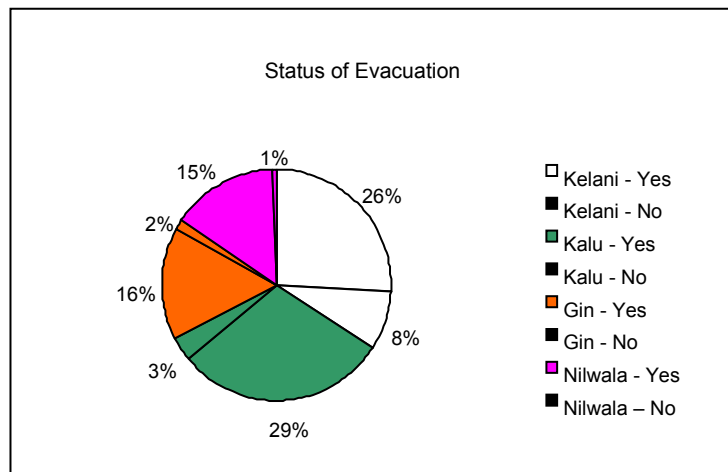


Figure C.5.1 Status of Evacuation

When residents get information of flooding from various sources such as GN, Police, Community or otherwise Media as TV, Radio, or understanding by themselves with their past experiences, they evacuate to safe places of neighbours in highlands, relatives, friends, schools and temples, etc.

The source of information for evacuation is given below:

Table C.5.2 Sources of Information of Flooding

River	Warning by Police	GN/AGA	Community	Others**	Total families
Kelani	31 (18%)	8 (5%)	31 (18%)	89 (50%)	177 (100%)
Kalu	82 (48%)	21 (12%)	63 (37%)	78 (46%)	171 (100%)
Gin	31 (35%)	10 (11%)	52 (58%)	7 (8%)	89 (100%)
Nilwala	11 (14%)	5 (6%)	78 (97%)	24 (5%)	80 (100%)

Note: \*Multiple answers possible

\*\*Others mean self understanding of flood, information from media etc.

The inundation height at evacuation is given below:

Table C.5.3 The Inundation Height at Evacuation

River	0-50 cm	50cm -1.0m	Over 1.0m	Total families evacuated
Kelani	59 (44%)	14 (10%)	61 (46%)	134 (100%)
Kalu	84 (55%)	49 (32%)	21 (14%)	154 (100%)
Gin	52 (64%)	23 (28%)	6 (8%)	81 (100%)
Nilwala	34 (44%)	28 (36%)	15 (20%)	77 (100%)

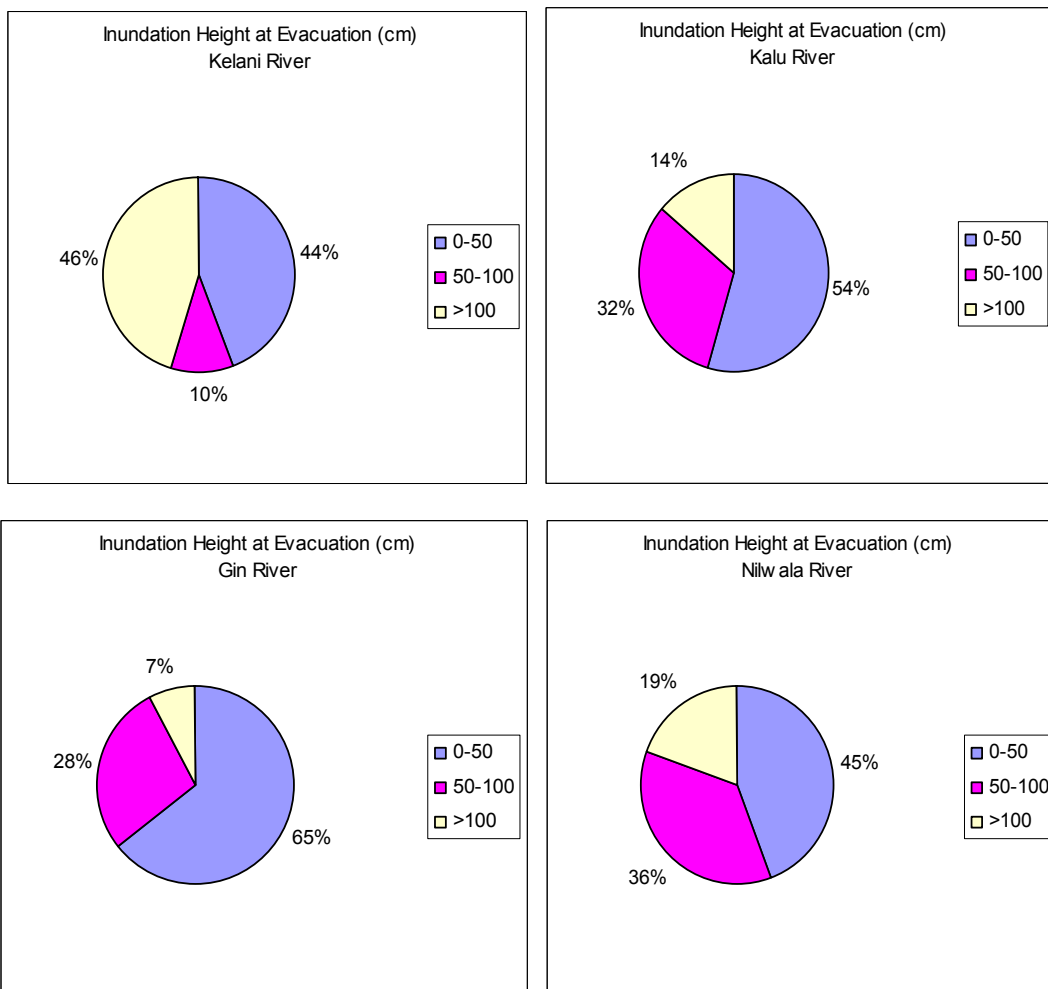


Figure C.5.2 Inundation Height at Evacuation

Evacuation Places are given below:

Table C.5.4 Evacuation Places

River	School	Temple	Neighbour/ friend/ relative	Other (bund/ road/higher place)
Kelani	20 (15%)	13 (10%)	84 (55%)	17 (20%)
Kalu	23 (15%)	24 (16%)	88 (57%)	19 (12%)
Gin	2 (2%)	9 (11%)	67 (83%)	3 (4%)
Nilwala	6 (8%)	5 (6%)	57 (74%)	9 (12%)

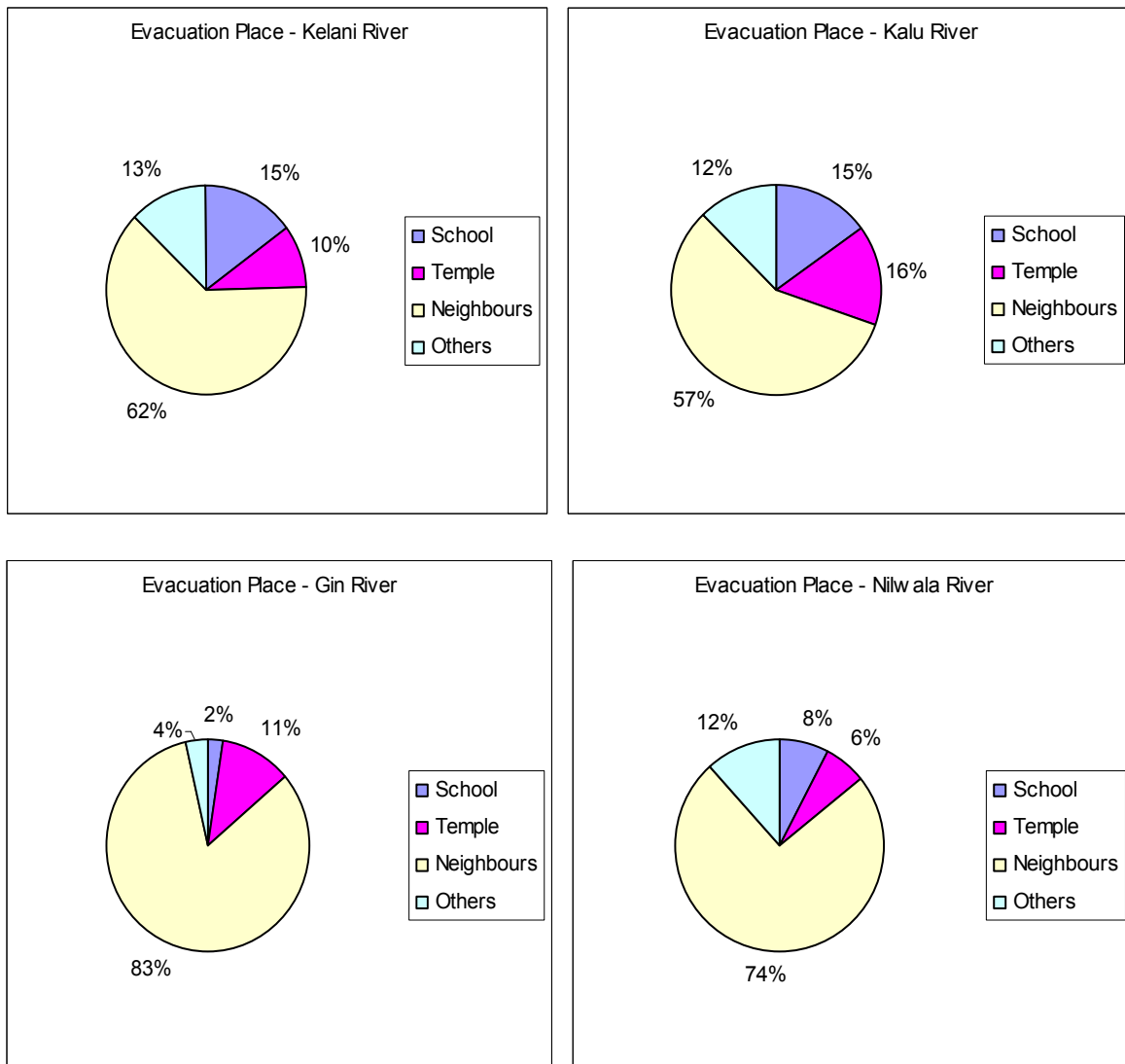


Figure C.5.3 Evacuation Places



Evacuation method is as follows:

Table C.5.5 Evacuation Methods

River	By Foot	By Car	By Boat	Other
Kelani	91 (68%)	7 (5%)	36 (27%)	- (0%)
Kalu	103 (67%)	2 (2%)	46 (30%)	3 (2%)
Gin	54 (67%)	6 (7%)	21 (26%)	1 (1%)
Nilwala	71 (92%)	6 (8%)	- (0%)	- (0%)

Note: Others mean "swimming".

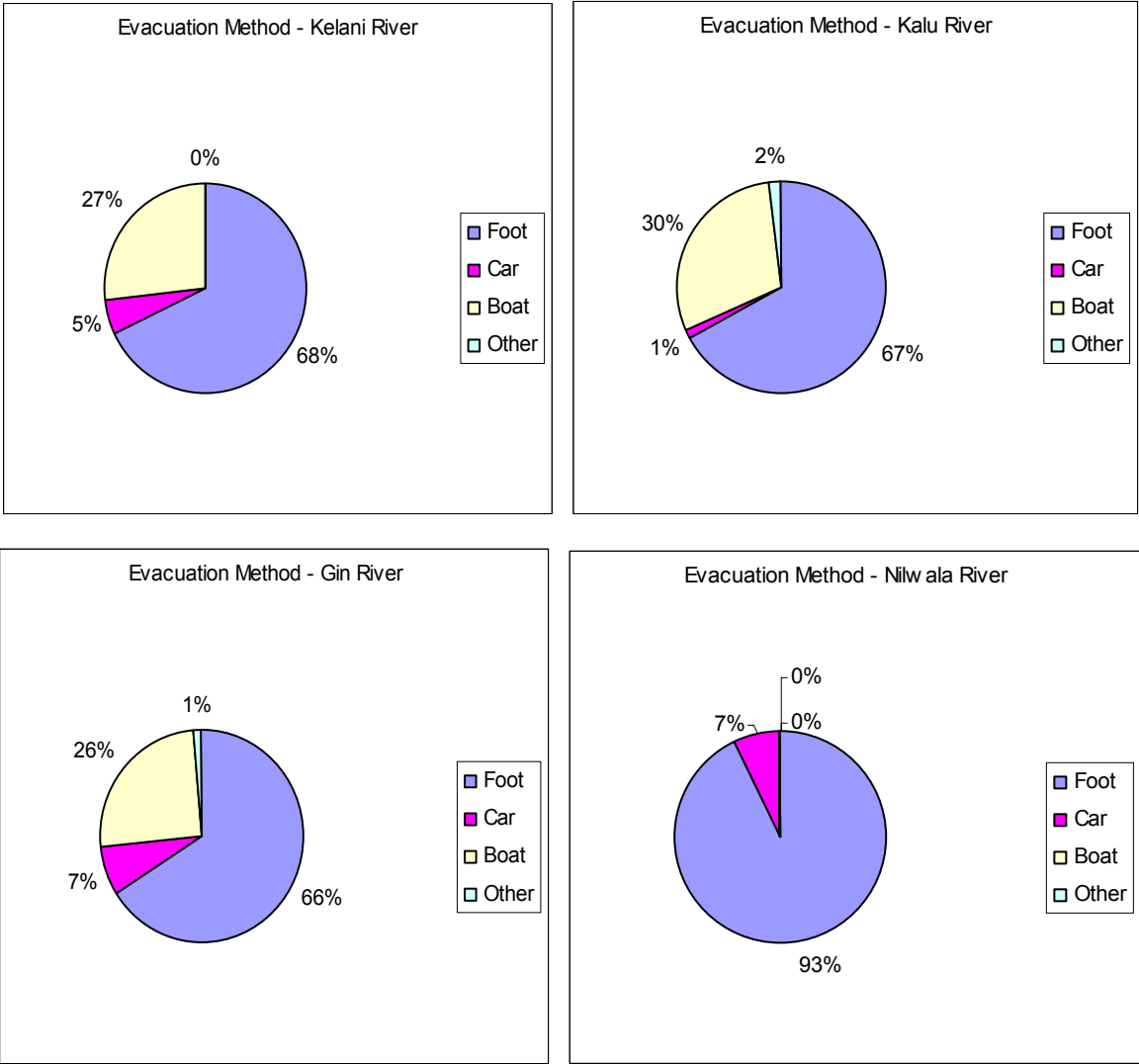


Figure C.5.4 Evacuation Methods

Table C.5.6 Time Spent for Evacuation

River	0 – 5 min	5 – 10 min	10 – 15 min	15 – 30 min	30 min – 1 hour	1 hour or more	Total
Kelani	9 (7%)	34 (25%)	36 (27%)	27 (20%)	10 (7%)	20 (15%)	134 (100%)
Kalu	15 (10%)	32 (21%)	46 (30%)	21 (14%)	11 (7%)	12 (8%)	154 (100%)
Gin	12 (15%)	20 (25%)	29 (36%)	9 (11%)	8 (10%)	2 (2%)	81 (100%)
Nilwala	14 (18%)	30 (39%)	17 (22%)	9 (12%)	3 (4%)	- (0%)	77 (100%)

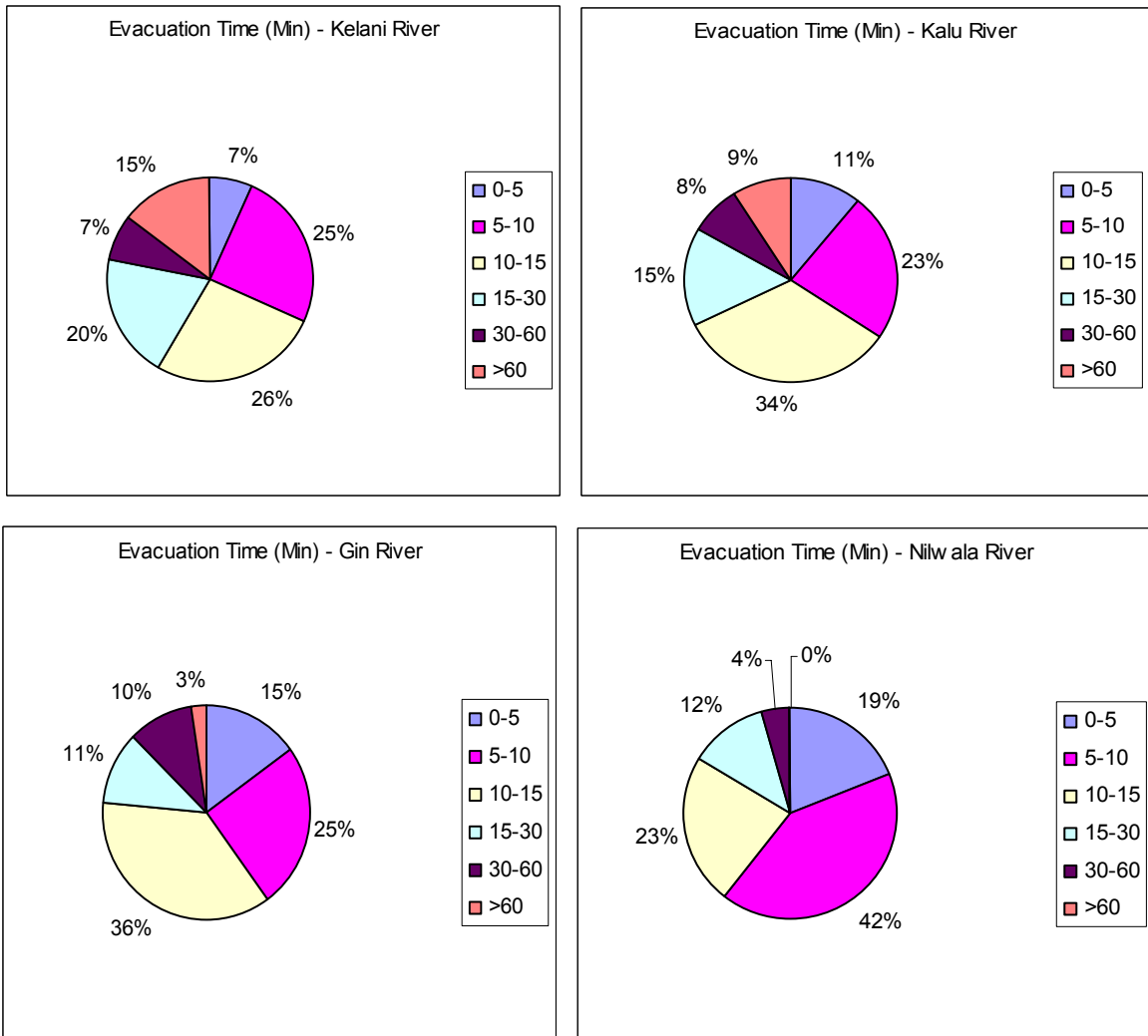


Figure C.5.5 Evacuation Time

The residents, who did not evacuate, responded as given below:

Table C.5.7 Reasons of Non-evacuation

River	Too late	No issuance of warning	Small inundation depth	Ordinary event	Others	Total
Kelani	1 (2%)	- (0%)	22 (51%)	8 (19%)	16 (37%)	43 (100%)
Kalu	8 (47%)	2 (12%)	7 (41%)	5 (47%)	2 (12%)	17 (100%)
Gin	1 (13%)	2 (25%)	6 (75%)	- (0%)	2 (25%)	8 (100%)
Nilwala	- (0%)	- (0%)	2 (67%)	1 (34%)	1 (33%)	3 (100%)

Note: \*Multiple answers possible

Others mean

- No water up to the floor level of their houses
- Move to upstairs of their own house
- Stay at home to protect the belongings

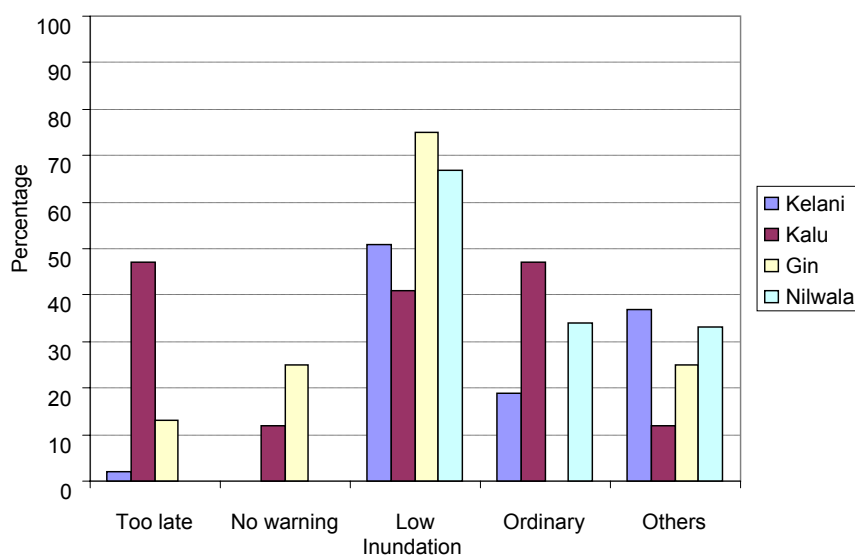


Figure C.5.6 Reasons of Non-evacuation

Table C.5.8 Response to Evacuation Warning

River	Did you hear the evacuation warning		If you are informed, do you evacuate?		Total
	Yes	No	Yes	No	
Kelani	18 (42%)	25 (58%)	20 (46%)	23 (54%)	43 (100%)
Kalu	7 (41%)	10 (59%)	11 (65%)	6 (35%)	17 (100%)
Gin	2 (25%)	6 (75%)	7 (88%)	1 (12%)	8 (100%)
Nilwala	1 (33%)	2 (67%)	2 (67%)	1 (33%)	3 (100%)

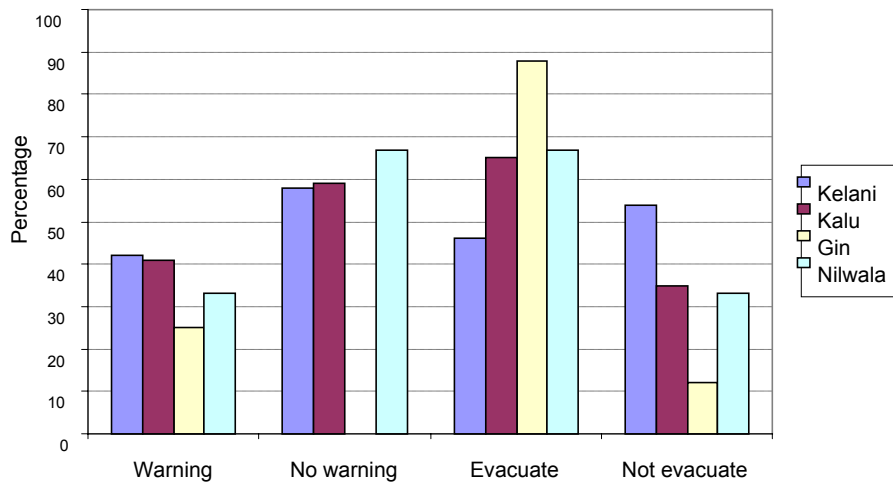


Figure C.5.7 Response of Evacuation from Non-evacuated People

Residents who did not evacuate and also, even if they are informed, they do not expect to evacuate due to the following reasons.

- They are living in highlands, though it is surrounded by floods
- They have upstairs buildings and inundation level is below the up stair level.
- A few residents said that a part of their house is built slightly higher level so that minor floods will not reach.
- A few indicated that as they want to protect their assets, they do not suppose to evacuate. They can basically live with the inundation depth.

