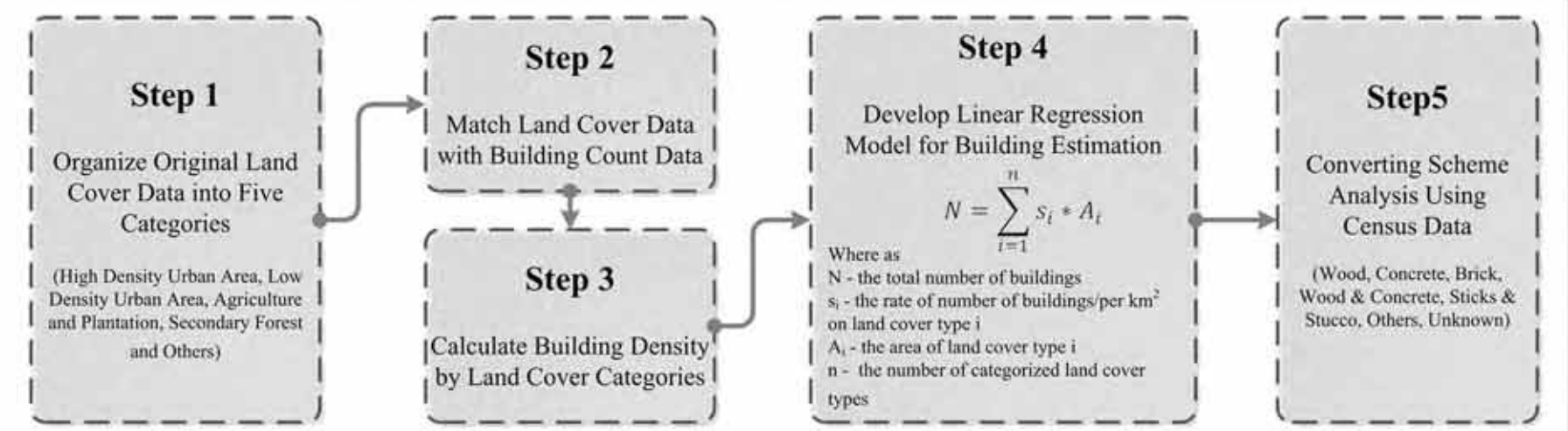


1 Building Inventory Development

In the wake of the 2010 Haiti earthquake, planners have focused greater attention on the need to prepare for seismic risks in the Caribbean, where traditional mitigation efforts have aimed primarily at hurricanes and flooding. Disaster mitigation is now viewed as an integral part of sustainable development in the region. Responding to this new mandate for Caribbean disaster planning requires communities and governments to obtain knowledge of people and inventories at risk so that they may steer growth to safer areas and promote safer development patterns (Burby 1999 & 2006, Olshansky & Etienne 2011).

A key part of any risk assessment is to understand what is at risk to the hazard. This requires the development of inventories of building stock, population distribution, and economic activity. Critical facilities including hospitals, police and fire stations and potential shelter facilities, as well as transportation infrastructure also are key components of vulnerability analysis. In this context, we try to answer three questions: (1) What data is available regarding hazard inventories and how does this vary among jurisdictions, (2) What are the similarities and differences among at-risk inventories in different Caribbean jurisdictions, and (3) How can GIS and Remote Sensing technologies help create building inventory estimation models when direct data sources are scarce or incomplete.

