



# LAND RECORDS & TRANSACTION SYSTEMS ASSESSMENT AND DESIGN TOOLKIT

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Version Released by Millennium Challenge Corporation JANUARY 2023

The findings, interpretations and conclusions expressed in this material are those of the material's authors, and are not necessarily those of the Millennium Challenge Corporation.

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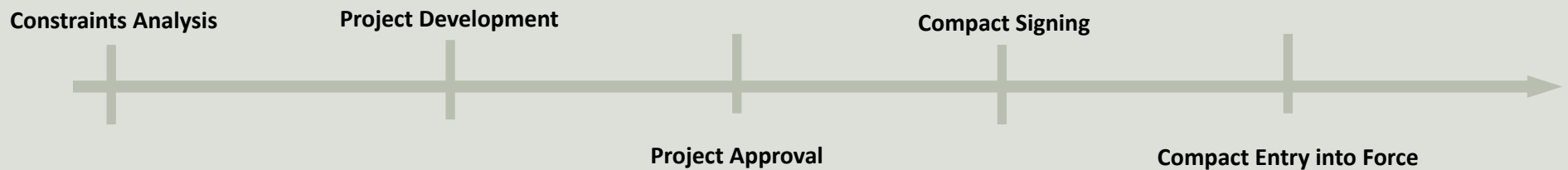
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# About

MCC has provided funding for both local and nationally reaching land records and transaction systems, typically part of broader projects. This toolkit is developed to serve as a comprehensive decision making framework to support the systematic consideration of operability, sustainability, political and institutional risks and benefits during the design of land records and transaction system project components.

This toolkit guides the design and selection of options and approaches for land records and transaction system funding. It is presented in two parts. This part (PART I) presents the toolkit, with key information on structure and how to complete. Part II is the working document, comprising the same information in worksheet form that can be completed by agency personnel, consultants and government counterparts.

## MCC Sequence for Compact Development

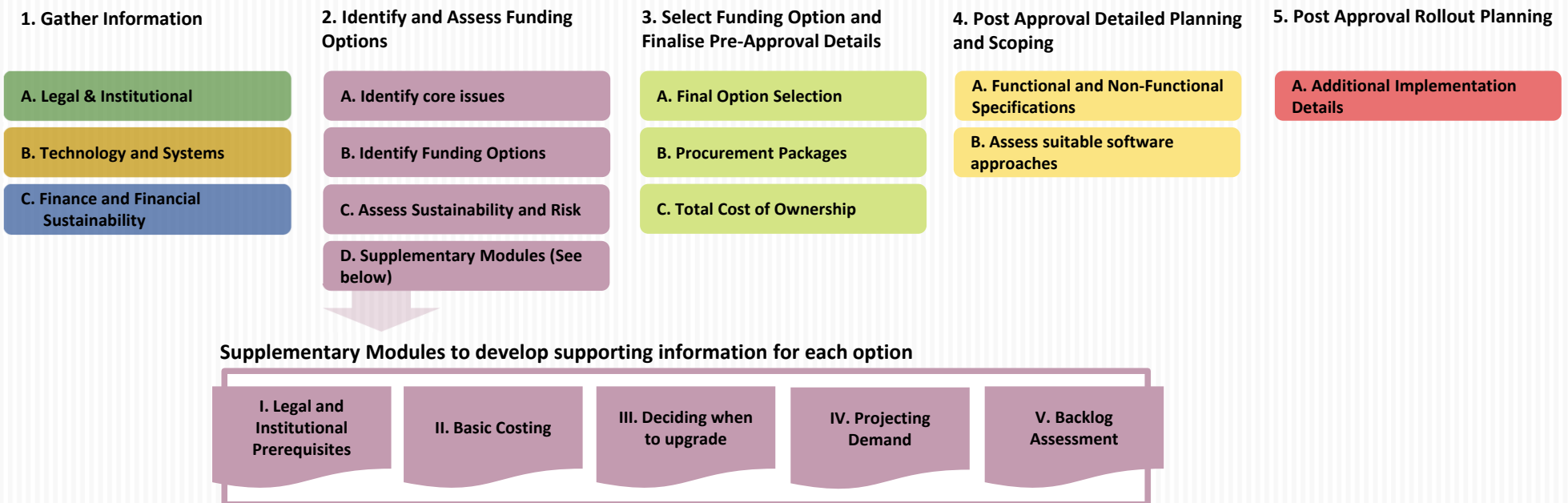


# Land Records and Transaction System Toolkit Structure

The LRTS Assessment and Design Toolkit structure is loosely aligned to the MCC sequence for Compact Development (see previous slide). Preliminary stages (Stages 1-3) are undertaken alongside early Compact Development phases and ultimately inform development of the Project Approval documentation. Post-approval stages (Stages 4 and 5) then provide tools for identifying additional detail, primarily on the technology solution, that may support Compact procurement/implementation activities. The toolkit is also usable to support development and implementation of MCC Threshold Programs.

A set of supplementary modules support Stage 2 to develop further detail around the Funding Options. This approach provides further scope to add modules to the tool as deemed necessary.

After project approval and signing or during implementation, new details, needs or issues may emerge as part of implementation, requiring additional or deeper analysis. In such situations (or at other significant program milestones) the toolkit could be used (Stages 3-5) to assess the impact of these new details or issues and to address whether system design and implementation plans should be refined or added to.



# How to use

The toolkit is designed to provide a framework for land sector practitioners, governments, consultants, and donor organizations for assessing the design of sustainable land records and transaction systems investments. It is supported by the *Land Administration Information and Transaction Systems State of Practice Paper* (2020), drawing extensively from the detail and structure provided by that document. Users should be familiar with this document before using the tool.

Whilst the structure has been designed to align with the MCC compact development process, the toolkit's application may not always strictly be linear; users will identify the most appropriate timeline and milestones for gathering needed information.

Designed in two parts, this Part I provides essential guidance on the structure and oversight of the tool. Part II provides the worksheets for data collection, collation and analysis.

Key resources to support data collection, collation and analysis can be found under [References](#).

The structure of the tool is presented on the preceding slide. Essentially the tool provides a structure for:

- Identifying core issues
- Identifying up to three Funding Options appropriate to the core issues identified - across low (or no), medium and high technology solutions
- Assessing sustainability and risk elements of Options and Solutions, to narrow down to a final reform option
- Developing additional detail to design, cost, procure and rollout the reform.

Two key terms used throughout the toolkit are defined here:

**Funding Options** comprise the activities identified as necessary and appropriate to addressing the core land sector issues.

**Technology Solutions** comprise the technology design components within the Funding Option.

## Key principles of approach

- Focus on availability of information, and what missing information means in terms of viability. Do not spend considerable time on any one worksheet – instead move on, and note the core gap.
- Focus on sustainability and project design elements that support post-project viability.
- Focus on the formal sector, recognising the emphasis is on viable transaction systems.
- Adopt a transparent, “comfort-level” approach to risk. The tool and design process recognises risks as inherent to all land projects. The purpose of the tool is to transparently identify an acceptable level of risk.

# Stage 1: Information Gathering

The first step of the tool is to gather the necessary information to form a preliminary assessment of core issues. These core issues ultimately feed into the problem diagnosis and concept note – forming the basis for selecting what we term here Funding Options and Technology Solutions

Stage 1 identifies tools across three thematic areas: legal and institutional, technology and systems, and finance and financial sustainability.





Tool themes are summarized in the checklist to the right, which serves to flag key gaps and areas for further investigation.

Tool completion (i.e.: information gathering) at this stage should not be onerous. If information is difficult to access or cannot be found, this alone provides detail about the level of existing capacity, documentation etc.

Governments and collecting entities (donors, consultants, etc) may agree on the specific treatment of information provided during the information gathering process, and modalities for ensuring it is protected and used for the intended purpose.

Part II to this Toolkit contains the worksheets which can be used to request or record information from relevant agencies. The agency – or agencies – responsible for land transaction systems are the core focus of information collection activities, but information may also be sought from private sector actors (notaries, surveyors), local experts and academics.

*Check the boxes below to flag where key gaps or concerns have been raised in this section, or where further investigation may be necessary. This checklist provides a point of reference for Stage 2.*

 <ul style="list-style-type: none"> <li><input type="checkbox"/> Policy, laws and regulations</li> <li><input type="checkbox"/> Applicable tenures</li> <li><input type="checkbox"/> Information accessibility</li> <li><input type="checkbox"/> Existing records: location, format and quality</li> <li><input type="checkbox"/> Existing coverage of the registry</li> <li><input type="checkbox"/> Institutional responsibilities</li> <li><input type="checkbox"/> Key human resource challenges</li> <li><input type="checkbox"/> Existing national strategies addressing land</li> <li><input type="checkbox"/> Related donor projects</li> <li><input type="checkbox"/> Private sector entity involvement</li> </ul>	 <ul style="list-style-type: none"> <li><input type="checkbox"/> Existing ICT infrastructure</li> <li><input type="checkbox"/> Available digital land data</li> <li><input type="checkbox"/> Relevant ICT-related government directives and initiatives</li> <li><input type="checkbox"/> Functional scope of existing systems</li> <li><input type="checkbox"/> Technology platforms of existing systems</li> <li><input type="checkbox"/> Technology support arrangements for existing systems</li> </ul>	 <ul style="list-style-type: none"> <li><input type="checkbox"/> Agency revenue collected</li> <li><input type="checkbox"/> Agency budget and fund allocations (from externals)</li> <li><input type="checkbox"/> Agency internal budget allocation</li> <li><input type="checkbox"/> Agency actual expenditure</li> <li><input type="checkbox"/> Schedule of fees and charges</li> <li><input type="checkbox"/> Policy for distributing revenue</li> <li><input type="checkbox"/> Level of effort for business processes</li> <li><input type="checkbox"/> Estimation of land market activity</li> </ul>
<p>LEGAL AND INSTITUTIONAL</p>	<p>TECHNOLOGY AND SYSTEMS</p>	<p>FINANCE AND FINANCIAL SUSTAINABILITY</p> 

## What policies, laws and regulations define how the land records and transaction system functions?

To make an investment, we need to know the extent to which the existing legal framework will support or hinder proposed changes. This tool:

- Captures the main policies, laws and regulations that are fundamental to the land records and transaction system; and
- Identifies whether there are obvious gaps that may need to be addressed prior to, or during an. investment.

It is not intended to be a comprehensive legal review, but should identify whether a further review is necessary as a prerequisite to any investment

**When filling out the table, consider:**

- Are there fundamental gaps in the legal framework that must be addressed prior to deciding on and/or making the investment?
- Is a larger legal review necessary?
- Does the legal framework, after a cursory examination, provide a reasonable basis for moving forward with the investment?

### List relevant laws

- A -  
B -  
C -  
D -

What laws, policies or other documents:	Ref	Are there obvious gaps (Y/N, describe)
...recognise and safeguard rights to land? - Consider: Rural, Urban, Condominium - Customary, group or collective tenure - Rights of women, indigenous peoples, vulnerable groups	E.g. A B C	E.g. Y/N - Tenures not recognised - Processes not recognised – e.g. processes for formalisation, individualisation
...provide the basis for surveying, mapping and demarcation of parcel boundaries?		E.g. Do these prevent fit-for-purpose approaches by being overly prescriptive?
...provide the basis for registration of parcels under different tenure regimes?		E.g. Limitations on registration/ownership by women or specific groups?
...provide for transactions to be made on land tenure types?		E.g. Limitations on transactions available to majority tenure types
...mandate institutional responsibility for administering land and land transactions?		E.g. Absent, overlapping or ambiguous responsibility allocations
...provide for transparency and public access to information?		E.g. Inadequate transparency or information access provisions
...provide for the recognition of digital data and digital signatures?		E.g. Conflict or ambiguity over the primacy of digital vs. non-digital data
...provide for e-government, NSDI and data sharing/exchange?		E.g. Insufficient legislative support and identification of responsibilities
...underpin personal identity/legal entity registration/databases and information privacy and protection?		E.g. Inadequate privacy protections
...require data security protections		E.g. inadequate data security protections
...provide for compensation against fraudulent or other loss of land?		E.g. Compensation inadequate or only in select circumstances

## What are the main tenure types within the land transaction system?

Available information on legally recognised tenure types and allowable transactions provides a basis for understanding the scope of the investment, the business case for reform and likely demand.

This tool summarises the core tenure types present, their legal basis and known/estimated coverage as well as applicable transaction rights. If information is difficult to obtain, then this suggests the need for either a deeper investigation, or, remedial action to address data gaps.

Note that the tenure types listed here will be referenced in future tools.

### When filling out the table, consider:

- Is sufficient information available?
- The number of tenure types (prioritise/limit coverage as necessary)
- Are transaction rights significantly restricted on majority tenures?
- Is a more detailed investigation of tenure types and their applicability necessary?

Tenure Type	Legal Basis	Area <sup>1</sup> <i>Est. to nearest 1,000 km<sup>2</sup></i>	Population <sup>1</sup> <i>Est. to nearest 1,000</i>	Transaction Rights (Y or N)						Comments
				Inherit only	Sale	Gift / exchange	Mortgage	Subdivide/ Merge	Other (please specify)	
	<i>Law: (refer to L.1.1.1)</i>									<i>E.g. Overlaps with other tenures? Limitations for gender/vulnerable groups?</i>

<sup>1</sup> Potential area and population covered by the specific tenure type. Not necessarily based on current tenure registered in a land records system.





## What are the key land institutions and transactions that the land transaction system must include?

Understanding the types of available transactions as a set of different business processes provides the basis for designing (or redesigning) a land transaction system.

This tool captures each transaction/business process, its basis in law, and agency responsible. There is space for comments to capture general information about known overlaps or ambiguities or likely applicability to the investment.

**When filling out the table, consider:**

- Are there key gaps in the legal provision for transaction processes?
- Are there overlapping or ambiguous institutional responsibilities?
- Is there sufficient legal support and/or documentation for institutional mandates? Does there appear to be cooperation between institutions?
- Is more detailed institutional review necessary?

List relevant institutions	Mandate	Applicable level/s of government	# of offices
I -		E.g. National E.g. Regional/District E.g. City/Village	
II -			
III -			

Transaction Type	Responsibility	Institution/s providing the services	Comments
E.g. Allocation of public land to private entity	Institution/Dept	Institution 1/Government Level 1 Institution 2/Government Level 2	Services provided
E.g. Property sale between private entities			
E.g. Mortgage of private property			
E.g. Discharge of mortgage over private property			



## What land records systems are required by law to be maintained?

It is essential that any consideration of a land records and transaction system investment takes into account existing land records systems, both analogue and digital, and any land records systems that may be required by law and not yet established.

This tool provides a summary of the land records system/s required to be established and maintained under national/state legislation, providing the basis for assessment of the need for upgrade or replacement.

### When filling out the table, consider:

- Is there a legal basis for the establishment/maintenance of identified records systems?
- Are these records systems established, in use, maintained and kept up to date?
- The key interest for the project is only those records systems that include transactions.

Records System	Responsible agency	Details/Comments/Issues
<i>E.G. Land Titles system, deeds registry, crown land register etc.</i>	<i>Reference relevant agencies from Tool L.1.1.3</i>	<i>Is it established? Maintained? Up to date? In use?</i>



## Is land administration and transaction information accessible?

Land records and transaction system investments will only be successful if there is significant and sustained public uptake of land transaction services – and public uptake is enabled through accessible information.

This tool identifies whether accessibility to property/transaction information and/or service provision information is a challenge.

### When filling out the table, consider:

- Various stakeholder perspectives
- Potential for variation between geographic location/government level

Who is able to obtain information on land ownership?	<i>Comment both on what information government makes publicly accessible, how it is made accessible and whether there are barriers to access in practice (i.e.: travel times, access to internet, website downtime, usage etc.)</i>
How can citizens access information on completing property transactions?	<i>Comment on what information is available, any gaps with regard to information or access, and whether information accessibility is a significant barrier to service uptake.</i>
Is the applicable property transaction fee schedule easily accessible?	
Is there a service standard that the property registration agency must adhere to?	<i>Yes/No, comment on suggested improvements and/or usage.</i>



## Location, format and quality of existing records

Land records systems identified in law have been previously identified [here](#). These play a key role in supporting the business processes that have been established to put policy and law into effect. Land records systems requiring investment may be poorly stored and managed, in frail or damaged condition and/or subject to illegal alteration or destruction. Traditionally land records have been in various forms of paper format and stored in different forms including loose-leaf folders and bound volumes. Many jurisdictions have attempted to standardize formats to support the introduction of ICT.

This tool seeks to inventorise the land records systems and the land records they contain, to inform the likely scale of restoration, scanning, digitisation and archive/backup that may be necessary in any land transaction system investment. These elements can form a major cost item in any land administration reform.

The tool addresses how land records systems have been established, and their accessibility to government users.

### When filling out the table, consider:

- Information from stakeholders and site visits
- The authority of information, and likely need and scope for upgrade/digitisation
- Focus on those land records that the land related investment would likely reference
- Information may not be readily available, and may need to be estimated.

Digital Records Systems	Location	Format	Accessibility	Quality	Estimated # of records digitised	Estimated % digitised	Cross-indexed Y/N	Detail any systems used to maintain linkages
Name/intent of the records system – <a href="#">ref</a>	National, Office-level etc.	E.g. Microfilm, scanned, digitised	Softcopy – do front desk staff have access to digital copy	If records have been digitized, is the process efficient? I.e.: is there no backlog,				
Hardcopy Records Systems	Location	Format	Accessibility	Quality	Number of records	Number of pages		
Name/intent of the records system – <a href="#">ref</a>	E.g. Province name	E.g. note size (A4/A0, etc.) and whether bound/unbound	E.g. stored onsite/offsite, location of authoritative version, well filed, good condition	Legibility and/or level of damage to hardcopies	Estimate if unknown	Estimate if difficult to obtain		



## What is the existing coverage of the formal registration system

This section seeks to document the percentage of administrative areas formally recorded in existing land records systems. This information is additionally broken down by parcels recorded, area covered, population covered and tenure type. This contributes to identifying the scope of the remaining records to be captured in formal land records systems, as well as isolating key target areas.

**When filling out the table, consider:**

- Availability of information, both documented and from stakeholders
- Where unavailable, can information be reliably estimated?
- Only transactionable tenure types.

Administrative Area	Tenure Type 1 (col)						Tenure Type 2					
	Parcels recorded		Area covered		Population covered		Parcels recorded		Area covered		Population covered	
	#	Est % total	#	Est % total	#	Est % total	#	Est % total	#	Est % total	#	Est % total
...												
Total												



## What are the key human resource challenges related to land records and transaction systems?

Human resourcing underpins institutional capacity. This review section contributes to an identification of existing institutional capacity and the development of a preliminary scope for necessary inputs to build capacity in support of a land-related investment. It seeks to capture whether institutions have a human resource development/management strategy, which human resourcing challenges have been identified and the effectiveness of any remedial initiatives implemented.

### When filling out the table, consider:

- Human Resource Development and Management (HRD/M) strategies may not exist, and/or information on initiatives and their effectiveness may not easily be reviewed – this is fine, and the tool can be left blank.
- Conversely, Human Resource Development and Management strategies may exist at more than one institution/agency and the tool should be completed for each strategy.
- Available documentation as well as stakeholder inputs
- Relevancy to a potential land-related investment

### Institution:

**Is there a HRD/M strategy and is it implemented effectively?**

What are the key HR challenges faced?	Have attempts been made to address these?	Comment
<i>E.g. Challenge finding/attracting staff</i>	<i>E.g. partnerships with training institutions</i>	<ul style="list-style-type: none"> <li>• Comment on effectiveness of any remediation activity</li> <li>• Comment on related causes</li> <li>• Comment on disparities of opinions</li> </ul>
<i>E.g. Low pay leading to low staff retention rates</i>		
<i>E.g. Poor working conditions leading to low staff morale</i>		



## What are the known staff retention issues and staffing gaps?

Identifying and addressing capacity and capability needs will drive project success and sustainability. This tool seeks to capture key information around perceptions of staffing gaps and needs.