### C.5.2 Evacuation Plan

- In Gin river basin, the residents in village “Telikada” of Horagampitiya Grama Niladari Division said that they have a currently operated evacuation plan coordinated by Police, Grama Niladari and Community. Then, police will inform early warning. However, it is not a very proper evacuation plan.
- All others participated in four river basin mentioned that no any people evacuation plan.
- Though no any organized evacuation plans are in operation, public used to stay at public places such as schools, temples or their neighbors/relatives till water level recedes.
- Most of the people more than 80% interviewed are of in the view that evacuation plan are necessary. However, others expressed following reasons, why they do not need evacuation plan;
  - They are in higher elevations
  - They have experiences of floods and know how, where and when to evacuate.

### C.5.3 Evacuation Drills

Except two people from Panagala GN division in Galle District of Gin river basin, all other 515 interviewees have not participated in evacuation drills.

#### **C.5.4 Facilities / Stockpiles at Evacuation Places**

No evacuation centers have been established. People basically used to go to temples, schools or neighbors/relatives. However, in these places, sufficient facilities such as space, water, electricity, toilets and sanitary conditions are not available as these places are not designed as evacuation centers.

#### **C.5.5 Primary Needs to be Protected**

First priority is life (100%). Second and third are house and furniture. Farmers worried about loss/damage to crop fields. Shop owners' second priority is goods at shops as it directly affect their lives due to loss of income source.

**Supporting Report D**

***Land Use Planning***

## **Supporting Report D Land Use Planning**

As a premise of flood management planning, land use can give necessary input from the perspective of the current land utilization and expectation of future change of the flood affecting area. In general, damage of flooding is depending on existing condition of land use, i.e. how many population live in, how the land is used for (agriculture, industry, etc.), or any urban utilization has been applied, and so on. Based on these analyses, flood management will effectively be planned and implemented within precise area.

In addition, land use control measure is one of the assurances to manage utilization of flood prone area to implement the flood management plan effectively.

From these points of view, this report, as a progress report, will give a brief explanation of existing land use, responsible agency for land use and future urban plan in national level of the study area.

From these view points, this report will give a brief explanation of existing land use, responsible agency for land use and future urban plan in national level of the study area.

### **D.1 National Physical Planning Policy in Sri Lanka**

In Sri Lanka, no plan relevant to national development has been established in the past. However, its necessity has become widely recognized because of the stalling economic policy. Towards this end, NPPD has been established in 2000 with the special mission to formulate the NPPP. With that aim in view, the NPPD has worked towards plan formulation in the past several years and is at present awaiting for the approval of said Plan in the near future (as of study in November 2006).

#### **D.1.1 Background of the National Physical Planning Policy**

In the late nineteen nineties a consensus began to emerge that there was a need to move beyond the Western Province where the economic and administrative center of Sri Lanka locates in and promote physical planning in other parts of the country as well. This viewpoint found expression in the recommendation made by the Presidential Task Force on Housing Development in 1997 that there should be a National Spatial Development Plan for Sri Lanka based on which all development should take place in a planned and coherent manner. Towards this end, the National Physical Planning Department (NPPD) was set up under the Town and Country Planning Amendment Act of July 2000 and the Director General was authorized to formulate a National Physical Planning Policy (hereafter refer to NPPP) for the country.

In preparing the policy the Department accepted the fact that the Colombo Metropolitan Region (CMR) is the most developed region in the country contributing 45.0% to the Gross Domestic Product (GDP). At the same time the Department took into consideration the popular view that the polarization of development in the CMR particularly in the recent past had led to a widening gap in development and living standards between the region and the rest of the country. Compared to the Western Province, the other provinces had lower income levels, higher poverty levels, less developed infrastructure services and educational and health facilities, and underdeveloped urban and service centre systems.

#### **D.1.2 Structure of Physical Planning Policy**

According to the Town and Country Planning Ordinance which authorize the formulation and implementation of a National Physical Planning Policy, structure of the physical plan and relative plans are

shown in Figure D.1.1 and the procedure to approve a physical plan of local level are shown in Figure D.1.2.

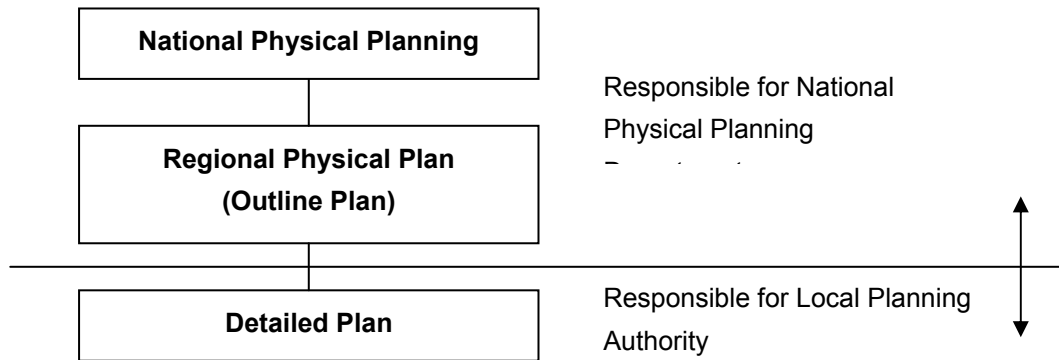


Figure D.1.1 Structure of the physical plan

Source: Made by Study Team based on the Town and Country Planning Ordinance

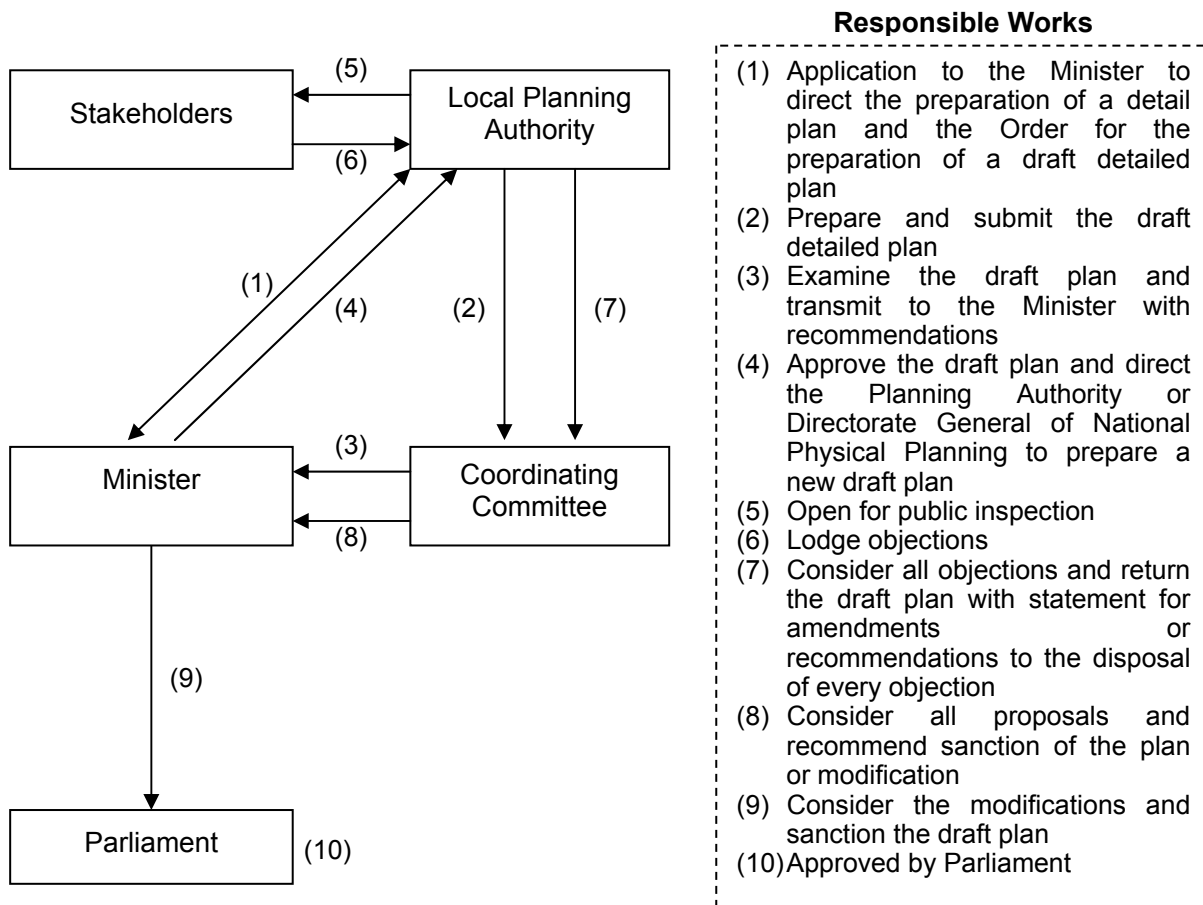


Figure D.1.2 Procedure of the Physical Planning

Source: Made by Study Team based on the Town and Country Planning Ordinance

### D.1.3 Outline of the policy (incl. objective, target year, etc.)

NPPP defines their mission as that of formulating the national physical policies, plans and strategies and ensuring and monitoring the implementation of such national policies and plans through regional and local



plans with the objective of promoting and regulating integrated planning and economic, social, physical, and environmental aspects of Sri Lanka.

Therefore, the preparation of the NPPP would provide a framework towards the achievement of an integrated and mutually complementary sectoral and regional development pattern and spatial structure for the future development of the country.

More specifically, the objectives of the NPPP are as follows.

- Accelerate national economic growth
- Promote integrated spatial development
- Improve Sri Lanka's international competitiveness
- Improve and utilize Sri Lanka's unique geographical locational advantage for the future economic upliftment
- Optimize the use of the country's limited resources
- Generate employment opportunities and raise levels of income throughout the country
- Achieve appropriate settlement patterns in terms of locations and levels of services provided
- Improve the quality of life for all sectors of society with the least threat of national disasters
- Conserve fragile environments and develop natural resources in a sustainable manner so as not to trigger/accelerate national hazards prevalent in the areas concerned
- Conserve and enhance the quality of the cultural heritage and places of aesthetic and architectural value

#### **D.1.4 Major Issues discussed in the National Physical Planning Policy**

As for the precondition of the NPPP, the economic conditions of Sri Lanka have been recognized as follows.

- Slow rate of economic growth
- High level of unemployment
- Low level of agricultural productivity
- Increasing poverty
- Weak industrial sector
- Weak international links
- Neglect of oceanic resources
- Heavy environmental degradation
- Widening regional disparities

Based on the recognition of present situation, the NPPP proposed the strategies to address these issues as follows.

- Capitalize on the country's locational advantage
- Establish stronger links with regional and international markets
- Accelerated development of the dry zone
- Integrate urban and rural development
- Promotion of industry as a "thrust" area
- Improve agricultural productivity by emphasizing high productivity areas
- Expand the tourist sector

- Make optimum use of minerals and other non-agricultural resources
- More intensive exploitation of oceanic resources
- Promote development oriented infrastructure
- Recognize the key role of the sector

As a result, implementation of the NPPP is expected to establish a new economic and spatial order, enhanced growth rate, new urban configuration and planned settlement structure, stronger industrial base, high agricultural production areas, new employment opportunities, viable and stronger infrastructure network, improved accessibility and mobility, reduced regional disparities, and a balance between production and protection.

### **D.1.5 Relating Policy to Urban Development in the Study Area**

#### **(1) Colombo Metropolitan Region**

The NPPP has projected the future population and major functions which shall be promoted in 2030 in whole nation. Table D.1.1 shows a part of that estimation, particularly that for Colombo Metropolitan Region, the region with the most populated area in Sri Lanka owing to it's being the seat of the national government, center of economic activities and is geographically located in the Kelani River basin area. For the reference, Figure D.1.3 shows location of each place name depicted in the regional structure plan of western region megapolice in 2030.

There are more than 5.3 million population living in Colombo Metropolitan Region at present and it is expected that its population will reach 7 million in 2030. According to the NPPP, major functions of the metropolitan region in the future are divided into some metro centers, characterized as follows:

- Colombo core which is the largest metro center will be specialized to the banking, financial, port-related and health functions.
- Negombo-Katunayaka which is the second largest metro center will be specialized to air port related function.
- Gampaha-Nittambuwa will be specialized to administration and institutional functions.
- Biyagama-Sapugaskanda which is the third largest metro center will be specialized to heavy industry functions.
- Homagama-Padukka will be specialized to medium scale industrial functions.
- Horana-Bandaragama will be specialized to large scale industrial functions.
- Matugama-Agalawatta which is the smallest metro center will be specialized to agro-based industrial function.
- High density residential area will be developed in Negombo-Katunayaka, Gampaha-Nittambuwa and Biyagama-Sapugasklanda.
- Commercial function will be developed in Homagama-Padukka and Matugama-Agalawatta.
- Tourism function will be developed in Colombo Core and Negombo-Katunayaka.
- Education function will be developed in Colombo Core and Gampaha-Nittambuwa.
- Institutional function will be developed in Gampaha-Nittambuwa, Horana- Bandaragama and Matugama-Agalawatta.

Table D.1.1 Existing and Projected Population Distribution Pattern  
in Colombo Metropolitan Region

Metropolitan Region & Metro Centres	Population (Mn) 2001	Target Population 2030	Major Functions Promoted in 2030
<b>Colombo Metropolitan Region</b>	<b>5,356,000</b>	<b>7,000,000</b>	
1. Colombo Core	1,300,000	2,000,000	Banking, financial, education, port related, health, tourism
2. Negombo- Katunayaka	367,400	600,000	Industrial, tourism, high density residential, air port related
3. Gampaha- Nittambuwa	170,300	275,000	Administration, educational, institutional, high density residential
4. Biyagama- Sapugaskanda	226,400	325,000	Heavy industries, high density residential
5. Homagama- Padukka	185,500	225,000	Medium scale industrial, residential, commercial
6. Horana- Bandaragama	120,000	200,000	Large scale industries, residential, institutional
7. Matugama- Agalawatta	25,000	150,000	Agro-based industries, residential, institutional, commercial
Population in Metro Centres	2,394,600 (44.7%)	3,775,000 (54.0%)	
Population in all other Urban Centres	1,014,200 (19.0%)	1,908,400 (27.3%)	
Population in rural areas	1,947,200 (36.3%)	1,316,600 (18.8%)	

Source: National Physical Planning Policy, Detailed Policy Report, September 2002

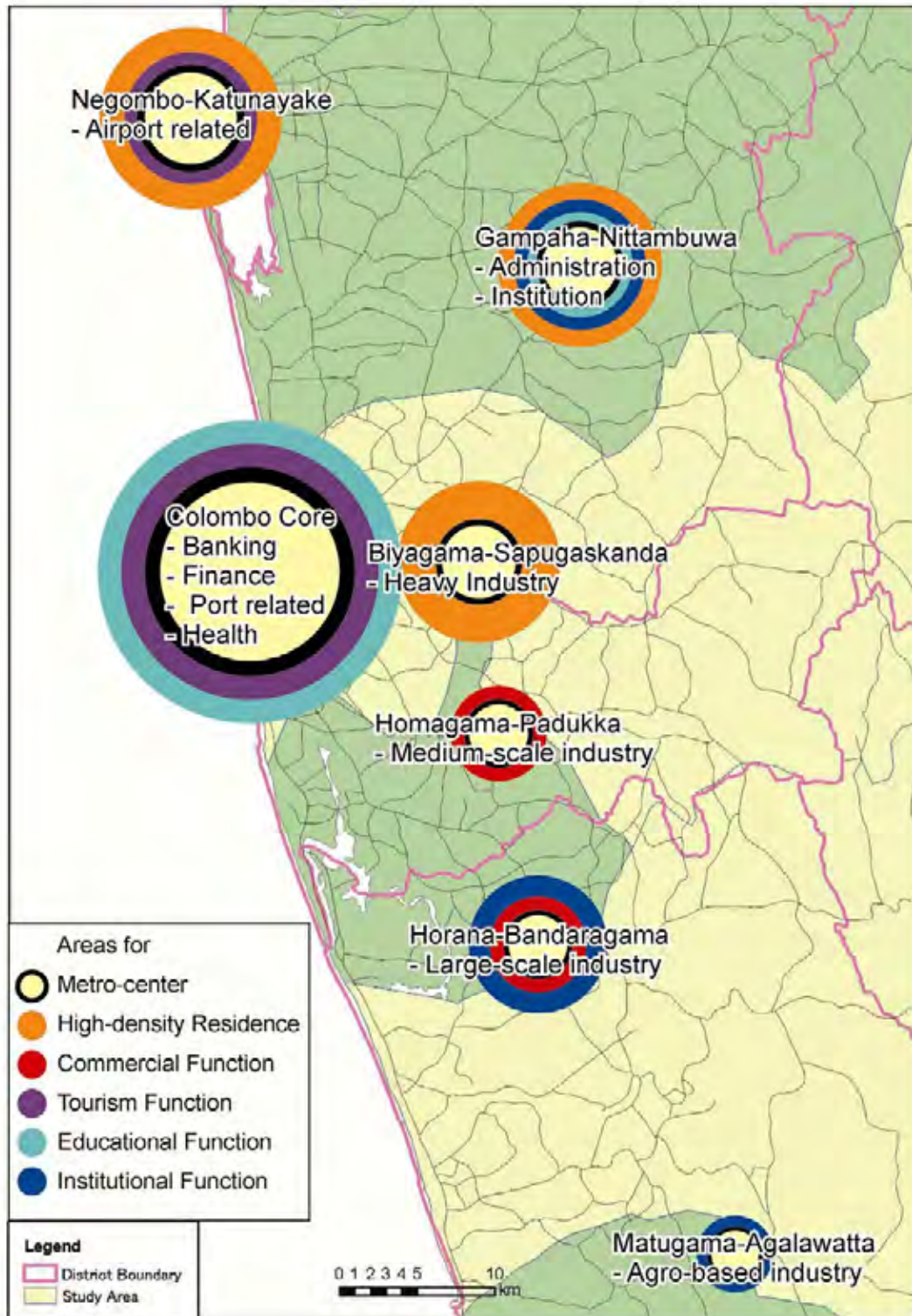


Figure D.1.3 Distribution of Metro-center and Its Function

## (2) Protected Area

The NPPP defines some portion of lands as protected area in order to fulfill certain objectives that will benefit the country as a whole and contribute to sustainable management. More specifically, the following are the guidelines in designating the protected areas:

- Protection of watershed areas, which are important for other areas and uses down stream.
- Protection of areas with rare eco-systems and ecosystems of exceptional diversity.
- Protection of areas with concentrations of economically important or potentially important species of varieties and threatened species.
- Protection of fragile areas that may be easily degraded.
- Protection of important aesthetic, cultural, historical, and recreational areas.

The protected areas are categorized into two depending on the level of stricture of the prohibited activities. That is, areas that will be strictly protected, as shown in Table D.1.2, and areas that will be protected where current development activities will be allowed to continue subject to restrictions. The locations of the protected areas are identified in the NPPP, as shown in Figure D.1.4.

Table D.1.2 Areas that will be Strictly Protected

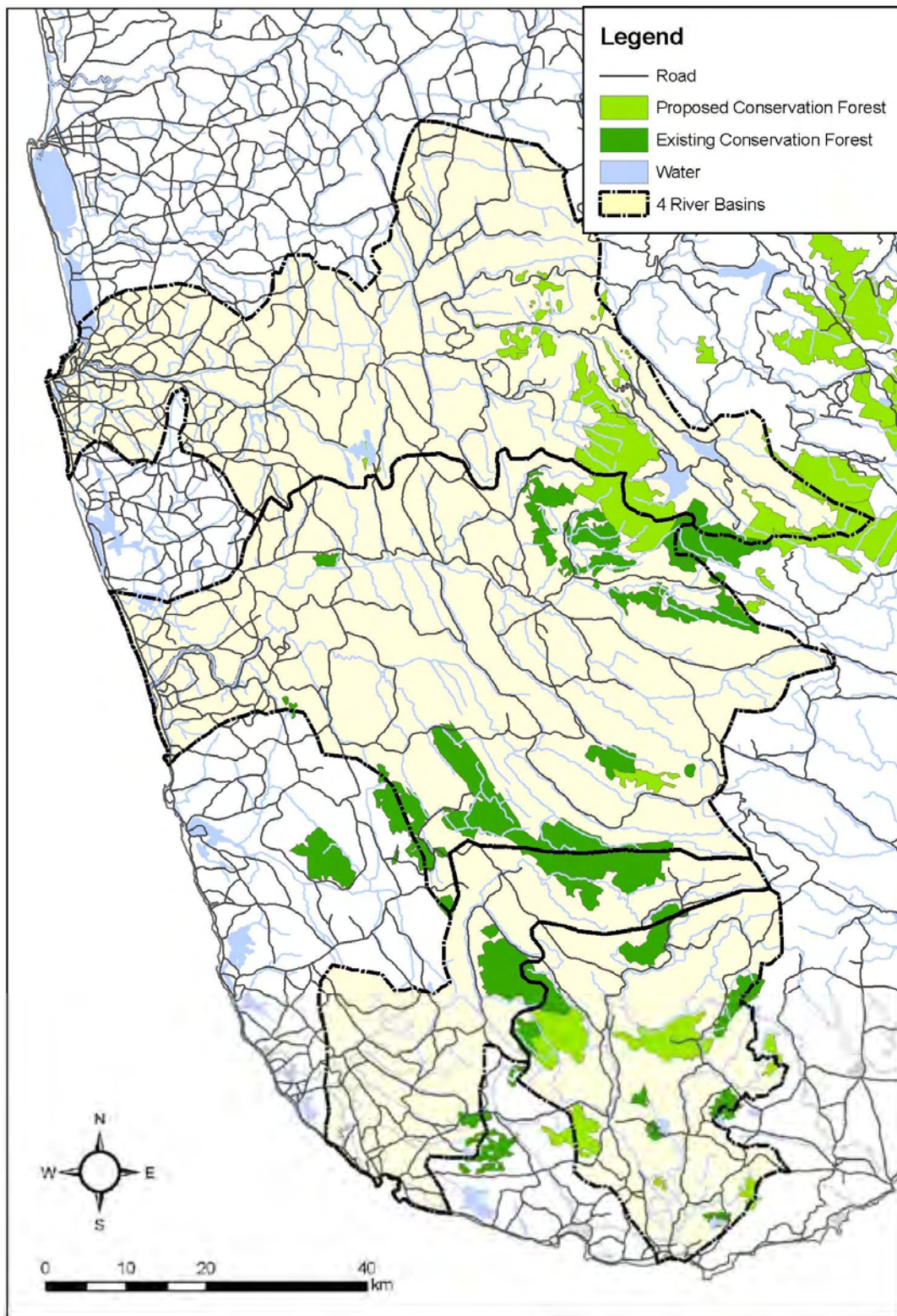
	<b>Areas to be Protected</b>	<b>Identified</b>	<b>Institutional Responsibility</b>
1	All wild life reserves. Corridors will be established wherever necessary to link these reserves.	Yes	Wild Life Department
2	All conservation forests identified by the Forest Department	Yes	Forest Department
3	Degraded forest areas that will be restored for ecological reasons.	No	Forest Department
4	Areas of archaeological and historical value where development	Yes	Archaeology Department
5	Ares of natural beauty and natural features of exceptional value (excluding coastal areas).	No	Tourist Board
6	Environmentally and hydrologically important wet lands	Yes	Central Environmental Authority, Irrigation Department
7	Areas where landslides are to be expected	Yes	National Building Research Organization
8	Unutilized lands, in areas of high rainfall intensity with slopes of over 60% and highly erodible soils.	No	Natural Resources Management Centre
9	All natural and man-made water courses and water bodies and their reservations.	Yes	Irrigation Department, Central Environmental Authority

Source: National Physical Planning Policy, Detailed Policy Report, September 2002

Table D.1.3 Protected Areas where Current Development Activities will be Allowed to Continue Subject to Restrictions