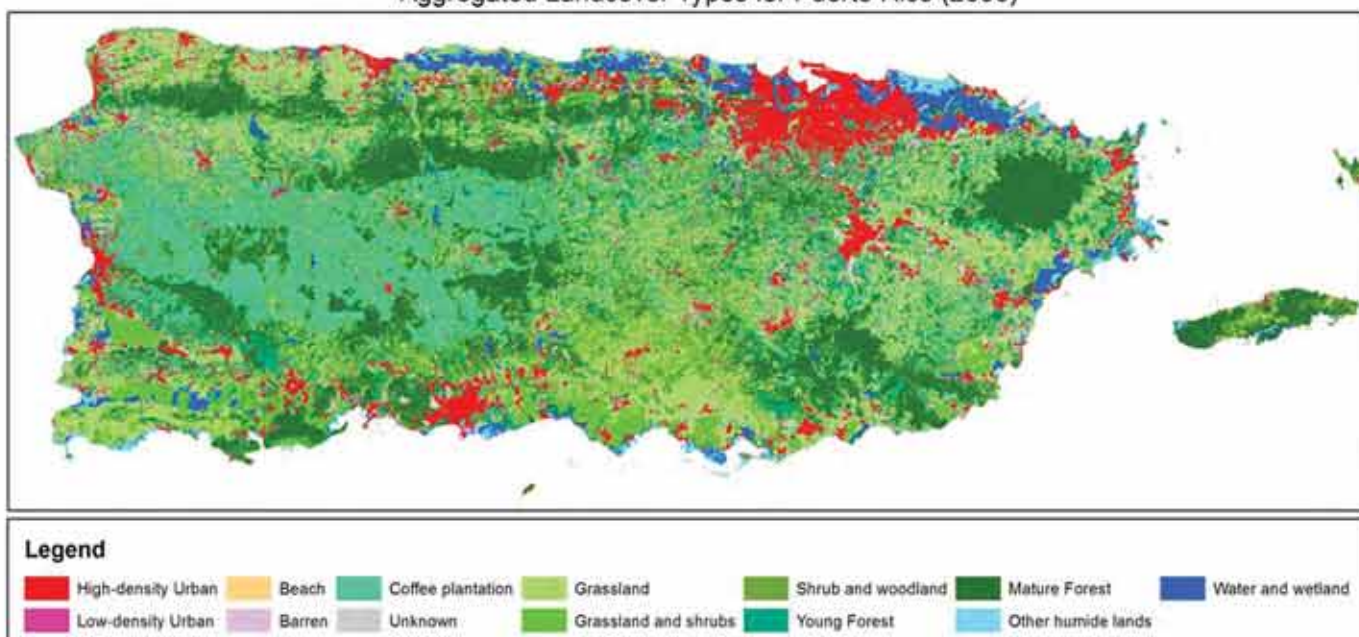


Assumptions:
Suppose each land cover type holds a fixed building density in expression of "number of buildings/per km²".
Suppose the building density is different between land cover types, and all the land cover types can be ranked into 5 categories based on the building density.

