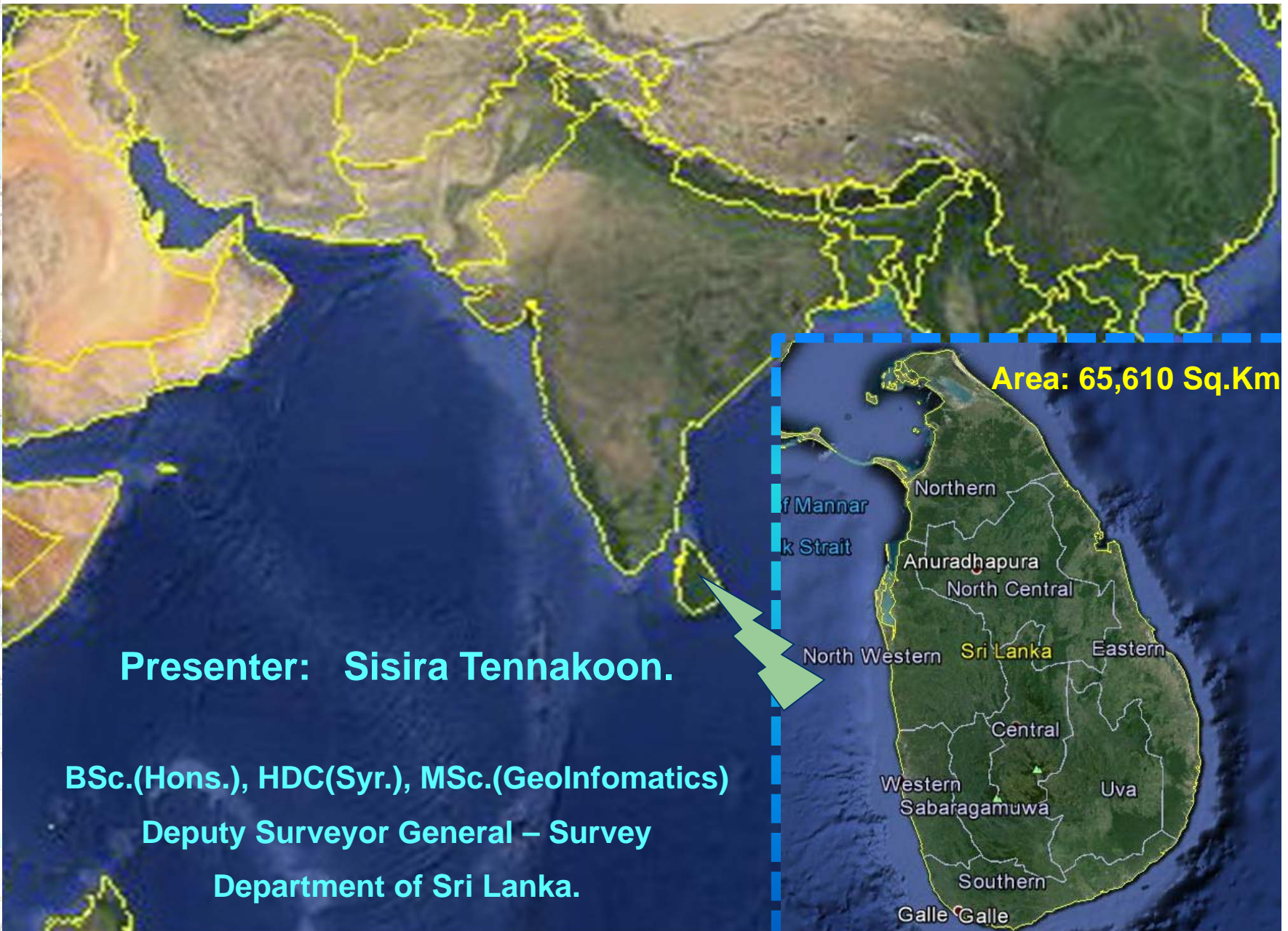




# Approaches to Determine and Represent Geographical Units, Including Geocoding, for Statistics



**Presenter: Sisira Tennakoon.**

**BSc.(Hons.), HDC(Syr.), MSc.(GeoInfomatics)**

**Deputy Surveyor General – Survey**

**Department of Sri Lanka.**





# Survey Act

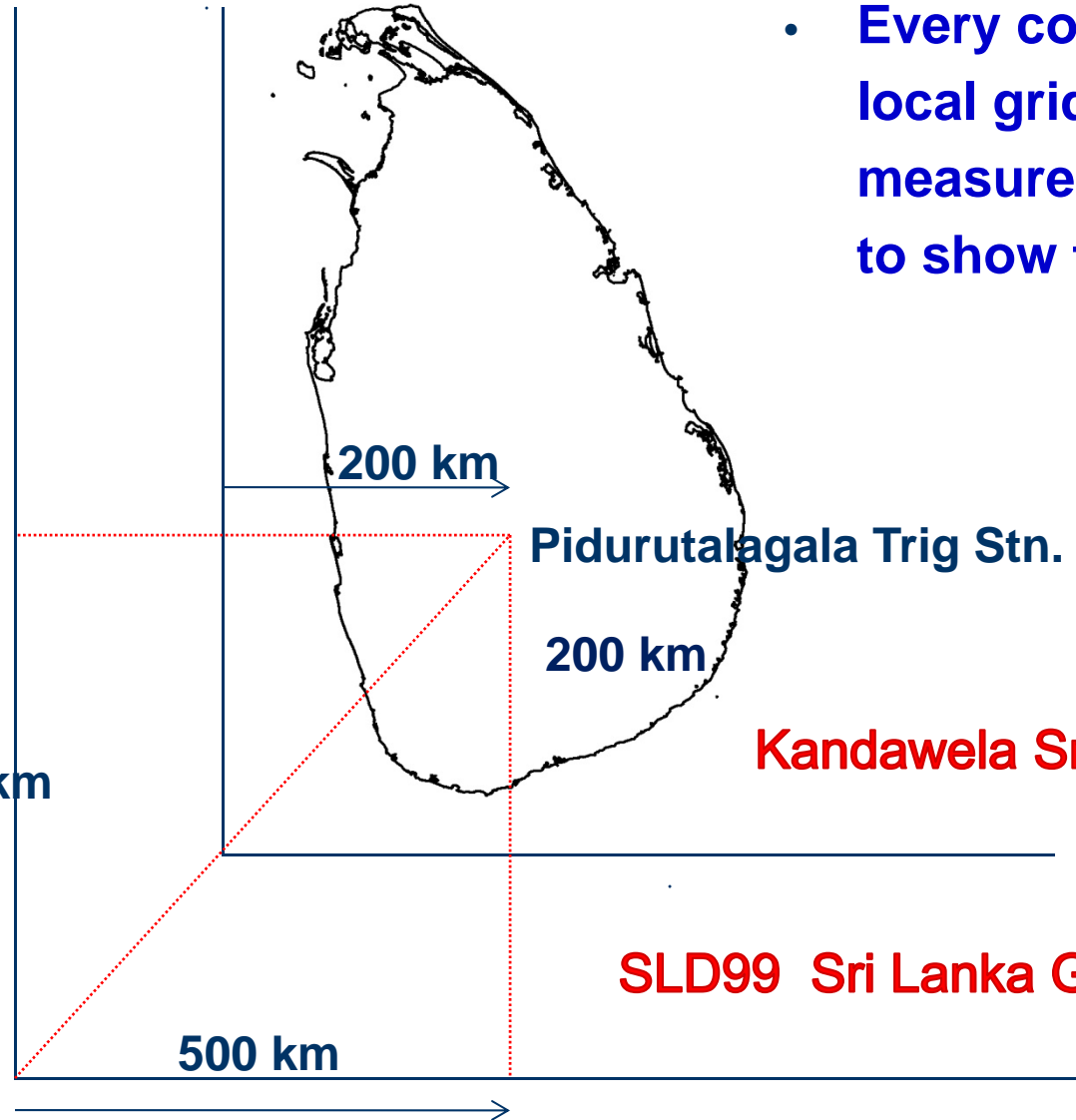
- The **Surveyor General** has been empowered by Survey Act No.17 of 2002 - article 2(k) to
  - **Receive, Store, Reproduce and Distribute****Topographic, Cadastral and Derived maps, Remote sensed data, Aerial photographs and other surveying and mapping documents.**





# Local Grid Reference of Sri Lanka

- Every country has its own local grid reference for measurement of distances and to show the directions.



**Kandawela Sri Lanka Grid**

**SLD99 Sri Lanka Grid 1999**

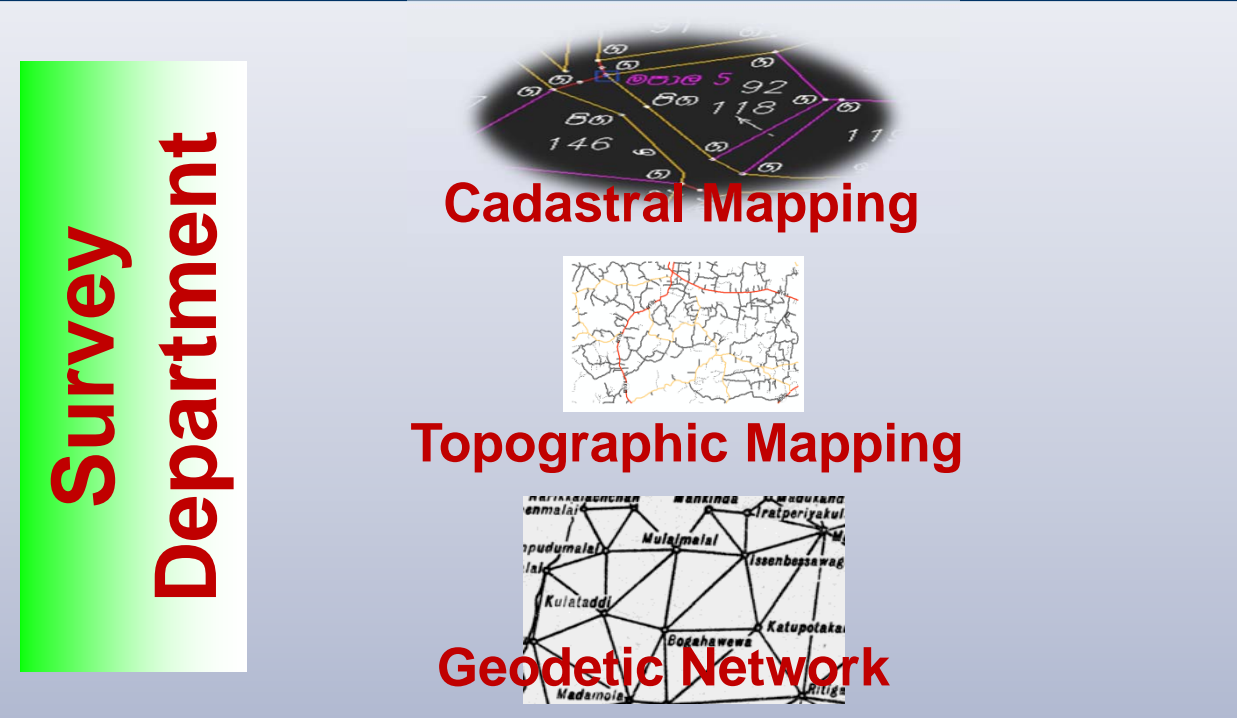
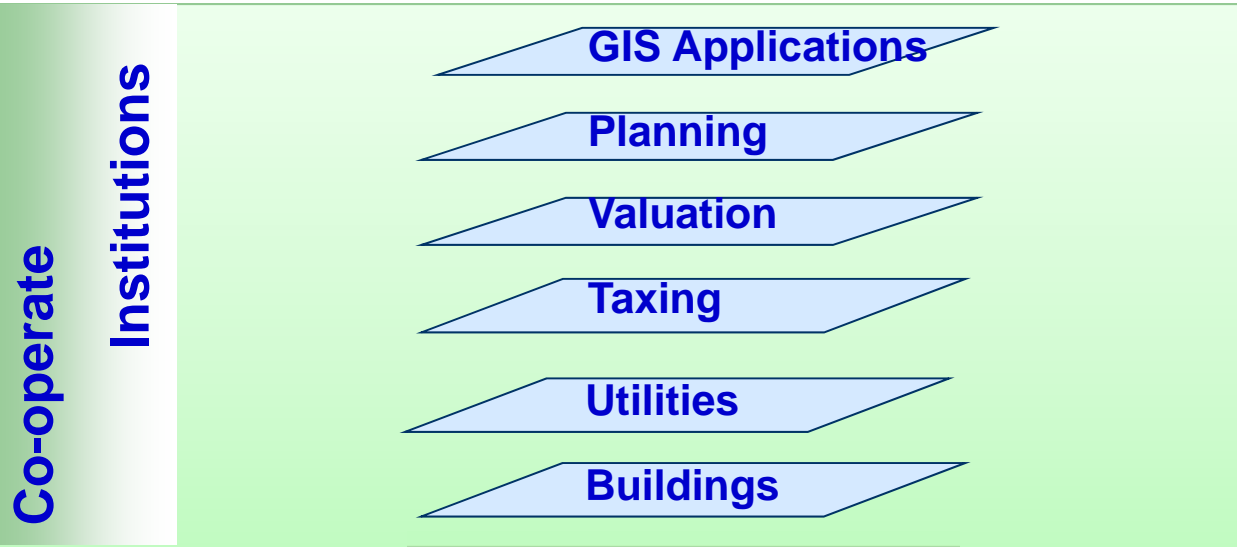