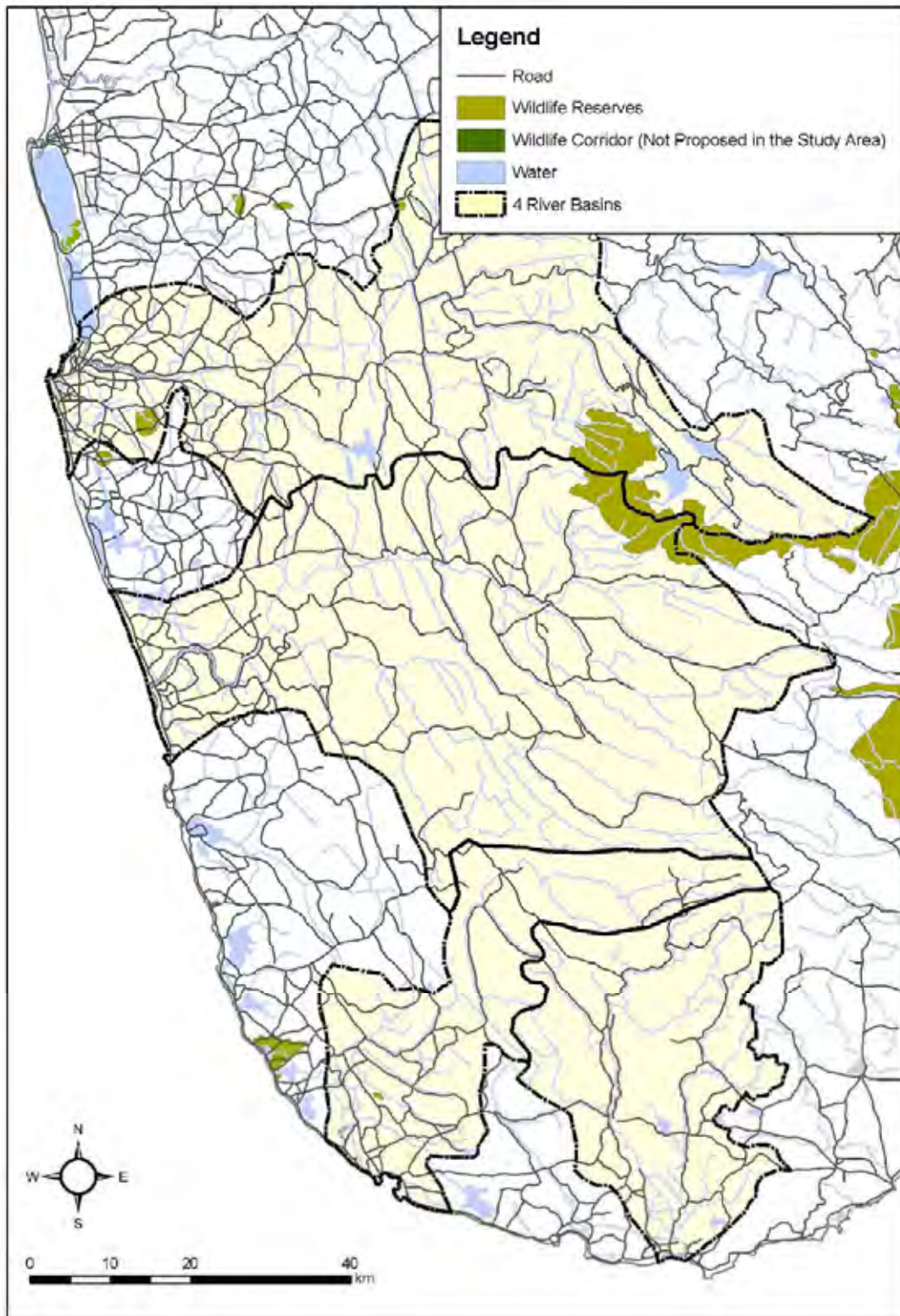
	<b>Protected Areas where development activities will be allowed to continue subject to restrictions</b>	<b>Identified</b>	<b>Institutional Responsibility</b>
1	Forest reserves and Proposed reserves other than conservation forests coming under the jurisdiction of the Forest Department	Yes	Forest Department
2	Degraded forest areas restored by replanting natural and economic species.	No	Forest Department
3	Archaeological sites located within developed areas. (a) Inland (b) Coastal	No	Archaeology Department Coast Conservation Department
4	Tourist development areas identified by the Tourist Board.	Yes	Tourist Board
5	Coastal natural habitats	Yes	Coast Conservation Department
6	Sensitive areas in river basins as defined by the National Water Supply & Drainage Board.	No	National Water Supply & Drainage Board
7	Areas where a modest level of landslide hazard exists.	Yes	National Building Research Organization
8	Utilized lands in areas of high rainfall intensity with slopes of over 60% and highly erodible soils.	No	Natural Resources Management Centre
9	Stream bank reservations.	Yes	Irrigation Department
10	Major ground water aquifers that should not be over exploited or polluted.	Yes	Water Resource Board
11	Flood protection areas	Yes	Irrigation Department
12	Areas of natural beauty and natural features of exceptional value in the coastal areas.	Yes	Coast Conservation Department

Source: National Physical Planning Policy, Detailed Policy Report, September 2002



Source: National Physical Planning Policy, Detailed Policy Report, September 2002

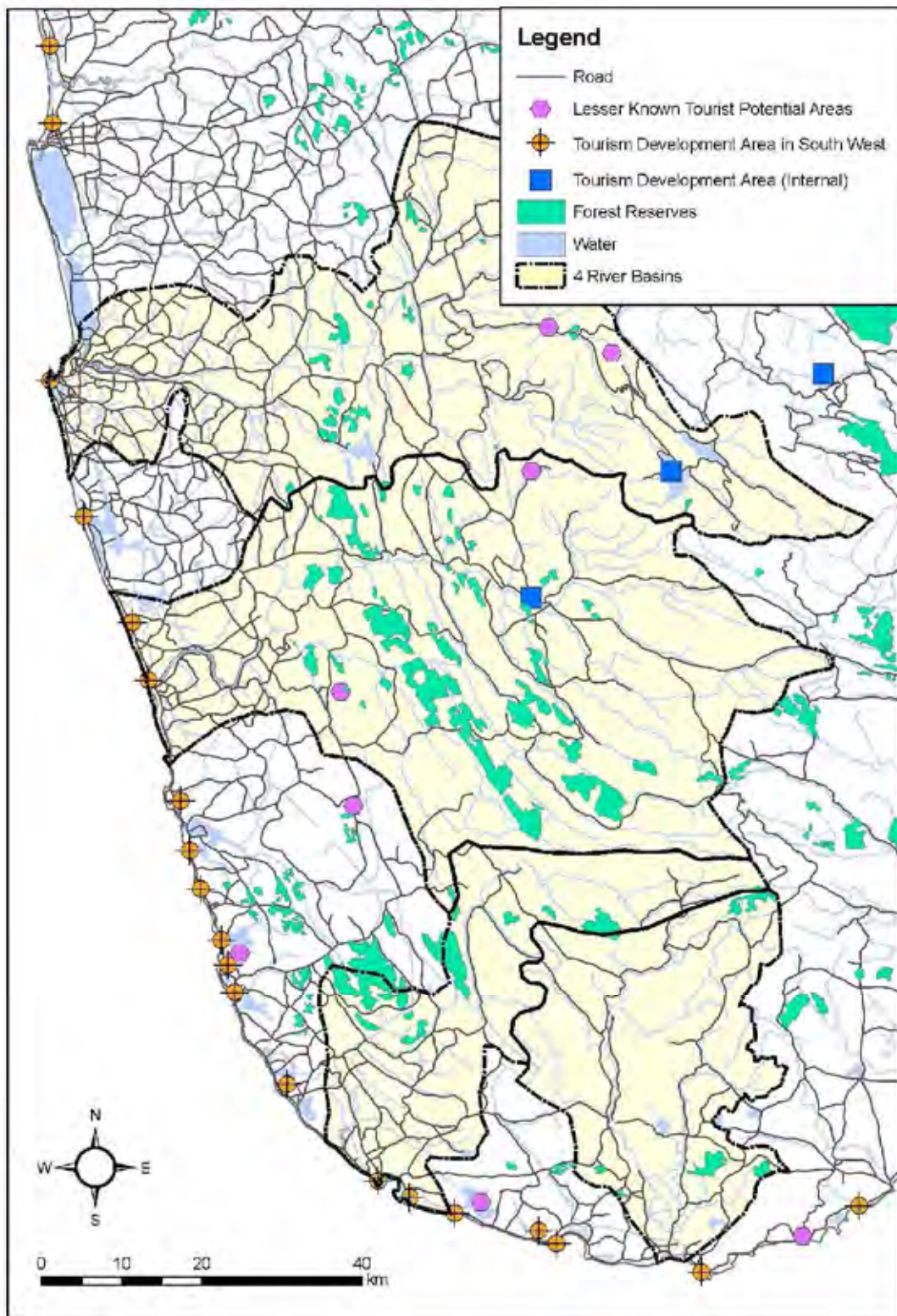
Figure D.1.4 Existing and Proposed Conservation Forest in the Study Area



Source: National Physical Planning Policy, Detailed Policy Report, September 2002

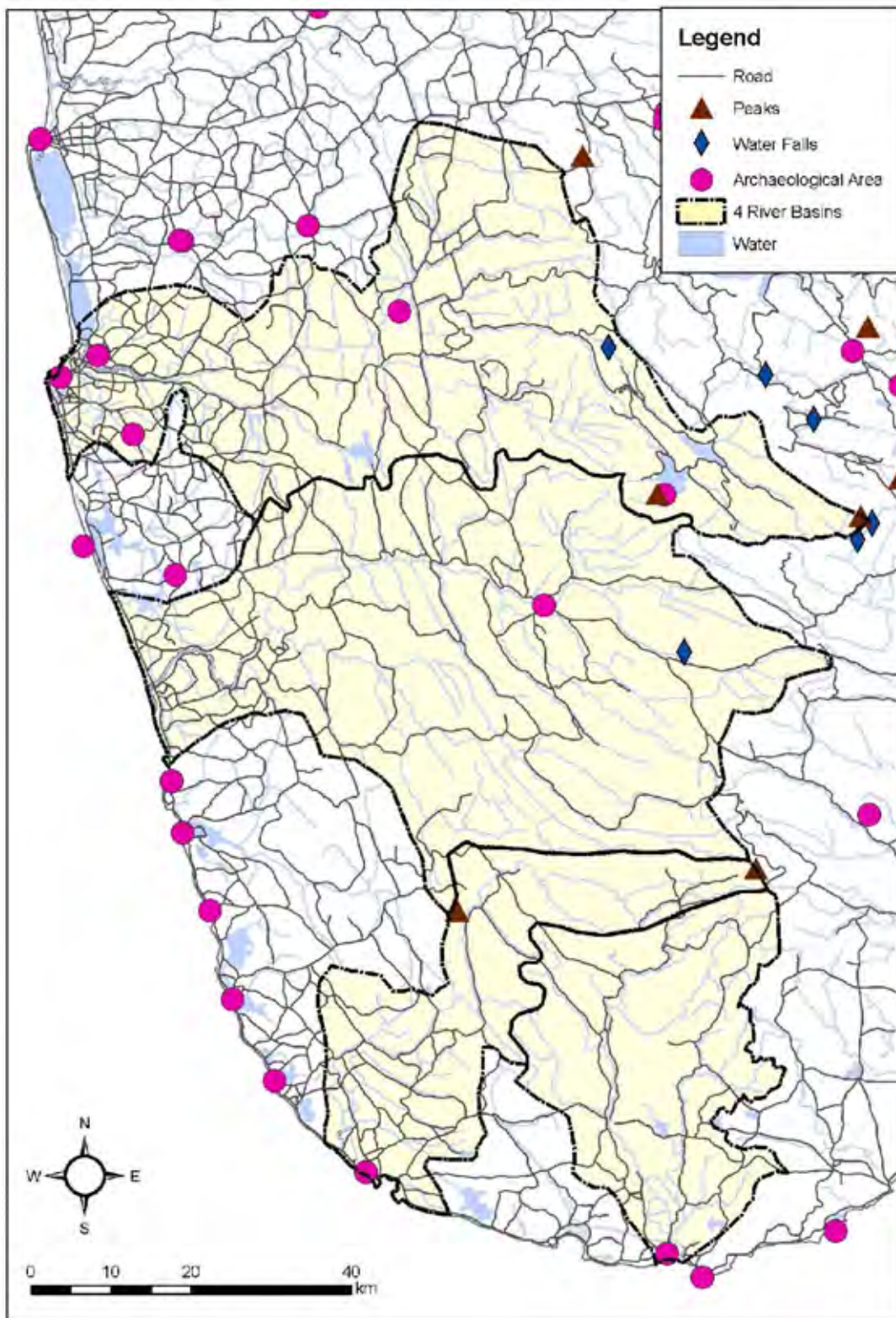
Figure D.1.5 Wildlife Reserves in the Study Area





Source: National Physical Planning Policy, Detailed Policy Report, September 2002

Figure D.1.6 Tourism Development Areas in the Study Area



Source: National Physical Planning Policy, Detailed Policy Report, September 2002

Figure D.1.7 Archaeological Areas and Tourism Sites in the Study Area

### (3) Future Land Use Policy in Physical Planning Policy

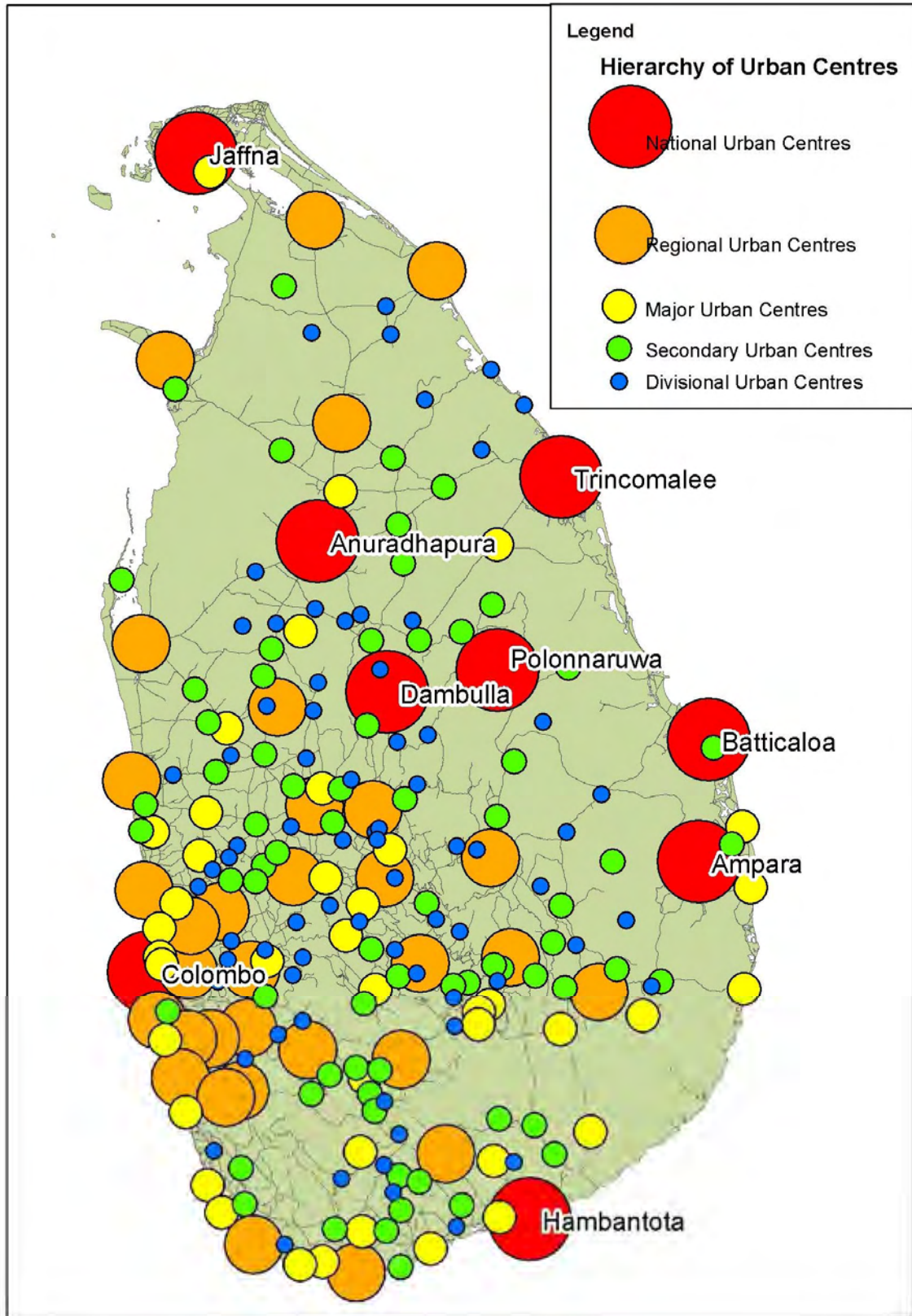
The policy relating to the future land use is defined as follows in the NPPP.

#### 1) Settlement

In order to accelerate the development of the country, minimize the existing regional disparities and shift the Colombo biased development towards other parts of the country, the NPPP has suggested a hierarchical framework of the Urban Center. In this regard, development of another Metropolitan Region in addition to the Colombo Metropolitan Region as the second Metropolitan Region is suggested that will be located in the North Central and Eastern part of the country encompassing Anuradhapura, Trincomalee, Dambulla and Polonnaruwa. In order to spread the Metropolitan development to other parts of the country, the following small scale Metropolitan Areas are also recommended: namely, Hamvantota, Jaffna, Ampara-Batticaloa.

Within the above larger urban configuration, the following thrust areas are identified for development. These areas defined as Metro Urban Centers would be the major focus areas in the settlement structure of the country within the next 30 years period. The proposed Metro Urban Centers are as follows:

[National Urban Centers]	- Colombo Core - Anuradhapura - Trincomalee - Dambulla - Polonnaruwa - Jaffna - Hambantota - Ampara - Batticaloa
[Regional Urban Centers (in Western Region)]	- Negombo-Katunayake - Gampaha-Nittambuwa - Biyagama-Sapugaskanda - Homagama-Padukka - Horana-Bandaragama - Matugama-Agalawatta



Source: National Physical Planning Policy, Detailed Policy Report, September 2002

Figure D.1.8 Hierarchy of Urban Centers in Sri Lanka

## 2) Agriculture

The agricultural sector has traditionally been viewed in terms of two sub-sectors, the A) Food Crop Sector with paddy as the dominant crop and the B) Export Crop Sector with tea, rubber and coconuts as the major crops. In addition to these, C) Live Stock Sector has been examined. Each sector is defined as the table shown in the following.

Table D.1.4 Definition of Agricultural Sector

		Contents
Food Crop Sector		<ul style="list-style-type: none"> <li>- Paddy</li> <li>- Other field crops including grain, legumes, coarse grains, oil seeds, condiments, root and tuber crops and fruits and vegetables</li> </ul>
Export Crop Sector	Plantation Sector	<ul style="list-style-type: none"> <li>- Tea</li> <li>- Rubber</li> <li>- Coconuts</li> </ul>
	Minor Export Sector	<ul style="list-style-type: none"> <li>- Beverage crops such as coffee and cocoa,</li> <li>- Spices such as cinnamon, pepper, cardamoms, cloves and nutmeg</li> <li>- Other crops such as citronella, lemon grass, arecanut, betel and vanilla</li> </ul>
Live Stock Sector	Daily Sector	
	Poultry Sector	

### (A) Food Crop Sector

The food crop sector or the domestic agricultural sector provides the chief means of sustenance to the majority of the rural population. Of these, paddy is the most important.

What is required in this sector is a market oriented agricultural system that would provide the farmers with incentives and the means to decide for themselves the way in which they would like to move forward. The policies that will be adopted in order to bring about this transformation are a) encourage the scale-economies and the farmers' cooperation, b) foster new generations of highly skilled, modern farmers, c) explore opportunities to increase value through diversification, d) make effective land markets, e) promote the integration of crops and livestock and intensive mixed production systems, f) select areas most suitable for each product that could maximize the yield and release marginally productive areas to be reconverted into forest and other environmentally friendly uses and so on.

Increase of the area under cultivation will be realized through expanding production in water short irrigation systems (i.e. with a cropping intensity of less than 150%), extending cultivation to minor irrigation areas and utilizing ground water resources, and increasing extents under cultivation on suitable rainfed uplands.

### (B) Export Crop Sector

The export crop sector comprises the so called (a) plantation sector with tea, rubber and coconut as the major crops, and (b) the minor export crop sector comprising of other perennial export crops.

#### A) Plantation Sector

Between 1982 and 1999 the extents under tea and rubber declined by approximately 12,000 hectares and 13,000 hectares respectively, because of the labor shortages and the rising costs of production.

In regards of these situation, the following policies should be taken in the small holder sector; a) encourage expansion particularly in the low country areas to enhance productivity and prevent land degradation, b) discourage new plantings other than in limited extents in the Kalurata and Kegalle Districts, c) provide necessary financial assistance and infrastructures development, and so on.

#### B) Minor Export Crops

Although the extent under cultivation is relatively small amounting to approximately 80,000 hectares, yet they contributed 7.0% towards the value of agricultural exports from the country and 43.0% towards the value of exports of “other” agricultural products in 1999. The export potential of minor export crops is quite high, and in the case of some crops such as spices, the world demand is particularly strong because of the quality of the products. In order to increase production, the following policies will be implemented; a) increase production on existing lands by (i) increasing plant density and (ii) introducing high yielding varieties, b) enhance the performance of the sector through quality improvement, c) encourage home garden production, d) bring new areas under production by encouraging tea and rubber estates to undertake crop diversification programmes, and e) encourage intercropping with minor export crops in forestry models.

#### (C) Live Stock Sector

The limited extent of forage land is considered to be a serious constraint on the dairy farming sector. The forage area has to be expanded by incorporating quality lands. The areas recommended for inclusion are a) areas being withdrawn from tea and rubber but suitable for pasture/fodder cultivation for high producing dairy cattle in the High and Mid Grown areas, b) abandoned and ill-drained paddy lands in the wet zone in the Western Province particularly in the peri-urban areas, and c) villu areas and other suitable non-irrigated areas in the dry zone, for both dairy cattle and dairy buffaloes.

#### 3) Industry

The industrial sector which contributed only 15.0% outwards the Gross Domestic Product in 1980, has expanded steadily since then, increasing its contribution to 17.4% in 2000. The main contributors to this growth have been the export oriented industries led by the apparel and textile industry which comprised 70.0% of the industrial exports in 1999.

86.0 % of industries registered with the Ministry of Industrial Development (1999) was concentrated in the Gampaha and Colombo Districts where could enjoy adequate infrastructure and essential services, skilled and unskilled labor and easy access to domestic and export markets. However, the excessive concentration of industries in these two districts has resulted in many urban problems. The government has therefore taken steps in recent years to encourage the setting up of industries in other areas not only to prevent further concentration in the two districts, but also to bring in economic development to the regions.

The industrial sector in the areas outside Colombo should be expanded in order to provide the bulk of the employment opportunities and its expansion has to take place largely through a diversification of the industrial base by encouraging foreign and local investors to invest in the “thrust” industries identified by the government and processing and adding value to the locally available raw materials.

In order to bring about this diversification the following policies especially in wet zone will be adopted; a) strengthen the existing and planned industrial estates outside the Colombo region to attract both local and foreign investors, b) in planned industrial estates, cluster together industries of particular type, c) strengthen the transport links between these estates and the larger urban centres in order to provide easy and quick access to the services and facilities available at these centers, d) establish air links between the Koggala Export Processing Zone and Colombo, and e) utilize air links and expressways as the backbone of regional industrialization.

#### 4) Tourism

Since Sri Lanka has the bounty of nature and history, tourism development is essential for the economic growth. The government is aiming to develop eco-tourism as an important branch of “Special Interest” Tourism and promote Sri Lanka as an eco-tourism destination. Therefore, the policies in coastal areas in general are a) tourism development will be encouraged only in designated areas, b) uncontrolled development with clusters of small guest houses, cafes and other facilities will be prevented, c) unsustainable and incompatible economic activities in resort areas will be discouraged.

