

ANNEX 6: IM4Davao GIS Database Development

1 Overview and Purpose of GIS Database Development

1. Geographic Information System (GIS) is one of the most powerful tools for decision making and planning. Its capability to handle large volumes of spatial and attribute information has made it an essential tool for development planning.
2. A comprehensive GIS database is being developed for IM4Davao to understand current conditions and perform analyses such as situational analysis and suitability assessment for land development. The database covers, in varying levels of detail, the administrative, natural, social, land use, infrastructure, public facility and hazard conditions of Davao City and surrounding areas.
3. Data collected from the different sources were then integrated into the GIS database. Data integration mainly consists of converting hardcopy data to digital form and processing digital data to conform to standards adopted in the study. The GIS data format adopted for the study is ESRI shapefile format. The coordinate system adopted for most of the GIS data is the Philippine Reference System 92 Zone 5.
4. The following table summarizes the GIS data developed so far:

Administrative

Folder: \10_Database\10_GIS\00_Administrative

Barangay Boundaries	Davao	A_DVO_BarangayBound2016_DvoCPDO_PRS92Zone5.shp	Polygon	DCPDO			PRS92 Zone5
Barangay Boundaries	Davao	A_DVO_BarangayBound_NEDA_PRS92Zone5.shp	Polygon	NEDA			PRS92 Zone5
Barangay Boundaries (Population Data Adjusted for Bgys that are spread over several locations)	Davao	A_DVO_BarangayBound2016_CpdoJpt_PRS92Zone5.shp	Polygon	DCPDO (edited by JPT)			PRS92 Zone5
Congressional District Boundaries	Davao	A_DVO_CongDistrict_DvoCPDO_PRS92Zone5.shp	Polygon	DCPDO			PRS92 Zone5
Davao City Boundary	Davao	A_DVO_CityMuniBound2016_DvoCPDO_PRS92Zone5.shp	Polygon	DCPDO			PRS92 Zone5
Davao City Boundary	Davao	A_DVO_CityMuniBound2016_DvoCPDO_WGS84.shp	Polygon	DCPDO			GCS WGS84
Davao Metropolitan Area Boundary	Davao	A_DVO_MetroDavao_NamriaTopo50k_PRS92Zone5.shp	Polygon	NAMRIA 50k			PRS92 Zone5
District Boundaries	Davao	A_DVO_District_DvoCPDO_PRS92Zone5.shp	Polygon	DCPDO			PRS92 Zone5

Natural Conditions

Folder: \10_Database\10_GIS\10_NaturalConditions

River System	Davao	N_DVO_RiverSystem_DvoCPDO_PRS92Zone5_Clip.shp	Line	DCPDO			PRS92 Zone5
Rivers and Streams (Lines)	Davao	N_DVO_Water_Line_Clip_NAMRIA50k_PRS92Zone5.shp	Line	NAMRIA 50k			PRS92 Zone5
Slope	Davao	N_DVO_Slope_NAMRIAJPT_PRS92Zone5.shp		NAMRIA 50k			PRS92 Zone5
Soil	Davao	N_DVO_Soil_DvoCPDO_PRS92Zone5.shp		DCPDO			PRS92 Zone5
Water Bodies	Davao	N_DVO_Water_Polygon_Clip_NAMRIA50k_PRS92Zone5.shp	Polygon	NAMRIA 50k			PRS92 Zone5
Watershed	Davao	N_DVO_Watersheds_DvoCPDO_PRS92Zone5.shp		DCPDO			PRS92 Zone5
Waterways (Line)	Davao	N_DVO_Waterways_OSM_PRS92Zone5.shp	Line	OSM			PRS92 Zone5

Waterways (Polygon)	Davao	N_DVO_Waterways_Polygon_OSM_CPDO_JPT_PR92Zone5.shp	Polygon	OSM, DCPDO, JPT			PRS92 Zone5
Waterways (Polygon)	Davao	N_DVO_Waterways_Polygon_OSM_PR92Zone5.shp	Polygon	OSM			PRS92 Zone5

Buildings

Folder: \10_Database\10_GIS\20_Buildings

Building Footprints	Davao Urban Area	B_AOI_BuildingFootprintsUpdated_PR92Zone5_v1.shp					PRS92 Zone5
Fire Stations	Davao	B_DVO_FireStations_DvoCPDO_PR92Zone5.shp		DCPDO			PRS92 Zone5
Hospitals	Davao	B_DVO_Hospitals2016_DvoCDPO_PR92Zone5.shp		DCPDO	2016		PRS92 Zone5
Police Stations	Davao	B_DVO_PoliceStations_DvoCPDO_PR92Zone5.shp		DCPDO			PRS92 Zone5
Schools	Davao	B_DVO_Schools2016_DvoCDPO_PR92Zone5.shp		DCPDO			PRS92 Zone5

Parcels

Folder: \10_Database\10_GIS\25_Parcels

Parcel Boundaries	Davao Urban Area	P_DVO_Parcels_DvoCDPO_PR92Zone5.shp	Polygon	DCPDO			PRS92 Zone5
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Road Network

Folder: \10_Database\10_GIS\30_RoadNetwork

Bridges	Davao	RN_DVO_Bridges2016_DvoCDPO_PR92Zone5.shp		DCPDO			PRS92 Zone5
Bypass Road (Planned)	Davao	R_DVO_ByPassRoad_JICA2017_PR92Zone5.shp		JICA	2017		PRS92 Zone5
Calinan-Panabo Road (Proposed)	Davao	R_DVO_ProposedCalinanPanaboRoad_2017_JPT_WGS84.shp					GCSWGS84
Coastal Road (Proposed)	Davao	R_DVO_CoastalRoad_DPWH_PR92Zone5.shp		DPWH			PRS92 Zone5
DPWH Proposed Projects	Davao	R_DVO_DPWHProposedProjects_2018_DPWH_PR92Zone5.shp		DPWH			PRS92 Zone5
DPWH Proposed Projects (Buffer 15m)	Davao	R_DVO_DPWHProposedProjects_2018_15mbuffer_DPWH_PR92Zone5.shp		DPWH			PRS92 Zone5
Ongoing Projects	Davao	R_DVO_DPWHProposedProjects_2017_DPWH_PR92Zone5.shp		DPWH			PRS92 Zone5
Proposed Priority Projects	Davao	R_DVO_ProposedPriorityProjects_2017_JPT_PR92Zone5.shp		JPT		2017	PRS92 Zone5
Proposed Projects	Davao	R_DVO_ProposedProjects_JICA2017_PR92Zone5.shp		JICA		2017	PRS92 Zone5
Road Network (Strada)	Davao	R_DVO_RoadNetwork_Strada_JPT_PR92Zone5.shp		JPT		2017	PRS92 Zone5
Road Network Nodes (Strada)	Davao	R_DVO_RoadNetworkNodes_Strada_JPT_PR92Zone5.shp		JPT		2017	PRS92 Zone5
Road Polygons	Davao Urban Area	RN_AOI_RoadNetwork_Polygon_JPT_PR92Zone5.shp	Polygon	JPT			PRS92 Zone5
Roads	Davao	RN_DVO_RoadLine_NAMRIA50k_PR92Zone5.shp		NAMRIA 50k	2013		PRS92 Zone5
Roads	Davao	RN_DVO_RoadNetwork2016_DvoCDPO_PR92Zone5_Clip.shp		DCPDO			PRS92 Zone5
Roads	Davao	RN_DVO_RoadNetwork2016_OSM_PR92Zone5.shp		OSM			PRS92 Zone5
Roads	Davao	RN_DVO_RoadNetwork_MetroDavao_OSM_PR92Zone5.shp		OSM			PRS92 Zone5
Roads	Davao	RN_DVO_RoadNetwork_NAMRIA50k_PR92Zone5.shp		NAMRIA 50k	2013		PRS92 Zone5

Roads (National)	Davao	RN_DVO_NationalRoads2015_DPWH_PR S92Zone5.shp		DPWH			PRS92 Zone5
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Transportation

Folder: \10_Database\10_GIS\40_Transportation

Airport	Davao	T_DVO_Airport_OSM_PRS92_Zone5.shp		OSM			PRS92 Zone5
Airport Polygon	Davao	T_DVO_Airport_Poly_OSM_PRS92Zone5.s hp		OSM			PRS92 Zone5
Davao Monorail	Davao	T_DVO_DavaoMonorail_JPT_PRS92Zone5. shp		JPT			PRS92 Zone5
Ferry Terminal	Davao	T_DVO_FerryTerminal_OSM_PRS92Zone5. shp		OSM			PRS92 Zone5
Mindanao Railway (Planned)	Davao	T_DVO_MindanaoRailway_JPT_PRS92Zon e5.shp		DOTR			PRS92 Zone5
Mindanao Railway Stations (Planned)	Davao	T_DVO_MindanaoRailwayStations_JPT_PR S92Zone5.shp		DOTR			PRS92 Zone5
Ports	Davao	T_DVO_Ports_OSM_PRS92Zone5.shp		OSM			PRS92 Zone5
PUJ Routes	Davao	T_DVO_PUJRoutes2013_DvoCPDO_PR9 2Zone5.shp		DCPDO			PRS92 Zone5

Utilities

Folder: \10_Database\10_GIS\50_Uilities

Blow-off valves	Davao	P_DVO_BlowoffValves_DCWD_PRS92Zon e5.shp		DCWD			PRS92 Zone5
Gate Valves	Davao	P_DVO_GateValves_DCWD_PRS92Zone5. shp		DCWD			PRS92 Zone5
Hydrant pipes	Davao	P_DVO_Hydrant_Line_DCWD_PRS92Zone 5.shp		DCWD			PRS92 Zone5
Hydrants	Davao	P_DVO_Hydrant_Point_DCWD_PRS92Zon e5.shp		DCWD			PRS92 Zone5
Pipe Network (Lines)	Davao	P_DVO_PipeSystem_Line_DCWD_PRS92Z one5.shp		DCWD			PRS92 Zone5
Pipe Network (Point)	Davao	P_DVO_PipeSystem_Point_DCWD_PRS92 Zone5.shp		DCWD			PRS92 Zone5
Pump Wells	Davao	P_DVO_PumpedWells_Point_DCWD_PR9 2Zone5.shp		DCWD			PRS92 Zone5
Water Reservoir Locations	Davao	P_DVO_WaterReservoir_Point_DCWD_PR 92Zone5.shp		DCWD			PRS92 Zone5
Water Supply Status	Davao	P_DVO_WaterSupplyStatus_JPT_PRS92Z one5.shp		JPT	2017		PRS92 Zone5
Water System Zones	Davao	P_DVO_WaterSystemZones_DCWD_PR9 2Zone5.shp		DCWD			PRS92 Zone5

Land Conditions

Folder: \10_Database\10_GIS\60_LandConditions

Ancestral Domains	Davao	LC_DVO_AncestralDomains_DvoCDPO_P RS92Zone5_Clip.shp		DCPDO			PRS92 Zone 5
Ancestral Domains	Davao	LC_DVO_AncestralDomains_NCIP_PRS92 Zone5.shp		NCIP			PRS92 Zone 5
BuiltUp Areas	Davao	LC_DVO_Builtup2015_DENRXI_PRS92Zon e5.shp		DENRXI			PRS92 Zone 5
BuiltUp Areas	Davao Urban Area	LC_DVO_Builtup2016_UrbanArea_JST_PR S92Zone5.shp		JPT			PRS92 Zone 5
BuiltUp Areas	Davao Urban Area	LC_DVO_Builtup_DvoCDPO_PRS92Zone5. shp		DCPDO			PRS92 Zone 5
CLUP 2013	Davao	LC_DVO_CLUP2013_2022_DvoCDPO_PR S92Zone5.shp					PRS92 Zone 5
Height Zones	Davao	LC_DVO_HeightZone_CAAP_PRS92.shp	Polygons	CAAP			PRS92 Zone 5
Land Capability	Davao	LC_DVO_LandUseCapability_DvoCPDO_P RS92Zone5.shp	Polygons	DCPDO			PRS92 Zone 5

Land Cover	Davao	LC_DVO_LandCover_DENRXI_PRS92Zone5.shp	Polygons	DENRXI			PRS92 Zone 5
Land Use 1994	Davao	LC_DVO_LandUse1994_DvoCPDO_PRS92Zone5.shp					PRS92 Zone 5
Land Use 2011	Davao	LC_DVO_ExistingLandUse2011_DvoCDPO_PRS92Zone5_Clip.shp					PRS92 Zone 5
Land Use 2017	Davao Urban Area	LC_AOI_LandUse2017_JPT_PRS92Zone5.shp					PRS92 Zone 5
Land Use 2017	Davao	LC_DVO_LandUse2017_JPT_PRS92Zone5_v2.shp					PRS92 Zone 5
Land Use Plan 2045	Davao Urban Area	LC_AOI_LandUsePlan_JPT_PRS92Zone5.shp		JPT			PRS92 Zone 5
Large Scale Public and Institutional Use	Davao	LC_DVO_LargeScalePublicandInstitutional_DvoCPDO_PRS92Zone5.shp	Polygons	DCPDO			PRS92 Zone 5
Residential Cluster 2017	Davao	LC_DVO_ResidentialCluster2017_DvoCPDO_NAMRIA_PRS92Zone5.shp	Polygons	DCPDO/NAMRIA			PRS92 Zone 5
SAFDZ	Davao	LC_DVO_SAFDZ_DvoCDPO_PRS92Zone5.shp	Polygons	DCPDO			PRS92 Zone 5
Subdivisions (Approved and Pending)	Davao	LC_DVO_SubdivisionApprovedPending_Polygon_DvoCPDO_PRS92Zone3.shp	Polygons	DCPDO			PRS92 Zone 5
Timberland	Davao	LC_DVO_Timberland_DvoCDPO_PRS92Zone5.shp	Polygons	DCPDO			PRS92 Zone 5
Urban Area 1980	Davao	LC_DVO_Urban1980_PSA_PRS92Zone5.shp	Polygons	PSA			PRS92 Zone 5
Urban Area 1990	Davao	LC_DVO_Urban1990_PSA_PRS92Zone5.shp	Polygons	PSA			PRS92 Zone 5
Urban Area 2000	Davao	LC_DVO_Urban2000_PSA_PRS92Zone5.shp	Polygons	PSA			PRS92 Zone 5
Urban Area 2010	Davao	LC_DVO_Urban2010_PSA_PRS92Zone5.shp	Polygons	PSA			PRS92 Zone 5
Urban Area 2015	Davao	LC_DVO_Urban2015_PSA_PRS92Zone5.shp	Polygons	PSA			PRS92 Zone 5
Vegetation Cover	Davao	LC_DVO_VegetationCover_DENR2016_PRS92Zone5.shp	Polygons	DENRXI	2016		PRS92 Zone 5
Water Resources	Davao	LC_DVO_WaterResource2016_DvoCDPO_PRS92Zone5.shp	Polygons	DCPDO	2016		PRS92 Zone 5
	Davao	LC_DVO_HeightZone_Line_CAAP_PRS92.shp	Lines	CAAP			PRS92 Zone 5
	Davao	LC_DVO_Industrial_CPDO_PRS92Zone5.shp					PRS92 Zone 5

Hazards

Folder: \10_Database\10_GIS\65_Hazards

Active Faults	Davao	H_DVO_ActiveFaultsMerged_PHIVOLCS_PRS92Zone5.shp	Line	PHIVOLCS	2017		PRS92 Zone 5
Active Faults Buffer	Davao	H_DVO_ActiveFaultsBuffer100m_PHIVOLCS_PRS92Zone5.shp	Polygon	PHIVOLCS	2017		PRS92 Zone 5
Erosion	Davao	H_DVO_Erosion_DvoCPDO_PRS92Zone5.shp					PRS92 Zone 5
Flood Hazard (100year)	Major Rivers	H_DVO_MajorRivers10mHaz_100yr_UPDREAM_CDPO_PRS92Zone5.shp	Polygon	DREAM			PRS92 Zone 5
Flood Hazard (25year)	Major Rivers	H_DVO_MajorRivers10mHaz_25yr_UPDREAM_CDPO_PRS92Zone5.shp	Polygon	DREAM			PRS92 Zone 5
Flood Hazard (5year)	Major Rivers	H_DVO_MajorRivers10mHaz_5yr_UPDREAM_CDPO_PRS92Zone5.shp	Polygon	DREAM			PRS92 Zone 5
Flood Hazard (Scale 1:10,000)	Davao	H_DVO_Flooding2014_10000Scale_MGB_CDPO_PRS92Zone5.shp	Polygon	MGB	2017		PRS92 Zone 5
Flood Hazard (Scale 1:10,000)	Davao	H_DVO_FloodProne_50000Scale_MGB_CDPO_PRS92Zone5_Clip.shp	Polygon				PRS92 Zone 5

Landslide (Scale10,000)	Davao	H_DVO_Landslide2014_10000Scale_MGB_CDPO_PR92Zone5.shp	Polygon	MGB/CP DO	2014		PRS92 Zone 5
Landslide (Scale50,000)	Davao	H_DVO_Landslide_50000Scale_MGB_CDP O_PR92Zone5_Clip.shp	Polygon	MGB/CP DO			PRS92 Zone 5
Liquefaction	Davao	H_DVO_Liquefaction_PHIVOLCS_UTMZon e51PRS92.shp	Polygon	PHIVOLC S			UTM Zone 51 PRS92
Liquefaction (1:50,000)	Davao	H_DVO_Liquefaction_50000Scale_MGB_C DPO_PR92Zone5.shp	Polygon	MGB/CP DO			PRS92 Zone 5
Storm Surge	Davao	H_DVO_StormSurge_UPDREAM_CDPO_P RS92Zone5.shp	Polygon	DREAM			PRS92 Zone 5

Socio-economic

Folder: \10_Database\10_GIS\70_SocioEconomic

Economic Zones	Davao	S_DVO_PEZA_OSM_PR92Zone5.shp		PEZA			PRS92 Zone 5
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Environment

Folder: \10_Database\10_GIS\80_Environment

Conservation Areas	Davao	E_DVO_Conservation_DENR1000_DvoCP DO_PR92Zone5.shp		DENR			PRS92 Zone 5
Conservation Areas (Land Use Capability and Environmental Management Project)	Davao	E_DVO_Conservation_LUCEM_DvoCPDO_ PR92Zone5.shp		DCPDO			PRS92 Zone 5
Protected Areas	Davao	E_DVO_NIPAS_DvoCDPO_PR92Zone5_ Clip.shp		NIPAS			PRS92 Zone 5

Abbreviations:	DCPDO	Davao City Planning and Development Office
	DCWD	Davao City Water District
	DENR	Department of Environment and Natural Resources
	DOTR	Department of Transportation
	DPWH	Department of Public Works and Highways
	JICA	Japan International Cooperation Agency
	JPT	JICA Project Team
	NAMRIA 50k	National Mapping and Resource Information Authority 1:50,000 Scale Topographic Maps
	NCIP	National Commission on Indigenous Peoples
	NEDA	National Economic Development Authority
	NIPAS	National Integrated Protected Areas System
	OSM	Open Street Map
	PSA	Philippine Statistics Authority

2 Land Use and Building Footprints Update

5. This report provides the information on the different tools and methods applied in the generation of updated land use for both urban and outside urban areas. Listed in the table below are the data involved in producing the updated land use while Figure 3.1 shows the stages followed in the updating process.

1) Sources

6. The following data provided by City Planning and Development Office (CPDO) of Davao city were used in updating the land use maps: (i) existing land use map of Davao City, which describes the land use classifications in the city in 2011 and (ii) land parcels data. Additionally, topographic data were obtained from the Department of Environment and Natural Resources (DENR) and National Mapping Resource Information Agency (NAMRIA) to gain better understanding of the geographical features of Davao City. The topographic data obtained were Land Cover and Water Bodies in Davao from DENR and NAMRIA, respectively. Additional geographic information produced by JPT were also used, such as the roof footprints that describes current use, location, and approximate size and shape of houses, buildings, and other structures, water bodies, and road alignments that shows the transportation network of the city. Table 3.1 is a summary of all pertinent data used in creating the updated Land Use map.

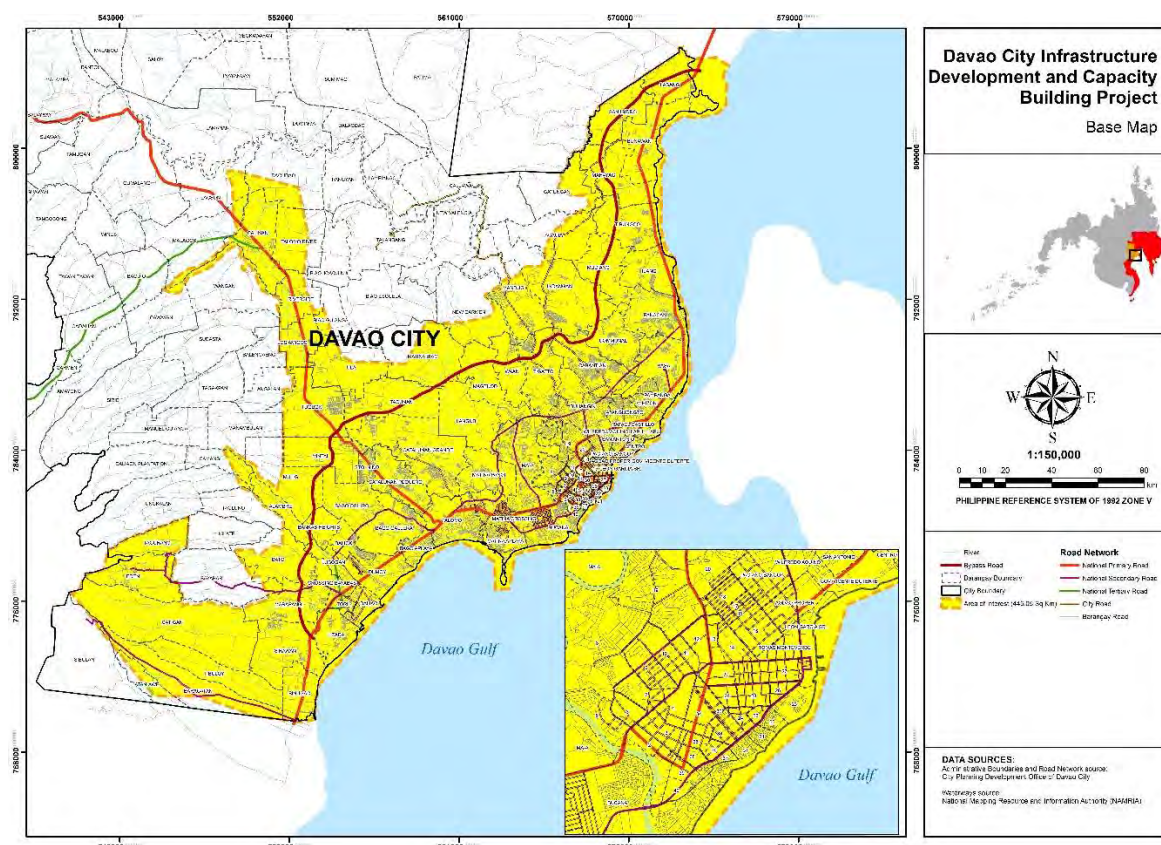
Table 2.1 Data Used for Land Use Update

Data	Year	Type	Coverage	Source
Land Use	2011	Polygon	Davao City	CPDO
Parcels		Polygon	Some parts of Urban Area	CPDO
Land Cover	2010	Polygon	Davao City	DENR
Davao City Water Bodies	2013	Polygon	Davao City	NAMRIA
	2013	Line	Davao City	NAMRIA
Building Footprints	2017	Polygon	Urban Area of Davao City/AOI	JPT
Water Bodies	2017	Polygon	Urban Area of Davao City/AOI	JPT
Roads	2017	Polygon	Urban Area of Davao City/AOI	JPT

Source: IM4Davao Team

2) Scope of Land Use Update

7. Update of land use focused on the urban area of Davao City. The urban area or the area of interest was defined by both CPDO and JICA Project Team based on the existing land use as shown in the figure below.

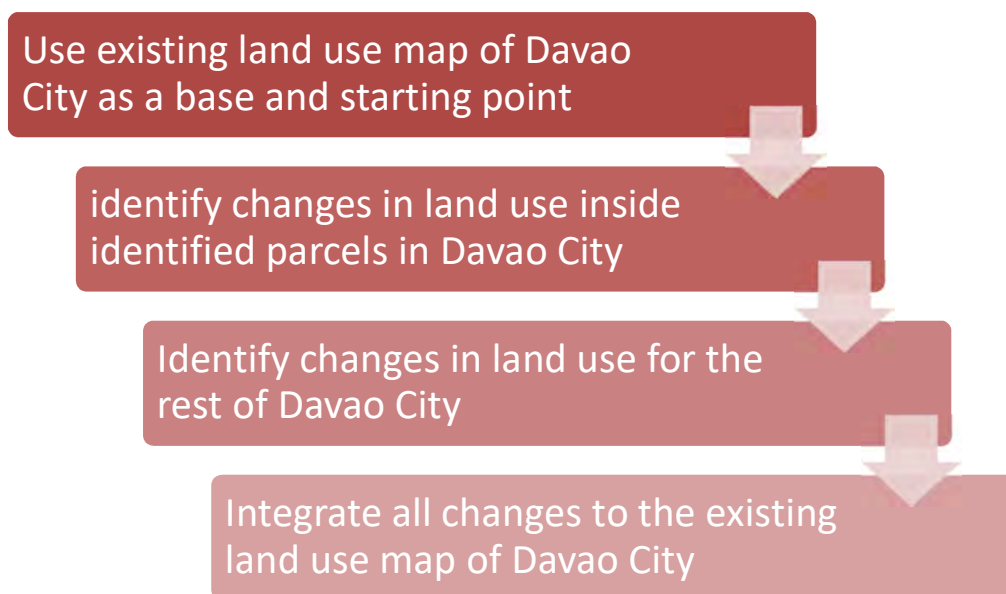


Source: IM4Davao Team

Figure 2.1 Land Use Update Stages

3) General Workflow

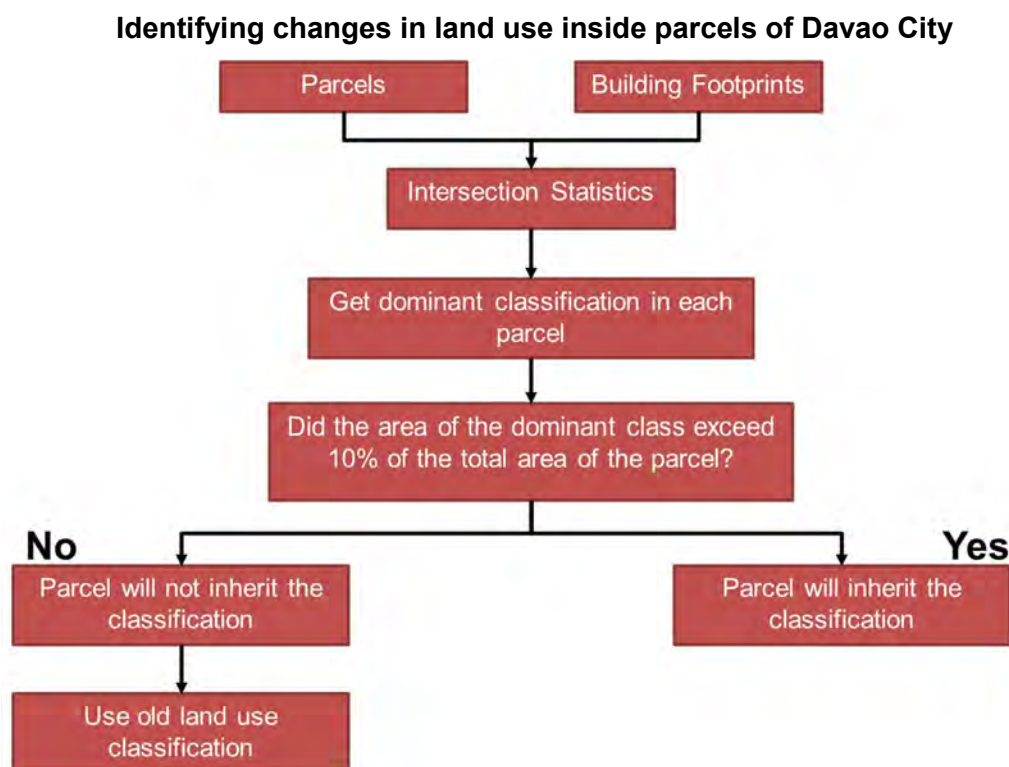
8. The existing land use map of Davao City will be used as a base and starting point in creating the updated Land Use map. The data gathered and as discussed in section 1) will be used to detect changes in land use from the year the old land use map was created up to the present date. First, using the building footprints data, the dominant land use (if there are any) inside any parcel can be determined. As an example, suppose 80% of the land area of Parcel 1 is occupied by buildings, which are used for commercial purposes e.g. retail stores, fast food and other business establishments, then Parcel 1's land use will be classified as commercial. If in the old land use map the indicated land use of Parcel 1 is different, then the land use classification will be updated and changed accordingly. Second, for the rest of Davao City without parcel data, a special method called Thiessen polygons will be used to create "pseudo-parcels." Basically, Thiessen polygons encapsulates each building such that it creates a minimum bounding geometry for each building relative to other buildings. This method allows us to restrict the land use changes, if there are any, to the immediate vicinity of the buildings. For example, imagine several industrial facilities clustered together and located in a land that is classified as agricultural based on the old land use map. The land use for that area would have to be changed to industrial and creating a Thiessen polygon will restrict the changes only in the immediate vicinity of that cluster. Lastly, all changes in land use as well as roads and water bodies will then be integrated to the existing land use map. The summary of the workflow is shown in Figure 3.2.



Source: IM4Davao Team

Figure 2.2 Land Use Update Stages

4) Detailed Workflow



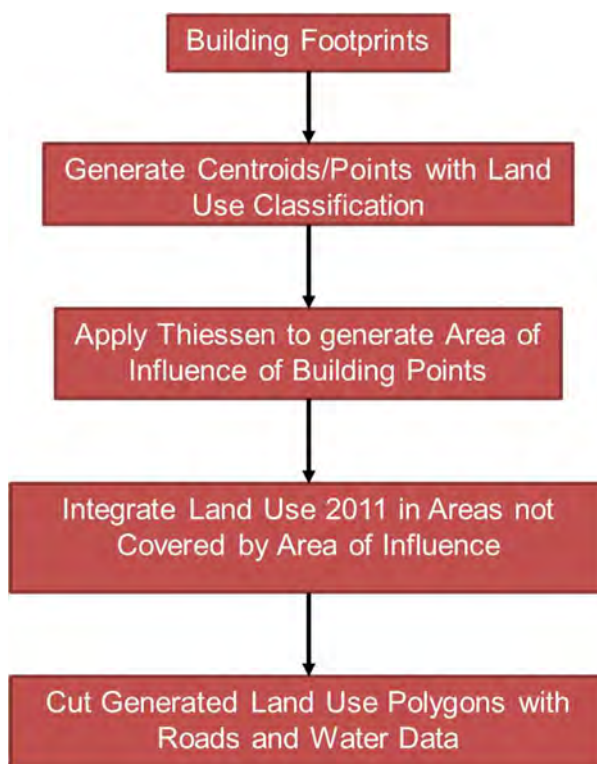
Source: IM4Davao Team

Figure 2.3 Land Use Update for Parcel Work Flow

9. Figure 3.4 shows the workflow of updating the land use inside the parcels, which mainly use the land use classification of building footprints. Firstly, lands in the defined urban area covered by the parcel data was identified. Building footprints with land use classification was added to the parcels using intersection statistics to determine the dominant classification in each parcel. For the updating of land use, a parameter of more

than 10% total area was set to determine the dominant class. Should the parcels have exceeded the 10% total area, then the parcel will inherit the dominant classification. If not, parcels will inherit the old land use classification.

Identifying changes in land use for the rest of Davao City



Source: IM4Davao Team

Figure 2.4 Land Use Update for Parcel Work Flow

3 ATLAS

10. This Atlas contains the many outputs of the GIS-processed information for analyses of the physical, environmental, socioeconomic and transport attributes of Davao City. A visual presentation of the study area in these aspects contributes significantly to planning its development framework.

1) Administrative Boundaries

11. Administrative boundaries of Metropolitan Davao were visualized according to barangay, district, and congressional district. Metropolitan Davao was defined by NAMRIA as Davao City, including Panabo, Carmen, and Tagum on its northeast, Samal Island on its east, and Sta. Cruz and Digos on its south. The project focused on Davao City which consists of 182 barangays, 11 districts and 3 congressional districts including some areas Mt. Apo National Park. Barangay, district, and congressional districts were based on Davao City Planning and Development Office and edited by JICA Project Team. Urban area used for the formulation of Land Use 2017 and 2045 was based on population of barangays.