2 Puerto Rico Building Inventory Development

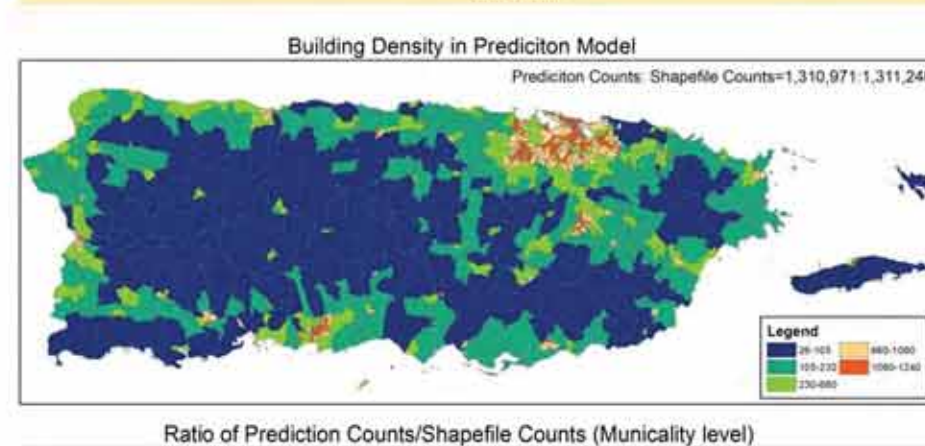
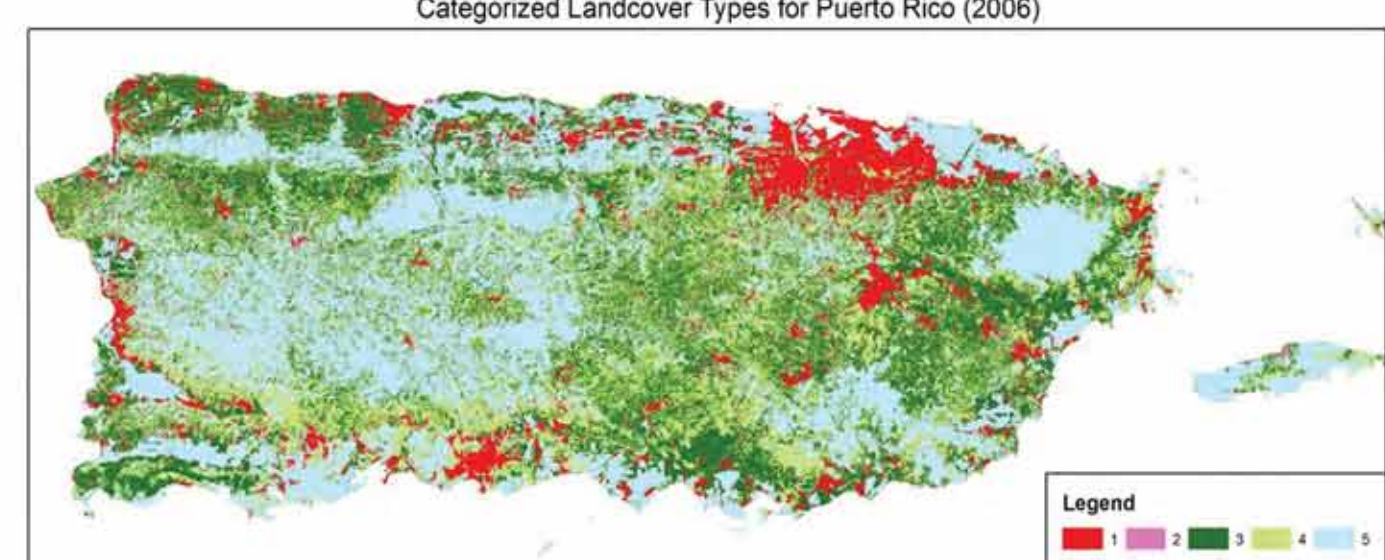
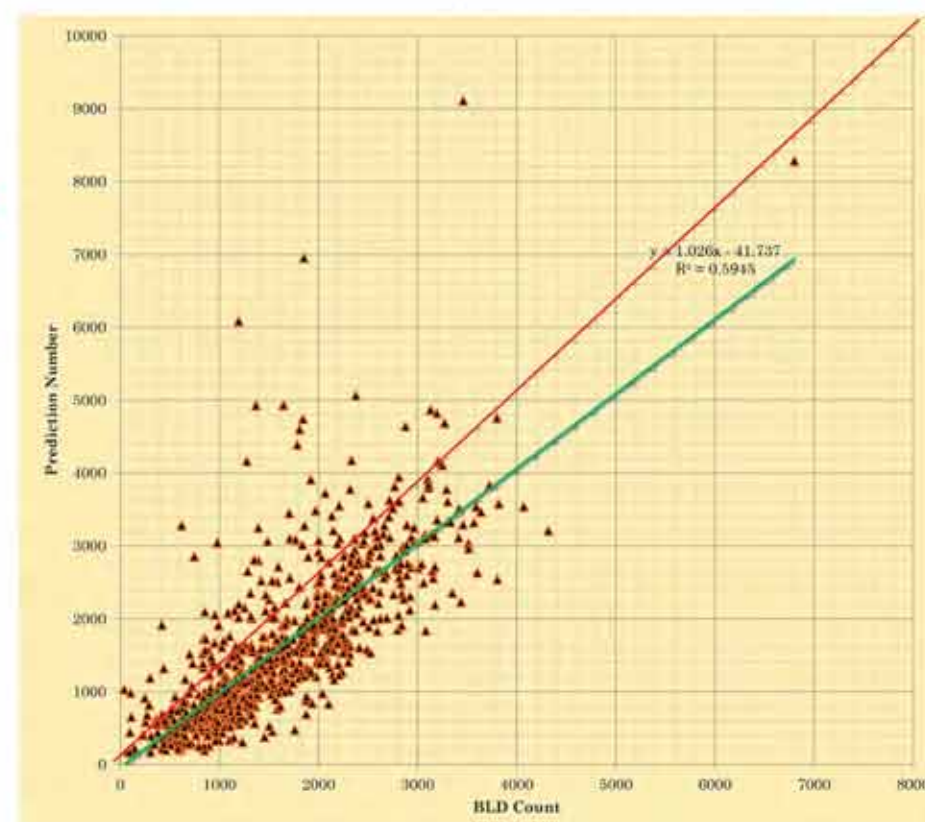
Step 1 - 5 Category land Cover Map