Especially the south west coast where the study area is located in is set the following policies;

1. The South West Coast will continue to play a fundamental role in the future development of Sri Lanka’s Tourism Industry.
2. Further expansion of accommodation facilities along the South-West Coast will be strictly regulated.
3. The existing tourist areas will be consolidated and improved by creating facilities and activities of a high standard in designated areas.
4. In preparing development plans, priority will be given to the Eight Tourism Development Areas (TDAs) that have been identified, those are Marawila, Walkkal, Negombo, Seeduwa, Wadduwa, Beruwala, Hikkaduwa and Unawatuna.

Within the TDAs (a) tourism facilities and other urban development will be coordinated, (b) the environment and the supply of infrastructure services to hotels and adjacent communities will be improved, (c) development will be undertaken according to prepared zoning plans and accompanying guidelines.

5. The programmes for the TDAs will be implemented on a staggered basis. Priority implementation is proposed for the TDAs of Negombo, Beruwela and Hikkaduwa.
6. The necessary institutional structures will be established in TDAs, to advice on the undertaking of development controls to liaise with stakeholders in the local tourism industry and to discuss issues related to employment and the management of local tourism.
7. Eco-tourism areas will be developed. Eg. Muturajawela.

Also, the tourism development policies in Inland Areas are as follows:

1. Potential eco-tourism sites will be identified and mapped in consultation with the Provincial councils, Pradeshiya Sabhas and other stakeholders.
2. When developing these sites steps will be taken to
  - (a) Promote the conservation and enhancement of the natural environment and historical, social and cultural heritages.
  - (b) Ensure that all tourism, services and activities will be compatible with religious, social and cultural traditions.
  - (c) Derive economic benefits by earning foreign exchange spreading development and general employment benefits.
  - (d) Develop economic linkages with other economic activities such as agriculture and rural industry.
  - (e) Secure community involvement.
3. The development of “Lesser known Archaeological, Nature and Scenic sites” already identified will be promoted on a staggered basis.
4. Primary and secondary cultural sites will be declared as National Heritage Parks. For each site:
  - (a) Zoning plans will be prepared.
  - (b) A buffer zone will be identified and the use of land within the buffer zone determined.
5. Sections of highways declared as protected highways will be strictly protected.

## **D.2 Development Plan in Provincial/District Level**

### **D.2.1 Responsible Agency and Legal Framework**

Land use planning is useful to control development trend and is related to political disposition. Therefore, the institution which is responsible for land use play important role in national development. The leading institutions which are responsible for land use in Sri Lanka are National Physical Planning Department (NPPD) and Urban Development Authority (UDA).

NPPD is an institution which is responsible for policy designing regarding the national development plan referred to as the “National Physical Planning Policy (NPPP)” and planning regional development plan. On the other hand, UDA is responsible for district level city development plan based on NPPP. Other than those, there are several agencies which holds jurisdiction over housing development and development of urban facilities. Table D.2.1 summarizes the departments related to land use planning and their respective functions.

Table D.2.1 Organizations Related to Landuse Planning

<b>Departments</b>	<b>Subject and Functions</b>
<b>MINISTRY OF URBAN DEVELOPMENT AND SACRED AREA DEVELOPMENT</b>	
National Physical Planning Department (NPPD)	- Physical Planning - Sacred area Planning and Development
Urban Development Authority (UDA)	- Formulation of Policies, programs and projects in respect of Physical Planning and Urban Development and assist in implementation of such programs and projects - Urban Planning and Development
Real Estate & Exchange (Pvt.) Limited (REEL)	- Urban Redevelopment



Departments	Subject and Functions
<b>MINISTRY OF HOUSING AND COMMON AMENITIES</b>	
National Housing Development Authority (NHDA)	- Implementation of policies, plans and programs in respect of Housing and Common Amenities - Planning Housing Schemes and provision of Amenities to slums
Centre for Housing Planning and Building (CHPB)	- Guiding rural masses in cost-effective house building Technologies - Implementing and coordinating settlements and housing projects for fishery and plantation sectors - Slum clearance and resettlement of slum dwellers
<b>MINISTRY OF LAND AND LAND DEVELOPMENT</b>	
Department of Land Commissioner	- Formulation and implementation of policies, plans and programs in respect of land and land development - Administration of State Land
Department of Land Settlement	- Land Settlement
Land Use Planning Division	- Land Use Planning
<b>MINISTRY OF DISASTER MANAGEMENT AND HUMAN RIGHTS</b>	
National Building Research Organization (NBRO)	- Research and Development in the fields of housing and building construction technology.
<b>MINISTRY OF IRRIGATION AND WATER MANAGEMENT</b>	
Department of Irrigation	- Formulation and implementation of policies plans and programs in respect of Irrigation , Reservoirs and Water management - Irrigation and drainage work

Source: GAZETTE EXTRAORDINARY OF THE DEMOCRATIC SOCIALIST REPUBLIC OF SRI LANKA – 29.01.2007

#### (1) National Physical Planning Department (NPPD)

##### 1) Law

Town and Country Planning Ordinance No.13 of 1946 as amended by Act No.49 of 2000

##### 2) Objective

The NPPD shall formulate a national physical planning policy and a national physical plan.

##### 3) Function

The NPPD leads local physical planning authorities by preparing physical planning guideline and assists regional or local planning authority when required to prepare any regional or local plan. In addition, the NPPD assists Provincial Councils also in the preparation and development of regional physical plan.

Aside from preparing the NPPP, the NPPD makes recommendations to the Coordinating Committee on the Plan. In addition, NPPD's duty is not only limited to the periodical revision and examination of the Plan, but also to monitor the implementation of the national physical plan.

#### (2) Urban Development Authority (UDA)

##### 1) Law

The foundation law of UDA activities is Urban Development Authority Law No.41 of 1978 of the National State Assembly (certified on 6 September 1978), which has been amended in Act No.70 in

1979, Act No.2 of 1980, Act No.4 of 1982, Act No.44 of 1984, Act No.49 of 1987, and Act No.41 of 1988.

## 2) Role of UDA

According to this law, the UDA shall develop every urban development area for better physical and economic utilization of such area to promote integrated planning and implementation of economic, social and physical development.

Incidentally, “Urban Development Area” is defined as any area suitable for development as declared in the Order published in the Gazette by the Minister. The Order defines the urban development area by setting out the metes and bounds of such area.

## 3) Power and Function of UDA

The power and function of UDA defined in the UDA law are as follows:

- To carry out integrated planning and physical development within and among the Urban Development Area.
- To implement related programs of development work, activities and services in the Urban Development Area which are consistent with integrated planning in the Urban Development Area.
- To formulate and submit development plans, including capital investment plans, to the Minister for approval by the Government.
- To undertake the execution of development projects and schemes as may be approved by the Government.
- To enter into any contract with any person for the execution of development projects and schemes as may be approved by the Government.
- To undertake the completion of any approved development project or scheme in default by any person failing to complete such project or scheme.
- To implement development plans and capital investment plans approved by the Government.
- To formulate capital improvement programs in the Urban Development Areas.
- To formulate and implement an urban land use policy in the Urban Development Areas.
- To develop environmental standards and prepare schemes for environmental improvements in the Urban Development Areas.
- To carry out building, engineering and other operations, and undertake any work in connection with the infrastructure development of the Urban Development Areas.
- To acquire and hold any movable or immovable property or dispose of any movable or immovable property acquired or held by it.
- To formulate and execute housing schemes in the Urban Development Areas.
- To cause the clearance of slum and shanty areas and to undertake the development of the Urban Development Areas.
- To prepare at the request of any Government agency development projects and planning schemes on behalf of such agency and to coordinate and supervise the execution of such projects or schemes.
- To approve, coordinate and control development projects or schemes of any Government agency in the Urban Development Areas.

- To provide technical planning services for the benefit of Government agencies or other persons in such areas.
- To regulate any planning projects or schemes prepared by any Government agency or other persons in the Urban Development Areas.
- To call upon any Government agency, at the direction of the Government, to undertake in consultation with the Authority, any development projects or schemes and to regulate the activities of such projects or schemes.
- To charge rents or fees for any building or for any services provided by the Authority.
- To accept gifts, grants, donations or subsidies whether in cash or otherwise and to apply them for carrying out any of the objects of the Authority.
- And to do all such acts or things as are incidental to or consequential upon the exercise, discharge and performance of its powers, functions and duties under this law.

## D.2.2 Development Plan

NPPD shall establish a Development Plan in national and provincial level based on the Town and Country Planning Ordinance and UDA shall establish a Development Plan in district level based on UDA Law.

The progress of acquiring development plans in provincial and district level as of 12th July 2007 is shown in the following table.

Table D.2.2 Relating Development Plan

	Name	Responsible Agency	Target Year	Type of Data
Province	Regional Structure Plan of the Western Region Megapolis	NPPD	2030	Word File
	Structure Plan for Southern Region	NPPD	2030	Map only
District	Colombo Development Plan 1999	UDA	2010 (revising)	Document
	Development Plan for Urban Development Area of Greater Galle (Revised Draft for Limited Circulation)	UDA	2020	Copy
	Kegalle Development Plan	UDA	2025	Document
	Development Plan for Kalutara Urban Development Area	UDA	2020	Copy
	Ratnapura Development Plan	UDA	2020	Word File
	Zoning Plan for Greater Matara	UDA	2030	Map only
	Proposed Zoning Plan for Nuwala Eliya	UDA	2016	Map only
Gampaha Development Plan	UDA	N.A.	N.A.	

Note: "Word file" means acquisition of a document file in Microsoft WORD format.

"Document" means acquisition of a document officially printed and published.

"Copy" means acquisition of a hard (paper-base) copy of the official document

"Map only" means acquisition of a soft (digital-base) copy of a map of the structure plan

### (1) Western Region

The Western Region Megapolis also referred to as the Colombo Metropolitan Region (CMR) comprises the districts of Gampaha, Colombo and Kalutara covers an area of approximately 3.7 million hectares. In 2001 the region had a population of approximately 5.2 million persons of whom 30.0% was classified as urban and 70.0% as rural. In terms of physical development, the CMR could be divided into 3 district areas, i.e. a highly urbanized area, a semi-urbanized area and a rural area.

The city of Colombo and its surrounding provinces have been developed based on a development plan prepared in accordance with the changes in the times summarized in the table in next page. At first, a development plan had been prepared only for the city of Colombo. Progressively, they became consider the city and its surrounding provinces as a unit of metropolis of the country.

Table D.2.3 History of the Development Plan for the Western Region

Year	Event	Background	Contents
Colonial times	Preparation of a Physical Plan for the CMR		Focus on the city of Colombo
Nearly three decades later			A plan for a larger area including the city of Colombo and the surrounding regions
1978	Preparation of a Colombo Master Plan Project (consisted from the Colombo Metropolitan Regional Structure Plan and the Colombo Urban Area Plan)	Following the concept of the former plan	A project covering the Colombo District including the Gampaha District and a part of the Kalutara District, and advocated a balanced regional development strategy.
1978	Establishment of the UDA		
1985	Preparation and gazette of a City of Colombo Development Plan		To enable the USA to implement zoning and building regulations within the city
'80s and early '90s	No significant planned development in Colombo		
1996	Decision by the government to update the Colombo Master Plan		
1997	Recommendation for establishment of a National Spatial Development Plan for Sri Lanka made by the Presidential Task Force on Housing Development	A consensus began to emerge that there was a need to move beyond the Western Province and promote physical planning in other parts of the country as well	There should be a National Spatial Development Plan in Sri Lanka based on which all development should take place in a planned and coherent manner
1998	Preparation of a Colombo Metropolitan Regional Structure Plan (CMRSP)	Instead of the updating of the Colombo Master Plan, a decision was made to prepare a new structure plan for the entire Western Province	Providing opportunities for increased economic development, employment generation and improved living standards and quality of life for all inhabitants of the CMR
2000	Establishment of NPPD		
2002	Preparation of the National Physical Planning Policy		Intended to minimize or eliminate regional disparities by providing a frame- work to achieve an integrated sectoral and regional development pattern and spatial structure for the future development of the country
	Preparation and gazette of the Western Region Physical Structure Plan (WRPSP)	Initiating action in 2002 to implement the CMRSP in 1998	To design a Strategic Physical Plan and prepare an Action Programme for the development of the region

Year	Event	Background	Contents
	Preparation of the Western Region Megapolis Plan (WRMP)	It has built on the data base and proposals in the CMRSP	A Resource Development Master Plan to develop the region to attract investment, promote economic and business activities, develop international linkages through trade and information technology and invite people to live and work

Today, a Regional Structure Plan for Western Region Megapolis were discussed and proposed by an international and local expert team which worked to achieve balanced inputs of opinions and ideas and a review committee which was comprised of relevant authorities, government departments and consultants to monitor progress, resolve issues and facilitate approvals.

The principal objective of the proposed plan is to “Provide opportunities for increased economic development, employment generation and improved living standards and quality of life for all inhabitants of the Western Region of Sri Lanka”.

The proposed plan is consisted from (A) regional structure plan and (B) Megapolis – Planning Zones (refer to the Figure D.2.1).

### 1) The Regional Structure Plan

The Regional Structure Plan of the Western Region Megapolis is a broad master plan providing overall framework for a more detailed level of planning such as the Development Guide Plan and the Detailed Development Plan. The structure plan establishes an infrastructure framework and major land uses. Based on the structure plan, development guide plans will be formulated for smaller areas where various types of public facilities, amenities, local roads and other land uses will be addressed in detail.

While the increase in density within Colombo city is inevitable due to the availability of modern facilities and its central location, the master plan promotes decentralization concept by directing the developments towards eastern, southern and northern parts of the region and thus spreading the development away from the city of Colombo. New growth areas will be proposed in the northern, eastern and southern parts of the region with more lands supply to create new living environment for the people.

To support this intention, it is essential for Western Region to have multi centers that will be well distributed in the planned growth areas such that residents living in the new growth area in the north,



Figure D.2.1 Structure Plan – Decentralized Planning

south or eastern parts of the region will have easy access to facilities and at the same time avoid over crowding at the main city of Colombo.

As a whole the structure was introduced as a necklace concept following its geometrical form. The two ring roads are identified as the inner necklace and outer necklace respective.

## 2) Megapolis – Planning Zones

Based on their roles, the megapolis is organized in 3 zones.

- (a) The **peripheral** region which will incorporate the **Outer Necklace Townships** which are self contained low density residential townships along the outer ring road, on the undulating areas further away from the Colombo Core.

It will include 5 **Regional Centres** located at Negombo, Attangalla, Avissawella, Horana and Kalutara along the outer necklace. Each Regional Centre is as a mini CBD integrating various business activities such as major branches of banks, offices, local government offices as well as shopping centers.

Agriculture will be a major economic activity in the region and steps will be taken to improve the productivity of all the agricultural lands and maintain this productivity on a sustainable basis.

The region will also accommodate industries which require larger land plots, especially for the relocation of those industries set-up within the city of Colombo. The major zoning of industries by types is as follows:

- More pollutive industries are zones at the southern part near Kalutara and Beruwala towns, where a sewerage treatment plant can be built and the wastewater discharge can be channeled directly to the sea and thus minimizing pollution of the rivers.
- Light industries that require large land area are proposed at the environmentally sensitive areas at the eastern part of the region. (Avissawella, Attanagalla and Horana).
- Export oriented industries, and Export Processing Zones are located near the port and airport at the northern part of the region.
- Smaller scale industries will be distributed across the region and integrated within different townships.

Environmentally sensitive areas will be protected and steps will be taken to address current environmental issues.

- (b) The **suburban** region which will incorporate the **Inner Necklace Townships** which are medium density residential townships along the inner ring road and immediately adjacent to Colombo Core as self-contained townships where most of the population will be accommodated.
- (c) The **Colombo Core** at the heart of the Western Region as the center of the megapolis, where major facilities at country level such as the Federal Administrative Centre, the Central Business District, the main hospitals, cultural and sport facilities as well as the regional level facilities and amenities will be located. The area is defined within the municipal councils of the City of Colombo, Dehiwala, Mt. Lavinia, Sri Jayawardanepure-Kotte and overlaps the boundaries of Kolonnawa, Kaduwela, Maharagama, Ratmalana and Kesbewa. The extent covers an approximate area of 19,000 Ha.

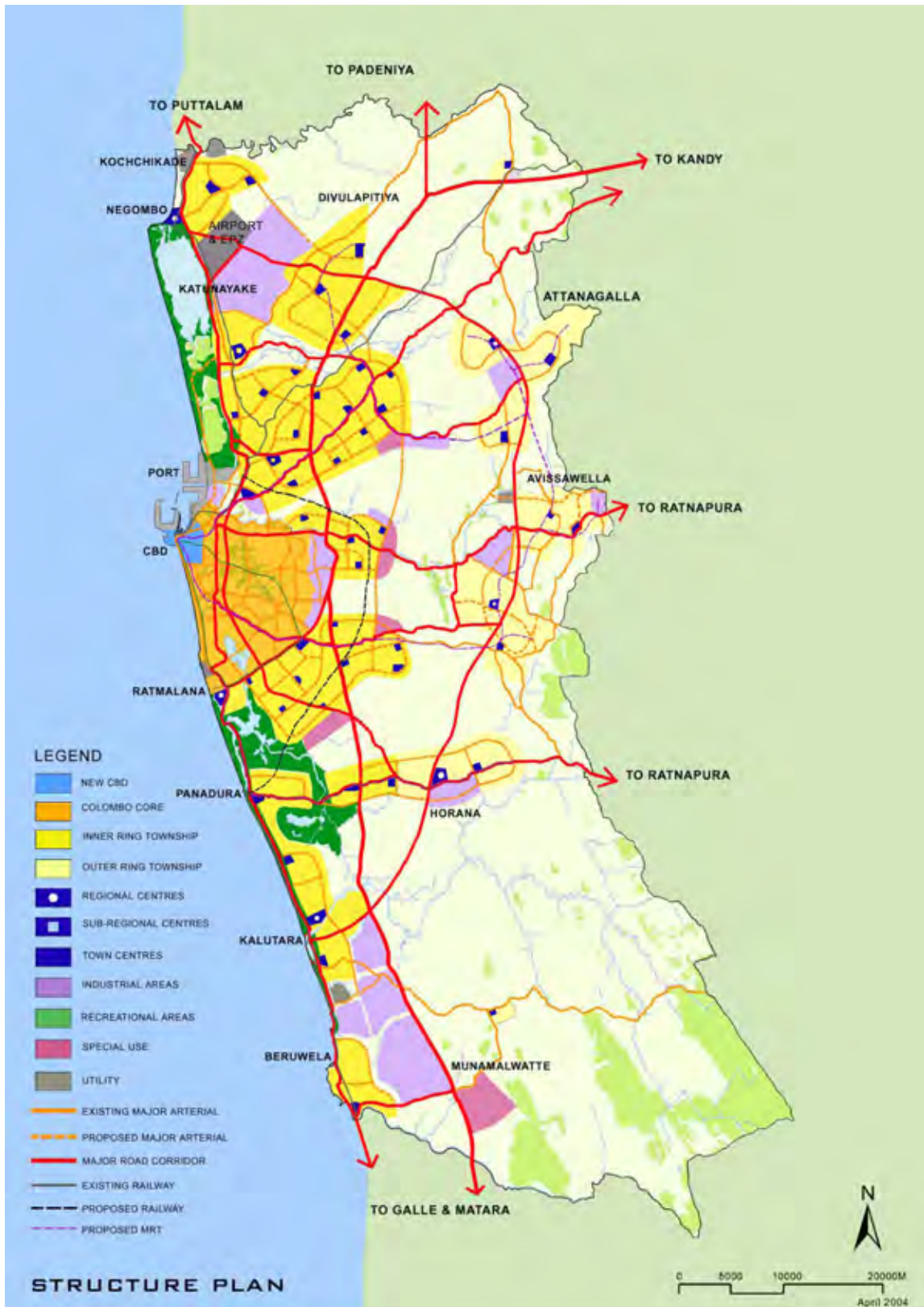
The Core Area Plan recognizes the importance of achieving a number of objectives such as to establish a Green Network system and improve pedestrian friendly concepts in built up areas for environmental enhancement, and so on.

The population distribution and its growth was set as shown in the Table D.2.4. The Colombo Core will accommodate about 1.9 million population, a 50% increase of its current population, while inner necklace townships will take the biggest load of about 4.8 million and outer necklace townships that are within environmentally sensitive areas will accommodate the least population of about 1.1 million.

