

Metro Project in Bogota

Challenges of infrastructure projects to the cadastre system in Colombia

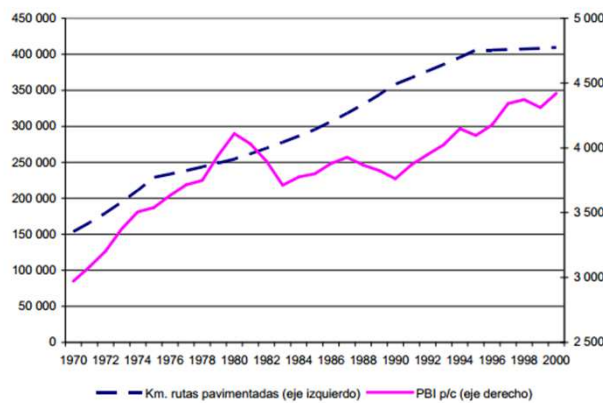
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Latin-America is growing and it is bringing resources for infrastructure projects

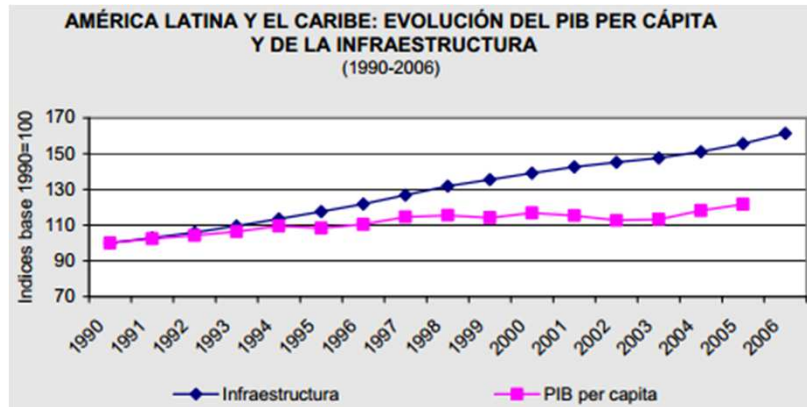
AMÉRICA LATINA Y EL CARIBE: KM. DE RUTAS PAVIMENTADAS Y PIB PER CÁPITA (1970-2000)



Fuente: elaboración propia en base a datos de CEPAL, el Banco Mundial y World Road Statistics (2006).

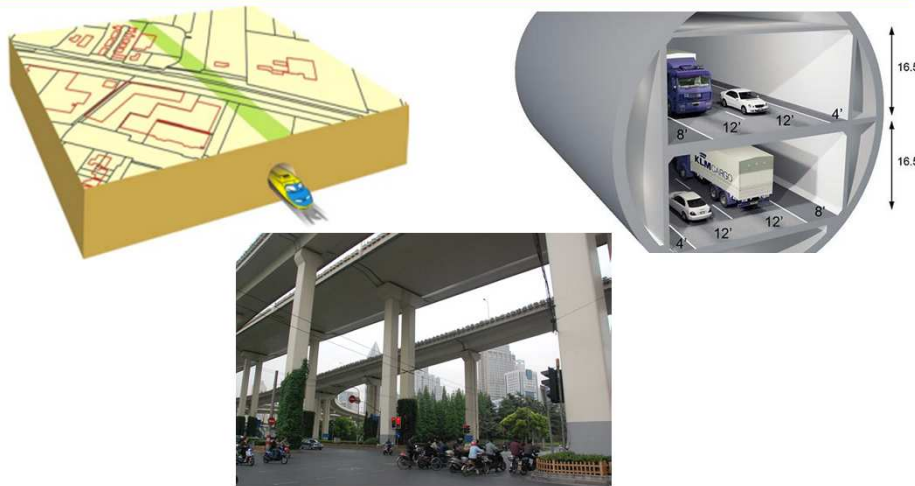
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Latin-America is growing and it is bringing resources for infrastructure projects




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These projects today are designed based on latest engineering technologies




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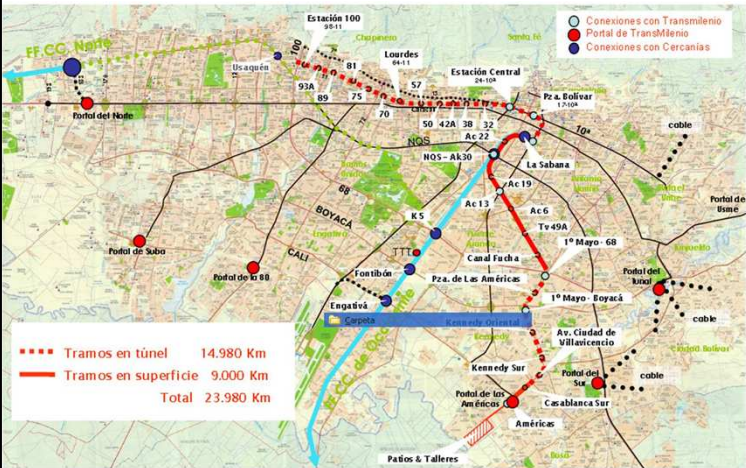
Proposals for the 2016 Olympic park are an example of this