### When filling out the table, consider:

- What positions/skills are most relevant to the context and land-related investment
- What is the availability (and documentation) of information
- When considering staffing numbers, are perceived gaps realistic?

CoFLAS provides a rough tool for estimating total staff (p.24) and may be a useful reference. It suggests a range of

- survey/cadastre staff between 0-10 staff/100,000 properties,
- registration staff between 3-10 staff/100,000 properties and
- management and non-technical staff to range to number no more than survey and registration combined (or as little as 10% for well automated systems).

What are the perceptions around staffing numbers and capacity gaps?	Consider: during site visits, are all staff occupied/engaged? How do staffing estimates compare with CoFLAS figures? Are there sufficient technical staff?
Are there clear processes in place to recruit and train new staff?	
What is the opinion on the effectiveness of these processes, and is there evidence in the numbers?	
What new skills may need to be recruited to support the implementation and operation of the land transaction system?	



## List existing national land sector strategies or plans

Focussing on the relevant institutions [previously identified](#), this section provides a basis for assessing the likely extent of institutional buy-in and support – or otherwise – for a land records and transaction system investment and associated activities.

The tool identifies key existing land sector strategies and initiatives that may support or align with proposed MCC programs. It may also provide an indication of existing supporting arrangements and in-government capacity.

### When filling out the table, consider:

- Government strategies or broader reform plans relevant to a land records and transaction system investment
- The extent to which supporting arrangements for initiatives are indicative of capacity to support/implement a land related investment

Initiative	Supporting policies/materials	How does it support or relate to land related investment?	Comment on status of implementation
<i>E.g. National Strategy/Vision, Reform action plan, e-government initiative, etc.</i>	<i>E.g. policy paper, 5-year plan, Ministerial plan, project proposal, budget etc.</i>	<i>E.g. includes a plan to register X number of parcels by 2050</i>	<i>Is it being implemented? How is it being monitored? What challenges is it facing?</i>





## List relevant recent, ongoing, or planned donor projects.

This section seeks to further elicit existing experience with land-related reform and investment, through an assessment of arrangements in place for previous and/or ongoing reform initiatives. This information informs the design of mechanisms for capacity and implementation support.

### When filling out the table, consider:

- Information from stakeholders and past project reports
- The relevancy of initiatives to a future land related reform.

Recipient Institution/ Agency	Project name	Donor/funder	Scope of project	Implemented by (contractor, NGO, in-house by agency, etc)
<i>E.g. Lands Department</i>	<i>E.g. Thailand Land Titling Project</i>	<i>E.g. World Bank</i>	<i>E.g. Agency/Ministry + World Bank Board</i>	<i>E.g. LTPO drawing on line agencies</i>
What does this tell us in terms of existing local capacity to manage and contribute to a planned project?		Comment.		



## Where are private sector entities presently involved in transaction system service delivery?

This section identifies the extent to which existing business processes ([identified here](#)) support the involvement of the private sector.

**When filling out the table, consider:**

- Information and documentation from both government and private sector stakeholders
- Documentation/formalisation of private sector involvement.

Transaction Types identified previously	What private actors are involved in each transaction type, and how?					Is this role mandated by law? (Y/N comment)	Comments and implications for reform?
	...notaries	...private lawyers	...private cadastral surveyors	...valuers	Others		



## What ICT infrastructure exists and how reliable is it?

There are certain elements of ICT infrastructure that IT Systems for Land Records and Transaction systems (henceforth, LRT IT System) depend upon, and some of this infrastructure is ideally provided through national or other governmental infrastructure. This section provides the basis for understanding what systems already exist and their reliability, and suitability, for underpinning a land-related technology investment.

### When filling out the table, consider:

- What ICT infrastructure categories are appropriate for the context?
- Is there significant difference between office categories (locations) and/or is further disaggregation necessary?
- What does this information mean for future service availability?

Office category	Main source	Reliability	Available backup source	Comment on impact and causes for concern
<b>Electricity</b>				
<i>E.g. Central/National</i>	E.g. National grid, generator	E.g. Frequency of brownouts and % of work time without power (annually and/or in last 2 months)	E.g. generator, solar and/or UPS (specify kVa/KW)	What is the impact of reliability on service availability? Are there additional risks that should be noted (e.g. generator not available due to no budget for fuel)
<i>E.g. Regional</i>				
<i>E.g. Local</i>				
<b>Internet</b>				
<i>E.g. Central/National</i>	E.g. 4G, 3G, leased lines	E.g. identify downtime (in last 2-3 months)	E.g. identify backup process	Is downtime a significant impediment for the existing system? Comment on the speed of main and backup
<i>E.g. Regional</i>				
<i>E.g. Local</i>				



## What ICT infrastructure exists and how reliable is it?

Other infrastructure (comment generally on the quality of office building and suitability for computerisation)

Office category	Describe general condition of office infrastructure that could impact on new computer technology installation
<b>Power cabling</b>	
Central/National	Are there sufficient power outlets in areas where system will be used ? Is the server room adequately served?
Regional	
Local	
<b>Wide/Local Area Network</b>	
Central/National	Are there leased lines to land agency regional and local offices? What is their capacity & cost ? Are there LAN outlets in operational areas where system will be used (or WiFi coverage)?
Regional	
Local	
<b>Server Room</b>	
Central/National	Is the server room secure ? Is there air conditioning in server room ? E.g. Will LAN and power cabling and hardware be vulnerable to damage from such infestation?
Regional	
Local	
<b>Other considerations pertinent to context</b>	
Central/National	
Regional	
Local	



## What digital land data does the land agency have?

ICT infrastructure also extends to the availability of digital land data, including scanned land records, vector map data, map imagery and other digital geographic information. For these data sources, the coverage, accessibility, resolution, accuracy and date of capture are all important features that assist in identifying whether investment in additional digital land data is necessary.

### When filling out the table, consider:

- Is there a significant gap in terms of digital data available to the land agency?
- Is digital data available, but significantly out of date?
- What is the variability in terms of access to digital data across identified land agencies/offices?

Digital Map data resource	Coverage (% complete)	Spatial accuracy / resolution	Age of data	Topological consistency	Additional comments/concerns on accuracy, completeness, % cloud-free (Imagery) and whether up-to-date (vector)
Vector map data					
Administrative boundaries		E.g. digitisation from map with scale 1/?	E.g. current as of 1964		
Parcel polygons					
Road network					
Other					
Map imagery					
Satellite imagery		E.g. GSD in ??m	E.g. date of imagery	N/A	
Orthophoto imagery					
Scanned documents land records					
E.g. land title certificates			E.g. date of scanning	N/A	
E.g. ownership transfers					
E.g. Survey plans					
Other					



## What relevant ICT-related government directives and initiatives exist?

Existing and/or planned government directives and whole-of-government initiatives in the technology space may have implications on the design and inclusions within any future land related investment. Directives and initiatives of interest concern the specific use of national ICT infrastructure, across one or more office levels.

The following seeks to identify relevant initiatives and directives, both existing and planned, and flag possible impacts and implications for investment design. A third category 'identified' seeks to highlight instances where government is aware of or has identified requirements but is yet to take action.

### When filling out the table, consider:

- Is there significant variation of infrastructure availability and impacts across agencies and office levels?
- Are existing directives being implemented effectively (and/or have there been prior teething issues)?
- To what extent do existing directives enable or impose limitations on the implementation of a future investment?
- The extent (and likely pace) of implementation, including impacts at sub-national level

Government ICT infrastructure requirement	Existing (E), Planned (P) or Identified (I)	Type of related infrastructure available to the land agency	Interoperability factors including key terms, conditions and cost of access	Further comments, likely impacts on potential investments
<i>E.g. Requirements related to Cloud servers</i>	<i>E / P / I</i>	<i>Identify infrastructure sub-type, as relevant, and applicability of initiative across office levels.</i>		<i>Is it possible to evaluate initiative effectiveness?</i>
<i>E.g. Requirements related to Server hubs</i>		...		<i>Are there lessons from other programs that are relevant to this investment?</i>
<i>E.g. Requirements related to National/regional network (with internet access)</i>				<i>Is there a requirement for certain design features in any land related technology investment?</i>
<i>E.g. Guidance to government agency ICT proposals</i>				
<i>E.g. System security</i>				
<i>E.g. E-Government</i>				
<i>E.g. Open Data</i>				
<i>E.G NSDI</i>				
<i>E.g. Data protection and/or privacy</i>				



## Outline the functional scope of existing digital land record system/s?

To determine the readiness of the land agency to implement or upgrade existing land records and transaction system/s (whether analogue or digital), it is necessary to identify and review existing systems, and specifically the data these systems contain, and the business processes for transactions.

**When filling out the table, consider:**

- Stakeholder inputs
- Available documentation (e.g. User manuals)

Name of System	Services supported by the System	Metrics for existing land records and transaction system	Additional Review Comments
List name of system 1, refer <a href="#">here</a>	Refer <a href="#">here</a>	<p>_____ number of parcels stored in system</p> <p>_____ number of owners/lessees stored</p> <p>_____ number of land admin transactions annually processed by system</p> <p>_____ number of provinces/districts served by system ("All" if national system)</p> <p>_____ land record collection has been scanned and is stored by system</p> <p>_____ percentage of this land record collections is accessible through the system.</p>	<ul style="list-style-type: none"> <li>• Is the system required by law?</li> <li>• Can work flows associated with this existing LRT IT system be inferred ?</li> <li>• Are there any implications for the proposed land related technology investment ?</li> <li>• Is the upgrade of the existing system a potential technology solution ?</li> </ul>
List name of system 2, refer <a href="#">here</a>			
List name of system 3, refer <a href="#">here</a>			



## What are the technology platform/s of digital land records and transaction system/s already operating within the land agency?

This tool evaluates existing technology platforms for identified land records and transaction systems to assess options for re-use and extent of effort upgrade or replace. The worksheet should be replicated for each identified existing LRT IT System.

### When filling out the table, consider:

- Different stakeholder perspectives across operational structures.
- Available documentation (e.g. User manuals)

Existing land records and transaction system # \_\_\_\_\_

Platform elements	Descriptions	Key comments/concerns	Implications to proposed investment
<b>Implementation history</b>	<i>e.g. When was the system implemented, have there been any major upgrades and who had the key implementation roles</i>	<i>E.g. Is it significantly out of date; are key implementers still present in relevant roles?</i>	
<b>Technical documentation exists (Y / N )</b>	_____ System design specifications _____ User manuals _____ System administrator manual _____ Other (.....)	<i>E.g. Is technical documentation available and complete; are users aware of and across materials?</i>	
<b>Server (hardware, operating system, DBMS &amp; other software)</b>	<i>Describe server hardware (including disk capacity and current disk volumes), operating system, DBMS and any other significant software hosted on the server.</i>  <i>Is there a stand-by server in case of (main) server failure?</i>	<i>Is existing server hardware adequate, or does it need to be updated or replaced?</i>	
<b>Client workstations</b>	<i>Specification and quantity</i>	<i>Identify replacement needs</i>	
<b>Printers</b>	<i>Number of working printers at each office location</i>	<i>Identify replacement needs</i>	
<b>Plotters</b>	<i>Number of working plotters (and plotter size details) at each office location</i>	<i>Identify replacement needs</i>	
<b>Scanners</b>	<i>Number of working scanners (and size) at each office location</i>	<i>Identify replacement needs</i>	
<b>Other ..</b>			





## What are the technology support arrangements for the existing digital land record system/s?

This tool evaluates existing technology support elements in place for identified LRT IT systems. Existing levels of support provide an indication of existing IT capacity to sustain any future investment, and the level of investment that may be necessary for support elements. The worksheet should be replicated for each identified existing LRT IT system.

**When filling out the table, consider:**

- Different stakeholder perspectives across operational structures.
- Available documentation

Existing LRT IT system # \_\_\_\_\_

Support elements	Description	# of staff	Location			# with professional qual.	# with tech. qual.	# with >5years ICT work experience	Key comments
			Nat.	Reg./ Prov.	City/ District				
<b>Staff maintaining system</b>	Software devt engineers								
	System operators								
	Database managers								
	Technicians								
	User support								
	Other								
<b>Main system administration tasks undertaken</b>	___ New user enrolment								
	___ User support								
	___ Software updates								
	___ Printer/plotter & scanner support								
	___ Database backups								
	___ Internet access								
	___ Other (.....)								
<b>Database backup regime</b>	How often is back-up done (check only 1): ___ daily ___ monthly ___ weekly								
	Storage location: ___ Offsite or ___ Onsite storage or ___ Dropbox or cloud or ___ Synchronized to external system								
<b>External supplier of system support services</b>	___ Software updates								
	___ Software support								
	___ User support								
	Where is the external supplier located?								
	Is all support provided remotely or are there site visits?								
<b>Other</b>									



## What revenue (and transaction numbers) is the agency typically generating?

The number of transactions and revenue over past financial years supports establishment of the existing demand for services, and a likely projection of potential future growth in demand for services resulting from land related investment.

This tool seeks transactions and revenue, broken down by business process/transaction type (upper table) and by location (lower table)

### When filling out the table, consider:

- Appropriate financial year or other measure
- Availability of information, both documented and from stakeholders

Number of transactions and revenue for the agency as a whole, by transaction type

Transaction type <i>(ref)</i>	Financial year x			Financial year x -1			Financial year x-2		
	#	\$ (local)	\$US	#	\$ (local)	\$US	#	\$ (local)	\$US
<b>TOTAL</b>									

Number of transactions and revenue by location

Location <i>(by province, district or office)</i>	Financial year x			Financial year x -1			Financial year x-2		
	#	\$ (local)	\$US	#	\$ (local)	\$US	#	\$ (local)	\$US
<b>TOTAL</b>									



## What fund allocations support the operation of the land agency?

The source of funds utilised for land agency expenditure provides additional detail relevant to the identification of the level and type of investment required.

### When filling out the table, consider:

- Expenditure revenue categories, and revising revenue categories as necessary
- Availability of information, both documented and from stakeholders
- Whether the table should be repeated for more than one land agency.

Source of funds used for expenditure by the land agency (repeat for multiple agencies)			
Agency:			
Revenue category	Amount		
	Year – 1	Year – 2	Year - 3
Retention of user fees and charges			
Routine annual budget allocation to agency by central government			
Special project allocation from central government			
Local government (e.g. city) revenue			
Loans			
Other			
<b>TOTAL</b>			
Where user fees and charges retained < total collected, comment here on allocation of remainder.			



## How is the agency budget allocated internally?

A review of the available budget and expenditure information of the land agency forms the basis for assessing likely sources of financing and potential investment activities for land reform. This table reviews what information is available on the budget allocation and expenditure, broken down into appropriate expenditure categories over the past three years. Where possible, budget allocation can be further disaggregated by office level and/or department.

### When filling out the table, consider:

- Revising expenditure categories as necessary
- Availability of information, both documented and from stakeholders
- Whether the table should be repeated for more than one land agency.

	Budget allocated to the land agency (repeat for multiple agencies, offices as available)		
Expenditure category	Year – 1	Year – 2	Year - 3
E.g. Staff Salaries	<Disaggregate by office level and/or agency department as appropriate and with information availability>		
Staff expenses			
Capital Assessment and Design			
Occupation expenses			
Operations and maintenance			
Other			
<b>TOTAL</b>			



## What is the actual expenditure of the land agency?

A review of the available budget and expenditure information of the land agency forms the basis for assessing likely sources of financing and potential investment activities for land reform. This table reviews if information is available on **agency expenditure**, over the last 3 years, broken down into appropriate expenditure categories.

### When filling out the table, consider:

- Revising expenditure categories as necessary
- Availability of information, both documented and from stakeholders
- Whether the table should be repeated for more than one land agency.

Actual Expenditure			
	Expenditure by the land agency (repeat for multiple agencies, offices as available)		
Expenditure category	Year – 1	Year – 2	Year - 3
E.g. Staff Salaries	<Disaggregate by office level and/or agency department as appropriate and with information availability>		
Staff expenses			
Capital Assessment and Design			
Occupation expenses			
Operations and maintenance			
Other			
TOTAL			
Comment on the reason behind any differences between budget allocated and expenditure: e.g. non-allocation of budgeted funds, late transfer of allocated funds, etc.			



## Schedule of fees and charges

Identification of the schedule of fees and charges against business processes assists in identification of potential business process reengineering, and potential for self-financing.

### When filling out the table, consider:

- Availability of information, both documented and from stakeholders
- Additional notes that should be made against fee charges

Schedule of user fees and charges (circumstances under which payable, and how each is assessed)

#	Transaction type ( <a href="#">ref</a> )	Fee charge 1	Fee charge 2	Fee charge 3	Etc.
		<i>Identify amount, circumstance under which payable, and how assessed.</i>	<i>Identify amount, circumstance under which payable, and how assessed.</i>	<i>Identify amount, circumstance under which payable, and how assessed.</i>	

**Note:** In many jurisdictions there are multiple fees, charges and taxes that may apply to a transaction. Possible examples of such fees, charges and taxes include: form fees, registration fees, stamp duty, capital gains tax, idle lands tax, speculation levy, fee to fast-track/expedite service delivery etc.



## Policy for distributing revenue from user fees and charges

Information around the policy and implementation of distributing revenue from user fees and charges supports financial modelling to explore options for financing ongoing operations and maintenance of a potential land related investment.

### When filling out the table, consider:

- Additional distribution categories
- Availability of information, both documented and from stakeholders

Is there a policy for distributing land-related revenue?	<ul style="list-style-type: none"> <li>- Does all revenue goes into consolidated government revenue?</li> <li>- Is some revenue retained by the land agency?</li> <li>- Is revenue provided to other agencies, including local government?</li> <li>- Is revenue retained by private sector service providers?</li> </ul>		
	Distribution of user fees and charges for the agency as a whole		
	Year – 1	Year – 2	Year - 3
Consolidated revenue			
Local government			
Retained by the land agency			
Retained by private sector service providers			
Other			
<b>TOTAL</b>			



## Is information available on the average time and level of effort required to complete each type of business process?

The average time, estimated level of effort and average costs of each business process provide the basis for international comparison and for identifying the need for business process reengineering.

### When filling out the table, consider:

- This tool should only be completed if existing analyses is available.
- How significant are the differences between legislated time to complete, agency pledged time to complete and the estimated average time to complete?
- Do these times tally with the estimated average level of effort, and estimated cost – and do these figures appear reasonable against international experience?

Average time and level of effort to complete each business process, for the agency as a whole

#	Transaction Type ( <a href="#">let</a> )	Legislated time to complete (working days)	Agency pledged time (if different to legislated) (working days)	Estimated average time to complete (working days)	Estimated average level of effort (person days)	Estimated average associated costs (if applicable)





## Estimate of land market activity

In addition to understanding the number of existing properties, it is also essential to have an understanding of the status of formal land market activity and whether this is considered to be low, moderate or high.

This tool provides an estimate of land market activity, as compared to a proposed average, based on an assessment of the number of transactions and the annual turnover as a percentage of total properties.

The focus here is on transfers, but additional transaction types may be included as information is available.