# Foundation Data



NSDI - Sri Lanka





# Topographical Maps



**1:250,000**

- 4 sections
- All Sheets in Digital Form



**1:50,000**

- 92 Sheets
- All Sheets in Digital Form



**1:10,000**

- 1834 Sheets
- 1583 - 10K Sheets in Digital Form





# Digital Topographic Database



**Data available for Entire Country**

**250K**

**50K**

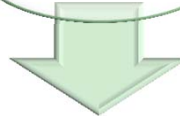
**10K**

**1K**

**Data available for 86 % of the Country**

**Colombo Metropolitan Area Only**

**Dataset 1** :Data available for Entire Country  
**Dataset 2**: New series from ALOS Satellite Images Sheet No. 1- 39



**GIS - TopoDB**

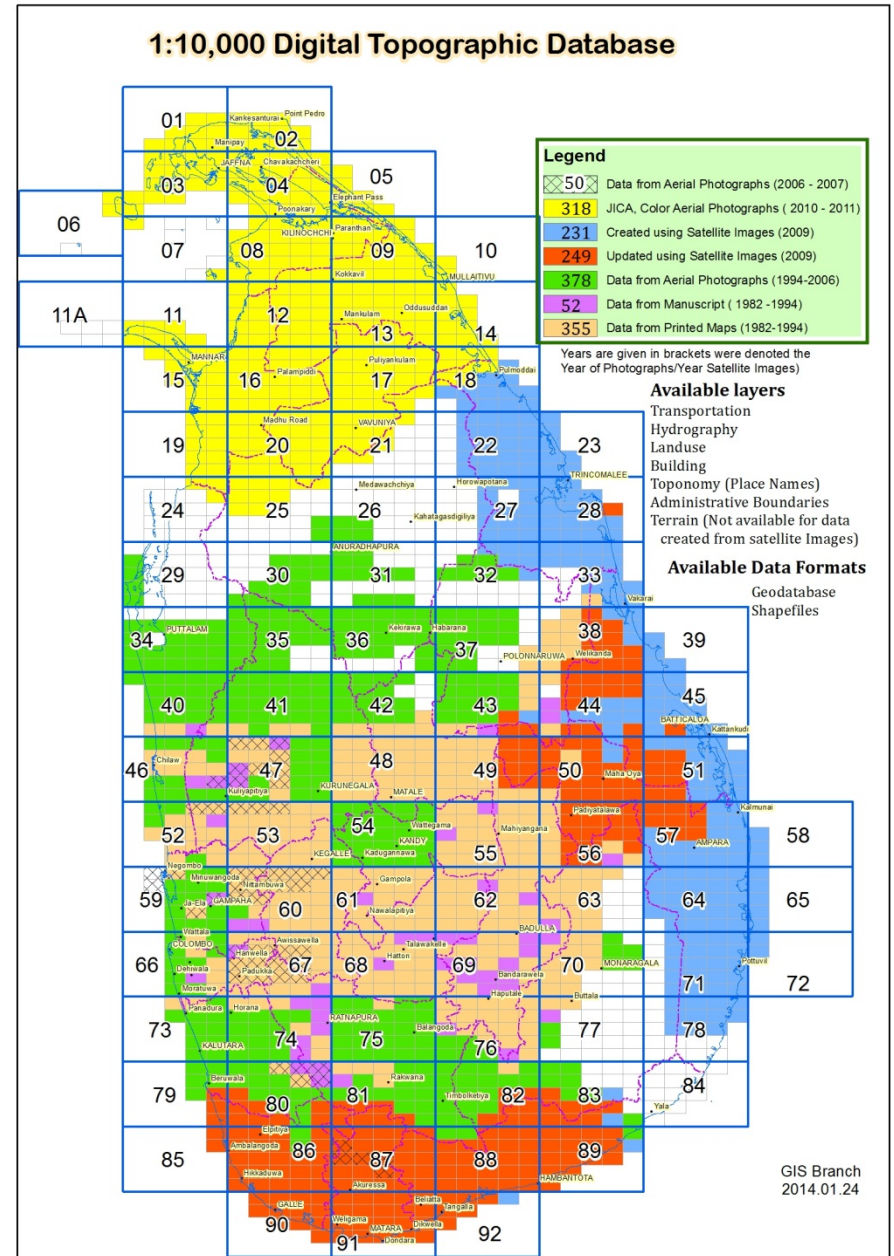




# 10K National Coverage

## Data Layers

- ✓ AD\_GN\_Pg (GN Level boundary)
- ✓ CO\_Building\_Pg (Buildings)
- ✓ CA\_Grid\_Li (Cartographic Grids)
- ✓ HY\_Hydro\_Li/Pg (Streams, Tanks)
- ✓ TR\_Transport\_Li (Roads, Railroad)
- ✓ LU\_Landuse\_Pg (Vegetation)
- ✓ CO\_Tponomy\_Pt (Place Names)
- ✓ TE\_Terrain\_Li/Pt (Contour, Spot Heights)
- ✓ UT\_Utility\_Li/Pt (High Tension Power Line)
- ✓ RS\_Reserves\_Pg (Natural Reserves)





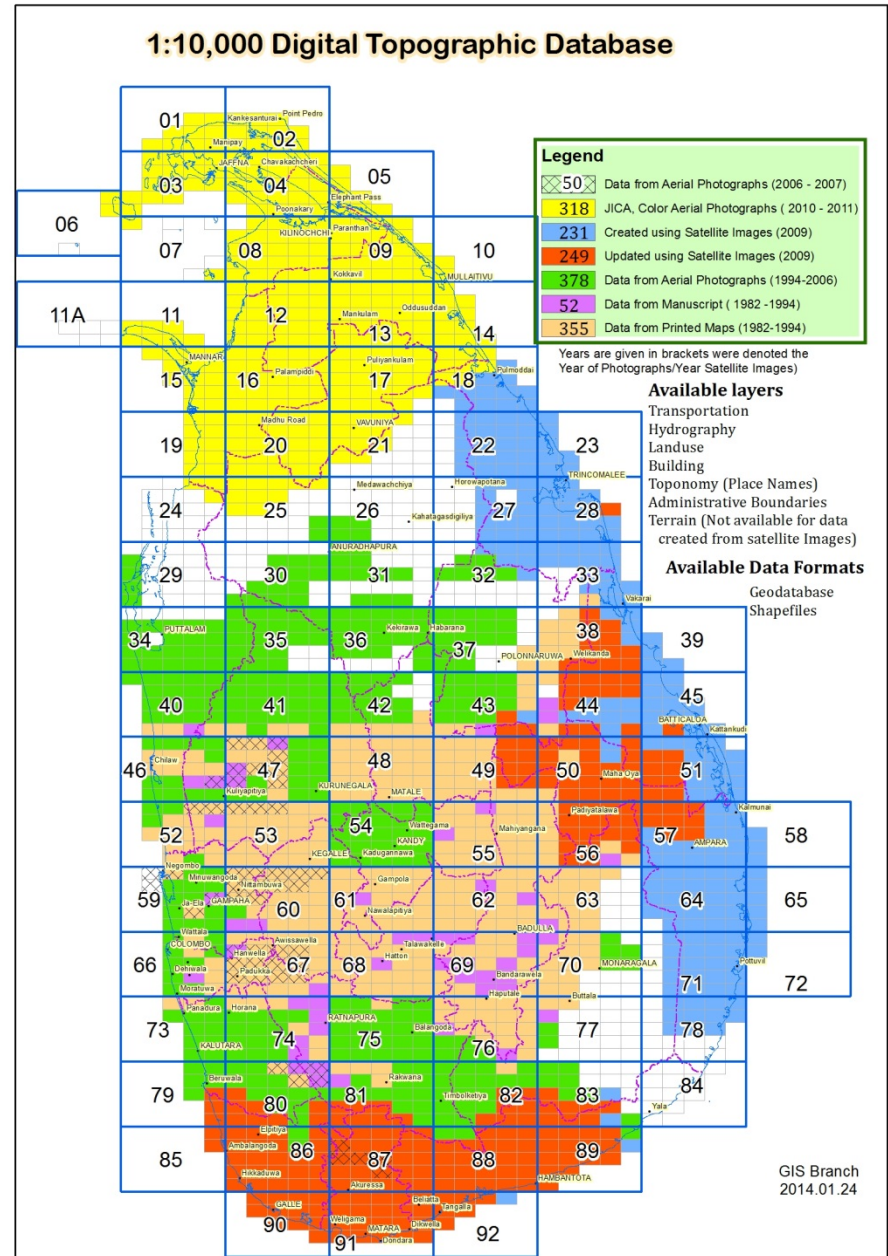
# 10K National Coverage

• In Esri ArcGIS Geodatabase Format.

• Tile Based Dataset (Not Seamless).

• Metadata for each Tile.

• Converts into DXF or Shapes on request.







# Lineage - Metadata

SHEET NO: 2107

DATA SOURCE:	Aerial Photograph/Satellite Image	Color Aerial Photograph
	Year of Photography/Satellite Image	2010 & 2011
	Scale of Photography/Resolution	1:20000
	Method of Data Collection	Stereo Compilation
	Year of Compilation	2013
	Field Checked	2013
	Database Completed	2014
	Sheet Covered by(Coordinate)	
		X <sub>min</sub> 168000
		Y <sub>Min</sub> 390000
	X <sub>Max</sub> 176000	
	Y <sub>Max</sub> 395000	





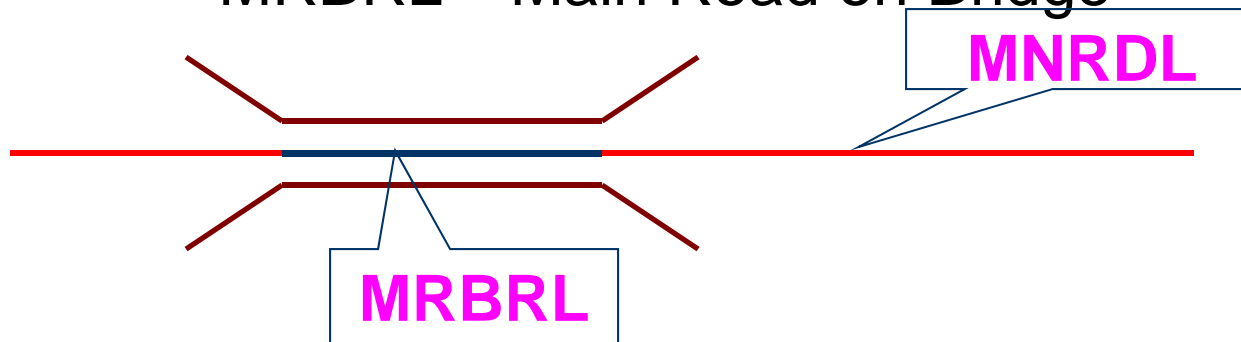
# GFCODE

Unique in the Database (5 Alphabetic Characters)

- 1-4 Chars : represent the feature
- 5<sup>th</sup> Char: represent the feature type
  - P -Point
  - L - Line
  - A - Area
  - V – Virtual

Eg. MNRDL – Main Roads

MRBRL – Main Road on Bridge





# Data Validation : OpenStreet Map with ArcGIS

50K\_Data -

File Edit View Bookmarks Insert Selection Geoprocessing Customize Windows Help

1:11,289

Editor

Table Of Contents

- Sri Lanka Seam less
- AD\_District
- Grid\_50
- Grid10
- Outerb\_Li
- Junction\_Name
- Main\_Towns
- Transport (line)

Type of Transport line

- Expressway
- Main Roads
- Minor Roads
- Jeep/Cart Track
- Footpath
- Railway line

- Transport (line)
- Transport (point)
- World Countries
- Toponym (point)
- Other\_Dept\_Data
- Kurunegala\_Field\_Data
- Scan\_Image\_50K
- Road Map 2012.jpg
- Batticaloa
- Openstreet Map
- Basemap

9093189.729 862095.63 Meters



# Compare with Google Earth Satellite Images

Sheet No 57/25 & 58/21 Field Identification Map Section No **4**



1	2	3	4	5
6	7	8	9	10

1:11,000  
 Prepared by  
 GIS Branch  
 Sr.S.S.(GIS)  
 Date : 2012 / /

Legend	
	Main Roads
	Secondary Road
	Jeep/Car Track
	Footpath
	Railways
	Stream/Bridge
	Bund
	Irrigation Channel
	Stream
	Building
	Place Names
	Culvert
	Streams/Tanks
	Scrub land (Scr)
	Homestead/Garden (G)
	Other Cultivation (Op)
	Cemetery
	Coconut (C)
	Forest (F)
	Mangrove (Mar)
	Paddy (P)
	Rock/Quarry (Rk)
	Playground/Park (Pg)
	Sand (Snd)