Table D.2.4 Population Distribution 2030 (in Millions)

<b>District</b>	<b>Core</b>	<b>Inner Necklace</b>	<b>Outer Necklace</b>	<b>Rural Area</b>	<b>Total</b>	<b>Present Population</b>
Gampaha	--	2.75	0.48	0.25	3.48	2.06
Colombo	1.94	1.05	0.4	--	3.39	2.23
Kalutara	--	1.04	0.24	0.25	1.53	1.12
Total	1.94	4.84	1.12	0.5	8.4	5.41

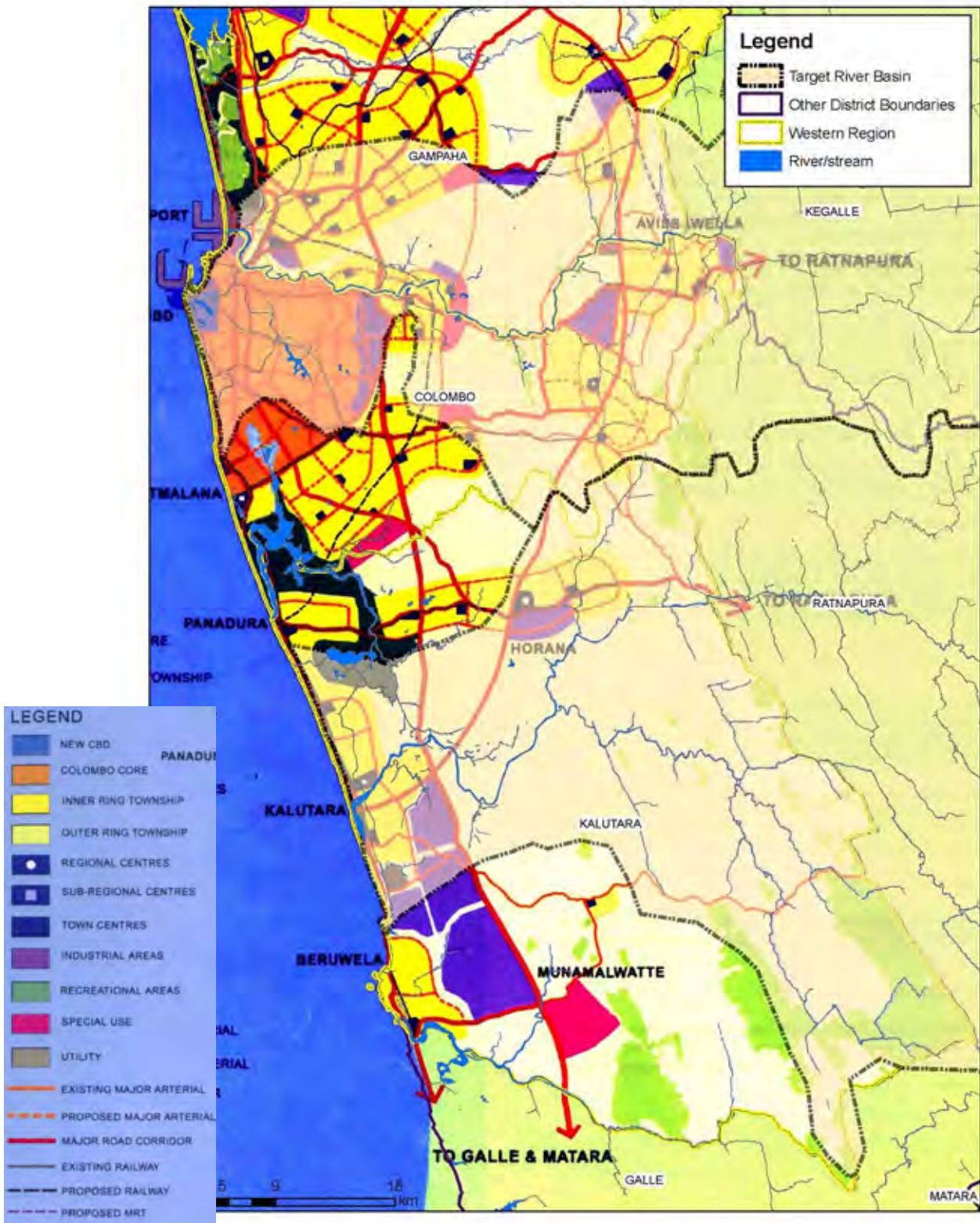
*Source: Regional Structure Plan of the Western Region Megapolis*



Source: Regional structure plan of western region megapolice in 2030

Figure D.2.2 Structure Plan of Western Region





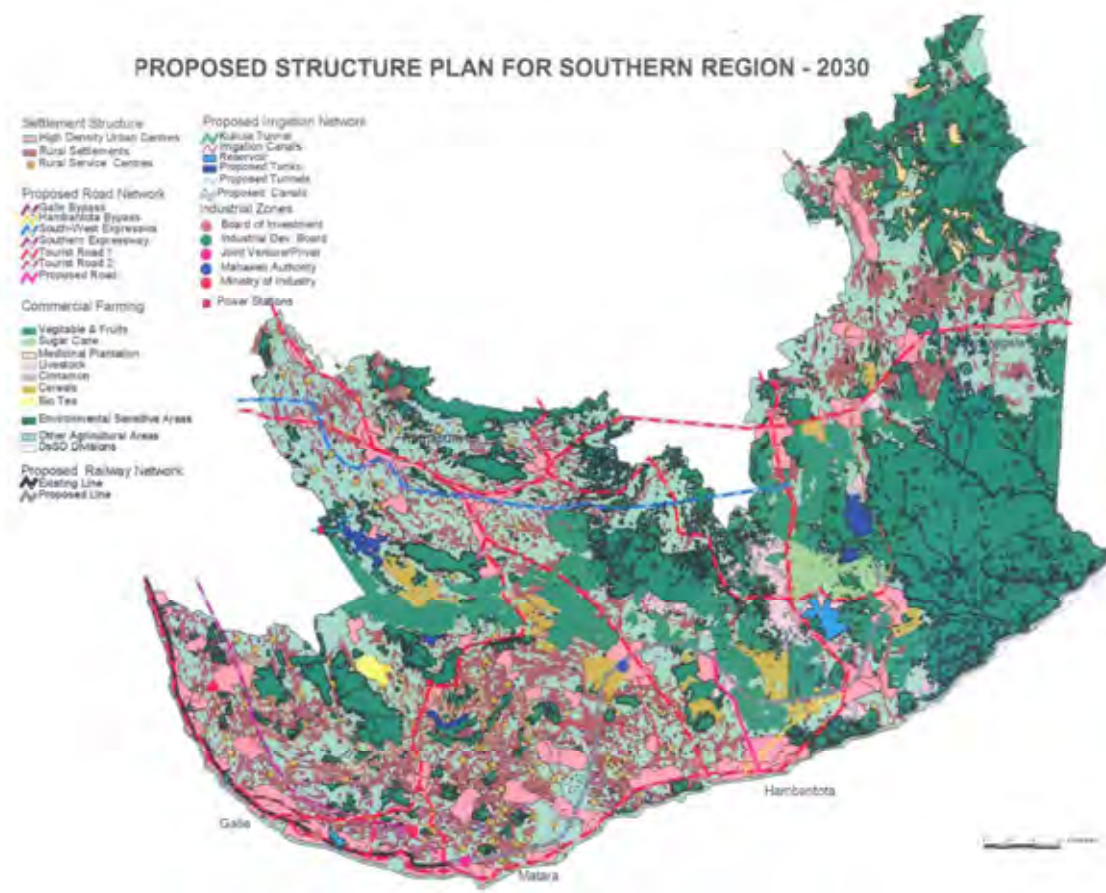
Source: Regional structure plan of western region megapolice in 2030

Figure D.2.3 Western region development plan & target river basins

(2) Southern Region

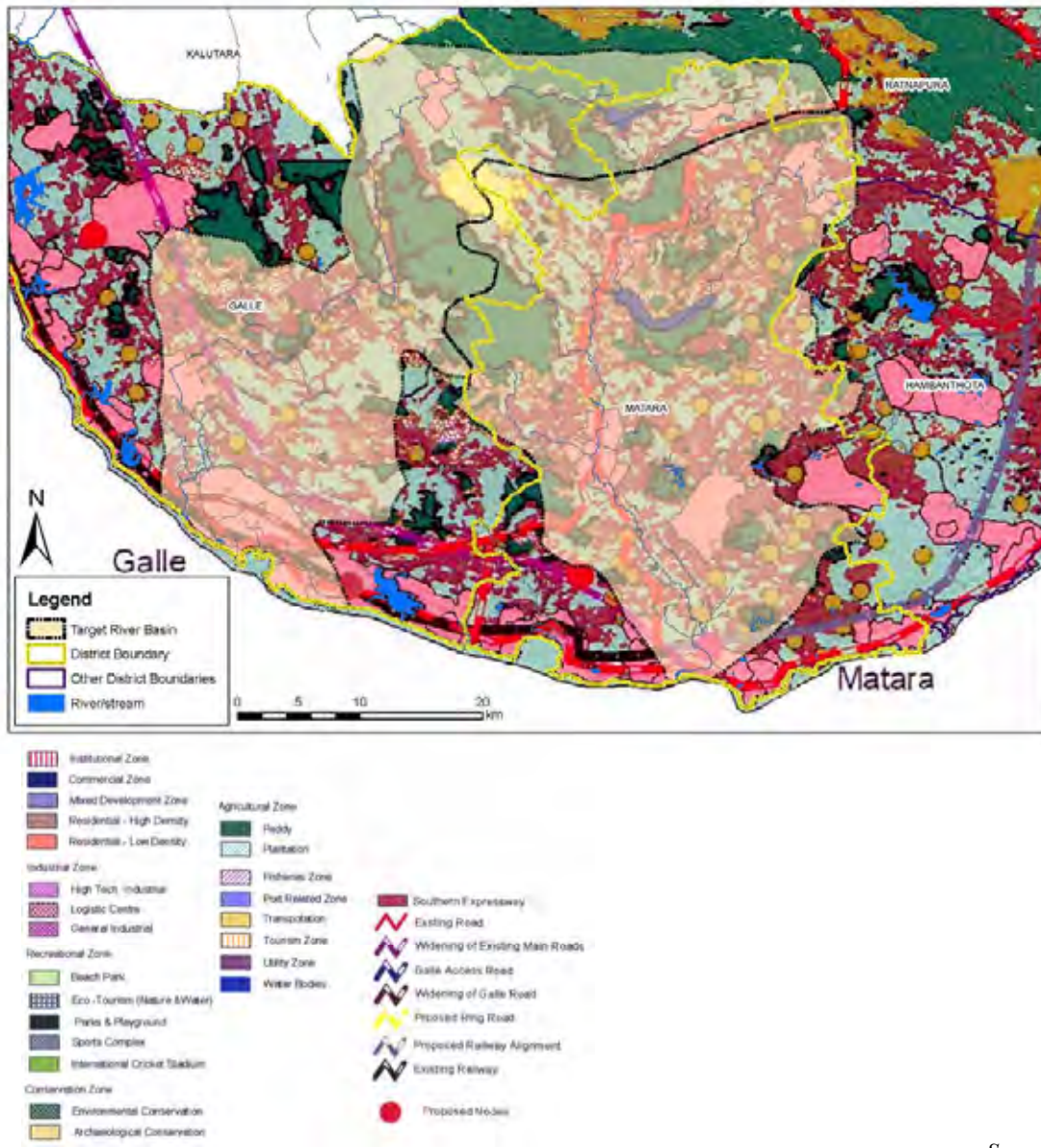
In the Southern Province, the population is concentrated to Galle District and Matara District. In addition, Hambantota are planning to be a National Urban Center which leads the regional development in the NPPP. However, the future development area is located around Gall and Matara City.

The development which affects to this region the most is new construction of the South-West Expressway. The road will be connected Galle/Matara area to Colombo City. Along this road, industrial area will be developed and it is expected that the economic activities will be accelerated in this region. This will possibly bring wider change of the land. That land use change should be managed carefully with strong policy.



Source: UDA

Figure D.2.4 Proposed Structure Plan for Southern Region - 2030



Source: UDA

Figure D.2.5 Southern Region Development Plan and the Target River Basin Area

### D.2.3 Wet Zone Conservation Plan in Western Province

In May 2004, the National Policy on Wetlands was approved by the Government of Sri Lanka. During the last 15 years, Sri Lankan Authorities have increasingly recognized the importance of wetlands and their management. The first major step was the establishment of the National Wetland Steering Committee (NWSC) in 1990 with Cabinet approval, which was reconstituted in 2003, in order to integrate plans for wetland areas and to coordinate development and conservation activities. The Secretary in charge of the Ministry of Environments and Natural Resources is the chairman of NWSC.

The overall landscape of the Western Region is characterized by its extensive Wetlands<sup>1</sup> network. This is an important asset of the Western Region although from time to time it has been reclaimed legally or illegally for development. The master plan has been needed to address the wetlands issue to ensure that this valuable asset is maintained and optimally and environmentally utilized.

In these regards, a Wet Zone Conservation Plan has been discussed by the initiative of Sri Lanka Land Reclamation and Development Corporation (SLLRDC) with relevant agencies such as Urban Development Authority (UDA), Central Environmental Authority (CEA), and so on in 2006.

The classification of the land use for wetland conservation are shown as follows:

- Wetland Protection Zone
- Wetland Nature Conservation Zone
- Wetland Agricultural Zone
- Special Paddy Cultivation Zone
- Low-lying Potential Development Zone

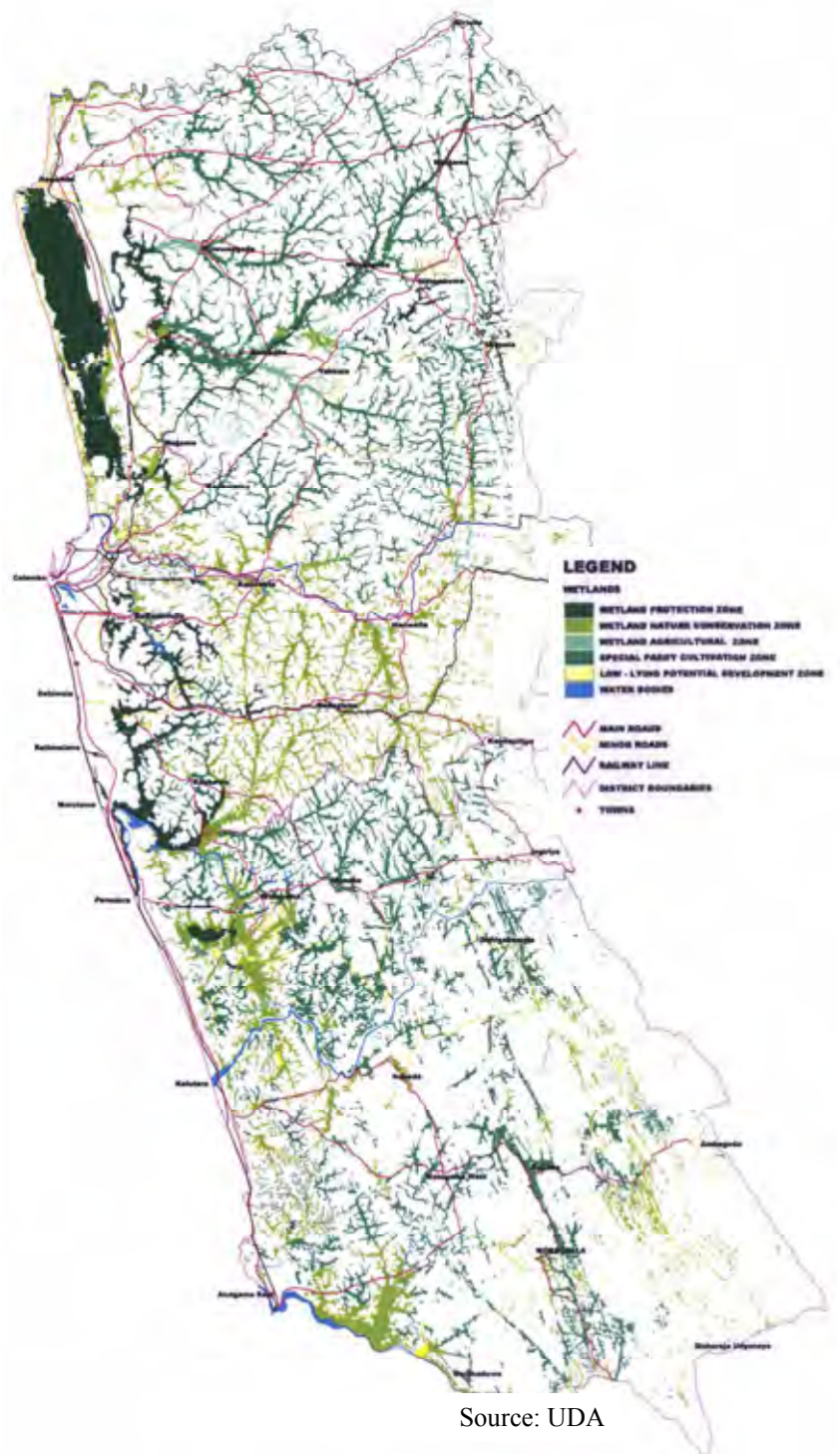
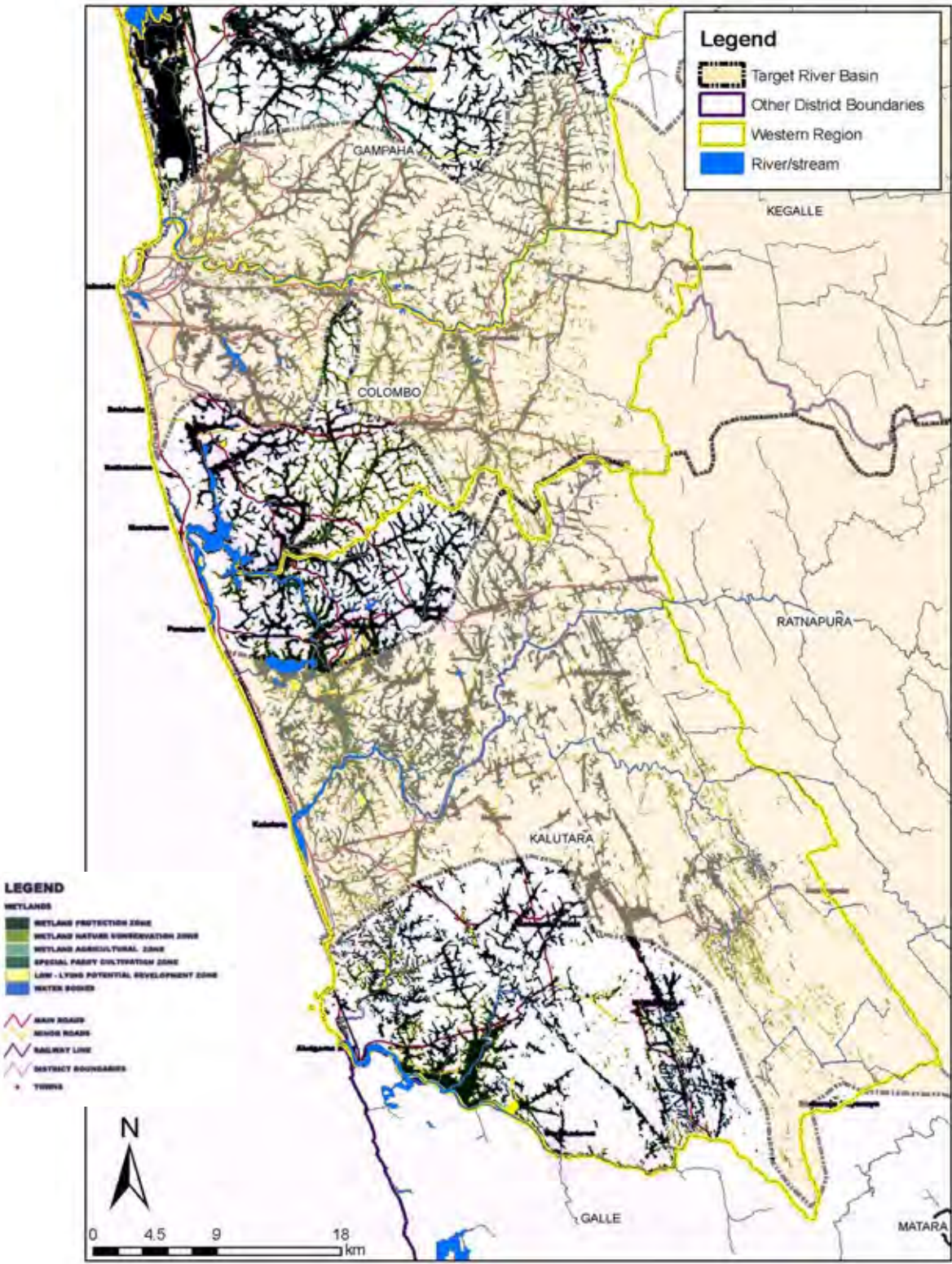


Figure D.2.6 Wet Zone Conservation Plan

<sup>1</sup> Wetlands means Areas of marsh, fen, peatland or water, where natural or artificial, permanent or temporary, with water that is static or flowing, fresh, brackish or salt, including areas of marine water the depth of which at low tide does not exceed six meters and may incorporate riparian and coastal zones adjacent to the wetlands, and islands or bodies of marine water deeper than six meters at low tide within the wetlands.



Source: Study Team Prepared based on the Data from UDA

Figure D.2.7 Wet Zone Conservation Plan and Target River Basin

### D.3 Land Use by the Target River Basins

The rivers which are included in the study area are Kelani River, Kalu River, Gin River, and Nilwala River. Their respective lengths and total river basin area and their location are shown in Table D.3.1. The four target river basins are 400 km long and 7,188 ha in terms of total area. Kelani River, which is 129km long, is the biggest river which runs through Colombo District where the central functions of government and economic activities are concentrated into the metropolitan area. This river also forms the boundary of Colombo District and Gampaha District.

Table D.3.1 Outline of the Target Four River Basins

River Name	District Included in Its River Basin	Length (km)	River Basin Area (km <sup>2</sup> )	
Kelani	Colombo, Gampaha, Kegalle, Nuwala Eriya	150	2,292	
Kalu	Kalutara, Ratnapura	101	2,719	
Gin	Galle, Matala, Ratnapura	113	932	
Nilwala	Matala	78	971	
<b>Study Area Total</b>		<b>442</b>	<b>6,914</b>	

Source: GIS Database developed by Study Team, original data from Survey Department of Sri Lanka

Table D.3.2 Jurisdiction and Population of the Four River Basins and Its Surroundings

River Basin	Province	District	Population (persons)	Total	Population Density (persons/ha)
Kelani	Western	Colombo	2,230,804	5,246,710	32.8
		Gampaha	2,066,096		77.1
	Central	Nuwala Eriya	700,083		192.4
	Sabaragamuwa	Kegalle	249,727		58.6
Kalu	Western	Kalutara	1,060,800	2,068,964	81.7
	Sabaragamuwa	Ratnapura	1,008,164		313.8
Gin	Southern	Galle	990,631	2,760,031	17.1
		Matala	761,236		89.9
	Sabaragamuwa	Ratnapura	1,008,164		313.8
Nilwala	Southern	Matala	761,236	761,236	89.9

Note: Population is shown by district not showing the population within each river basins

Source: Population Census

Land use in the four target river basins is depicted in Figure D.3.1 and summarized in Table D.3.3, Table D.3.4 and Table D.3.5. According to these map and data, the following characteristics can be found.

- Kelani river basin has the most crowded population because of concentration of road network. Also, other river basins have their population concentrated along the coastal area near river mouth.
- The ratio of the built-up area also shows that Kelani river basin is the most developed area among these four river basins.
- Kelani river basin has the largest area of crop field (49.7%) such as coconut, rubber and tea. Among these crops, rubber accounted the most 67.4% in the crop field.
- Kalu river basin has the largest cultivated area of 43.2 % such as chena, paddy area, homesteads/garden, and other cultivation. Within the cultivated area, chena and homesteads/garden occupy the largest area which account for 38.9% and 36.1% respectively.
- Regarding Gin river basin, cultivated area accounts for the largest area (38.5%) while its forest area (23.1%) shows the highest ratio within the four river basins.
- Along Nilwala river basin, cultivated area occupies the largest area at 45.6%. The homesteads/garden spreads the largest area (60.7 %) within the cultivated area.
- Among crop fields of the four river basins, Kelani and Kalu river basins have relatively larger ratio of rubber field, and Gin and Nilwala river basins have relatively larger ratio of tea field. This shows that cultivation of tea is more active in the southern area.
- Scrub area accounts for a relatively larger ratio in Gin river basin and Nilwala river basin (11.5 % and 10.5 %, relatively).
- Gin river basin has relatively the largest ratio of forest area (23.1 %).
- Paddy field occupies relatively larger ratio in Gin river basin and Nilwala river basin (31.7% and 31.1%, respectively).

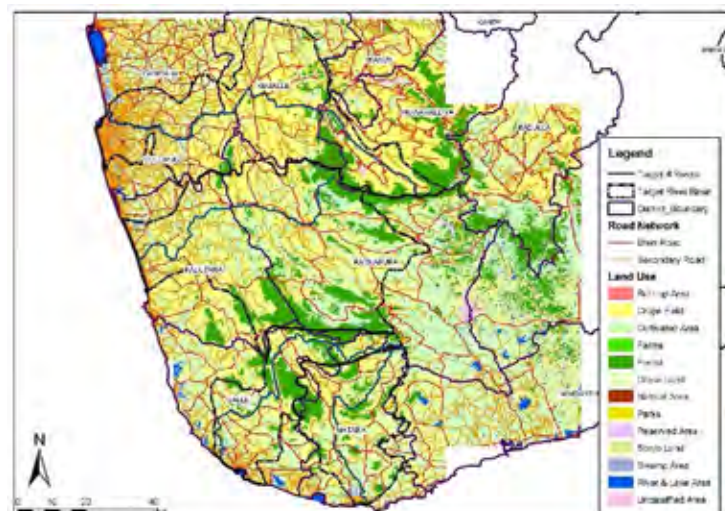


Figure D.3.1 Land Use around Target Four River Basins

Table D.3.3 Land Use along the Four River Basin (Above: ha, Below: %)

	Kelani	Kalu	Gin	Nilwala	Total
Built-up Area	2,278	84	189	428	2,979
	1.0	0.0	0.2	0.4	
Public Open Space (Park, Cemetery, etc.)	0	0	0	0	0
	0.0	0.0	0.0	0.0	0.0
Cultivated Area	80,039	122,333	35,859	46,948	285,179
	34.0	43.2	38.5	45.6	
Crop Fields	117,077	95,054	22,744	24,067	258,942
	49.7	33.6	24.4	23.4	
Farm Area	0	0	0	0	0
	0.0	0.0	0.0	0.0	
Grass Land	0	169	147	134	450
	0.0	0.1	0.2	0.1	
Scrub Area	5,289	7,743	10,718	10,791	34,469
	2.2	2.7	11.5	10.5	
Forest Area	23,598	51,540	21,506	19,039	115,683
	10.0	18.2	23.1	18.5	
Reservation Area	963	0	24	0	987
	0.4	0.0	0.0	0.0	
Swamp Area	1,769	194	445	415	2,823
	0.8	0.1	0.5	0.4	
Natural Field (Sand, Rock, etc.)	1,723	800	325	21	2,869
	0.7	0.3	0.3	0.0	
Water Area	3,001	4,969	1,202	1,109	10,281
	1.3	1.8	1.3	1.1	
<b>TOTAL</b>	<b>235,736</b>	<b>282,885</b>	<b>93,159</b>	<b>102,952</b>	<b>714,662</b>
	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	

Source: GIS Database developed by Study Team, original data from Survey Department of Sri Lanka

Table D.3.4 Land Use along the Four Target River Basins : Breakdown of Crop Field  
(Above: ha, Below: %)

	Kelani	Kalu	Gin	Nilwala
Coconut	10,951	4,189	2,165	2,256
	9.4	4.4	9.5	9.4
Rubber	78,938	73,052	8,750	5,827
	67.4	76.9	38.5	24.2
Tea	27,188	17,813	11,830	15,984
	23.2	18.7	52.0	66.4
<b>TOTAL</b>	<b>117,077</b>	<b>95,054</b>	<b>22,744</b>	<b>24,067</b>
	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>

Source: GIS Database developed by Study Team, original data from Survey Department of Sri Lanka



Table D.3.5 Land Use along the Four Target River Basins : Breakdown of Cultivated Area  
(Above: ha, Below: %)

	<b>Kelani</b>	<b>Kalu</b>	<b>Gin</b>	<b>Nilwala</b>
Homesteads/Garden	59,299	44,212	18,470	28,491
	74.1	36.1	51.5	60.7
Paddy Area	17,951	25,935	11,367	14,578
	22.4	21.2	31.7	31.1
Chena	276	47,580	2,850	1,928
	0.3	38.9	7.9	4.1
Other Cultivation	2,513	4,606	3,172	1,950
	3.1	3.8	8.8	4.2
<b>TOTAL</b>	<b>80,039</b>	<b>122,333</b>	<b>35,859</b>	<b>46,948</b>
	100.0	100.0	100.0	100.0

Source: GIS Database developed by Study Team, original data from Survey Department of Sri Lanka

The detail land use by each river basin is investigated in the followings. The items for the investigation are 1) existing land use, 2) change from the past land use, 3) future land use and 4) specific development activities that are located in the inundation area.