### When filling out the table, consider:

- What transaction type categories should be considered

Estimate land market activity						
Transaction Type	Financial year x					
	Urban			Rural		
	# of transactions <i>From slide __</i>	Annual turnover as a % of total properties <i>Refer slide __</i>	Known/Estimated Revenue	# of transactions <i>From slide __</i>	Annual turnover as a % of total properties <i>Refer slide __</i>	Known/Estimated Revenue
Registration of property transfers						
<b>Record data for the following – or additional categories - as appropriate:</b>						
Mortgage						
Inheritance (or other change of ownership)						
Lease (long term 3+ years)						
Other						

Is there a need to consider land market activity broken down by region/district?  
Are there barriers to transactions that should be considered

Annual turnover as a comparison to average:  
If <4%, Low  
If 4-8%, Moderate  
If >9%, High



# Stage 2:

## Identification and Assessment of Funding Options

- Stage 2 commences with an identification of core issues, drawing from information gathered in Section 1 and guiding issue descriptions.
- Core issues identified are used to select up to three Assessment and Design Options, incorporating various levels of Technology Solutions
- Supporting modules provide a mix of tools and decision frameworks that may or may not be relevant to an investment design; and/or which can be adopted at various stages of the process. Modules include:
  - Decision on when to upgrade vs. invest in a new land record and transaction system (with or without expanding ICT)
  - Supporting tools for a basic land record and transaction system investment costing
  - Legal, institutional and financial sustainability prerequisites
  - Demand projection
  - Assessing the backlog
- Finally, an assessment of sustainability and risk considerations leads to the selection of the final investment option, and related technology solution, to be summarized in Stage 3.

*Use the tools in Stage 2 to summarize the identified Funding Options below.*

<b>Funding Option 1 – Low (or No) Technology Solution</b>	
<b>Funding Option 2 – Medium Technology Solution</b>	
<b>Funding Option 3 – High Technology Solution</b>	



# Summary of core issues

Check the relevant issues, using the following slides as guidance.  
(Noting that issues additional to those listed here may certainly also be identified)

This checklist provides a reference for Stage  
2B – Funding Option Selection.



- ☐ There are fundamental gaps in the legal framework.
- ☐ Insufficient information on tenure coverage
- ☐ Key tenures and transaction rights are not legally recognised/allowable.
- ☐ There is no or limited political support for change.
- ☐ There are significant political economy risks.
- ☐ Access to land is difficult.
- ☐ Land records are in poor condition.
- ☐ There are many land records systems.
- ☐ Land records systems are on paper only.
- ☐ There are many missing land records.
- ☐ Land administration services are not provided nationally.
- ☐ Land administration transaction processes are inefficient.
- ☐ Land administration transaction processes are poorly communicated and/or perceived.
- ☐ Institutions have unclear mandates.
- ☐ Institutions have a severe capacity gap.
- ☐ There is resistance to change from within the land agency.
- ☐ There is limited or no private sector involvement in transaction system service delivery.
- ☐ Property dispute figures are significant.
- ☐ Other \_\_\_\_\_

## LEGAL AND INSTITUTIONAL



- ☐ Existing ICT infrastructure is unreliable.
- ☐ ICT-related government directives are planned and/or underway.
- ☐ The existing system has too much “down time”.
- ☐ Office facilities are insufficient .
- ☐ Existing system/s do not have national coverage.
- ☐ Hardware needs to be upgraded in order for existing system to meet requirements.
- ☐ Existing system is difficult to use.
- ☐ Users of the existing system have suggestions on how the system could be improved or expanded.
- ☐ There is a significant technical staffing shortage.
- ☐ The existing system is not aligned to new operating procedures and/or office layouts in the land agency.
- ☐ The existing system is no longer supported or updated by the original supplier.
- ☐ The software is out of date resulting in security vulnerabilities or incompatibilities with other software.
- ☐ Digital data products available to the agency are lacking and/or out of date.
- ☐ Services are not interoperable between locations.
- ☐ Other \_\_\_\_\_

## TECHNOLOGY AND SYSTEMS



- ☐ Data on revenue streams is unavailable/insufficient.
- ☐ Insufficient budget has been historically allocated to support and maintain the land transaction system.
- ☐ There has been insufficient investment in land administration service provision.
- ☐ There is not a culture of registration: citizens appear unwilling to pay for or utilise land administration services, and/or do not trust the formal system.
- ☐ Agency has insufficient revenue streams/information on revenue streams to maintain a land transaction system.
- ☐ There is no or limited political support for change.
- ☐ Other \_\_\_\_\_

## FINANCE AND FINANCIAL SUSTAINABILITY



## Summary of relevant legal and institutional issues identified from information gathering

Issue	Illustrative possible actions for inclusion, depending on scope/goal of project. Other actions may also be identified.
<input type="checkbox"/> <b>There are fundamental gaps in the legal framework.</b> <i>Is there a legal basis for all tenures? Is there a sufficient legal basis for digital processes and e-governance? Are there any significant legal conflicts? Does the law overprescribe land registration processes/surveying accuracies? Is there provision for private sector involvement?</i>	Make investment conditional on: <input type="checkbox"/> Drafting and approval of new laws and regulations
<input type="checkbox"/> <b>Insufficient information on tenure coverage.</b> <i>Is sufficient information available to support the identification of dominant tenures and estimation of potential transaction loads and demand/revenue streams?</i>	Define investment to include: <input type="checkbox"/> Improved organization and review of paper records <input type="checkbox"/> Improved institutional capacity support to improve tenure mapping and record managements
<input type="checkbox"/> <b>Key tenure regimes are not legally recognised, or do not allow sufficient transaction rights.</b> <i>The law does not recognise the property rights of a significant proportion of the population. There are policy/other constraints in the land market that limit or may limit future transactions (e.g. customary/cultural limits on property transfers, poorly developed mortgage markets, etc.). The lack of legal recognition limits ability to design a sustainable project and/or limits likely project scope or sustainability.</i>	Make investment conditional on: <input type="checkbox"/> Drafting and approval of new laws and regulations
<input type="checkbox"/> <b>There is no or limited political support for change.</b> <i>Key land sector legislation is out of date and/or poorly implemented. There is no high-level document/s setting out a land sector reform agenda.</i>	Make investment conditional on: <input type="checkbox"/> Consensus seeking consultation involving all key potential stakeholders prior to finalization of investment
<input type="checkbox"/> <b>There are significant political economy risks.</b> <i>Transparency International's corruption index indicates a significant risk of corruption. There are no real incentives for government employees to use formal processes and technology. A significant number of articles on high-level rent-seeking feature in news/popular media.</i>	Make investment conditional on: <input type="checkbox"/> Consensus seeking consultation involving all key potential stakeholders prior to finalization of investment Define investment to include: <input type="checkbox"/> Measures in both the design of the land system and the associated business processes that strengthen land governance within the land agency and wider government environment
<input type="checkbox"/> <b>Access to land is difficult.</b> <i>Prevalence of informal settlements in urban areas, the size of family landholdings in rural areas and the number of people those landholdings support. The predominance of the wealthy elite in accumulating land</i>	Make investment conditional on: <input type="checkbox"/> Consensus seeking consultation involving all key potential stakeholders prior to finalization of investment Define investment to include: <input type="checkbox"/> Safeguard measures to protect vulnerable groups



## Summary of relevant legal and institutional issues identified from information gathering

Issue		Illustrative possible actions for inclusion, depending on scope/goal of project. Other actions may also be identified.
Land records	<input type="checkbox"/> <b>Paper records are in poor storage condition:</b> there are many missing, they are difficult to find, and/or records do not match reality on the ground.  <i>Records are lost or damaged. Land records system is not easily navigable and/or is not comprehensive. Records are out-of-date or contain unexplainable inaccuracies. Land records are unable to be accessed in a timely manner by those providing services.</i>	Define investment to include: <ul style="list-style-type: none"> <li><input type="checkbox"/> Improved organization and review of paper records</li> <li><input type="checkbox"/> Record restoration activities</li> <li><input type="checkbox"/> Scanning/digitizing/indexing/extracting of key land records</li> <li><input type="checkbox"/> Development of a analogue/digital searchable records system</li> <li><input type="checkbox"/> Development of an analogue or digital land system incorporating record management</li> <li><input type="checkbox"/> Business process re-engineering to               <ul style="list-style-type: none"> <li><input type="checkbox"/> reorganise office flow and processes</li> <li><input type="checkbox"/> increase formalise processes and increase accountability for those who handle records</li> </ul> </li> <li><input type="checkbox"/> Introduction of public accountability tools (e.g. cameras)</li> <li><input type="checkbox"/> Digital security with audit function</li> </ul>
	<input type="checkbox"/> <b>There are many land records systems,</b> and these are complex and overlap. <i>Multiple analogue and/or digital land records systems exist across tenure types, geographies (rural/urban/local offices) etc.</i>	Define investment to include: <ul style="list-style-type: none"> <li><input type="checkbox"/> Creation of technology linkages between existing (“siloed”) IT systems</li> <li><input type="checkbox"/> Institutional streamlining to consolidate/centralize responsibilities to reduce records fragmentation</li> </ul>
	<input type="checkbox"/> <b>Land records systems are on paper only,</b> or attempts have been made to digitise but these remain incomplete. <i>Land records management system is not supported by an existing IT system, or attempts have been made but these are dated and have not been sustained, are missing key indexes, etc.</i>	Define investment to include: <ul style="list-style-type: none"> <li><input type="checkbox"/> Restoration, scanning, digitization of existing land records.</li> <li><input type="checkbox"/> Development of improvement land records management systems and infrastructure</li> </ul>
	<input type="checkbox"/> <b>There are many missing land records.</b>	Define investment to include: <ul style="list-style-type: none"> <li><input type="checkbox"/> Implementation of mass land administration upgrade (eg. first registration) or a plan for a future national implementation.</li> </ul>
Land administration services (LAS)	<input type="checkbox"/> <b>Land administration services are not provided nationally or are vulnerable to service disruption.</b> <i>The institution/s with the mandate to provide land administration services does not have the capacity to serve property owners throughout the country.</i>	Define investment to include: <ul style="list-style-type: none"> <li><input type="checkbox"/> Development of a strategic plan or road map to provide nationwide services</li> <li><input type="checkbox"/> Development of business continuity plan for land agency</li> </ul>
	<input type="checkbox"/> <b>Land administration transaction processes are inefficient.</b> They are complex with many steps, take significant time and/or require significant financial costs  <i>Land administration transactions take considerable time to complete (and be registered where appropriate) and require multiple visits to offices responsible for transaction processing. There is no clear promise on the time, costs, and outputs from the process to register a land administration transaction. Multiple approvals are required by officials which create inefficiencies.</i>	Define investment to include: <ul style="list-style-type: none"> <li><input type="checkbox"/> Redefinition of land agency business processes to increase efficiencies and transparency (BPR).</li> </ul> And <ul style="list-style-type: none"> <li><input type="checkbox"/> Implementation of new land system that supports redefined business processes and the restoration and digitization of key land records</li> </ul>



## Summary of relevant legal and institutional issues identified from information gathering

Issues		Illustrative possible actions for inclusion, depending on scope/goal of project. Other actions may also be identified.
LAS	<input type="checkbox"/> <b>Land administration transaction processes are poorly communicated and/or perceived</b> and there is low public uptake of services. <i>Steps involved in processing land administration transactions are not clearly displayed or communicated, e.g. online or in the offices processing these transactions. Complaints have been received from those seeking to register a property transaction – or complaints are not monitored or recorded, but can be anticipated.</i>	Define investment to include: <ul style="list-style-type: none"> <li><input type="checkbox"/> Design and implementation of a communication campaign</li> <li><input type="checkbox"/> Redesign and renovation of land agency public counter area</li> <li><input type="checkbox"/> Simplification of procedures for critical land administration transactions including making them more client oriented, more transparent, less susceptible to demands for informal payments and consider introducing case management approach</li> </ul>
Institutions	<input type="checkbox"/> <b>Institutions have unclear mandates</b> , that may overlap, and operate as silos with limited collaboration and efficiency. <i>Institutions providing land administration services do not have clear mandates for their services, typically provided through supporting policies or legislation. Key organizations providing services (survey, registration, valuation, etc.) operate as silos, do not have clear communication lines and/or demonstrate power imbalances.</i>	Define investment to include: <ul style="list-style-type: none"> <li><input type="checkbox"/> Preparation of modernization plan for the land agency (including HR, a training needs assessment (TNA), restoration and digitization of records, investment in low-technology or simple record-keeping solutions, BPR)</li> </ul> and / or funding is conditional on: <ul style="list-style-type: none"> <li><input type="checkbox"/> Government clarifying mandates of public agencies potentially involved in project-funded activities and related government services</li> </ul>
	<input type="checkbox"/> <b>Institutions have a severe capacity gap</b> and find it difficult to attract and retain key technical staff <i>There is limited information available from the existing HR system and HR records in the land agency. There is no training plan, and/or records on training are poor and any past or existing plans have not been well implemented or sustained. Many approved positions within the land agency have not been filled. There may be high staff turnover.</i>	Define investment to include: <ul style="list-style-type: none"> <li><input type="checkbox"/> An organisation, management, operations study, to develop a HR Strategy that describes measures to strengthen resilience in roles critical to the delivery of land administration services nationally including new recruitment and outsource of some roles to contractors/service providers.</li> <li><input type="checkbox"/> A study to consider alternative financing arrangements such as self-financing or a PPP arrangement (only where there is a clear demonstration of demand for services).</li> <li><input type="checkbox"/> The implementation of a simple land records and transaction management system able to be sustainably operated and managed by the available human resources</li> </ul>
	<input type="checkbox"/> <b>Potential resistance to change from land agency staff and other participants in land administration transactions and services</b> <i>Anecdotal comments received during information gathering for the proposed investment</i>	Make investment conditional on: <ul style="list-style-type: none"> <li><input type="checkbox"/> Consensus seeking consultation involving all key potential stakeholders prior to finalization of investment</li> </ul> Define investment to include: <ul style="list-style-type: none"> <li><input type="checkbox"/> Preparation of land agency Business Continuity Plan to include possibility that some of those involved in the processing of land transaction and service delivery may seek to disrupt these processes.</li> </ul>



## Summary of relevant legal and institutional issues identified from information gathering

Issues		Illustrative possible actions for inclusion, depending on scope/goal of project. Other actions may also be identified.
Institutions	<input type="checkbox"/> <b>There is limited or no private sector involvement in transaction system service delivery</b> <i>There is limited or no legal recognition for the role of the private sector, and the private sector has played only a limited role in land registration and transactions to date. No professional organisations have been established, and/or organisations have been established but are too new to be effective.</i>	<p>Make investment conditional on:</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Drafting and approval of new laws and regulations to facilitate and control private sector involvement</li> </ul> <p>Define investment to include:</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Any necessary upskilling of private sector service providers</li> <li><input type="checkbox"/> Design and implementation of safeguards to ensure citizen access to all critical land administration services (and there are no barriers such as affordability)</li> </ul>
DR	<input type="checkbox"/> <b>Property dispute figures are significant</b> , and undermine the land administration system. <i>Property disputes are a major case load in the courts.</i>	<p>Define investment to include:</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Implementation of an alternative dispute resolution mechanism</li> </ul> <p>And / or</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Implement a dedicated and specialist land court</li> </ul>
Backlog	<input type="checkbox"/> <b>There is a significant backlog in transactions to be recorded</b> , which is increasing. <i>Supplementary Module: assessing the backlog helps to assess the size of the problem.</i>	<p>Define investment to include:</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Business process re-engineering to increase the efficiency and transparency of transaction processing.</li> </ul>



## Summary of relevant technology and systems issues identified from information gathering

Issues	Illustrative possible actions for inclusion, depending on scope/goal of project. Other actions may also be identified.
<input type="checkbox"/> <b>Existing ICT infrastructure is unreliable.</b> <i>Electricity and/or internet networks have significant downtime across one or more office categories. Local offices struggle with sufficient power cabling etc. Nationwide infrastructure is inadequate for existing and/or proposed systems.</i>	Define investment to include: <ul style="list-style-type: none"> <li><input type="checkbox"/> Provision of alternative or backup power arrangements</li> <li><input type="checkbox"/> Note that lack of reliable internet connectivity as a land system design constraint</li> <li><input type="checkbox"/> Consideration of low- or no technology project design</li> </ul> Or <ul style="list-style-type: none"> <li><input type="checkbox"/> Preparatory ICT infrastructure upgrades required prior to start of project/investment</li> </ul>
<input type="checkbox"/> <b>ICT-related government directives (especially those facilitating interoperability between government agencies) are planned and/or underway.</b> <i>Existing and/or proposed ICT-related government directives require new projects to meet certain design requirements, including interoperability, mandated suppliers/technology, etc. Of particular interest to land agencies will be system interoperability with the national ID system and tax agencies and land agency involvement in any National Spatial Data Infrastructure program</i>	Define investment to include: <ul style="list-style-type: none"> <li><input type="checkbox"/> Consideration that existing/proposed directives may facilitate a high or medium technology project design.</li> <li><input type="checkbox"/> External government directives are incorporated in project design</li> <li><input type="checkbox"/> Identification of participating agencies in relevant government directives as stakeholders to proposed investment / project</li> </ul>
<input type="checkbox"/> <b>There is too much “down time” on the existing system and this is impacting on work performance</b> <i>Probably a result of inappropriate system design including an inability to high handle higher volumes of transactions and user interactions or poor quality software code will result in a lack of confidence in the system and abound in informal workarounds processes.</i>	Define investment to include: <ul style="list-style-type: none"> <li><input type="checkbox"/> Stronger case for a new system that deals to identified problems (rather than upgrading the existing land system)</li> <li><input type="checkbox"/> Strong emphasis on user training for new (or upgraded) system that reinforces the correct working of the associated business processes</li> <li><input type="checkbox"/> A user support role in project design</li> </ul>
<input type="checkbox"/> <b>Office facilities are insufficient to meet the needs of the existing/proposed LRT IT System and existing system data backup regime is ineffectual</b> <i>Existing office facilities do not meet the existing or anticipated needs of current/future land systems in terms of space, layout or need for air conditioning and /or weather protection. Regular data backups with off-site storage of backup media is not happening</i>	Define investment to Include: <ul style="list-style-type: none"> <li><input type="checkbox"/> Provision for office renovation works in the proposed investment</li> <li><input type="checkbox"/> An appropriate data backup regime and disaster recovery processes.</li> <li><input type="checkbox"/> Consideration of low technology solutions, or activities requiring no technology.</li> </ul>
<input type="checkbox"/> <b>Existing system/s do not have national coverage, and only serve some locations.</b> <i>Existing digital land systems only cover urban areas, or only rural areas, or only certain cities. Existing systems may have overlapping mandates. The systems of some locations may not operate consistently with specifications, including localised adoption of informal processes/workarounds and/or significant downtime that can compromise trust and data authority.</i>	Define investment to include: <ul style="list-style-type: none"> <li><input type="checkbox"/> A staged roll-out of the existing system to all locations and concluding with the consolidation of these distributed systems into one centralized system serving all locations.</li> </ul> Or <ul style="list-style-type: none"> <li><input type="checkbox"/> Develop a new centralized system capable of serving all locations and progressively transition existing systems to the new system</li> </ul>