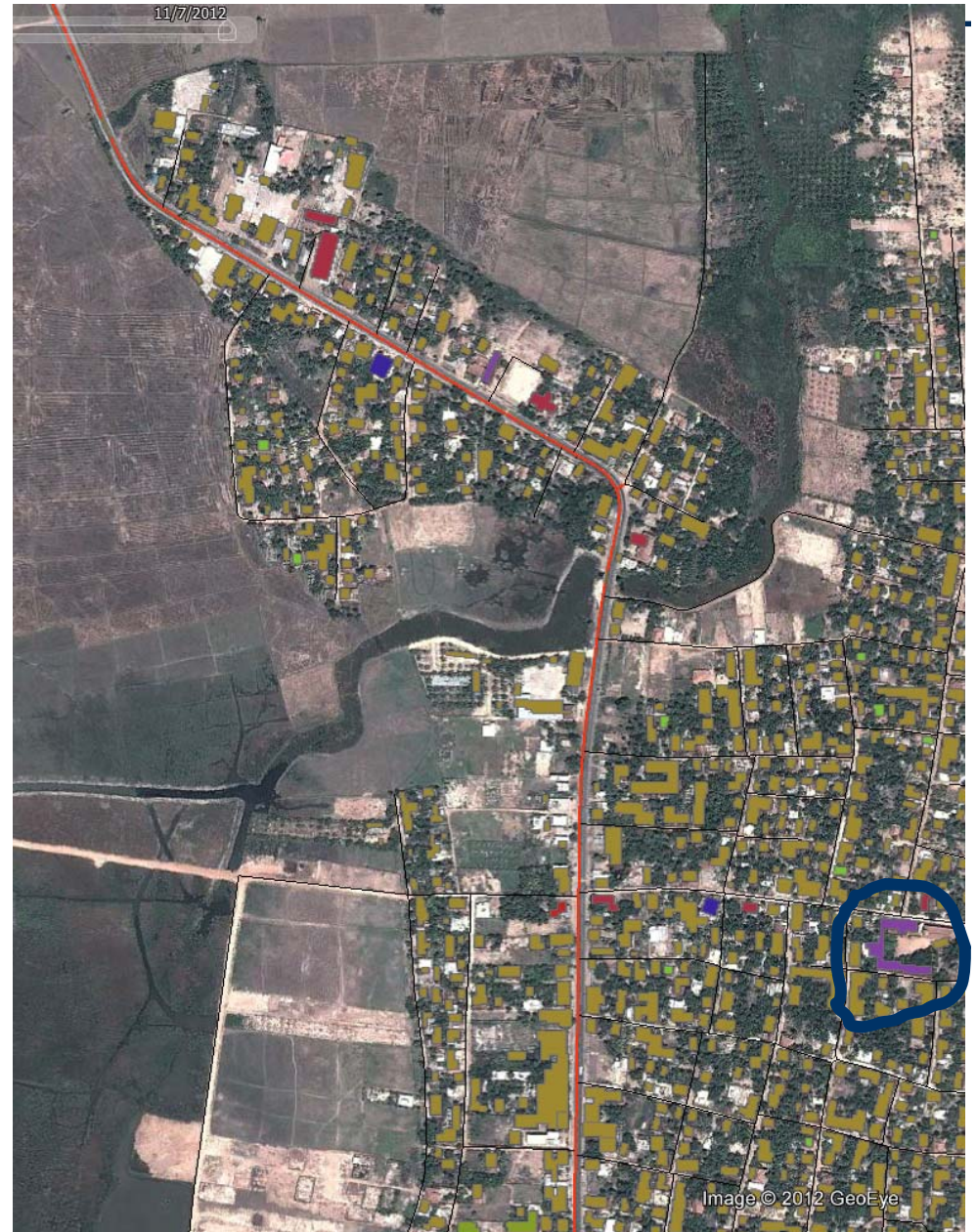
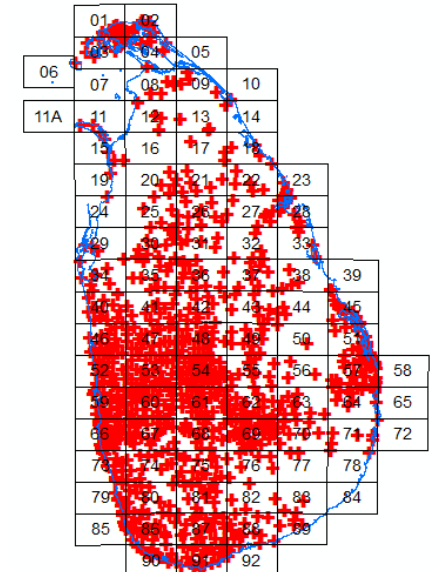
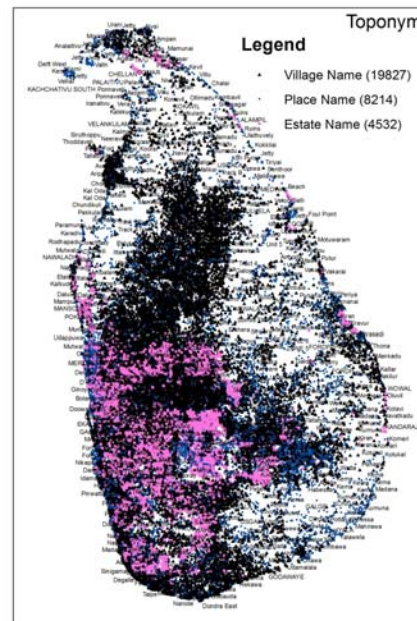
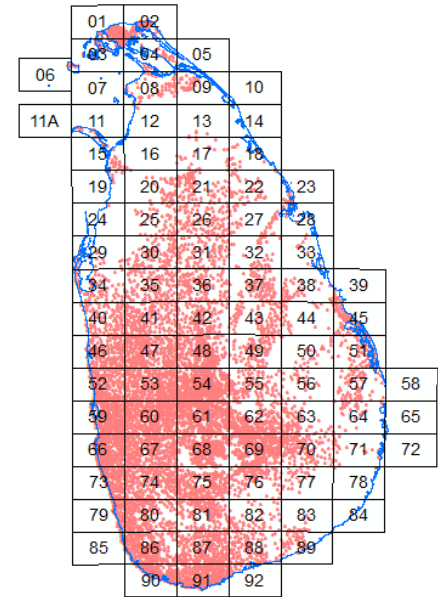


Image © 2012 GeoEye



# Sri Lanka – Other Data

- School Locations  
Approx. 9500
- Hospital Locations  
Approx. 1100
- Toponymy  
Approx. 32,573





# Sri Lanka – Administrative Divisions

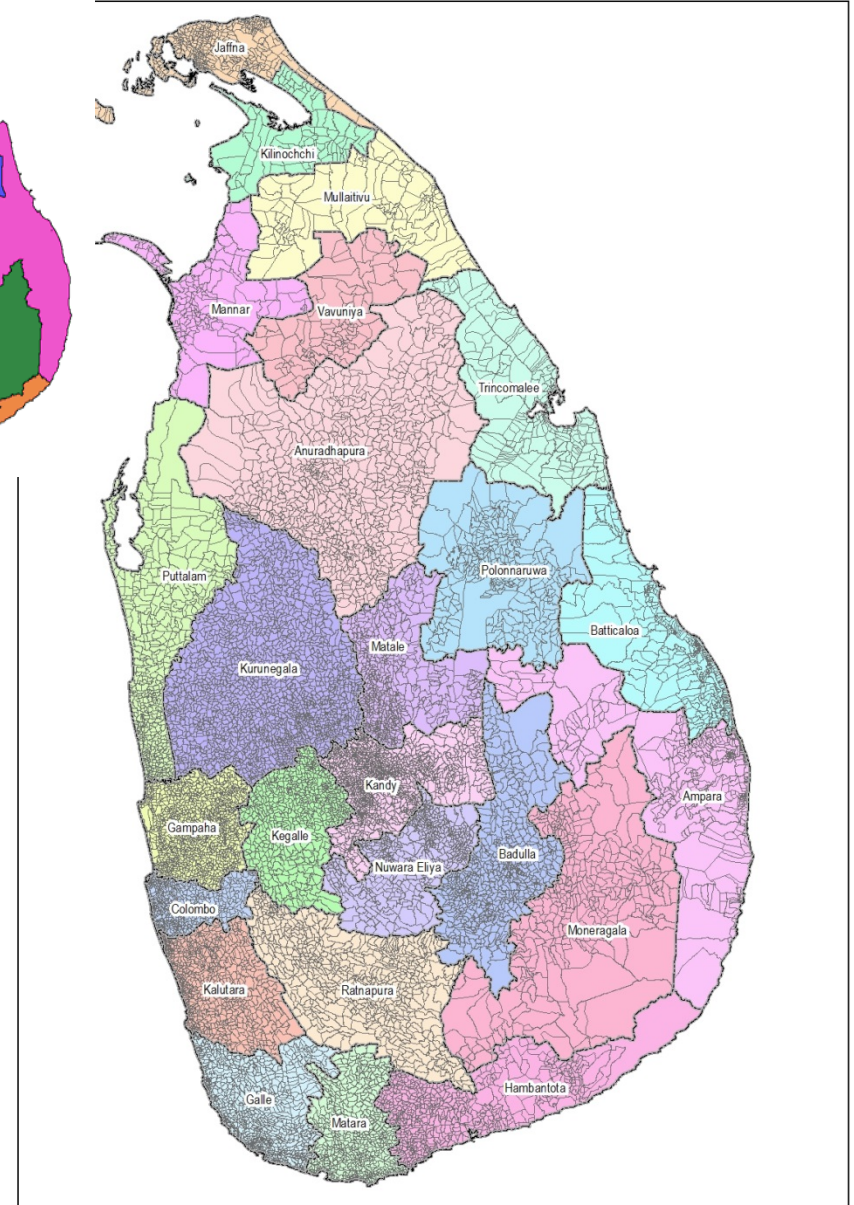
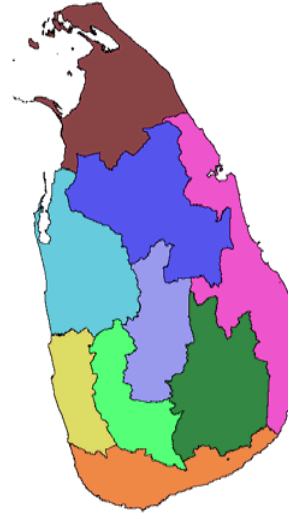
**Province : 9**  
(Largest Admin Unit)

**District : 25**  
(Sub Division of Province)

**DS Division : 331**  
(Divisional Secretariat Division  
Main Public Administrative Unit)

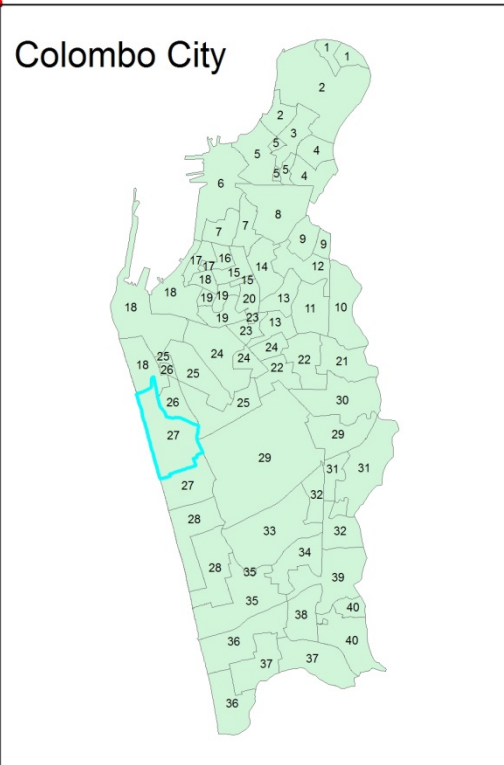
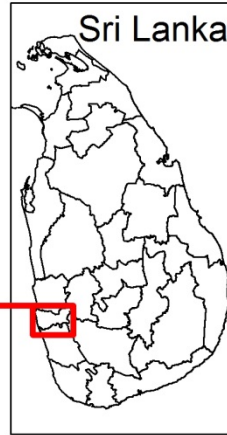
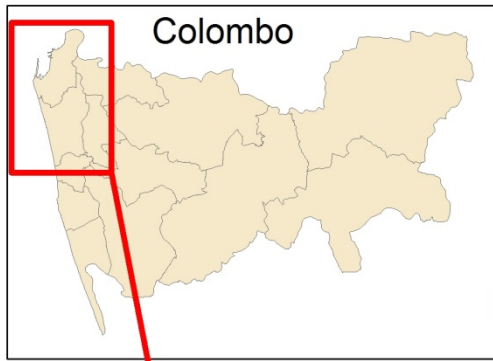
**GN Division : 14,021**  
(Grama Niladari Division.  
Sub Divisions of DS Division  
Smallest Administrative Unit)

**Local Authority : 335**  
(Local Revenue Authorities  
Pradesiya Saba, Urban Council and  
Municipal Council)





# GN- Division Data– Smallest Admin. Units



Field	Value
OBJECTID_1	744
Shape	Polygon
OBJECTID	211
PROVINCE_N	Western
PROVINCE_C	1
DISTRICT_N	Colombo
DISTRICT_C	1
DSD_N	Thimbirigasyaya
DSD_C	27
GND_NO	190
GND_N	Kollupitiya
GND_C	005
MC_UC_PS_N	Colombo MC
MC_UC_PS_C	11
POLLI_DV_N	Colombo West
POLLI_DV_C	005
SECTOR_N	Urban
SECTOR_C	1
AREA	914714.88
WARD_Name	Kollupitiya
WARD_No	27
Shape_Length	5321.288967
Shape_Area	1101298.770113

**14,021 Units cover the whole Island**





# GN Division Data with Geo Coding

Identify

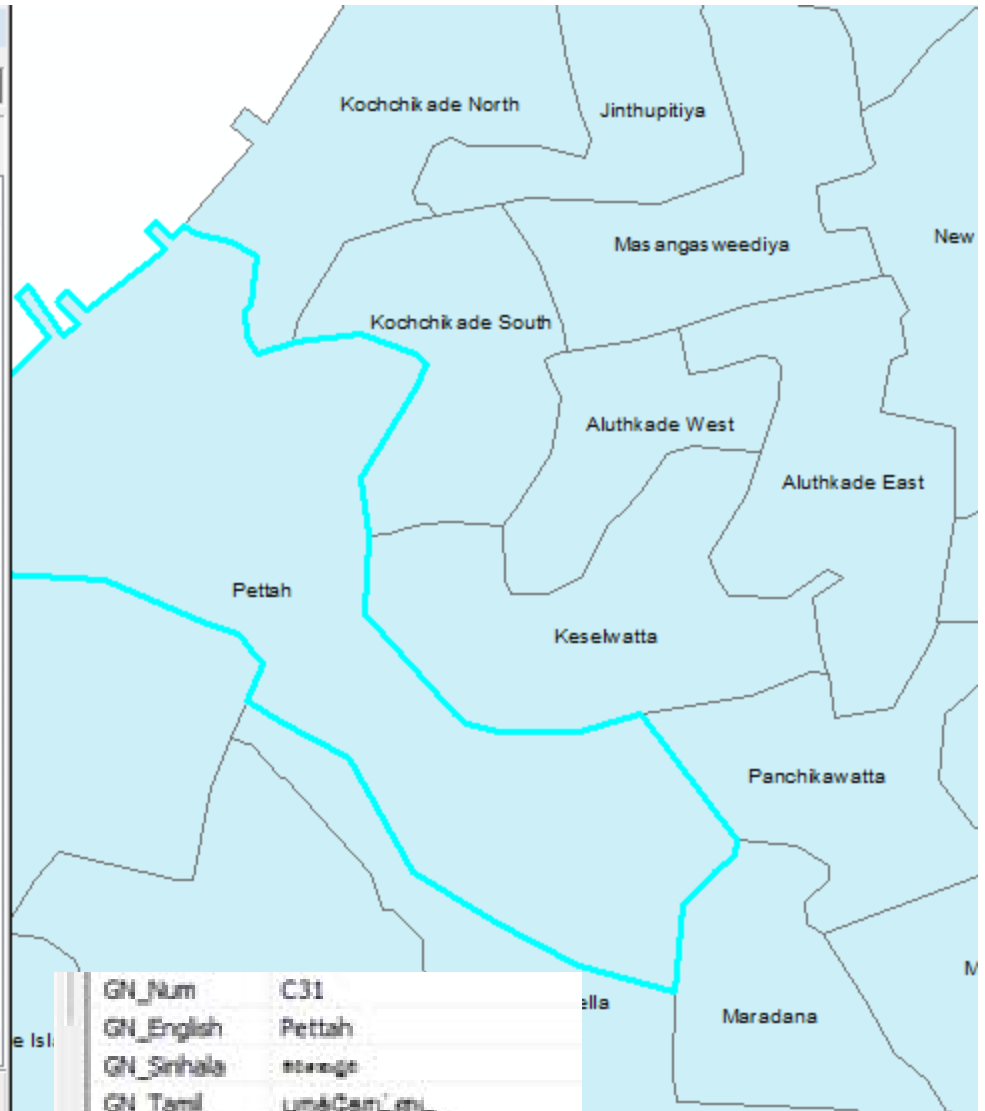
Identify from: <Top-most layer>

AD\_GN\_Pg  
Western

Location: 98,187.510 192,916.052 Meters

Field	Value
OBJECTID	3121
SHAPE	Polygon
PROVINCE_N	Western
DISTRICT_N	Colombo
DSD_N	Colombo
GND_N	Pettah
GND_C	115
DSDCODE4	<null>
GND_CODE7	1103115
SHAPE_Length	6064.91776
SHAPE_Area	834263.816213
No	31
DS_No	950
GN_Order	115
GN_Num	C31
GN_English	Pettah
GN_Sinhala	පෙට්ටා
GN_Tamil	பெட்டை
GN_C_ICTA	1-1-03-115
GN_CODE7	1103115
Date	10/15/2008 3:27:26 PM