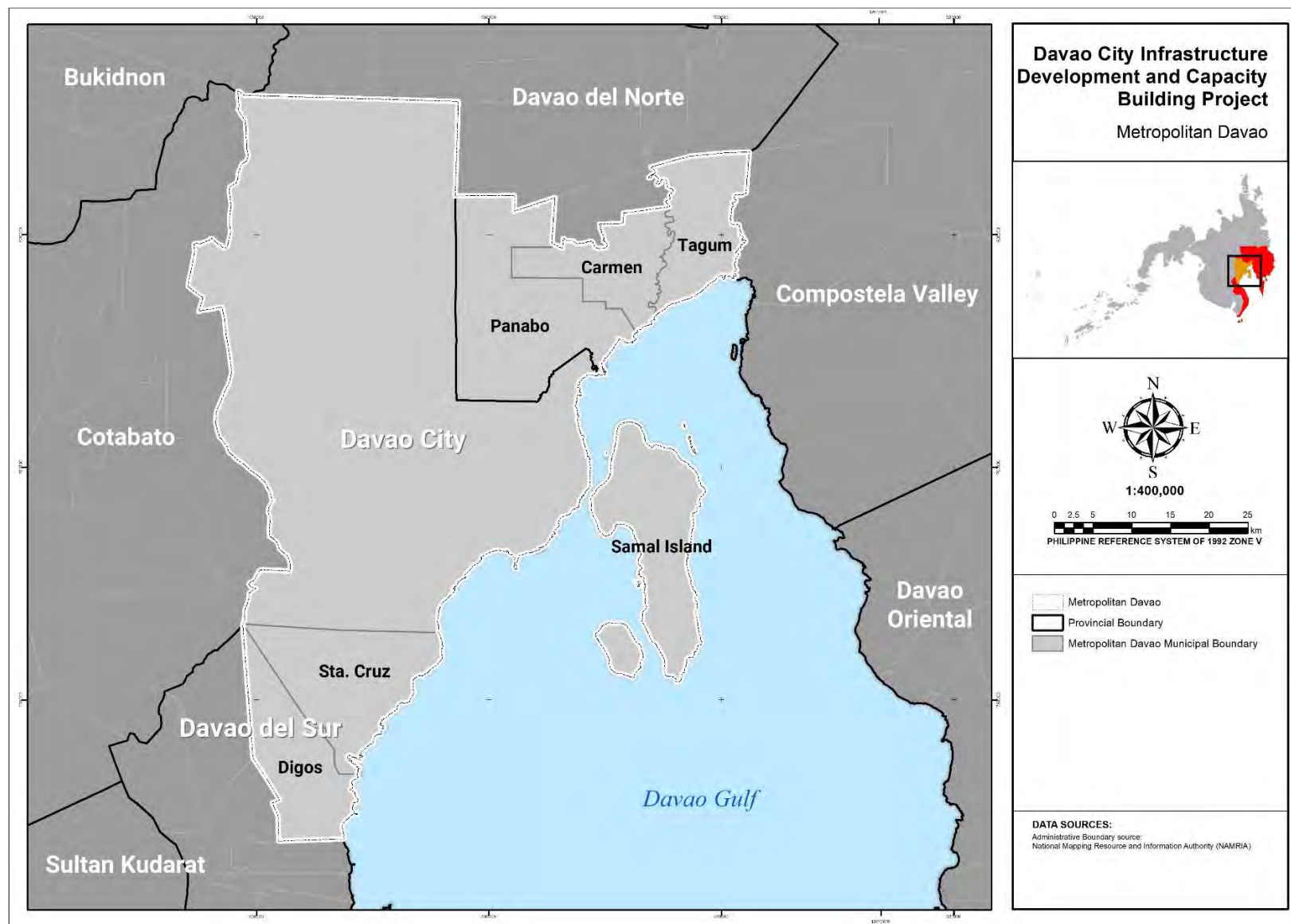


Figure 3.1 Administrative Boundaries - Metro Davao

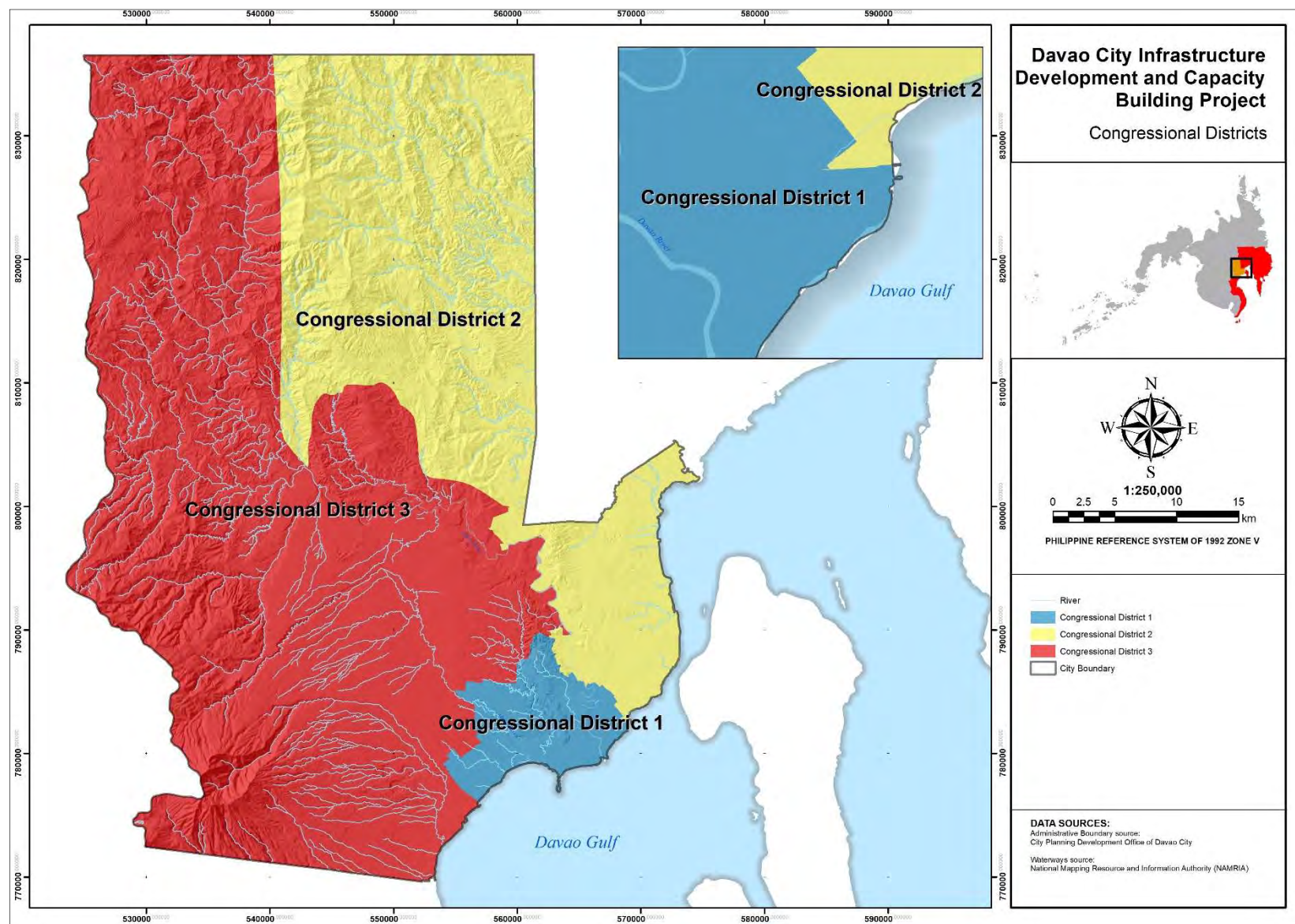


Figure 3.2 Administrative Boundaries – Congressional District

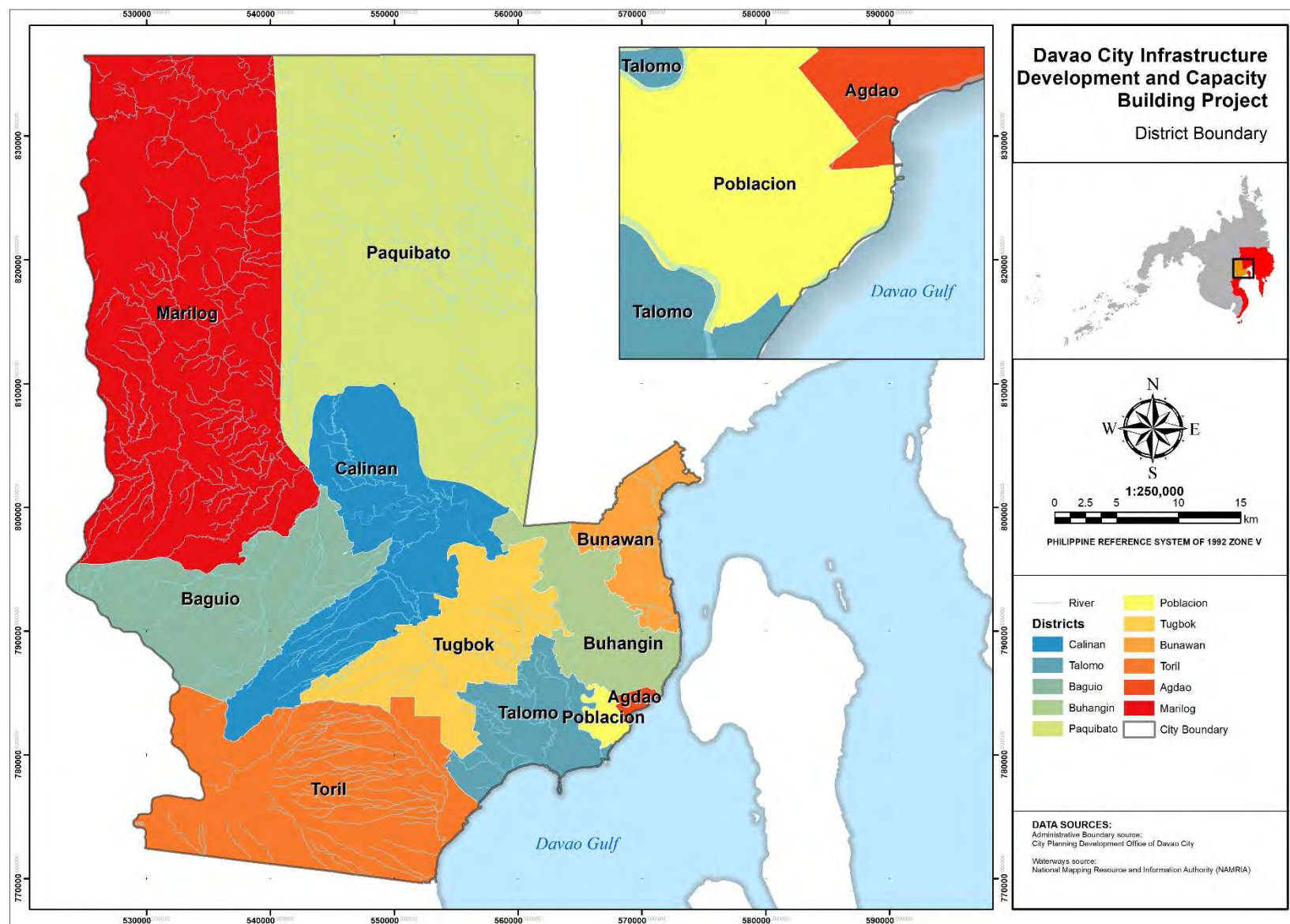


Figure 3.3 Administrative Boundaries – District

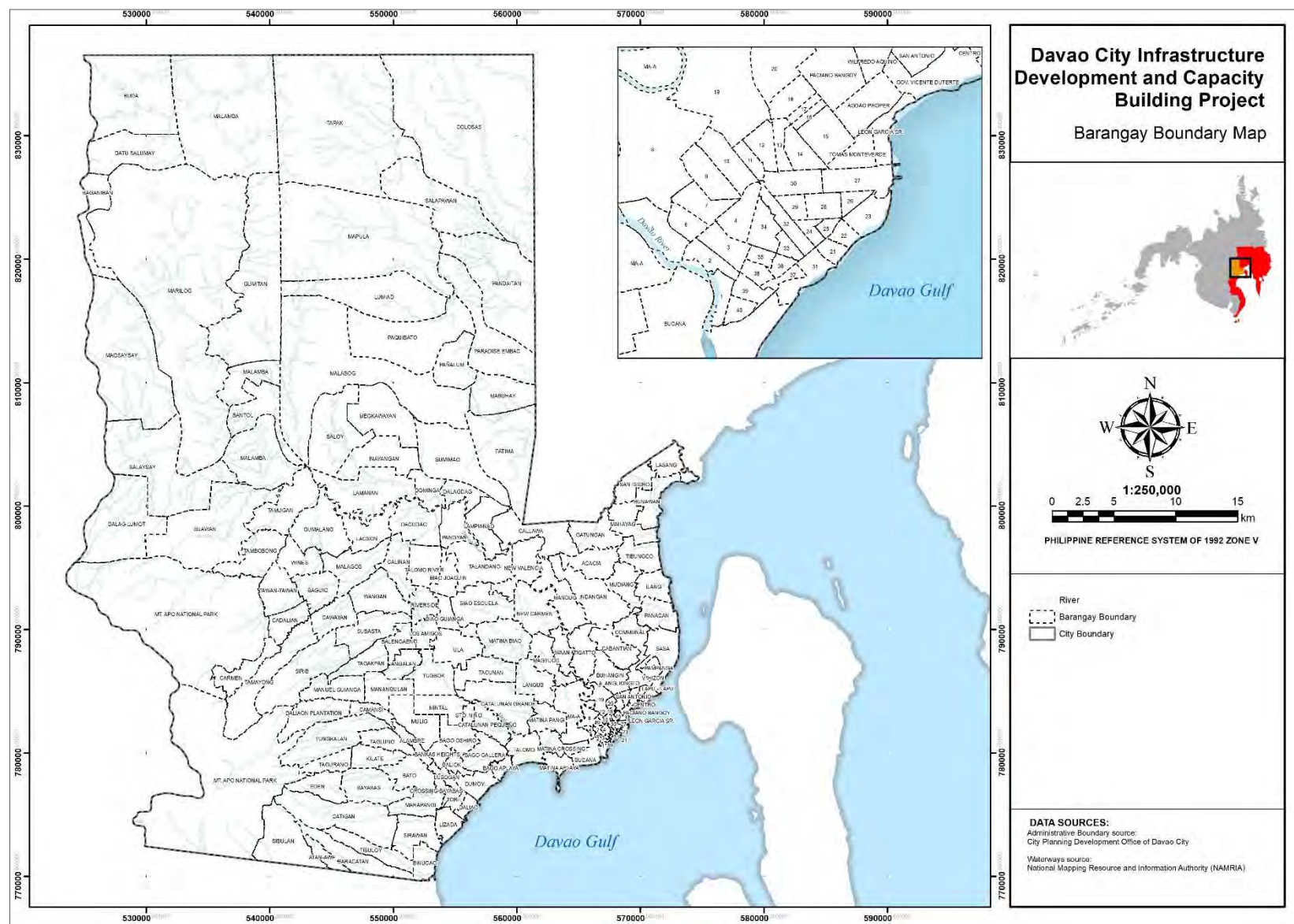


Figure 3.4 Administrative Boundaries – Barangay

2) Natural Conditions

12. River and streamlines, and waterbody polygons for the entire Davao City were digitized from NAMRIA 1: 50,000-scale topographic maps. Watershed polygons and soil data were from Davao City Planning and Development Office. Slope data was also generated using NAMRIA 1: 50,000-scale topographic maps by JICA Project Team.

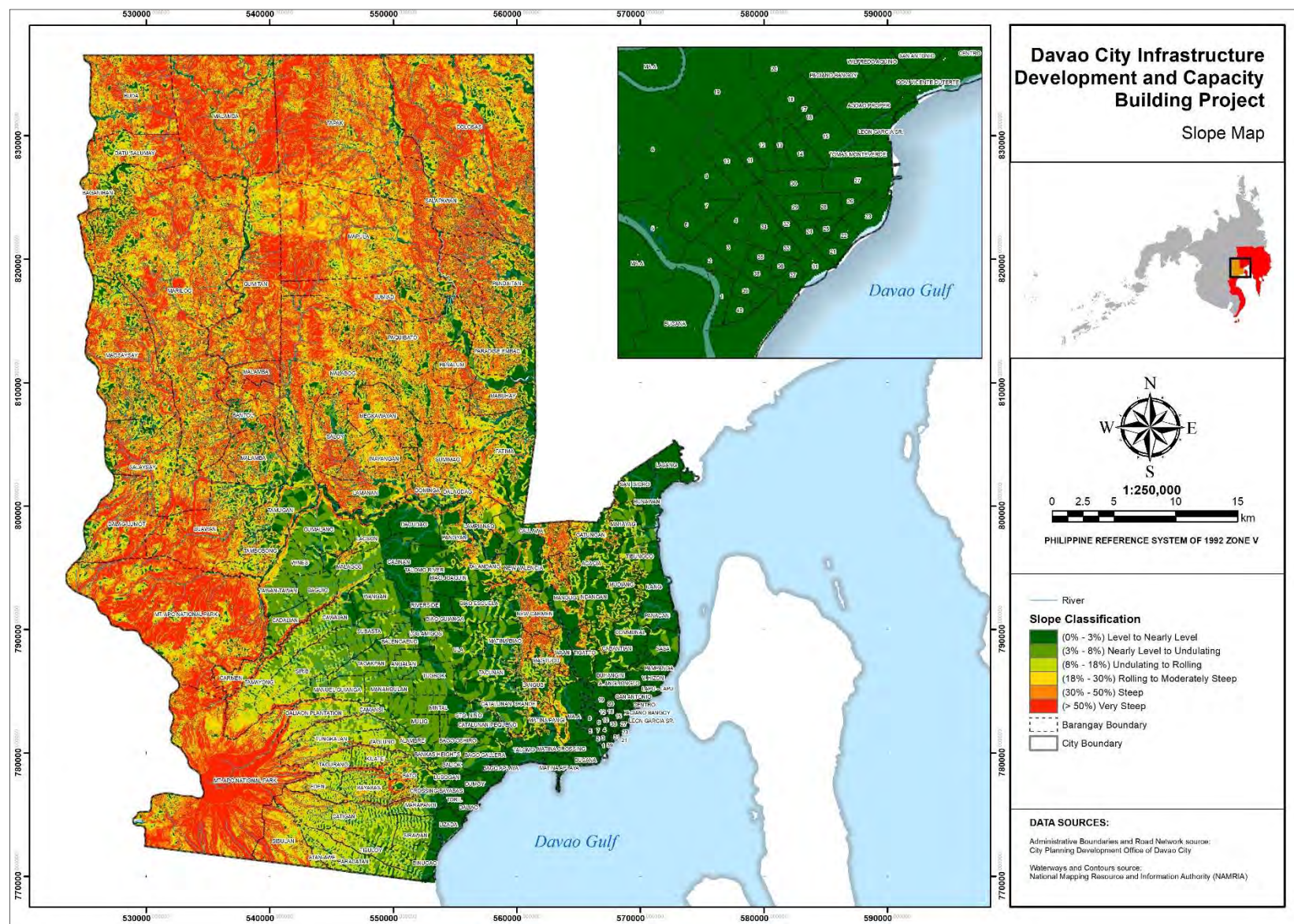


Figure 3.5 Slope Map

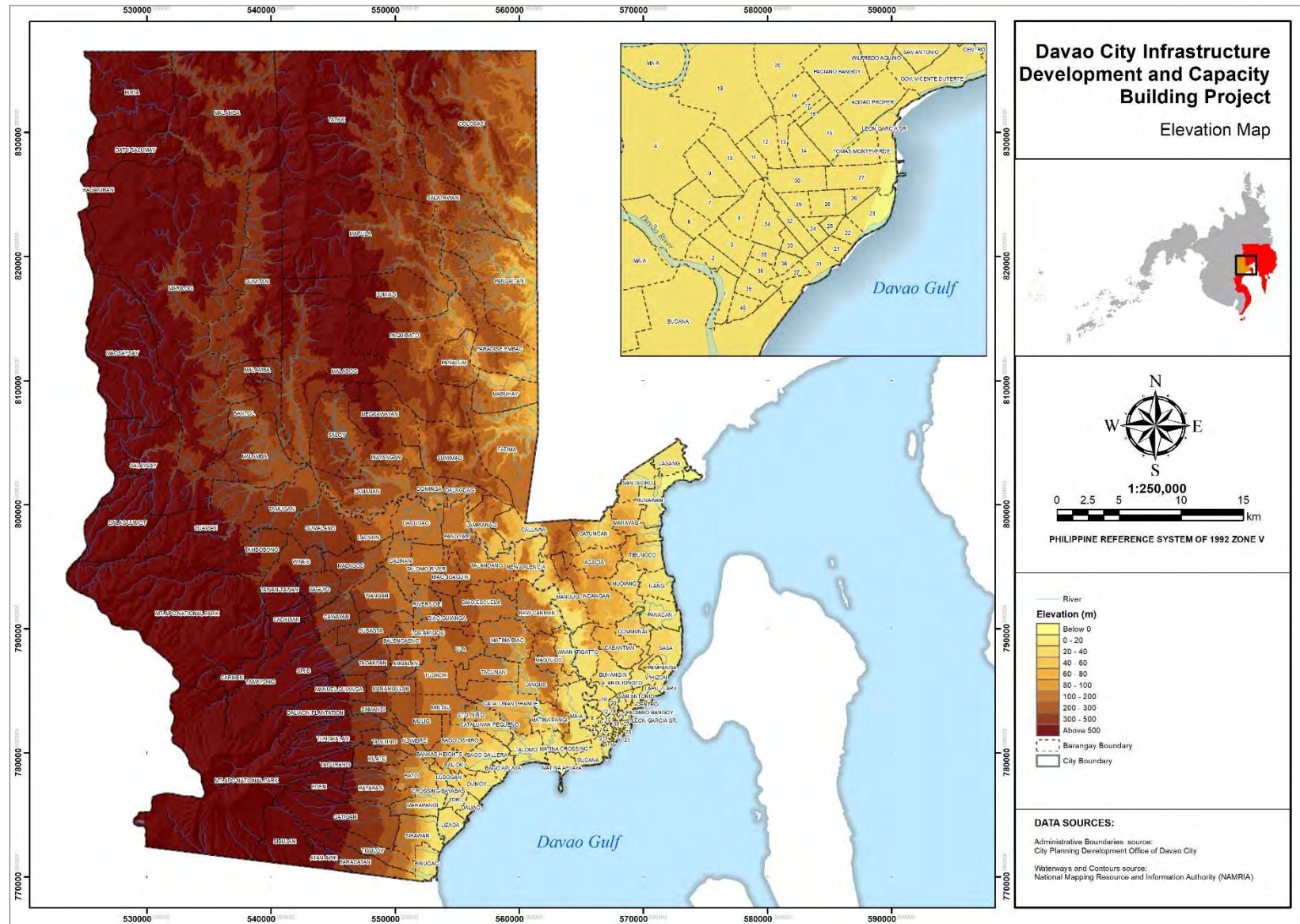


Figure 3.6 Elevation Map

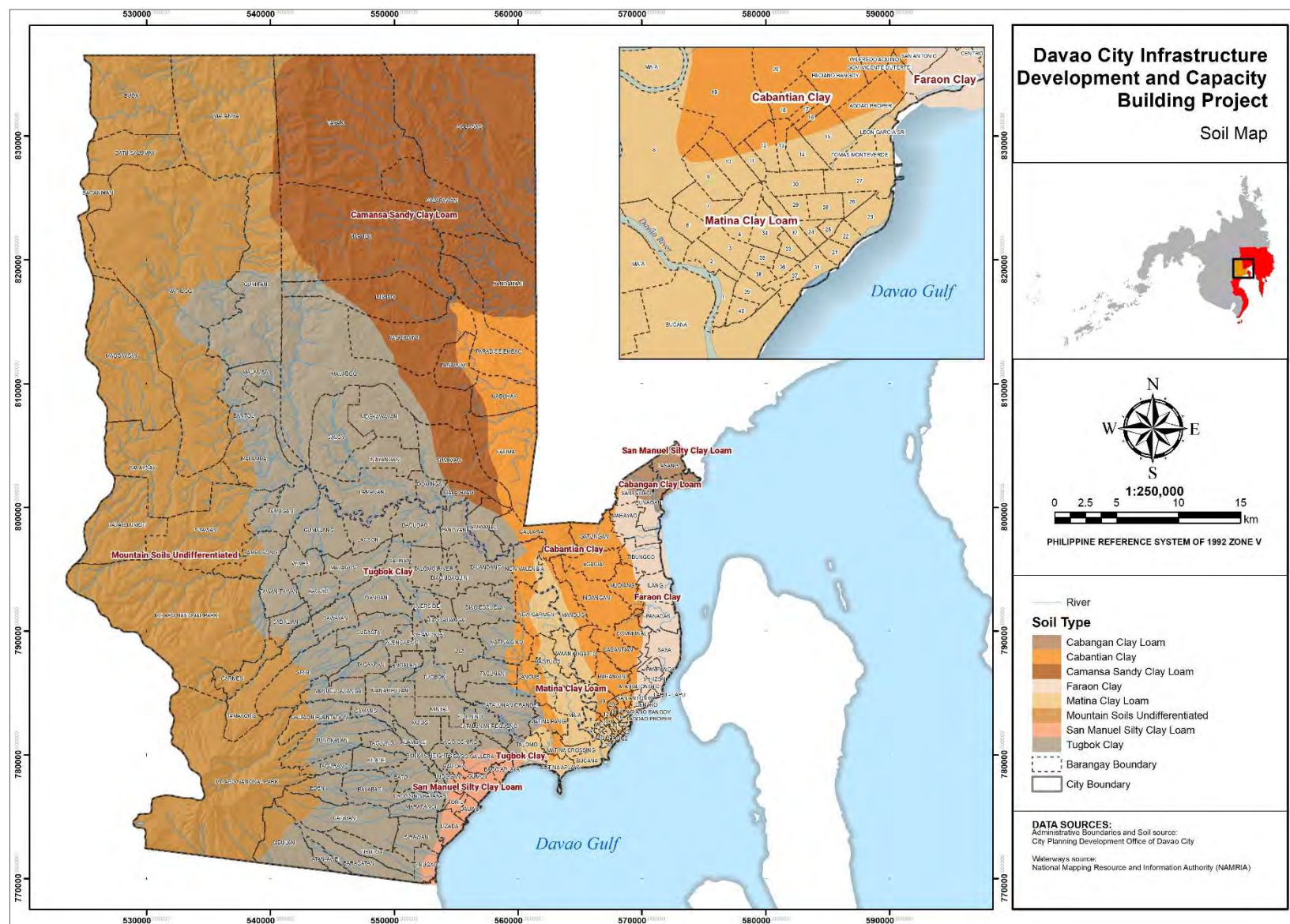


Figure 3.7 Soil Map

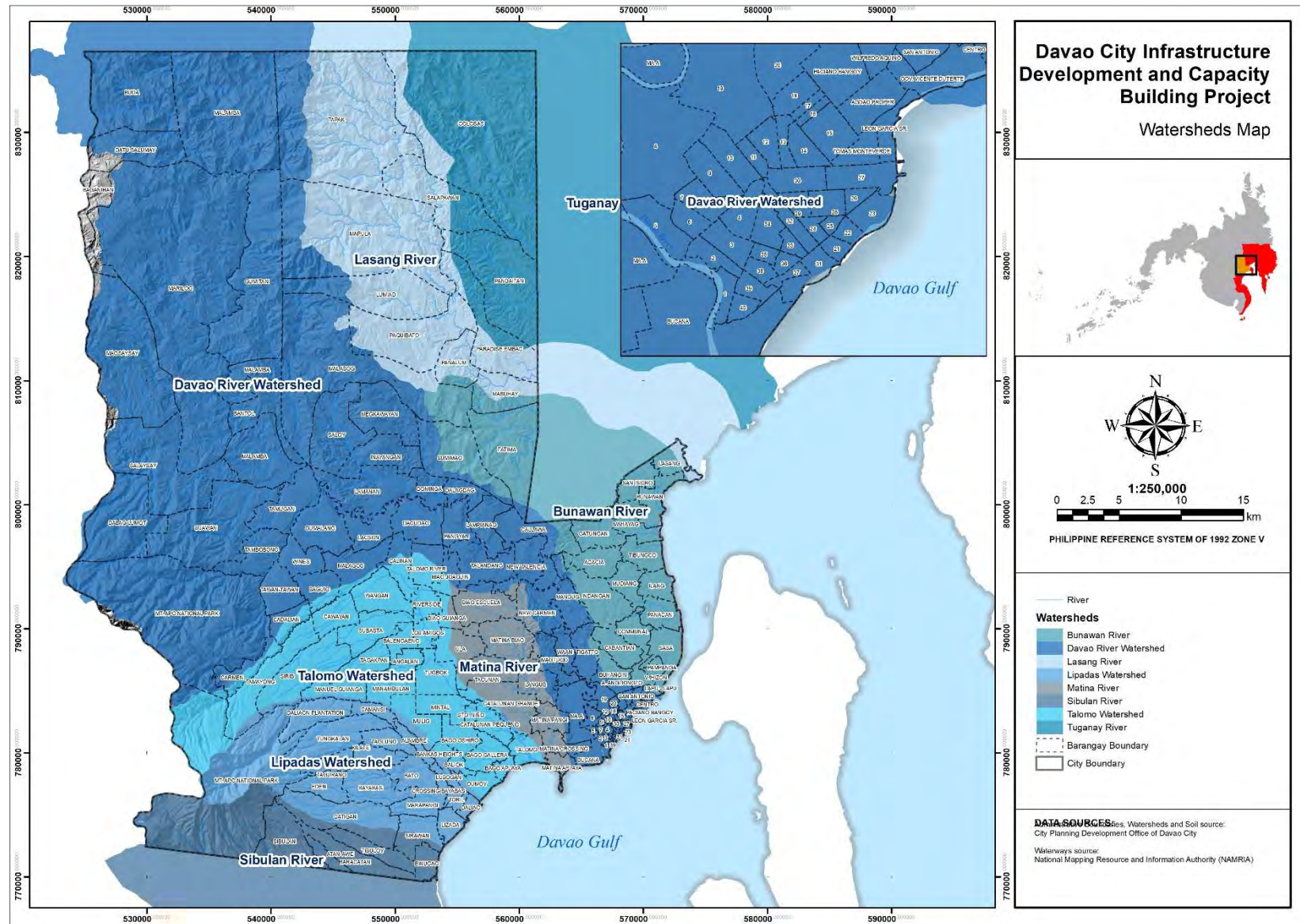


Figure 3.8 Watersheds Map

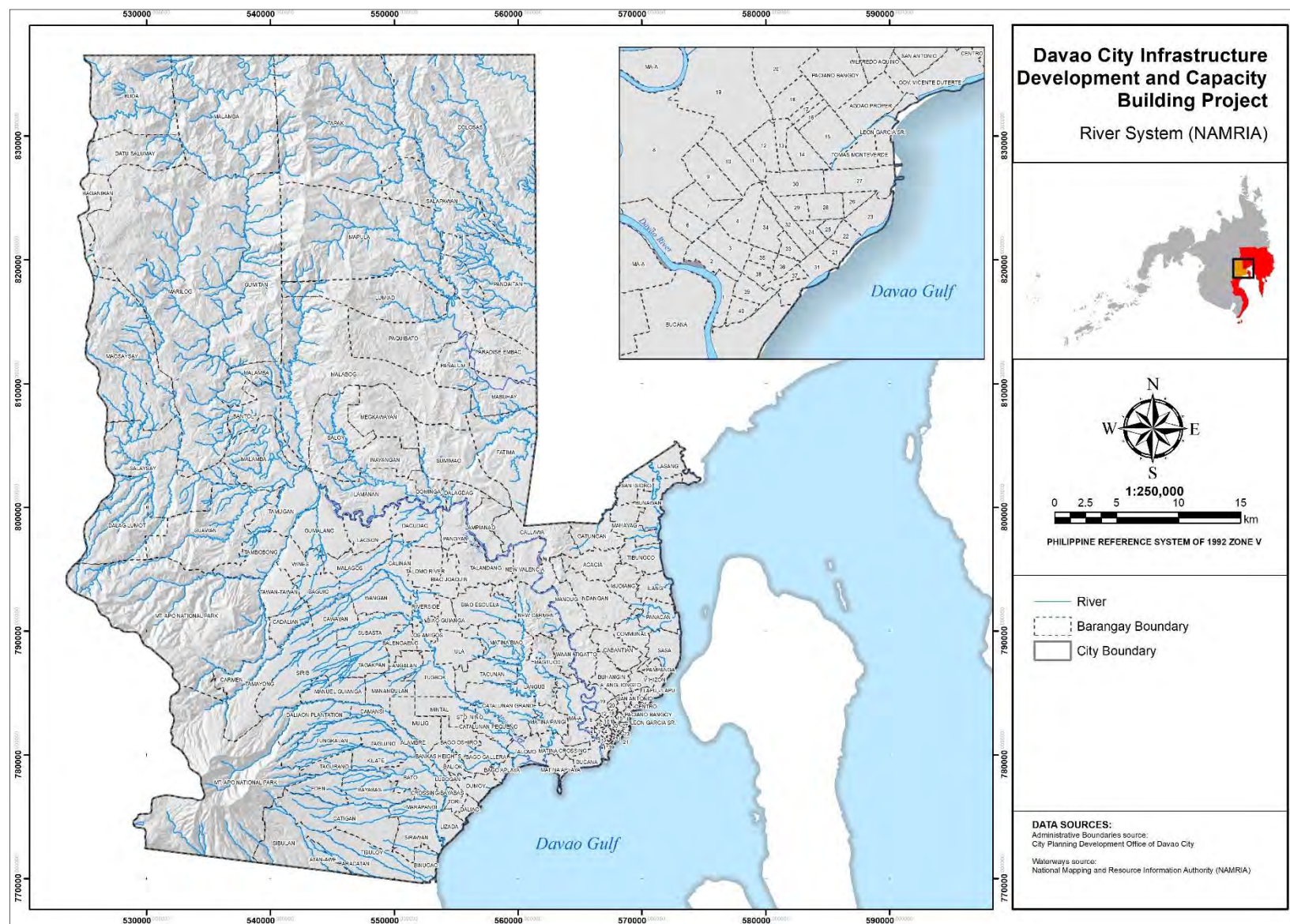


Figure 3.9 River System Map

3) Buildings

13. Building footprints for Davao City were digitized based on satellite imagery acquired between January 2016 and April 2017. Data for institutional buildings such as fire stations, hospitals, police stations, schools, and town halls were collected from Davao City Planning and Development Office, Openstreetmap.org, and JICA Project Team.

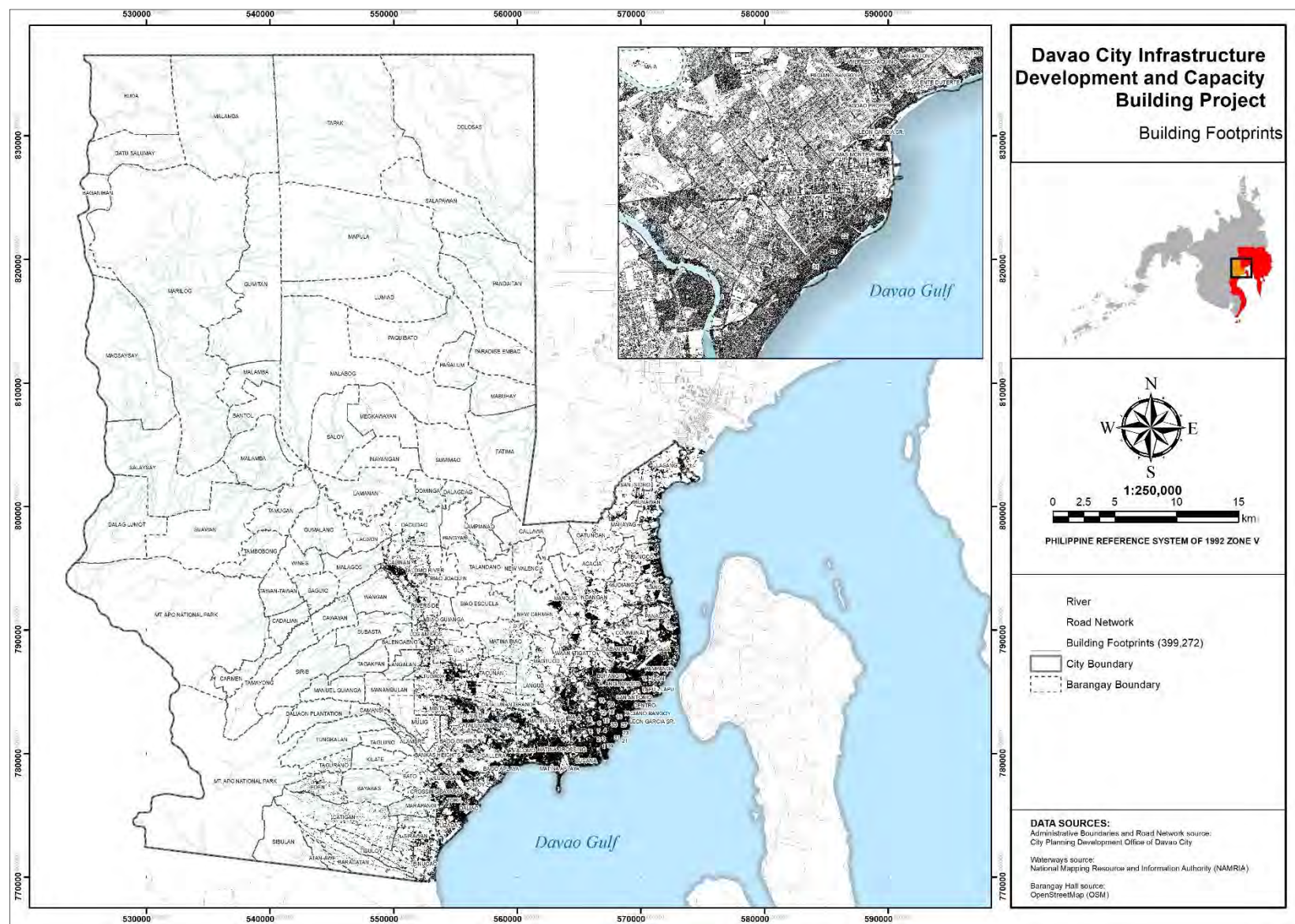


Figure 3.10 Building Footprints Map

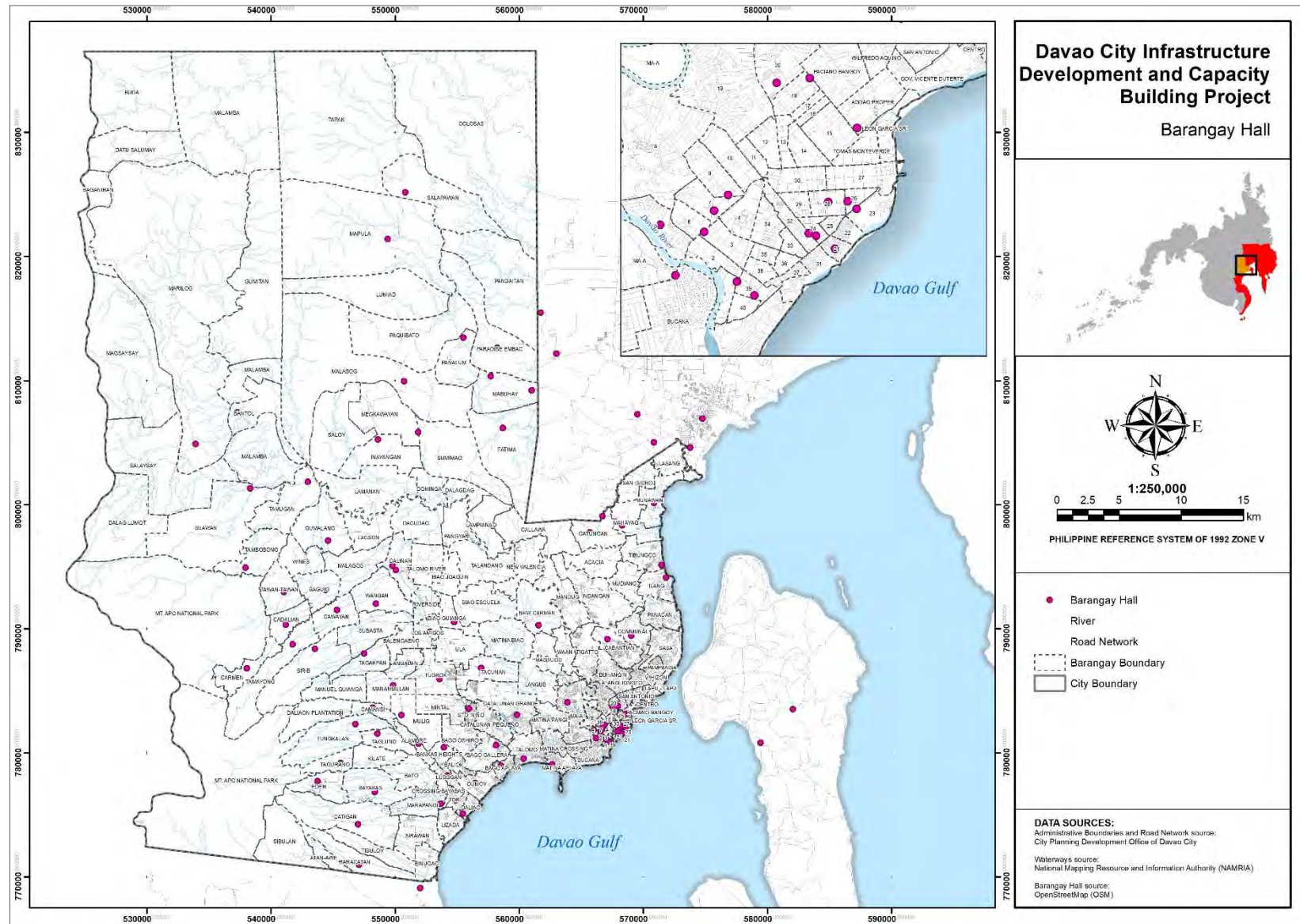


Figure 3.11 Barangay Halls Map

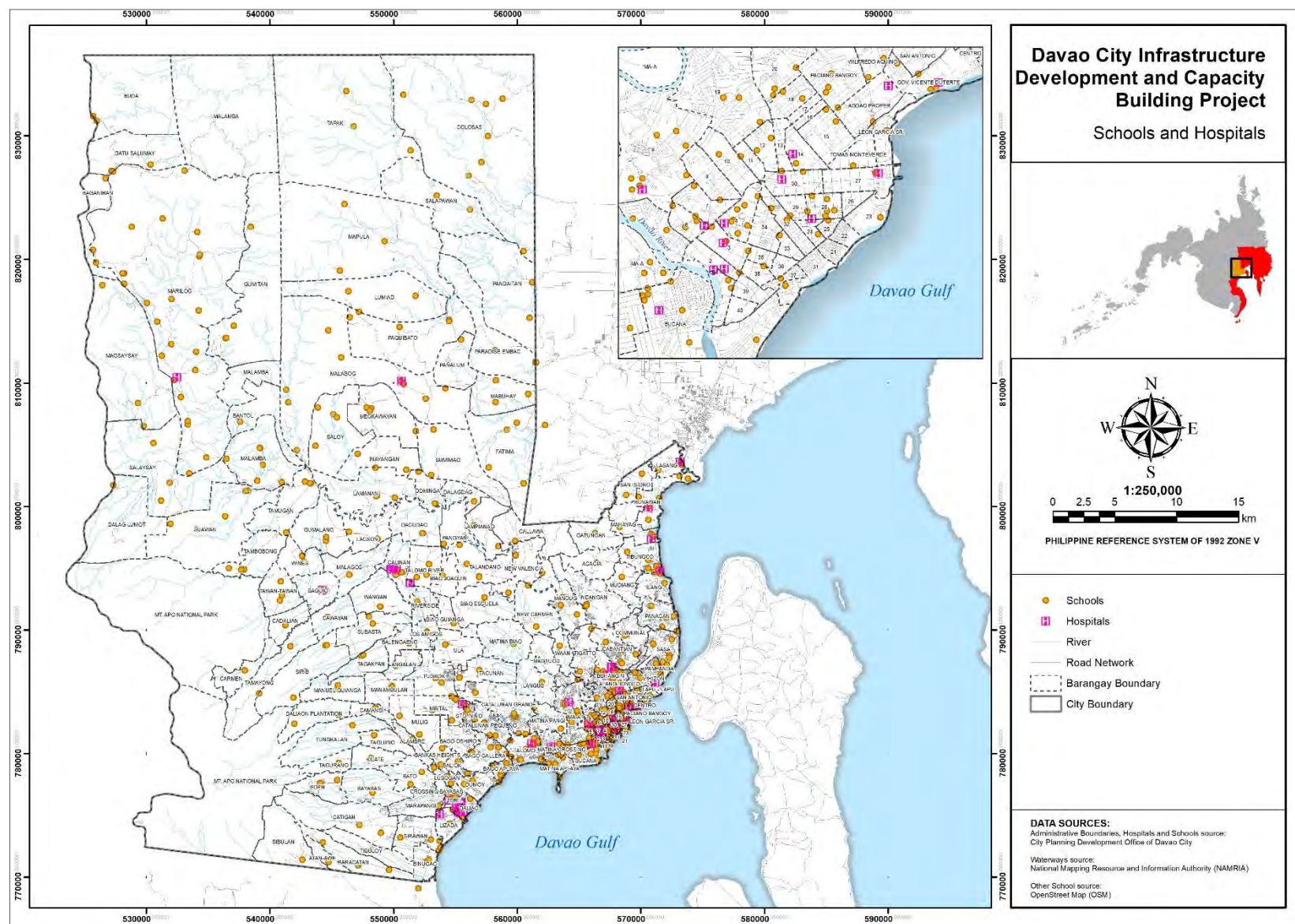


Figure 3.12 Schools and Hospitals Map

4) Parcel

14. Davao City Planning and Development Office provided parcel data for parts of Davao City. The data partially covered urban areas within districts 1 and 2 near Davao Gulf. Parcels, where available were used as reference in the preparation of Land Use 2017.

