UNIVERSITY OF TWENTE.

REVISITING POINT CADASTRES

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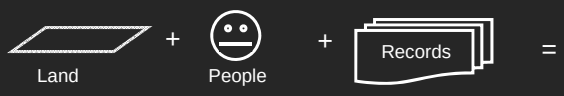
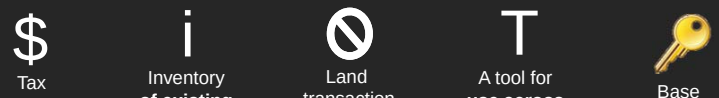
Land Administration 101





Henssen 2010

Daniel Roberge says…

FIG Commission 7 Chair 2010 - 2014

"Good land rights infrastructures exit in only between 35 and 50 countries"

"Only 25% of the estimated 6 billion land parcels are formally registered"

"This leaves more than 4 billion land parcels without land tenure security"

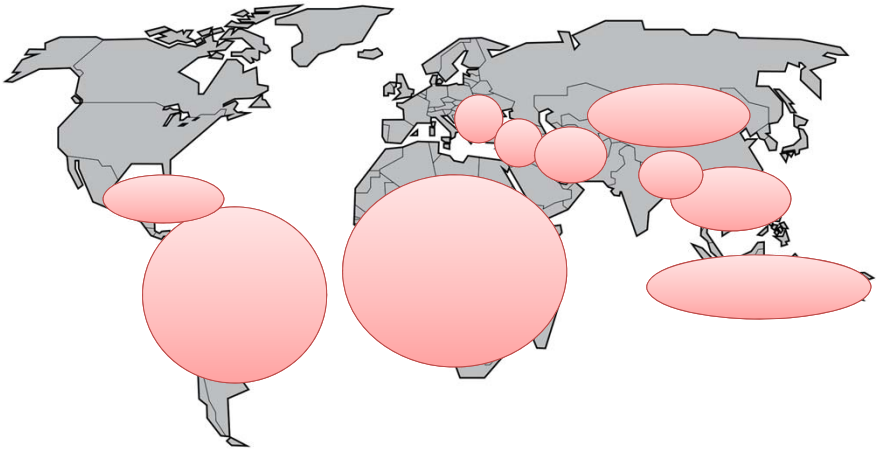
http://www.gim-international.com/issues/articles/id1841-Good_Land_Governance_is_Key_in_Sustainable_Development.html

Jaap Zevenbergen says…

Director UNU School for Land Administration

"At current rates it would take decades, or even centuries, to deliver more complete levels of registration in many countries"

“The Cadastral Divide”



http://upload.wikimedia.org/wikipedia/commons/thumb/4/41/Simple_world_map.svg/2000px-Simple_world_map.svg.png