The existing land use is investigating the characteristics of the land use in the Study Area based on the GIS database which has been developed by the Study Team utilizing the GIS data bought from the Survey Department of Sri Lanka.

The change from the past land use is investigating the characteristics of the change occurred between the past land use in 1981 ~ 1984 and the existing land use around 2000. The land use is changing as the time may demand of the policy and economic situation. This section is investigating two maps of the old land use which was acquired from the Survey Department and the current land use which could calculate on the GIS database developed by the study team based on the GIS Data of the Survey Department. However, unfortunately, an old land use map for Kalutara District was not available. Moreover, the classification of land use type sometimes differs from the old land use map and the data in GIS, and the method of the calculation is different. Therefore, the analysis made in this section is limited in generally speaking trend and not requiring accuracy of the number itself.

The future land use is investigating the possible change of land use based on the development plan of provincial level and district level. The provincial level development plan has been managed by the National Physical Planning Department (NPPD) and the district level development plan has been managed by the Urban Development Authority (UDA). However, the year when the development plan was prepared and the target year are different by the plan.

The specific development activities that are located in the inundation area is investigating the development activities which will affect to change of land use in the inundation area where identified in this study based on the development plan.

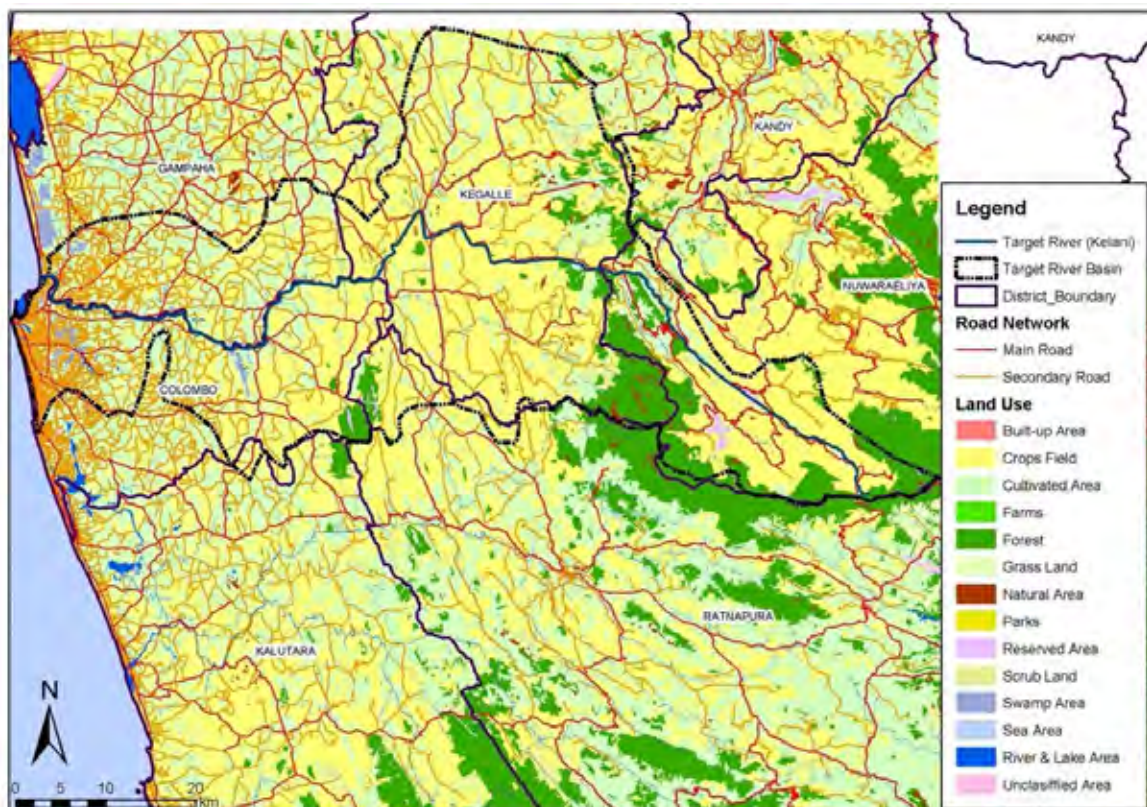
### D.3.1 Kelani River

#### (1) Existing Land Use

Kelani River, which is 150 km long of the entire river, originates its flow in Nuwala Eriya District, runs through Kegalle District, Colombo District and Gampaha District, and flows into the Indian Ocean. The Kelani River basin spreads 2,292 km<sup>2</sup> and its vertical drop is 2,160 m.

The characteristics of land use are as follows (refer to Figure D.3.2 and Land Use Data Sheet in Appendix).

- Built-up area occupies 1.0% of the river basin area which is the largest area in the four river basins.
- Crop fields spreads almost half (49.7 %) of the river basin area. Within this area, rubber field accounts for the largest area (67.4 %).
- The second largest utilization of the land is for cultivated area (34.0 %). Within this area, homesteads/garden area accounts for the largest area (74.1 %) and paddy area is the second largest (22.4 %).



Source: GIS Database developed by Study Team. Original data from Survey Department of Sri Lanka.

Figure D.3.2 Land Use around Kelani River Basin

#### (2) Change from the Past Land Use

- The land use which has been made a remarkable change is the homestead, that is, the 17% of decrease in these almost twenty years. Especially in Gampaha and Kegalle District, the decrease is significant. Contrary, it is increasing widely in Colombo District.

- Instead of the increase of the homestead area in Colombo District, rubber and coconut area are decreasing. It seems that the change cause by the residential development in suburban area of Colombo District instead of the plantation area.
- The forestland is also significantly decreased of 19 % from twenty years ago.
- The coconut area is increasing in Gampaha and Kegalle District instead of the homestead area.
- The rubber area is increasing in Kegalle District, especially Dehiowita, Delaniyagala, Yatiyanthota area.
- The tea area is increasing in Nuwara Eliya District instead of the decrease of the grassland.

Table D.3.6 Change of the Total Land Use of the Districts along Kelani River  
(Colombo, Gampaha, Kegalle, Nuwara Eliya)

		Old	Current	
Urban Land	Built-up Land		10,799	2,993
	Associated Non-agricultural Land		804	0
Agricultural Land	Homesteads		139,694	115,794
	Tree and Other Perennial Crops	Tea	68,464	70,930
		Rubber	75,512	88,148
		Coconut	42,283	35,584
		Cinnamon	-	0
		Mixed Tree and Other Perennial Crops	13,254	0
		Oilpalm	-	0
	Cropland	Paddy	48,777	42,503
		Sparsely Used Cropland (Chena)	9,482	275
		Other Cropland	33,758	5,710
Forestland	Natural Forest	Dense Forest	40,523	50,885
		Open Forest	13,489	
	Forest Plantations		8,919	
Rangeland	Scrubland		12,518	11,077
	Grassland		9,541	10
Wetland	Forested	Mangroves	619	0
	Non-forested	Marsh	2,880	3,415
Water		11,139	8,722	
Barren Land		1,683	4,141	
(Area where is not covered by GIS Database developed by the Study Team)		0	97,229	
<b>TOTAL</b>		<b>543,778</b>	<b>537,415</b>	

Source: Calculated by the Study Team based on the Data Sheet by District which has been made based on the map of the Survey Department

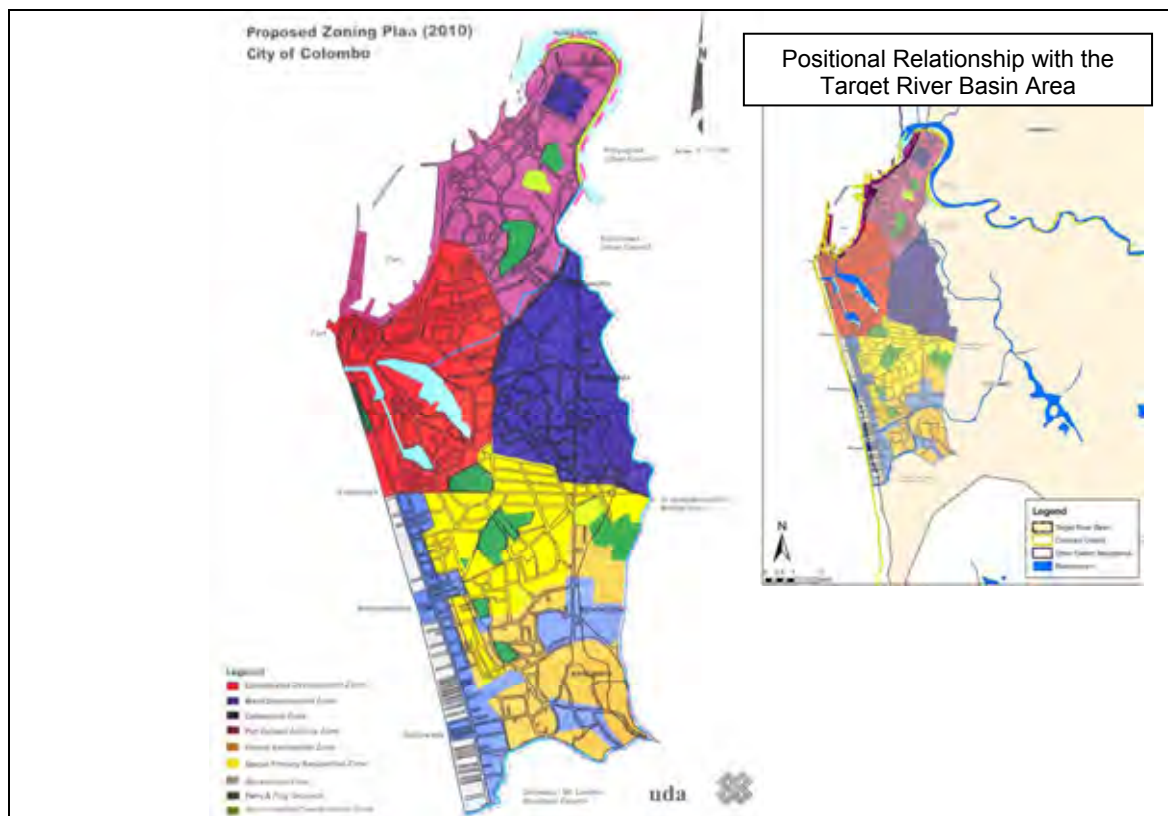
(3) Future Land Use (Provincial Level Development Plan of Western and Sabaragamuwa Province, District Level Development Plan of Colombo, Gampaha and Kegalle)

The future land use plan of the district was available for Colombo, Kegalle and Nuwara Eliya. The Plan for Gampaha District was not available because of lack of stock. Besides, the urban development area of Kegalle and Nuwara Eliya District are out of the study area.

However, we should pay attention for the development plan of Colombo Core Area in the Regional Structure Plan of the Western Region Megapolis, because the latest Colombo Development Plan was not available since revision works to come up with the current situation has not been finished yet.

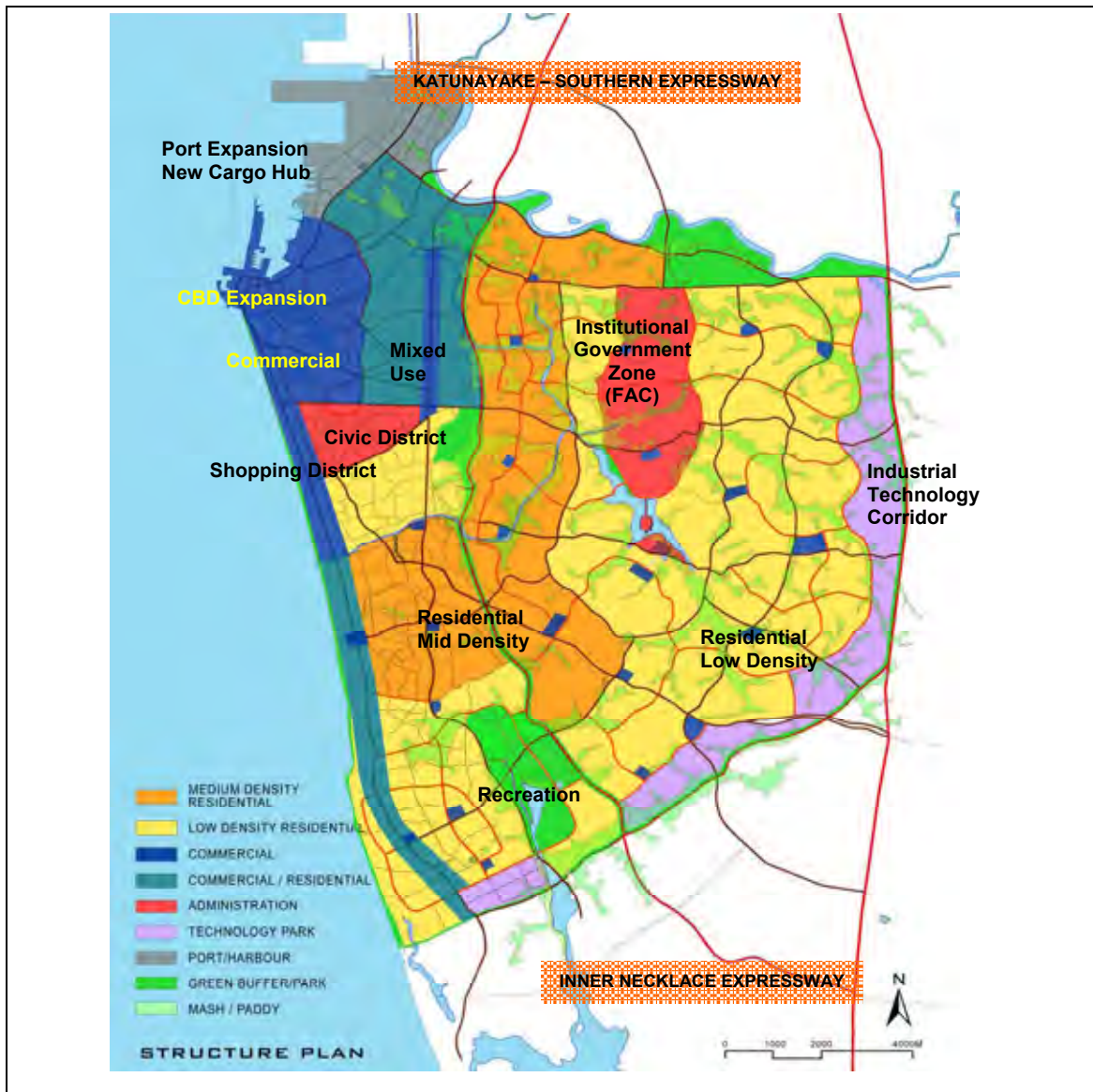
According to the Colombo Development Plan, the land use in 2010 had been planned as shown in the Figure below. The area along the Kelani River was planned as the Port Related Activity Zone.

Besides, in the Regional Structure Plans of the Western Region Megapolis, the Colombo Core Area was covering wider area than the Colombo Development Plan reflecting current concentrating of population and economic activities. The area along the Kelani River was planned as Port Expansion Area, Mixed Use Area, Residential Area of Mid Density, and Green Buffer / Park Area.



Source: Colombo Development Plan 1999, UDA

Figure D.3.3 Future Land Use Plan of the City of Colombo



Source: Regional Structure Plan of the Western Region Megapolis, UDA

Figure D.3.4 Future Land Use Plan of the Colombo Core Area

(4) Specific Development Activities that are located in the inundation area

Colombo Core Area is the most populated and concentrated area in the country. Many economic and development activities not only new activities but also redevelopment work can be happened. In regards of the disaster management along the Kelani River, the development activities should be controlled by strict regulations and the leadership of the responsible agency.

In addition to the Colombo Core Area, Avissawella will become another residential center with industrial use according to the Regional Structure Plan of the Western Region Megapolis. The disaster management activities is also necessary in this area.

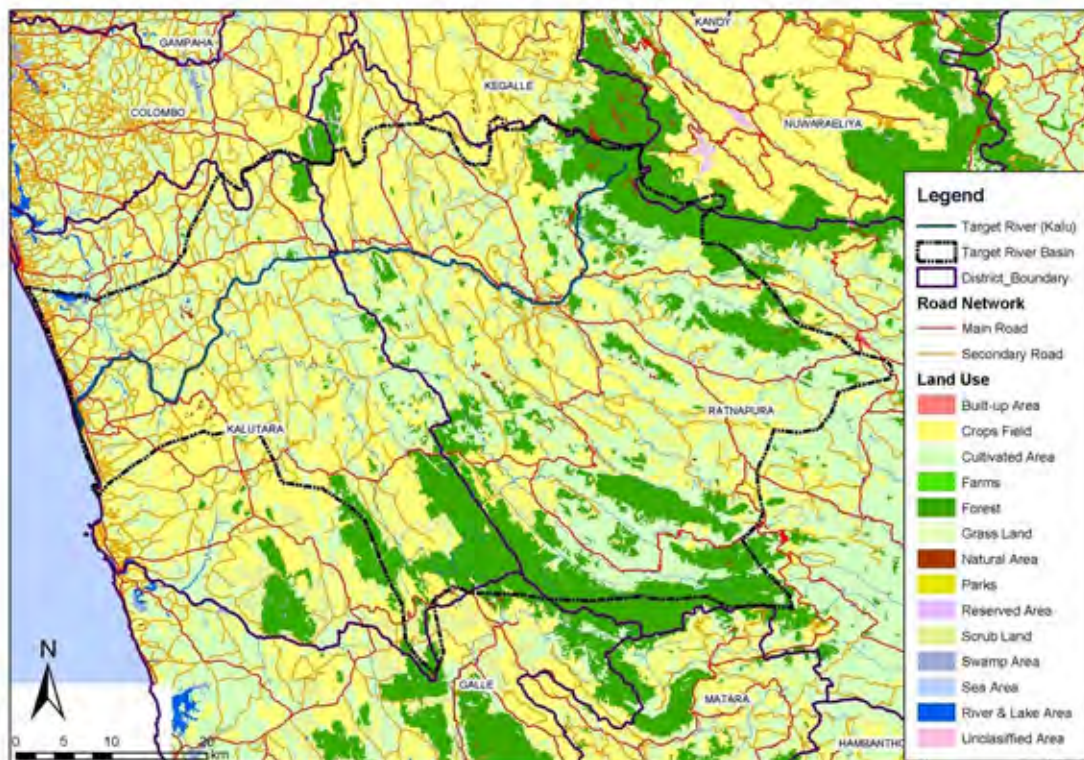
### D.3.2 Kalu River

#### (1) Existing Land Use

Kalu River, which is 101 km long of the entire river, originates its flow in Ratnapura District, runs through Kalutara District, and flows into the Indian Ocean. The Kalu River basin spreads 2,719 km<sup>2</sup> and its vertical drop is 1,960 m.

The characteristics of land use are as follows (refer to Figure D.3.5 and Land Use Data Sheet in Appendix).

- Cultivated area spreads the largest area (43.2 %) of the river basin area. Within this area, chena area and homesteads/garden area occupies almost the same ratio, 38.9 % and 36.1 %, respectively.
- The second largest utilization of the land is for crop field (33.6 %). Within this area, rubber field occupies the largest area of 76.9 %.
- Forest area occupies relatively large area (18.2 %).



Source: GIS Database developed by Study Team. Original data from Survey Department of Sri Lanka.

Figure D.3.5 Land Use around Kalu River Basin

#### (2) Change from the Past Land Use

- The total land use in current cannot compare with the old land use since the old land use map of Kalutara District was not available
- The rubber and homesteads area are increasing instead of the decreasing of the paddy and sparsely used cropland area.

- Kalutara District also has the vast rubber area.
- The forestland is slightly (2.5 %) decreased in Ratnapura District.