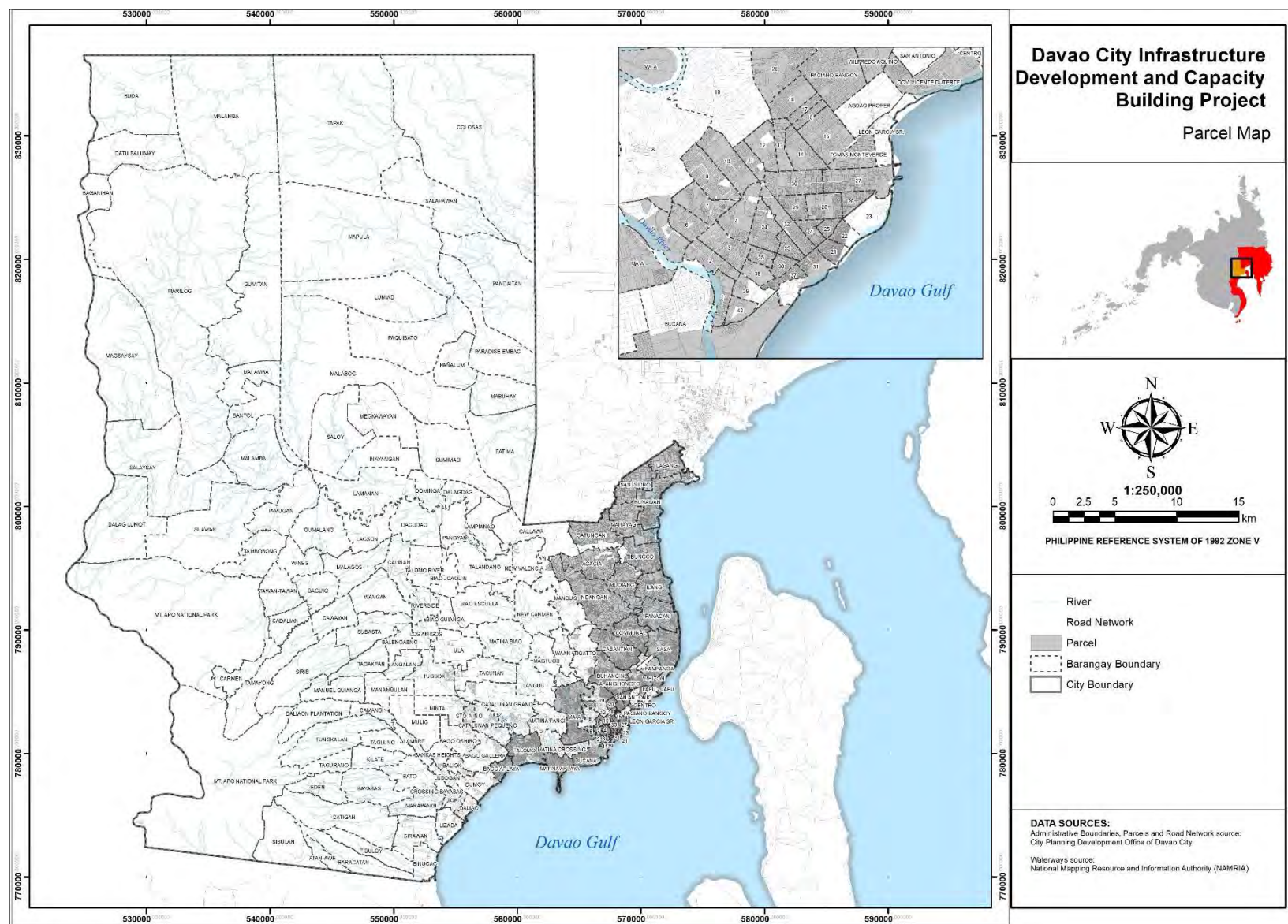


Figure 3.13 Parcel Map

5) Road Network

15. Roads in the following thematic maps are classified as primary, secondary and tertiary. Existing national roads, ongoing project roads, and proposed roads come from Department of Public Ways and Highways while bridges and bypass roads were from Davao City Development and Planning Office. City and barangay roads of Metro Davao were extracted from open street map (OSM). JICA Project Team provided JICA Proposed Priority Project roads, bypass road centerlines, road network nodes and road network lines. Maps were also generated for the location and results of traffic and passenger survey.

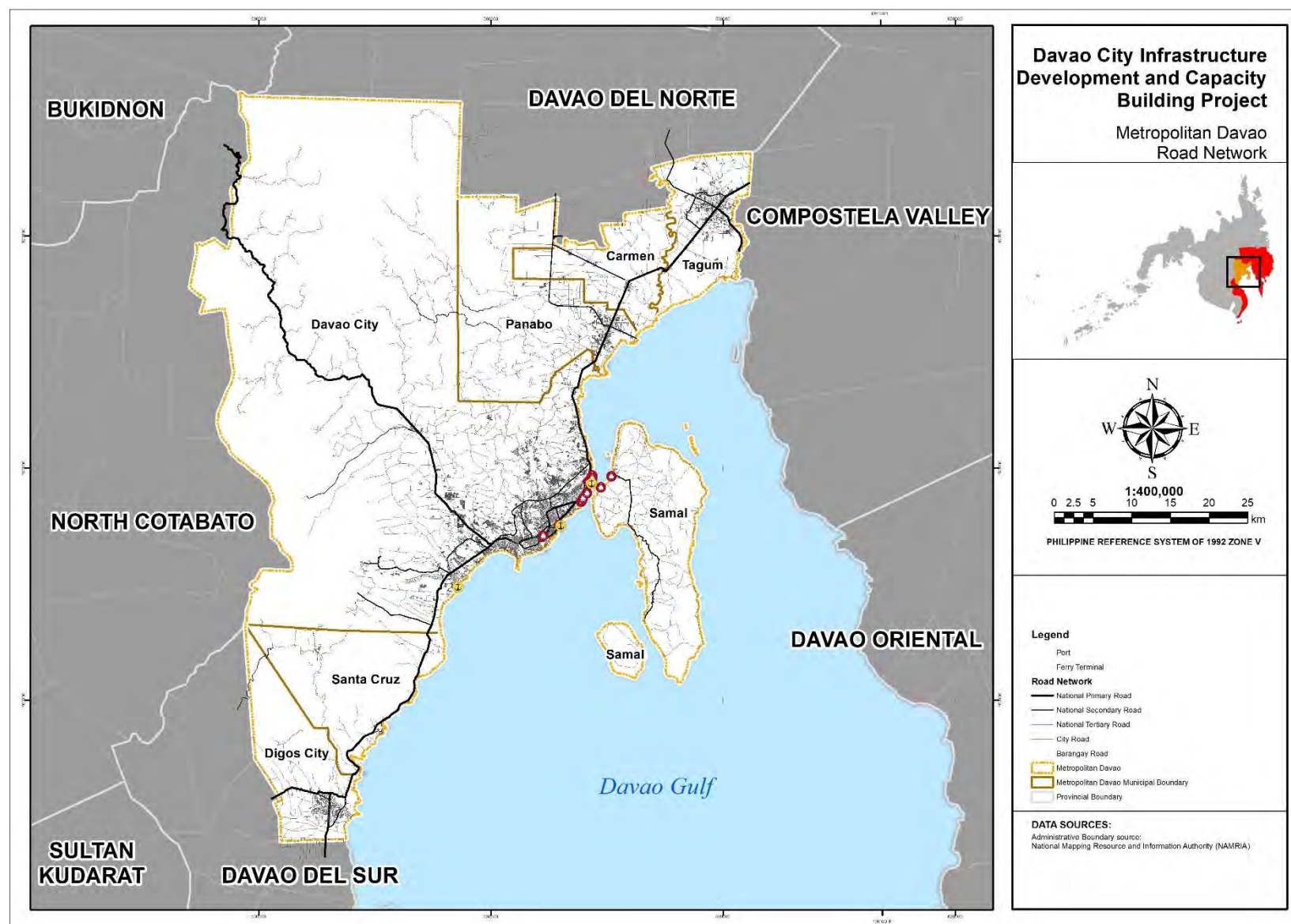


Figure 3.14 Metro Davao Road Network

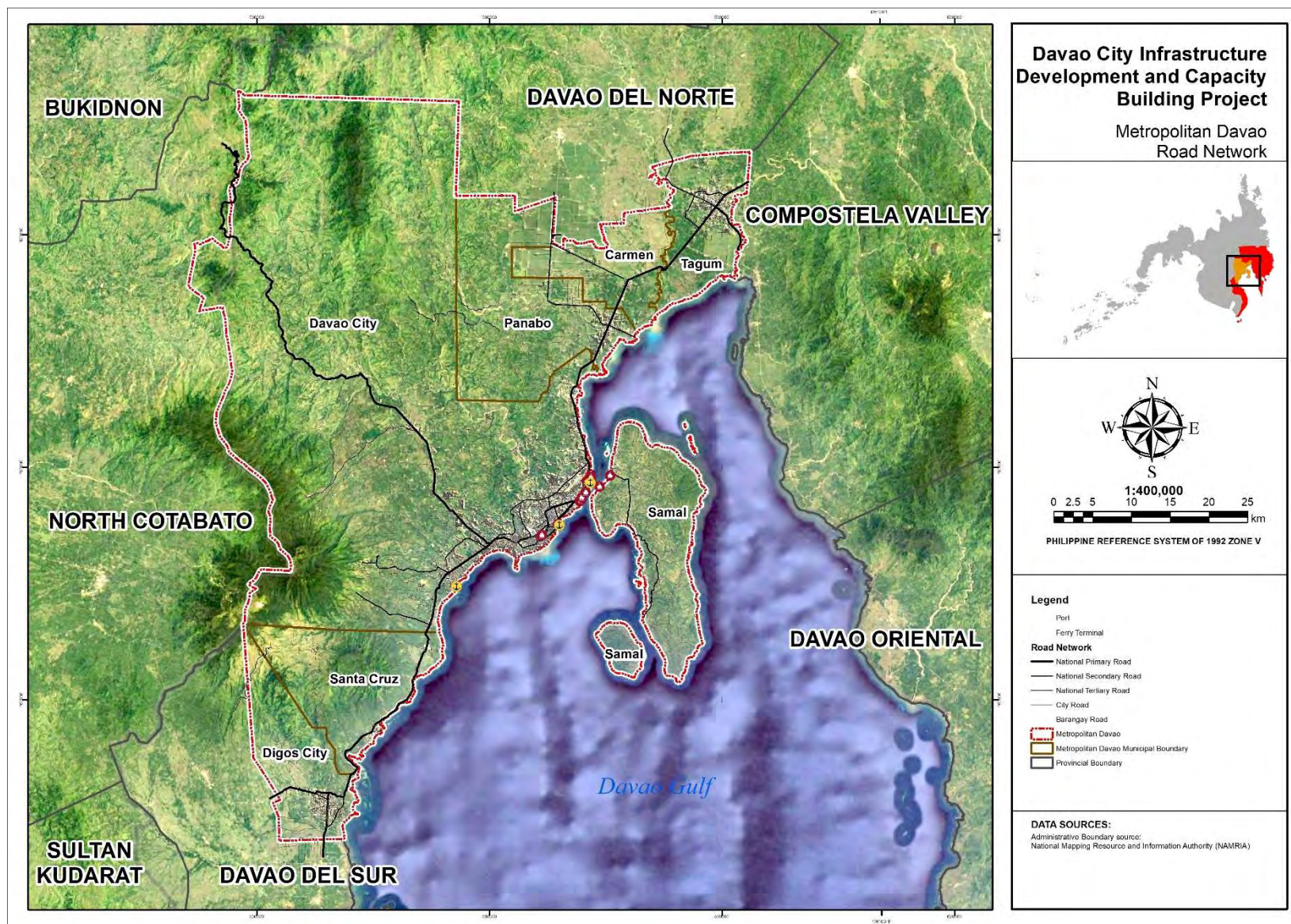


Figure 3.15 Metro Davao Road Network with Google Satellite Image

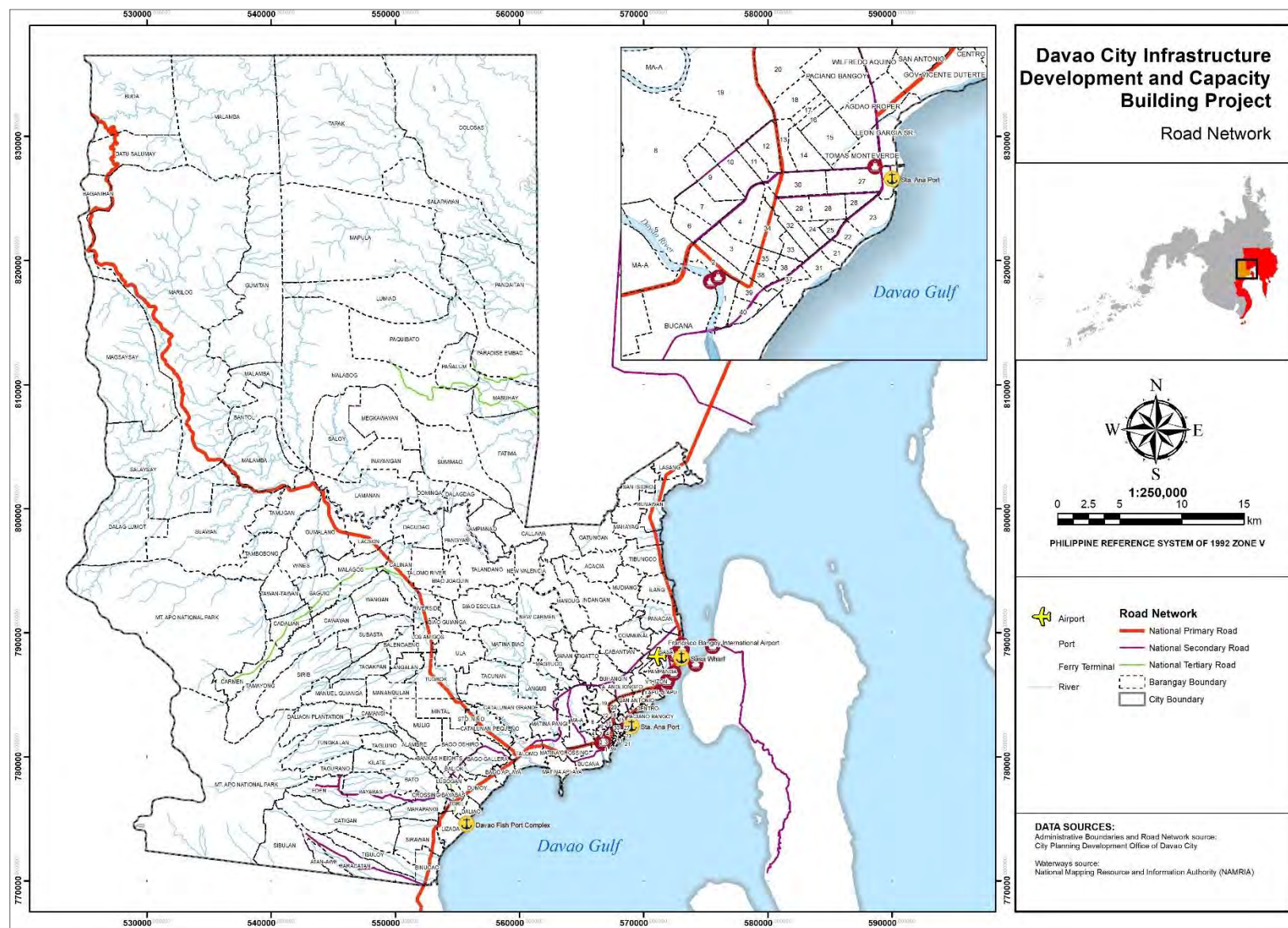


Figure 3.16 National Road Network Map

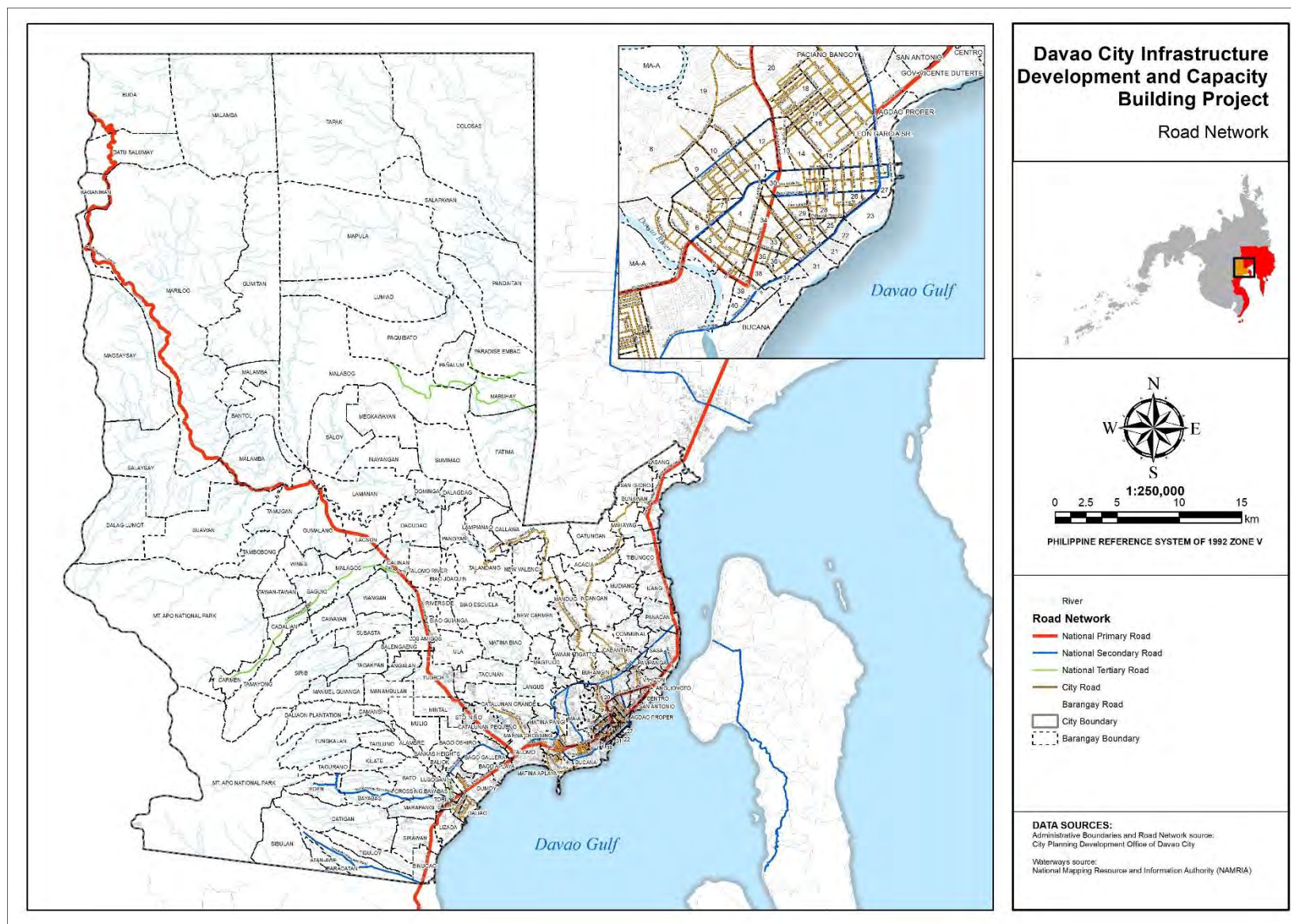


Figure 3.17 Road Network by Road Class

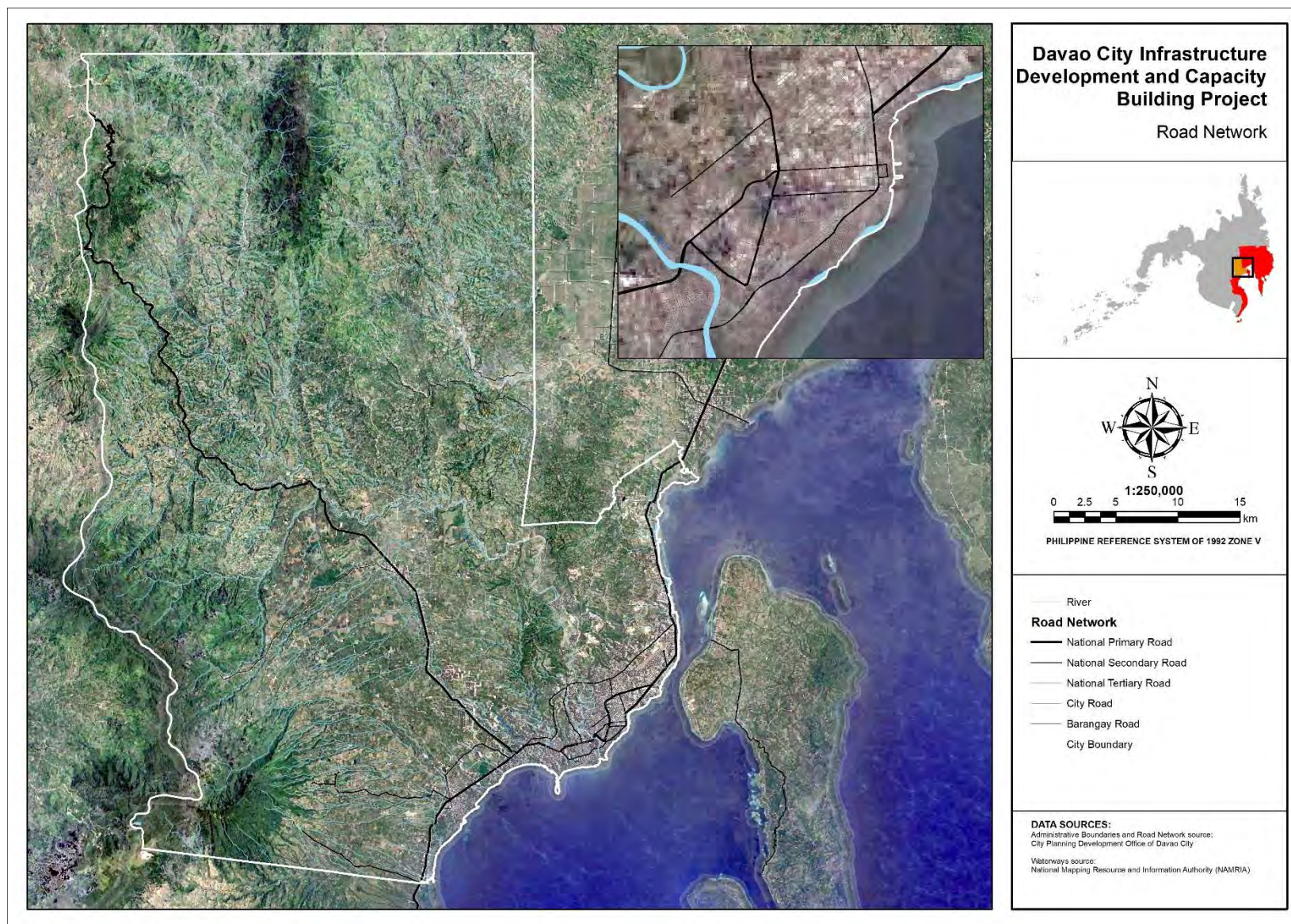


Figure 3.18 Road Network with World Imagery 2016

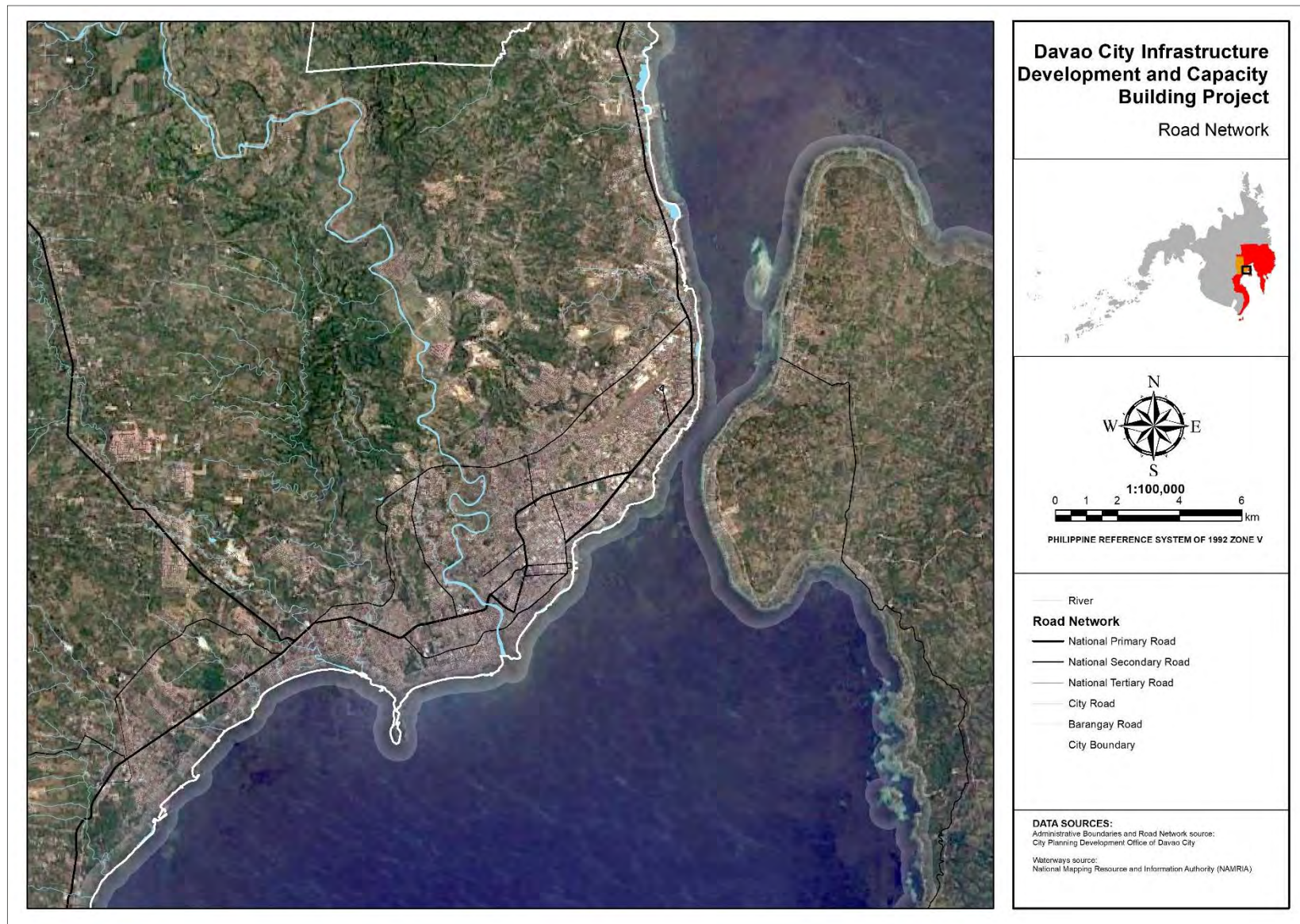


Figure 3.19 Road Network with World Imagery 2016 (Zoomed In)

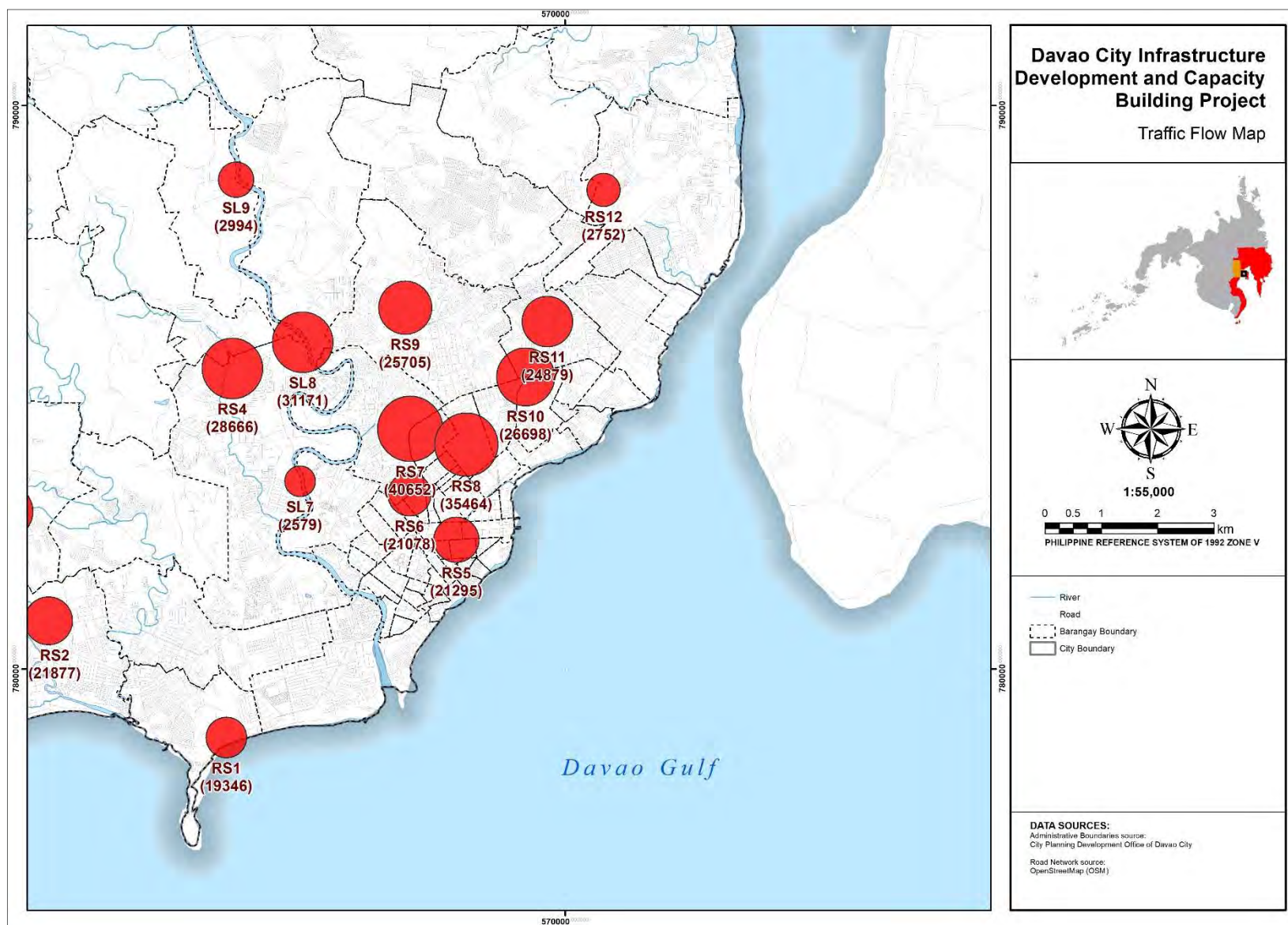


Figure 3.20 Traffic Flow Map (Zoomed In)

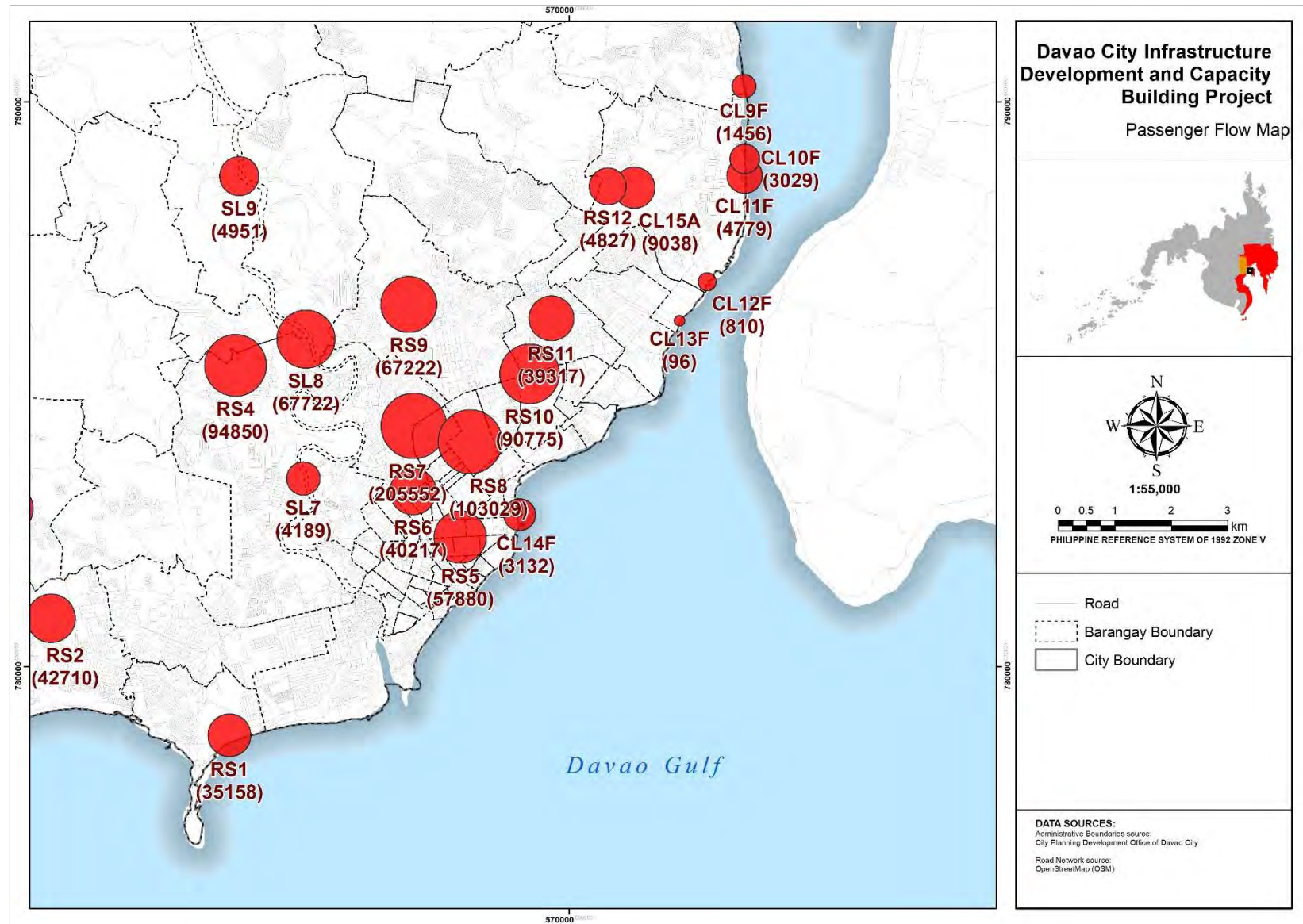


Figure 3.21 Passenger Flow Map (Zoomed In)