## Summary of relevant technology and systems issues identified from information gathering

Issues	Illustrative possible actions for inclusion, depending on scope/goal of project. Other actions may also be identified.
<p><input type="checkbox"/> <b>Hardware needs to be upgraded</b> in order for existing system to meet current workloads and/or run current versions of the digital land system software</p> <p><i>Although demands on digital land systems might be modest when initially implemented, workloads processed by the digital land system will typically increase over time and especially where a mass upgrade program (such as first registration &amp; land record digitization) is running in parallel. Increases in database size may impact on data retrieval times especially when scanned images are involved and necessitate faster and greater capacity communication linkages as well as upgraded servers and workstations. Upgrades to operating systems and the land system software can have a similar effect.</i></p>	<p>Design investment to include:</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> New hardware with a sufficiently high specification to meet projected processing workloads and database size for the next 5 years</li> </ul> <p>and where there is existing hardware that will be used in conjunction with either the new, upgraded or existing land system</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Land agency to be encouraged to implement “cascade” maintenance and reassign current hardware to land agency offices with smaller processing workloads or to sections within a land agency office with less demanding computerized processes</li> </ul>
<p><input type="checkbox"/> <b>Existing system is difficult to use</b></p> <p><i>Evidence of this situation can become apparent by user comments, the persistence of paper-based processing the digital land system was supposed to replace, awareness of gaps in the digital records, a lack of software support or the loss of key technical personnel.</i></p>	<p>Design investment to include:</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> More comprehensive user training and/or the recruitment of more technically-competent staff</li> <li><input type="checkbox"/> More comprehensive user support and software support arrangements</li> <li><input type="checkbox"/> Upgrade and modernize the existing land system software to remedy reported failings OR replace with new system that better meets current and projected requirements</li> <li><input type="checkbox"/> Refine office workflows associated with digital land system and, if there are more fundamental problems associated with office business processes, to initiate a BPR exercise that looks at how IT can better support land agency processes and service delivery of land administration services.</li> </ul>
<p><input type="checkbox"/> <b>Users of the existing system have suggestions on how the system could be improved</b> or expanded to support other aspects of their work</p> <p><i>Such feedback might come back from a user feedback/suggestions box arrangement or, more typically, as a result of anecdotal comments received during discussions with the land agency on potential investments. Before a feedback suggestion is actionable, it needs to be verified, prioritized and the effort to action quantified. With such suggestions it is important to know if they could be actioned through any software maintenance arrangements in place.</i></p>	<p>Design investment to include:</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Suggested improvements in the specification for the upgrade of an existing system OR the development of a new replacement system</li> <li><input type="checkbox"/> Suggested improvements in the redesign of land agency business processes</li> </ul>
<p><input type="checkbox"/> <b>There is a significant technical staffing shortage.</b></p> <p><i>Do the targeted agencies have the staff needed to absorb/utilize new systems, if not can they expand staff/build capacity? What would be needed to make this happen? And if not, is that a factor pointing to a less complex options.</i></p>	<p>Design investment to include:</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> A detailed staffing plan to modernize the land agency and enable it to take advantage of applicable technology in processing land administration transactions and service delivery generally through up-skilling and more targeted recruitment</li> </ul> <p>Or</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Implement a technology solution that is less technically demanding on land agency staff or</li> <li><input type="checkbox"/> Outsource or devolve certain processes to the private sector</li> </ul>
<p><input type="checkbox"/> <b>The existing system is not aligned to operating procedures</b> in the land agency</p> <p><i>Are land administration transactions processed both digitally and in paper? Does the existing system primarily support a data entry step at the end of a paper based transaction? Are processing times unusually long or are significant bottle-necks common? How complicated are the movements of paper documents supporting a land administration transaction and do documents get misplaced?</i></p>	<p>Design investment to include:</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> office workflows associated with the existing system should be refined to align operating procedures with the existing system and streamline workflows generally</li> </ul> <p>Or</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Undertake a comprehensive BPR study of the land agency to streamline operating procedures assuming the operation of a computerized land system and</li> <li><input type="checkbox"/> Upgrade or replace the existing land system so that it supports the revised business processes recommended by the BPR study</li> </ul>



## Summary of relevant technology and systems issues identified from information gathering

Issues	Illustrative possible actions for inclusion, depending on scope/goal of project. Other actions may also be identified.
<input type="checkbox"/> <b>Existing system is no longer supported or updated by the original supplier</b> <i>Check if the reliability of the existing system is impacted by the lack of support and land system updates and assess if the impacts are significant.</i>	Define investment to include: <input type="checkbox"/> Develop a replacement digital land system to meet current and (short-term) future requirements including the migration of data from the existing system
<input type="checkbox"/> <b>Software (including any software components such as DBMS) are out of date</b> resulting in security vulnerabilities or incompatibilities with other software used by land agency. <i>Check if the reliability of the existing system is impacted by out-of-date software and how. If there are significant problems, check the version and date of all the components making up the existing system (i.e. DBMS, GIS, reporting, software development platform for bespoke software (MS Visual Studio, Java using Netbeans), application server). Is the existing system connected to the internet? Or can existing users access email (private or work related) or social media? Are files including Word documents or Excel spreadsheets, YouTube clips, music, photos exchanged by way of workstations used by the existing system? In such situations the security vulnerabilities are real and urgent action is required (in addition to prohibiting these risky uses of existing system workstations)</i>	Define investment to include: <input type="checkbox"/> Any upgrade of the existing land system should include the updating of all software components associated with the upgraded land system and <input type="checkbox"/> Any new or replacement land system should include the latest version of all software components  <input type="checkbox"/> The development of a "land agency user protocol" describing acceptable user practices for the land system and training in this protocol
<input type="checkbox"/> <b>There is a significant lack of digital data products available to the agency and/or available data is out of date</b> <i>Is the processing of land administration transactions on the existing system significantly compromised or delayed by the lack of certain digital data products (or if the available data is out of date)? Check transactions for missing supporting documents such as scanned records or an incomplete digital map pertaining to a transaction? Are transaction processing backlogs increasing as a result of missing or out of date digital data products?</i>	Define investment to include: <input type="checkbox"/> Provision for the required digital data product or an update to a previously provided digital data product and <input type="checkbox"/> Investigation into the long term financial viability of using these digital data products and if possible identify alternative more cost-effective digital data products or refinements to business processes or existing system to negate the need for these digital data products
<input type="checkbox"/> <b>Services are not interoperable between locations</b> <i>Leased lines (and/or internet connectivity) have not been established between land agency locations and there are multiple systems, or multiple instances of systems operating in different land agency locations. Consequently systems do not seamlessly or reliably 'talk' to each other. Different standards or operating procedures may be in use.</i>	Define investment to include: <input type="checkbox"/> Upgrade land agency office LAN arrangements (including cabling and/or wifi) <input type="checkbox"/> Upgrade land agency office power cabling (workstations, printers, scanners, local servers & wifi routers) and alternative power backup arrangements <input type="checkbox"/> Procure addition hardware to ensure all staff performing critical tasks to deliver land administration services have at desk access



## Summary of relevant finance/sustainability issues identified from information gathering

Issues	Illustrative possible actions for inclusion, depending on scope/goal of project. Other actions may also be identified.
<input type="checkbox"/> <b>Data on revenue streams is unavailable/insufficient</b> Data has not been historically maintained and/or is not readily available regarding revenue from property transactions.	Define investment to include: <input type="checkbox"/> If viability and long-term sustainability will be dependent on these revenue streams, undertake preparatory study to collect and/or estimate data
<input type="checkbox"/> <b>Insufficient budget has been historically allocated to support and maintain the land transaction system.</b> Insufficient budget is allocated to the land agency. The percentage of the budget request that is allocated is significantly below the request. The budget allocation is unreliable, and frequently delayed. No new initiatives have been funded in the land agency in recent years.	Define investment to include: <input type="checkbox"/> Preparation of strategy to strengthen IT (operations and maintenance (O&M), desktop support, etc.) drawing on best government IT experience. Make investment conditional on: <input type="checkbox"/> A commitment from government to fund the sector by budget allocation or through alternative means such as the retention of fees and changes as a condition to the investment
<input type="checkbox"/> <b>There has been insufficient investment in land administration service provision</b> Budget to maintain and operate land agency services, including periodic upgrading, has historically been limited. No or limited budget has been allocated to non-salary investments in areas such as first registration, positioning, mapping and computerisation. Approved positions in the agency remain unfilled.	Define investment to include: <input type="checkbox"/> Development of detailed fiscal model to cost out land administration services. <input type="checkbox"/> Reduce level of investment and/or reduce technology level/reliance of the investment
<input type="checkbox"/> <b>There is not a culture of registration: citizens appear unwilling to pay for or utilise land administration services, and/or do not trust the formal system.</b> Information on recent transactions and revenue from user fees and charges is either absent or does not sufficiently demonstrate a demand for services. No modelling/research on willingness to pay has been undertaken. Information on customer complaints is either absent or poor. There is no efficient system in place to monitor and respond to complaints.	Define investment to include: <input type="checkbox"/> Comprehensive stakeholder analysis <input type="checkbox"/> Development & implementation of a plan to improve participation (fees and charges, BPR, access, social and behavior change, etc.) <input type="checkbox"/> A lower or no technology approach.
<input type="checkbox"/> <b>Agency has insufficient revenue streams/information on revenue streams to maintain a land transaction system.</b> The land agency does not have a history of generating significant revenue from user fees and charges. Revenue does not exceed annual expenditure. The land agency is unable to retain part of the fees and charges collected from users. No plan has – or can – been developed to generate surplus funds from the investment.	Define investment to include: <input type="checkbox"/> Institutional strengthening and technical assistance activities <input type="checkbox"/> Limit scope and technology solution to match available funding Make investment conditional on: <input type="checkbox"/> Land agency making a submission to government for additional funding to provide (certain) land administration services as a “public good” and/or <input type="checkbox"/> Land agency making a submission to government for investment in the development of a digital land system
<input type="checkbox"/> <b>There is no or limited political support for change.</b> Non-land agencies do not see the value in supporting or linking to the land transaction system or there is resistance resulting from a perception that change will breakdown existing cultural practices.	Make investment conditional on: <input type="checkbox"/> Positive consultations that result in commitment from key stakeholders to mitigate these concerns



## Stage 2B: Elaboration of Funding Options

Referring to the core issues and possible associated actions identified in the previous 2A, this tool provides the template for identifying the Funding Options, and associated low, medium and high technology solutions.

[The supplementary modules](#) and the [annexes](#) may further assist to identify the appropriate Technology Solution Options.

An [example](#) is provided following on how to complete this.

**When filling out the table, consider:**

- Is there a role for technology in solving the main records and transaction system problems?
- Are there aspects of the information/transaction system problems that will not be solved by technology?

Core Issues Identification			
Legal/Institutional Issues to be addressed • • •	Technology/Systems Issues to be addressed • • •	Financial/Financial Sustainability Issues to be addressed • • •	
Overview of government's long-term strategic initiatives to address core issues			
Associated strategic initiatives are: • • •	Timeframe • • •	Lead Agency • • •	Funding • • •
Main elements to be addressed in proposed investment			
Legal/Institutional elements are: • • •	Technology/Systems elements are: • • •	Financial/Financial Sustainability elements are: • • •	
Funded Solution Options			
Funding Option 1: Low or No Technology	Funding Option 2: Medium Technology	Funding Option 3: High Technology	
<i>Describe the solution involving simple (or no) technology</i>	<i>Describe solution involving some technology</i>	<i>Describe solution involving technology that could be demanding in this setting</i>	
<i>Associated non-technology components</i>	<i>Associated non-technology components</i>	<i>Associated non-technology components</i>	
Clarifications, Conditions & Prerequisite actions (necessary prior to finalization of Project/Compact Approval Documentation) :			
• •			



## Example Funding Option Identification

Core Issues Identification			
<b>Legal/Institutional Issues to be addressed</b> <ul style="list-style-type: none"><li>complexity from fragmentation of land blocks from urbanization</li><li>expectations of land professionals for more modern land systems</li><li>loss of institutional knowledge through retirement of key land agency staff</li></ul>	<b>Technology/Systems Issues to be addressed</b> <ul style="list-style-type: none"><li>physical deterioration of key land records</li><li>digital record to be legal recognized record</li><li>need for modern geocentric geodetic datum (&amp; associated map projection)</li></ul>		<b>Financial/Financial Sustainability Issues to be addressed</b> <ul style="list-style-type: none"><li>land agency operational units have “user pay” based fee targets that need to be met</li><li>minimal changes to land agency budget allocations possible</li><li>Loss of staff with IT skills to private sector &amp; overseas</li></ul>
Overview of government’s long-term strategic initiatives to address core issues			
<b>Associated strategic initiatives are:</b> <ul style="list-style-type: none"><li>modernising urban survey control &amp; cadastral maps through introduction of new datum</li><li>Land Court computerisation project</li></ul>	<b>Timeframe</b> <ul style="list-style-type: none"><li>in the 2 years following the end of the compact</li><li>Currently Year 1 of 3 year project</li></ul>	<b>Lead Agency</b> <ul style="list-style-type: none"><li>Land ministry</li><li>Land Court</li></ul>	<b>Funding</b> <ul style="list-style-type: none"><li>within existing ministry budget for survey operations</li><li>Development assistance grant to government from XYZ</li></ul>
Main elements of identified Funding Options			
<ul style="list-style-type: none"><li>Draft/adopt new Title registration legislation</li><li>Implement new simple workflows for title registration across registration &amp; survey operational units</li><li>Prepare HR strategy identifying key actions to strengthen sustainability through recruitment and appropriate outsourcing of critical tasks</li></ul>	<ul style="list-style-type: none"><li>Develop computerized system-registration &amp; map</li><li>Establish new geodetic datum</li><li>Create digital cadastral map</li><li>Convert microfilm records to digital</li></ul>		<ul style="list-style-type: none"><li>New system to calculate “user pay” fees &amp; record payments</li><li>Secure services of “bonded” IT students on government study awards on graduation</li></ul>
Technology Solution Options			
Technology Solution Option 1: Low or No Technology	Technology Solution Option 2: Medium Technology	Technology Solution Option 3: High Technology	
Paper based title registration	Integrated Title Registration & Cadastral Mapping Computerized System	Integrated Title Registration & Cadastral Mapping Computerized System with modern geodetic datum	
Clarifications, Conditions & Prerequisite actions (prior to finalization of Project/Compact Approval Documentation) :			
<ul style="list-style-type: none"><li>Parliamentary consideration and adoption of new Title Registration legislation by XX month after EIF.</li><li>Land agency to confirm availability of sufficient resourcing by X months after EIF, to undertake deeds conversion, cadastral map digitization &amp; new geodetic datum survey field work including connections to old datum survey work</li><li>Government commits to amending survey act to permit use of drone imagery</li></ul>			



## Summary of core supporting elements relevant to each option

This table provides a summary of core supporting elements that may be necessary to expand upon the options identified in slide 44. Supplementary modules, commencing [here](#), provide a basis for gathering/guiding additional detail as needed – but note that not all sections identified below and not all modules may be necessary to complete.

	<b>Description of Option</b>		
	<b>Funding Option 1</b> <i>Low or No Technology</i> <i>(involves simple (or no) technology)</i>	<b>Funding Option 2</b> <i>Medium Technology</i> <i>(involves some technology)</i>	<b>Funding Option 3</b> <i>High Technology</i> <i>(involves technology which could be demanding in this setting)</i>
Does the option involve upgrading an existing system, or developing anew? (If relevant)	See <a href="#">Module New vs Upgrade</a>	See <a href="#">Module New vs Upgrade</a>	See <a href="#">Module New vs Upgrade</a>
What geographic coverage is envisaged?			
What is the back of the envelope costing? (order of magnitude)	See <a href="#">Module: Basic Costing</a>	See <a href="#">Module: Basic Costing</a>	See <a href="#">Module: Basic Costing</a>
Are any legal/institutional pre-requisites required to be completed prior to investment?	See <a href="#">Module: Pre-requisites</a>	See <a href="#">Module: Pre-requisites</a>	See <a href="#">Module: Pre-requisites</a>
Are any financial sustainability pre-requisites required to be completed prior to investment?	<ul style="list-style-type: none"> <li>See <a href="#">Module: Prerequisites</a></li> <li>See <a href="#">Module Demand Projection IF</a></li> </ul>	<ul style="list-style-type: none"> <li>See <a href="#">Module: Prerequisites</a></li> <li>See <a href="#">Module Demand Projection IF</a></li> </ul>	<ul style="list-style-type: none"> <li>See <a href="#">Module: Prerequisites</a></li> <li>See <a href="#">Module Demand Projection IF</a></li> </ul>
Have ongoing post-project options for service delivery and maintenance been considered, and what might these be?	Short description of relevant options: <ul style="list-style-type: none"> <li>- PPP</li> <li>- LaaS</li> <li>- Long term contract with service provider</li> <li>- Other</li> </ul>	Short description of relevant options: <ul style="list-style-type: none"> <li>- PPP</li> <li>- LaaS</li> <li>- Long term contract with service provider</li> <li>- Other</li> </ul>	Short description of relevant options: <ul style="list-style-type: none"> <li>- PPP</li> <li>- LaaS</li> <li>- Long term contract with service provider</li> <li>- Other</li> </ul>
Have appropriate software architecture and development options been considered at this stage?	Summarize any known software architecture preferences – noting additional detail is to be covered under <a href="#">Stage 4</a> .	Summarize any known software architecture preferences – noting additional detail is to be covered under <a href="#">Stage 4</a> .	Summarize any known software architecture preferences – noting additional detail is to be covered under <a href="#">Stage 4</a> .
What is the estimated implementation complexity?	(H/M/L)	(H/M/L)	(H/M/L)
Are measures to address an existing backlog necessary, and if so what is suggested?	See <a href="#">Module: Assessing the Backlog</a>	See <a href="#">Module: Assessing the Backlog</a>	See <a href="#">Module: Assessing the Backlog</a>



## Assessment of Options: Sustainability Assessment

This tool is used to identify the factors likely to influence investment sustainability, and to comment on the subsequent suitability of the Funding Option. Complete for each option. The following tools address legal and institutional, technology and system, and finance and financial sustainability influencing factors.

### Strategic Option: H / M / L

Influencing factors	Key questions to assess sustainability of proposed strategic options	Comment regarding sustainability impacts and suitability of strategic option.
<input type="checkbox"/> Can political economy risks be effectively managed?	<input type="checkbox"/> Do proposed activities include measures to address high-level rent-seeking in the land sector, or is this n/a? <input type="checkbox"/> Have actions been planned to address corruption, or is this n/a? <input type="checkbox"/> Do proposed activities include measures that address/promote public uptake and trust in services? <input type="checkbox"/> Do proposed activities include measures to promote institutional transparency, accountability and integrity?	
<input type="checkbox"/> Is there sufficient high-level political support for reform?	<input type="checkbox"/> Is key land sector legislation up-to-date? <input type="checkbox"/> Have identified pre-requisites have been met? <input type="checkbox"/> Is there an engaged, high-level political champion for the investment? <input type="checkbox"/> Do senior officials in the land agency have the incentive to adopt and maintain a new LRT IT System / implementation of land administration technology?	
<input type="checkbox"/> Is there sufficient buy-in and capacity at the institutional level?	<input type="checkbox"/> Do front-line users and technical officials have incentives to utilize new procedures and systems? <input type="checkbox"/> Do the key organizations providing services (survey, registration, valuation, etc.) cooperate (rather than operate as silos)? <input type="checkbox"/> Is there a willingness to discuss change/BPR? <input type="checkbox"/> Is the proposed project seen as more than just an IT project? <input type="checkbox"/> Is there a clear institutional mandate and division of responsibilities?	
<input type="checkbox"/> Are land administration business processes efficient and straightforward to reform?	<input type="checkbox"/> Are the land records systems well maintained with little or no problems with lost or damaged records? <input type="checkbox"/> Can land records be accessed in a timely manner by those providing land administration services? <input type="checkbox"/> Is the land records management system supported by an existing IT system (at least a key index related to property, right/document, right holder)? <input type="checkbox"/> Are land administration business processes commonly adopted across all offices, and/or has variation been incorporated in to the design?	
<input type="checkbox"/> Are there existing trained staff and qualified technicians, either in government or in country?	<input type="checkbox"/> Is existing institutional capacity sufficient/close to sufficient and/or are there existing plans in place and underway to address capacity? <input type="checkbox"/> Are there appropriate staff to take on critical management or technology roles necessary to the investment?	
[other?]		