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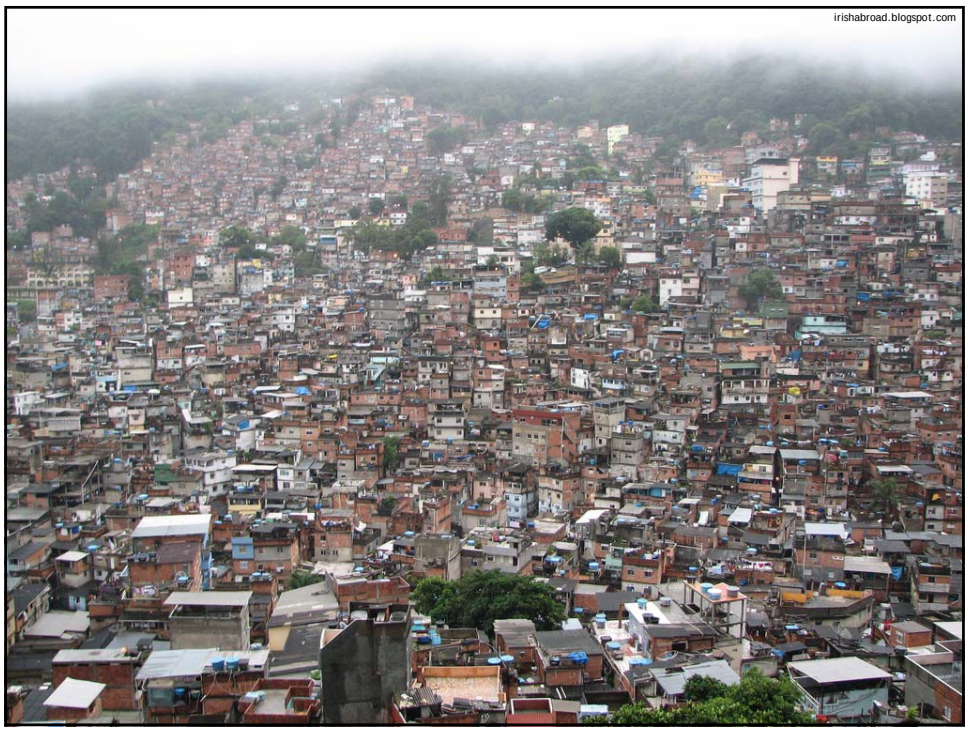
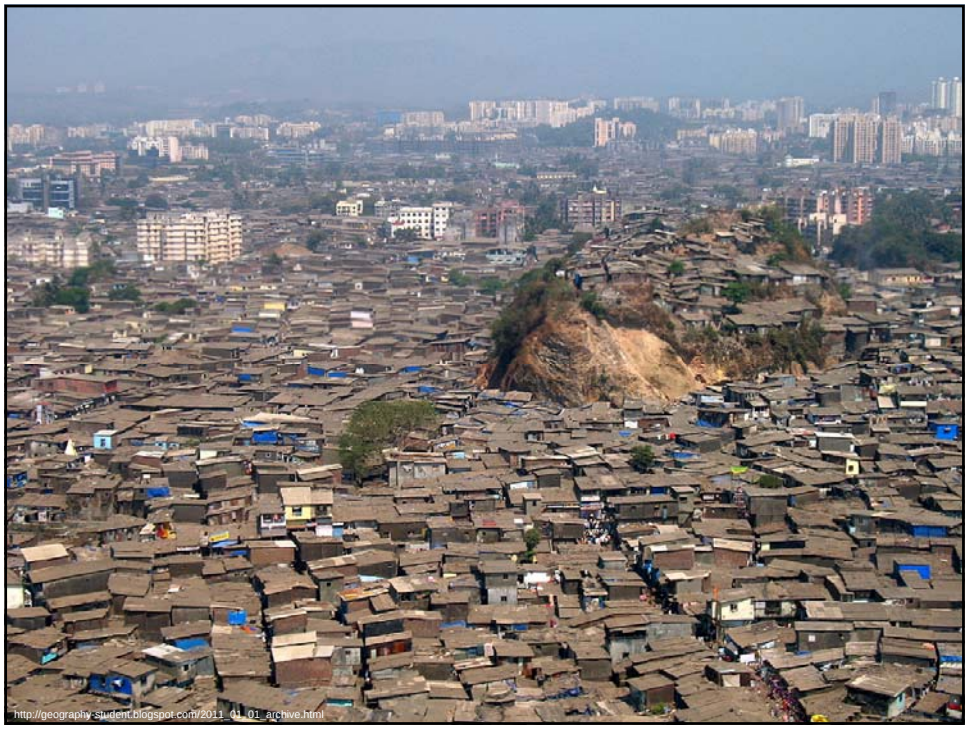