6) Public Transportation Network

16. Public Utility Jeepneys (PUJ) route data were provided by Davao City Planning and Development Office.

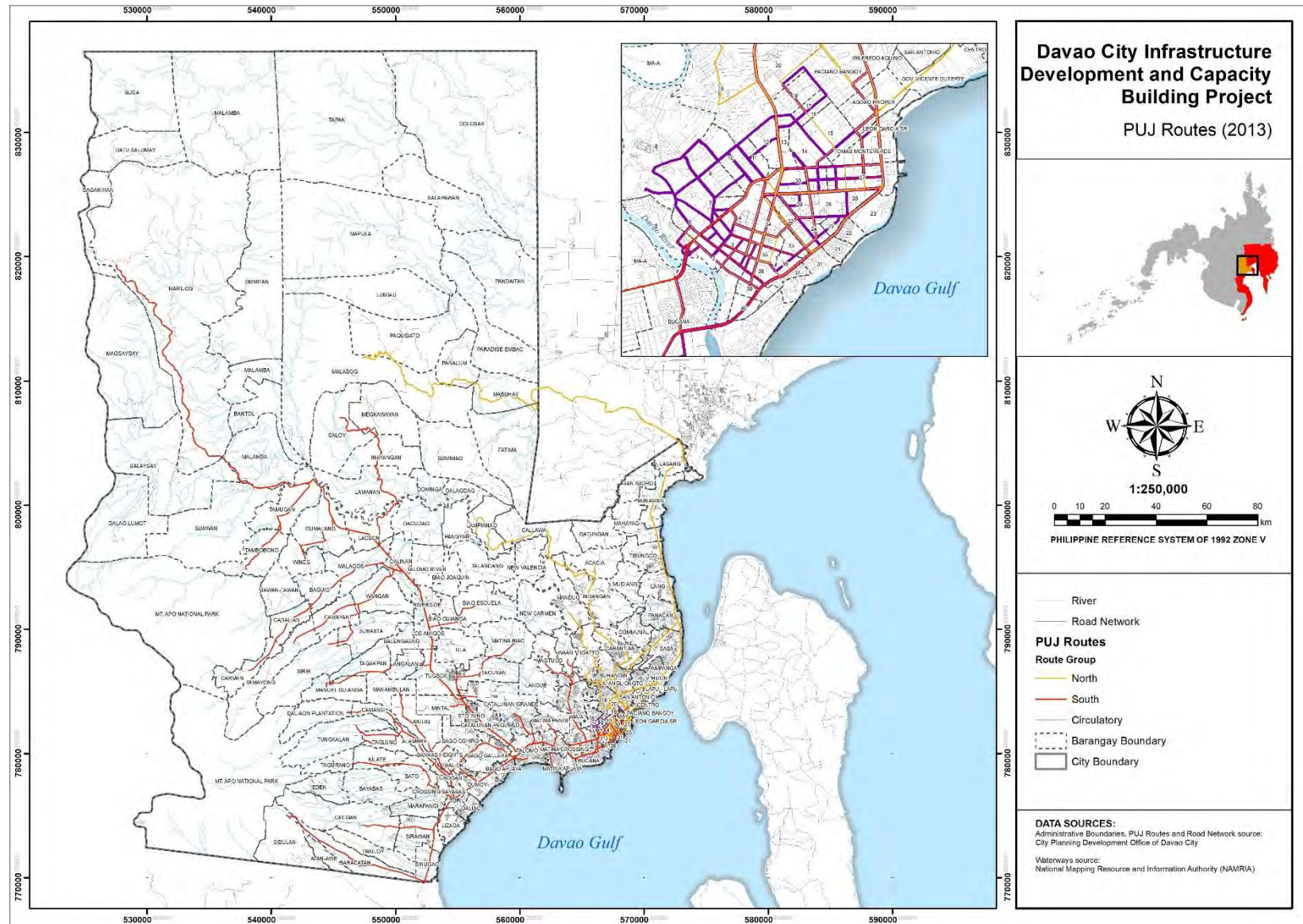


Figure 3.22 PUJ Route

7) Service Coverage

17. Water system zones data was provided by Davao City Water District while water supply status polygons were from JICA Project Team.