## Assessment of Options: Sustainability Assessment

Strategic Option H / M / L

Influencing factors	Key questions to assess sustainability of proposed strategic options	Comment regarding sustainability impacts and suitability of strategic option.
<input type="checkbox"/> Strength and vulnerability of option	<input type="checkbox"/> Is the proposed technology solution able to be supported locally? <input type="checkbox"/> Will the identified core issues be addressed through the technology solution? <input type="checkbox"/> Have all applicable vulnerabilities in the locations where technology will likely be located been identified? <input type="checkbox"/> Is there insistence that any new implementation of land related technology must be built on existing government IT infrastructure? <input type="checkbox"/> If so, has this requirement created difficulties in the past? <input type="checkbox"/> Will all LRT IT Systems fully integrate the Strategic Option into daily workflows?	
<input type="checkbox"/> What is needed to ensure integration of new systems into daily workflows?	<input type="checkbox"/> Does the existing LRT IT System, operate in all offices providing land administration services? Has the Strategic Option taken any variation into account? <input type="checkbox"/> To what extent does any existing LRT IT System operate in parallel with a manual system, and has the Strategic Option taken this into account? <input type="checkbox"/> Does the agency have available qualified staff to support the project?	
<input type="checkbox"/> Do the targeted agencies have the staff needed to absorb/utilize new systems?	<input type="checkbox"/> Has the agency identified any personnel for assignment to the proposed project, particularly the team leaders? <input type="checkbox"/> Is there a strategy to identify, recruit and train the staff needed to support (and potentially develop) the proposed investment in land related technology? <input type="checkbox"/> Does the agency have experience in implementing focused training programs to support changes in systems, particularly when introducing new IT systems? <input type="checkbox"/> Has the agency historically had difficulties attracting, hiring and retaining qualified staff? <input type="checkbox"/> Can staffing requirements be met through upskilling and institutional capacity building, in addition to new hires?	<ul style="list-style-type: none"> <li>• Are there significant staffing/capacity barriers to implementing the strategic option?</li> <li>• Does this indicate a need to prioritise lower technology options, or preparatory activities?</li> </ul>
<input type="checkbox"/> Will targeted facilities be able to provide appropriate office facilities? Can they be mobilized? Does MCC need to fund this? If not, does that point to a less complex option?	<input type="checkbox"/> Is sufficient office space that is secure, air-conditioned and with adequate power available to be a server room? <input type="checkbox"/> Can sufficient LAN cabling – or reliable wifi connectivity - be provided in all offices and to all staff who will be required to use the technology and systems? <input type="checkbox"/> What additional office furniture will be required? <input type="checkbox"/> What additional power outlets will be required? <input type="checkbox"/> What changes need to be made to public counters? <input type="checkbox"/> What changes need to be made to (paper) record archive office space? <input type="checkbox"/> What funding is available for this office renovation work? <input type="checkbox"/> What levels of service are available and where? <input type="checkbox"/> How reliable are these service in different locations? <input type="checkbox"/> What are the costs of these services and are they like to change? <input type="checkbox"/> What backup or alternative services are available?	
<input type="checkbox"/> Is there adequate nationwide infrastructure (electricity, dedicated communication links, Internet connectivity) to support the operation of the proposed LRT IT System/land related technology?	<input type="checkbox"/> What levels of service are available and where? <input type="checkbox"/> How reliable are these service in different locations? <input type="checkbox"/> What are the costs of these services and are they like to change? <input type="checkbox"/> What backup or alternative services are available?	
<input type="checkbox"/> [other?]	<input type="checkbox"/>	





## Assessment of Options: Sustainability Assessment

### Strategic Option H / M / L

	Influencing factors	Key questions to assess sustainability of proposed strategic options	Comment regarding sustainability impacts and suitability of strategic option.
<input type="checkbox"/>	Will existing sources of funding be sufficient to cover the operations of the option, and if not, what is the plan to address?	<input type="checkbox"/> Has agency budget allocation typically been provided in a timely manner? <input type="checkbox"/> Does the land agency have sufficient revenue to cover predicted operational costs, and/or does the option include engagement with Ministry of Finance or similar to ensure sufficient budget flows? <input type="checkbox"/> Does the option design include mechanisms/consideration to ensure ongoing operations funding?	E.g.
<input type="checkbox"/>	Likelihood of government willingness/ability to fund ongoing operations and future maintenance and periodic upgrading, including revenue-related reforms that may be necessary	<input type="checkbox"/> Have previous agency approved budgets included significant non-salary investments in areas such as first registration, positioning and mapping, computerization, etc.? <input type="checkbox"/> Have previous budgets been sufficient to cover IT support and maintenance? And, if not: has budget for support and maintenance been built into option design? <input type="checkbox"/> Has sufficient budget been allocated in recent years to training and capacity building ? If not, has budget for training been included in the option design ? <input type="checkbox"/> Does the land agency have control of its own budget? <input type="checkbox"/> Does the revenue generated by the land agency exceed the annual expenditure required to support the land agency in supplying land services? And if not, can a realistic plan be developed for the land agency to generate surplus funds?	
<input type="checkbox"/>	Is demand for services and willingness to pay (WTP) robust, or will it be reasonably generated?	<input type="checkbox"/> Is there a clear concept, where necessary, for converting informal market activity into formal? <input type="checkbox"/> Are there any policy or constraints in the land market that might limit future transactions (legal prohibition or customary or cultural limits on property transfers, poorly developed mortgage markets, etc.)? <input type="checkbox"/> What assumptions and options around ensuring a sustainable demand for services have been made/designed? <input type="checkbox"/> Does the option include design of an efficient system to respond to complaints?	
<input type="checkbox"/>	[other?]	<input type="checkbox"/>	



## Assessment of Options: Risk Assessment

This tool provides an overview risk assessment for a investment option and associated technology solution.

Follow these steps:

1. Identify the key risks associated with the investment option and associated technology solution
2. Identify the mitigating actions **to be incorporated** into the investment option and associated technology solution
3. Using the illustrated **Risk Matrix** assess the risk **probability** and **impact** assuming the mitigating actions are implemented
4. Identify the appropriate **Justification recommendation** after reviewing the risk rating

		Impact		
		Low	Medium	High
Probability	High	Medium	High	High
	Medium	Low	Medium	High
	Low	Low	Low	Medium

Strategic Option \_\_\_\_\_ Technology Level \_\_\_\_\_

Risk type	Risk	Actions to Mitigate	Risk assessment after proposed mitigation actions taken			
			Probability	Impact	Risk Rating	Justification to proceed
Development & implementation of technology solution on-time	Identified by expert	To be identified by expert	(High, med, low) from risk matrix	(High, med, low) from risk matrix	(High, med, low) Calculated from risk matrix	See inset
Development & implementation of technology solution on-budget (or complete planned scope with budget available)	Refer to costing slides					
Ability of the investment option meet specific land issues	refer to Sec 2B slides					
Lack of staff expertise in the investment option and/or technology solution related areas	Identified by expert					
Critical Sustainability Concerns (including progress of associated strategic initiatives & long term funding arrangements)	Refer to sustainability tool					
[other?]						

### Example justifications:

- **Low risk:** mitigating actions lower risk to acceptable level
- **Buy-in:** Sufficient stakeholder buy-in to justify risk level
- **Critical reform activity:** Risk level is not ideal, but the activity is sufficiently critical to the investment to accept the risk.
- **Technology growth:** Risk level is not ideal, but anticipated growth in technology and technology capacity should see gradual risk reduction.
- **Add further risk justifications here as appropriate**



# Supplementary Modules

Stage 2 includes 5 supplementary modules to assist in developing any necessary supporting detail within each Funding Option. The modules are:

- Checklist for deciding whether to upgrade existing land records and transaction system or start anew
- Basic Costing of high, medium and low (or no) technology investment options
- Legal and Institutional Prerequisites
- Financial sustainability prerequisites
  - Mapping support for success
  - Projection of demand
- Assessing the backlog

The detail from these modules informs the [summary of core supporting elements relevant to each option](#).



## Checklist for deciding whether to upgrade existing LRT system or start anew

This checklist is applicable when a decision is required as to whether it is more appropriate to upgrade or modify an existing system, or to start anew. Key considerations lie with the level of complexity associated with each option.

### When filling out the table, consider:

- Available documentation
- Where the checklist assessment is inconclusive, consider the political will behind and sustainability of each option.
- Are there key factors requiring further review?

Considerations for identified Strategic Option	Preliminary assessment		Comment on viability of upgrade vs. new system?
Complexity associated with modifying/extending functionality of existing system	Sufficient documentation available (refer <a href="#">here</a> ):	Y/N	Is extending the functionality of the existing system/s a viable option? Why/why not?
	If yes, assess the following (check one of High [H], Medium [M] or Low [L])	H M L	
	Documentation comprehensiveness		
	Available expertise (in office/in country) to manage upgrade		
	Likelihood of changes negating future software updates		Are there key factors requiring further review?
	Likelihood of additional software licenses needing to be purchased ?		
	Quality of existing software code?		
	Likely quality of modified code?		
	Likelihood of existing software architecture remaining compatible with proposed functionality and likely upgrades <5years?		
	Likely impact of software upgrade on system performance?		
Complexity associated with developing a new system (including data migration)	Likelihood of all identified functional and non-functional requirements being met?		
	Other concerns		
	Legacy data compliant with LADM		Is there a compelling reason to develop a new system instead of expanding or upgrading existing? Why/why not?
	Same DBMS involved in both legacy/new system?		
	Likely complexity of geospatial data restructure?		
	Quality of legacy data		
	Likely complexity of restructure and indexing of scanned document imagery?		Are there key factors requiring further review?
	Other		



## Basic costing - Summary and Office Details

The basic costing module detailed here draws extensively on the Costing and Financing of Land Administration Systems (CoFLAS, 2015) tool. It provides a framework of core costing components along with guidance on appropriate values and estimates. It is broken down into five components: software and software development costs, physical infrastructure and hardware costs, annual operating costs (inc. LAaaS) and costs for preparatory work. An assumption is made that larger offices require more staff, and that lower tech offices require more staff – the staffing requirements component should be updated first, as it is the basis for later slides.

**When filling out the table, consider:**

- Intent: order of magnitude costing only
- What assumptions have been made, and are they comparative across technology levels?
- **All indicative costings are in US dollars, and were established in 2021. These costs will evolve with time and may vary by country context. They may also vary with procurement method and implementation approach)**

**Basic cost summary and total** – use the summary tables from the tools in this section to complete the following.

Costing component	Total cost (\$US)		
	High Technology	Medium Technology	Low Technology
Software & software development, if part of option	<a href="#">Slide 55</a>	<a href="#">Slide 55</a>	<a href="#">Slide 55</a>
Initial LAaaS service contract (if applicable)	<a href="#">Slide 57</a>	<a href="#">Slide 57</a>	<a href="#">Slide 57</a>
Physical ICT infrastructure, if part of option	<a href="#">Slide 56</a>	<a href="#">Slide 56</a>	<a href="#">Slide 56</a>
Hardware & Equipment	<a href="#">Slide 56</a>	<a href="#">Slide 56</a>	<a href="#">Slide 56</a>
Systematic registration	<a href="#">Slide 58</a>	<a href="#">Slide 58</a>	<a href="#">Slide 58</a>
Conversion	<a href="#">Slide 58</a>	<a href="#">Slide 58</a>	<a href="#">Slide 58</a>
Spatial framework upgrade	<a href="#">Slide 59</a>	<a href="#">Slide 59</a>	<a href="#">Slide 59</a>
Other costs	<a href="#">Slide 59</a>	<a href="#">Slide 59</a>	<a href="#">Slide 59</a>
Contingency	Estimated 40% of investment	Estimated 40% of investment	Estimated 40% of investment
<b>Total Cost</b>			
<b>Annual Operating Costs</b>	<a href="#">Slide 57</a>	<a href="#">Slide 57</a>	<a href="#">Slide 57</a>

Summary costs (\$US)			
	High	Med	Low
<b>Total cost</b>			
<b>Annual ops costs</b>			



## Basic costing - Determining Office Sizes

The following assists in identifying the total number of offices that the investment options will cover. The estimated figures are drawn from CoFLAS, and should be revised according to context and local knowledge. There is a broad assumption that lower technology environments will typically require higher staffing levels.

The summary table provides the basis for identifying in which offices the investment option will be implemented, categorising by low, medium or high technology solutions as appropriate.

### When filling out the table, consider:

- Do staffing estimates tally with local experience?
- Intent: order of magnitude costing only
- What assumptions have been made, and are they comparative across technology levels?

### Staffing requirements

Number of staff in the office	High Level of Staffing/Office	Medium Level of Staffing per Office	Low level of staffing per office
Management/admin/non-technical staff	About the same as the number of registration and survey/cadastre staff	About half the number of registration and survey/cadastre staff	About 10% of the number of registration and survey/cadastre staff
Registration staff <i>per 100,000 properties covered by the office</i>	Manual records, complicated registration process, limited role for private sector 10	Efficient registration process, possibly computerised, limited role for private sector 5	Computerised records, efficient registration process, substantial role for private sector 3
Survey/cadastre <i>per 100,000 properties covered by the office</i>	Survey/cadastre not automated, limited role for private sector 10	Survey/cadastre automated, limited role for private sector 5	Survey/cadastre automated, limited role by government 3 LAS services provided without cadastre 0

### Identify offices where LRT IT system investment will be implemented

	High	Med	Low
Number of offices			
Specify which offices (or ALL if national)			
Specify total staff required			



## Basic costing - Software, Software Development and initial LAaaS Costs

Software and software development costs will vary according to technology level and associated complexity. These figures are from 2021, are estimated from international experience, are rough estimations only and take into account additional MCC requirements including approvals and review processes, checks, etc. It is likely that local governments directly implementing an investment would have significantly lower costs, particularly in the low and medium technology categories.

### When filling out the table, consider:

- Cost estimates are developed specifically for MCC
- Other inclusions that may not be specified, and how they would impact estimated cost ranges

### Software and software development costing parameters

Technology	Estimated cost range (\$US)	Possible inclusions
High	2.5 million – 10 million	<ul style="list-style-type: none"> <li>• Supports multiple transaction categories, including some additions in a new system and/or replaces an existing system with major new functionality</li> <li>• Implements latest technology with limited track record within comparable land agencies</li> <li>• Central server with linkages to both external and in-house servers</li> <li>• Complex migration of legacy data</li> <li>• Requires expertise not readily available locally</li> </ul>
Medium	500,000 – 2.5 million	<ul style="list-style-type: none"> <li>• Supports several transaction categories (new system or a significant extension to existing system)</li> <li>• Supports simple linkages to other internal or external systems</li> <li>• Central server or multiple office standalone implementations (potentially supported by national regular data consolidation)</li> <li>• Implementation largely undertaken (and subsequent support provided) by local software developers</li> </ul>
Low	<500,000	<ul style="list-style-type: none"> <li>• Supports only routine registration &amp; cadastral transactions or is a simple extension/upgrade to existing system</li> <li>• Standalone implementation</li> <li>• No linkages required to other internal or external systems</li> <li>• Local requirements can be incorporated largely by configuration and no or very limited software customization</li> <li>• Implementation and subsequent support can be provided by local software developers</li> <li>• <i>Low options may also reflect no software or IT use; that may also be reflected here</i></li> </ul>

### Initial LAaaS investment funding (if LAaaS being explored)

Technology	Fee for LAaaS (5 years, \$US)	Possible inclusions
High	3 million	<i>National implementation and supports multiple land administration transactions</i>
Medium	1.5 million	<i>National implementation but only supports land registration transactions</i>
Low	0.75 million	<i>Sub-national implementation and only supports certain land registration transactions (e.g. transfers &amp; mortgages)</i>



## Basic costing - Physical ICT infrastructure and Hardware Costs

Physical ICT infrastructure and hardware costs will vary by office size and technology level. Figures are informed by CoFLAS and international experience, but will obviously vary between regions. The following provides a basis for rough estimation of these costs. Summary tables to the right of the slide should be used to complete the module summary slide.

When filling out the table, consider:

- Infrastructure costs significantly vary according to region and scale, so estimates should be revised if local references are available.
- Costs may also vary by procurement method and implementation approach

### Physical ICT infrastructure upgrade cost per office - \$US

#### Stand-alone office implementation

	Small office	Medium office	Large office	Use staffing as proxy for office size
High	40,000	50,000	60,000	• Solar & batteries power backup, extensive(power & LAN) cabling, Secure & airconditioned server room, if applicable.
Medium	30,000	35,000	45,000	• Solar & batteries power backup, minimal(power & LAN) cabling, Secure server room
Low	10,000	20,000	30,000	• Minimal(power & LAN) cabling, Secure server room. Lower if costs limited to non-IT if reliable power/internet not available – paper file storage

#### Centralized system with linkages to local offices

	Small office	Medium office	Large (Central) office	Use staffing as proxy for office size
High	30,000	40,000	75,000	• Solar & batteries power backup, extensive(power & LAN) cabling, Secure & airconditioned central server room, ergonomic furniture
Medium	20,000	25,000	60,000	• Solar & batteries power backup, minimal(power & LAN) cabling, secure central server room
Low	5,000	10,000	40,000	• Minimal (power & LAN) cabling. Lower if costs limited to non-IT if reliable power/internet not available – paper file storage

### Hardware and equipment costs per office - \$US

Office size (staffing as proxy for office size)				Inclusions
	Small office	Medium office	Large (Central) office	
High	10,000	15,000	30,000	• Higher spec server & auxiliary equipment for central server • Low spec servers for other offices. • All new hardware & redundant workstations scanners & printers
Medium	10,000	15,000	20,000	• Medium spec server & auxiliary equipment for central server • Low spec servers for other offices. • Reuse some existing hardware & redundant workstations scanners & printers.
Low	10,000	10,000	15,000	• Lower spec server & auxiliary equipment for all offices • Reuse most workstation but ensure some redundant workstations scanners & printers in case of equipment failure. Lower if costs limited to non-IT if reliable power/internet not available – paper file storage

#### Estimated Physical ICT infrastructure upgrade costs per office

Office type	#	\$US		
		High	Med	Low
Small				
Medium				
Large				
Total				

#### Estimated hardware and equipment costs

Office type	#	\$US		
		High	Med	Low
Small				
Medium				
Large	1			
Total				





## Basic costing - Annual Operating Costs and LAaaS

Annual operating costs are again estimated using CoFLAS as a guide. These are estimated as a percentage of total capital costs. Land administration as a service fees are estimated based on international experience, and will vary by the extent of services provided and region.

When filling out the table, consider:

- Regional variations that may impact cost estimations.

### Annual Operating Costs

Hardware service cost per office				
	Small office	Medium office	Large (Central) office	Inclusions
ALL	10% of total hardware cost			<ul style="list-style-type: none"> <li>• Hardware, hardware consumables, and maintenance</li> </ul>

### ICT Infrastructure related operating costs

	Small office	Medium office	Large (Central) office	
High	10% of physical ICT infrastructure upgrade costs			<ul style="list-style-type: none"> <li>• Leased lines, internet, backup generators and fuel</li> </ul>
Medium				<ul style="list-style-type: none"> <li>• Internet and backup generators and fuel</li> </ul>
Low				<ul style="list-style-type: none"> <li>• Occasional internet, backup generators and fuel</li> </ul>

### Software license and support fee

	Small office	Medium office	Large (Central) office
ALL	20% of total capital cost		

### Annual LAaaS fee

	Small office	Medium office	Large (Central) office	
High	20% of initial LAaaS investment expense			<p>Incorporates LAaaS providers server infrastructure expenses, software license fees and support fees. LAaaS is a very recent offering and so associated fee estimates are quite speculative. Expect these fees to be in the 10% - 25% range</p>
Medium				
Low				

### Additional staff costs

	Small office	Medium office	Large (Central) office	
High	Estimate the number of additional staff required			<p>In the longer term computerization will generally result in staff savings however in the short term (first 5 years) there may be a need to establish new staff positions to provide ICT support to users of the land records and transaction system</p>
Medium				
Low				

### Replacement cost of system (in Yr 10)

Total	40% of investment cost		
-------	------------------------	--	--



## Basic costing - Preparatory Activities

A number of activities may be necessary to ensure sufficient accurate and reliable data is available to the land records and transaction system. These costs are covered in the following tools, including costs to cover systematic registration, document conversion, title conversion, spatial framework and other costs. Estimates are drawn from CoFLAS and international experience, they may or may not be relevant to MCC-funded project procurement approaches. Summary tables to the right should be used to update the module summary slide.