http://geography-student.blogspot.com/2011_01_01_archive.html


commons.wikimedia.org


http://branko-kadri.blogspot.com/2010_08_01_archive.html

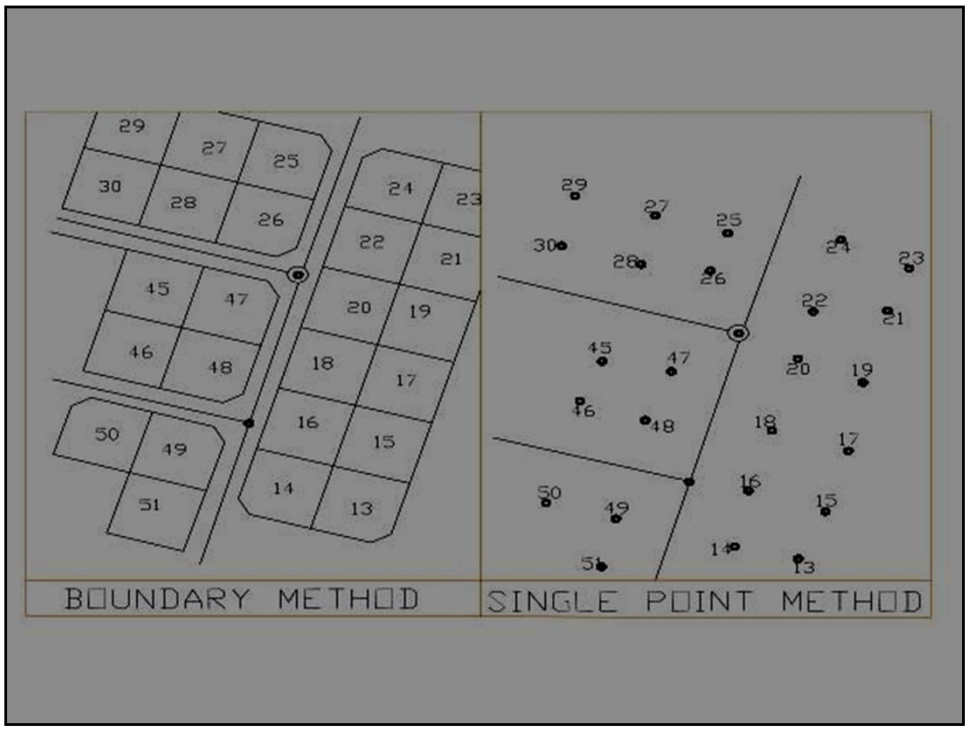

newsecuritybeat.blogspot.com

Faster

Cheaper

Fit for Purpose

Point Cadastre



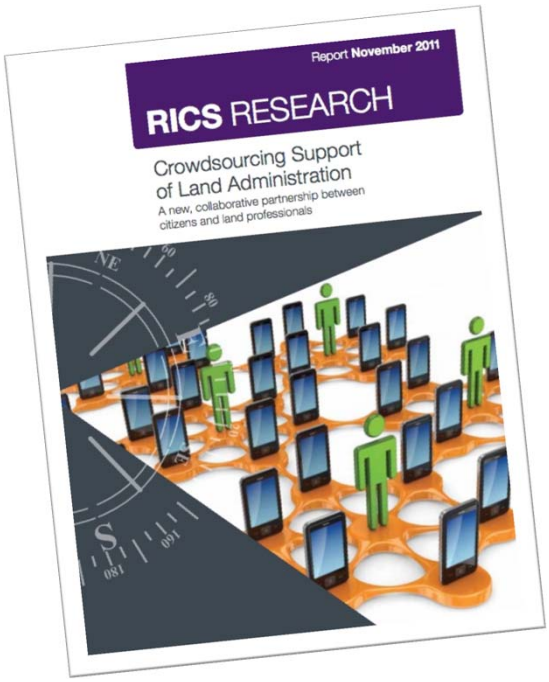
1980s
- Dale and McLaughlin
- Larsson

1990s
- Holstein
- Durand-Lasserve
- Home and Jackson
- Davies
- Torhonen and Goodwin
- Fourie and Nino-Fluck
- Latu

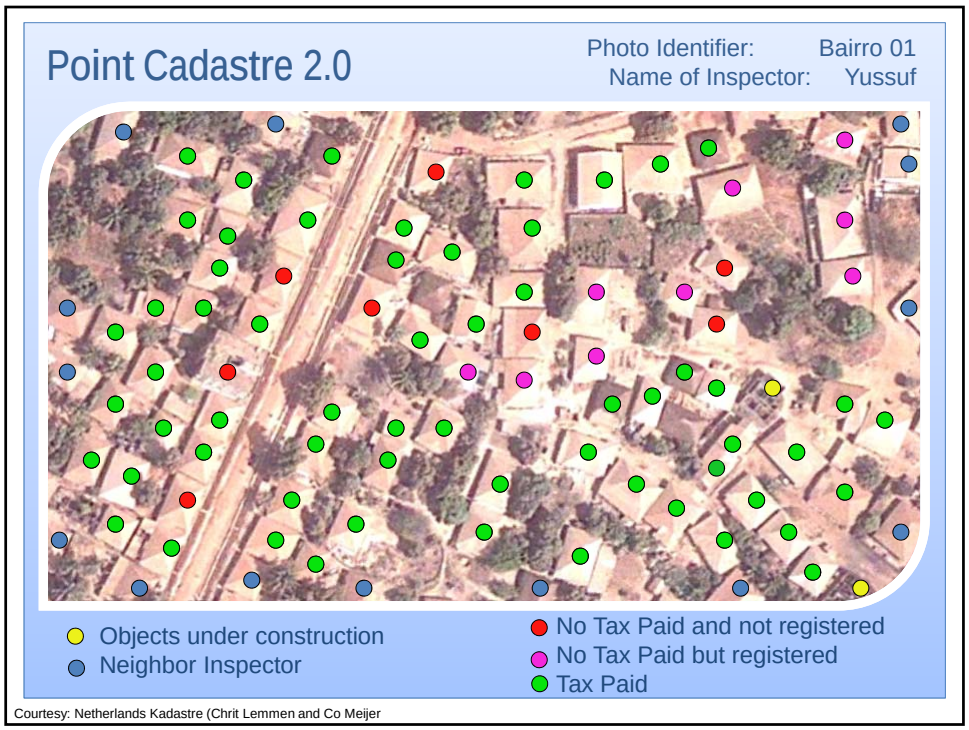
2000s
- Van Oosterom et al
- Lemmen et al
- FIG
- Lemmen