Identified 1 feature

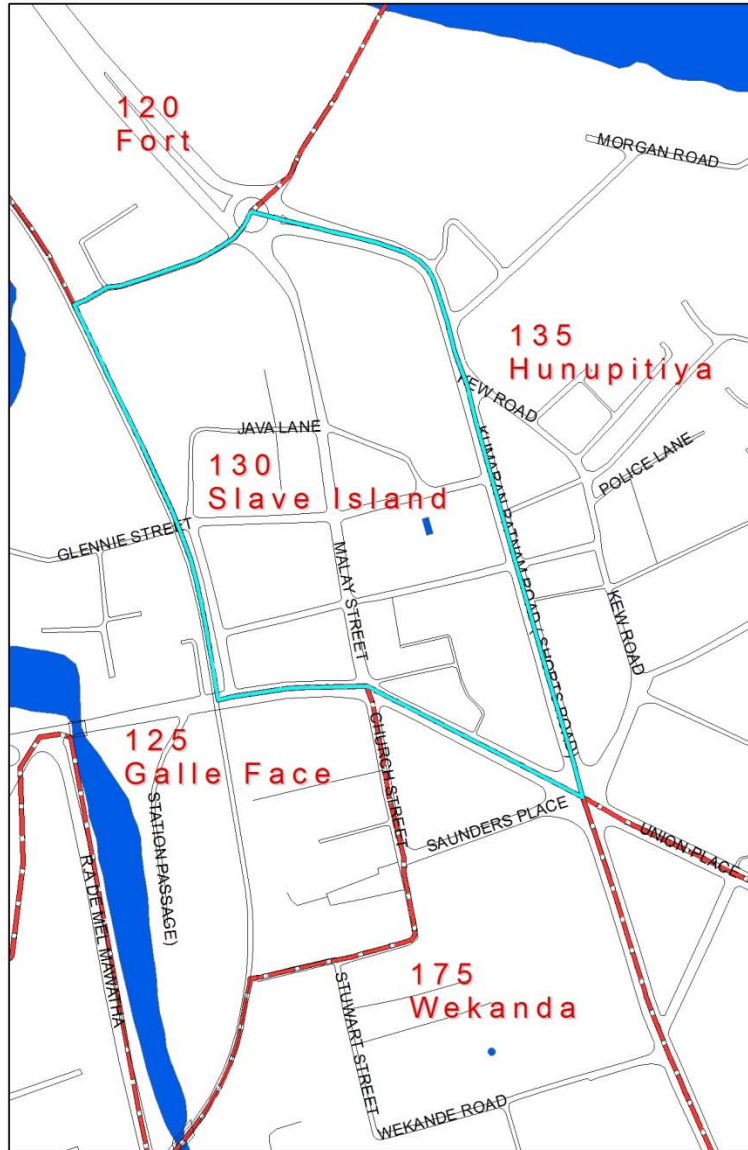


GN_Num	C31
GN_English	Pettah
GN_Sinhala	පෙට්ටා
GN_Tamil	பெட்டை
GN_C_ICTA	1-1-03-115
GN_CODE7	1103115
Date	10/15/2008 3:27:26 PM





# GN Division with Population



Identify

Identify from: <Top-most layer>

Col\_DS  
130

Location: 97,853.705 191,915.188 Meter

Field	Value
FID	25
Shape	Polygon
GND_NO	130
GND_N	Slave Island
Polulation	3783
area	0.1194
Male	1869
Female	1914
Less_15yrs	1020
Age_16_59yrs	2313
Above_60yrs	450