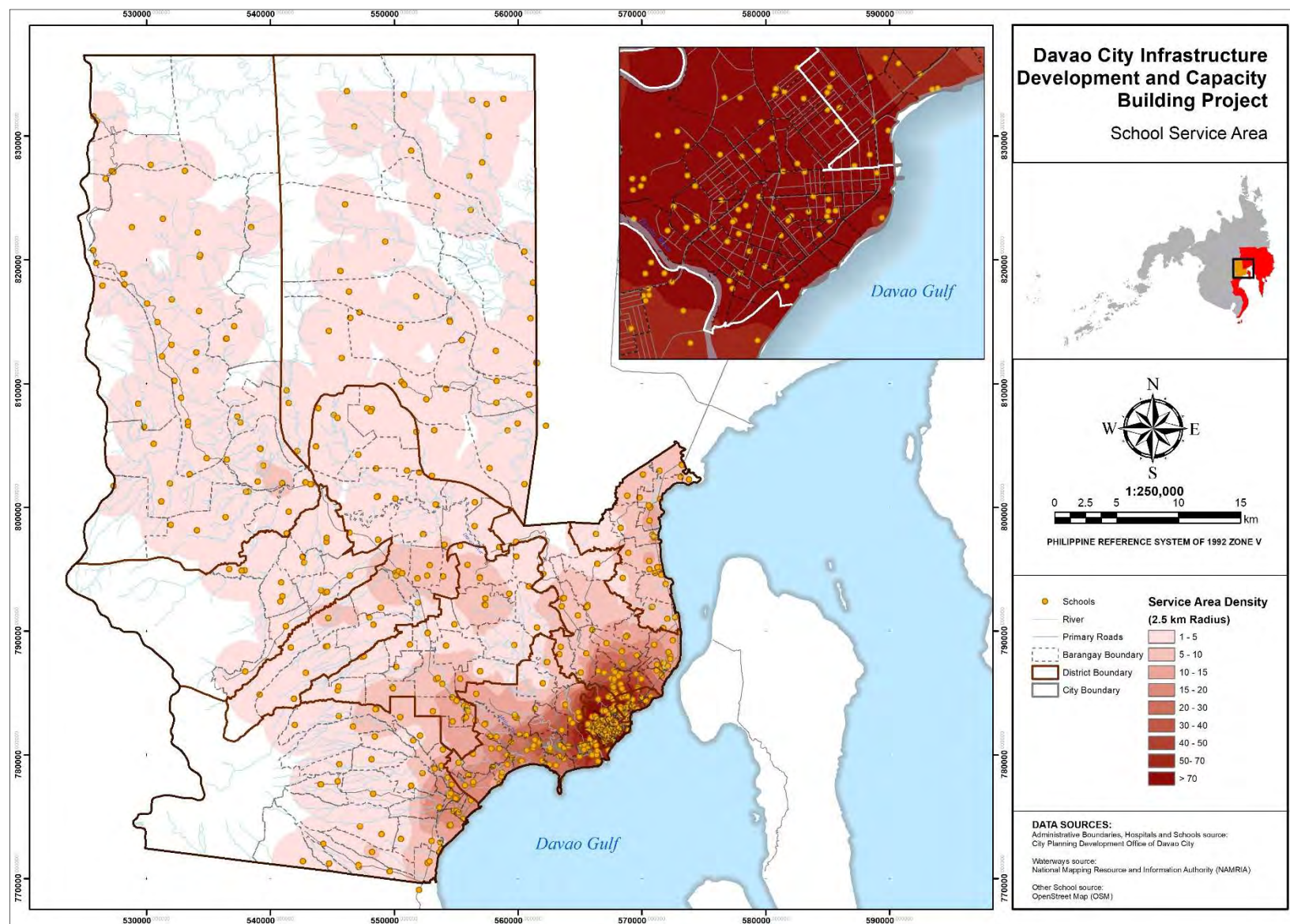


Figure 3.23 School Service Area Map

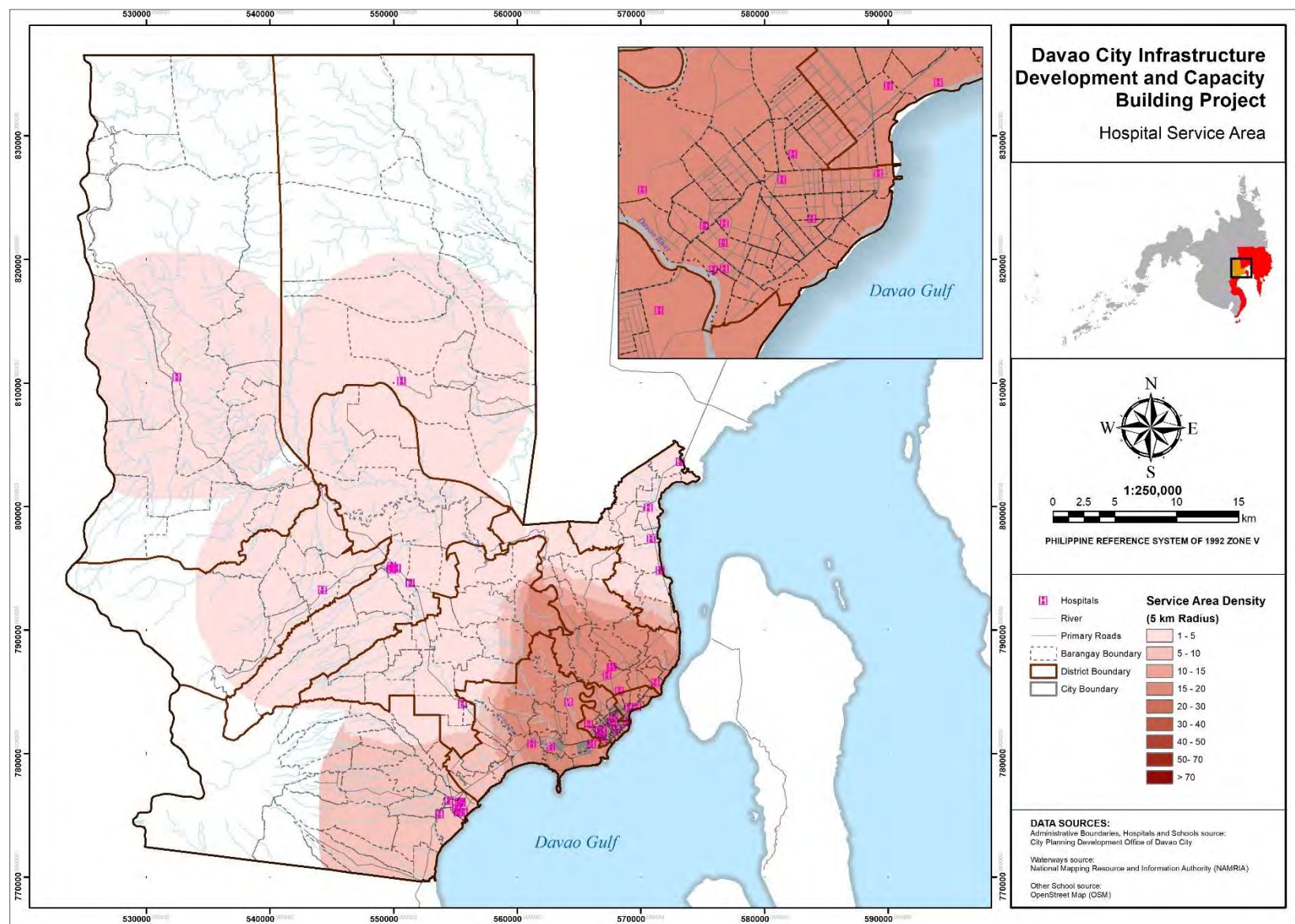


Figure 3.24 Hospital Service Area Map

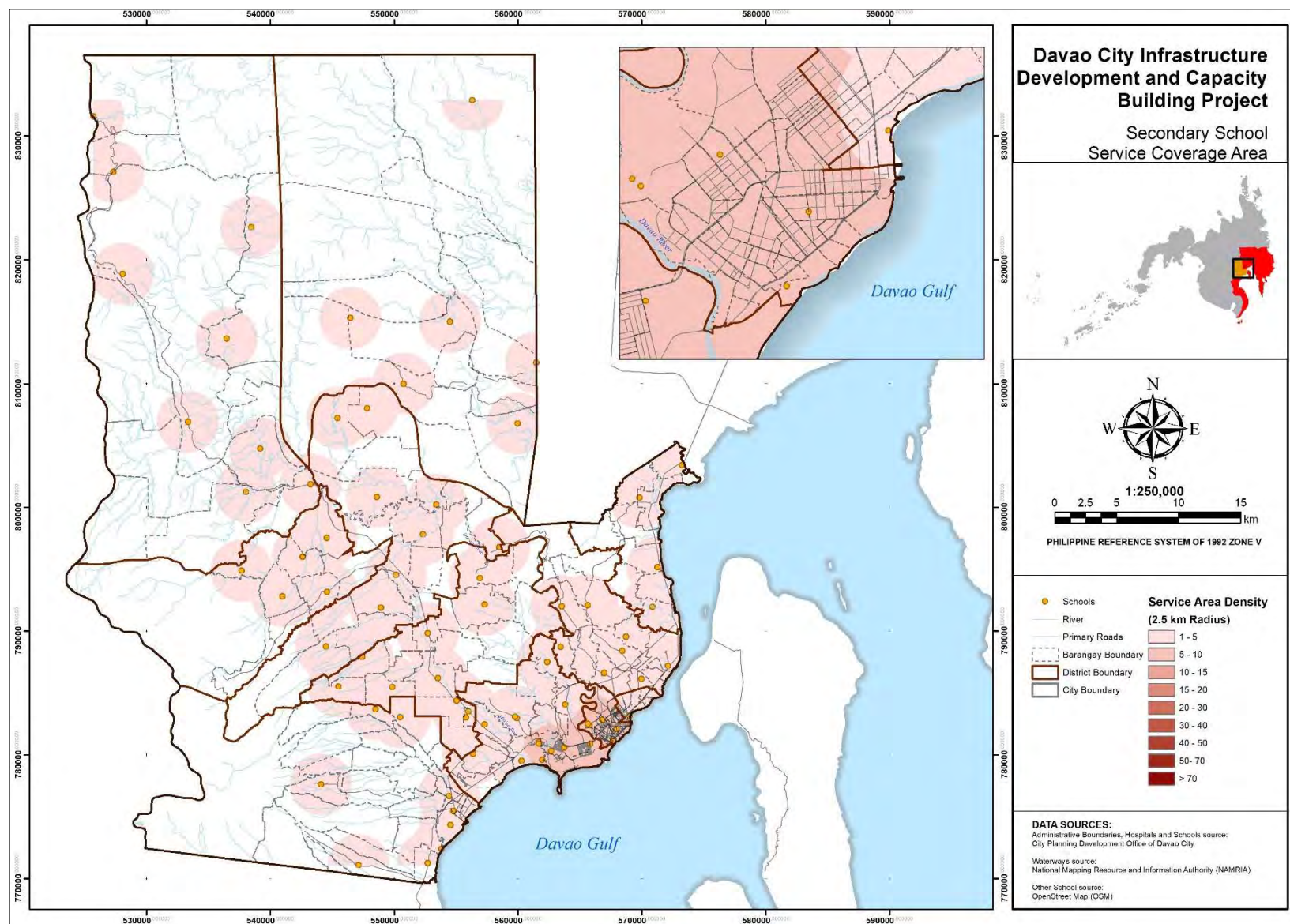


Figure 3.25 Elementary Schools Service Coverage Area Map

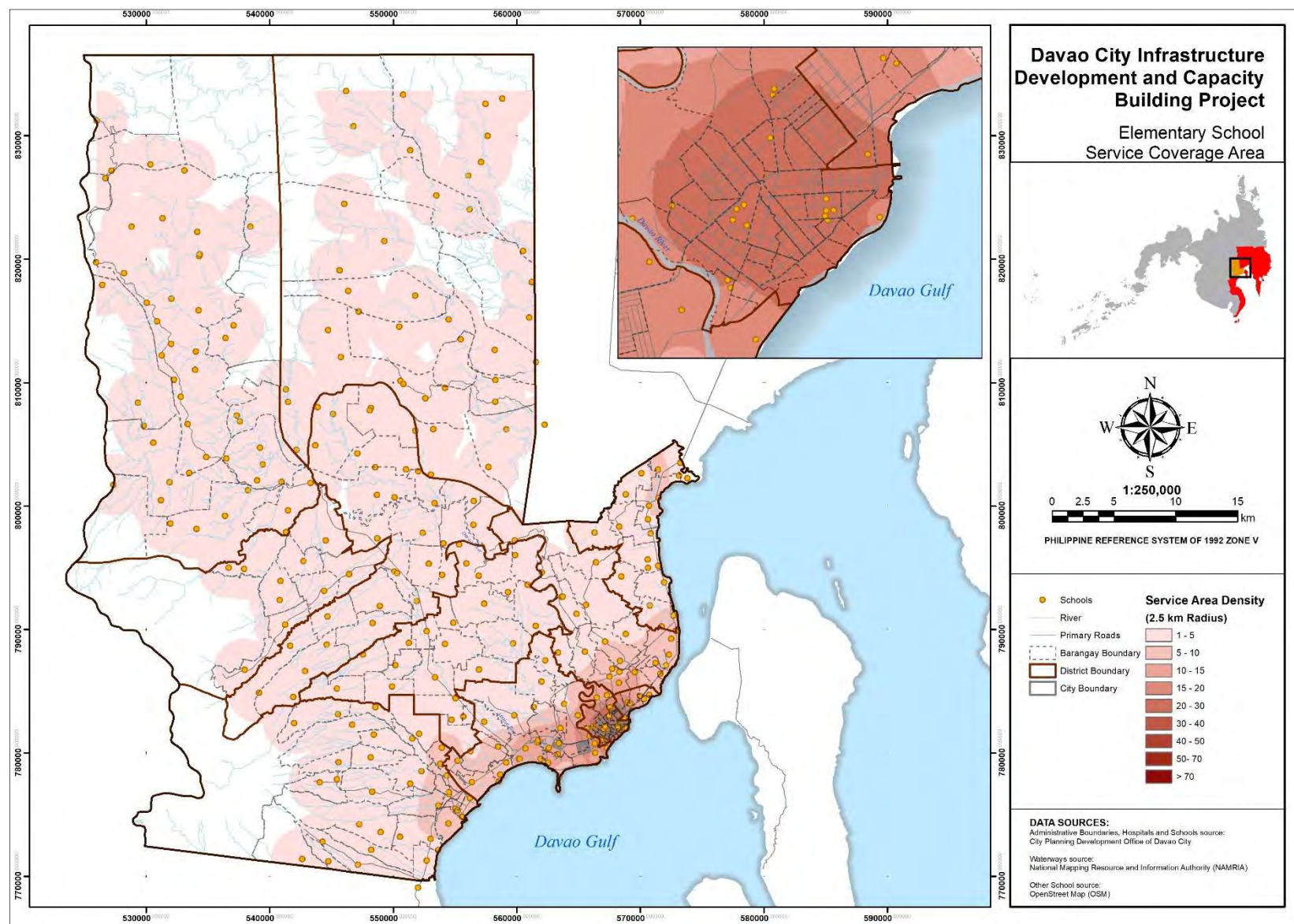


Figure 3.26 Secondary Schools Service Coverage Area Map

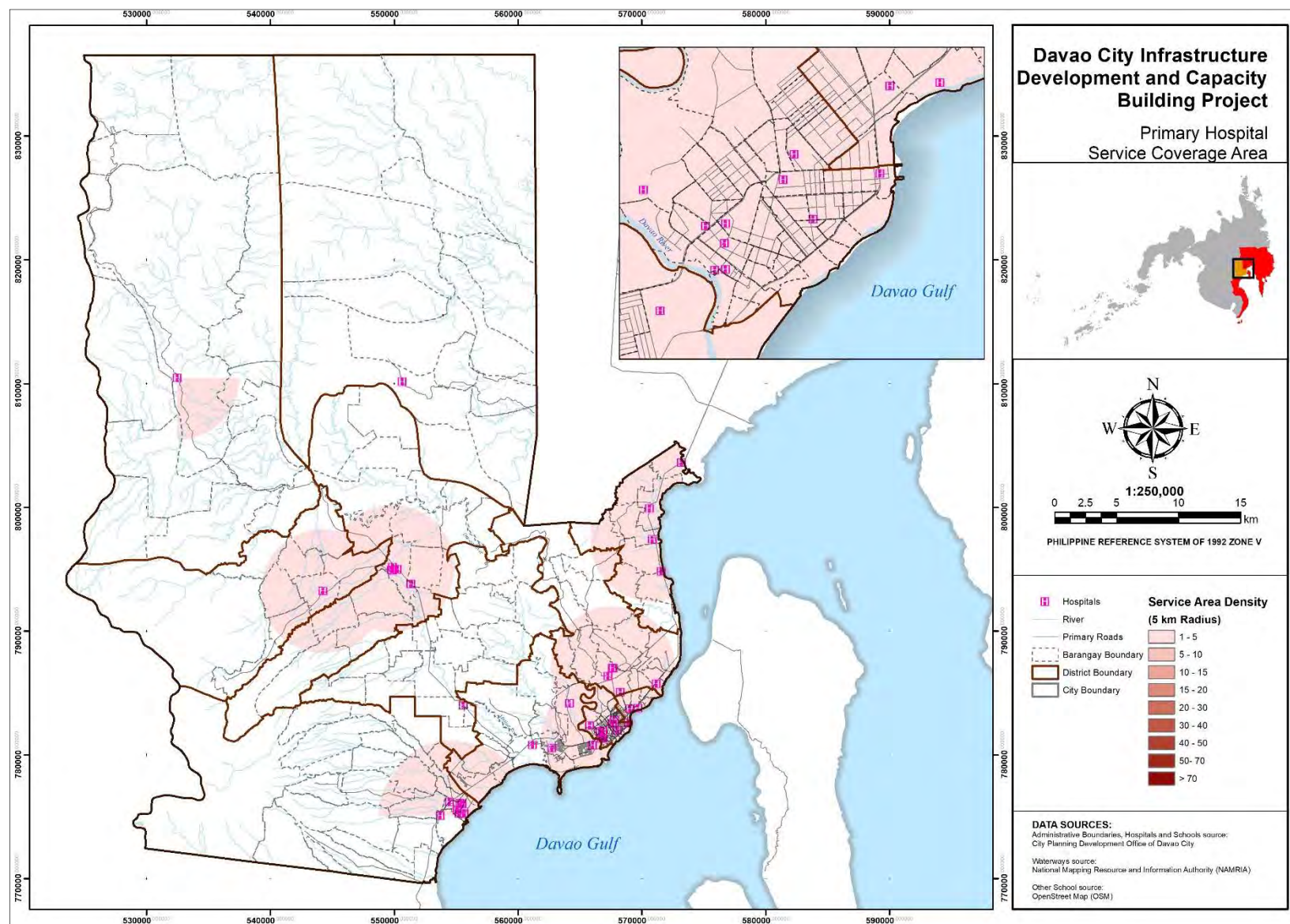


Figure 3.27 Primary Hospitals Service Area Map

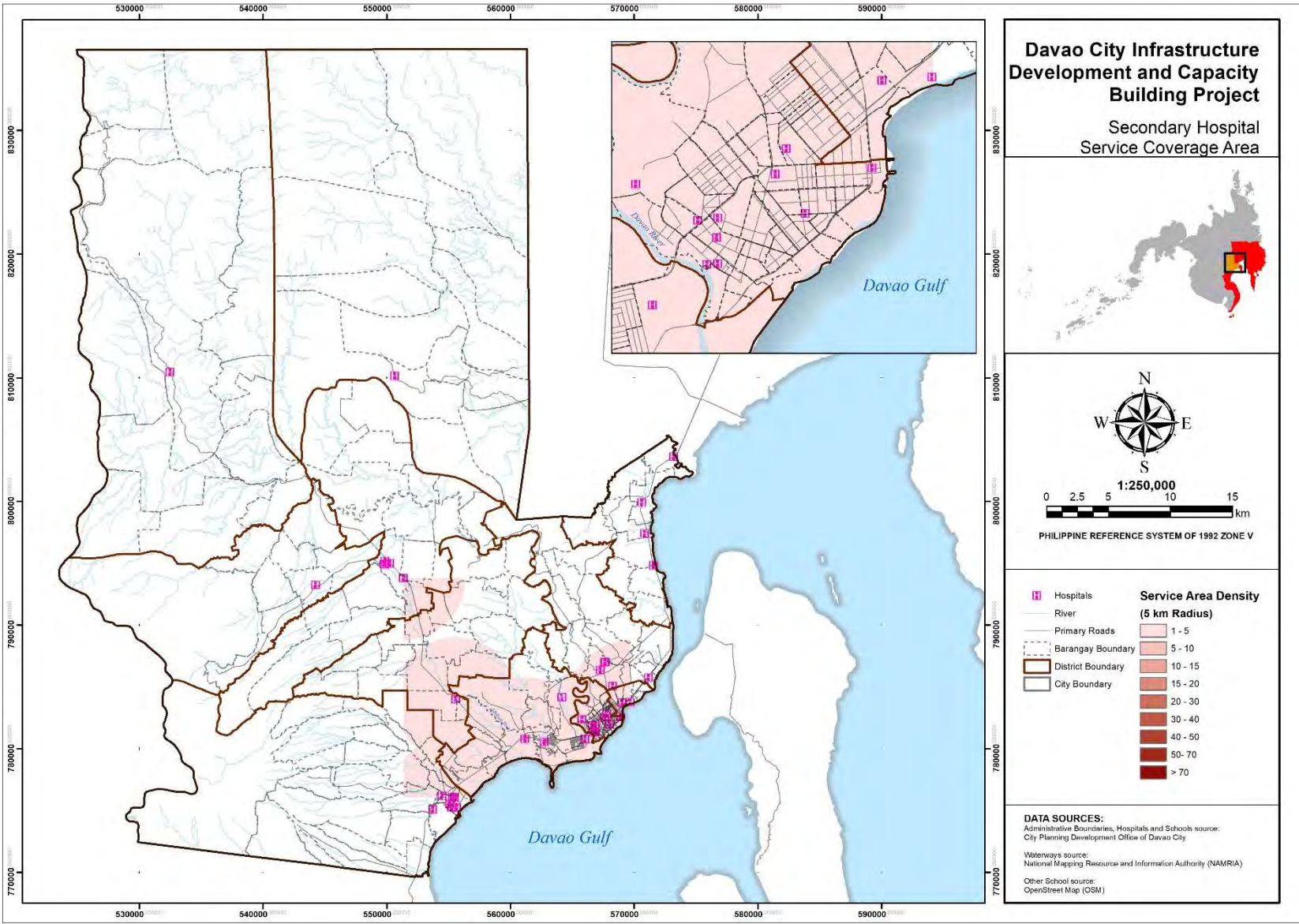


Figure 3.28 Secondary Hospitals Service Area Map

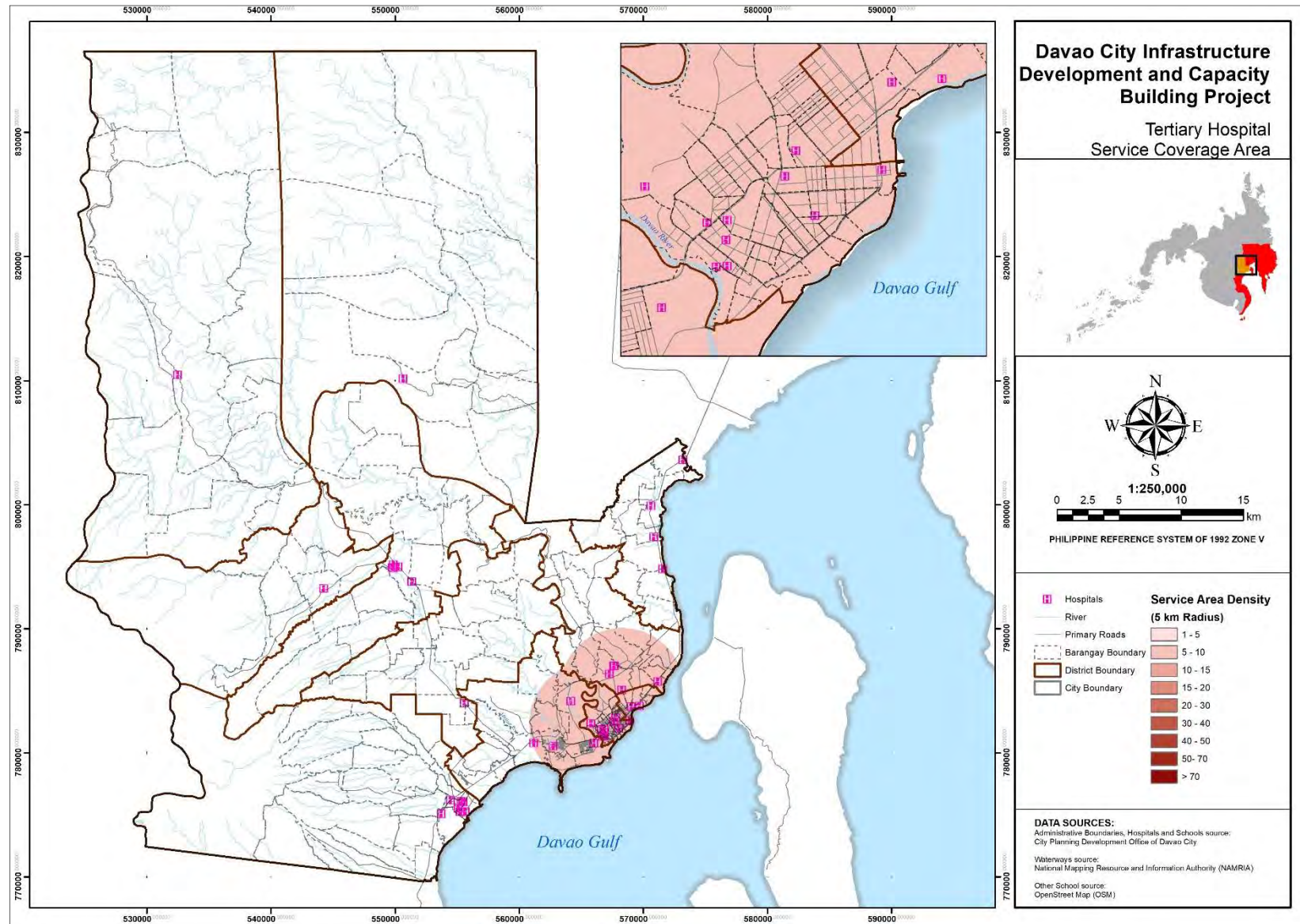


Figure 3.29 Tertiary Hospitals Service Area Map

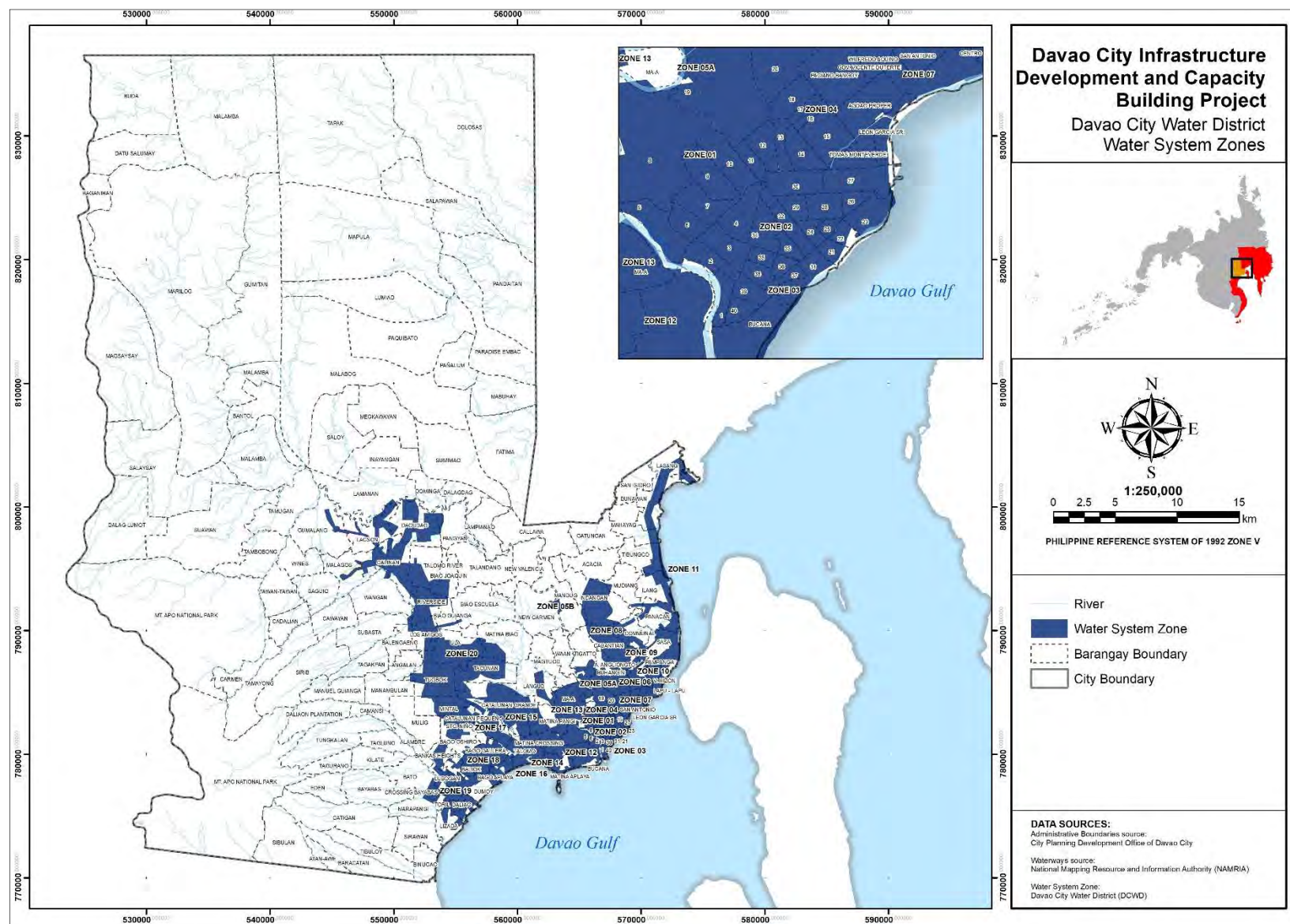


Figure 3.30 Davao City Water District Water System Zones

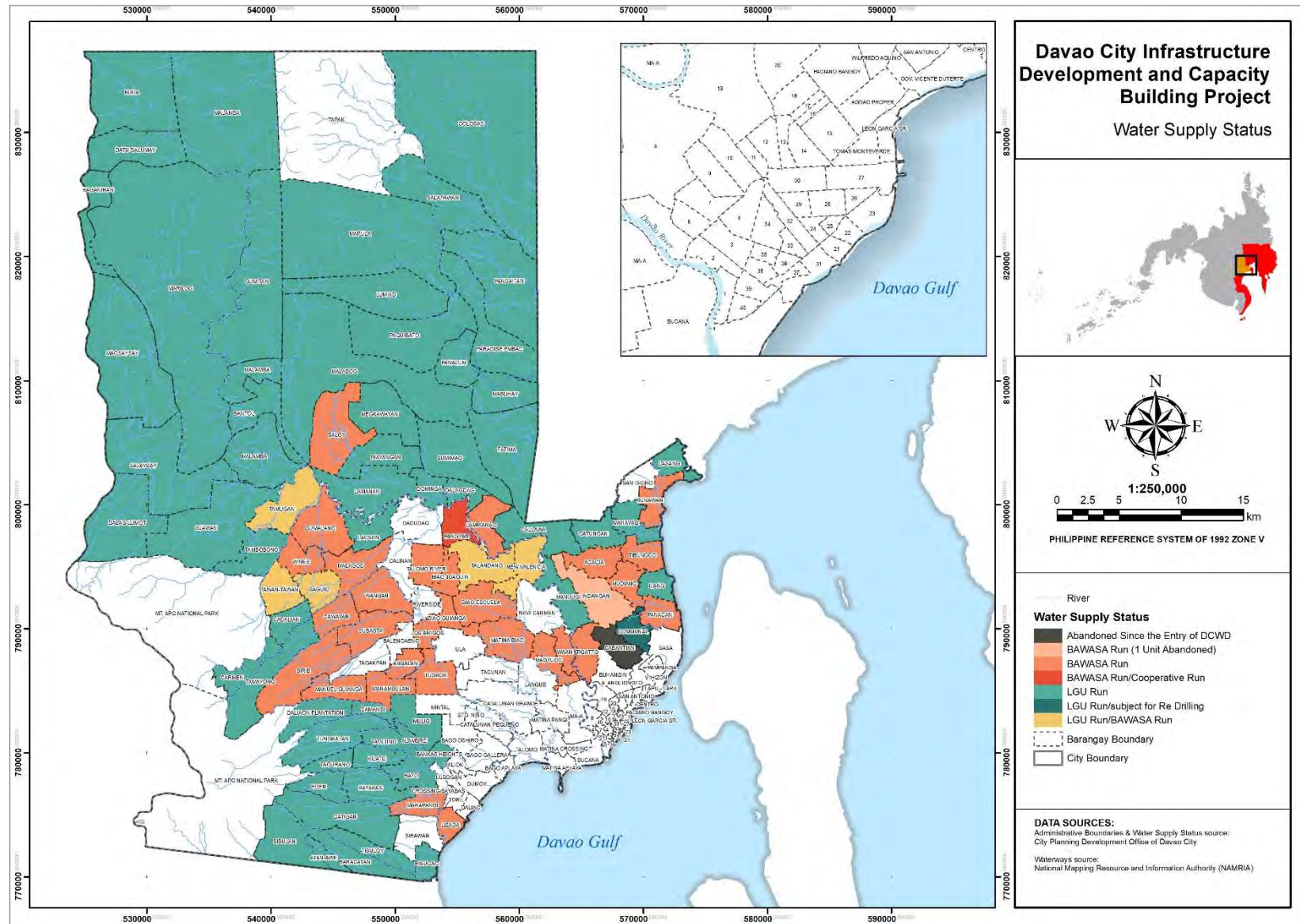


Figure 3.31 Water Supply Status

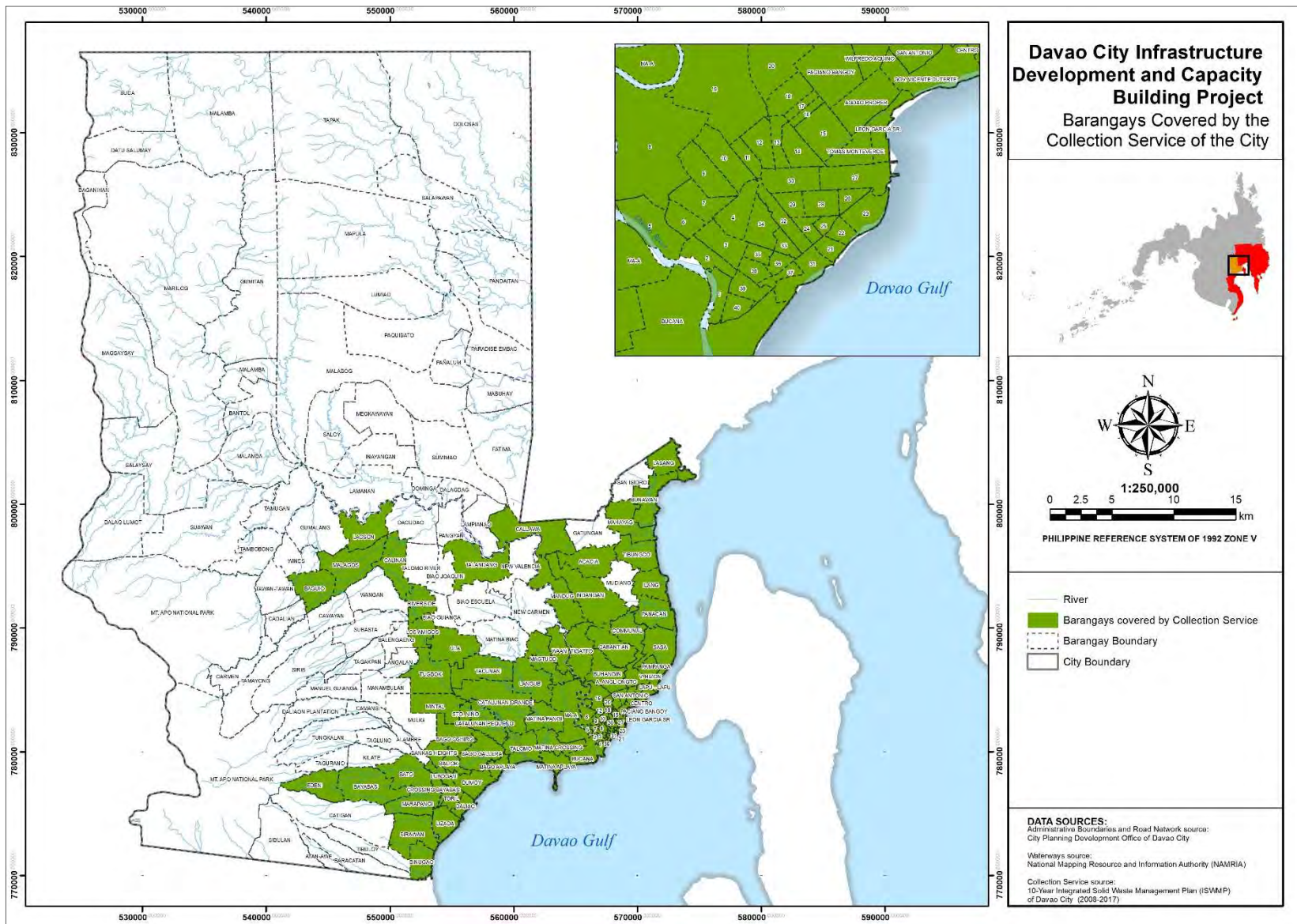


Figure 3.32 Barangays Covered by the Collection Service of the City

8) Land Conditions

18. Land conditions visualized as GIS data from various sources were processed. Urban areas from 1980 to 2015 were determined by Philippine Statistics Authority. For the entire Davao City, built up areas, vegetation cover, and land cover were acquired from Department of Environment and Natural Resources Region XI. Davao Urban Areas built up areas, land capability, large scale public and institutional land use, SAFDZ, timberland, and water resources polygons were obtained from Davao City Planning and Development Office. Ancestral domains were determined by National Commission on Indigenous Peoples.

19. Land use maps for 2011 (prepared by Davao CPDO) and 2017 (prepared by JICA Project Team) used in the various planning activities of the project are also included in this atlas.

20. National conservation areas were declared by Department of Environment and Natural Resources while Conservation Areas under Land Use Capability and Environmental Management Project were from Davao City Planning and Development Office. Protected Areas, however, were declared by National Integrated Protected Areas System.

21. Location of economic zones in the City reflected on the map were determined by Philippines Economic Zones Authority.

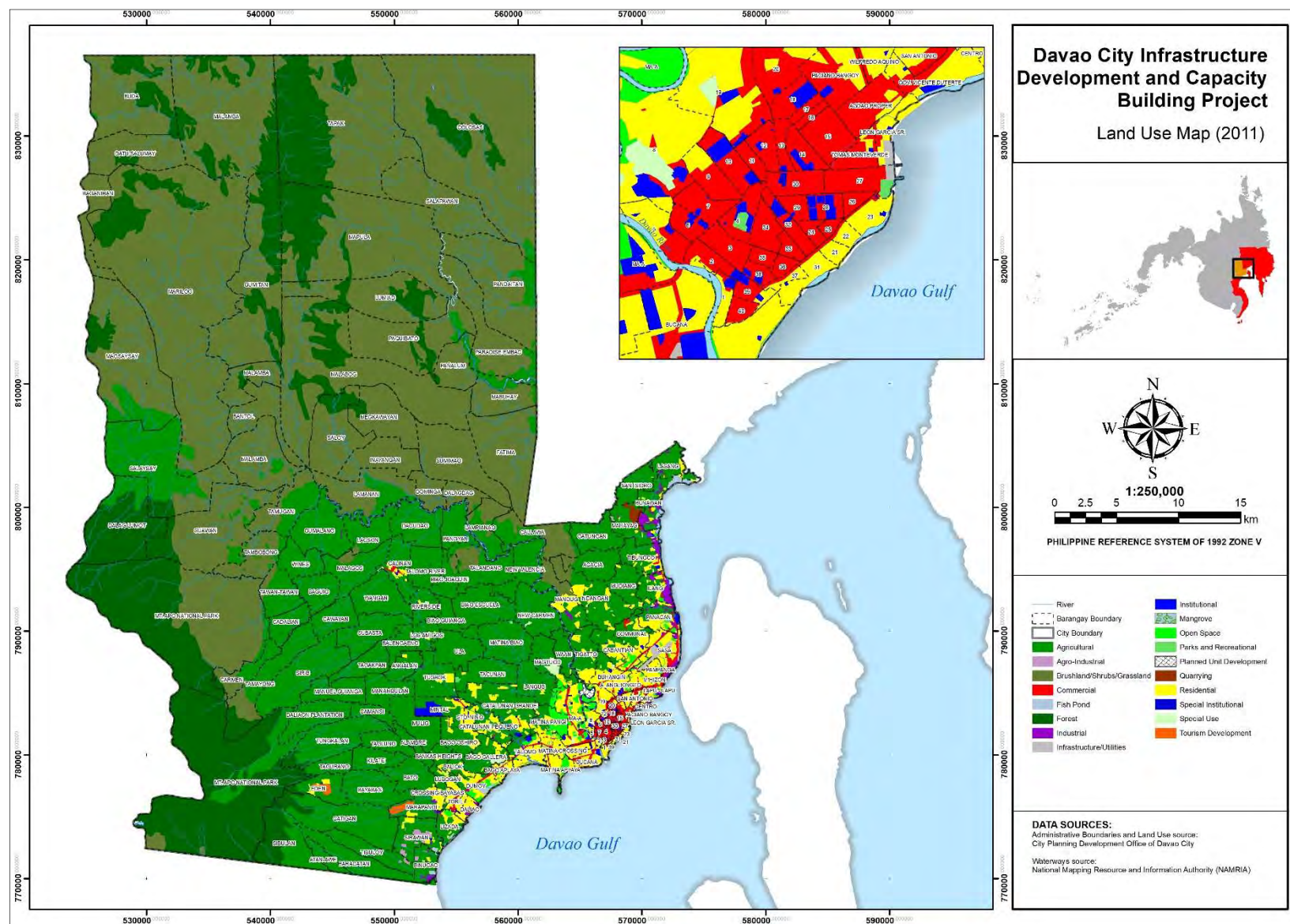


Figure 3.33 Land Use Map (2011)