Courtesy: Netherlands Kadastre (Chrit Lemmen and Co Meijer)

Courtesy: Netherlands Kadastre (Chrit Lemmen and Co Meijer



http://www.testmanager.nl/wp-content/uploads/2011/04/cloud.jpg



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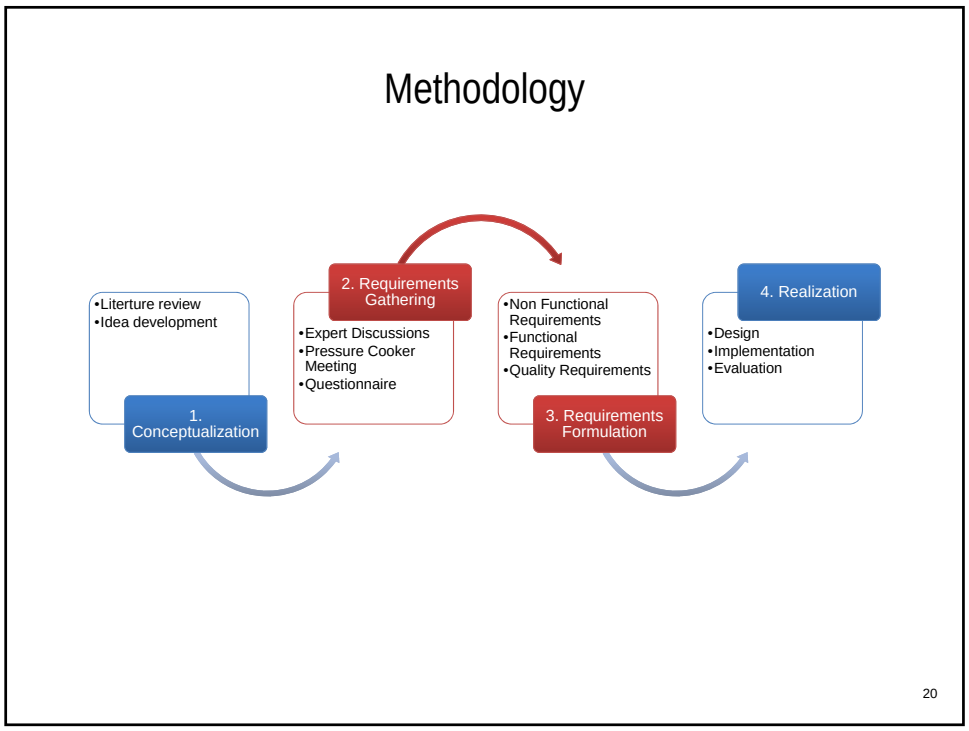

Expert Group Discussion

Code	Supporting statements
Cost	Funding issues must be considered as well
	Cost of process should be assessed
	Cost must be calculated- whether paper base or otherwise
	Base Layer may be affordable satellite image
Accuracy	Level of precision of GPS to apply is not known
	The point cadastre should be suitable for planning & execution of plans
	Point cadastre should be accurate enough to execute planning schemes
	Accuracy & precision of applied mapping device should be enough to execute plans in field
Speed	Should be quick and simple
	Parcel-based cadastre takes too long
Ease of Use	Apply tool that require just basic training for users
	Should be simple for all manner of persons
	Point cadastre should be within the reach of local expertise
	Point cadastre should be fully controlled by locals
	Should be very easy for users
	Consider what fits for the purpose at a given time
	Should be possible to map in the field
	Point cadastre should be very simple & easy to use
Flexibility	Innovative approaches could be tried
	Map should have link with GPS
	Should be flexible enough to use in several countries.
	Should support a combination of dots and lines
	Should be possible to easily include administrative data
	Consider when newer version of (Google) images comes
	should be able to absorb all forms of administrative data
	Should be able to accommodate existing administrative data
	Addition of existing parcel sketches may be considered
	Paper-based should eventually become digital
	Should support AutoCAD docs
	Pictures of buildings may be included
Scalability	Should develop into multipurpose SDI in future
	May be aggregated even unto servers for internet accessibility
	Should be good to serve several cadastre organisations.
Applicable resources	Lack of basic structures should be considered in choice of equipment
	Consider capacity of developing countries
	May be paper based at the early stages
	Importation of new equipment involves training and maintenance
	Point cadastre should be within the reach of local expertise
Equipment and software	Lack of modern equipment should not hinder Point cadastre building
	Lack of modern equipment in developing countries
	Consider simple tools like 'ipad'
	Use of GPS required for easy data collection
	Use of GIS software required
	Should be suitable within older versions of computers
Parcel identification	Parcel identification method should cater for future additions
Base layer	Parcel identification procedure needs critical attention
	Google images may be worth applying
	Base Layer may be satellite or Google images