USGS and GAP land cover GIS files with resolution of 30m



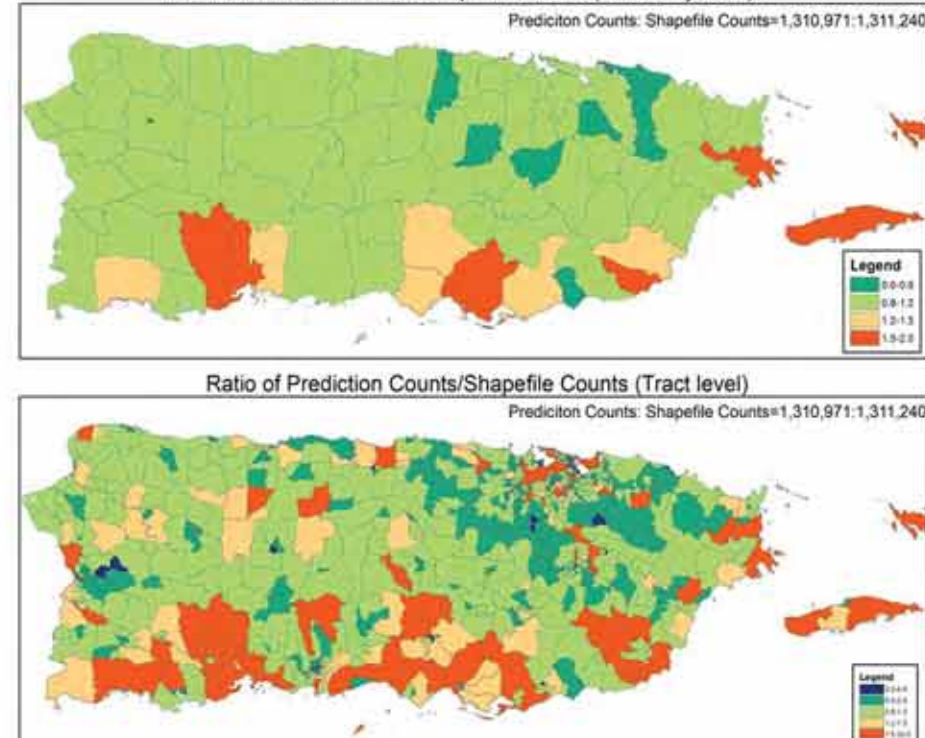
Step 4 Linear Model in Puerto Rico:

$$N = 1237.7A1 + 777.1A2 + 84.3A3 + 50.1A4 + 9.5A5$$



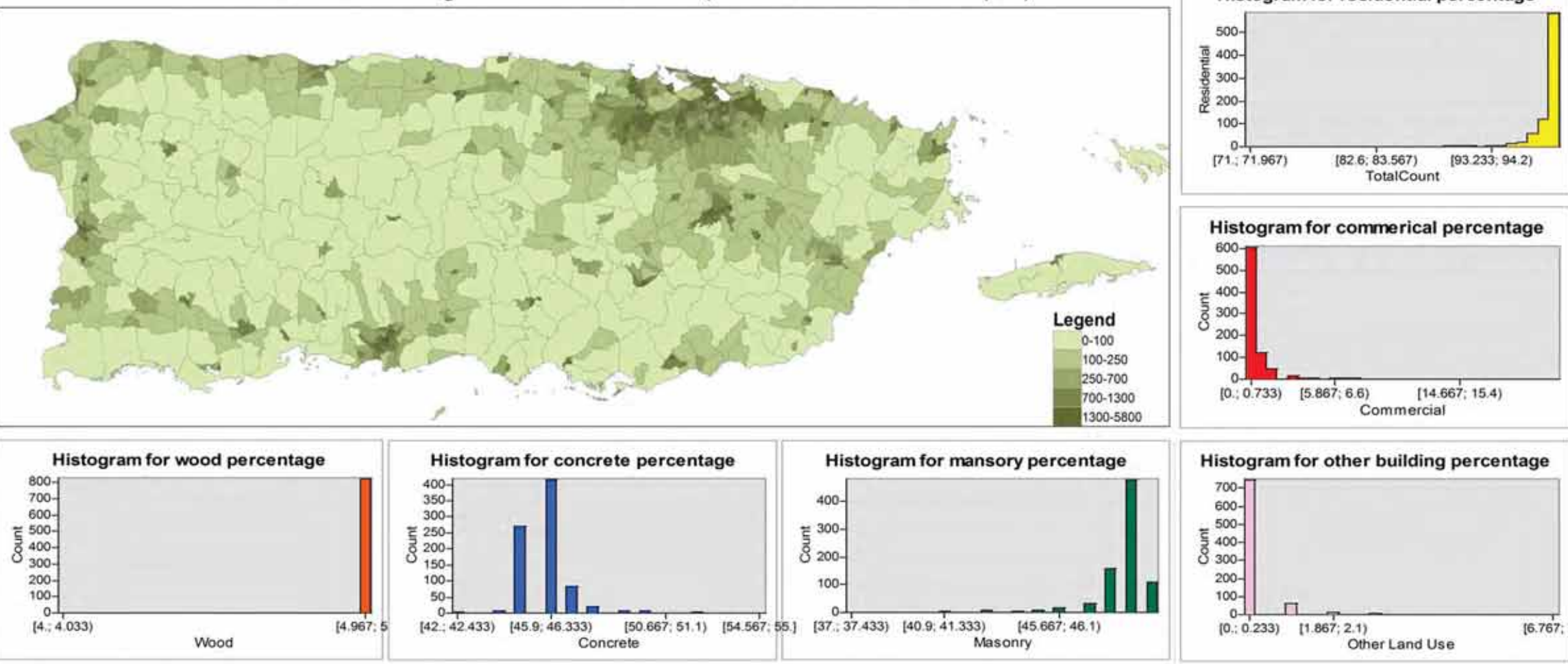
Step 2 & 3 Match Land Cover Data with Building Count Data to obtain Building Density

Category	Major Land cover types	BLD#	Land Area (sqkm)	Bld Density (#/sqkm)
1	High-density Urban	665,359	538	1,237.7
2	Low-density Urban	281,237	362	777.1
3	Grassland	225,166	2,671	84.3
4	Shrub and young forest	110,149	2,198	50.1
5	Others	29,451	3,096	9.5
Total	-	1,311,516	8,865	147.9