Table D.3.7 Change of the Total Land Use of the Districts along Kalu River  
(Kalutara and Ratnapura)

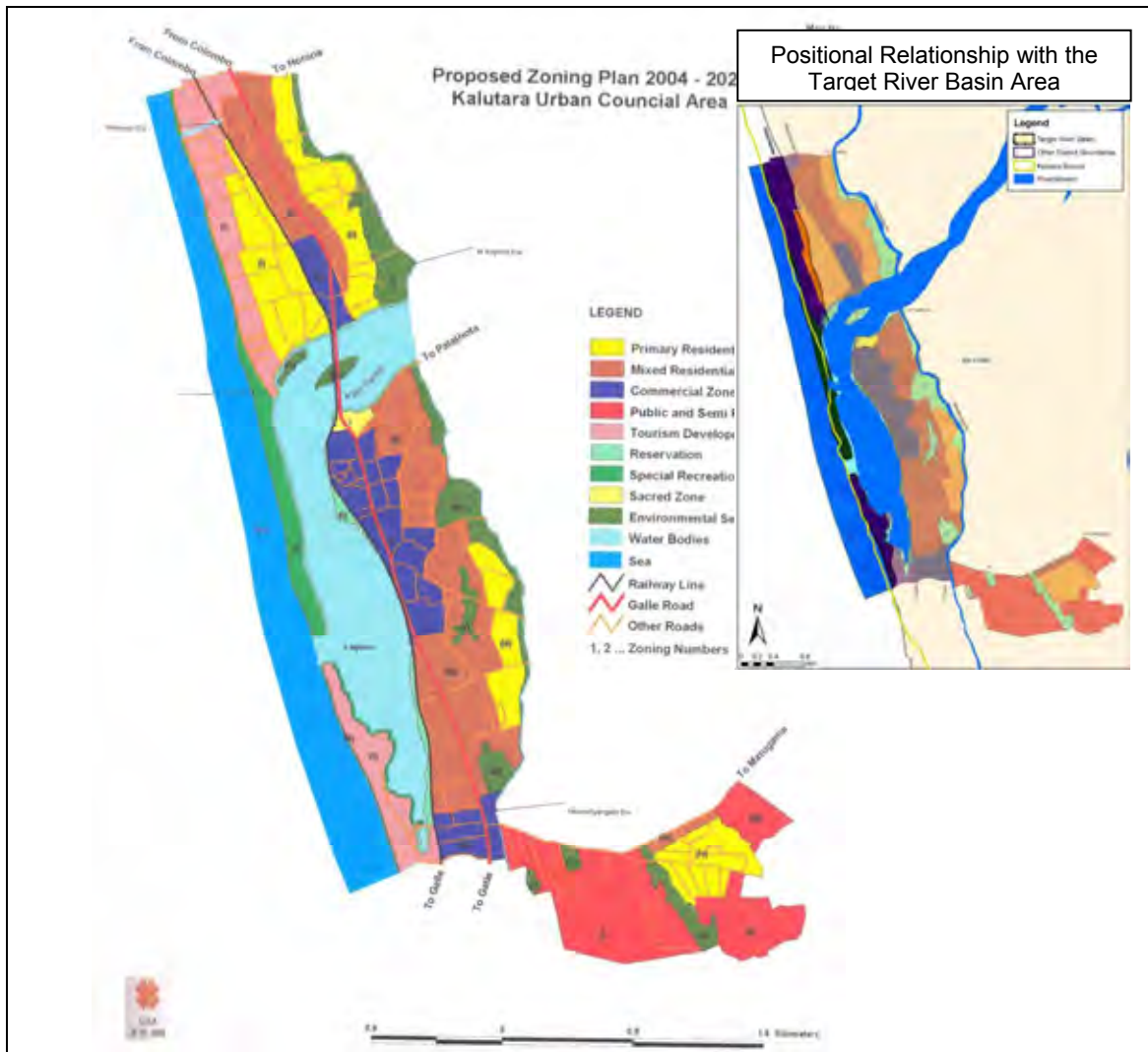
			Old Rathnapura Only	Current With Kalutara and Ratnapura
Urban Land	Built-up Land		260	368
	Associated Non-agricultural Land		90	0
Agricultural Land	Homesteads		52,480	83,624
	Tree and Other Perennial Crops	Tea	21,300	25,321
		Rubber	35,830	100,335
		Coconut	3,730	10,316
		Cinnamon	-	0
		Mixed Tree and Other Perennial Crops	4,220	0
		Oilpalm	-	0
	Cropland	Paddy	23,200	22,850
		Sparsely Used Cropland (Chena)	101,570	88,007
		Other Cropland	340	33,517
Forestland	Natural Forest	Dense Forest	48,430	71,146
		Open Forest	14,070	
	Forest Plantations		2,320	
Rangeland	Scrubland		11,970	15,901
	Grassland		3,150	2,667
Wetland	Forested	Mangroves	0	7,030
	Non-forested	Marsh	0	81
Water			3,950	5,517
Barren Land			630	3,768
(Area where is not covered by GIS Database developed by the Study Team)			0	3,514
<b>TOTAL</b>			<b>327,540</b>	<b>493,278</b>

(3) Future Land Use (Provincial Level Development Plan of Western and Sabaragamuwa Province, District Level Development Plan of Kalutara and Ratnapura)

Kalutara District is the city located at the river month of the Kalu River. In regard of this, the developed area is extended along the river and a sandbank is lying at the river mouth.

According to the Development Plan for Kalutara Urban Development Area, Commercial Zone, Mixed Residential Zone, Sacred Zone and Environmental Sensitive Zone has been planned.

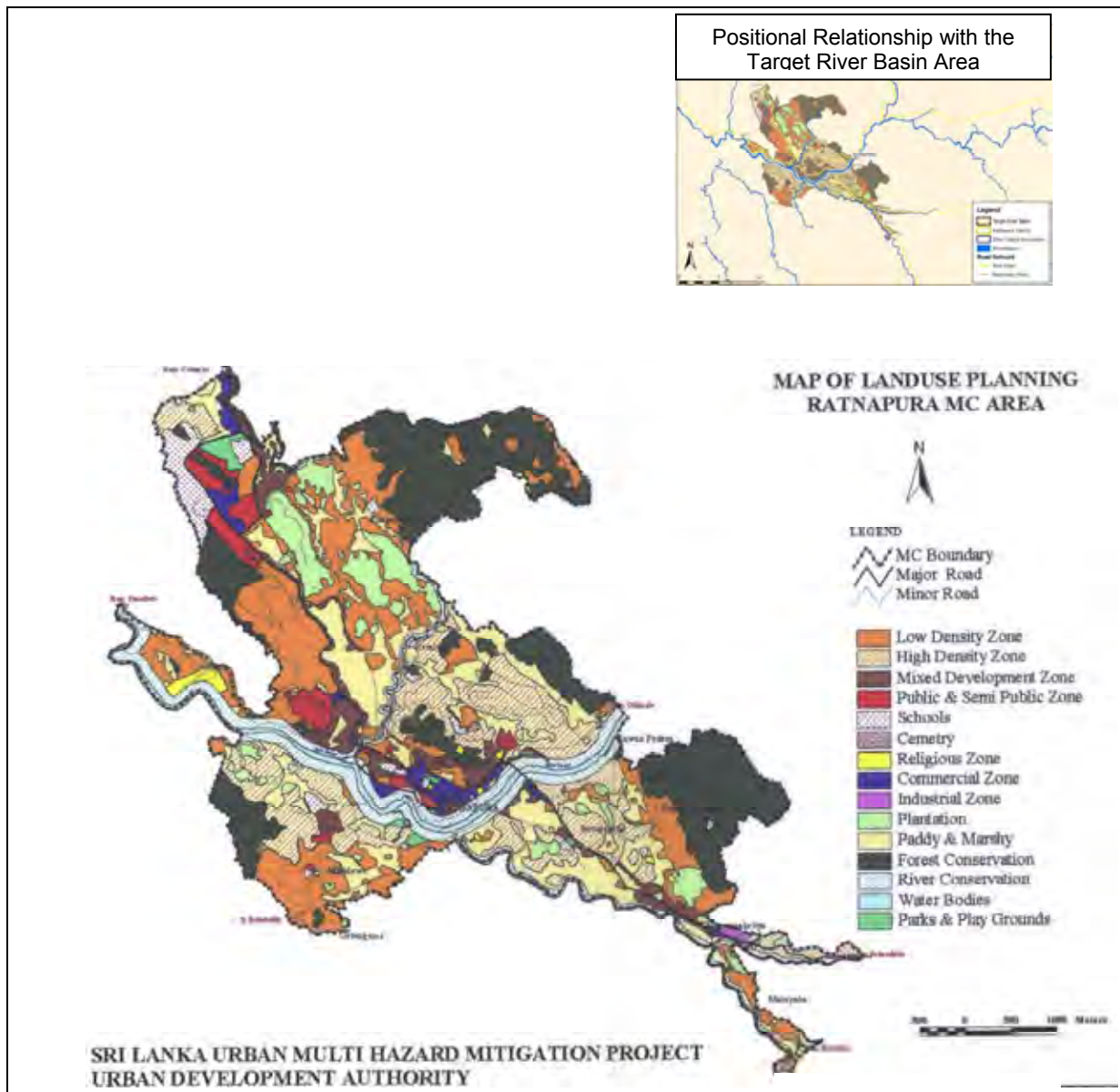
Besides, the Ratnapura Development Plan is showing an area for public & semi-public area and commercial area separated from the existing town center where frequently affected by the flooding of Kalutara River. That area is locating far from the bank of Kalutara River to avoid the flooding. Recently, UDA and the local government are developing that area as a new town center. Other from the existing town center, High and Low Density Residential Area were planned.



Source: Development Plan for Kalutara Urban Development Area, UDA

Figure D.3.6 Future Land Use Plan of Kalutara Urban Development Area





Source: Ratnapura Development Plan, UDA

Figure D.3.7 Future Land Use Plan of Ratnapura Urban Development Area

(4) Specific Development Activities that are located in the inundation area

In regard of the Regional Structure Plan for the Western Region Megapolis, Horana is also planned as a new town center with industrial and residential area. Those area is included in the possible affected area of the flooding by Kalutara River. Careful attention should be paid for the development and management of the town.

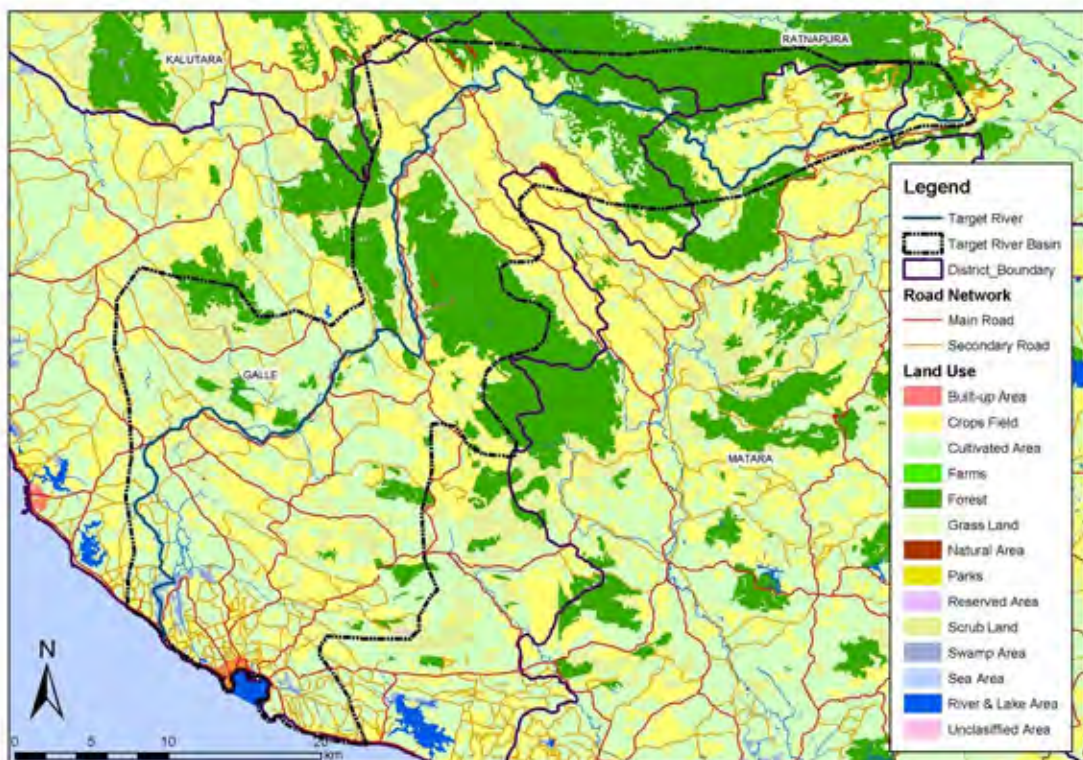
### D.3.3 Gin River

#### (1) Existing Land Use

Gin River, which is 113 km long of the entire river, originates its flow in Ratnapura District, runs through Matala District and Galle District, and flows into the Indian Ocean. The Gin River basin spreads 932 km<sup>2</sup> and its vertical drop is 1,280 m.

The characteristics of land use are as follows (refer to Figure D.3.8 and Land Use Data Sheet in Appendix).

- Cultivated area spreads the largest area (38.5 %) of the river basin area. Within this area, homesteads/garden area occupies more than half of this area (51.5 %) and paddy area is the second largest (31.7 %).
- The second largest utilization of the land is for crop field (24.4 %). Within this area, tea field occupies the largest area at 52.0 % and rubber field is the second at 38.5 %.
- Forest area occupies almost same ratio with the second largest (23.1 %).



Source: GIS Database developed by Study Team. Original data from Survey Department of Sri Lanka.

Figure D.3.8 Land Use around Gin River Basin

#### (2) Change from the Past Land Use

- Sparsely used cropland is drastically decreased and homesteads area is also decreased from the old land use. Moreover, paddy area and tea area are slightly decreased. Instead, the scrubland is widely expanded. It seems that the land has been quitted its utilization and became the rangeland. However, rubber area and coconut area are increased.

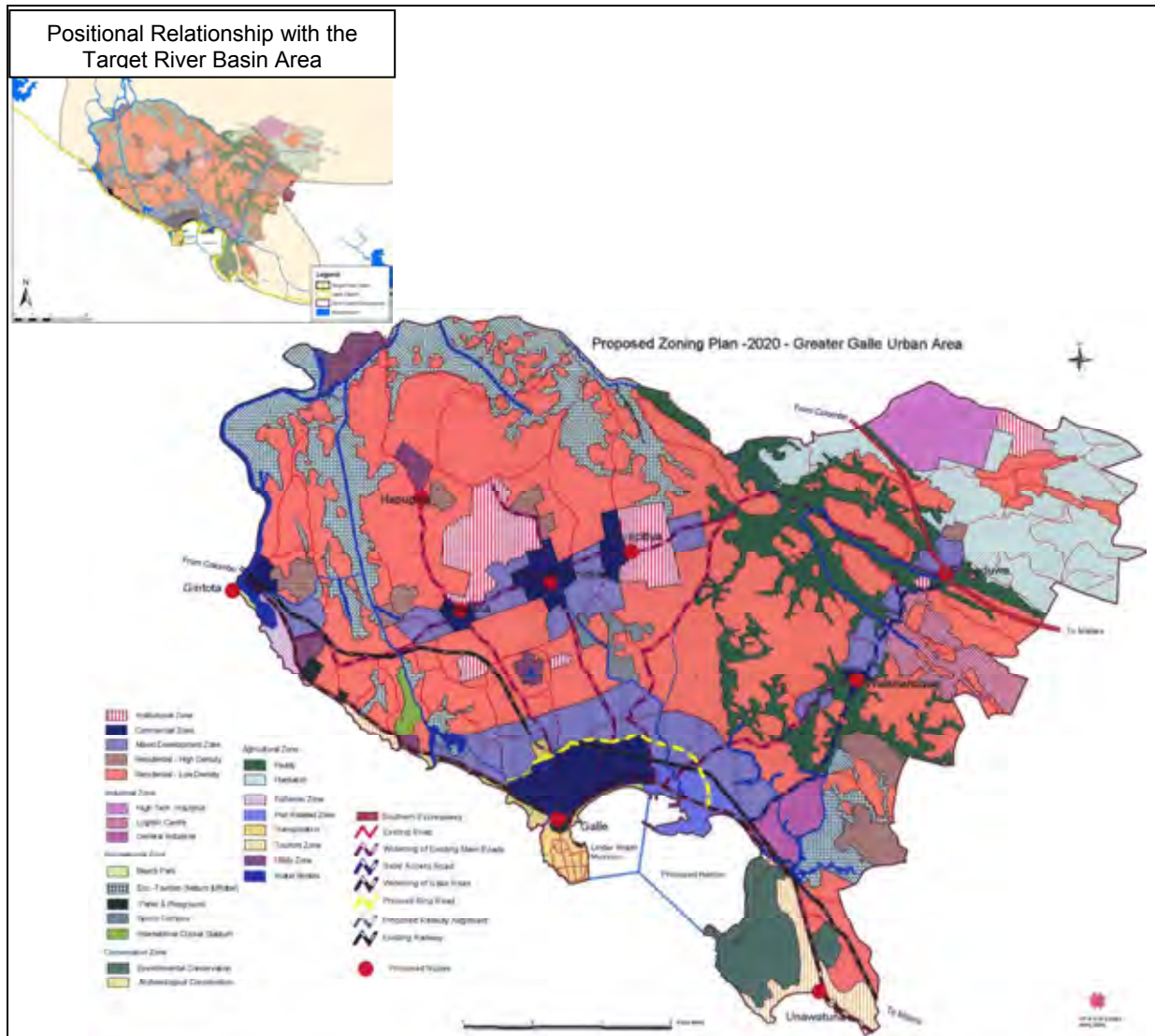
Table D.3.8 Change of the Total Land Use of the Districts along Gin River (Galle)

		Old	Current	
Urban Land	Built-up Land	580	688	
	Associated Non-agricultural Land	160	0	
Agricultural Land	Homesteads	46,500	38,705	
	Tree and Other Perennial Crops	Tea	16,000	12,373
		Rubber	16,000	19,559
		Coconut	2,370	7,444
		Cinnamon	6,280	0
		Mixed Tree and Other Perennial Crops	1,210	0
		Oilpalm	1,030	0
	Cropland	Paddy	28,070	24,772
		Sparsely Used Cropland (Chena)	16,320	1,037
		Other Cropland	70	8,991
Forestland	Natural Forest	Dense Forest	20,790	22,753
		Open Forest	2,070	
	Forest Plantations	740		
Rangeland	Scrubland	960	17,184	
	Grassland	910	150	
Wetland	Forested	Mangroves	470	0
	Non-forested	Marsh	490	1,901
Water		3,550	3,892	
Barren Land		590	634	
(Area where is not covered by GIS Database developed by the Study Team)		0	1,406	
<b>TOTAL</b>		<b>165,160</b>	<b>161,489</b>	

(3) Future Land Use (Provincial Level Development Plan of Southern Province, District Level Development Plan of Galle)

The future land use plan is defined covering the Greater Galle Urban Area. The planned land uses along Gin River are commercial area, low-density residential area, plantation area and technical facility area. The technical facility area means the existing water purifying facility. However, the water intake of that facility is locating in 10km upstream from the facility. The environment around the intake should be protected.

An interchange of the South-West Expressway is planned in the Area. The area around the interchange is planned as the high-density residential area and mixed-use area. In addition an area for logistic center is planned along the access road to the interchange, and huge area for high-tech industry is located along the expressway. However, those areas are away from main stream of the Gin River.



Source: Development Plan for Urban Development Area of Greater Galle (Revised Draft for Limited Circulation), UDA

Figure D.3.9 Future Land Use Plan of Galle Urban Development Area

(4) Specific Development Activities that are located in the inundation area

The development of the South-West Expressway and induced development in the area along the expressway will bring drastic change of the land use and economic activity in this region. However, the other considerations for this area are development of the port area and conservation of the World Heritage Area.

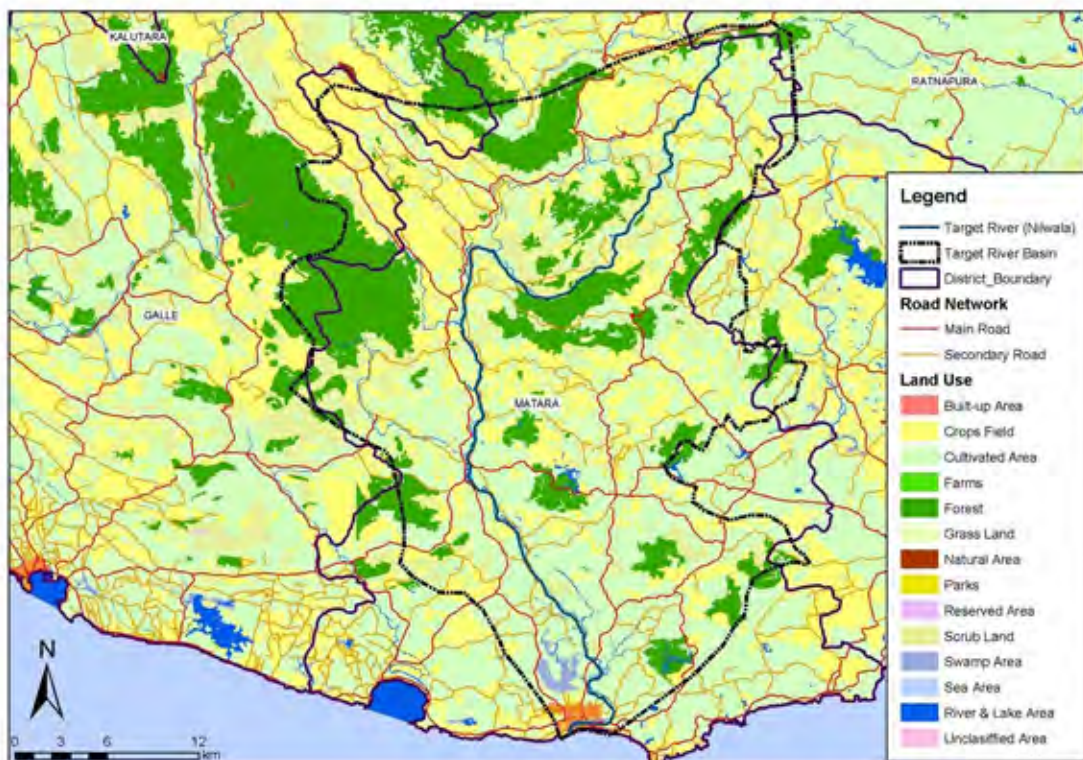
**D.3.4 Nilwala River**

(1) Existing Land Use

Nilwala River, which is 78 km long of the entire river, originates its flow around the boundary of Matara District and Ratnapura District, runs through Matara District, and flows into the Indian Ocean. The Nilwala River basin spreads 971 km<sup>2</sup> and its vertical drop is 980 m.

The characteristics of land use are as follows (refer to Figure D.3.10 and Land Use Data Sheet in Appendix)

- Cultivated area spreads the largest area (45.6 %) of the river basin area. Within this area, homesteads/garden area occupies the largest area at 60.7% and paddy area is the second largest at 31.1 %.
- The second largest utilization of the land is for crop field (23.4 %). Within this area, tea field occupies the largest area at 66.4 %.
- Forest area occupies relatively large area (18.5 %).



Source: GIS Database developed by Study Team. Original data from Survey Department of Sri Lanka.

Figure D.3.10 Land Use around Nilwala River Basin

## (2) Change from the Past Land Use

- Homestead area and paddy area are slightly increased. Besides, scrubland is increased more widely than the expansion of the agricultural land.
- Instead, tea area and sparsely used cropland are decreased.