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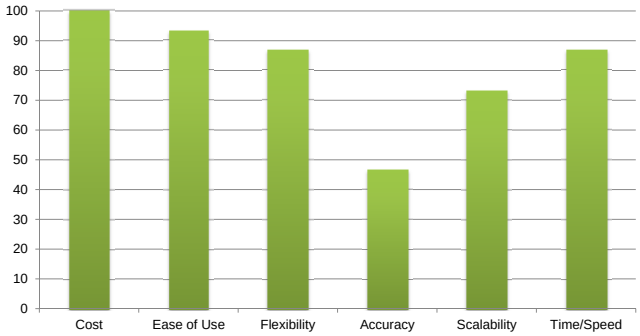
Questionnaire



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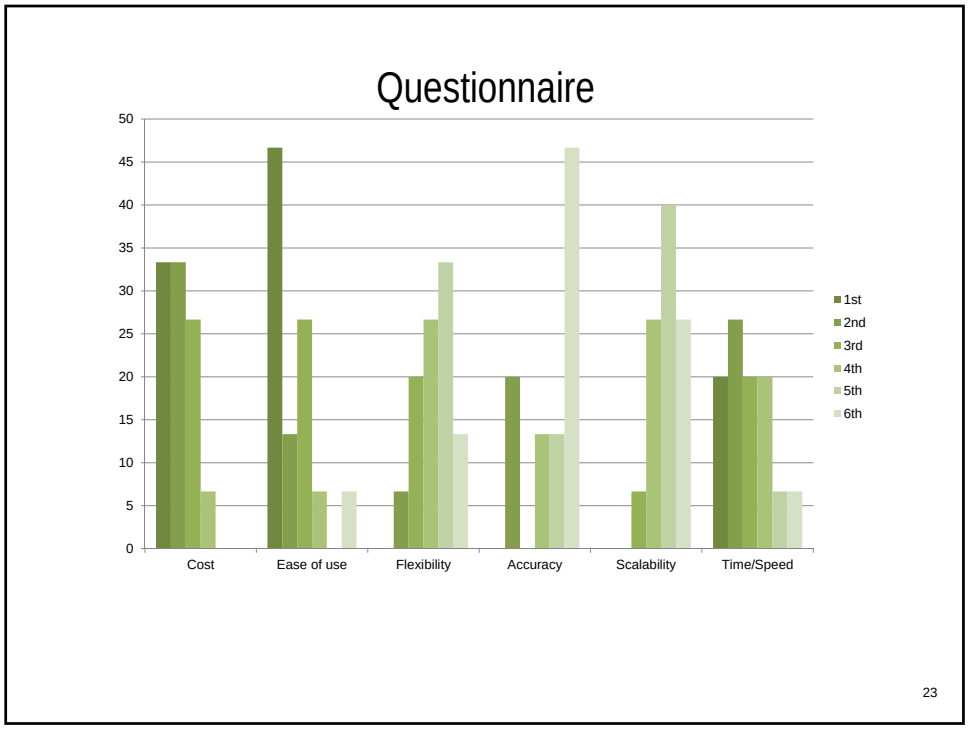
Questionnaire
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Cost
Ease of use
Flexibility
Accuracy
Scalability
Time/Speed
1st
2nd
3rd
4th
5th
6th