Step 5 Converting Scheme Analysis Using Census Tract Data

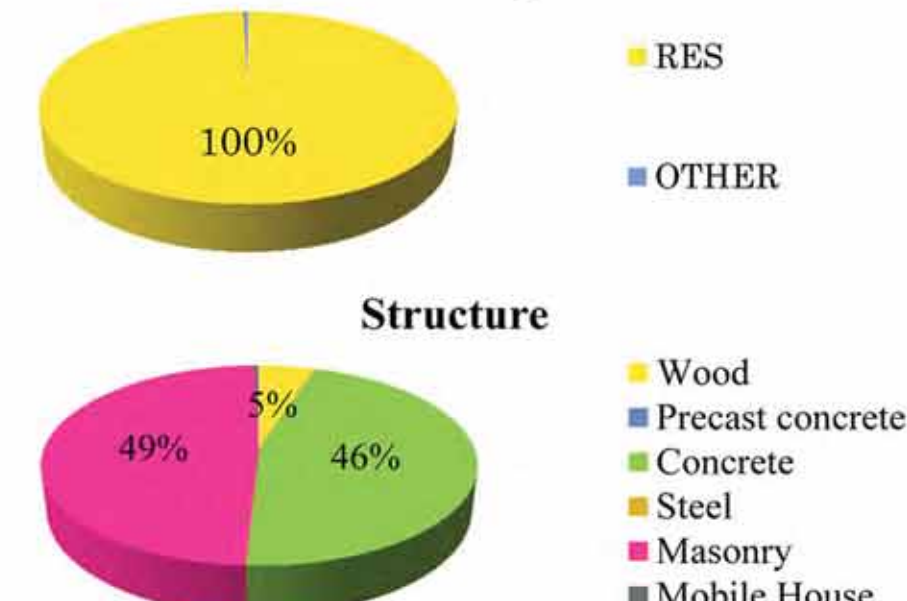
Normalized Total Building Count in Puerto Rico (HAZUS 2000 Units: #/Sqkm)



Puerto Rico Building Inventory Summary

	RES	COM	IND	AGR	REL	GOV	EDU	Total
Wood	65067	242	42	3	9	4	6	65374
Precast Concrete	0	493	125	7	18	9	13	665
Concrete	596813	2406	337	32	90	44	64	599786
Steel	0	725	168	10	27	13	19	962
Masonry	639458	966	168	13	36	18	26	640685
Manu. Housing	4611	0	0	0	0	0	0	4611
Housing	1305949	4832	840	65	180	89	128	1312083