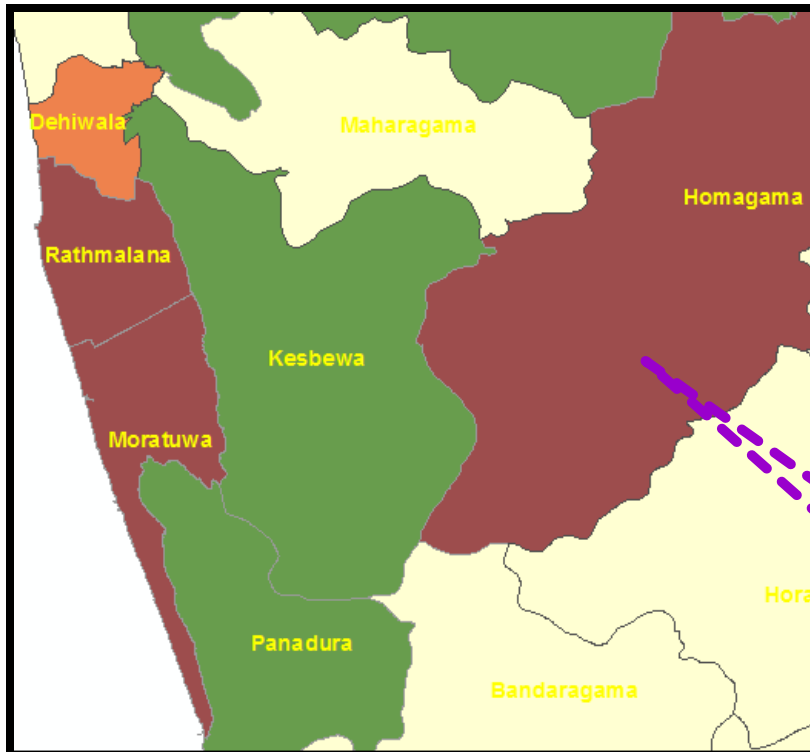
Identified 1 feature



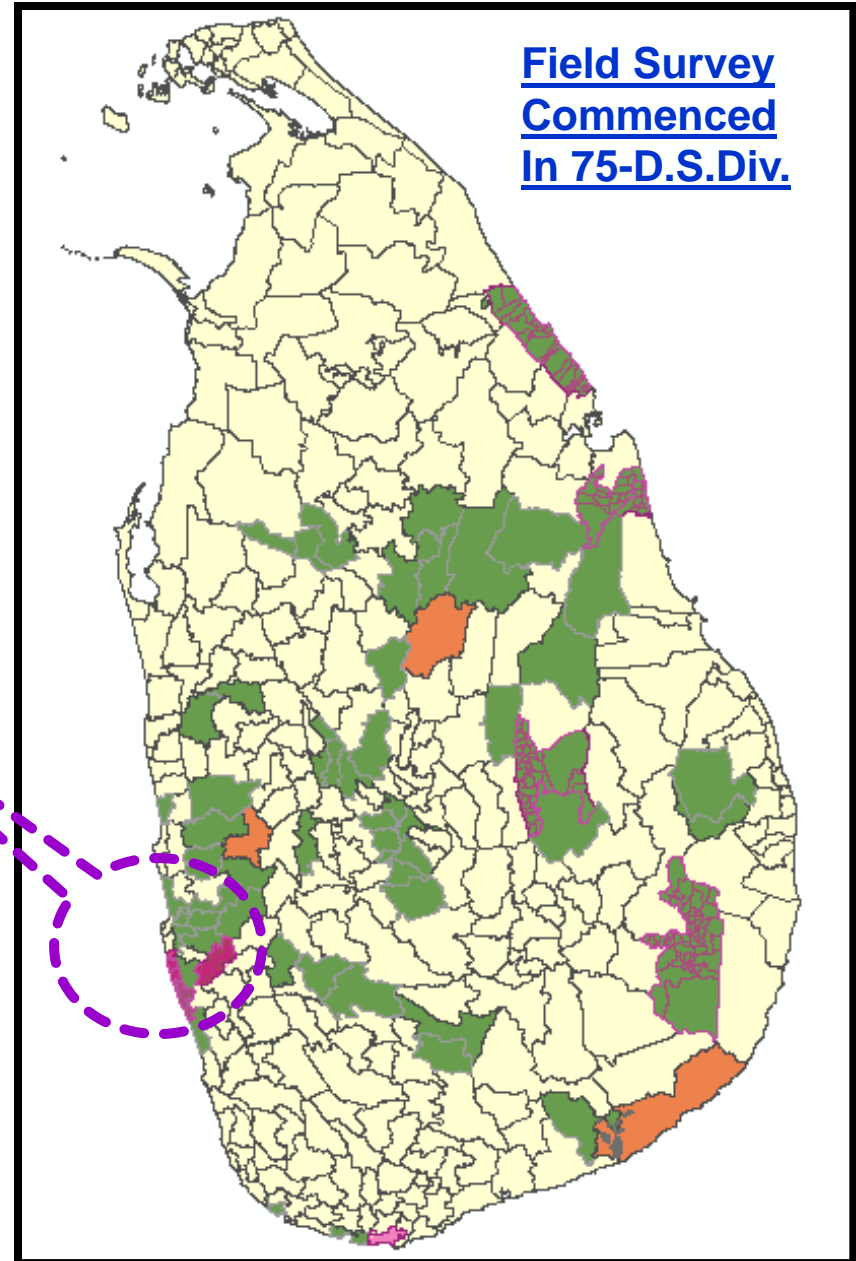


# Parcel Base Land Information System.

**Parcel DB completed - 15 D.S.Div.**



**Field Survey  
Commenced  
In 75-D.S.Div.**

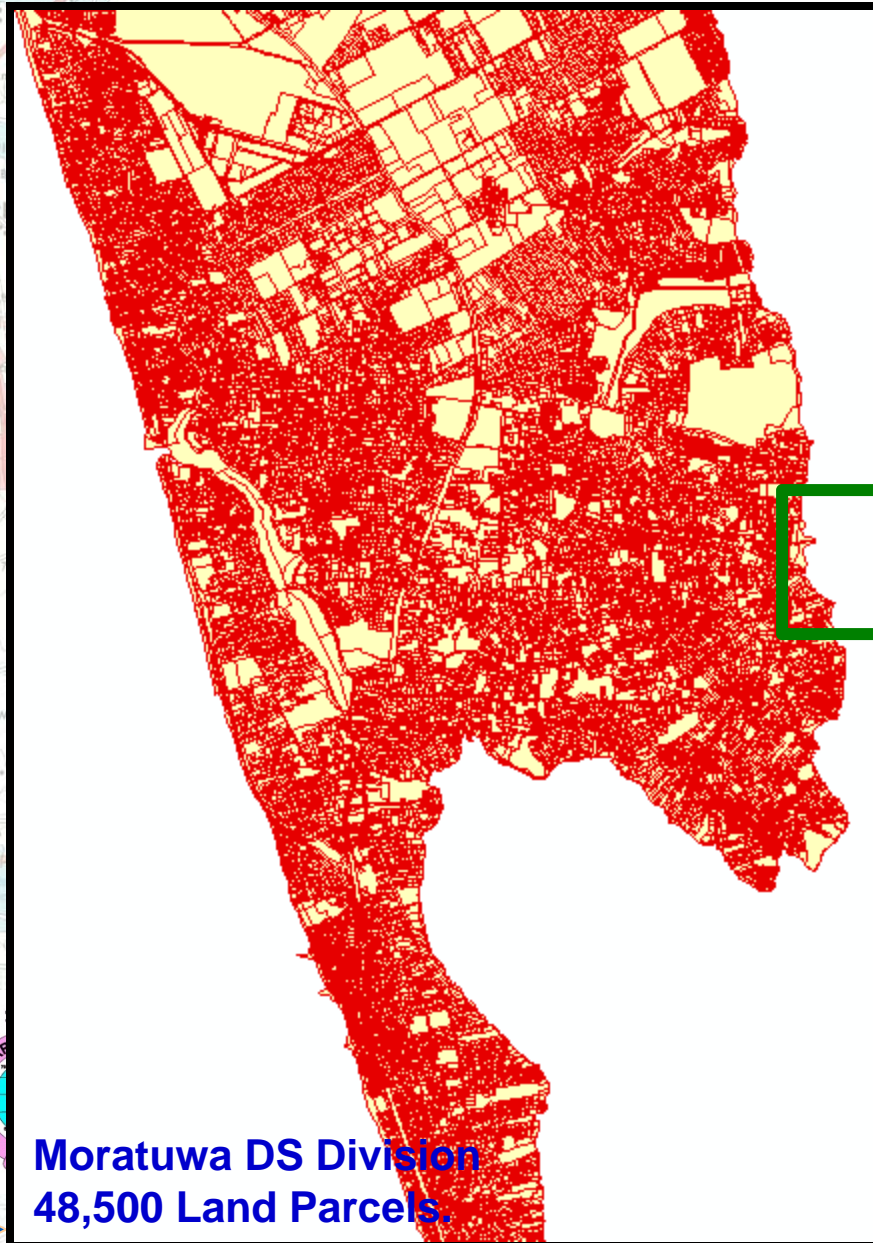


**Planning to Expedite LIS through  
e-Land Hub**





# Parcel Base Land Information System.



**Moratuwa DS Division**  
**48,500 Land Parcels.**

## 12-Digits National ID for each Land Parcel

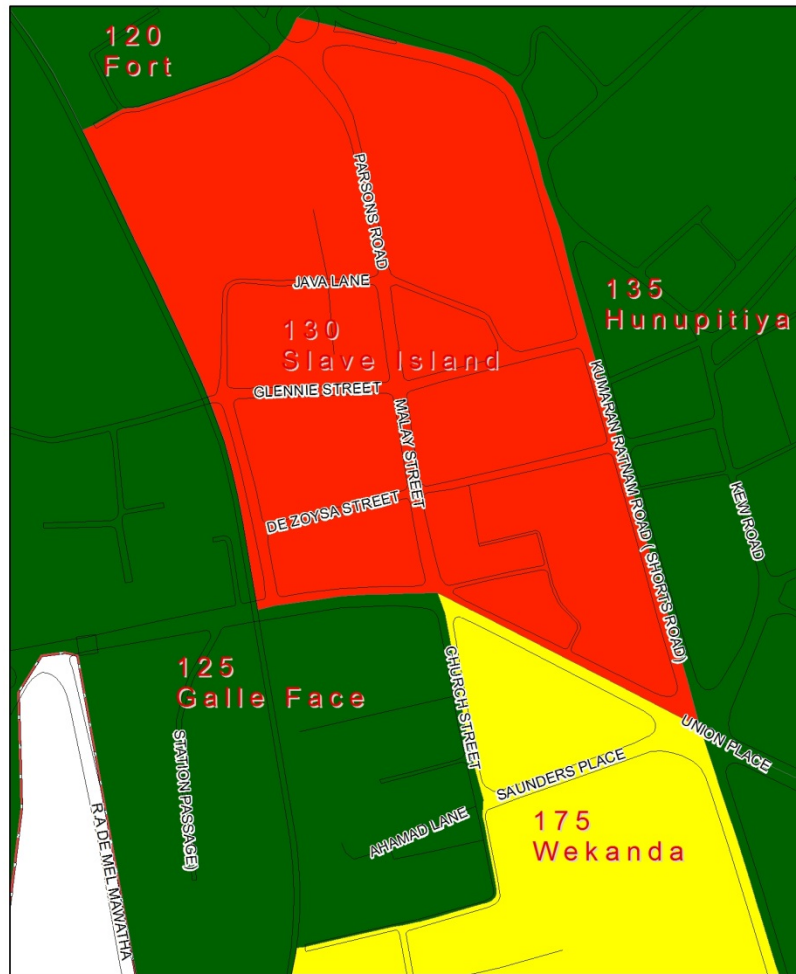
Location:	411.609 476.559 Kilome
<b>Value</b>	<b>Parcel Information</b>
	Part of Lot 8150(TP 90975) of PP 2248
	Gorakagahakanatta
	Garden
	Damith Chandana Agalakada
	520024070040
	0.0387



# Population Density



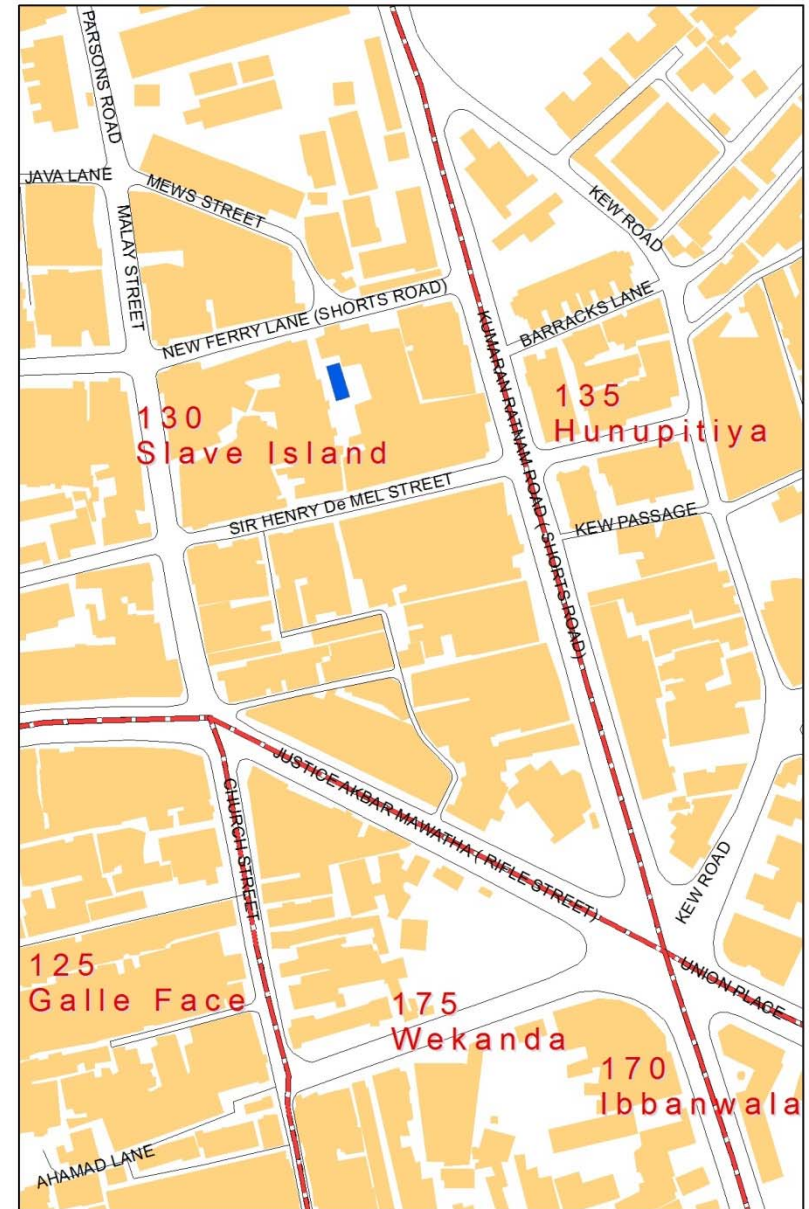
Population Density



1:3,000

**Legend**

- Low
- Medium
- High

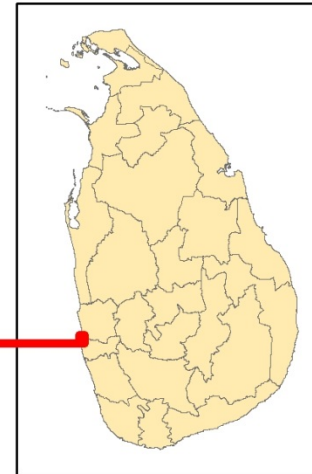
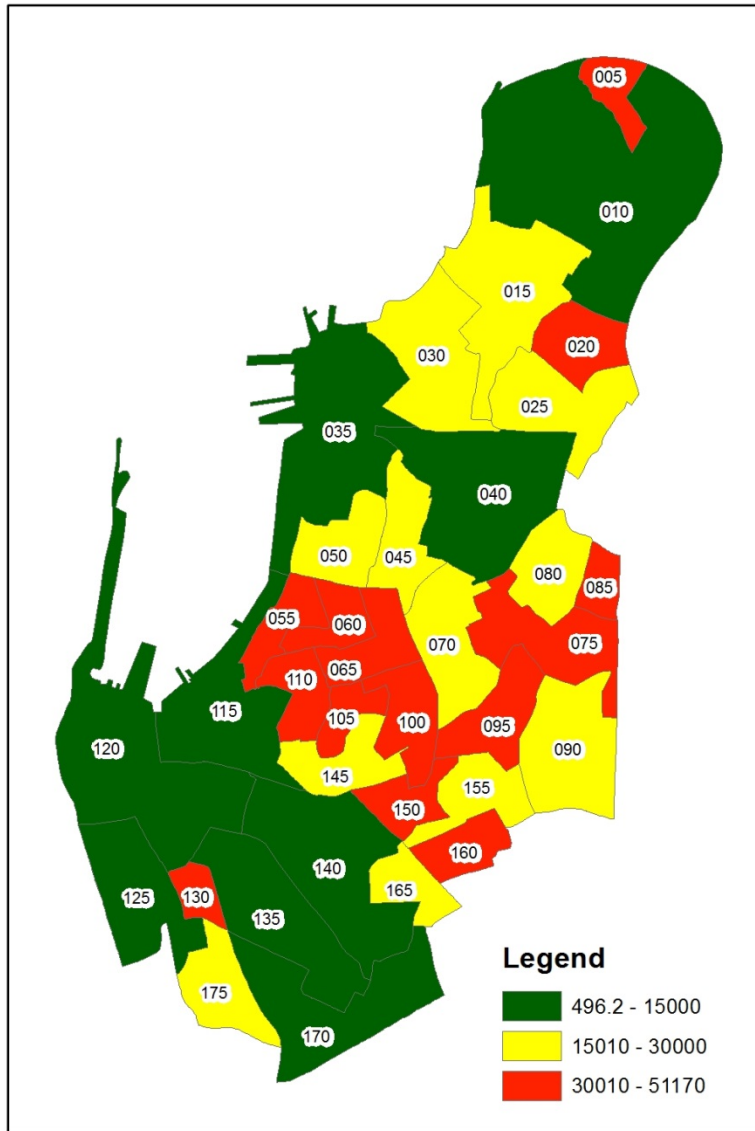


1:2,000



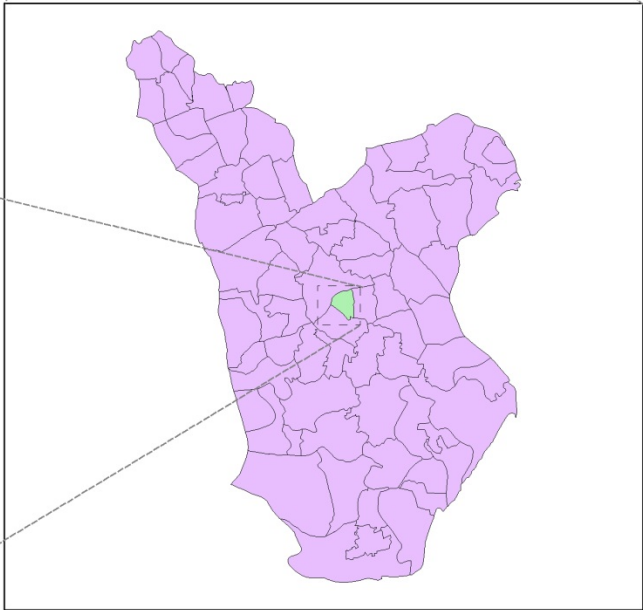
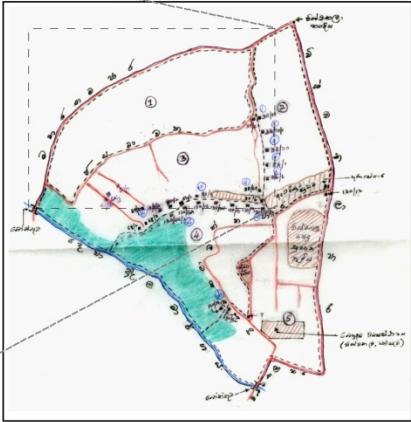
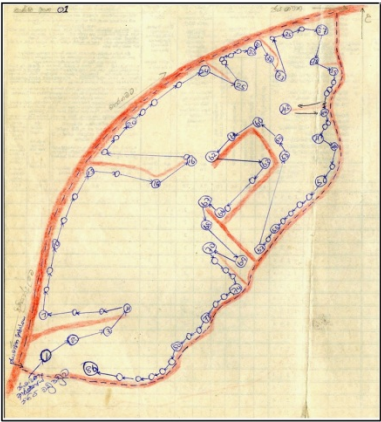
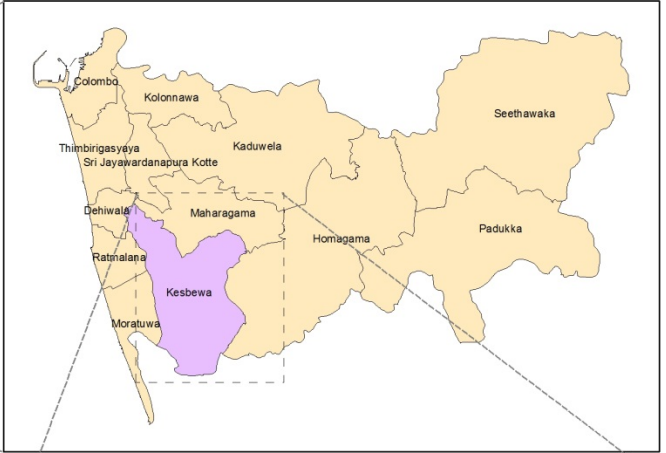
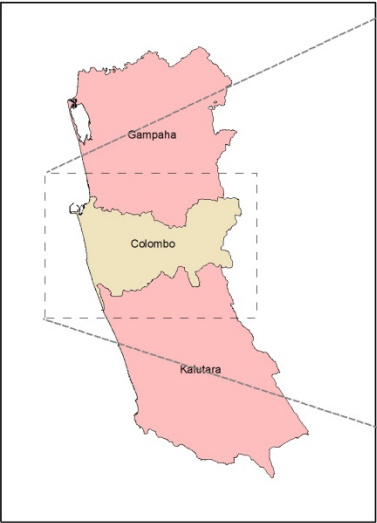
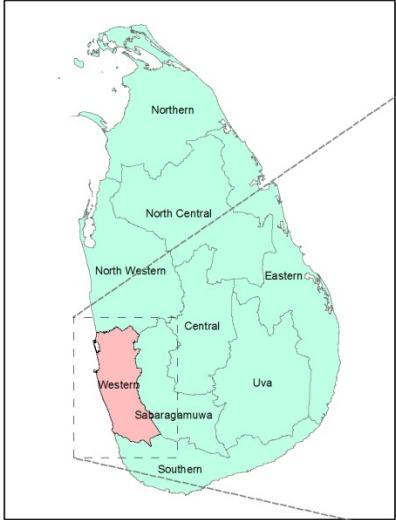
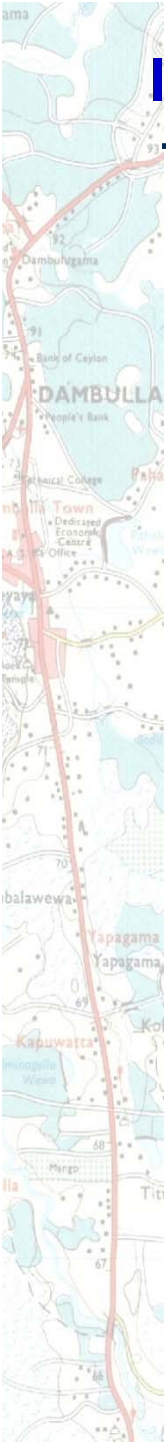