When filling out the table, consider:

- Regional variations that may impact cost estimations.
- Procurement approaches, including other overhead costs or required complementary costs, time constraints, and risk factors. These are factors in costs higher than indicated

### Systematic first registration or community recording – unit cost per property (\$US)

A	B	C	D
Adjudication by local volunteers, no surveys	Use of large scale image maps with little investment in GRN, paid field staff.	Use of large scale image maps with investment in GRN, paid field staff.	Ground surveys, with investment in GRN, paid field staff.
1	10	15	50

### Scanning existing land records – unit cost per property (\$US)

E.g. conversion of documents lacking survey information to new records with improved status/information

Scanning process	A	B	C	D
	Automated document scanning	Document scanning with some additional effort	Document scanning with additional work to resolve data quality	Document scanning with field verification to resolve identified anomalies in cadastre
Unit cost	Documents • sorted • consolidated • good condition • regular sizes 0.5	Documents • sorted • consolidated but in poor condition and/or irregular sizes 1	Documents sorted or consolidated. but in poor condition and irregularly sized 10	Documents in poor condition Unsorted, unconsolidated, some field verification required. 75

### Conversion process from deeds to title registration – unit cost per property (\$US)

Conversion process	A	B	C	D
	Data entry from deeds indexes	Data entry of registration transactions with further "live" interests	Matching of deeds to equivalent cadastral map parcels (typically with matching software)	Review of deeds documents to resolve or record issues preventing conversion (~30% of properties)
Unit cost	0.5	1.5	0.5	10

### Systematic registration costs

	A	B	C	D
Number of properties* in each category				
Total cost				
TOTAL				

### Conversion process costs

– from [tenure type] to [tenure type]

	A	B	C	D
Number of properties* in each category				
Total cost				
TOTAL				

### Conversion process costs

– from deeds to title registration

	A	B	C	D
Number of properties* in each category				
Total cost				
TOTAL				

\*it may be appropriate to estimate a percentage of total; refer [here](#) for property estimates



## Basic costing - Preparatory Activities continued

Identify also here (bottom table) other costs that may be applicable to this context.

### Upgrade of spatial framework

	Office size (staffing as proxy for office size)		
	Small office	Medium office	Large (Central) office
Design		100,000	
Continuously operating reference stations (CORS) & associated equipment (unit cost per office)	40,000	40,000	60,000
Imagery acquisition: HRSI, drone imagery, etc.		\$30/km*	
		*note a minimum cost for each supply usually applies	

### Other costs

Cost item	Office size (staffing as proxy for office size)		
	Small office	Medium office	Large (Central) office
Unit cost	Unit cost	Unit cost	Unit cost
Unit cost	Unit cost	Unit cost	Unit cost

### Upgrade of spatial framework

	S	M	H
Number of offices			1
CORS costs			160,000
Square km of HRSI coverage			
HRSI costs			
TOTAL			

### Other costs

	A	B	C
Number of units			
TOTAL Costs			
TOTAL			



## Legal and institutional pre-requisites and conditions module

This module is used to identify the key assumptions that have been made in developing investment options and to detail the likely pre-requisites and requirements (conditions precedent).

The tool should be completed for each investment option

**Funding Option:** \_\_\_\_\_

*Overview:*

	Considerations for each identified Strategic Option	Legal/institutional pre-requisites and requirements	Project actions needed to be included in scope and budget
Legal	<ul style="list-style-type: none"> <li>What assumptions have been made around the legal/regulatory environment?</li> <li>What are the core legal needs/issues?</li> </ul>	<i>e.g. Update legal tools to allow digital signature authorisation</i>	<i>Establish a land sector reform taskforce</i>
Institutional	<ul style="list-style-type: none"> <li>What is the institutional scope of the Option?</li> <li>What are the core institutional needs?</li> </ul>	<i>e.g. Review agency mandate for data sharing, acquisition, etc.</i>	
Business process	<ul style="list-style-type: none"> <li>What are the core business process issues?</li> </ul>		
Data sharing and information	<ul style="list-style-type: none"> <li>What is the status of data sharing and what are the core issues?</li> </ul>	Time,	



## Legal and institutional pre-requisites module – roles and responsibilities

Drawing on the previous identification of pre-requisite activities, use the below to identify key responsibilities for undertaking prerequisite actions and identify additional needs with respect to ensuring capacity to deliver and engaging with wider stakeholders.

Complete for each investment option

**Funding Option:** \_\_\_\_\_

Project actions needed to be included in scope and budget (last column of previous table)	Main responsible institution: role	Comment on institutions capacity to deliver	Other parties involved, how? subsequent roles
Establish a Land Sector Reform Task Force	Department of Lands, Ministry of Natural Resources and Environment: Chair of the Task Force, main funder.	Y/N: e.g. Assign Task Force leadership to Director, allocate budget to operate task force.	E.g. National Mapping Agency: Assign representative to Task Force.
Key activity 2 ...		Y/N:	
Key activity 3 ...		Y/N:	
Key activity 4 ...		Y/N:	



## Financial sustainability prerequisites

This tool is used to identify the existing (and/or likely future) availability of political and institutional This module is used to identify the key assumptions that have been made in developing investment options and to detail the likely pre-requisites and requirements (conditions precedent).

The tool should be completed for each investment option to identify assumptions and prerequisite actions prior to investment.

**Funding Option:** \_\_\_\_\_

*Overview:*

	Considerations for each identified Strategic Option	Financial sustainability pre-requisites and requirements	Project actions needed to be included in scope and budget
Financial	<ul style="list-style-type: none"> <li>What assumptions have been made around the legal/regulatory environment?</li> <li>What are the core legal needs/issues?</li> </ul>	<i>e.g. Ensure commitment from government to fund ongoing system operations and maintenance.</i>	<i>E.g. Undertake modelling to determine viability of fees/charges funding the system over the long-term.</i>
Political support	<ul style="list-style-type: none"> <li>Is there sufficient political support for the investment (and how is this demonstrated)?</li> <li>What further actions may be necessary and/or what are the implications of identified support levels?</li> </ul>	<i>e.g. Review agency processes for allocating budget</i> <i>e.g. Has there historically been sufficient budget allocated to the land agency? If not, what actions are suggested to ensure sufficient budget available in future?</i>	<i>E.g. Adoption of budgeting reform indicating dedicated resource line.</i>
Data and Demand	<ul style="list-style-type: none"> <li>Is there a sufficient data basis to support demand and/or revenue projections?</li> </ul>	<i>e.g. Review demand projection module and/or undertake additional modelling</i>	
Other..			



## Financial sustainability prerequisites – roles and responsibilities

Drawing on the previous identification of pre-requisite activities, use the below to identify key responsibilities for undertaking prerequisite actions and identify additional needs with respect to ensuring capacity to deliver and engaging with wider stakeholders.

Complete for each investment option

Funding Option: \_\_\_\_\_

Project actions needed to be included in scope and budget (last column of previous table)	Main responsible institution: role	Comment on institutions capacity to deliver	Other parties involved, how? subsequent roles
<i>E.g. Deliver modelling report to confirm long-term funding viability of land records and transaction system.</i>	<i>E.g. Department of Lands, Ministry of Natural Resources and Environment: Chair of the Task Force, main funder.</i>	<i>Y/N: e.g. Assign leadership to Director, allocate budget to do modelling.</i>	<i>E.g. Ministry of Finance to review.</i>
Key activity 2 ...		Y/N:	
Key activity 3 ...		Y/N:	
Key activity 4 ...		Y/N:	

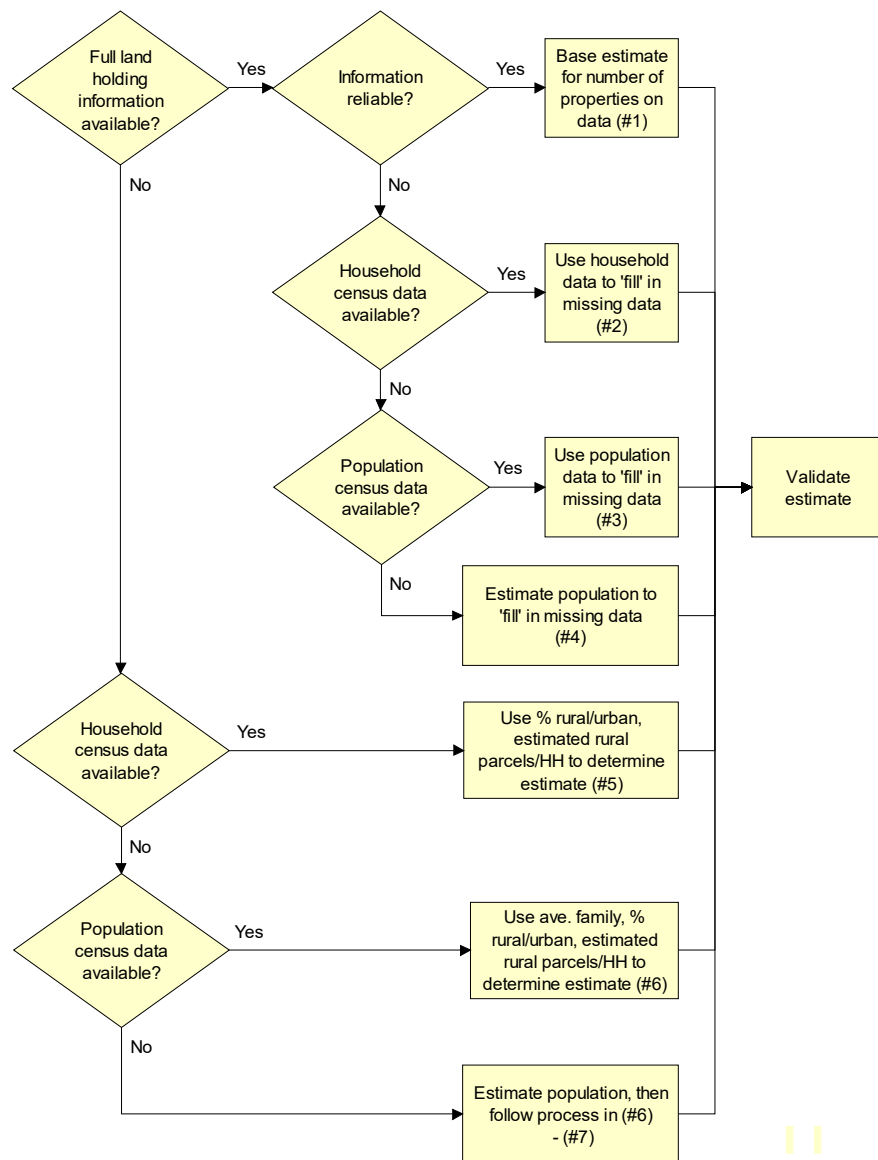






## Projection of present and future demand.

### Process for estimating total number of properties, if not reliably known



One step to determining the financial soundness of any investment in land records and transaction systems is to understand the number of properties present in the investment context. This may be known already, or may be estimated using census data.

If the number of properties is known, then these should be entered into the tool. If the number of properties is not known and must be estimated, the tool provides a basis for estimation. This tool draws from the Costing and Financing of Land Administration Services (CoFLAS) tool, with the full methodology available at pp 50-54. The steps within this methodology can be summarised in the Figure to the left, and the following steps identify the resources to be drawn upon :

1. Is household census data available? If yes, proceed, otherwise estimate or use population census data.
2. Use the [World Bank 'country at a glance'](#) to gain % urban population (E)
3. Use local estimate for
  - (F) condominium population, or 0
  - (G) % non-residential urban property, or 25%
  - (H) rural population dependent on agriculture, or 100%
  - (I) Average number of households/plot in agriculture, or census
  - (J) % non-agricultural rural plots, or 25%

These figures are compiled and calculated in the table on next slide.

The figure to the left depicts this workflow.



## Projection of present and future demand.

### *Calculate the estimated number of properties, if not reliably known*

A key-step to generating a sound financial arrangement to support an investment in land administration technology is understanding the number of properties present. This may be known already, or may be estimated using census data.

If the number of properties is known, then skip this section.

If not, go through the following steps:

1. **We adopt the assumption that there is one residential property per urban household.** Hence, columns (B) and (D) are used only if household data is unknown. Is household census data available? If yes, complete column C and ignore columns B and D. If no, estimate or use population census data to complete columns (B), (D) and then calculate (C).
2. Use [World Bank 'country at a glance'](#) to gain % urban population (E)
3. Use local estimate for
  - (F) condominium population, or 0
  - (G) % non-residential urban property, or 25%
  - (H) rural population dependent on agriculture, or 100%
  - (I) Average number of households/plot in agriculture, or census
  - (J) % non-agricultural rural plots, or 25%

The total number of properties can now be estimated and entered into the preceding table (slide 62), broken down by number of urban, rural and condominium. We use the following assumptions for these calculations:

- One residential property per urban household

**Number of urban land properties** =  $C * E * (1-F) * (1+G)$

**Number of rural land properties** =  $C * (1-E) * [(H*I) + (1-H)] * (1+J)$

**Number of condominiums** =  $C * E * F$

Where possible, this information should be validated – for example, through review by local experts and stakeholders as well as with international experience. Well developed countries may have as many as 1 property per every 1 or 2 people; whereas lower income countries may have 1 property for every 3-5 people, especially if communal tenure is prevalent.

A	B	C	D	E	F	G	H	I	J
Administrative Area	Pop.	Households	Ave. Pop/HH	% Pop. Urban	% urban pop. in condominium.	% of urban prop. non-resident.	% rural pop. in agricult.	Ave. plots/HH in agric.	% of rural plots non-agricult.
<b>Total</b>									



## Are there backlogs in responding to requests for services?

This module provides the basis for assessing the presence of a backlog in responding to land service requests (undertaking business processes). For the purposes of this table, a backlog is defined as an increasing number of outstanding applications over subsequent years.

An assessment of the backlog – and whether this is increasing or decreasing – speaks to the efficiency of the existing business processes to record transactions, and the need to reform the land records and transaction system. Backlog also, to some extent, provides evidence of demand and public use of the existing land records system.

The module records the number of outstanding applications over the past three financial years for each transaction type, to determine the extent of the current backlog, and whether this figure has been increasing or decreasing over recent years.

In filling out the table, consider:

- Only complete if information is easily available, preferably documented, but stakeholder inputs can also be a source of information.
- Has backlog been increasing or decreasing over recent years, and what might be the reason behind this?
- What does the growth or decline in backlog imply regarding a land record and transaction system investment?

Outstanding applications for transactions at year end for the agency as a whole				
#	Business process / Transaction Type <a href="#">(ref)</a>	Number of outstanding applications		
		- end of financial year x	- end of financial year x-1	- end of financial year x-2



# Stage 3: Final Pre-Approval Details

- Stage 3 follows the selection of the investment option to provide additional detail to the project definition, including
  - Identification of implementation modalities such as procurement strategies and implementing entities.
  - Further refinement of costing, using a Total Cost of Ownership approach

*The tools from Stage 2, including supplementary modules, can be used to summarize the selected investment option and its key features below. This forms the basis for finalizing details for the investment memo.*

Selected Funding Option:			
Technology level	High	Medium	Low
Solution components	1) 2) 3)		
Geographic Scope			
CPs/Reform Requirements: a) Legal/Institutional and b) Financial Sustainability	a) b)		
IM-stage (basic) cost + contingency			
IEA Roles and Responsibilities for Implementation			



## Selection of Final Funding Option

Drawing on the previous Stage 2 tools and modules, review the Funding Options and select the most appropriate. Identify preferred investment option and Technology Level, and complete table fields (below) reflecting the selected option.

Selected Funding Option: _____		Technology Level _____
Key technology and systems solution components, as relevant	Detail components/steps, building upon <a href="#">original option</a> 1) 2) 3)	
Additional necessary components addressing legal/institutional and finance/financial sustainability issues not addressed by technology	Detail components/steps, building upon <a href="#">original option</a> 1) 2) 3)	
Geographic Scope	Detail whether national, urban/rural and/or which administrative areas to be covered.	
CPs/Reform Issues to be addressed	Refer to identified prerequisites/reform requirements: a) <a href="#">Legal/Institutional</a> and b) <a href="#">Financial Sustainability</a>	
Approval-stage (basic) cost + contingency	From <a href="#">basic costing</a>	
Implementing entity roles and responsibilities for implementation		
Budgetary allocation to implementing entities if/as required to support operating costs		
Comment re: risk and sustainability	<a href="#">Draw from sustainability and risk assessment</a>	
Other selection reasons		



## Procurement packaging and implementation (IEA) arrangements

### Identify procurement strategy

This tool provides a high-level indication of the key activities necessary and the proposed resource arrangements under each of the identified strategic options.

Activity	Selected Funding Option	
	Applicable	Provision by
Software design and development	<input type="checkbox"/>	<input type="checkbox"/> In-house <input type="checkbox"/> Other Govt. <input type="checkbox"/> Contractor <input type="checkbox"/> [other?]
Procurement of hardware	<input type="checkbox"/>	
Procurement of civil works	<input type="checkbox"/>	
Capacity building and training	<input type="checkbox"/>	<input type="checkbox"/> In-house <input type="checkbox"/> Other Govt. <input type="checkbox"/> Contractor <input type="checkbox"/> [other?]
Digitization of existing manual records (including any necessary restoration work)	<input type="checkbox"/>	<input type="checkbox"/> In-house <input type="checkbox"/> Other Govt. <input type="checkbox"/> Contractor <input type="checkbox"/> [other?]
Systems administration	<input type="checkbox"/>	<input type="checkbox"/> In-house <input type="checkbox"/> Other Govt. <input type="checkbox"/> Contractor <input type="checkbox"/> [other?]
Internet access and/or network arrangements	<input type="checkbox"/>	<input type="checkbox"/> In-house <input type="checkbox"/> Other Govt. <input type="checkbox"/> Contractor <input type="checkbox"/> [other?]
Base mapping (including digital cadastral mapping, orthophotos and acquisition of satellite imagery)	<input type="checkbox"/>	<input type="checkbox"/> In-house <input type="checkbox"/> Other Govt. <input type="checkbox"/> Contractor <input type="checkbox"/> [other?]
Business continuity planning	<input type="checkbox"/>	<input type="checkbox"/> In-house <input type="checkbox"/> Other Govt. <input type="checkbox"/> Contractor <input type="checkbox"/> [other?]
Other consultant services	<input type="checkbox"/>	
[other?]	<input type="checkbox"/>	



## Indicative Total Cost of Ownership – Detailed Budget Estimate Prior to Program Approval

The preparation of indicative costings is a key component of assessing strategic options for the land administration technology investment.

This tool builds on earlier basic costings to provide further detail to the Funding Option selected, covering a 10 year period. It is important to note that MCC or another funder may decide to fund only certain elements of any system as agreed with the Government in the Compact Agreement. Examples may be the Government funding the cost of additional staff and ongoing operations or the cost of certain hardware, etc.

When filling out the table, consider:

- Does the list of cost items cover all anticipated items for the initial investment and ongoing operations?
- Identify and estimate the cost of these additional items for the particular context/investment.
- Note that commencing procurement in Year 1 may be ambitious, so initial costs can be delayed.
- Where possible, identified costs should be reviewed by relevant experts – though the process should not be significantly delayed in doing so.