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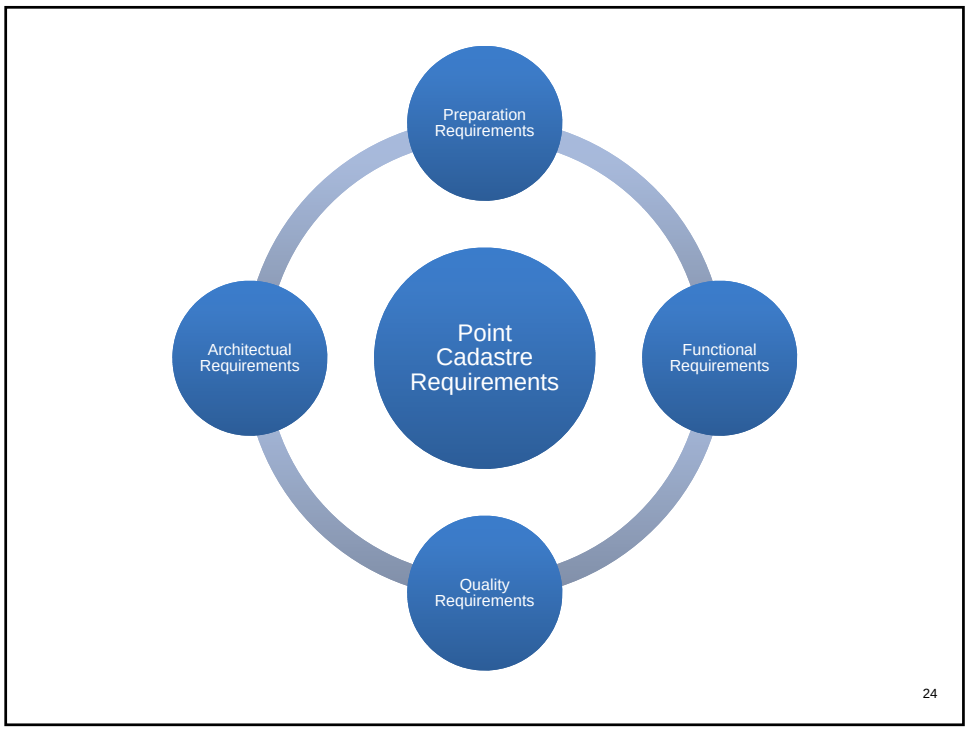
Preparation Requirements
Architectual Requirements
Point Cadastre Requirements
Functional Requirements
Quality Requirements

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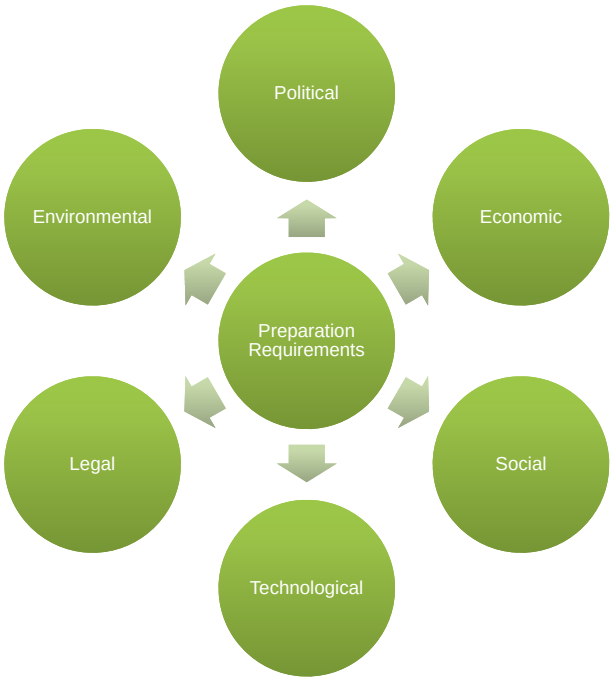

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Preparation Requirements

Analysis item	Specific issues to consider
Political	Governance context; government structure; land administration organizations
Economic	Economic basis; financial stability and growth; public sector and private sector interactions; financing options
Social	Levels of professionalism, education, and health; types of land uses
Technological	Existing infrastructures (hard and soft); existing data sources
Legal	Land laws, regulations and tenures
Environmental	Topography; natural resources; levels and locations of degraded lands