# Population Density



GND_NO	GN_Nam e
005	Sammanthranapura
010	Mattakuliya
015	Modara
020	Madampitiya
025	Mahaw atta
030	Aluthmaw atha
035	Lunupokuna
040	Bloemendhal
045	Kotahena East
050	Kotahena West
055	Kochchikade North
060	Jinthupitiya
065	Masangaw eediya
070	New Bazaar
075	Grandpass South
080	Grandpass North
085	Naw agampura
090	Maligaw atta East
095	Khettarama
100	Aluthkade East
105	Aluthkade West
110	Kochchikade South
115	Pettah
120	Fort
125	Galle Face
130	Slave Island
135	Hunupitiya
140	Suduw ella
145	Keselw atta
150	Panchikaw atta
155	Maligaw atta West
160	Maligakanda
165	Maradana
170	Ibbanw ala
175	Wekanda

# Illustration of nested Administrative Hierarchy of Sri Lanka










# Digital map & image for Vishwakalawa Grama Niladharee Division\_574B

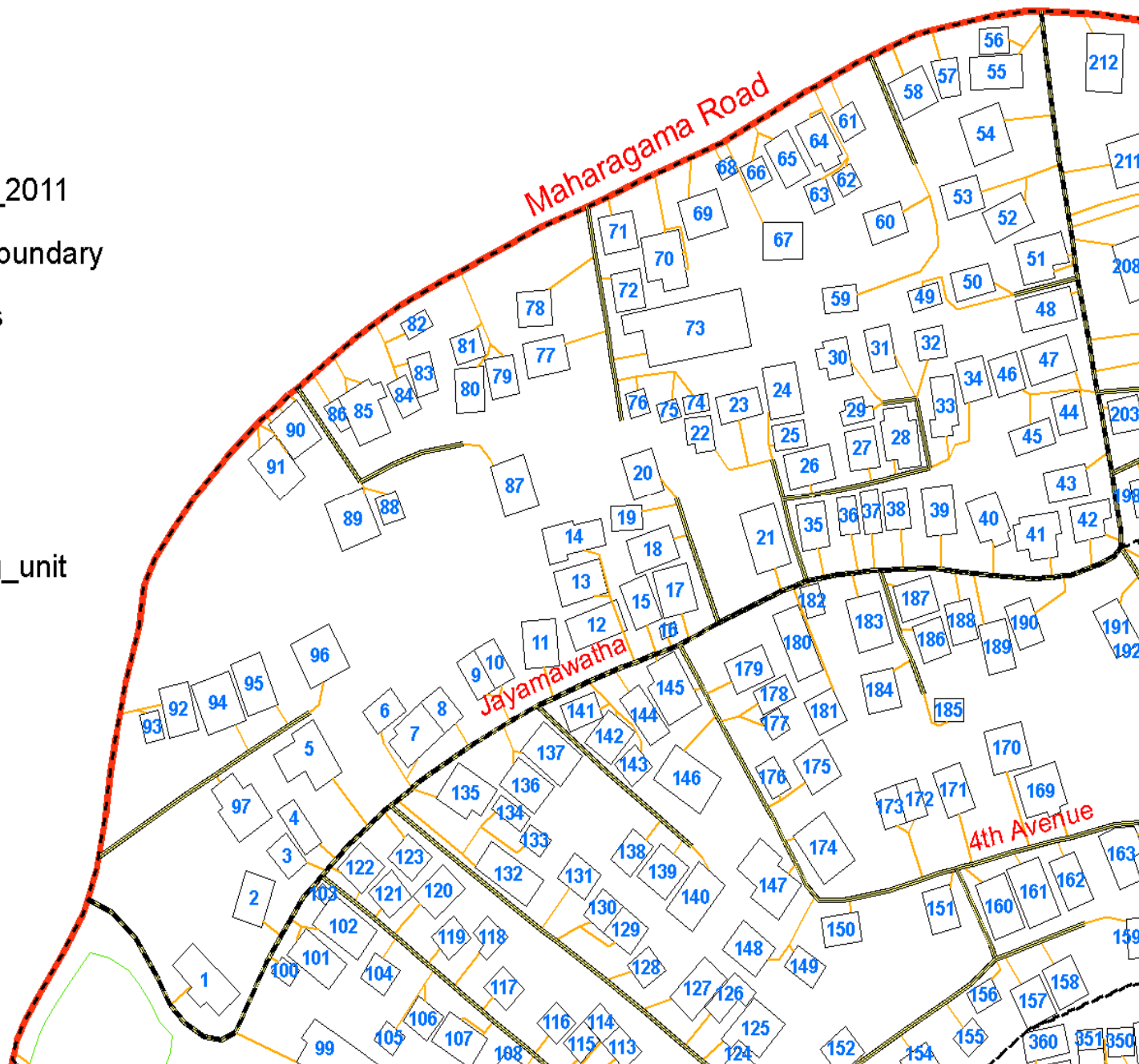




# Digital map for Vishwakalawa Grama Niladharee Division\_574B

## Legend

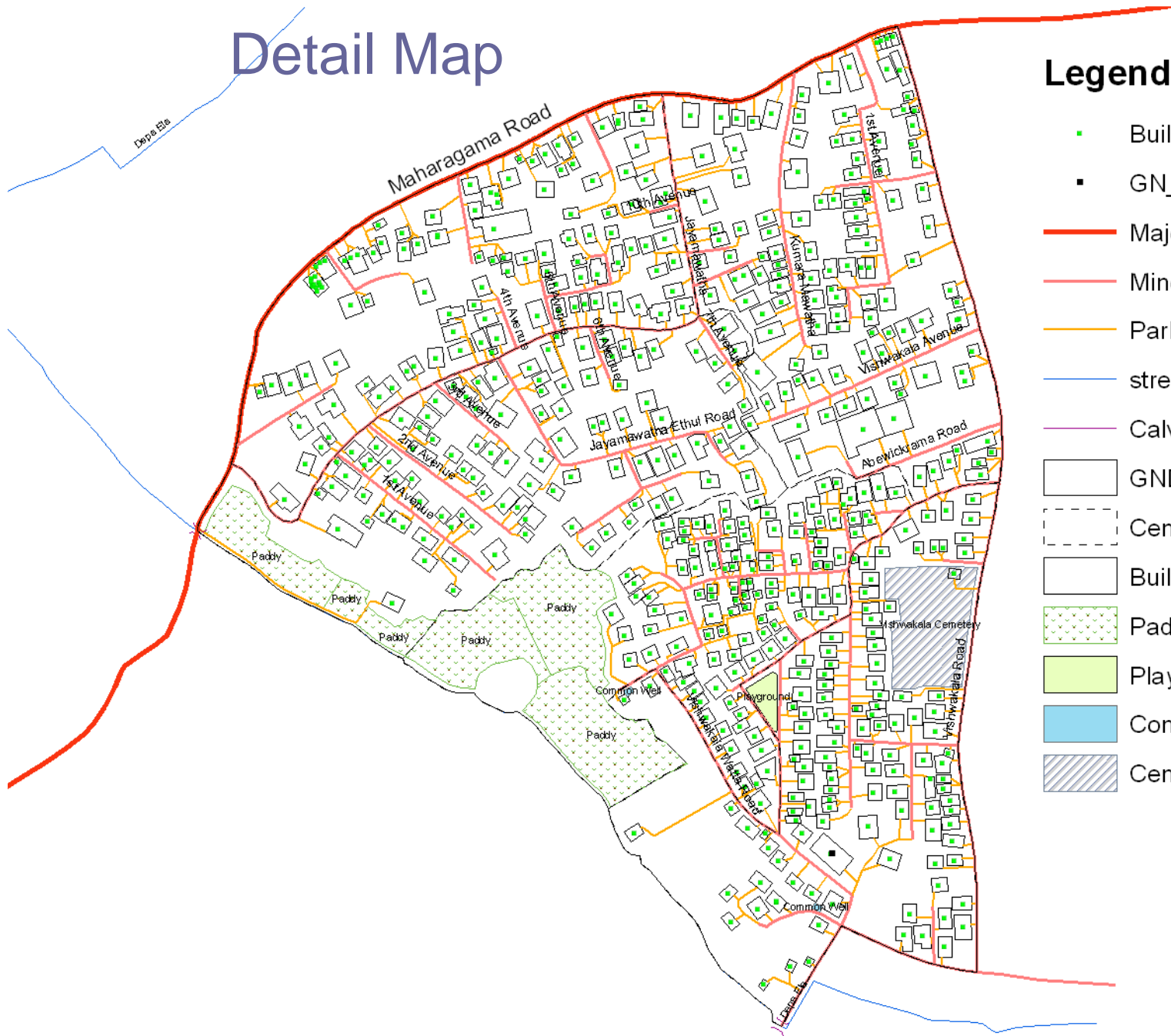
-  GND\_boundary\_2011
-  census\_block\_boundary
-  building\_outlines
-  paddy
-  major\_road
-  minor\_road
-  parh\_to\_building\_unit



0 10 20 40 60 80 Meters



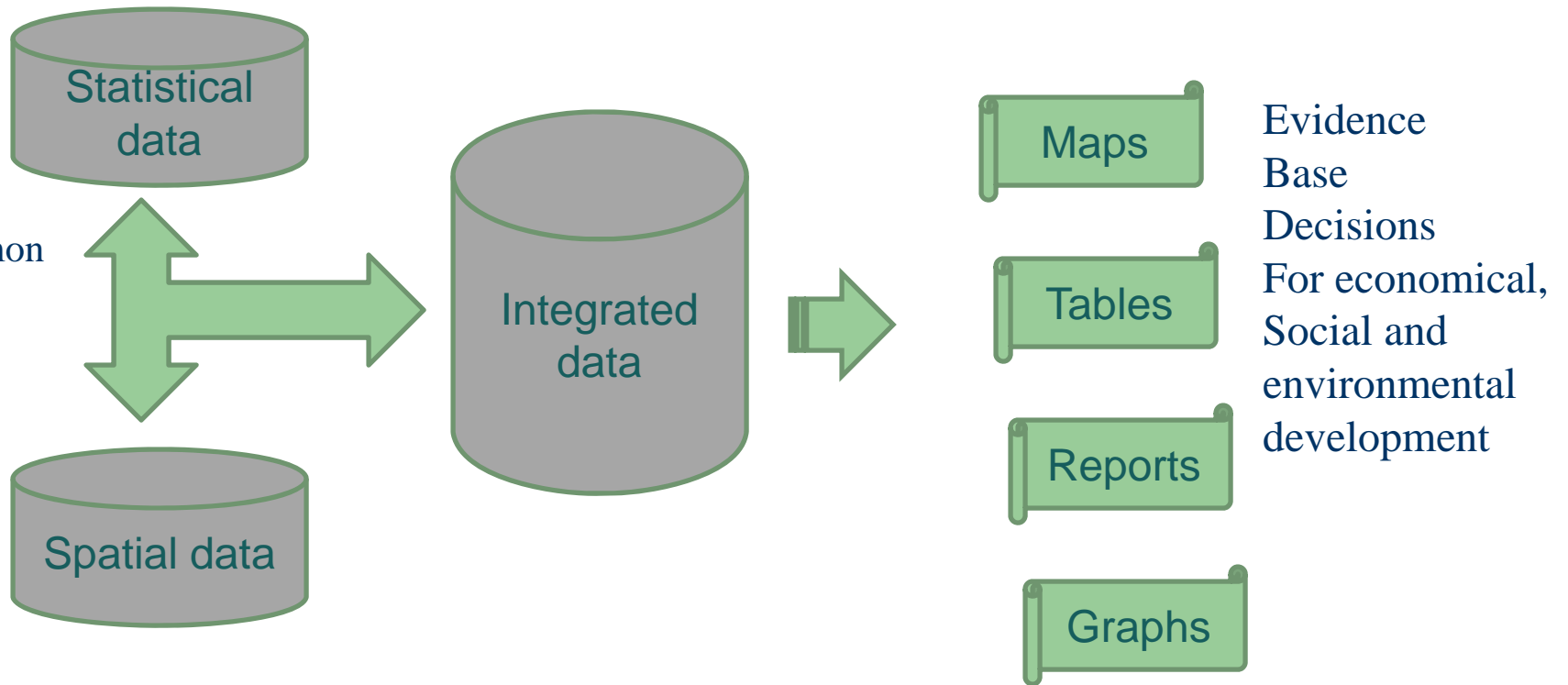
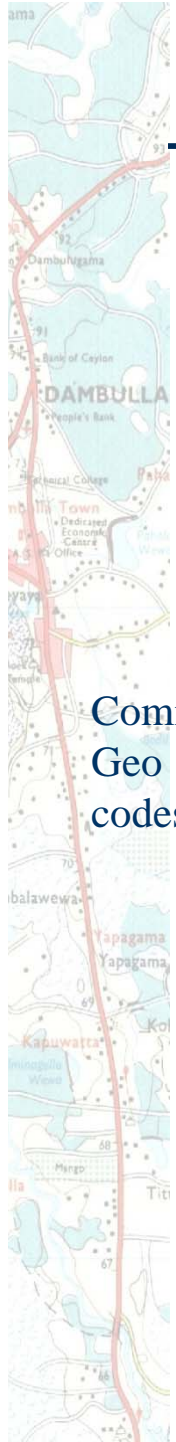
# Detail Map