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Bogota has proposed the development of a Metro project in the next 10 years



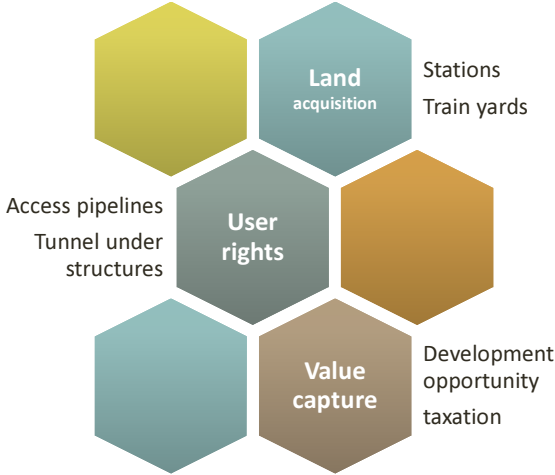
■■■■ Tramos en túnel 14.980 Km
■■■■ Tramos en superficie 9.000 Km
Total 23.980 Km

- 23.9 km
- Portal Americas to Calle 100
- Subway (14.9 km) and surface (9.0 km)
- 28 stations
- Cost around USD\$4 billion


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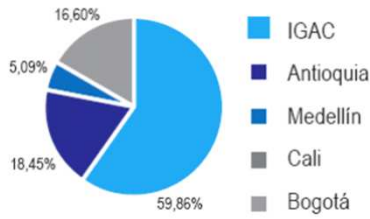
Cadastral instruments are required to successfully implement the Metro Project




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However, the cadastral system in Colombia is not prepared




Entity	Percentage
IGAC	59.86%
Bogotá	18.45%
Antioquia	16.60%
Medellín	5.09%



República de Colombia

200000 0 200000 Kilometers

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Multiple administrative issues are under 5 delivery agencies


1 legislation, 5 institutions, many problems

Gráfica 1 – Proceso de Actualización IGAC

Año	Predios IGAC	Predios C. Descentralizados	Municipios IGAC
2002	1,092	77	7
2003	766	105	10
2004	1,101	130	13
2005	1,700	871	16
2006	743	174	17
2007	1,029	483	12
2008	1,119	560	12


Entidad	Predios Urbanos	%	Predios Rurales	%	Predios Totales	%
Antioquia	620.987	7,0	403.779	12,4	1.024.766	8,5
Bogotá	1.822.641	20,6	11.353	0,3	1.833.994	15,2
IGAC	5.238.108	59,2	2.782.980	85,4	8.021.088	66,3
Medellin	633.563	7,2	37.418	1,1	670.981	5,5
S. de Cali	526.892	6,0	23.855	0,7	550.747	4,6
Total	8.842.191	100,0	3.259.385	100,0	12.101.576	100,0

Fuente: Elaboración Propia a partir de las estadísticas catastrales de Antioquia, Bogotá, IGAC, Medellín y Santiago de Cali. Vigencia Fiscal a 1 de enero de 2005. Documentos Conpes.



Significant areas of Colombia are not included yet in the cadastre system

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Although Bogota has the most developed cadastre system, it is far from ready

Cuadro 1 – Situación Catastral del país, a 1° de enero de 2008^(a)

		Total		Urbanos		Rurales	
			%		%		%
IGAC	Actualizados	5,014,814	56.9	3,737,896	65.3	1,276,918	41.5
	Por Actualizar	3,659,359	41.6	1,985,421	34.7	1,673,938	54.3
	Por Formar*	132,601	1.5	3,154	0.1	129,447	4.2
	Total	8,806,774	100.0	5,726,471	100.0	3,080,303	100.0
Antioquia	Actualizados	730,317	66.1	457,093	68.7	273,224	62.1
	Por Actualizar	374,798	33.9	208,368	31.3	166,430	37.8
	Por Formar*	473	0.0	0	0.0	473	0.1
	Total	1,105,588	100.0	665,461	100.0	440,127	100.0
Medellin	Actualizados	786,525	100.0	762,183	100.0	24,342	100.0
	Por Actualizar	0	0.0	0	0.0	0	0.0
	Por Formar*	0	0.0	0	0.0	0	0.0
	Total	786,525	100.0	762,183	100.0	24,342	100.0
Cali	Actualizado	561,810	95.8	561,810	100.0	0	0.0
	Por Actualizar	24,359	4.2	0	0.0	24,359	100.0
	Por Formar*	0	0.0	0	0.0	0	0.0
	Total	586,169	100.0	561,810	100.0	24,359	100.0
Bogotá	Actualizado	1,213,541	61.6	1,202,853	61.4	10,688	94.3
	Por Actualizar	755,906	38.4	755,265	38.6	641	5.7
	Por Formar*	0	0.0	0	0.0	0	0.0
	Total	1,969,447	100.0	1,958,118	100.0	11,329	100.0
Total Nacional	Actualizado	8,307,007	62.7	6,721,835	69.5	1,585,172	44.3
	Por Actualizar	4,814,422	36.3	2,949,054	30.5	1,865,368	52.1
	Por Formar*	133,074	1.0	3,154	0.0	129,920	3.6
	Total	13,254,503	100.0	9,674,043	100.0	3,580,460	100.0