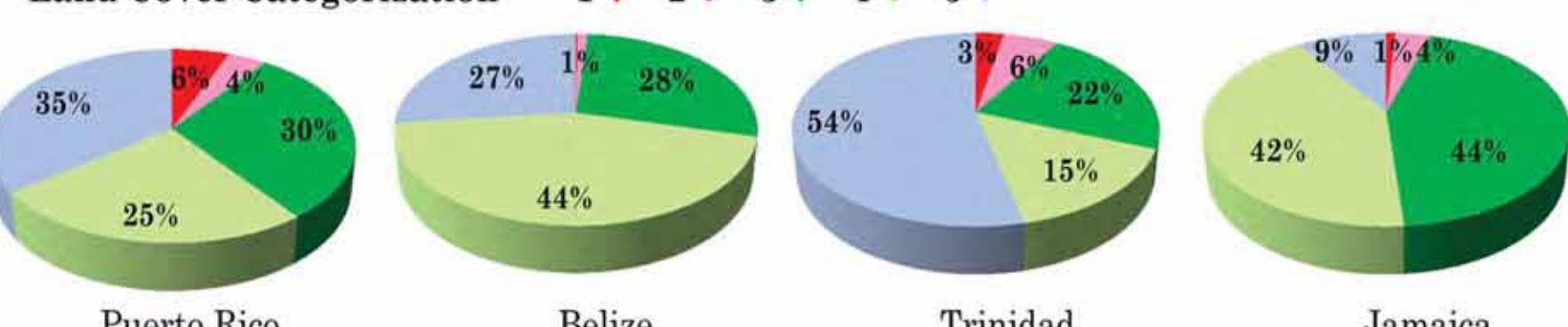
Zoning



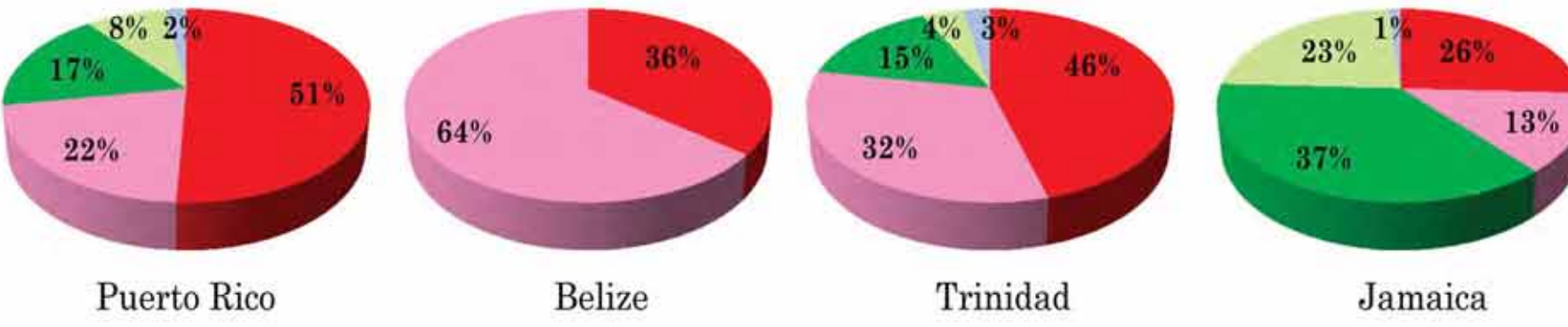
6 Caribbean Building Inventories Summary

1. Land Cover and Building Number Distribution Summary

Land Cover Categorization



Building Number Distribution



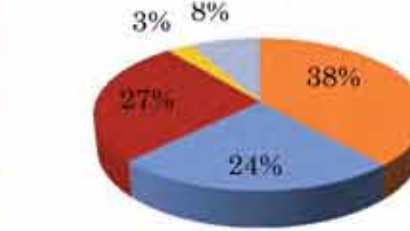
2. Building Scheme Analysis Summary

Structure	Building#	Percentage
Wood	65,374	4.98%
Concrete	599,786	45.71%
Masonry	640,685	48.83%
Precast Concrete	665	0.05%
Steel	962	0.07%
Manu. Housing	4,611	0.35%
Total	1,312,083	100%

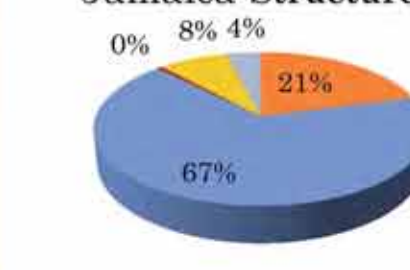
Puerto Rico Structure



Belize Structure



Jamaica Structure



3. Building Inventories Summary for Major Large Cities

City/Country	Land Area (sq km)	Building #	Population	Bld Density (#/sqkm)	Pop Density (#/sqkm)
Puerto Rico	8,865	1,312,082	3,808,610	148.0	429.6
San Juan	102	114,382	417,286	1,116.1	4,071.9
Ponce	80	46,597	143,135	583.2	1,791.3
Bayamon	70	64,463	202,474	918.4	2,884.8
Carolina	55	45,957	154,257	834.7	2,801.8
Mayaguez	54	22,695	68,032	417.2	1,250.7
Caguas	29	27,104	80,276	921.4	2,729.1
Belize	22,121	88,310	323,359	4.0	14.6
Belize City	19	17,956	57,310	952.5	3,040.0
Belmopan	19	3,843	13,998	199.4	726.2
Corozal	7	2,996	10,308	436.5	1,501.8
San Pedro	6	4,194	11,780	746.7	2,097.1
Orange Walk	5	3,733	13,709	724.5	2,660.6
Santa Elena	5	1,948	7,403	419.3	1,593.4
Trinidad	4,815	334,084	1,205,995	69.4	250.5
Port of Spain	9	10,961	45,504	1,257	5,219
Wallerfield	8	291	544	37	69
Chaguanas	7	5,911	23,446	860	3,411
Carlisle Field	5	381	674	74	131
San Fernando	5	4,424	16,766	857	3,250