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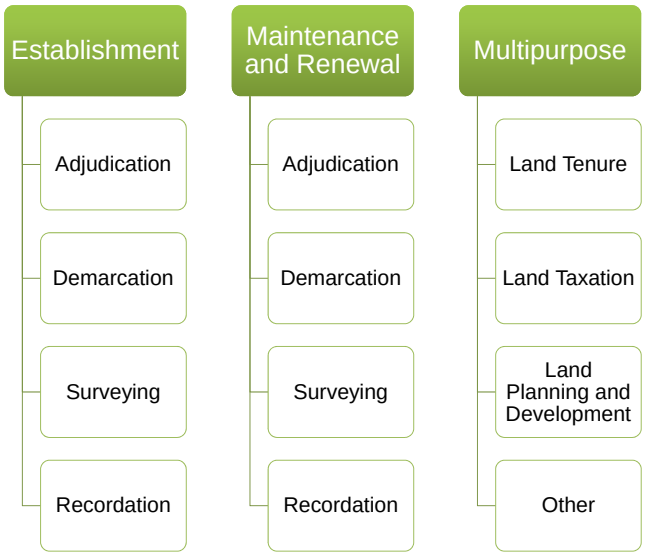
Functional Requirements



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Functional Requirements

Function	Tasks	Description
Establishment	Adjudication	• Must enable the articulation of adjacent (or overlapping land tenures) • Location of boundary lines is not required
	Demarcation	• Must physically demarcate land tenures in a simple way. For example, marking a building with an address or ID number. • Existing features can be used (e.g. trees) for demarcation • Demarcation can also be virtual (e.g. retraceable grid coordinates)
	Surveying	• Utilize either ground or aerial methods of survey. • Can be considered to use general boundaries: a single point approximates a parcel and its boundaries.
	Recordation	• Should store results from adjudication, demarcation, and surveying in some form of information system. • Graphical (e.g. cadastral point map) and textual elements (tenure information) should be recorded. • No boundary records are required, however, spatial referencing should be sort. • The two types of information should be linked. • An underlying high-resolution image or topographic map should be added to the system to provide contextual information.
Maintenance and Renewal	As above	• Should enable establishment tasks (adjudication, demarcation, surveying and recordation) to be repeated in a sporadic fashion for data upgrading and system upgrading.
Multipurpose	Land Tenure	• Should enable very basic spatial recording of land tenures
	Land Taxation	• Can allow for simple land valuation and taxation assessment and enforcement
	Land Planning and Development	• Combined with other sources of data can support infrastructure decision making (e.g. acquisition), land use planning decision-making and enforcement.
	Other	• After basic land administration functions are implemented, point cadastre can be utilized for governance of health, education, and other social requirements.

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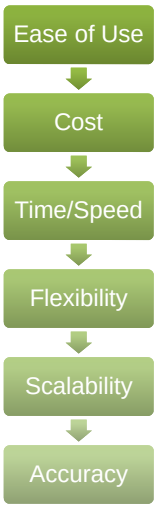
Quality Requirements



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Quality Requirements

Quality	Definition	Rank
Ease of use	Level of technical/specialized capacity to build and maintain the point cadastre	1st
Cost	Costs of technical equipment, human resources, supplies, etc., in producing and maintaining the point cadastre database	2nd
Time/Speed	Time required to initially develop and maintain the point cadastre	3rd
Flexibility	Capacity of the point cadastre to be used across different agencies by many stakeholders	4th
Scalability	Ability of the system to be extended for use at regional and national levels (i.e. increasing the types of data collected, spatial coverage, allowing for concurrent users)	5th
Accuracy	Refers to spatial accuracy of the points collected (i.e. the closeness of the positions of objects in the point cadastre to the positions on ground)	6th

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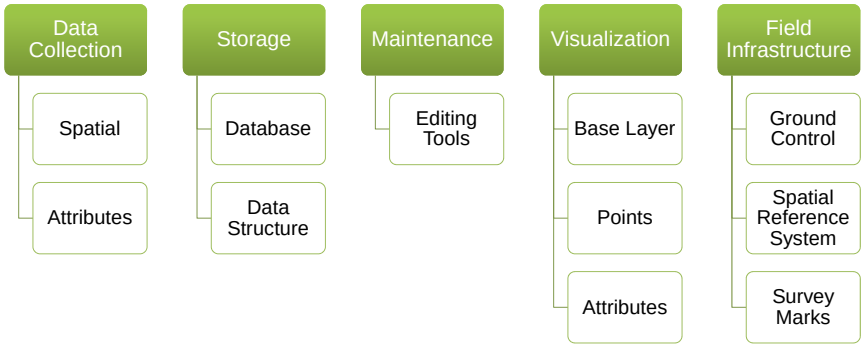
Architectural Requirements