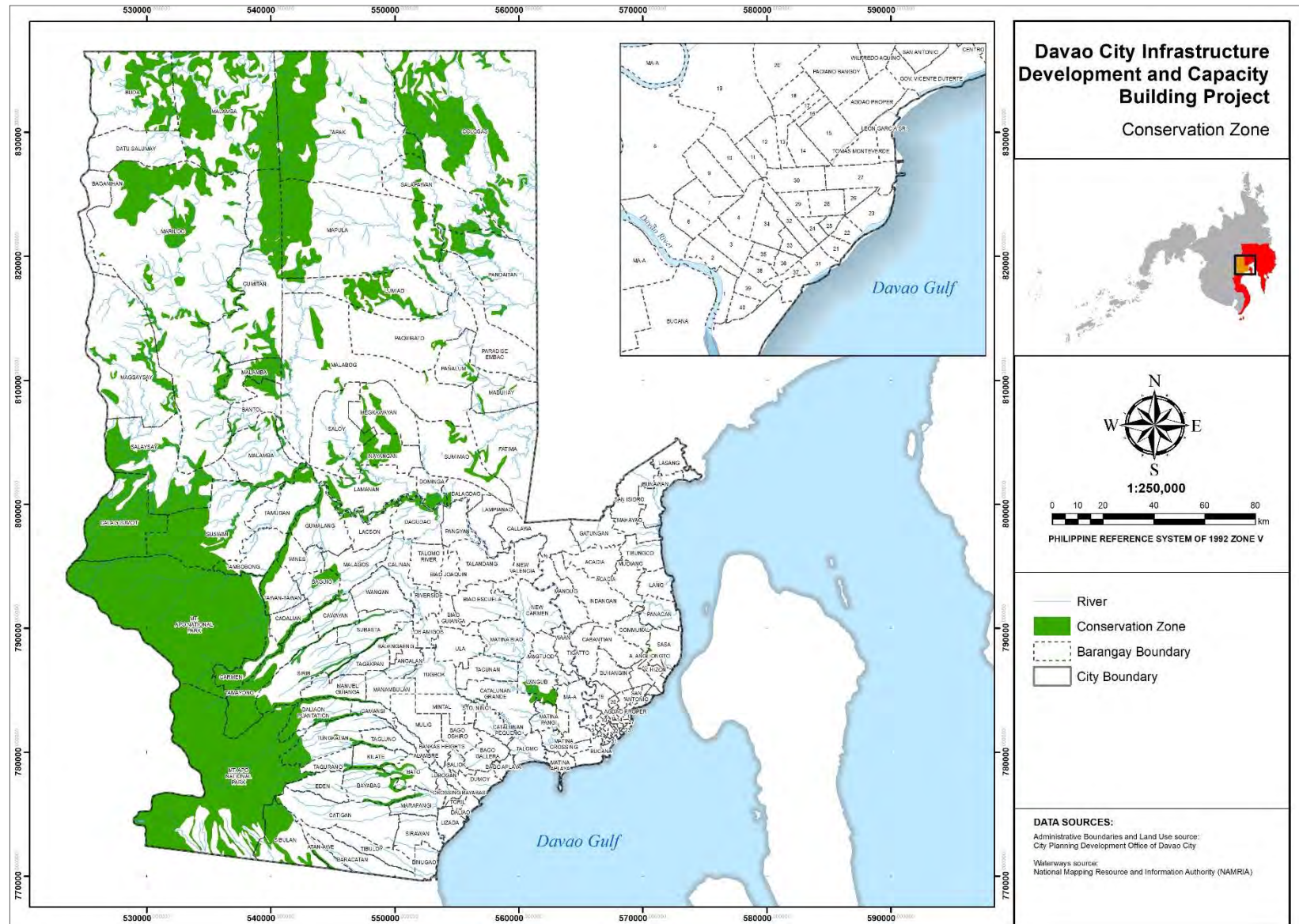


Figure 3.34 Conservation Zone Map

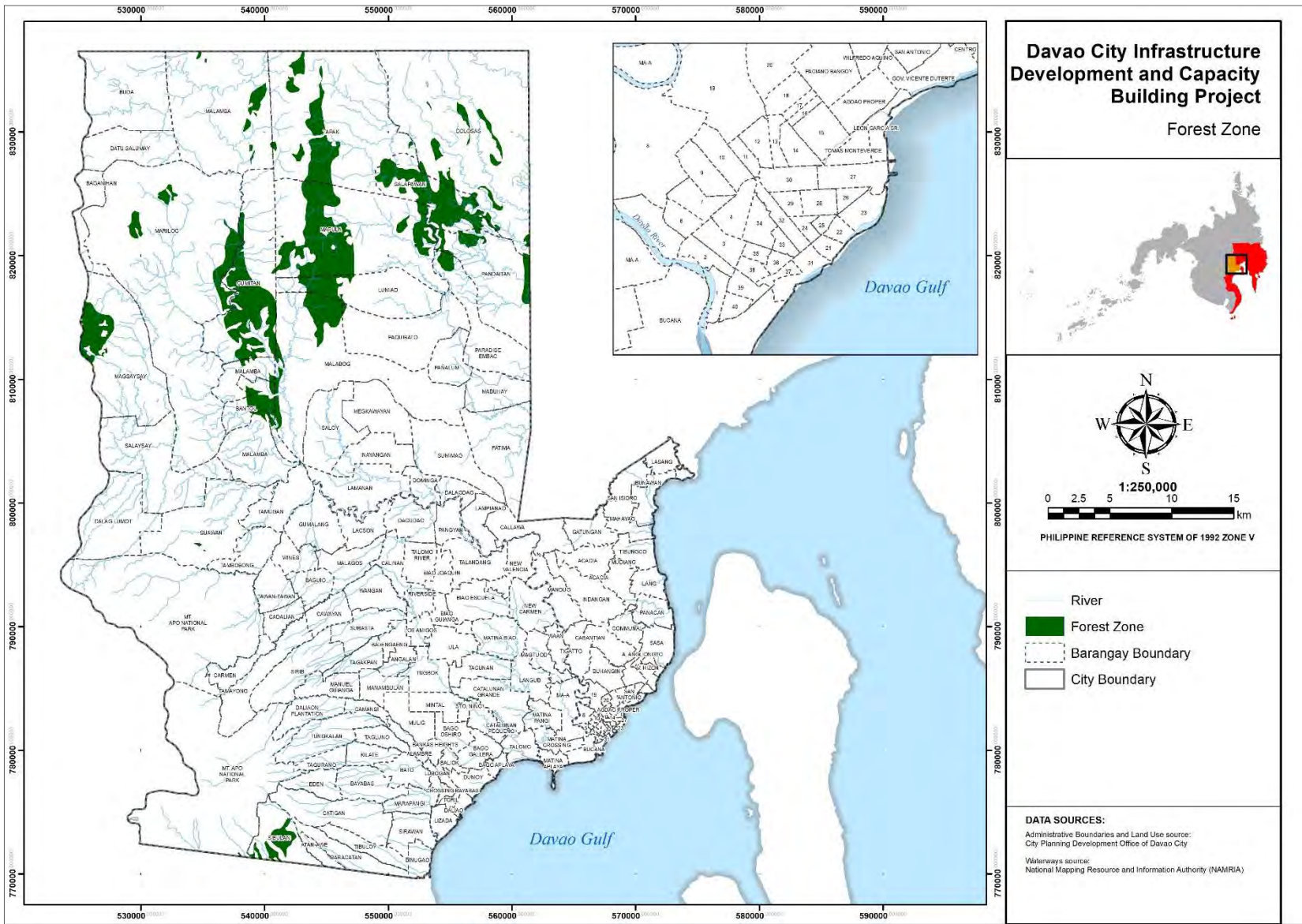


Figure 3.35 Forest Zone Map

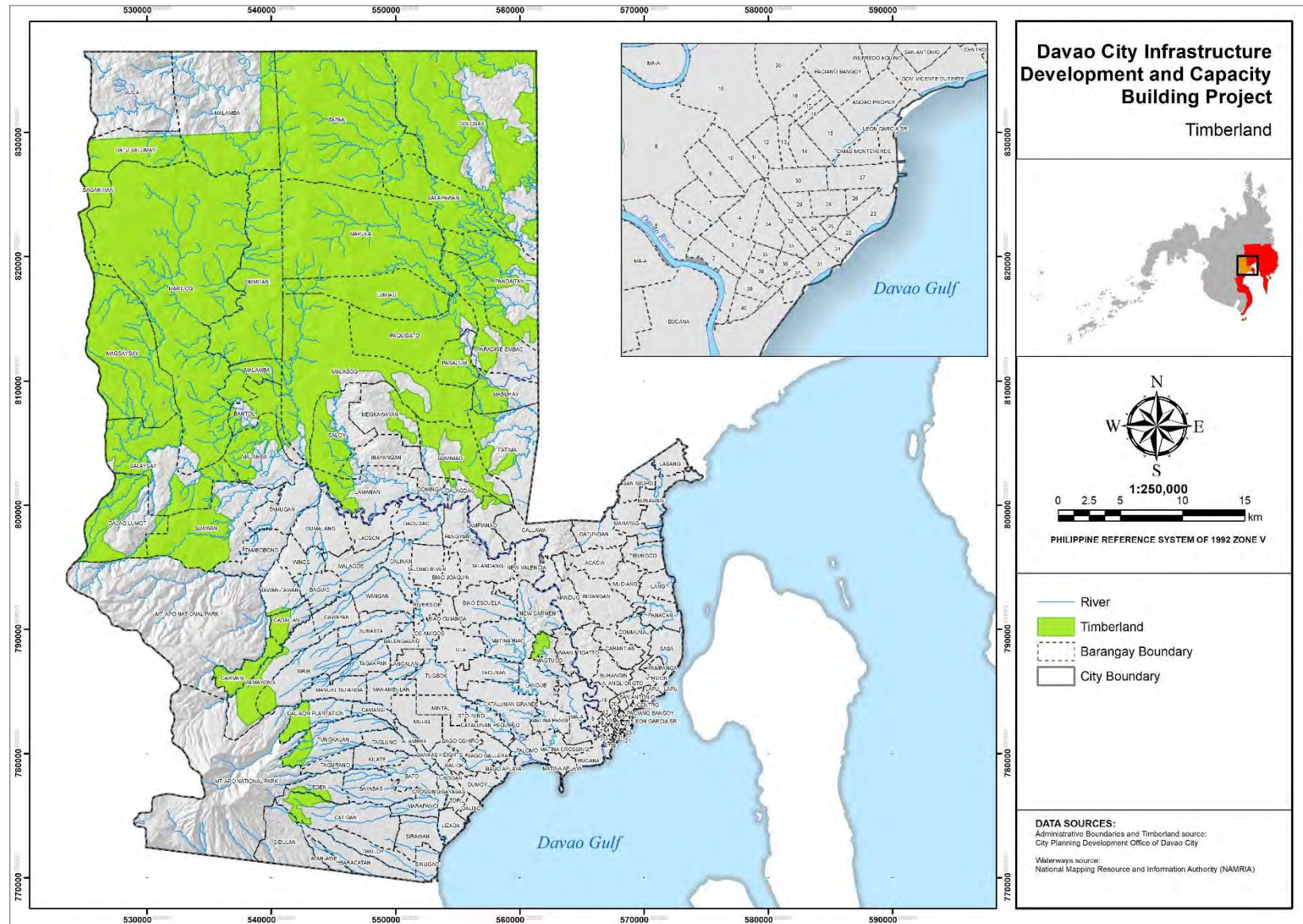


Figure 3.36 Timberland

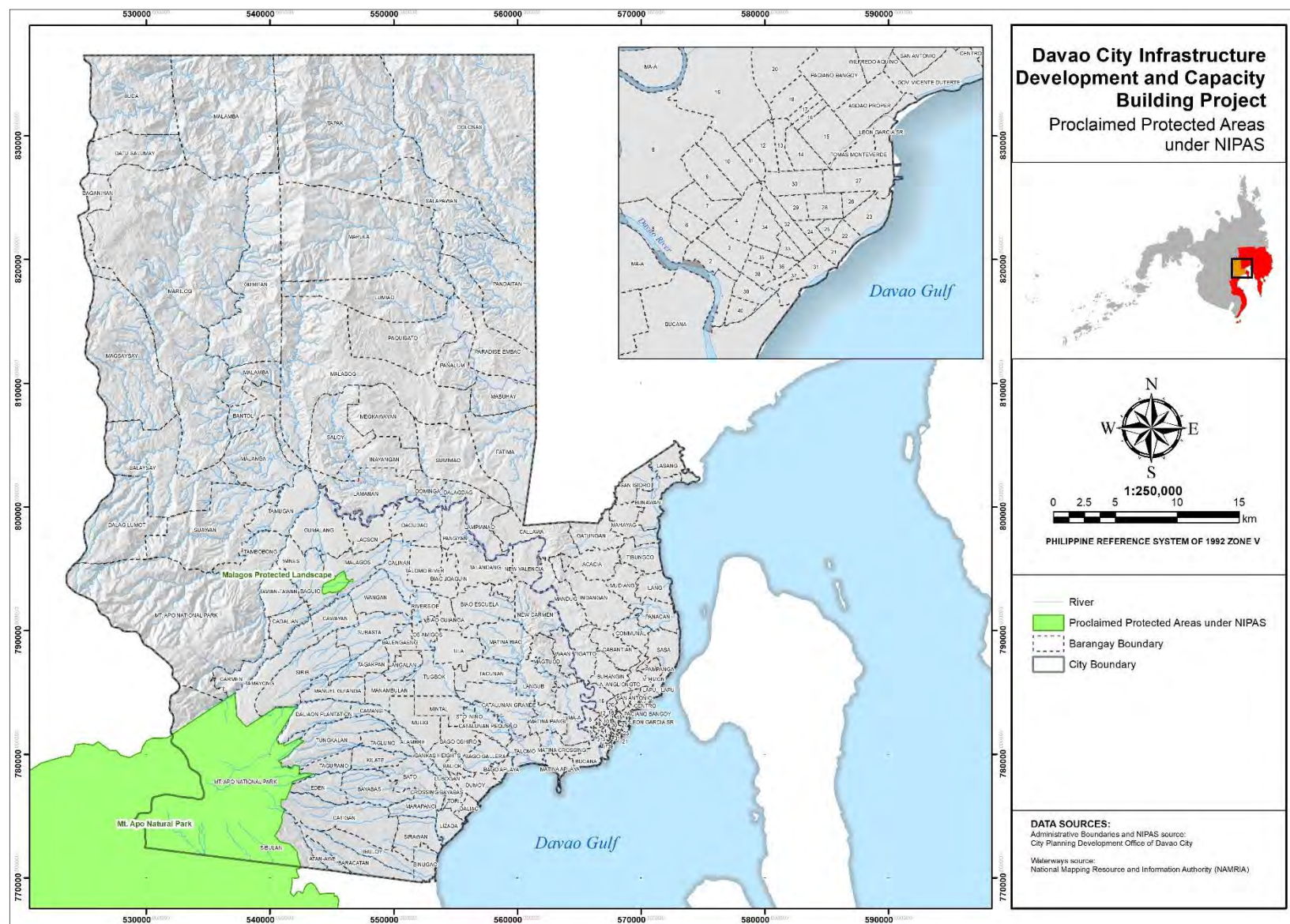


Figure 3.37 Proclaimed Protected Areas under NIPAS

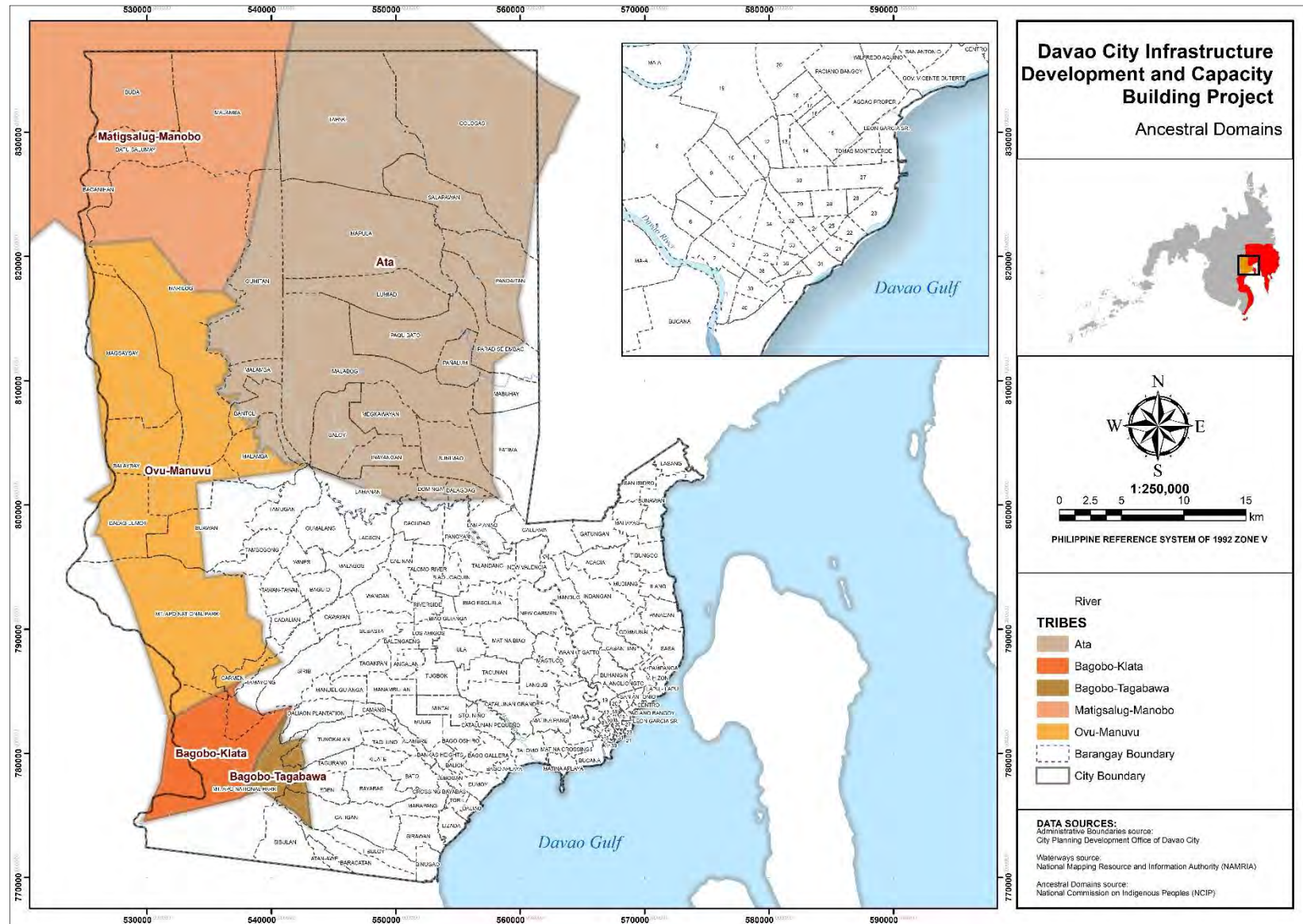


Figure 3.38 Ancestral Domains

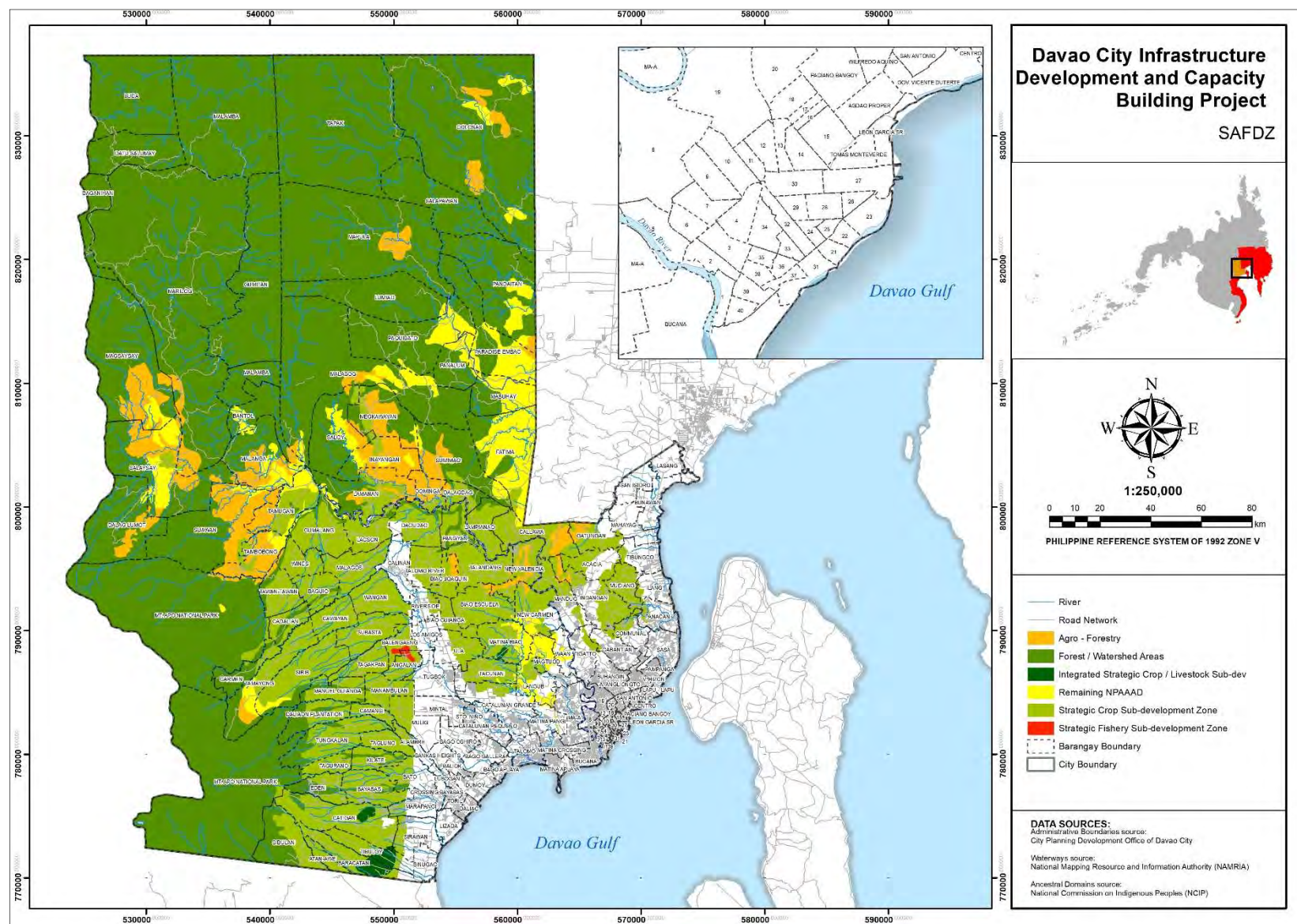


Figure 3.39 SAFDZ

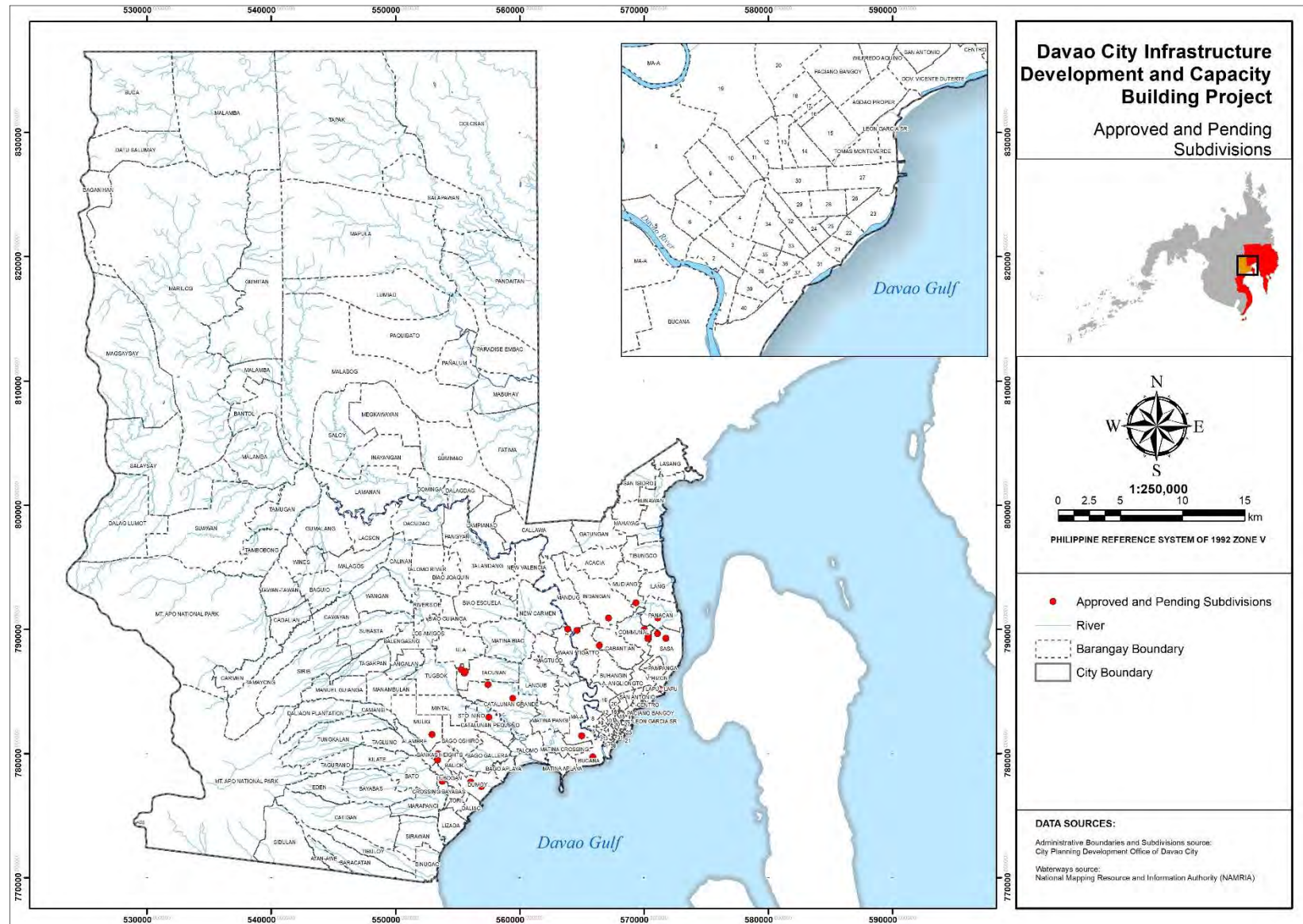


Figure 3.40 Approved and Pending Subdivisions Map

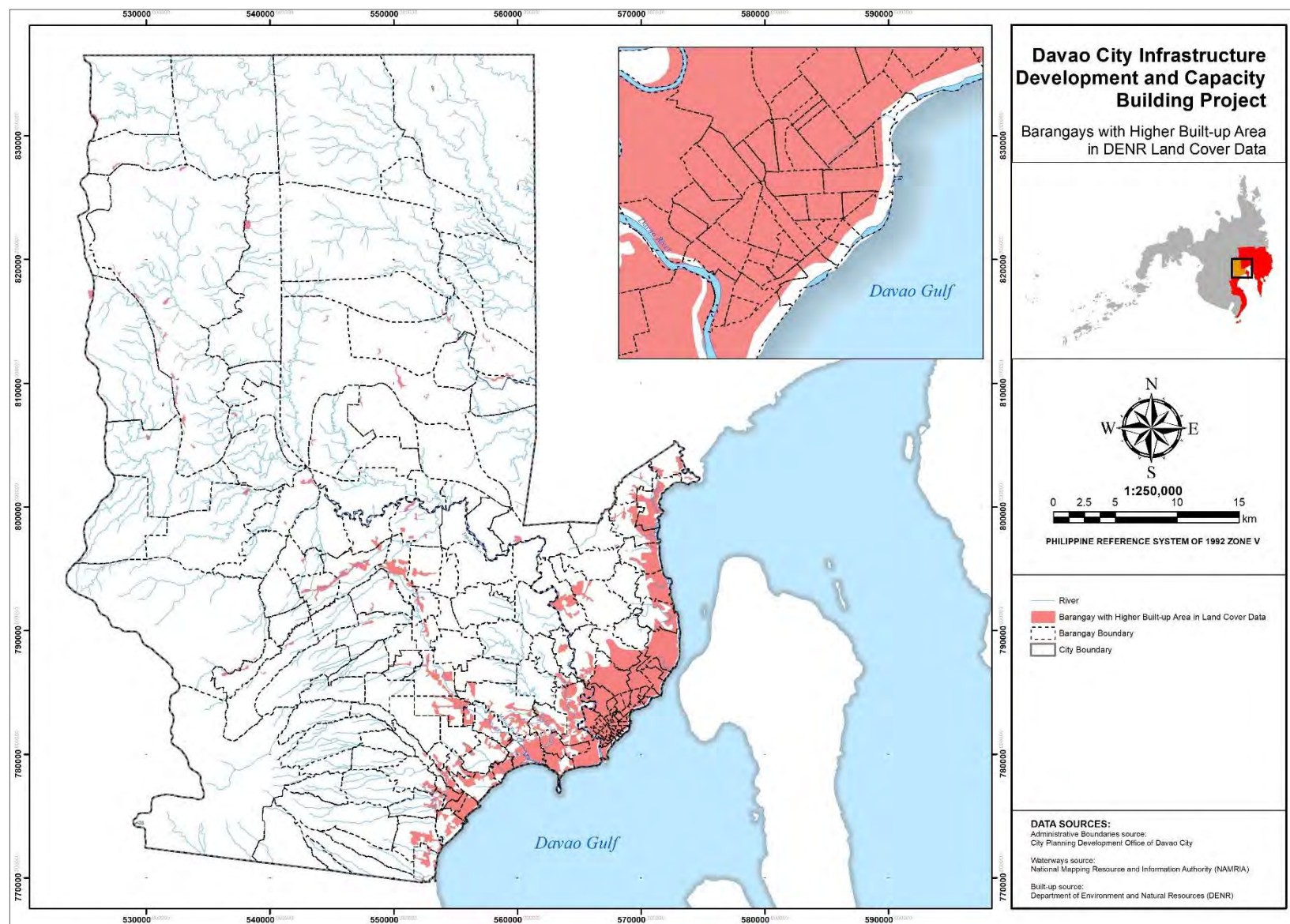


Figure 3.41 Barangays with Higher Built-Up Areas in DENR Land Cover Data Map

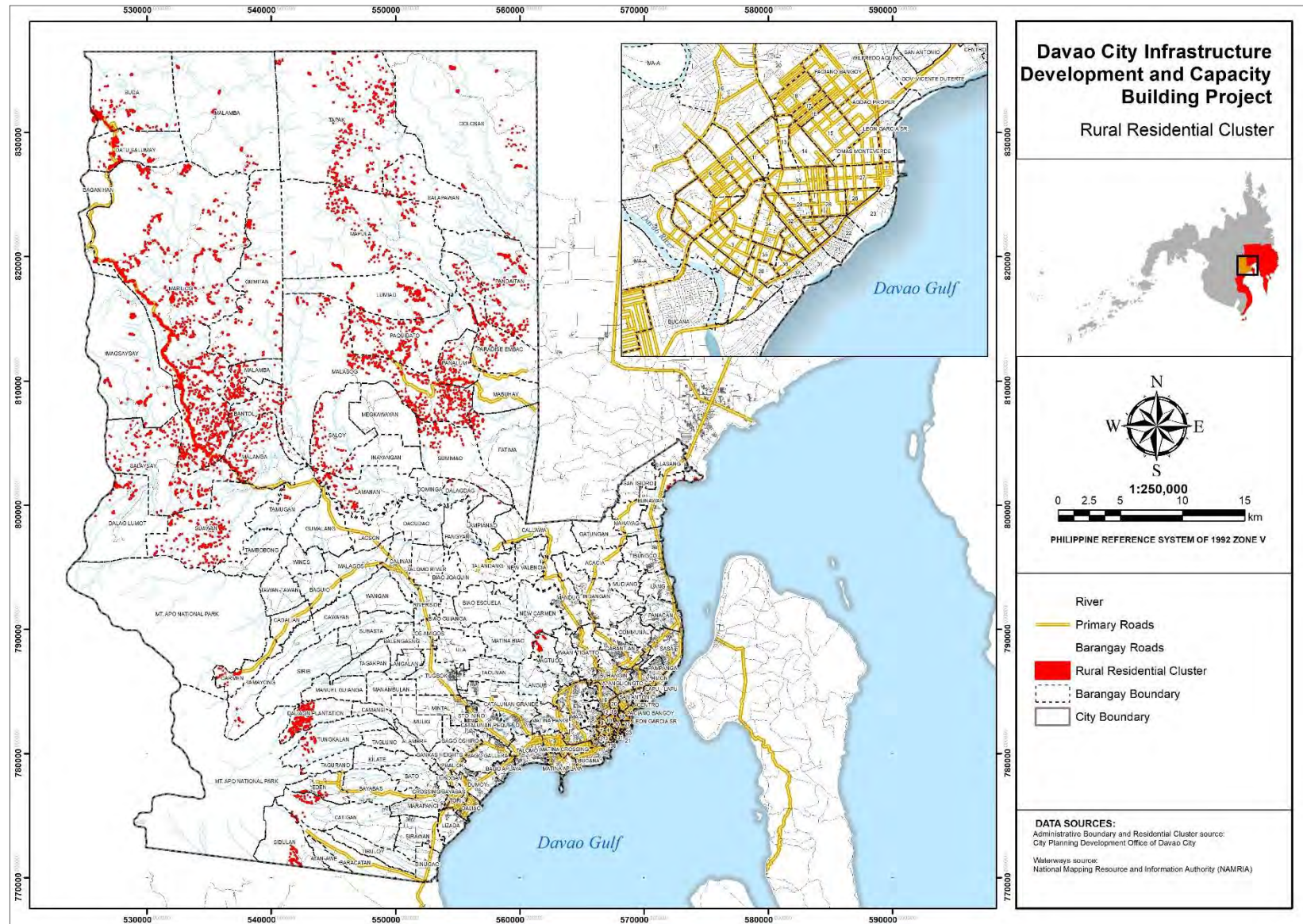


Figure 3.42 Residential Clusters

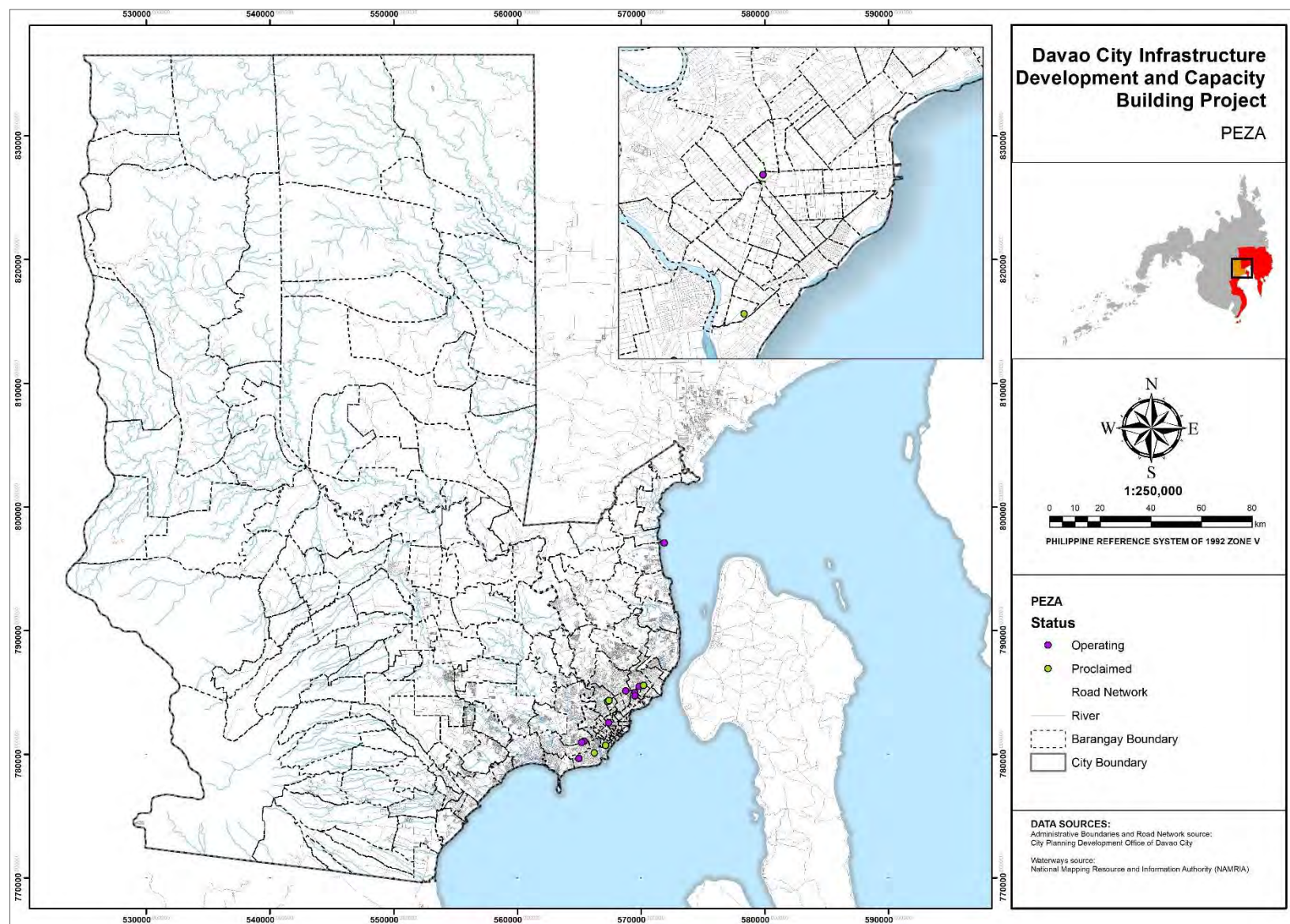


Figure 3.43 PEZA

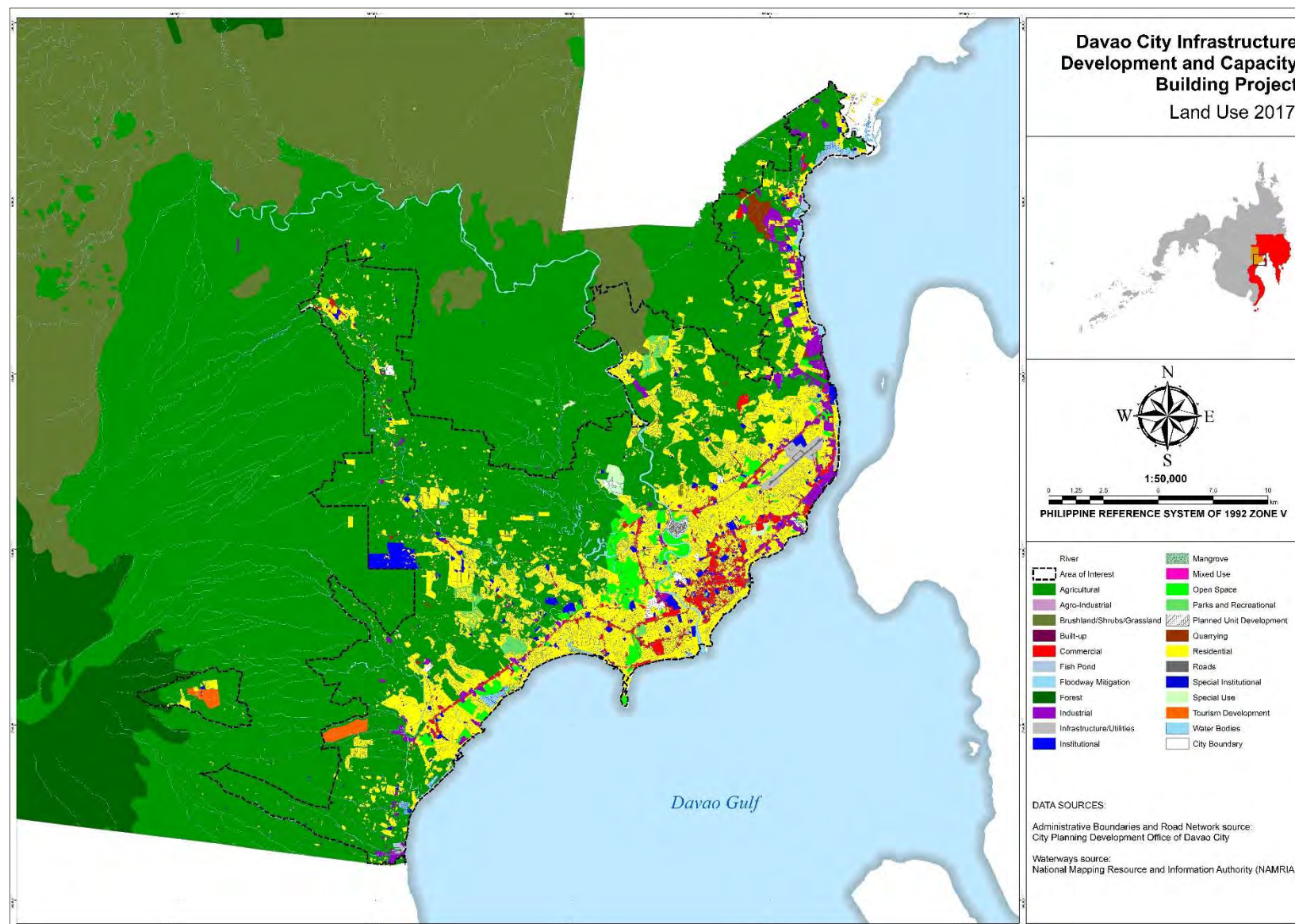


Figure 3.44 Land Use Map (2017)

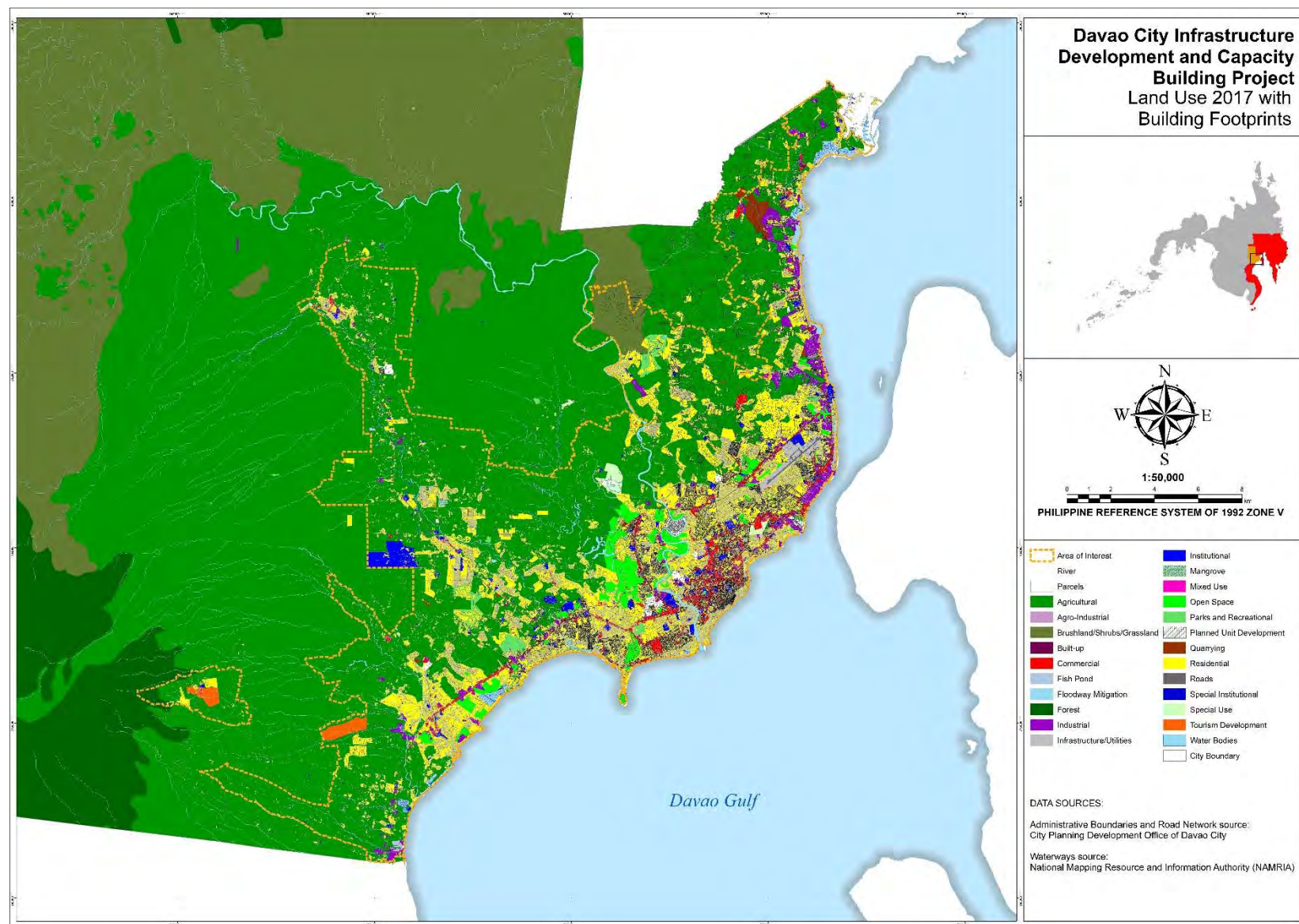


Figure 3.45 Land Use Map (2017) with Building Footprints

9) Hazards

22. The hazards determined in the following thematic maps are active fault, erosion, flood, landslide, liquefaction and storm surge. Active fault lines and liquefaction data were obtained from Philippine Institute of Volcanology and Seismology. Five-year, twenty-five-year, and one hundred-year flood hazard and storm surge were from Disaster Risk and Exposure Assessment for Mitigation (DREAM), while 1: 10,000 and 1: 50,000 scale flood hazard maps were from Mining and Geosciences Bureau (MGB). Landslide data of 1: 10,000 and 1: 50,000 scales, and liquefaction of 1: 50,000 scale were also from MGB and City Planning and Development Office.

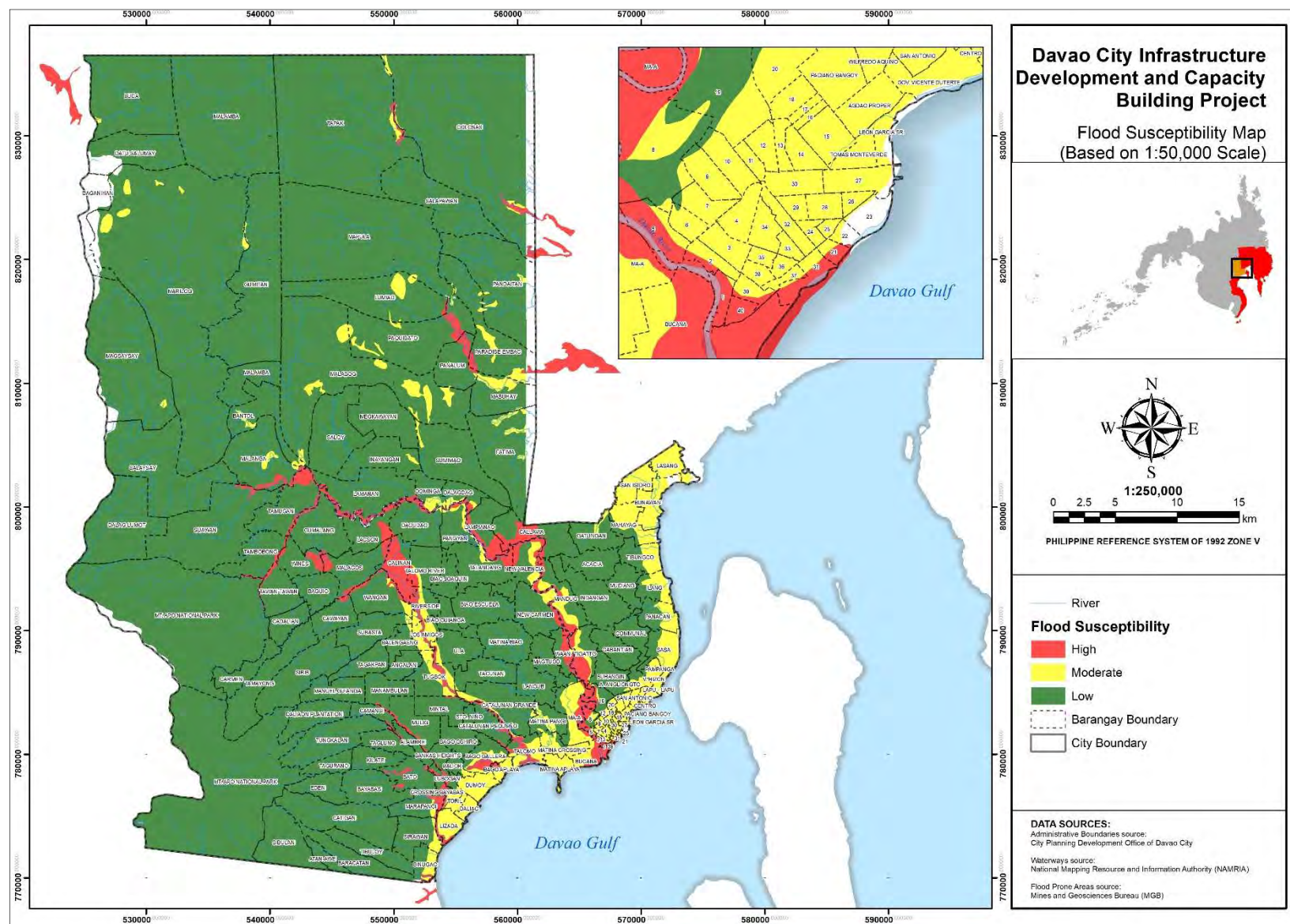


Figure 3.46 Flood Susceptibility Map (1:50,000)

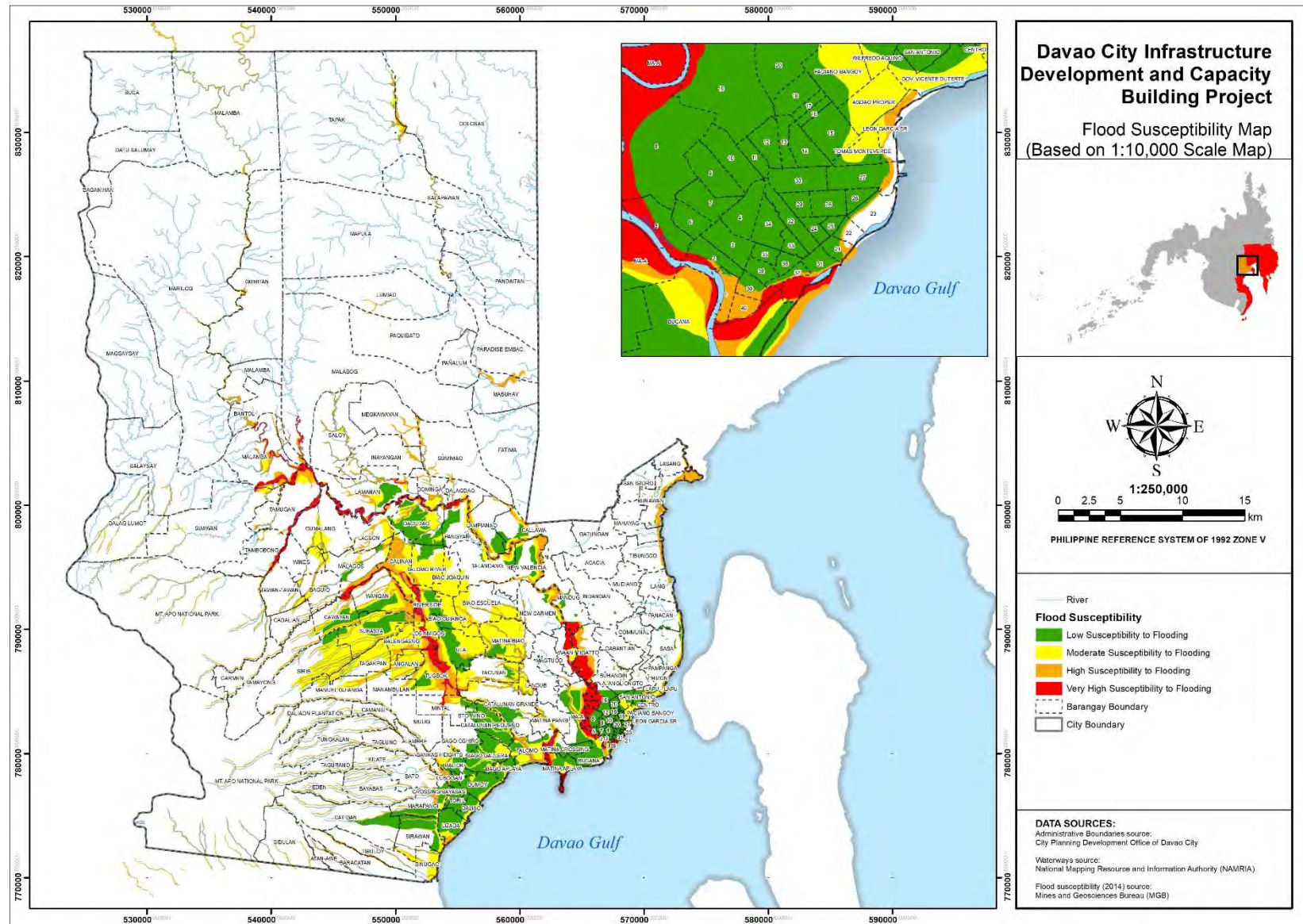


Figure 3.47 Flood Susceptibility Map (1:10,000)

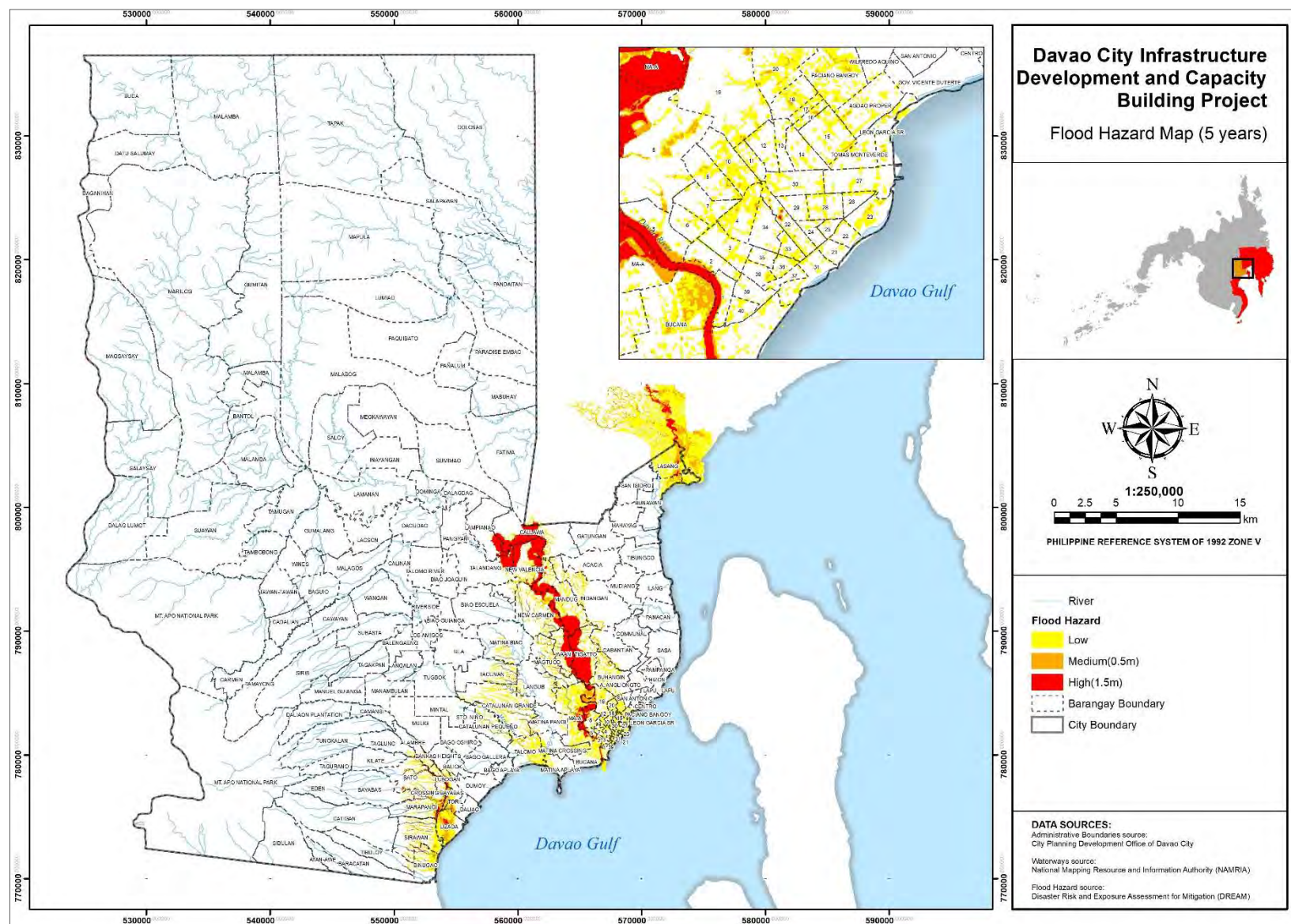


Figure 3.48 Flood Hazard Map (5 years)

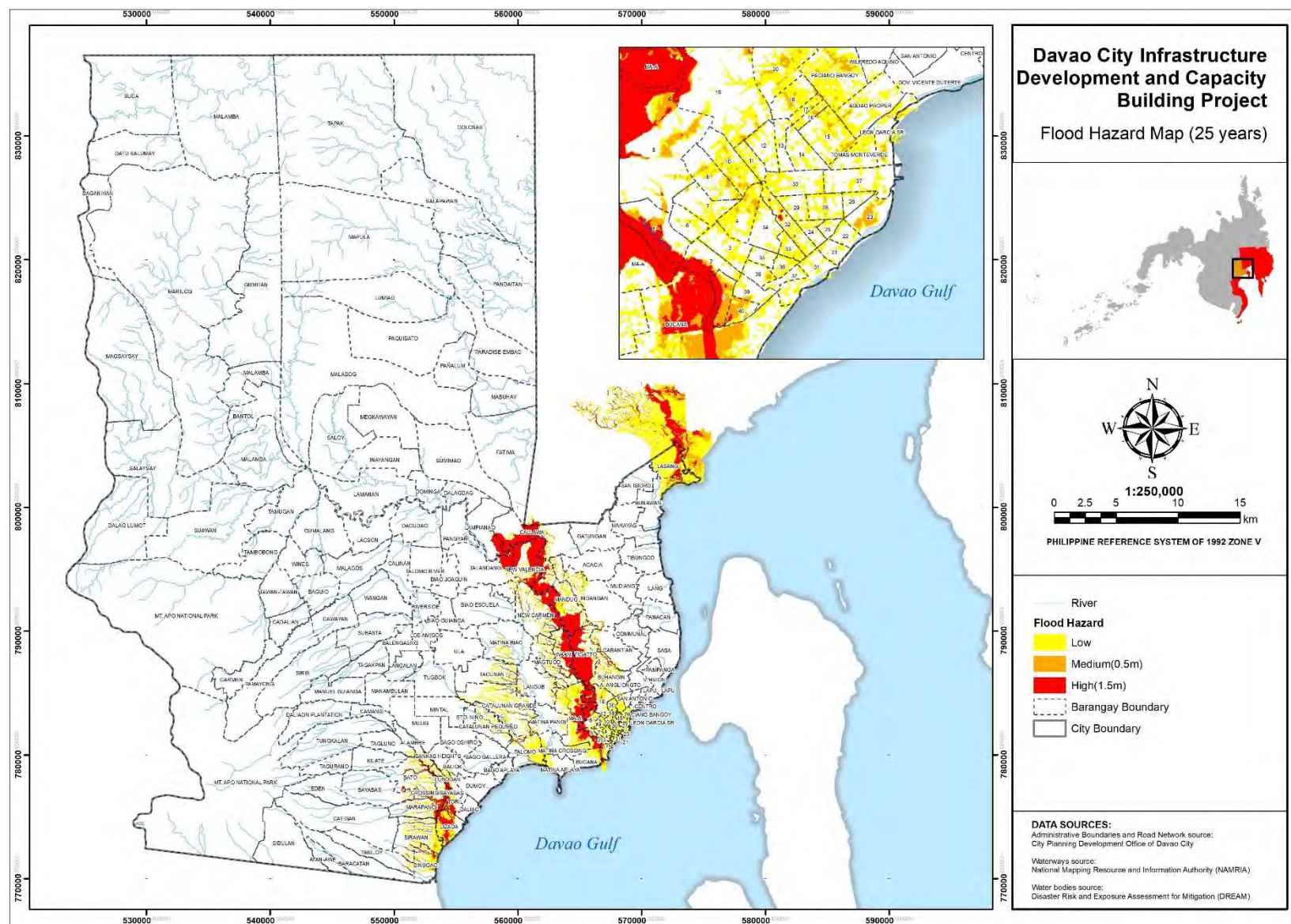


Figure 3.49 Flood Hazard Map (25 years)