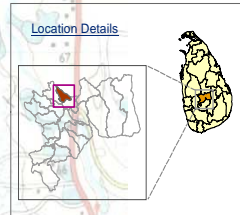
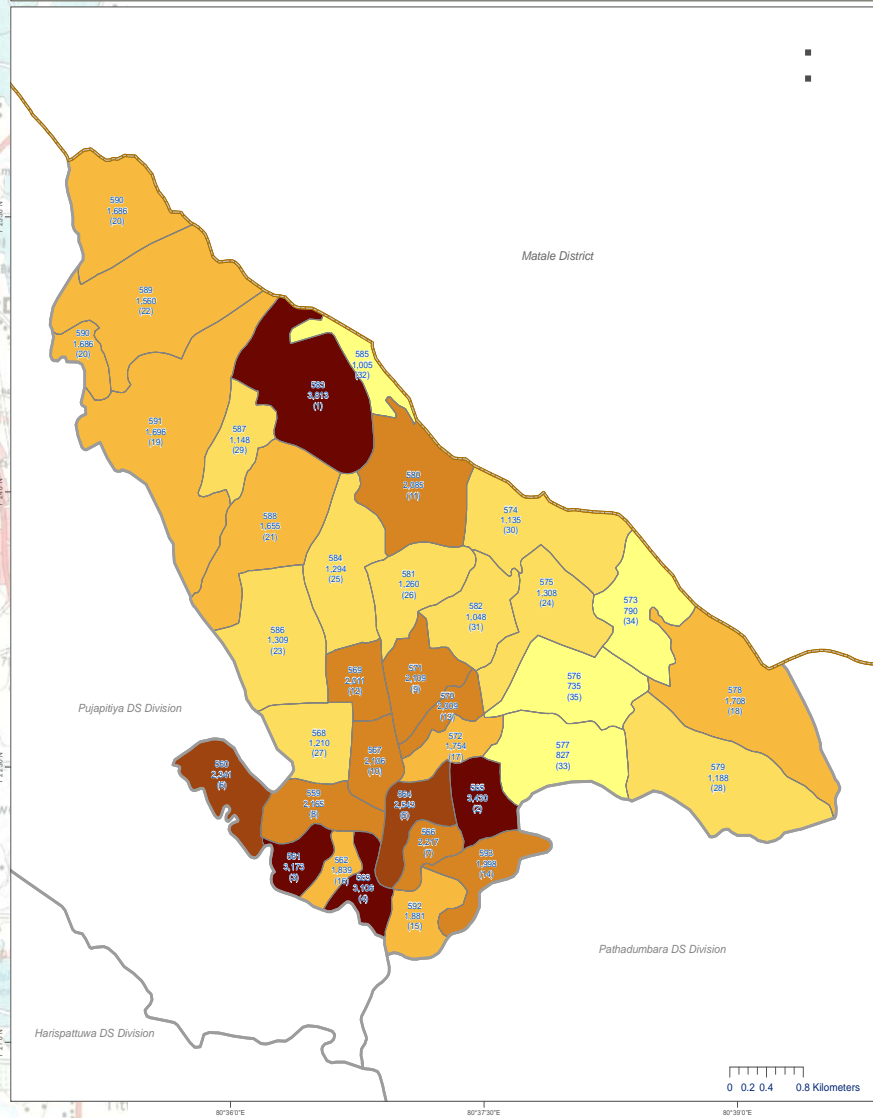
## Legend

- Building\_Unit
- GN\_office
- Major\_Road
- Minor\_Road
- Parh\_to\_Building\_Unit
- stream
- Calvert
- GND\_Boundary\_2011new
- - - Census Block Boundary\_2011
- Building\_Outline
- ▨ Paddy
- Playground
- Common\_Well
- ▨ Cemetery

# Common platform for decision making



Map: P4.21.09.1 Population by GN Division - Akurana DS Division, Kandy District - 2012



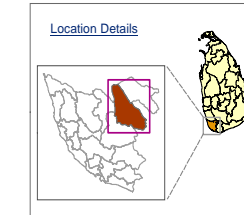
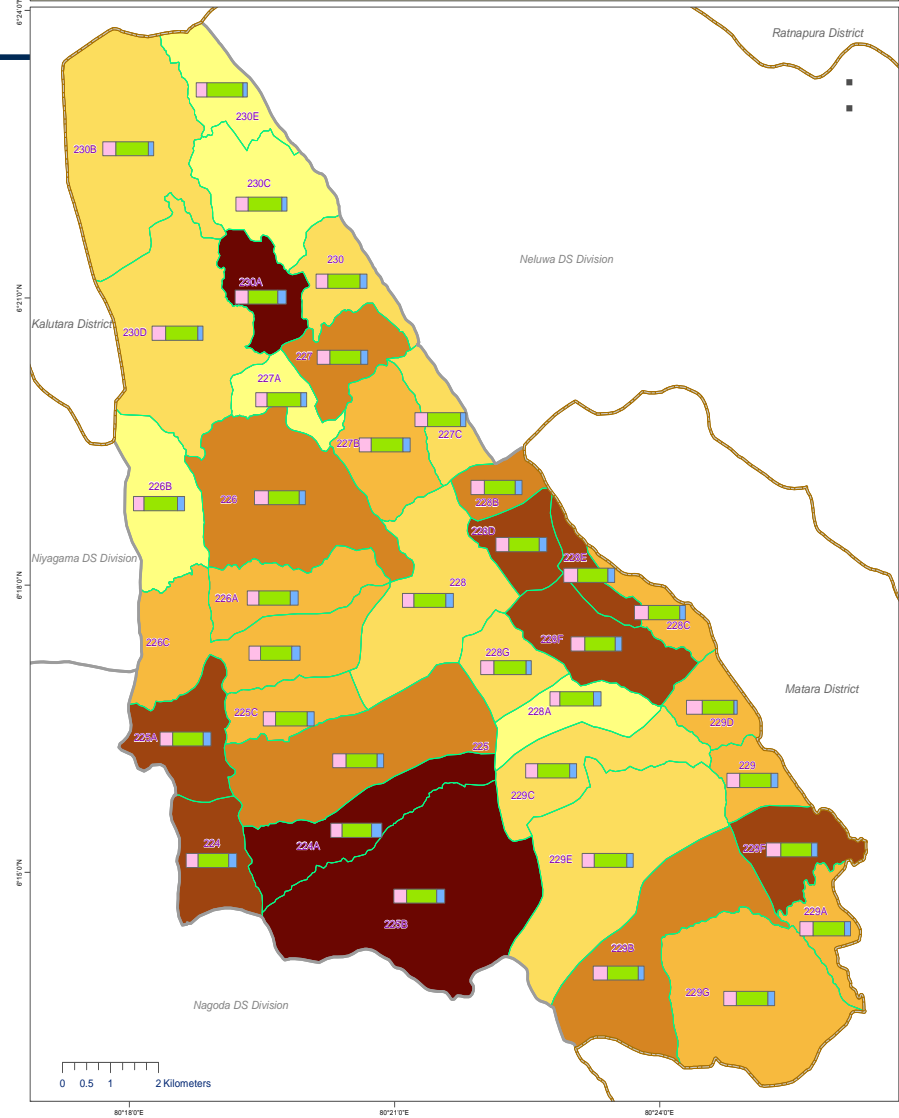
**Legend**

Boundaries	Population
District	735 - 1,005
DS Division	1,006 - 1,309
GN Division	1,310 - 1,881
	1,882 - 2,217
	2,218 - 2,543
	2,544 - 3,813

Notes:  
 \* 1, 1A, 1B, ..., 45, 45A, 45B ... 325, 325A, ... :  
 Denotes the GN Division Number (Refer Annex for relevant GN Division Name)  
 \*\* 9,999 Indicates the Population of the GN Division  
 \*\*\* (1), (2), ... (35), (36) ... (126), (127) ... :  
 Indicates the GN Division rank according to the Population size  
 (least number for highest Population)

Data Source: Preliminary Results of Census of Population and Housing - 2012.  
 Prepared by: Cartography Division, Department of Census & Statistics.

Map: P4.31.18.3 Population by Age Group (less than 15 years, 15 to 59 years, 60 years and over) and Dependency Ratio by GN Division - Thawalama DS Division, Galle District, 2012



**Legend**

Boundaries	Dependency Ratio **
District	41.9 - 52.9
DS Division	53.0 - 59.3
GN Division	59.4 - 63.0
	63.1 - 65.0
	65.1 - 68.5
	68.6 - 72.8

Age Group (%) \*

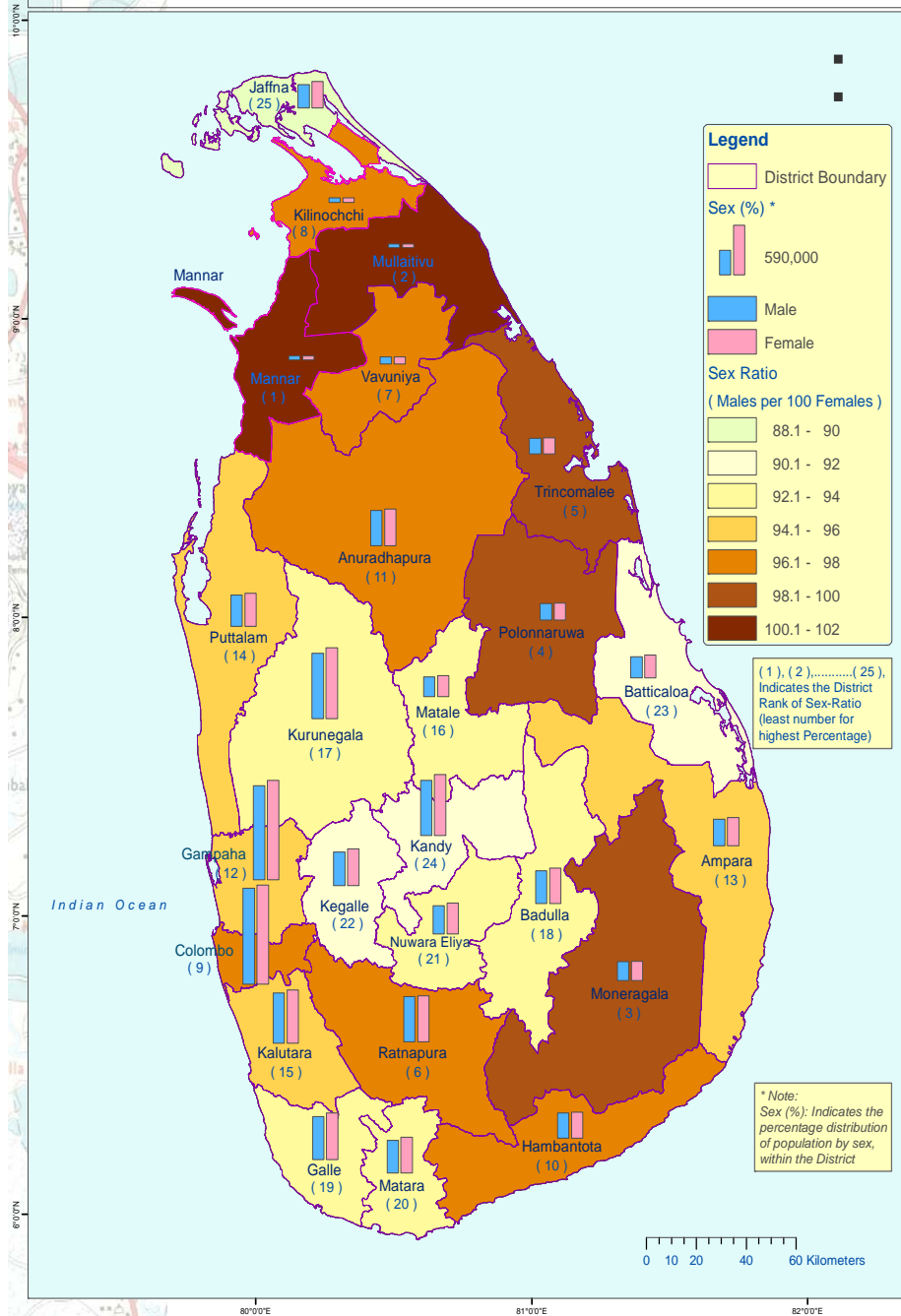
- Less than 15 years
- 15 - 59 years
- 60 years and over

Notes: \* Age Group (%) indicate the percentage distribution of population by age (less than 15 years, 15 to 59 years & 60 years and over) within the GN Division.  
 \*\* Dependency Ratio = (persons Aged below 15 years and above 59 years / Persons Aged 15 to 59 years) \* 100  
 \*\*\* 1, 1A, 1B, ..., 45, 45A, 45B ... 325, 325A, ... :  
 Denotes the GN Division Number (Refer Annex for relevant GN Division Name)