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Architectural Requirements

Architectural Element	Items	Tools
Data Collection	Spatial	• Low-end GNSS receiver (e.g. Trimble Juno) • Office based heads-up digitizing of imagery • Field based heads-up digitizing (e.g. tablet computer) • Field sketches (pen and paper) • Use of high-end GNSS, plane tables, or total stations is considered to undermine low cost, high speed approach
	Attributes	• Low-end mobile data storage device (e.g. Trimble Juno) • Office based heads-up data entry • Field based heads up digitizing (e.g. table computer) • Field notes (pen and paper)
Storage	Database	• Object-relational database (potentially based in the cloud) • Relational database (potentially based in the cloud) • Paper based system
	Data Structure	• Somewhat dependant on database approach • Immediate focus should be on simplicity (e.g. a single layer) • Tools must enable linking spatial points and associated attribute information (e.g. simple IDs, various people types, land uses, land tenures, land values, and potentially other multipurpose data)
Maintenance	Editing tools	• Basic tools for: adding, moving, and removing points; for changing and removing attribute information; for querying spatially and by attributes (potentially based in the cloud)
Visualization	Base Layer	• Imagery of low-cost and high-resolution to enable contextualization of individual points (e.g. Ikonos, Quickbird) • If available, use of topographic map base (e.g. OpenStreetMap)
	Points	• Simple spatial viewer overlaying points and base imagery
	Attributes	• Same tool as for points with viewing options for imagery (e.g. frontage or people) and audio data (potentially for illiterates)
Field Infrastructure	Ground Control and Spatial Reference System	• A limited number of reasonably well positioned ground control points (potentially CORS stations), however, requirement for limited spatial accuracy (e.g. +/5m) mitigates need for extensive ground control • If GNSS utilized, requirement for datum transformation and coordinate conversion procedures – must fit into national reference network
	Survey Marks	• Coordinates and signage (e.g. address or parcel ID) preferred over physical markers (e.g. concrete pillars)

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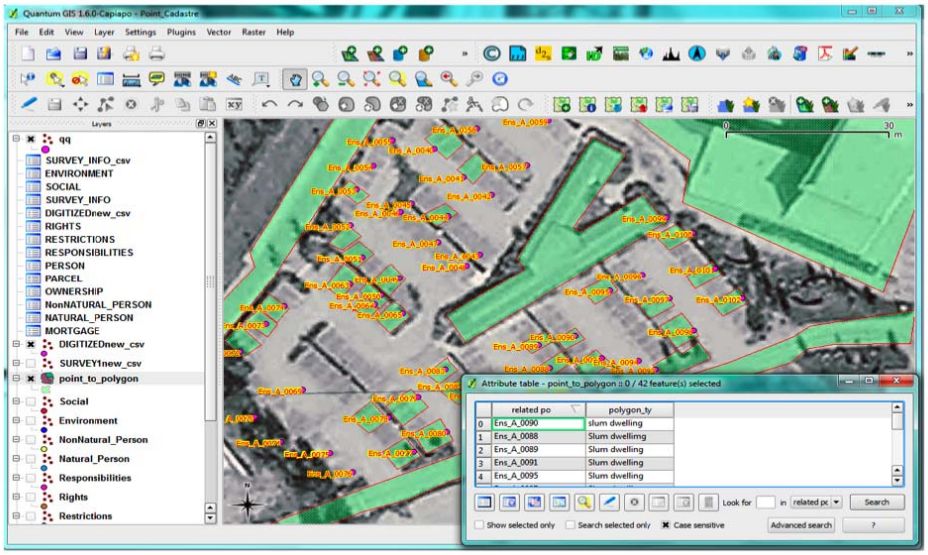

Requirement			Availability	Assessment requirement					
				Ease of use	Cost	Time / Speed	Flexibility	Scalability	Accuracy
Component/ phase	Option	*No:*	*1*	*7*	*8*	*9*	*10*	*11*	*12*
Base image Preparation	Google	*2, 3 & 4*	H	M	L	H	M	M	M
	Quickbird		M	M	M	M	L	L	M
	Ikonos		M	M	M	M	L	L	M
Setting up storage device	ArcGIS	*5 & 6*	H	M	H	M	M	M	
	QuantumGIS		H	H	L	H	M	M	
	GeoMajas		H		L			H	
Setting up mapping device	Juno SD	*3*	M	M	M	M	M	H	M
	Leica1200		M	L	H	M	H	M	H
	Garmin12XL		M	H	L	M	L	L	L
Cadastral overlays	Field Survey	*3*	M	M	M	M	M	M	H
	Digitising		H	H	L	H	H	H	M

Piloting in real world context

Development of workflows at scale

Integration with other pro-poor approaches