Fuente: IGAC, Catastros descentralizados. Cálculos DNP-DDUPA.

^(a) El Plan Nacional de Desarrollo 2006-2010 definió la vigencia de actualización catastral para un periodo de cinco (5) años.

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Significant differences between jurisdictions

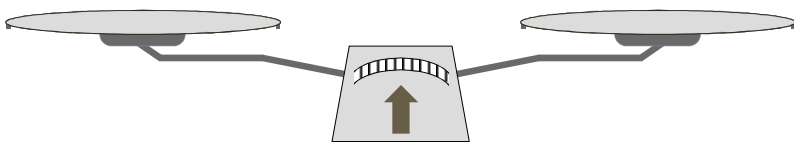
Although 100% of Bogota is in the cadastre, 38% of parcels are not up to date


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The dilemma: should the country invest in a cadastre base or be prepared for the future?

- Register 100% title
- Update jurisdiction
- Create an unifying system

- Prepare for new projects requirement
- Develop state of the art approaches
- Include concepts such as 3D cadastre



- What would help Colombia achieve sustainable development?
- Is there a balance between them?

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An option is to work at both ends to generate synergies between them

The diagram consists of two main parts. On the left, a circular flow diagram with three arrows forming a circle. The top arrow is labeled 'Build a strong cadastre base', the bottom arrow is labeled 'Cather for the Needs of projects', and a central box is labeled 'Sustainable Development'. On the right, a graph with a vertical axis and a horizontal axis. A dashed red line at the top is labeled 'State of the art'. A large arrow points from the bottom-left towards the top-right. Below this arrow, a list of four items is shown: 'Registration', '3D cadastre', 'Regulation', and 'Unification'. Lines connect these items to the main arrow, indicating they are components of the state-of-the-art trend.


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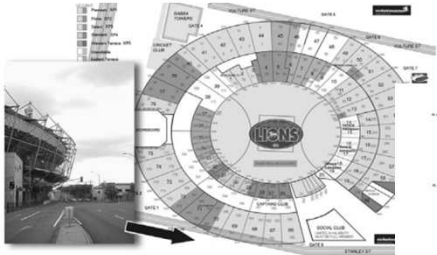
For infrastructure projects, the development of a 3D cadastre appears as imperative

The diagram illustrates the need for 3D cadastre through a sequence of images. It starts with a 2D cadastral map on the left. A red arrow points to a 3D wireframe model of a building. Another red arrow points to a 3D model of a city block. Above the 3D wireframe, there is a 3D model of a building with labels: 'Apartments' for the upper part and 'Metro Tunnel' for the lower part. Below this model, there are labels 'Underground parking area' and 'Technical and legal problems'. The source is cited as 'Source: Rajabifard et al (2012)'.

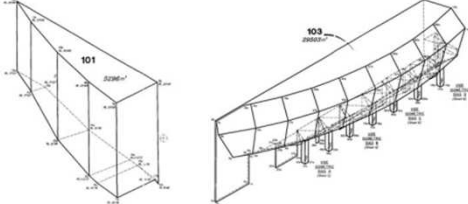
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As part of the design of the metro, Bogota needs to generate its own actualization in 3D



Case Study: Queensland - Australia




(a) 3D diagram of parcel 101 (b) 3D diagram of parcel 103

Figure 4.3: Examples of 3D diagrams added to volumetric titles.

Source: STOTER et Al (2011)

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In summary, Colombian cadastre has structural problems but an integrated approach is needed

- Basic cadastre development is needed
 - Further investment
 - Land policies
 - Unifying work between jurisdictions
- Catering for needs of society
 - Tools needed by infrastructure projects
 - State-of-the-art approaches such as 3D

The gap is significant and the cost of waiting for a strong foundation might jeopardize opportunities today

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