### Summary of costs, showing example approach to apportion costs

#### Establishment costs (US\$)

	Yr1	Yr2	Yr3	Yr4	Yr5	Yr6	Yr7	Yr8	Yr9	Yr10	Check Total %
Software & software development	20%	30%	40%	10%							
Physical ICT infrastructure	50%	50%									
Hardware & Equipment		20%	80%								
Initial LAaaS service contract			100%								
Other Costs	30%	40%	30%								
Contingency*	8%	12%	20%	30%	30%						
<b>Funding Total</b>	<i>Total Yr 1</i>	<i>Total Yr 2</i>	<i>Total Yr 3</i>	<i>Total Yr 4</i>	<i>Total Yr 5</i>	<i>Total Yr 6</i>	<i>Total Yr 7</i>	<i>Total Yr 8</i>	<i>Total Yr 9</i>	<i>Total Yr 10</i>	<i>Total establishment funding needs</i>

#### Operations and maintenance costs

	Yr1	Yr2	Yr3	Yr4	Yr5	Yr6	Yr7	Yr8	Yr9	Yr10	Check Total %
Annual Operating Costs					50%	50%	100%	100%	100%	100%	
Laaas Annual fee						100%	100%	100%	100%	100%	
Cost of replacement system or system upgrade at end of operating life										100%	
Additional staff costs	?extra staff cost	?extra staff cost	?extra staff cost	?extra staff cost	?extra staff cost	?extra staff cost	?extra staff cost	?extra staff cost	?extra staff cost	?extra staff cost	
<b>Required land agency operational budget(US\$)</b>	<i>Total Yr 1</i>	<i>Total Yr 2</i>	<i>Total Yr 3</i>	<i>Total Yr 4</i>	<i>Total Yr 5</i>	<i>Total Yr 6</i>	<i>Total Yr 7</i>	<i>Total Yr 8</i>	<i>Total Yr 9</i>	<i>Total Yr 10</i>	<i>Total operational budget allocations required</i>

- Note contingency is suggested at 40%, apportioned over the years when establishment costs are expected to be incurred.
- Replacement/upgraded system costs at end of life suggested as 30% of original establishment costs



## Indicative Total Cost of Ownership: Detailed costing

The preparation of indicative costings is a key component of assessing strategic options for the land administration technology investment. A worksheet is ultimately provided to capture individual cost items, their quantities and unit costs.

A Total Cost of Ownership approach recognises that the components of an investment comprise establishment costs, operations and maintenance costs, and long-term post-project costs that may need to be considered.

The following tool overview provides a summary of cost items likely to be encountered. The worksheet should be referred to for the complete tool, including indicative costs to facilitate a rapid, but complete costing.

Ongoing operations and long-term expenses would normally be assumed by the land agency. Additionally, MCC or other funders may agree that the Government fund certain elements of system development and implementation.

When filling out the table, consider:

- Appropriateness of expenditure categories, and revise as necessary
- Availability of information, both documented and from stakeholders
- Whether the table should be repeated for more than one land agency.
- What assumptions are being made? What information is missing?





## Indicative Total Cost of Ownership: Detailed costing

Initial Donor Funding Expense	Operation expenses during and post-project	Long-term expenses post-project
<b>Software &amp; software development</b>		
<ul style="list-style-type: none"> <li>• Server operating system &amp; utility software</li> <li>• Server DBMS with spatial processing software</li> <li>• Server Report Generation software</li> <li>• Server Application Server software</li> <li>• Server Document Archive software</li> <li>• Server Geospatial imagery publishing software</li> <li>• Workstation office &amp; utility software</li> <li>• *Supply, installation, configuration, training and initial software support of land administration software package</li> <li>• *Migration expenses</li> <li>• *ICT services contract for software customization or bespoke software development</li> </ul>	Software licence fees <ul style="list-style-type: none"> <li>• Ongoing user training</li> <li>• Audit (internal and external)</li> <li>• Insurance</li> <li>• *Software support</li> </ul> <i>Risks mitigation (covering e.g. downtime, failure and outage expenses; diminished performance (i.e. users having to wait, diminished money-making ability); security (including breaches, loss of reputation, recovery, and prevention))</i>	<ul style="list-style-type: none"> <li>• *Replacement</li> <li>• *Future upgrade</li> </ul>
<b>Physical ICT infrastructure</b>		
<ul style="list-style-type: none"> <li>• Contract to provide and install alternative solar power system including batteries</li> <li>• Contract to upgrade and extend current power cabling &amp; sockets in land agency offices</li> <li>• Contract to upgrade and extend (or establish) CAT6 LAN cabling in land agency offices</li> <li>• Contract with Telco for leased communication lines/VPN between central land agency office and all land agency offices to be connected to new land system (or for upgrade of existing leased lines)</li> <li>• Contract with Telco to provide internet connectivity to land agency offices</li> <li>• *Renovation of land agency offices' server rooms including making them more physically secure and airconditioned</li> </ul>	<ul style="list-style-type: none"> <li>• Infrastructure (office floor space)</li> <li>• Electricity (for related equipment, cooling, backup power)</li> <li>• Leased lines/private VPN</li> <li>• Internet connectivity</li> <li>• Servicing of solar power setup</li> </ul>	
<b>Hardware and equipment</b>		
<ul style="list-style-type: none"> <li>• Server</li> <li>• Workstation</li> <li>• UPS</li> <li>• Data backup device</li> <li>• Wifi router</li> <li>• A4 Laser printers</li> <li>• A3 Inkjet printer</li> <li>• A4 scanner with ADF</li> <li>• A3 scanner</li> <li>• Tables for hardware</li> <li>• Ergometric furniture for workstations &amp; operators</li> <li>• Initial warranty &amp; servicing arrangement</li> <li>• Printer consumables for first 6 months of operation</li> <li>• Contract for offsite storage of data backups (e.g. Dropbox or cloud server storage)</li> </ul>	Hardware maintenance & servicing <i>Downtime, failure and outage expenses</i>	<ul style="list-style-type: none"> <li>• *Replacement</li> <li>• *Future upgrades or upscaling to deal with increased volumes of transactions</li> <li>• *Decommissioning of items</li> </ul>
<b>Land Administration as a Service (LAaaS) arrangements – if relevant</b>		
<i>Initial contract to provide a LAaaS service to the land agency for a defined period (no less than 5 years)</i>	<i>Subsequent contracts to provide a LAaaS service to the land agency</i>	<ul style="list-style-type: none"> <li>• *Replacement</li> <li>• *Future upgrade or scalability expenses</li> <li>• *Decommissioning of supplier</li> </ul>
<b>Additional staffing (permanent &amp; contract positions)</b>		
<ul style="list-style-type: none"> <li>• Individual contractors to undertake data entry tasks</li> <li>• Individual contractors to undertake bespoke software development of new land system</li> <li>• Individual contractors to provide software support for an initial period of time</li> </ul>	<ul style="list-style-type: none"> <li>• Recruit software developers for software support to land agency users</li> <li>• Recruit data entry operators to accept applications at land agency public counters or digitise critical paper land records</li> <li>• Recruit call center staff to provide user support</li> </ul>	
<b>Additional items necessary</b>		
E.g. Preparatory costs		



## Indicative Total Cost of Ownership – Detailed Costing Worksheet overview

The detailed TCO worksheet should be completed. An snapshot of the tool is provided below.

Cost Category	Units	Number of Units							(Cost US\$)								Fund Source	Procurement Method
		2020	21	22	23	24	Total Units	Unit Cost	2020	21	22	23	24	Total Cost				
Initial Assessment and Design Expense																		
Hardware Costs																		
Rack server / Cloud storage	unit																	
LAN router and cabling / wireless router	unit																	
UPS and batteries	unit																	
Air conditioning unit for the server room	unit																	
Desktop computers with UPS protection	unit																	
Panchromatic laser printers	unit																	
A3 Color Inkjet printer	unit																	
A3/A4 scanners	unit																	
Tablet mobile devices	unit																	
6-month supply of printer consumables	unit																	
Internet access for remote support	unit																	
Consulting services																		
Record scanning, digitisation,	contract																	
Technical design specification	contract																	
Architectural design	contract																	
Public Awareness	contract																	
Software development	contract																	
Training	contract																	
Civil Works																		
Office renovation	contract																	
Building works	contract																	
Incremental Cost																		
Travel	unit																	
Accommodation	unit																	
Per diem	unit																	
Media expenses	unit																	
Utilities, Communication, Internet	unit																	
Workshops	unit																	
Ongoing Operational Expense																		
Software Licenses																		
COTS – Land (LIS related)	Year																	
COTS - DBMS	Year																	
COTS - GIS	Year																	
COTS - Reports	Year																	
COTS – server other including operating system etc.	Year																	
COTS – for workstations (Operating System, Anti-virus, word processing, spreadsheets etc.)	Year																	
Software Development (including customization and configuration)																		
Software developers (employed by or under contract to land agency)	Person - month																	
S consultancy (note this is the same Consultancy Services – software development below)	One-Off																	
System Support (ongoing)																		
Software maintenance & support (COTS, Open Source & Bespoke software)	Year																	
Server related hardware support	Year																	
Other hardware support (beyond warranty period) for workstations, printers, scanners, network cabling & devices	Year																	
IaaS establishment, use & operation - could also be shown under Consultancy Services below	Year																	
Dedicated land agency system support staff (or contractor staff)	Person years																	



# Stage 4:

## Post Approval Detailed Planning and Scoping

Stage 4 provides further inputs to support detailed planning and scoping of the investment following development of the investment memorandum.

It includes a tool to determine the specific functional and non-functional requirements of the technology solution, as well as a tool to determine appropriate software development and software architecture approaches.

Material and topics included in this section may certainly be examined during the MCC Pre-Approval/Compact Development stage, but in general are unlikely to alone be drivers of project approval decisions, hence their inclusion for post-approval purposes.



## What are the functional requirements for the selected investment option?

This tool identifies the [functional requirements](#) and provides a basis for determining their relevancy, and ranking in terms of most critical in order to delimit requirements as necessary.

In filling out the table, you should consider:

- Achieving the ranking via a workshop or some similar means in order to achieve some level of consensus

	Functional Requirements	Comments
<b>Process land administration transactions</b>		
<input type="checkbox"/>	Case management of each transaction	
<input type="checkbox"/>	Process services according to specific workflow	
<input type="checkbox"/>	Calculate fee calculation & record receipts for fees paid	
<b>Manage Property Details</b>		
<input type="checkbox"/>	Retrieve property details	
<input type="checkbox"/>	Retrieve property history of transactions	
<input type="checkbox"/>	Retrieve scanned images of supporting documents for transactions (past and current)	
<input type="checkbox"/>	Edit property details (corrections & refinements)	
<b>Manage Spatial Units (Parcels)</b>		
<input type="checkbox"/>	Support subdivision/split of parcels service	
<input type="checkbox"/>	Support merge parcels service	
<input type="checkbox"/>	Support redefine/correct parcel boundaries service	
<input type="checkbox"/>	Support for other spatial units (e.g. easements, land to be acquired, assessment units etc)	
<b>Manage Spatial Information</b>		
<input type="checkbox"/>	Search and view spatially defined cadastre objects	
<input type="checkbox"/>	Search property/parcel and transaction details spatially	
<input type="checkbox"/>	Display other spatial map layers	
<b>Manage Rights, Restrictions &amp; Responsibilities (RRR)</b>		
<input type="checkbox"/>	Support registration & recording services	
<input type="checkbox"/>	Support services to cancel registration or recording of RRR	
<input type="checkbox"/>	Support the recording of RRR rightsholders (including changes to rightsholder details)	
<input type="checkbox"/>	Support mass systematic registration (including the bulk loading of completed systematic registration records)	



## What are the functional requirements for the selected investment option?

	Functional Requirements	Comment
<b>Manage Digital Document Archive</b>		
<input type="checkbox"/>	To store (for easy retrieval) scanned images of documents supporting a transaction	
<input type="checkbox"/>	Link these scanned images to the requested service and the appropriate properties	
<input type="checkbox"/>	Search and retrieve document images stored in the digital document archive	
<input type="checkbox"/>	Bulk loading of scanned historic land records	
<b>Generation of certificates and reports</b>		
<input type="checkbox"/>	Generate certificates that have been customized to meet local legal requirements and language	
<input type="checkbox"/>	Generate client search products (including those with maps)	
<input type="checkbox"/>	Generate notifications associated with land administration services	
<input type="checkbox"/>	Auto generate email (or SMS) notifications to applicant / owner when key milestones of a service are passed	
<input type="checkbox"/>	Generate office (or staff member specific) transaction processing metrics report	
<b>Linkages with other IT systems within land agency</b>		
<input type="checkbox"/>	Land Lease system / Finance system	
<input type="checkbox"/>	Mapping system	
<input type="checkbox"/>	Document management system / Land Record Digital Archive	
<input type="checkbox"/>	Mass systematic registration system	
<input type="checkbox"/>	Other	
<b>Linkages with external systems</b>		
<input type="checkbox"/>	Taxation Office system	
<input type="checkbox"/>	Citizen ID system	
<input type="checkbox"/>	Other	
<b>Other functional requirements <i>not identified above</i></b>		



## What are the non-functional requirements for the selected funding option?

[Non-functional requirements](#) encompass criteria used to judge the operation of a system, typically detailed in a system architecture. This tool provides the basis for determining the applicability of common non-functional requirements.

In filling out the table, you should consider:

- Achieving the ranking via a workshop or some similar means in order to achieve some level of consensus

	Non-functional requirements	Comment
<b>System security</b>		
<input type="checkbox"/>	User authentication	
<input type="checkbox"/>	User role management including managed access to perform certain functions and view certain database and archive details	
<input type="checkbox"/>	Logging of all changes to critical data elements	
<input type="checkbox"/>	Ability to audit database changes and system access	
<input type="checkbox"/>	Land agency network protected by firewall (if there is external connectivity)	
<input type="checkbox"/>	SSL (TLS) encryption between server hosting web application and client computers (if technology involves a web application accessed via the internet)	
<b>Software maintainability</b>		
<input type="checkbox"/>	Commitment to updating LRT IT system/land administration technology software including dealing with newly identified security vulnerabilities	
<input type="checkbox"/>	The ability for land agency (system support) to maintain reference data / code lists	
<input type="checkbox"/>	The ability for land agency (system support) to modify business rule logic including validation routines and workflow logic	
<input type="checkbox"/>	Support for refining language localizations in any software	
<b>Software portability</b>		
<input type="checkbox"/>	Specify the operating system(s) required on the server and client computers	
<input type="checkbox"/>	Specify the web browsers to be used on client computers	
<input type="checkbox"/>	Specify application server	
<input type="checkbox"/>	Specify which Database Management System (DBMS)	
<input type="checkbox"/>	Specify report generation app	
<input type="checkbox"/>	Specify geospatial mapping app	
<input type="checkbox"/>	Specify related mobile applications and the means of data exchange	
<input type="checkbox"/>	Specify the means of deployment	Desktop app, local client-server, web client server, local server but “cloud ready”, cloud. Docker – non Docker



## What are the non-functional requirements for the selected funding option?

	Non-functional requirement	Comment
<b>User Interface</b>		
<input type="checkbox"/>	Style of user interface	
<input type="checkbox"/>	Layout of Dashboard	
<input type="checkbox"/>	Help function	
<b>Standards to be adopted</b>		
<input type="checkbox"/>	Land Administration Domain Model (LADM) ISO 19152:2012 – database design	
<input type="checkbox"/>	Simple Feature Access Part 2 SQL Options (ISO 19125:2004) - database spatial definitions & associated SQL queries	
<input type="checkbox"/>	Geographic Markup Language (GML) – spatial data interchange	
<input type="checkbox"/>	PDF/A ISO 19005 – scanned land records	
<input type="checkbox"/>	Unicode – for certain language scripts	
<input type="checkbox"/>	JSON ISO/IEC 21778:2017 for interchange of data between mobile devices and servers/workstations	
<input type="checkbox"/>	HTTPS RFC 2818 – for safe & secure access to web applications via the internet	
<input type="checkbox"/>	National Unique Parcel Identifier – in parcel related records	
<input type="checkbox"/>	Other	
<b>Other non-functional requirements</b>		



## Suitability of a BESPOKE software development option

This module provides a simplified decision framework for selecting appropriate approaches to the technology investment. The tool cycles through options applicable to a traditional approach, including bespoke software development, in-house development or commercial off-the-shelf product selection with or without customisation. Appropriate software architecture approaches are then reviewed, before determining the applicability of a less traditional approach of Land Administration as a Service (LAaaS). In each case a series of questions are posed. It may not be necessary to answer each, any red (typically negative) response indicates that option is unsuitable. If users have in mind a preferred or likely option, it may be strategic to move straight to that section .

To complete: review the questions below and ‘tick’ the applicable option, drawing from previous tools.

- Any **RED** response indicates a Bespoke option is NOT suitable
- **GREEN** responses to all questions indicates a Bespoke option appears to be suitable
- A mixture of **GREEN** & **ORANGE** responses indicates a Bespoke option may be suitable

Note that a bespoke software development would potentially still involve *COTS or Open Source software applications and the customization of these applications.*

Suitability Question	Responses			Additional Comment/ Justification
	GREEN	ORANGE	RED	
Are there software development providers with the right expertise and experience prepared to engage with the land agency to develop the required software solution and, in the longer term to support the software solution?	<b>___ Team has appropriate expertise and experience and it is possible to recruit further software developers locally</b>	<b>___ Team might not have expertise or experience necessary for proposed investment but it is possible to recruit further software developers locally</b>	<b>___ No</b>	
Is there in-house capability within the land agency to <u>manage</u> this software development or could a suitably experienced consultant (ideally local) be recruited to assist the land agency in this role?	<b>___ Yes, including someone trained in a modern software development methodology</b>	<b>___ Yes but software development methodology training required OR an external (local) consultant recruited for the project</b>	<b>___ No and it would be difficult to recruit someone locally</b>	
Does the land agency commit to make available to the software development provider staff members expert in the business processes impacted by the proposed investment to elaborate the functional requirements and participate in user acceptance testing ?	<b>___ Yes</b>	<b>___ Yes, but laptops and internet connectivity may need to be arranged (for communications between these land agency staff and the software developer provider etc)</b>	<b>___ No</b>	





## Suitability of an IN-HOUSE software development option

To complete: review the questions below and 'tick' the applicable option, drawing from previous tools.

Any **RED** response indicates an in-house option is NOT suitable

**GREEN** responses to all questions indicates an in-house option appears to be suitable

A mixture of **GREEN** & **ORANGE** responses indicates an in-house option may be suitable

Suitability Question	Responses			Additional Comment/ Justification
	GREEN	ORANGE	RED	
Is there an existing in-house team of software developers and can that team be augmented by recruiting contractors or new staff?	<input type="checkbox"/> <b>Team has appropriate expertise and experience and it is possible to recruit further software developers locally</b>	<input type="checkbox"/> <b>Team might not have expertise or experience necessary for proposed investment but it is possible to recruit further software developers locally</b>	<input type="checkbox"/> <b>No</b>	
Is there in-house capability to <u>manage</u> this software development?	<input type="checkbox"/> <b>Yes, including someone trained in a modern software development methodology</b>	<input type="checkbox"/> <b>Yes but software development methodology training required OR an external (local) consultant recruited for the project</b>	<input type="checkbox"/> <b>No and it would be difficult to recruit someone locally</b>	
Is the extension or upgrade of one of the existing LRT IT systems developed or supported by their in-house software developer team considered a potential technology solution for the proposed investment?	<input type="checkbox"/> <b>Yes</b>	<input type="checkbox"/> <b>Yes, but upskilling of the in-house team would be required</b>	<input type="checkbox"/> <b>No and the necessary expertise and experience is lacking in the in-house team and not easily remedied</b>	
Are the existing LRT IT systems developed by the in-house software developer team considered to be "well constructed" ?	<input type="checkbox"/> <b>Yes</b>	<input type="checkbox"/> <b>No, but in-house team could be up-skilled and with better leadership is capable of developing "well constructed" software for the proposed investment</b>	<input type="checkbox"/> <b>No, and upskilling in the timeframe of the proposed investment is not likely</b>	
Is the experience gained from developing (or supporting) an existing LRT IT system relevant to the software development envisaged in the proposed investment ?	<input type="checkbox"/> <b>Yes</b>	<input type="checkbox"/> <b>Yes but some upskilling or recruitment of software developers with particular skills would be necessary</b>	<input type="checkbox"/> <b>No</b>	



## Suitability of a COTS software development option

To complete: review the questions below and 'tick' the applicable option, drawing from previous tools.