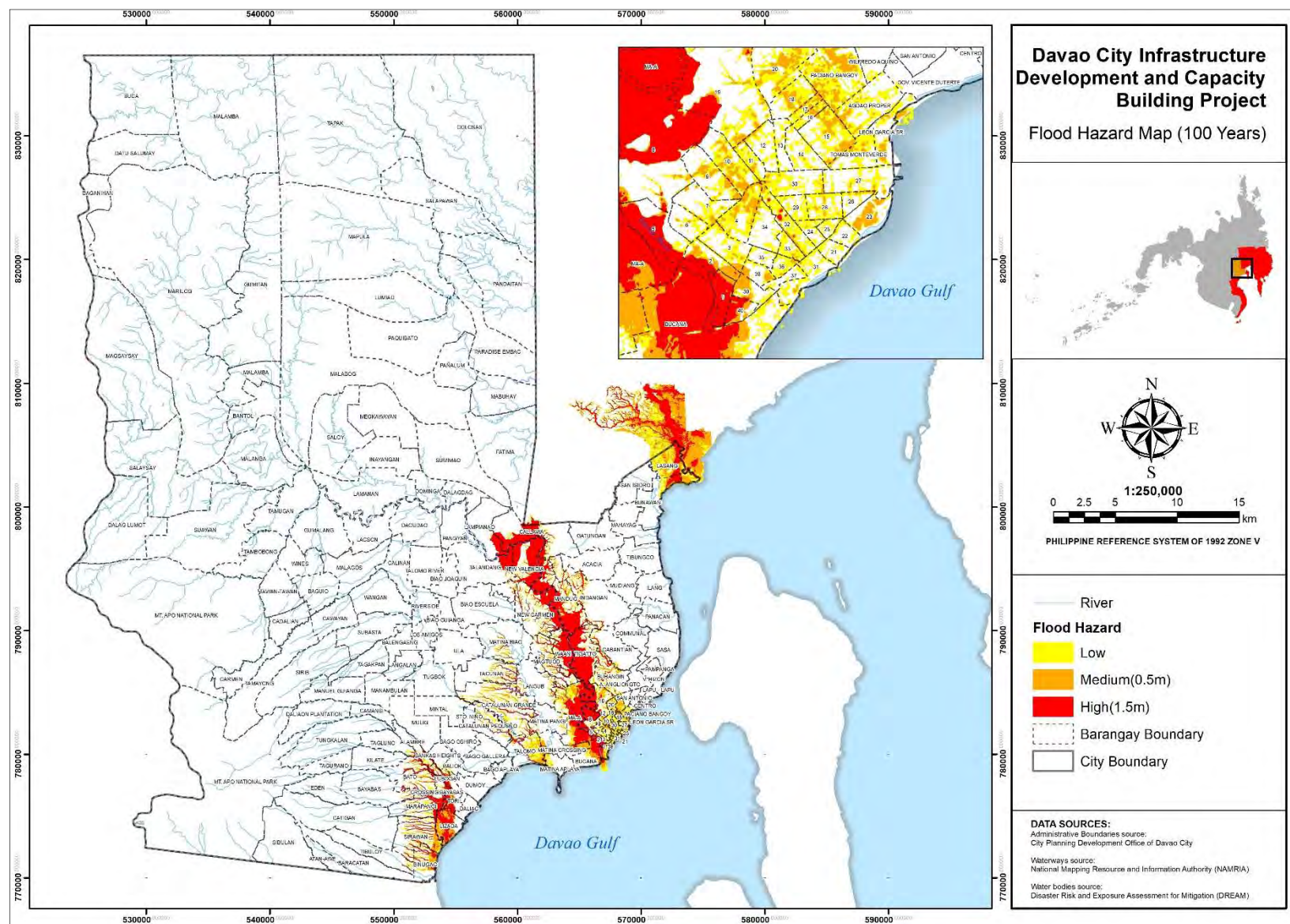


Figure 3.50 Flood Hazard Map (100 years)

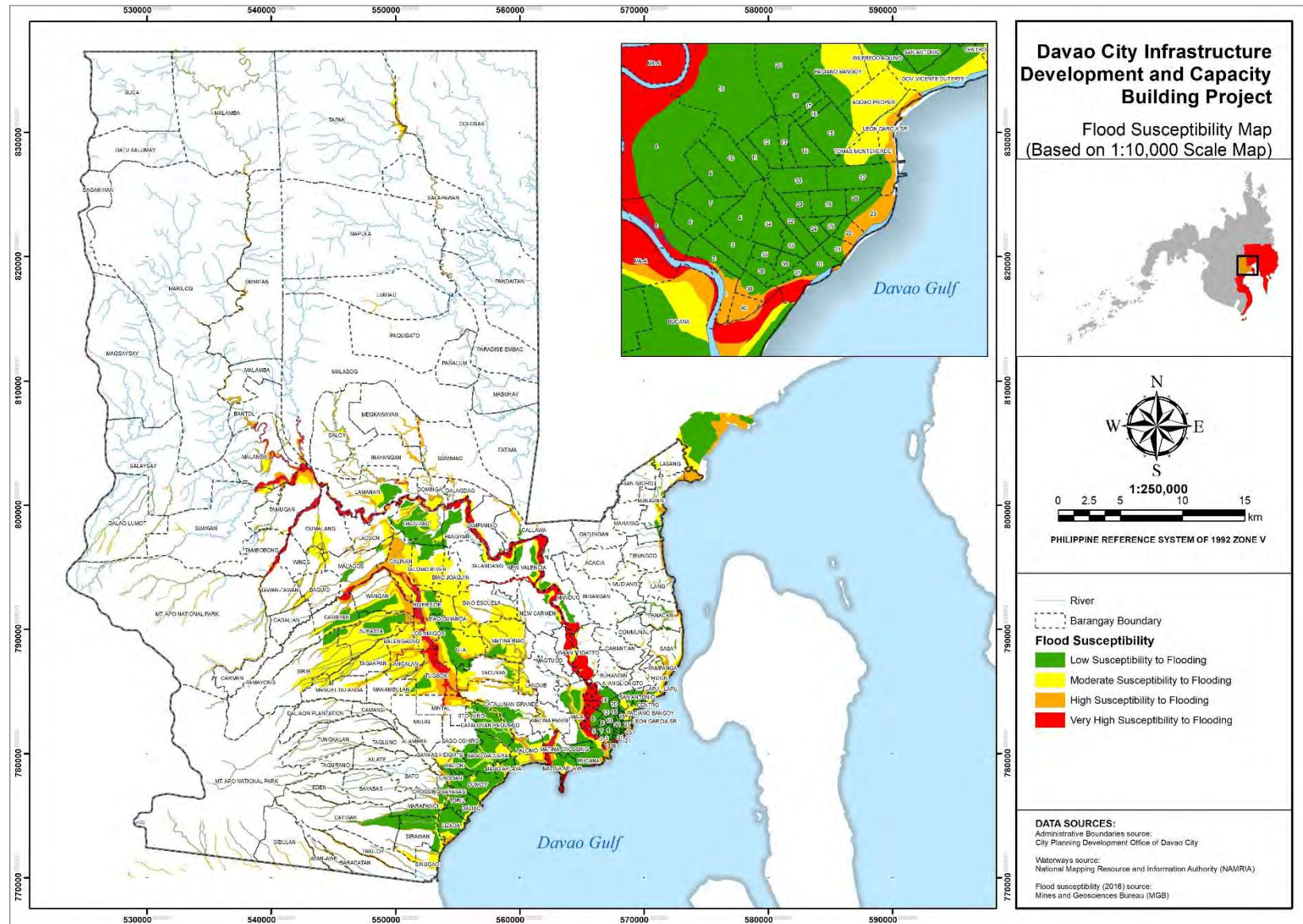


Figure 3.51 Flood Susceptibility Map (MGB)

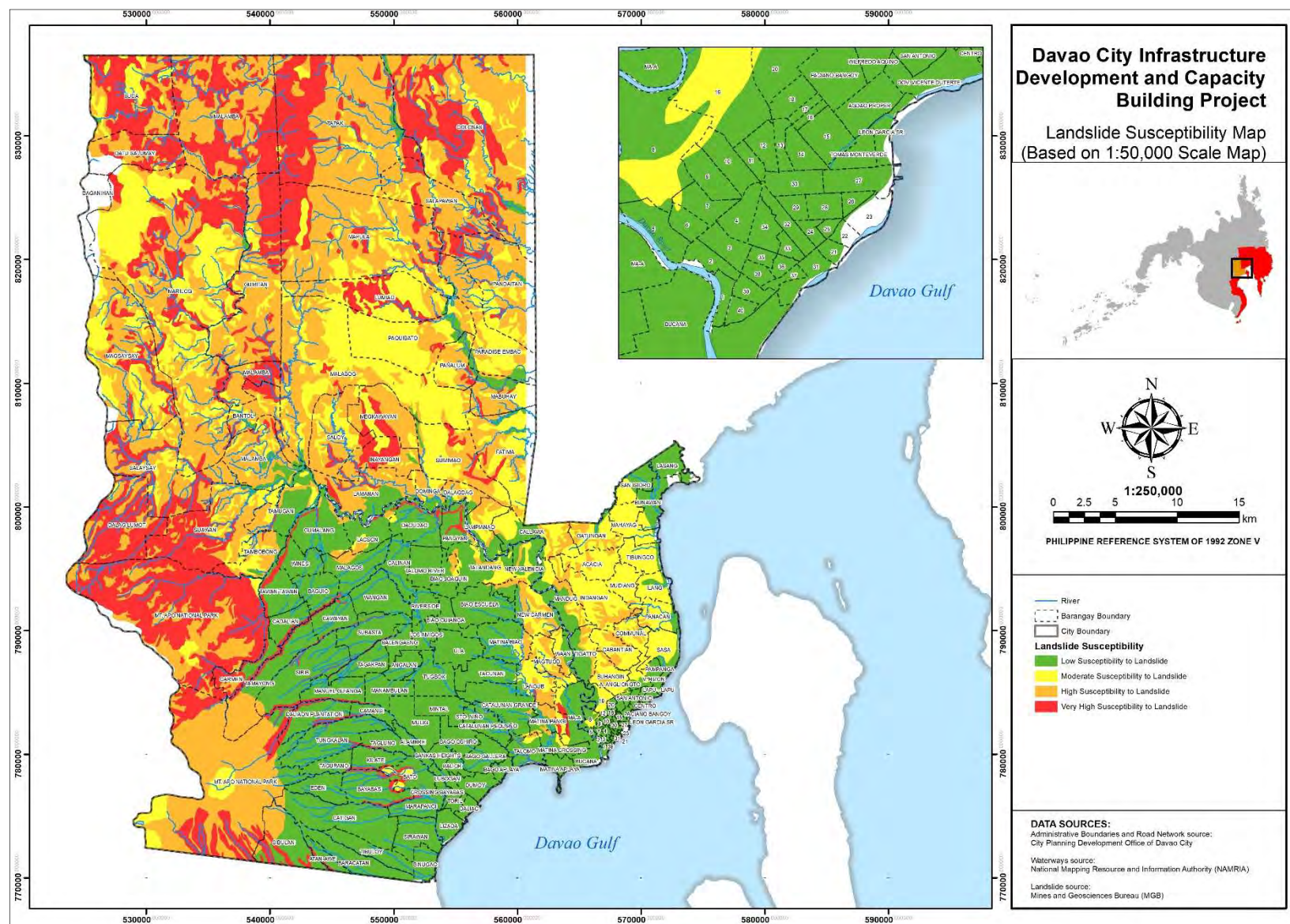


Figure 3.52 Landslide Susceptibility Map (1:50,000)

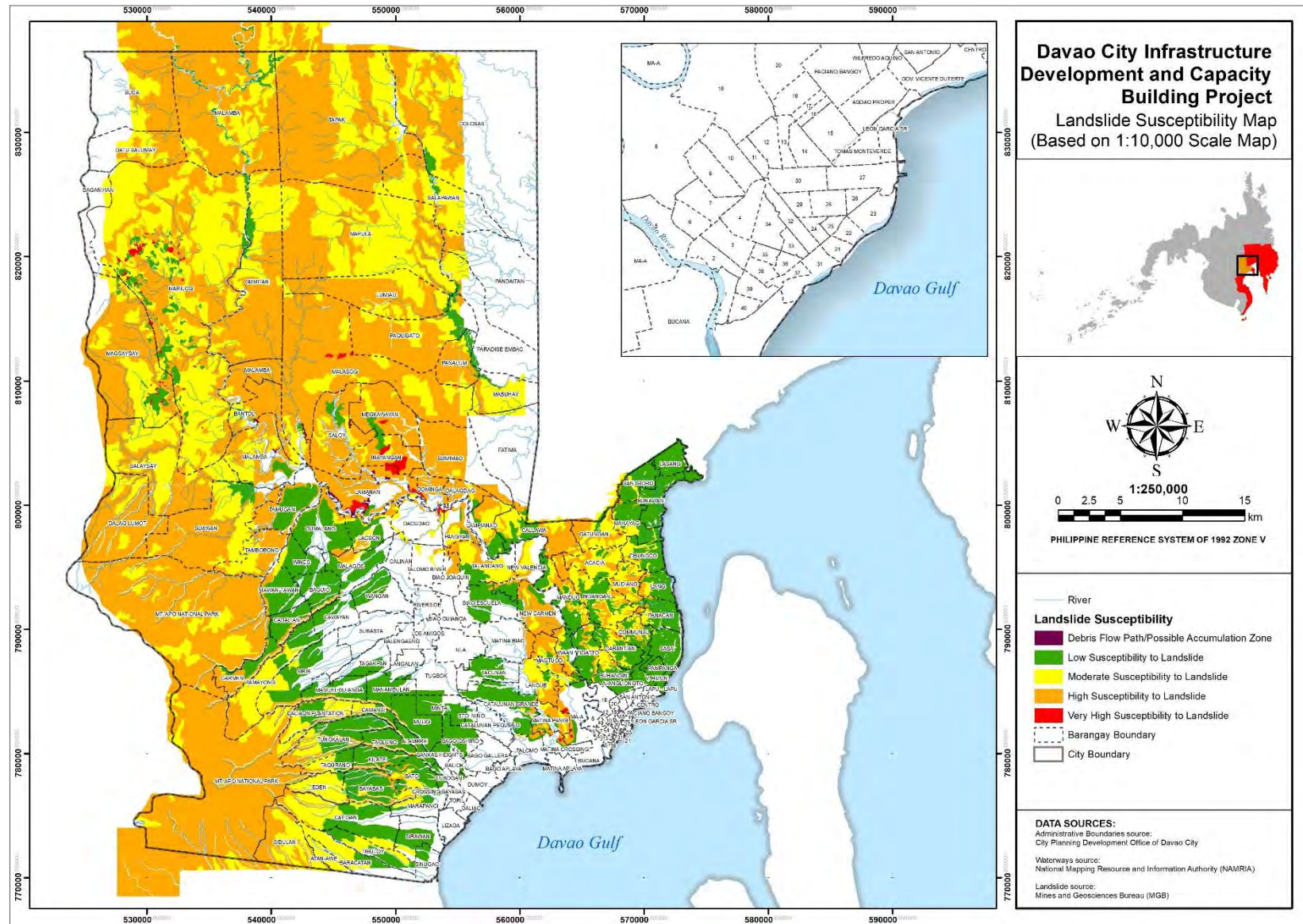


Figure 3.53 Landslide Susceptibility Map (1:10,000)

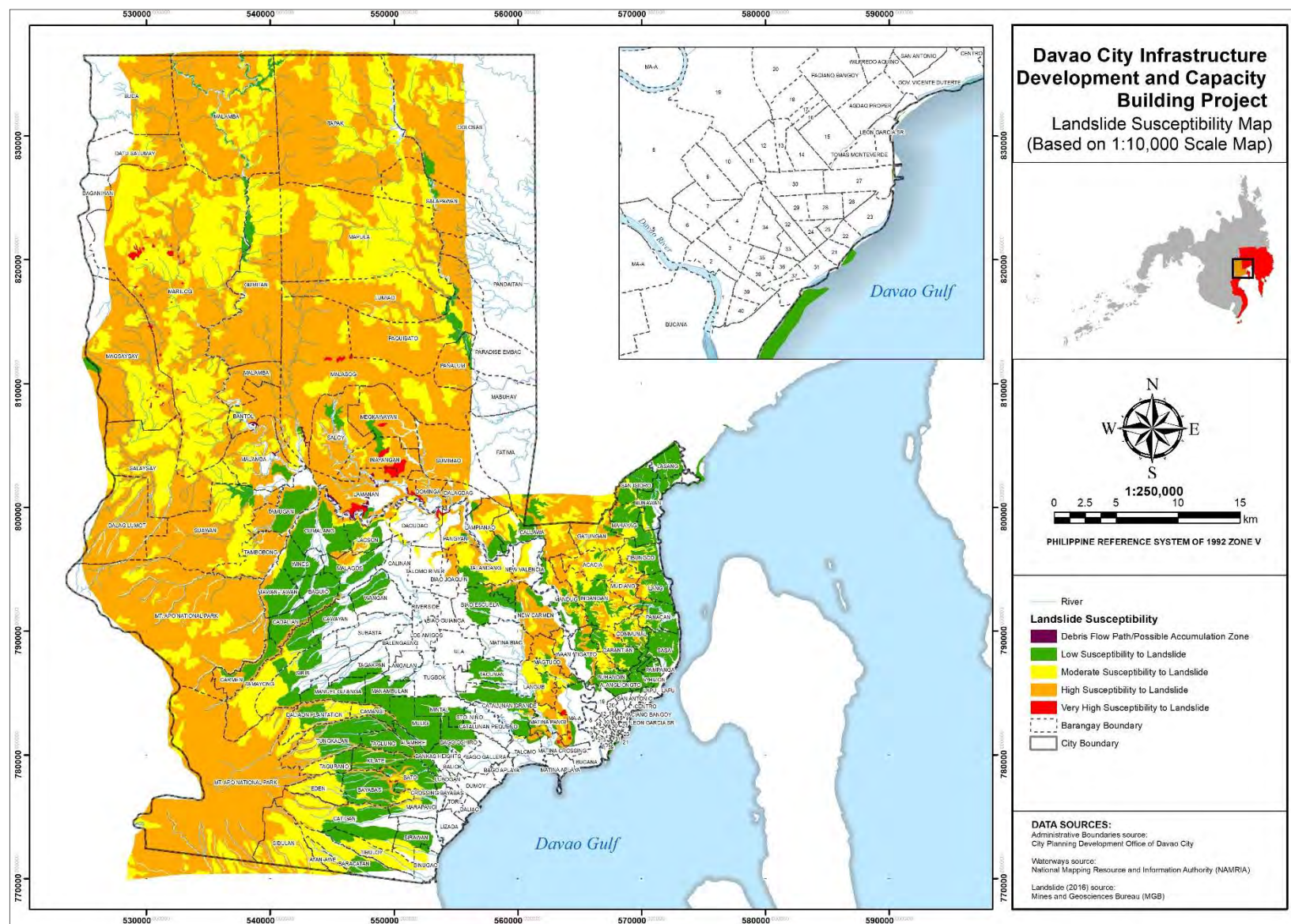


Figure 3.54 Landslide Map (MGB 2016)

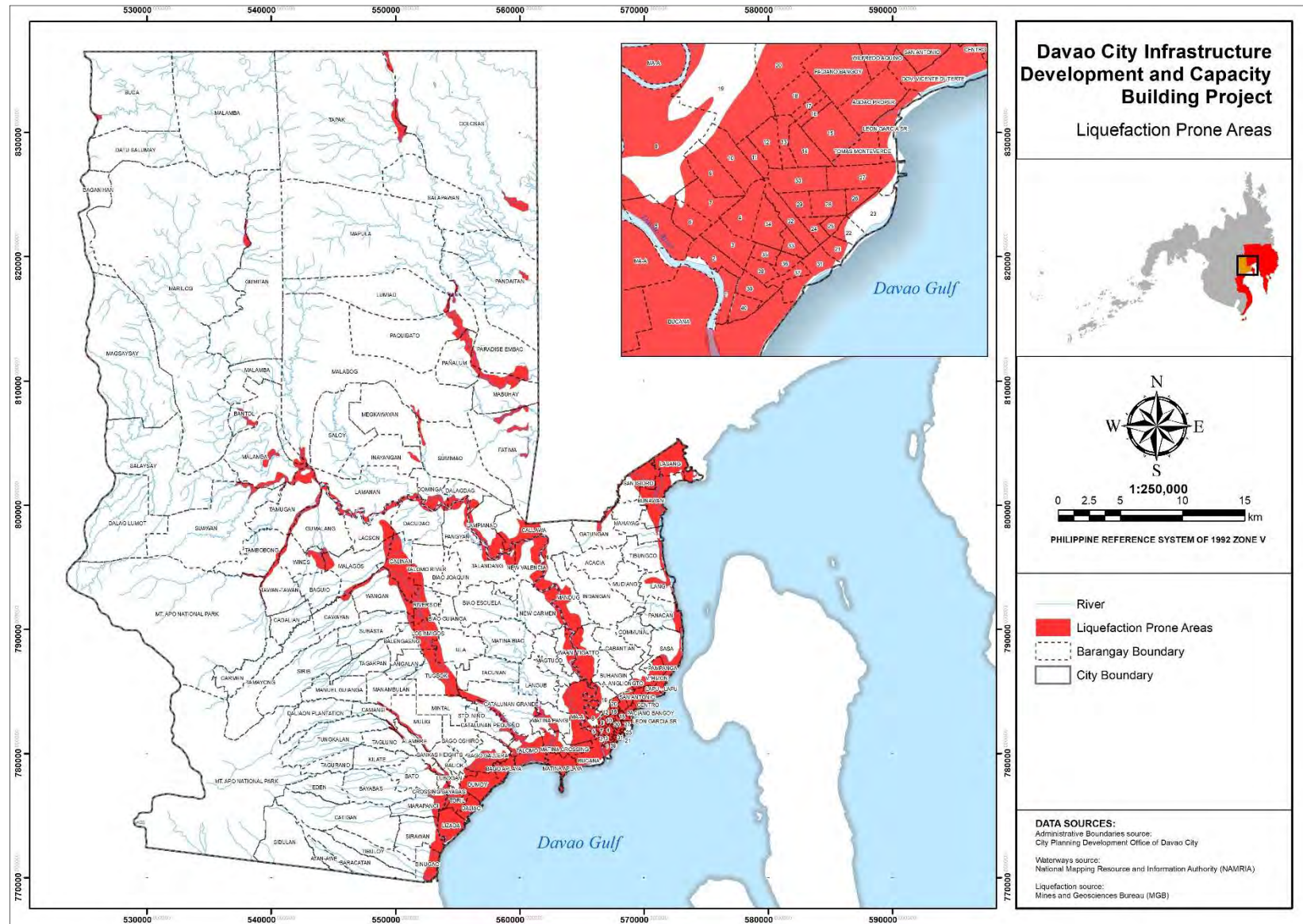


Figure 3.55 Liquefaction Prone Areas Map

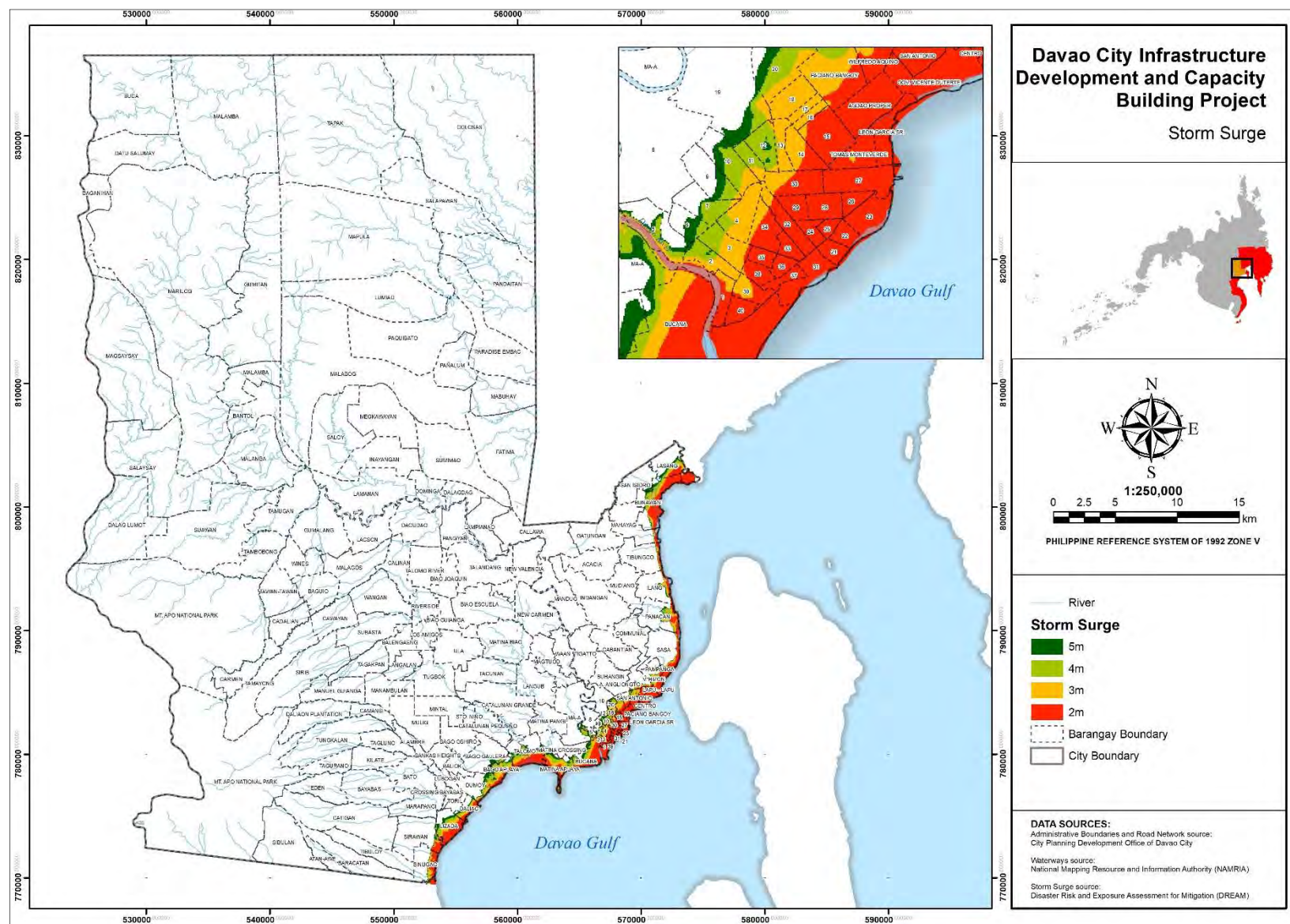


Figure 3.56 Storm Surge Prone Areas Map

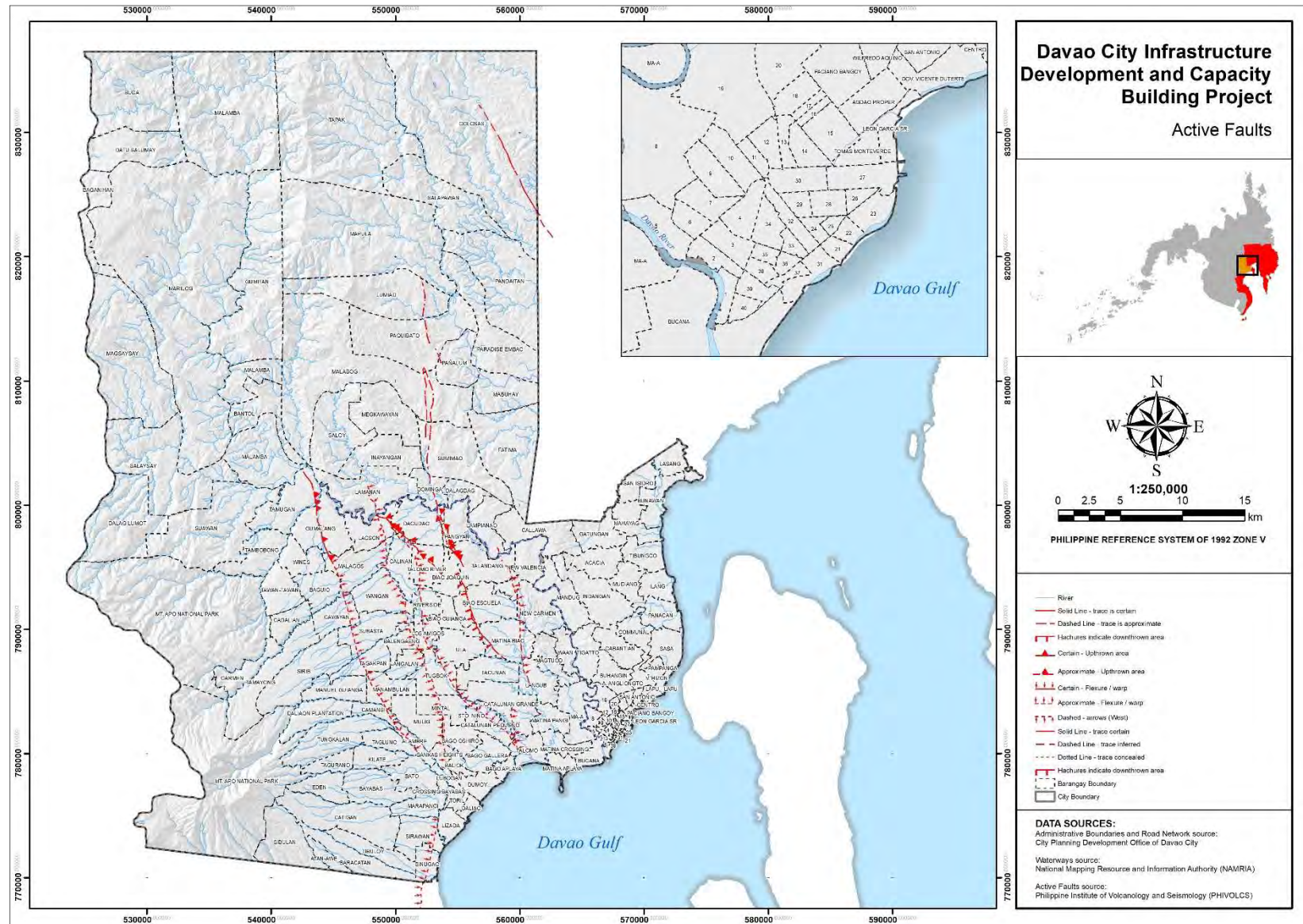


Figure 3.57 Active Faults Map

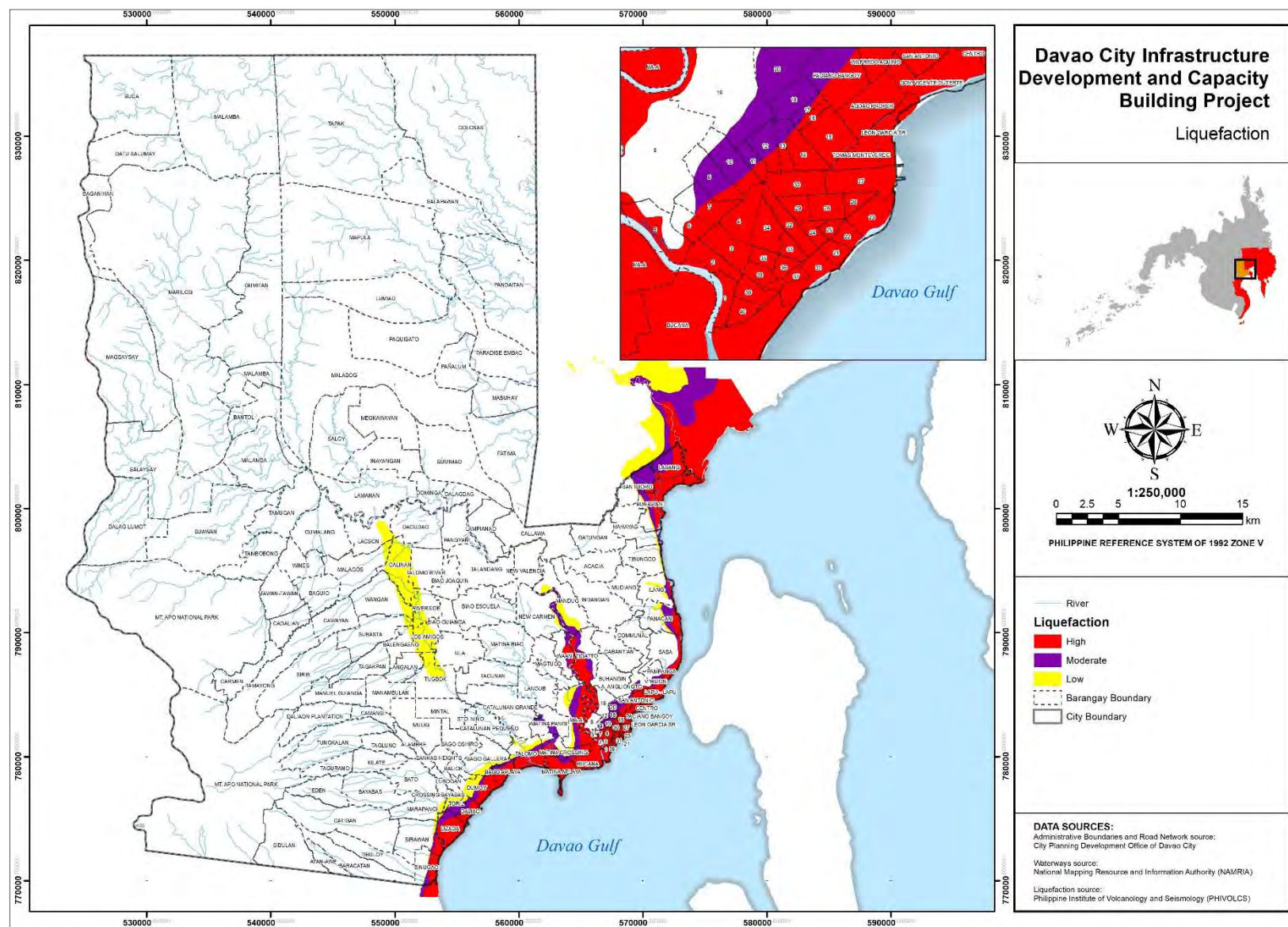


Figure 3.58 Liquefaction Map (Phivolcs)

10) Socio-economic

23. Maps prepared for this section were mainly on population of Davao City. The JICA Project Team used the population data of Philippine Statistics Authority (PSA) for census years 2000, 2010 and 2015 at the barangay level. Maps were then used in analyzing the city's current situation which involved visualization and comparison of population distribution, density and growth. Other factors considered in analyzing the Davao City's present socio-economic state are the informal settlements and indigenous people. The team used maps in determining the urban trend, locating settlements and counting informal structures.