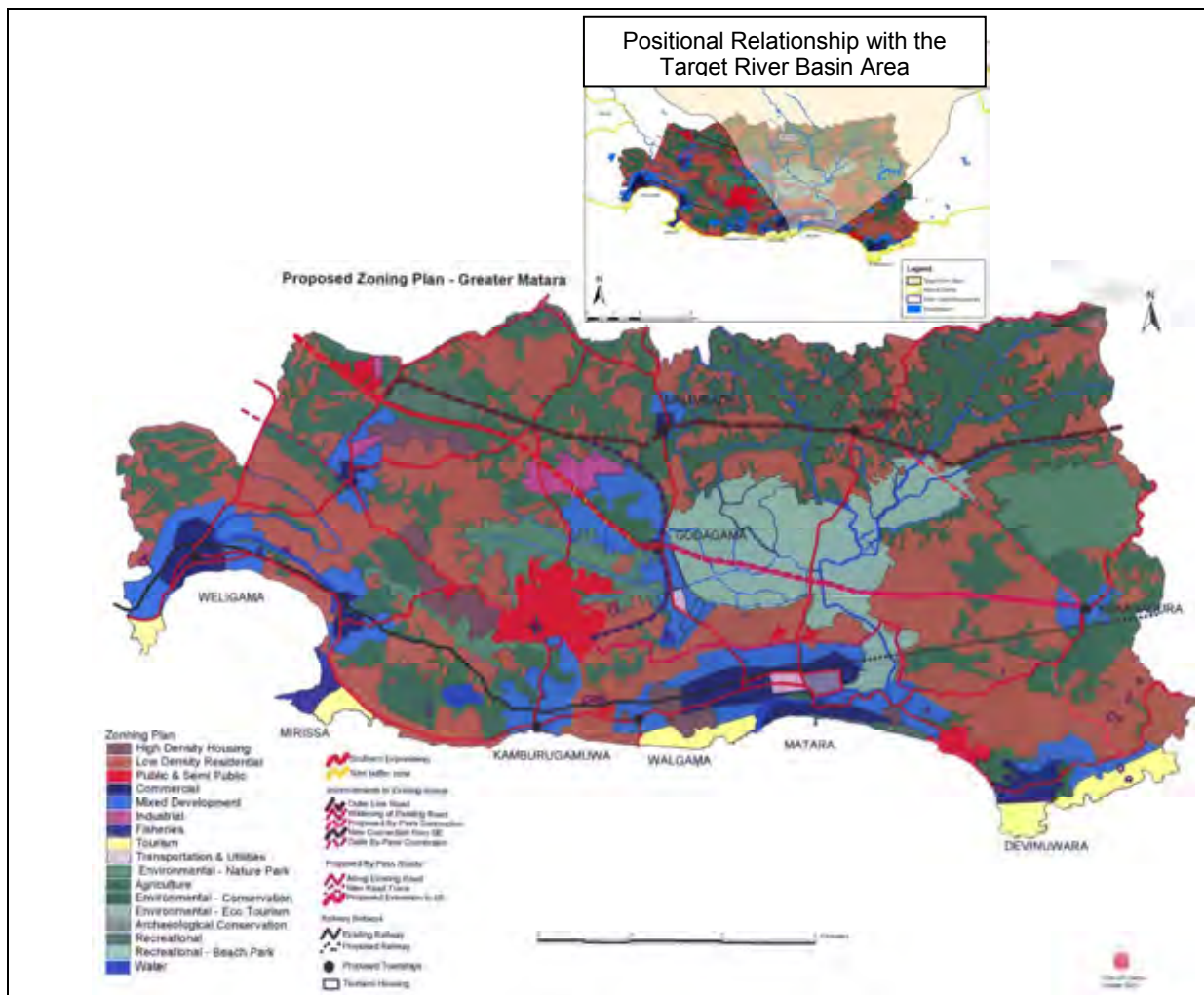
Table D.3.9 Change of the Total Land Use of the Districts along Nilwara River (Matara)

		Old	Current	
Urban Land	Built-up Land	610	441	
	Associated Non-agricultural Land	10	0	
Agricultural Land	Homesteads	39,120	42,512	
	Tree and Other Perennial Crops	Tea	20,130	18,151
		Rubber	6,230	6,981
		Coconut	5,210	6,173
		Cinnamon	2,600	0
		Mixed Tree and Other Perennial Crops	3,640	0
		Oilpalm	40	0
	Cropland	Paddy	16,890	19,337
		Sparsely Used Cropland (Chena)	9,690	2,721
		Other Cropland	80	1,735
Forestland	Natural Forest	Dense Forest	14,250	19,356
		Open Forest	2,990	
	Forest Plantations	1,430		
Rangeland	Scrubland	3,070	10,868	
	Grassland	200	148	
Wetland	Forested	Mangroves	20	0
	Non-forested	Marsh	480	502
Water		1,310	1,686	
Barren Land		250	294	
(Area where is not covered by GIS Database developed by the Study Team)		0	-102	
<b>TOTAL</b>		<b>128,250</b>	<b>130,806</b>	

(3) Future Land Use (Provincial Level Development Plan of Southern Province, District Level Development Plan of Matara)

The future development plan is defined within the Greater Matara Urban Area. The areas along the Nilwara River is planned mostly as environment-ecotourism area and environment- conservation area. However, commercial area and mixed development area are spread around the river mouth, also industrial area and archaeological conservation area are located along the river. These areas should be considered a disaster management program against flood disaster.

The development of the South-West Expressway is also planned in this region. A terminal of the expressway will be located in the east part of the region. However, around the area of the terminal interchange is planned as mixed development and low-density residential area. No area specialized for industry or logistic center is planned. In addition the Right of Way of the expressway is affecting the environmental-ecotourism area.






Source: Zoning Plan for Greater Matara, UDA

Figure D.3.11 Future Land Use Plan of Matara Urban Development Area

(4) Specific Development Activities that are located in the inundation area

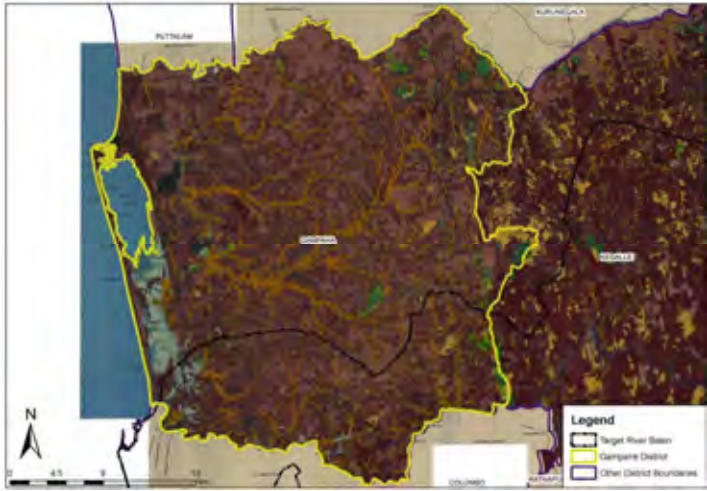

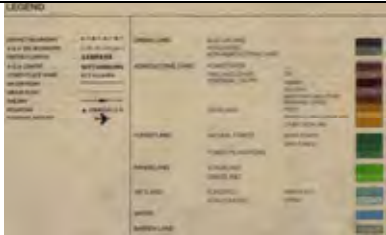
The development of the South-West Expressway is the one which will affect the most to this area. In addition, Hambantota is planned as the new National Urban Center. It may cause newly development of industrial area, commercial area and residential area.

Appendix: Land Use Data Sheet by District

Land Use Data Sheet		Colombo District		
				
 <p>[Location of Colombo District]</p>		 <p>[Legend of Land Use]</p>		
		<b>1981</b>	<b>2000</b>	
Urban Land	Built-up Land		7,959	2,790
	Associated Non-agricultural Land		474	0
Agricultural Land	Homesteads		14,354	28,527
	Tree and Other Perennial Crops	Tea	214	20
		Rubber	20,952	17,605
		Coconut	6,193	3,061
		Cinnamon	-	0
		Mixed Tree and Other Perennial Crops	2,624	0
		Oilpalm	-	0
	Cropland	Paddy	9,997	10,539
		Sparsely Used Cropland (Chena)	712	103
Other Cropland		208	546	
Forestland	Natural Forest	Dense Forest	1,273	1,259
		Open Forest	19	
	Forest Plantations		19	
Rangeland	Scrubland		608	488
	Grassland		1,581	0
Wetland	Forested	Mangroves	9	0
	Non-forested	Marsh	-	1,289
Water		2,199	1,549	
Barren Land		63	241	
(Area where is not covered by GIS Database developed by the Study Team)		-	-27	
<b>TOTAL</b>		<b>69,458</b>	<b>68,018</b>	

Source: "Colombo District Land Use 1981" published by the Survey Department in December 1983  
 Source: GIS Database developed by Study Team, original data from Survey Department of Sri Lanka

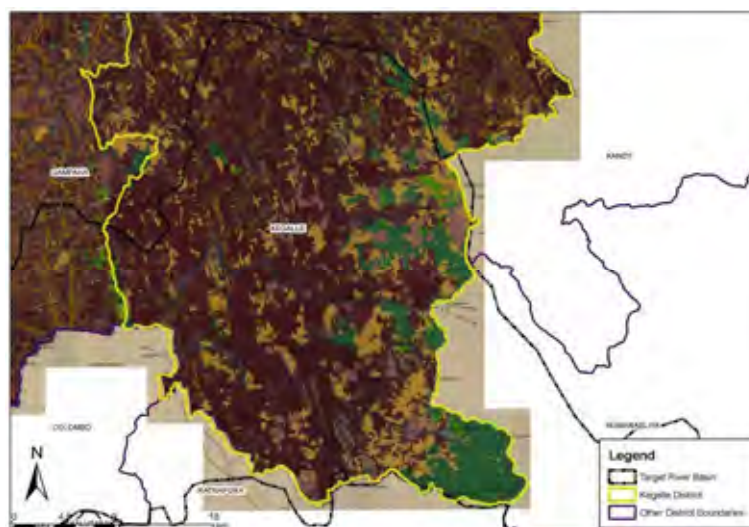


Land Use Data Sheet		Gampaha District		
				
 <b>[Location of Gampaha District]</b>		 <b>[Legend of Land Use]</b>		
		<b>1981</b>	<b>2000</b>	
Urban Land	Built-up Land		1,950	167
	Associated Non-agricultural Land		270	0
Agricultural Land	Homesteads		69,670	47,468
	Tree and Other Perennial Crops	Tea	10	0
		Rubber	5,190	4,280
		Coconut	25,000	29,523
		Cinnamon	-	0
		Mixed Tree and Other Perennial Crops	1,920	0
		Oilpalm	-	0
	Cropland	Paddy	22,550	21,884
		Sparsely Used Cropland (Chena)	120	3
		Other Cropland	2,140	240
Forestland	Natural Forest	Dense Forest	600	715
		Open Forest	450	
	Forest Plantations		340	
Rangeland	Scrubland		740	1,682
	Grassland		200	0
Wetland	Forested	Mangroves	610	0
	Non-forested	Marsh	2,880	2,009
Water			4,620	4,476
Barren Land			610	397
(Area where is not covered by GIS Database developed by the Study Team)			-	28,979
<b>TOTAL</b>			<b>139,870</b>	<b>112,844</b>

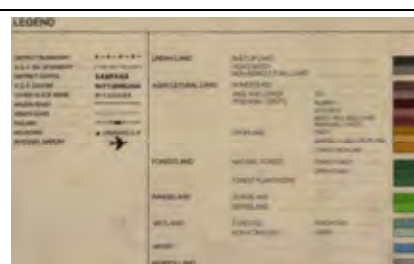
Source: "Gampaha and Kegalle Districts Land Use 1981" published by the Survey Department in July 1985

Source: GIS Database developed by Study Team, original data from Survey Department of Sri Lanka

<b>Land Use Data Sheet</b>	<b>Kegalle District</b>
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[Location of Kegalle District]

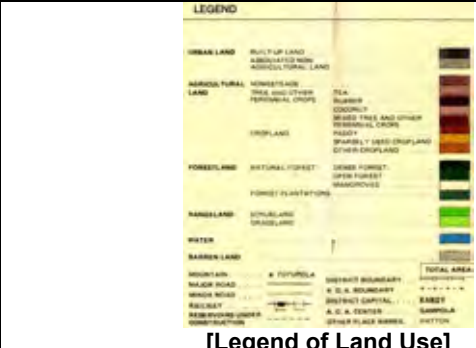
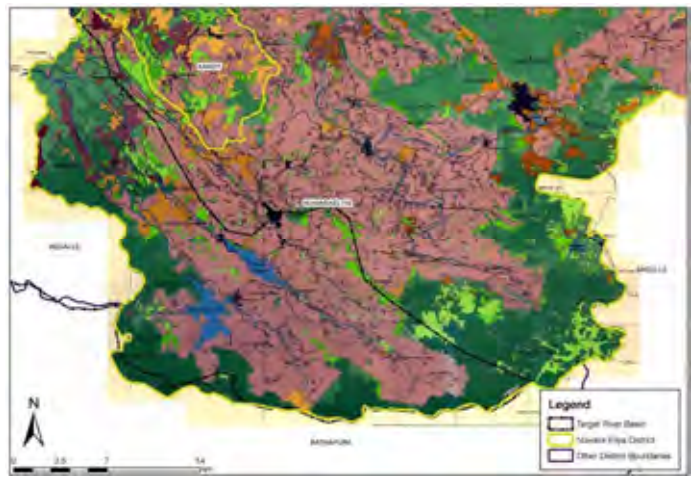


[Legend of Land Use]

		1981	2000	
Urban Land	Built-up Land	90	4	
	Associated Non-agricultural Land	40	0	
Agricultural Land	Homesteads	44,270	28,171	
	Tree and Other Perennial Crops	Tea	5,660	6,216
		Rubber	49,070	65,607
		Coconut	10,780	3,000
		Cinnamon	-	0
		Mixed Tree and Other Perennial Crops	8,220	0
	Cropland	Oilpalm	-	0
		Paddy	10,880	7,719
Sparsely Used Cropland (Chena)		20	0	
Forestland	Other Cropland	20,970	1,162	
	Natural Forest	Dense Forest	8,240	10,420
		Open Forest	2,450	
Forest Plantations	970			
Rangeland	Scrubland	930	4,494	
	Grassland	200	0	
Wetland	Forested	-	Mangroves	0
	Non-forested		Marsh	0
Water		820	1,487	
Barren Land		500	1,419	
(Area where is not covered by GIS Database developed by the Study Team)		-	23,368	
<b>TOTAL</b>		<b>164,110</b>	<b>153,066</b>	


Source: "Gampaha and Kegalle Districts Land Use 1981" published by the Survey Department in July 1985  
 Source: GIS Database developed by Study Team, original data from Survey Department of Sri Lanka

**Land Use Data Sheet**      **Nuwara Eliya District**



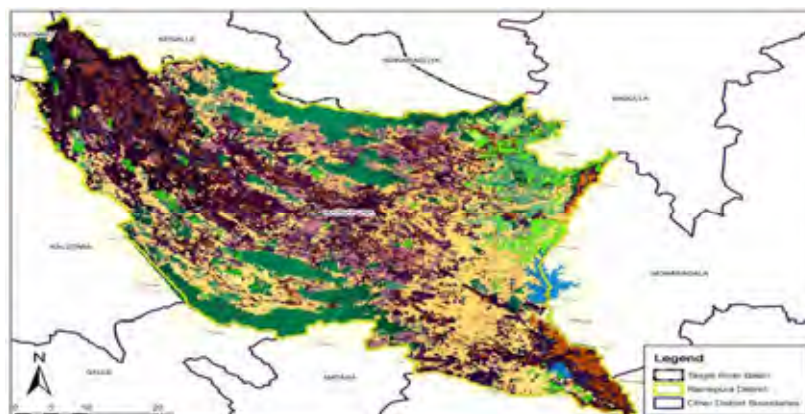
			1981	2000
Urban Land	Built-up Land		800	33
	Associated Non-agricultural Land		20	0
Agricultural Land	Homesteads		11,400	11,628
	Tree and Other Perennial Crops	Tea	62,580	64,693
		Rubber	300	656
		Coconut	310	0
		Cinnamon	-	0
		Mixed Tree and Other Perennial Crops	490	0
		Oilpalm	-	0
	Cropland	Paddy	5,350	2,361
Sparsely Used Cropland (Chena)		8,630	169	
Other Cropland		10,440	3,762	
Forestland	Natural Forest	Dense Forest	30,410	38,491
		Open Forest	10,570	
	Forest Plantations	7,590		
Rangeland	Scrubland		9,880	4,413
	Grassland		7,560	10
Wetland	Forested	Mangroves	-	0
	Non-forested	Marsh	-	117
Water			3,500	1,211
Barren Land			510	2,084
(Area where is not covered by GIS Database developed by the Study Team)			-	44,909
<b>TOTAL</b>			<b>170,340</b>	<b>174,535</b>

Source: "Kandy and Nuwara Eliya Districts Land Use 1979/81" published by the Survey Department in March 1984  
 Source: GIS Database developed by Study Team, original data from Survey Department of Sri Lanka

Land Use Data Sheet		Kalutara District		
N.A.				
 <p style="text-align: center;"><b>[Location of Kalutara District]</b></p>		<b>[Legend of Land Use]</b>		
		<b>1984</b>	<b>2000</b>	
Urban Land	Built-up Land		N.A.	200
	Associated Non-agricultural Land		N.A.	0
Agricultural Land	Homesteads		N.A.	30,884
	Tree and Other Perennial Crops	Tea	N.A.	3,968
		Rubber	N.A.	56,794
		Coconut	N.A.	6,664
		Cinnamon	N.A.	0
		Mixed Tree and Other Perennial Crops	N.A.	0
		Oilpalm	N.A.	0
	Cropland	Paddy	N.A.	27,699
		Sparsely Used Cropland (Chena)	N.A.	7,969
Other Cropland		N.A.	1,134	
Forestland	Natural Forest	Dense Forest	N.A.	18,181
		Open Forest	N.A.	
	Forest Plantations		N.A.	
Rangeland	Scrubland		N.A.	7,030
	Grassland		N.A.	53
Wetland	Forested	Mangroves	N.A.	0
	Non-forested	Marsh	N.A.	208
Water			N.A.	3,514
Barren Land			N.A.	326
(Area where is not covered by GIS Database developed by the Study Team)			N.A.	0
<b>TOTAL</b>			N.A.	<b>164,625</b>

*Source: GIS Database developed by Study Team, original data from Survey Department of Sri Lanka*

<b>Land Use Data Sheet</b>	<b>Ratnapura District</b>
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[Location of Ratnapura District]

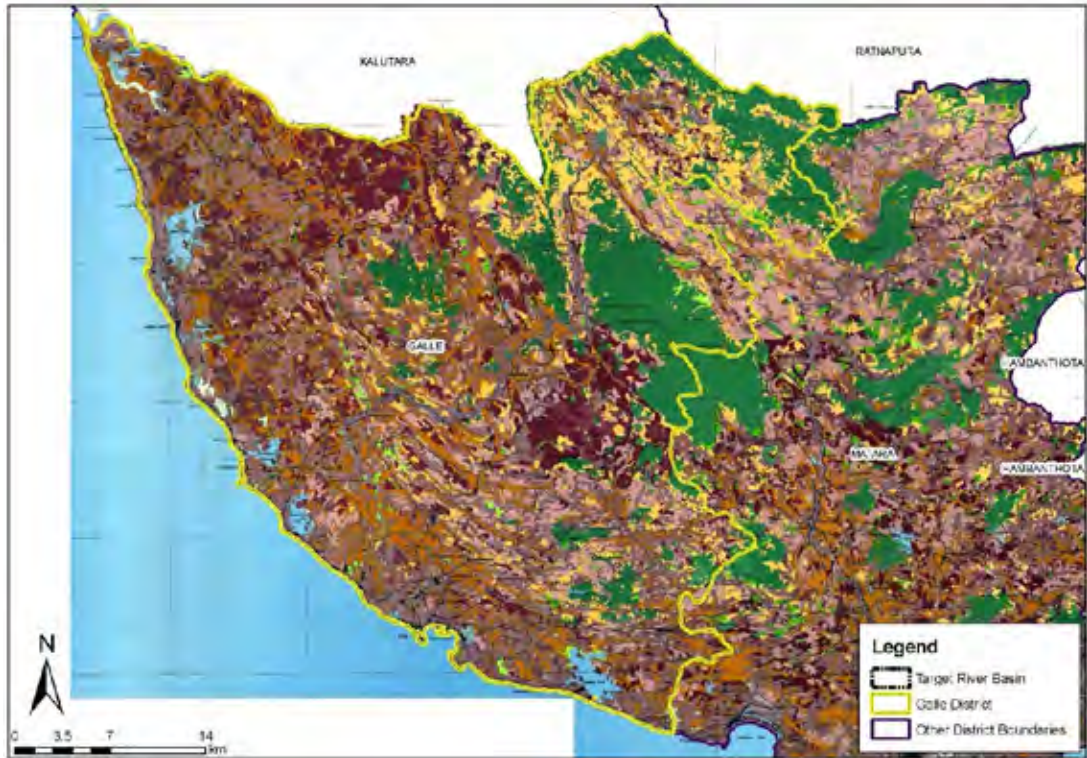


[Legend of Land Use]

		1984	2000	
Urban Land	Built-up Land	260	168	
	Associated Non-agricultural Land	90	0	
Agricultural Land	Homesteads	52,480	52,741	
	Tree and Other Perennial Crops	Tea	21,300	21,354
		Rubber	35,830	43,541
		Coconut	3,730	3,652
		Cinnamon	-	0
		Mixed Tree and Other Perennial Crops	4,220	0
		Oilpalm	-	0
	Cropland	Paddy	23,200	22,850
		Sparsely Used Cropland (Chena)	101,570	88,007
Other Cropland		340	5,818	
Forestland	Natural Forest	Dense Forest	48,430	63,177
		Open Forest	14,070	
	Forest Plantations	2,320		
Rangeland	Scrubland	11,970	15,901	
	Grassland	3,150	2,667	
Wetland	Forested	Mangroves	-	0
	Non-forested	Marsh	-	28
Water		3,950	5,517	
Barren Land		630	3,560	
(Area where is not covered by GIS Database developed by the Study Team)		-	0	
<b>TOTAL</b>		<b>327,540</b>	<b>328,980</b>	

Source: "Ratnapura District Land Use 1981 - 84" published by the Survey Department in December 1987

Source: GIS Database developed by Study Team, original data from Survey Department of Sri Lanka



[Location of Galle District]



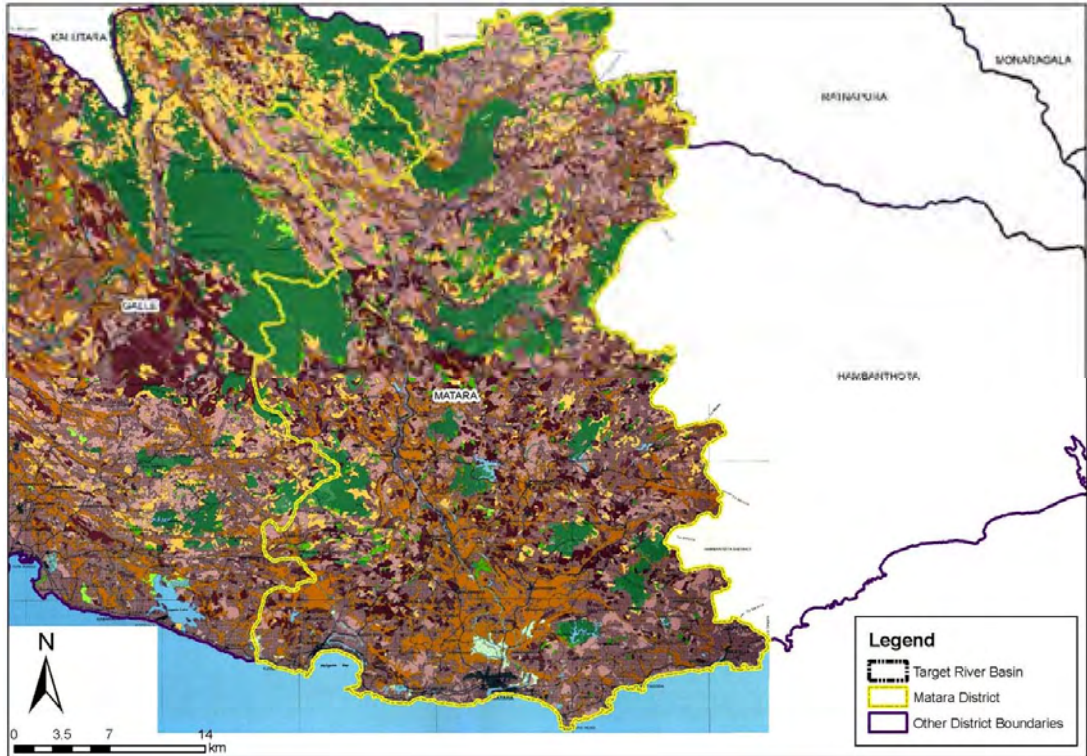
[Legend of Land Use]

The Change of the land use is same with the table \*\*

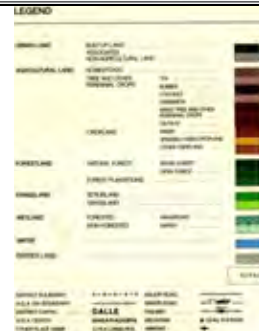
Source: "Galle/Matara Districts Land Use 1983" published by the Survey Department in November 1986  
 Source: GIS Database developed by Study Team, original data from Survey Department of Sri Lanka

**Land Use Data Sheet**

**Matara District**



**[Location of Matara District]**



**[Legend of Land Use]**

Source: "Galle/Matara Districts Land Use 1983" published by the Survey Department in November 1986  
 Source: GIS Database developed by Study Team, original data from Survey Department of Sri Lanka