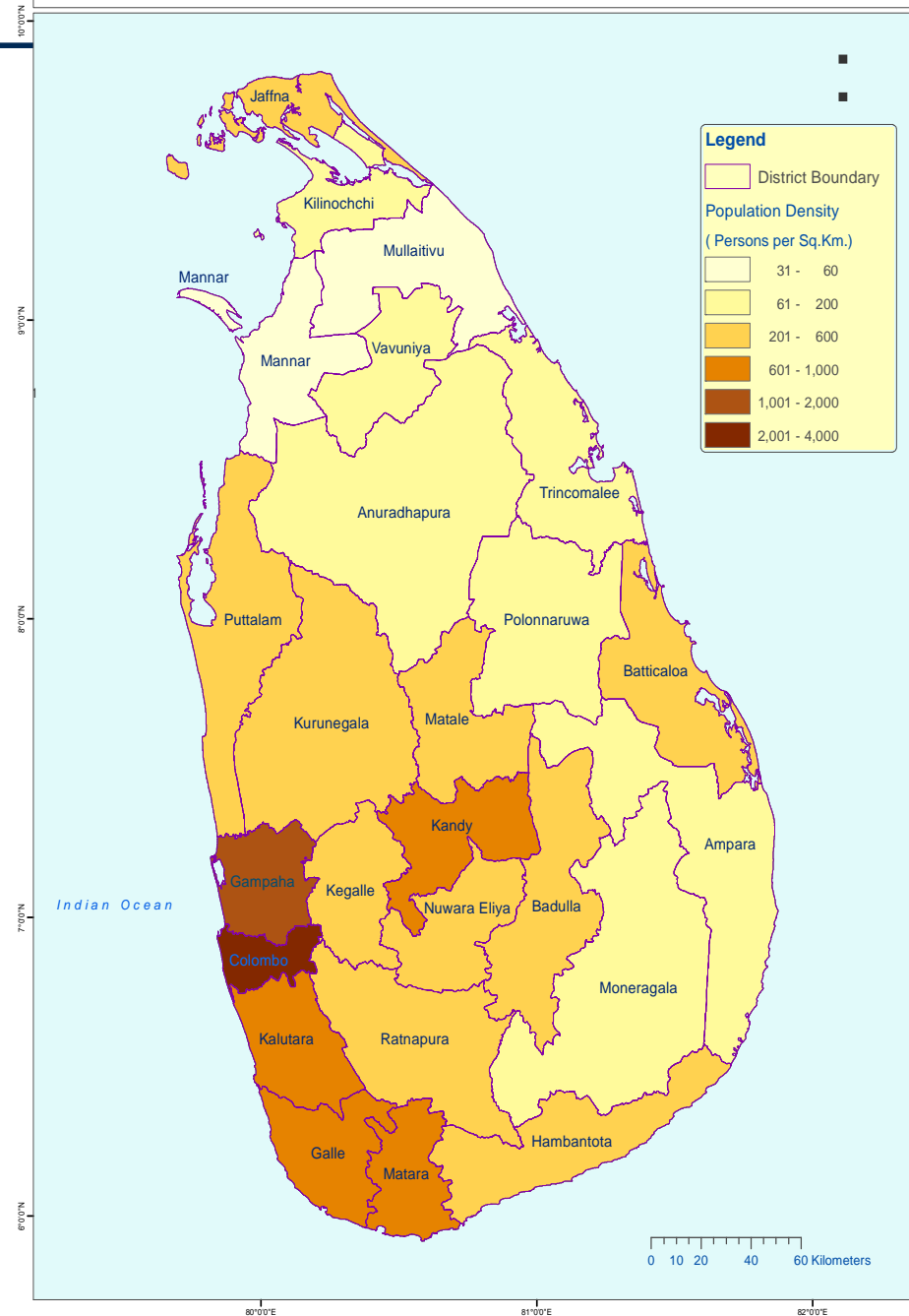
27

Data Source: Preliminary Results of Census of Population and Housing - 2012.  
 Prepared by: Cartography Division, Department of Census & Statistics.

Population by Sex and Sex Ratio by District, 2012

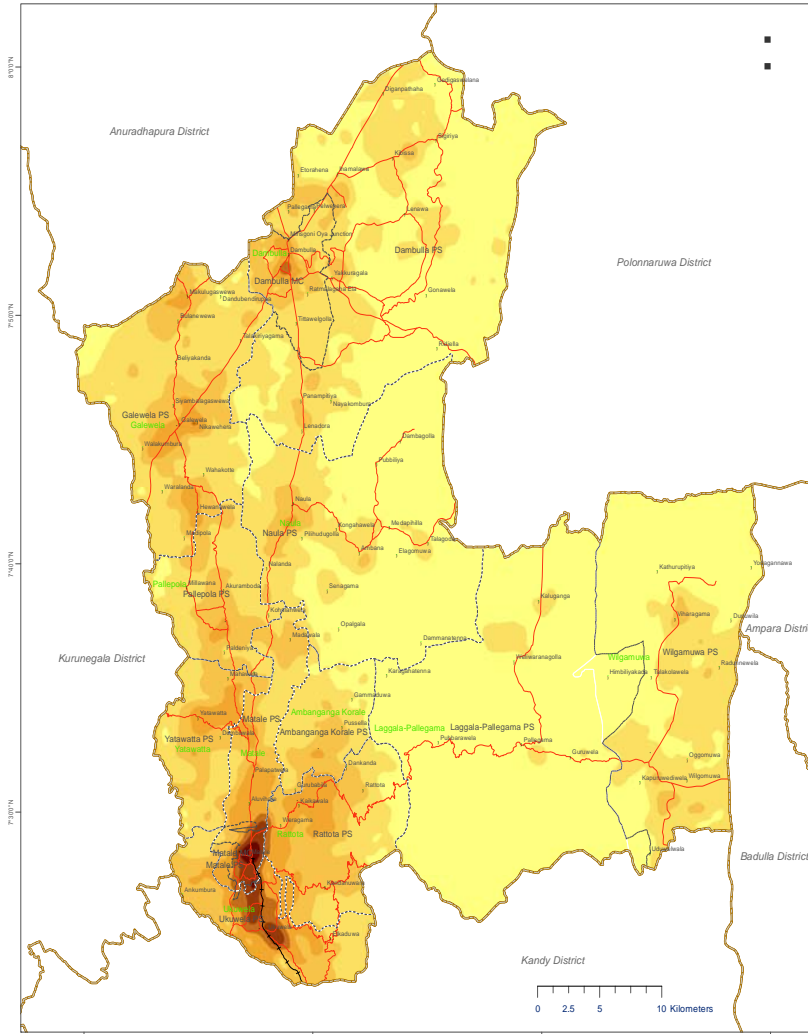


Population Density by District, 2012



# Distribution of Population Density- District Level

Map: P3.22.1.4 Distribution of Population Density - Matale District, 2012



**Location Details**

**Legend**

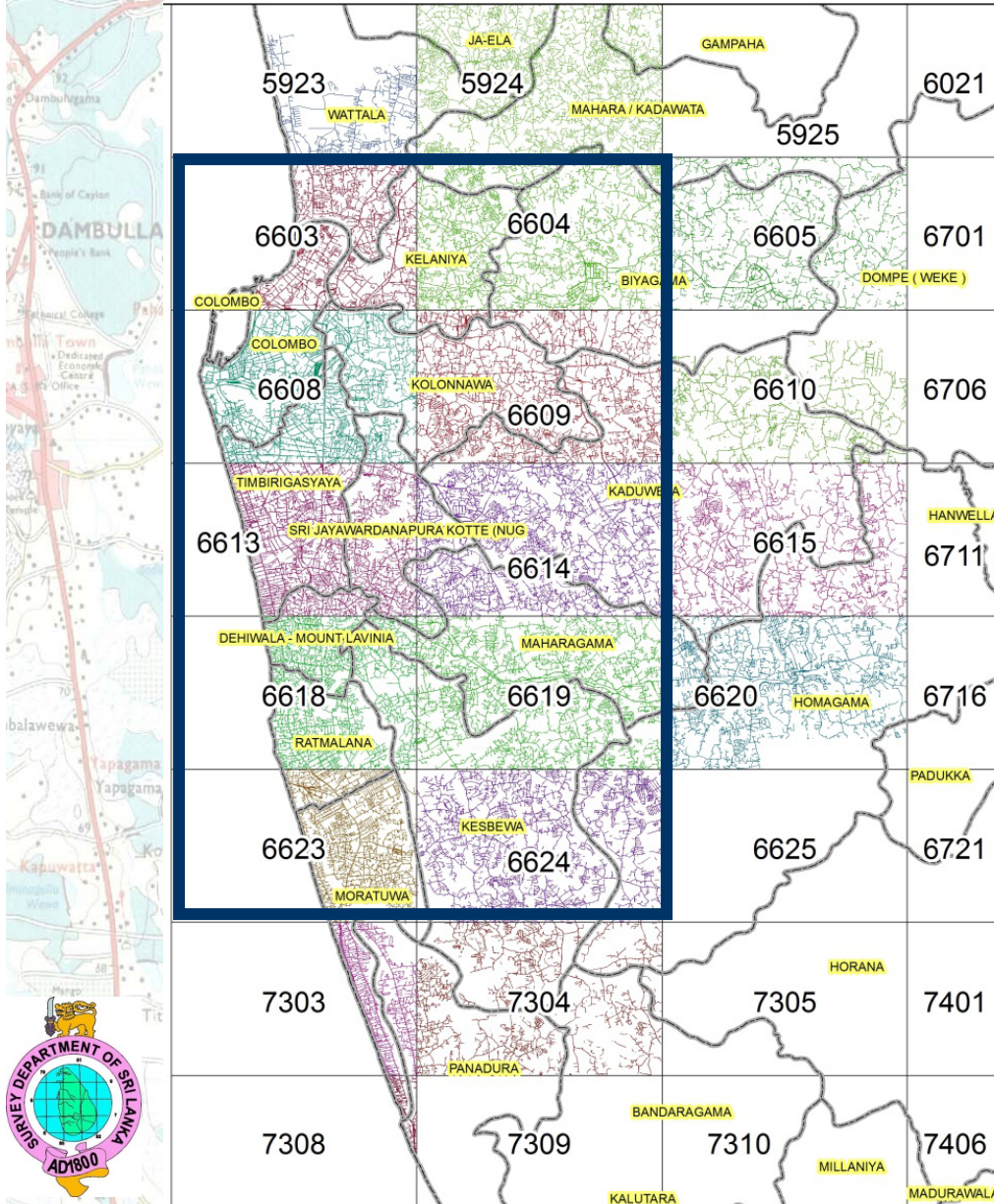
• District Secretariat	— Boundaries	Population (Persons per Sq.Km.)
• Divisional Secretariat	— District	0 - 132
• Town	— DS Division	133 - 369
— Major Road	— Local Authority	370 - 737
— Railway		738 - 1,475
		1,476 - 2,607
		2,608 - 4,240
		4,241 - 6,715

Data Source: Preliminary Results of Census of Population and Housing - 2012.  
Prepared by: Cartography Division, Department of Census and Statistics.





# Current Status - 1:1,000 Topo Database



Construction (CO)	CO_Building_Pt
	CO_Building_Pg
Hydro (HY)	HY_Hydro_Pt
	HY_Hydro_Li
	HY_Hydro_Pg
Landuse (LU)	LU_Landuse_Pt
	LU_Landuse_Pg
	LU_Reserves_Pg
Terrain (TE)	TE_Terrain_Pt
	TE_Terrain_Li
Transport (TR)	TR_Transport_Pt
	TR_Transport_Li
	TR_Transport_Segment





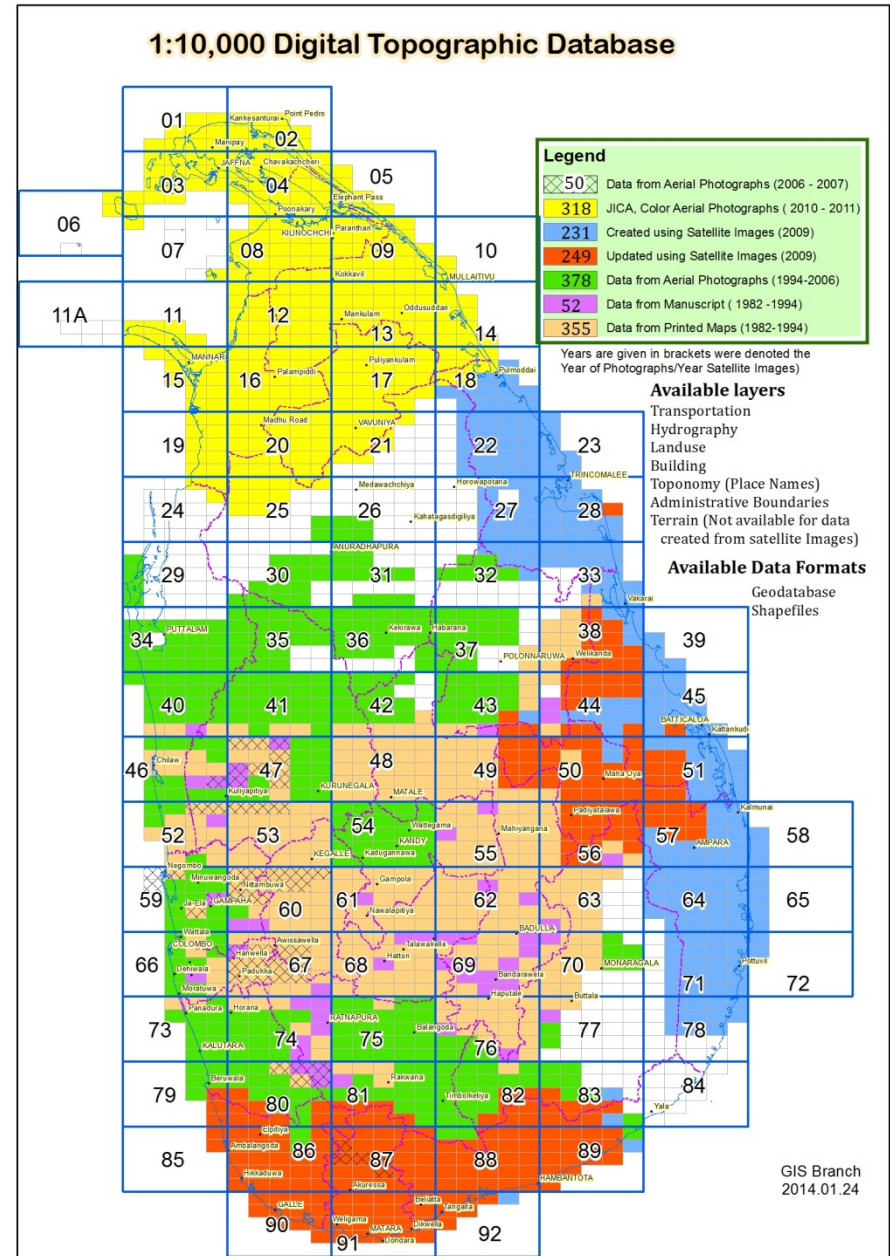
# 1K Data – Colombo Metropolitan Area.





# Future endeavors.

- Implement a NSDI (National Spatial Data Infrastructure)
- Introduce fast map updating system.
- Transform Tile base Database to a Seamless one.
- Providing Foundation Data in Open Standards.







Thank  
You