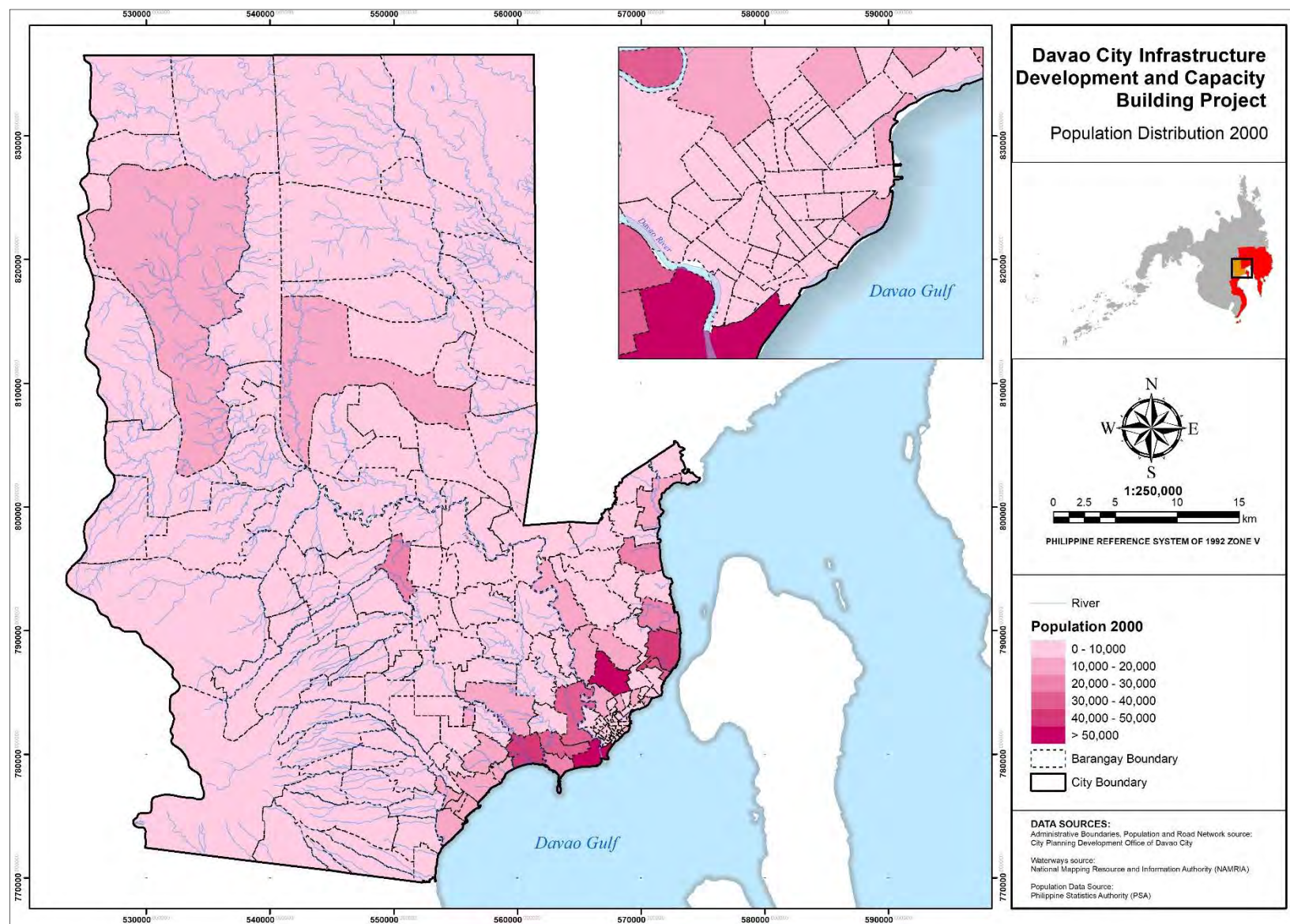


Figure 3.59 Population Distribution 2000

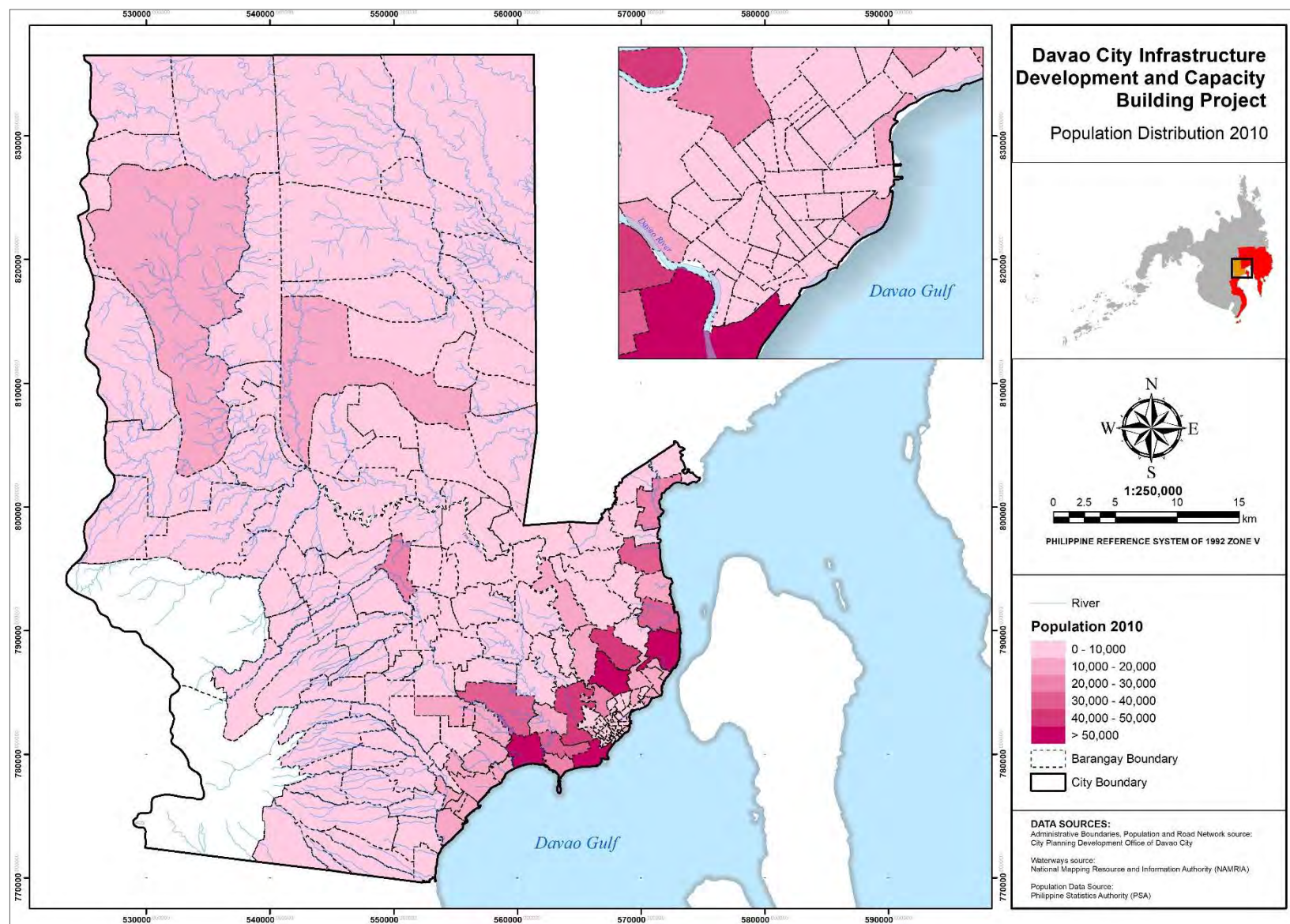


Figure 3.60 Population Distribution 2010

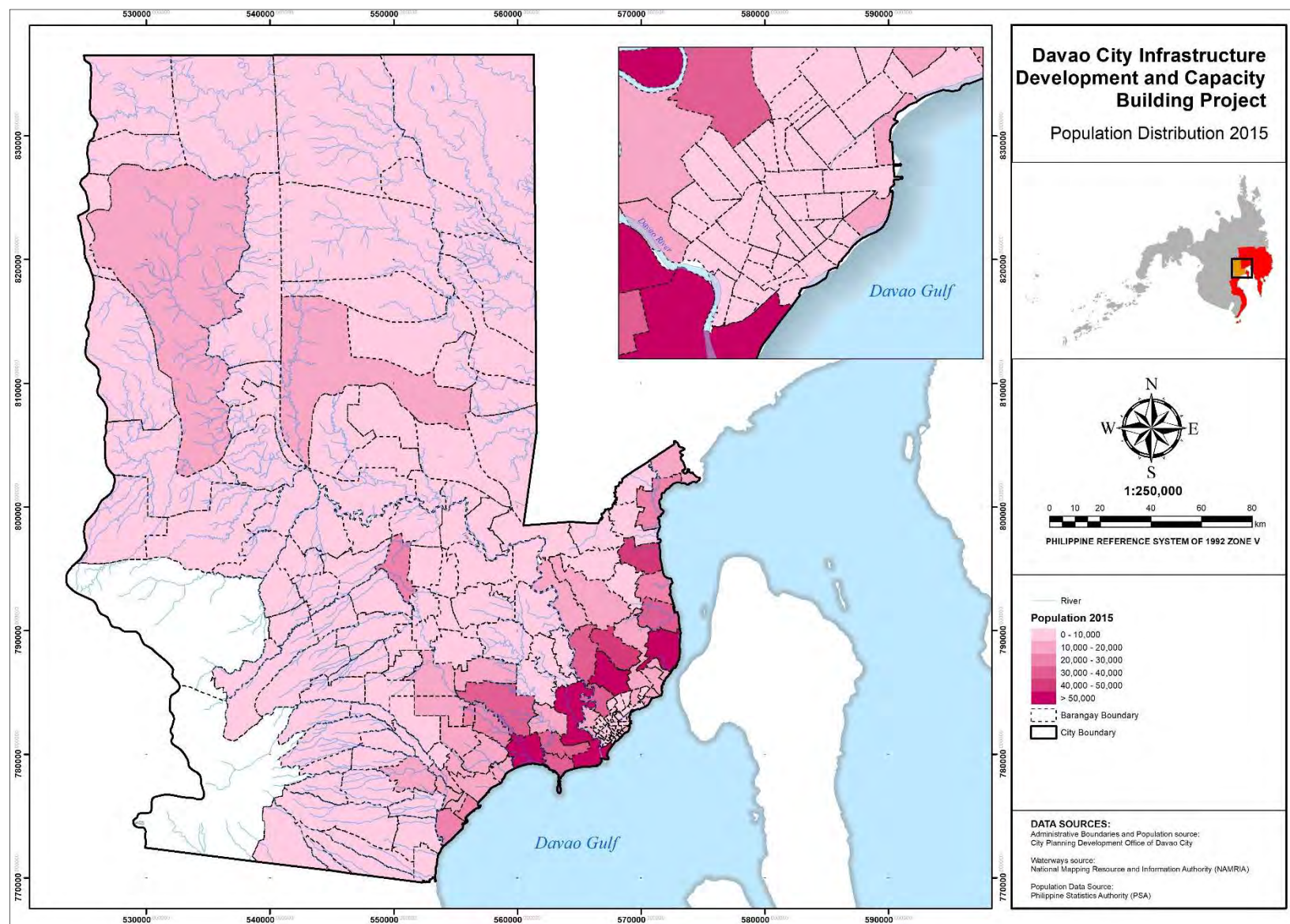


Figure 3.61 Population Distribution 2015

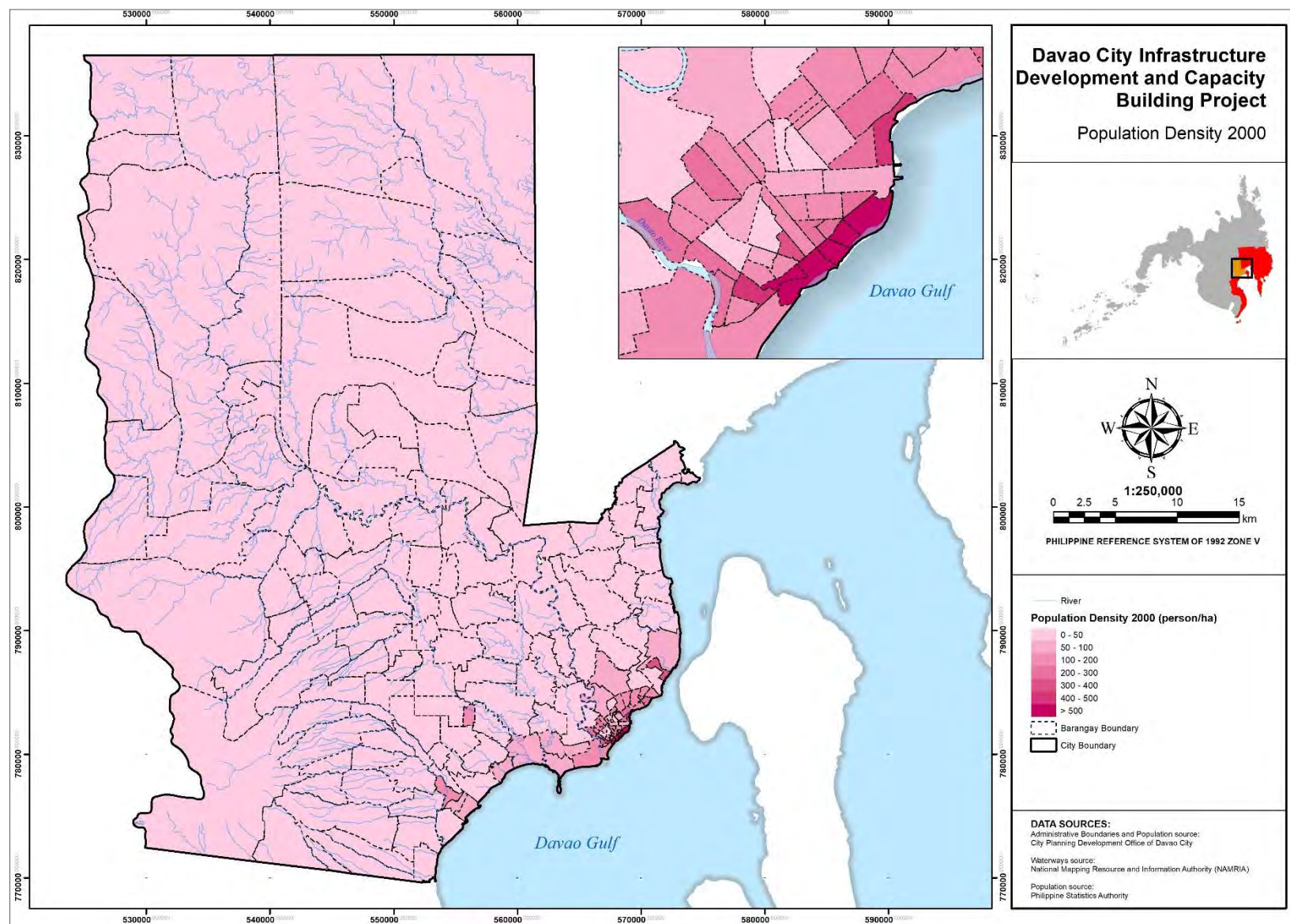


Figure 3.62 Population Density 2000

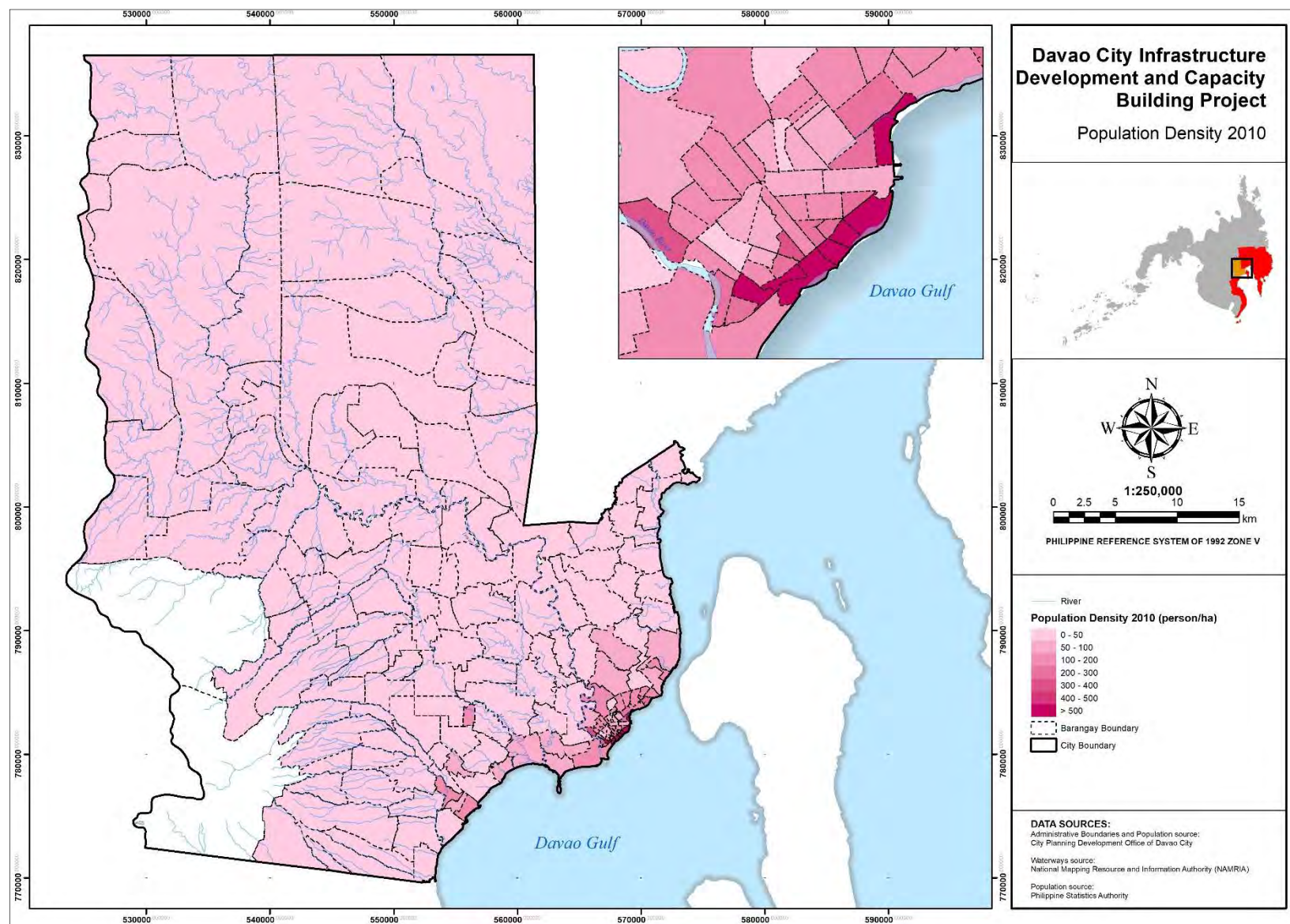


Figure 3.63 Population Density 2010

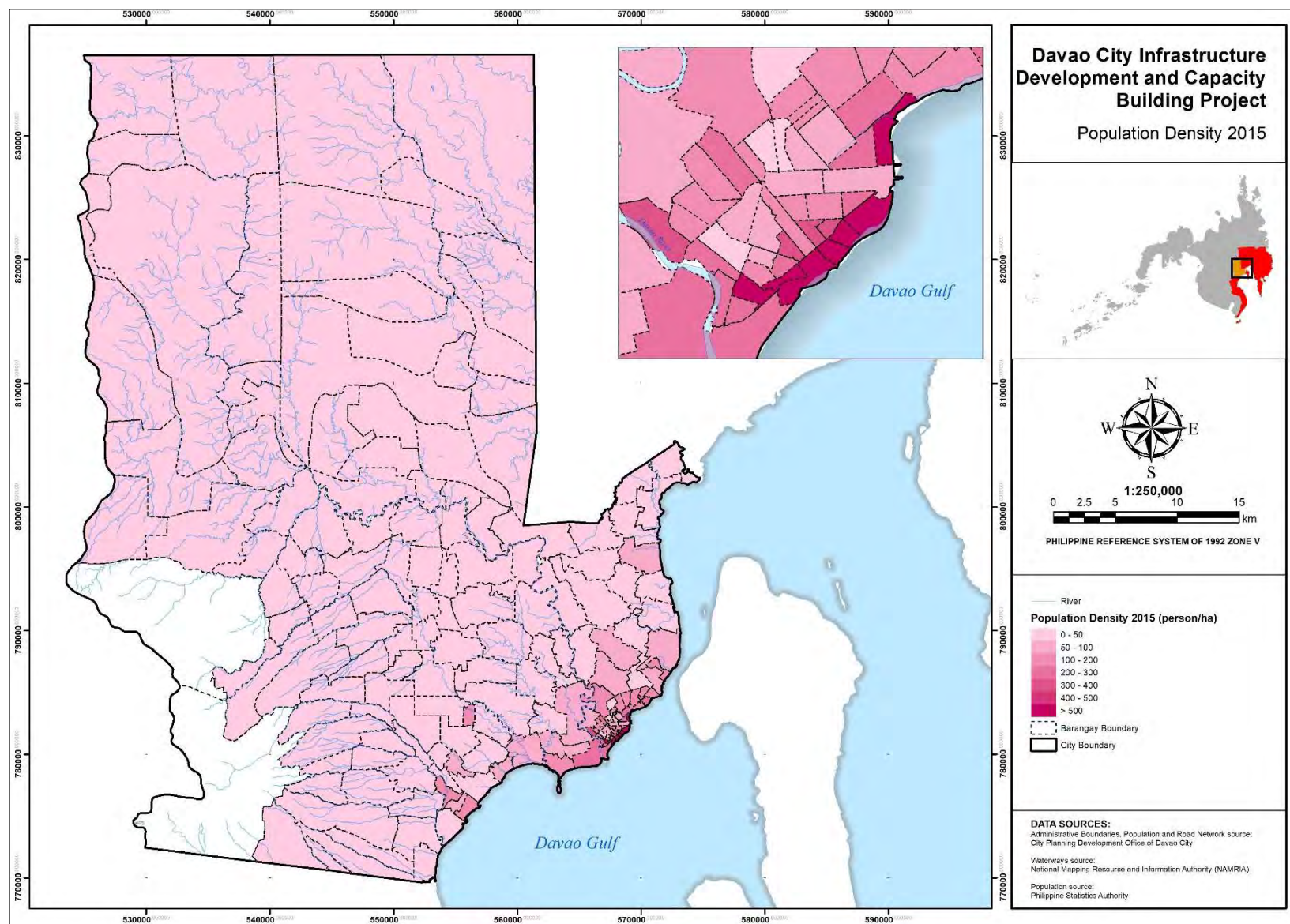


Figure 3.64 Population Density 2015

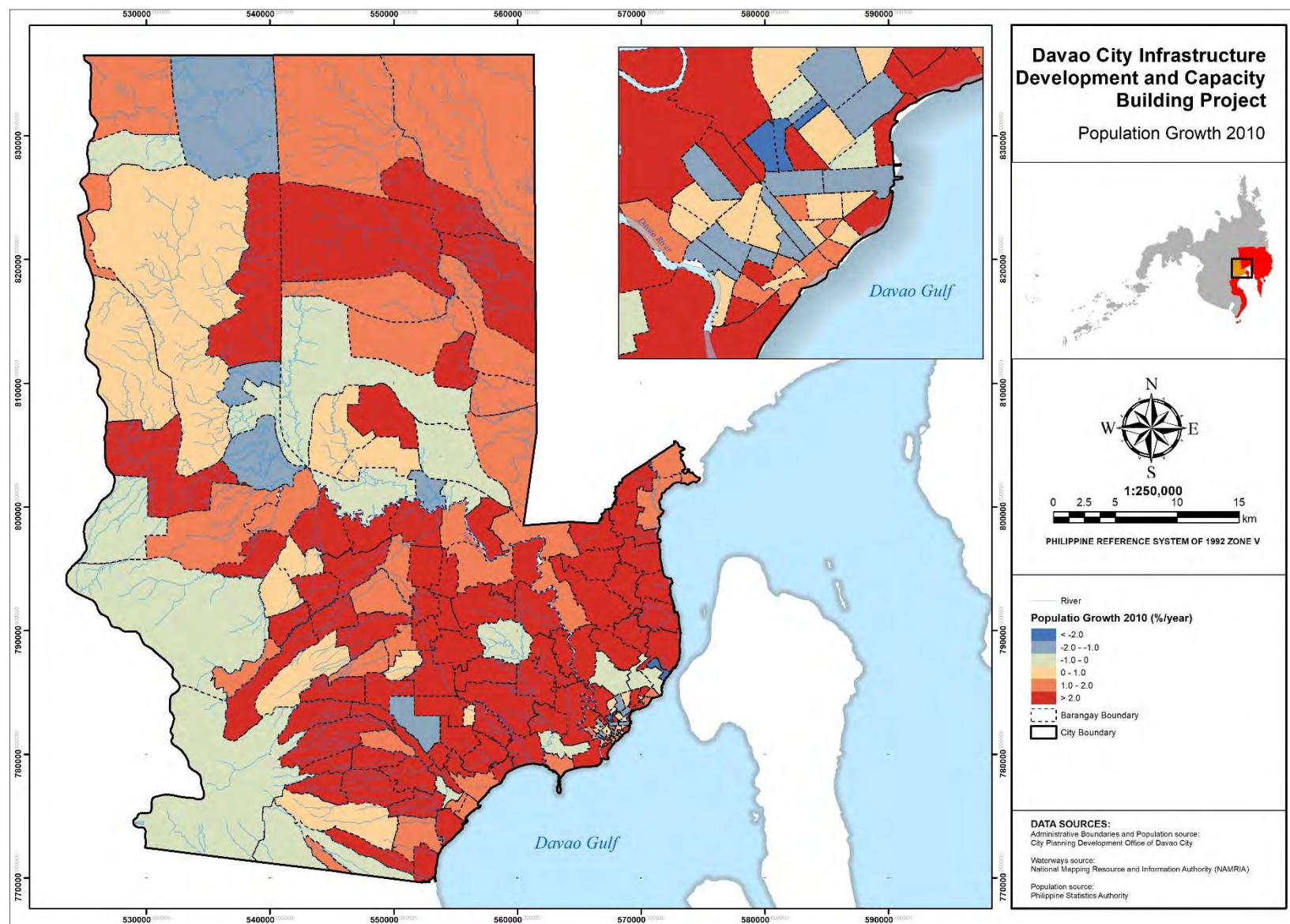


Figure 3.65 Population Growth 2010

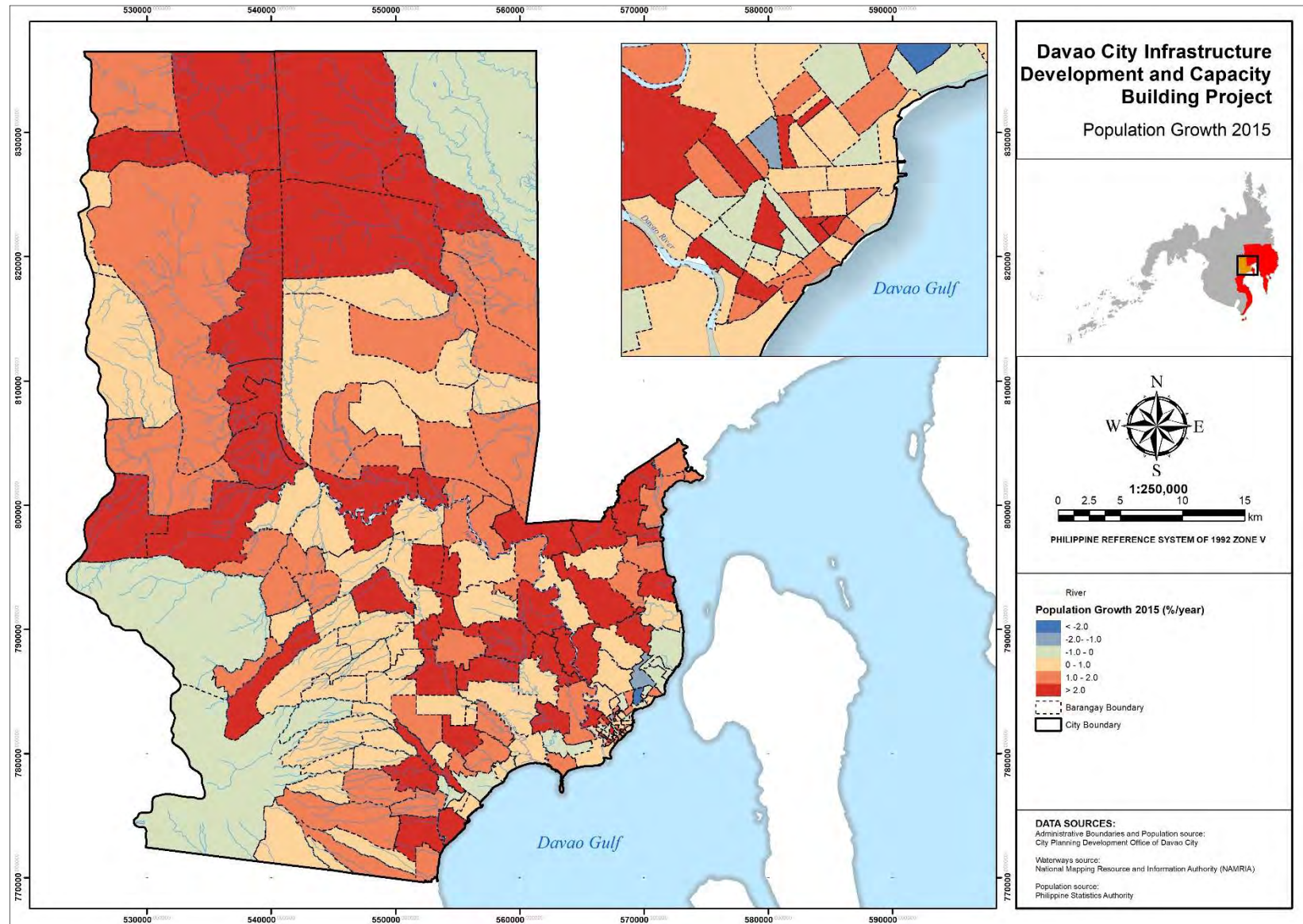


Figure 3.66 Population Growth 2015

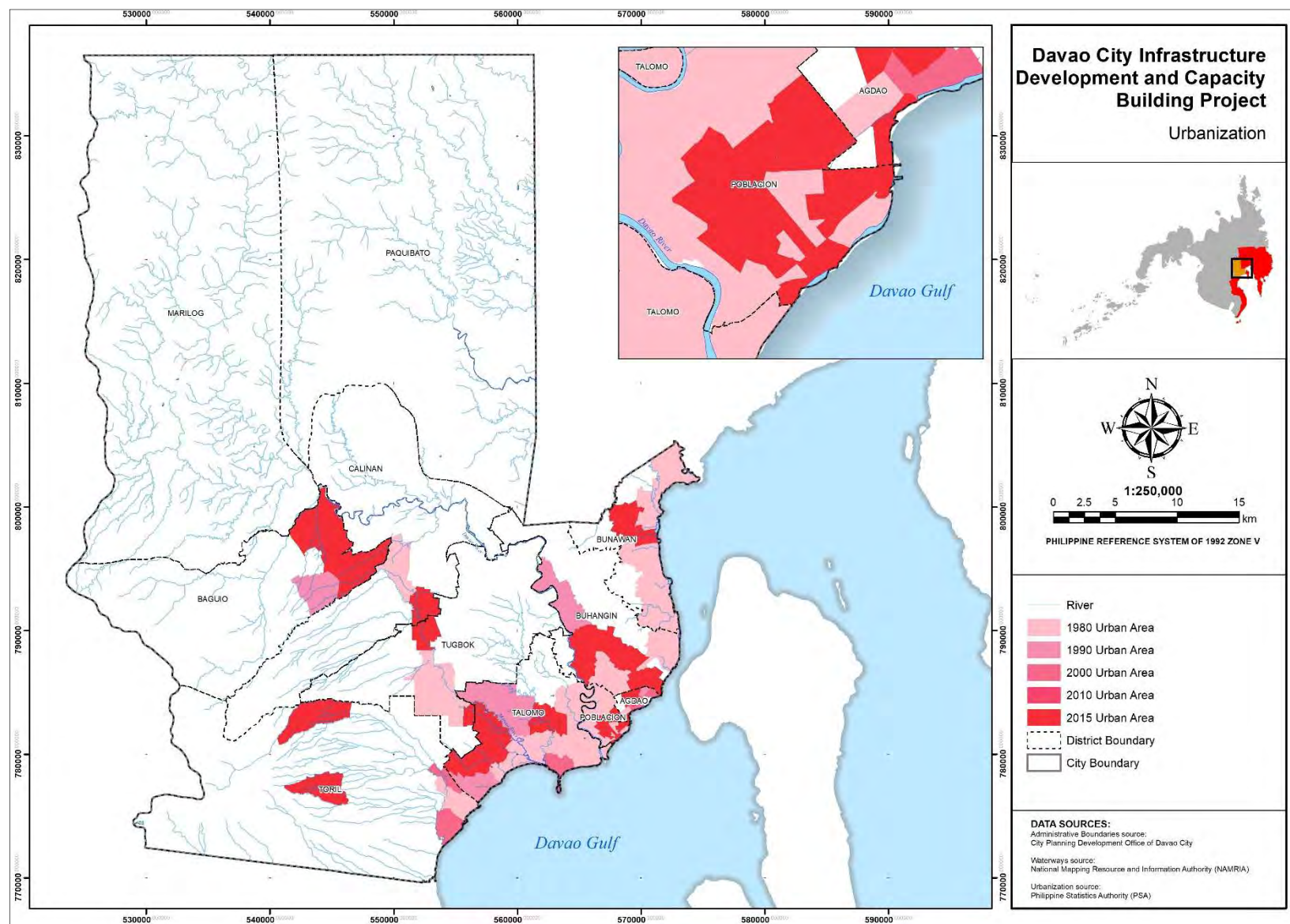


Figure 3.67 Urbanization Map with District Boundaries

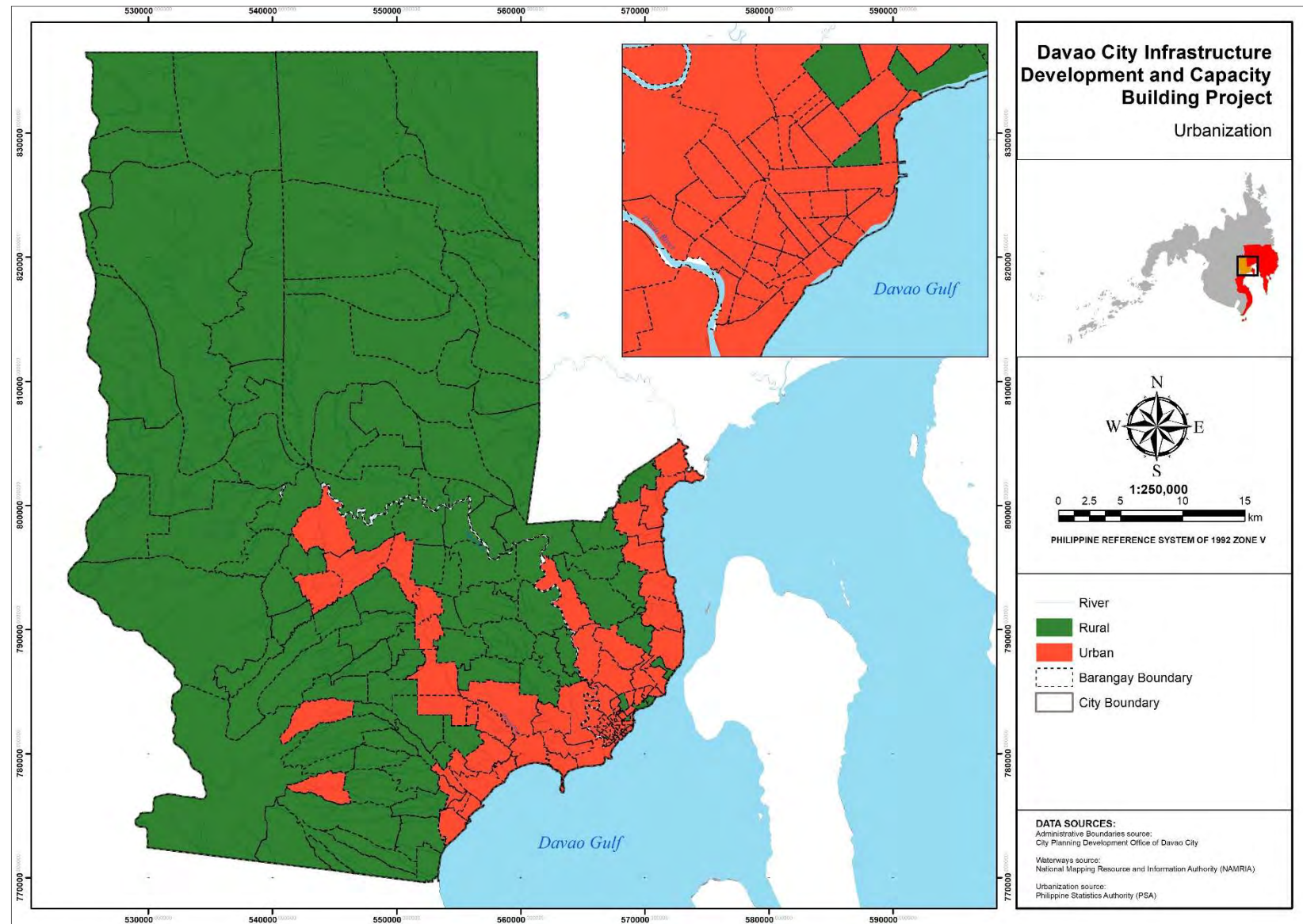


Figure 3.68 Urbanization Map

11) Others

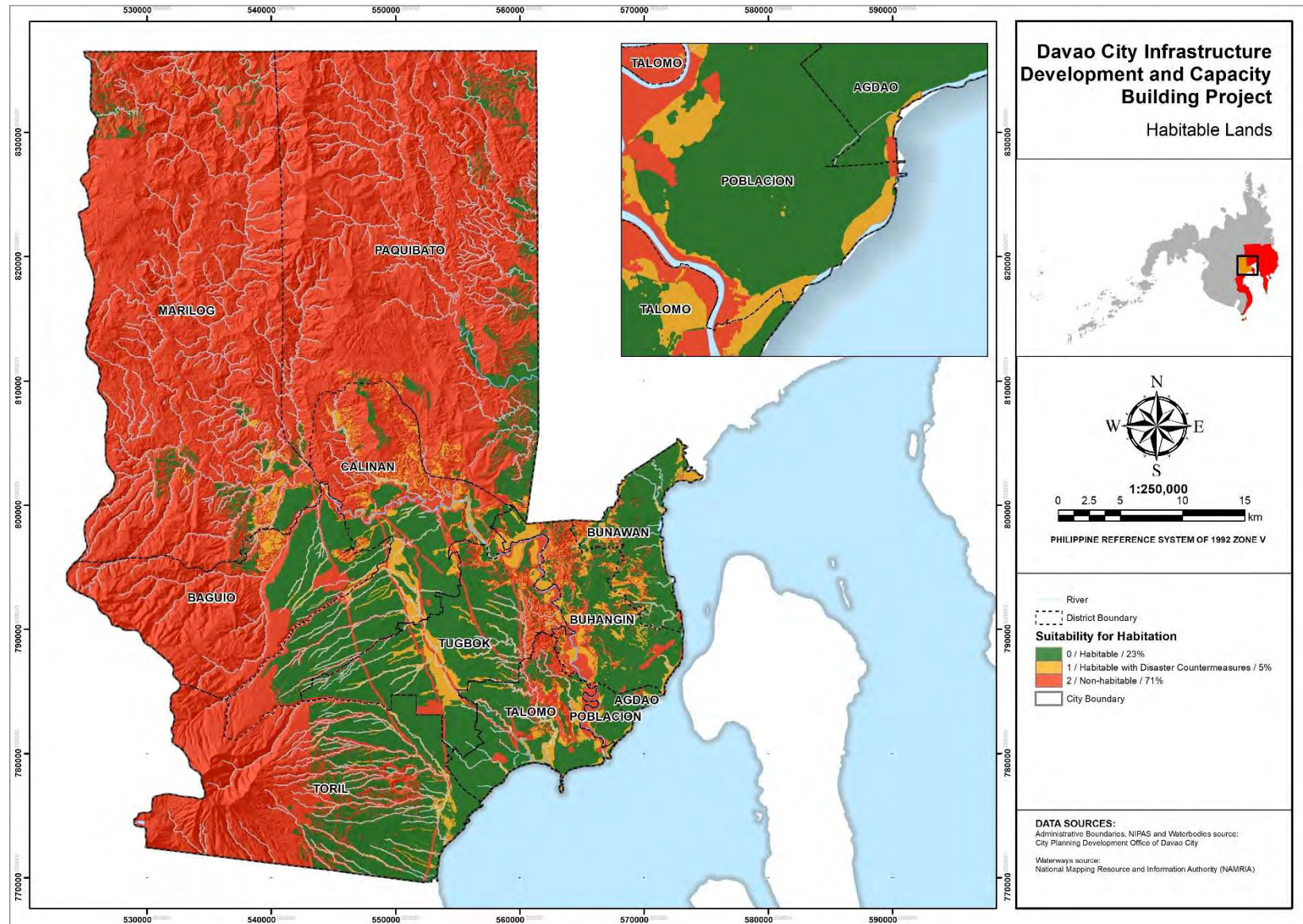


Figure 3.69 Habitable Lands