Any **RED** response indicates a COTS option is NOT suitable

**GREEN** responses to all questions indicates a COTS option appears to be suitable

A mixture of **GREEN** & **ORANGE** responses indicates a COTS option may be suitable

Suitability Question	Responses			Additional Comment/ Justification
	GREEN	ORANGE	RED	
Are there COTS offerings that meet the system requirements for this proposed investment?	<input type="checkbox"/> <i>There is a complete match of all critical requirements (potentially involving configuration) &amp; the remaining requirements can be met through customization of the software</i>	<input type="checkbox"/> <i>Customization is required to meet critical requirements</i>	<input type="checkbox"/> <i>There are critical requirements that cannot be met</i>	
Do the COTS providers have a local agent with software support capacity ?	<input type="checkbox"/> <i>Yes</i>	<input type="checkbox"/> <i>Yes but there is no previous association with the land agency</i>	<input type="checkbox"/> <i>No</i> <i>OR</i> <i>there is a local agent but previous associations with the land agency (or other local organizations have not been constructive</i> <i>OR</i> <i>previously the local agent has not been well supported by the COTS provider</i>	
Are the COTS providers able to provide firm costing of licence fees and software support to the land agency for first 5 years of post Compact operation of the software provided?	<input type="checkbox"/> <i>Yes</i>	<input type="checkbox"/> <i>No, but there is a willingness to negotiate</i>	<input type="checkbox"/> <i>No and there is a history of price hikes when development assistance ends</i>	



## Suitability of a MONOLITH software architecture

To complete: review the questions below and 'tick' the applicable option, drawing from previous tools.

Any **RED** response indicates a Monolith architecture is NOT suitable

**GREEN** responses to all questions indicates a Monolith architecture appears to be suitable

A mixture of **GREEN** & **ORANGE** responses indicates a Monolith architecture may be suitable

Suitability Question	Responses			Additional Comment/Justification
	GREEN	ORANGE	RED	
Each land agency office will operate a discrete stand-alone system (on either a single workstation or server and local area network) ?	<input type="checkbox"/> <b>Yes</b>		<input type="checkbox"/> <b>No</b>	
Continuous, reliable internet connectivity is <u>not</u> available nor is continuous internet connectivity required to meet software requirements?	<input type="checkbox"/> <b>Continuous internet not required or is not available</b>	<input type="checkbox"/> <b>Yes providing occasional internet is available for system support</b>	<input type="checkbox"/> <b>No, internet connectivity is required to meet software requirements</b>	
This will be : <ul style="list-style-type: none"> <li>the first computerized LRT IT system in the land agency,</li> </ul> AND <ul style="list-style-type: none"> <li>software development will be undertaken using relatively inexperienced developers</li> </ul> AND <ul style="list-style-type: none"> <li>there are no requirements for system linkages (internal or external)</li> </ul> AND <ul style="list-style-type: none"> <li>Software requirements indicate software complexity is low</li> </ul>	<input type="checkbox"/> <b>If all these conditions apply</b>	<input type="checkbox"/> <b>If a simple data exchange mechanism is sufficient to achieve a system linkage requirement</b>	<input type="checkbox"/> <b>No (if one or more of these conditions do not apply)</b>	
Are the currently stated system requirements likely to change ?	<input type="checkbox"/> <b>The land agency is strongly committed to these requirements &amp; they are likely to remain highly relevant for at least the next 5 years</b>	<input type="checkbox"/> <b>These requirements are likely to remain relevant for at least the next 5 years</b>	<input type="checkbox"/> <b>Not known OR the land agency (or public sector generally) are subject to significant change OR there is a chaotic environment</b>	



## Suitability of a SERVICE-ORIENTED (SOA) software architecture

To complete: review the questions below and 'tick' the applicable option, drawing from previous tools.

Any **RED** response indicates a SOA architecture is NOT suitable

**GREEN** responses to all questions indicates a SOA architecture appears to be suitable

A mixture of **GREEN** & **ORANGE** responses indicates a SOA architecture may be suitable

Suitability Question	Responses			Additional Comment/ Justification
	GREEN	ORANGE	RED	
Do the requirements include linkages to other systems (local or external) ?	<input type="checkbox"/> <b>Yes</b>		<input type="checkbox"/> <b>No</b>	
Do some of these factors apply :to this new LRT IT system ?	<input type="checkbox"/> <b><i>If all of these factors apply</i></b>	<input type="checkbox"/> <b><i>If some of these factors apply</i></b>	<input type="checkbox"/> <b><i>If none of these factors apply</i></b>	
<ul style="list-style-type: none"> <li>this is the first computerized LRT IT system in the land agency,</li> <li>software development will be undertaken using relatively inexperienced developers</li> <li>software requirements indicate software complexity is low – moderate</li> <li>system will contain records for more than 100,000 parcels ( or land titles or properties etc)</li> <li>a system upgrade to incorporate more functionality in the next 3 years is likely</li> </ul>				



## Suitability of a MICROSERVICES software architecture

To complete: review the questions below and 'tick' the applicable option, drawing from previous tools.

Any **RED** response indicates a Microservices architecture is NOT suitable  
**GREEN** responses to all questions indicates a Microservices architecture appears to be suitable  
 A mixture of **GREEN** & **ORANGE** responses indicates a Microservices architecture may be suitable

Suitability Question	Responses			Additional Comment/ Justification
	GREEN	ORANGE	RED	
Is this new system an upgrade of an existing LRT IT system ?	<input type="checkbox"/> Yes	<input type="checkbox"/> No, but there is significant local microservice architecture software development experience	<input type="checkbox"/> No	
Is there significant local microservice architecture software development ?	<input type="checkbox"/> Yes	<input type="checkbox"/> No, but local software developers involved can be up-skilled	<input type="checkbox"/> No	
Is continuous, reliable internet connectivity available ?	<input type="checkbox"/> Yes		<input type="checkbox"/> No	
Do software requirements indicate software complexity is moderate – high?	<input type="checkbox"/> Yes	<input type="checkbox"/> No, but there is significant local microservice architecture software development experience	<input type="checkbox"/> No	



## Suitability of a SERVERLESS architecture

To complete: review the questions below and 'tick' the applicable option, drawing from previous tools.

Any **RED** response indicates a Server-less architecture is NOT suitable  
**GREEN** responses to all questions indicates a Server-less architecture appears to be suitable  
 A mixture of **GREEN** & **ORANGE** responses indicates a Server-less architecture may be suitable

Suitability Question	Responses			Additional Comment/ Justification
	GREEN	ORANGE	RED	
Is continuous, reliable internet connectivity available?	<input type="checkbox"/> Yes		<input type="checkbox"/> No	
Are there any legal or policy constraints on the use of cloud servers located in another country?	<input type="checkbox"/> Yes	<input type="checkbox"/> <i>if the legal or constraint can be changed to allow such use within a timeframe that does not delay implementation of the new system</i>	<input type="checkbox"/> No	
Is there international consensus and standards covering the implementation of server-less architecture?	<input type="checkbox"/> Yes		<input type="checkbox"/> No	
Is this new system an upgrade of an existing LRT IT system?	<input type="checkbox"/> Yes	<input type="checkbox"/> <i>No, but there is significant local server-less architecture software development experience</i>	<input type="checkbox"/> No	
Is there significant local server-less architecture software development experience?	<input type="checkbox"/> Yes	<input type="checkbox"/> <i>No, but local software developers involved can be up-skilled</i>	<input type="checkbox"/> No	
Do software requirements indicate software complexity is moderate – high?	<input type="checkbox"/> Yes	<input type="checkbox"/> <i>No, but there is significant local microservice architecture software development experience</i>	<input type="checkbox"/> No	



## Tool to assess suitability of LAAS Software + O&M option

To complete: review the questions below and 'tick' the applicable option, drawing from previous tools.

Any **RED** response indicates a LAaaS service solution is NOT suitable  
**GREEN** responses to all questions indicates a LAaaS service solution appears to be suitable  
 A mixture of **GREEN** & **ORANGE** responses indicates a LAaaS service solution may be suitable

Suitability Question	Responses			Additional Comment/ Justification
	GREEN	ORANGE	RED	
Can reliable and affordable internet be provided in all land agency offices where land administration transactions and services are initiated, processed or delivered ?	<input type="checkbox"/> <i>Suitable internet is available in all land agency offices</i>	<input type="checkbox"/> <i>Suitable internet will be available in some land agency offices during first half of the Compact</i>	<input type="checkbox"/> <i>Suitable internet will not be available until at least the second half of the Compact</i>	
Is there suitable LAN, power & other land office infrastructure or can it be sufficiently upgraded?	<input type="checkbox"/> <i>Suitable reliable infrastructure exists</i>	<input type="checkbox"/> <i>infrastructure can be upgraded or undertaken as part of the preparations for the proposed investment</i>	<input type="checkbox"/> <i>It is not certain when infrastructure will be adequately upgraded</i>	
What is the state of maturity of LAaaS offerings? Are there LAaaS offerings that meet the system requirements for this proposed investment?	<input type="checkbox"/> <i>There is a complete match on all highly ranked requirements &amp; most of the remaining requirements</i>	<input type="checkbox"/> <i>All critical requirements can be met</i>	<input type="checkbox"/> <i>There are critical requirements that cannot be met</i>	
Are the currently stated system requirements likely to change ?	<input type="checkbox"/> <i>The land agency is strongly committed to these requirements &amp; they are likely to remain highly relevant for at least the next 5 years</i>	<input type="checkbox"/> <i>These requirements are likely to remain relevant for at least the next 5 years</i>	<input type="checkbox"/> <i>Not known OR the land agency (or public sector generally) are subject to significant change OR there is a chaotic environment</i>	
Is there experience within the client government in managing similar "As a Service" arrangements ?	<input type="checkbox"/> <i>Yes there is experience and it has been a positive experience</i>	<input type="checkbox"/> <i>Yes there is experience but experience has been mixed</i>	<input type="checkbox"/> <i>No</i>	
Are there any legal impediments to computerization of land administration transaction processing or government "As a Service" arrangements?	<input type="checkbox"/> <i>No</i>	<input type="checkbox"/> <i>Yes, but any impediments can be accommodated</i>	<input type="checkbox"/> <i>Yes</i>	



# Stage 5:

## Post Approval Rollout Planning

- Stage 5 follows project development and looks toward rollout planning of the investment. It includes one tool, that seeks to provide additional details critical to implementation planning for a land records and transaction system investment.
- Elements the tool addresses include
  - Business process re-engineering
  - Business continuity
  - Data conversion
  - System complexity
  - Training and capacity development
- The tool seeks to flag possible strategies that address risks that may impact the success, pace or sustainability of implementation





## What additional details are critical to planning for implementation of the technology solution?

Funding Option: \_\_\_\_\_

Topic	Describe key issues and likely risks	Potential Solutions	Required Strategy or Plan
<b>Business processes</b>			
Business process reform	Describe the business activities directly involved in or are impacted by the investment option and technology solution.	<p><i>What are the operational issues likely to be encountered in implementing the investment option and technology solution?</i></p> <p><i>What is the logic behind business rules that could be incorporated into the computerized system as automated validation checks?</i></p> <p><i>What roles (to view records, to edit records to validate transactions or to approve transaction or to administer the system need to be included in the computerized system</i></p> <p><i>Proposed timeline to implement investment option business process changes</i></p>	<p><i>What is the most appropriate approach</i></p> <p><i>E.g. the identification of the initial revised workflow(s) to incorporate computerized support with detailed workflows developed as part of system design and system implementation planning OR an organization-wide BPR as a prerequisite to any system development ?</i></p>
Business continuity	<i>Likely risks/challenges to business continuity</i>	<i>E.g. What steps will need to run in parallel with both paper based processing and computer supported processing and for what length of time?</i>	<i>Overarching strategy vs. temporary measures that may be needed (e.g. legislation, staffing, office space) for transitional period</i>
	<i>E.g. Transition needs E.g. Possible system downtime due to system implementation and/or risk of malfunction</i>		
	<i>E.g. Excessive staffing workloads and any resulting transaction processing backlogs during transition period</i>		
	<i>E.g. System downtime when new system is operational and mitigating actions to limit impact</i>	<i>E.g. Strategy for regular, data back-up regimes and processes to restore from backups</i>	<i>Comprehensive new system disaster recovery plan which is regularly reviewed and processes are trialled by system administrators</i>
Digitisation	<i>E.g. Inadvertent and malicious user data entry mistakes impacting on the integrity of the new systems database</i>	<i>E.g. Alternative power or communication linkages.</i>	
	<i>E.g. Interruption to power supply or failures in system linkages (including internet, if applicable)</i>	<i>E.g. Ability to store transaction processing details and data changes locally and upload later when communication linkage is re-established</i>	
	<i>E.g. natural (and other) disasters</i>		
	<i>Land records systems requiring digitisation:</i>	<i>Comment on any likely logistical challenges</i>	<i>Digitization Plan</i>
Migration of data from legacy system(s)	<i>Name - location - # records - % of total requiring digitisation</i>	<i>Comment on minimum necessary scope</i>	<i>Digitization training material</i>
		<i>E.g. describe data format and quality of legacy data</i>	<i>Data Migration Plan</i>
Training and Capacity building		<i>E.g. describe Export data format and how Export will be generated and when</i>	
	<i>Refer to details in Legal and Institutional information gathering.</i>		<i>User training plan and training material</i>
			<i>System administration training plan and training material</i>



# Annexes

- Relevant materials from State of Practice paper to aid decision-making, including:
  - Enabling environment considerations for land records and transaction systems
  - Software architecture model options
  - Software development options
  - Factors that determine implementation complexity
- Glossary
- References



## Enabling environment considerations for LRT IT Systems

System reliability		
Internet connectivity	<ul style="list-style-type: none"> <li>+ Allows for a single, centralized server</li> <li>+ Facilitates nationally consistent client services and data quality</li> <li>+ Allows for simplified system infrastructure at decentralized local offices</li> </ul>	<ul style="list-style-type: none"> <li>- Requires additional risk mitigation planning for malicious threats, internal user errors, down-time and system upgrading</li> <li>- Requires infrastructure in place and/or additional time and costs to install and maintain infrastructure (including mechanisms to address any rural-urban or other divides)</li> </ul>
Power supply reliability	<ul style="list-style-type: none"> <li>+ Facilitates business continuity of land administration agency</li> <li>+ Minimizes the need for cumbersome alternative processes and infrastructure when power supply is interrupted</li> <li>+ Potential environmental and financial benefits arising from use of solar energy generation (where implemented)</li> </ul>	<ul style="list-style-type: none"> <li>- Power supply interruptions significantly threaten system sustainability, efficiency, and data integrity</li> <li>- Need budget to cover the costs of power for servers, computers, and associated equipment such as air conditioning and fuel for backup generators</li> </ul>
Cloud servers and cloud storage	<ul style="list-style-type: none"> <li>+ Emerging number of companies offering software-as-a-service, allows computerized land administration services to be provided in locations where there is limited or no in-house system support capacity</li> <li>+ Remote data storage accessed via a cloud server best facilitates 'anywhere access' and disaster recovery through automated back-ups and easy restores</li> <li>+ Typically, low cost, secure and scalable, with support easily outsourced</li> <li>+ Cloud storage can be good for first generation IT systems in tough environments, by providing a simple means for offsite database and file backups</li> </ul>	<ul style="list-style-type: none"> <li>- Internet connectivity is required</li> <li>- Many countries will require remote servers to be located nationally – may be problematic as not all countries have servers, may increase cost by reducing available suppliers</li> <li>- Can mean fixed and ongoing contracts</li> <li>- State may not be comfortable with external control of data (i.e. by a private entity providing the cloud server)</li> </ul>
System comprehensiveness		
Faster, more accurate geographic positioning/mapping	<ul style="list-style-type: none"> <li>+ More options to gather data, e.g. through a wide range of Global Navigation Satellite System (GNSS) receivers (smart phone – survey grade dual band GNSS receivers) and more GNSS satellite constellations, automated feature extraction, etc., allowing for “fit-for-purpose” data collection that is rapid and low cost</li> <li>+ Increases efficiency and lowers cost of systematic registration</li> <li>+ Facilitates recording of cadastre changes and promotes cadastre integrity</li> <li>+ Facilitates digital lodgement, process automation and rules-based validation and process control (that are applicable to all Land IT System supported land administration transactions, not just spatially related transactions)</li> <li>+ Wider map coverage and more consistent spatial data</li> </ul>	<ul style="list-style-type: none"> <li>- Professionals can push for higher accuracies that may not be “fit-for-purpose”</li> <li>- May highlight boundary discrepancies and cause conflict where none existed previously</li> </ul>
System access and interoperability		
Mobile device proliferation	<ul style="list-style-type: none"> <li>+ Mass adoption of mobile devices (in particular smart phones with greatly extended functional capabilities) accompanied with competency in the use of mobile device software applications greatly facilitates participatory and crowdsourced tenure recording and mapping, as well as customer access to land data</li> <li>+ New remote channels to access land administration services</li> </ul>	<ul style="list-style-type: none"> <li>- May increase data security risks</li> <li>- Exacerbates existing digital divides</li> </ul>
Technology access	<ul style="list-style-type: none"> <li>+ Many technology options available to facilitate efficient, reliable, and low-cost land administration service provision</li> <li>+ Enables interoperability between agencies, and with public sector</li> <li>+ Enables value-added services to facilitate financing, enables software-as-a-service</li> </ul>	<ul style="list-style-type: none"> <li>- Requires increasingly technically qualified staff; staff capacity, adequate training and retention can be challenging</li> <li>- Technology maintenance and upgrading can be difficult to keep up to date and plan and cost for</li> <li>- Many developing nations will need hybrid or offline approaches to reduce system downtime and/or appropriate back-up measures</li> </ul>
NSDI/fundamental datasets	<ul style="list-style-type: none"> <li>+ Secure, read-only access to data held within land administration database(s) impacts on the design of LRT IT Systems</li> <li>+ NSDI can provide a remote online channel to land administration services</li> </ul>	<ul style="list-style-type: none"> <li>- Can take time to establish, especially if siloed institutional practices are well-established</li> </ul>

<sup>[1]</sup> First generation means the first product or technology of a particular type to be developed.

<sup>[2]</sup> Electronic lodgement of title transactions (may also include digital lodgement of cadastral survey data). Also comes under the banner of “e-conveyancing”.

<sup>[3]</sup> An early deliverable from a national spatial data infrastructure is improved access to several “fundamental datasets” such as the current cadastre map. Other such datasets can include land registers and other public registers.

<sup>[4]</sup> Graglia & Mellon, 2018. “Blockchain and Property in 2018: At the End of the Beginning”. World Bank 2018 Conference on Land & Poverty.

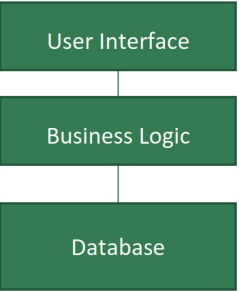


## Enabling environment considerations for LRT IT Systems

System and data security		
Authentication of land administration transactions and land information with digital signature	<ul style="list-style-type: none"> <li>+ Facilitates digital lodgement of land administration service requests</li> <li>+ Reassurance to users that they are dealing with authentic and authoritative land information</li> <li>+ Can be a more rigorous form of Land IT System user authentication</li> </ul>	<ul style="list-style-type: none"> <li>- Law change to legally recognize digital signatures takes time</li> <li>- Added ongoing expense to the land administration agency and certain external users to obtain and renew digital signature service</li> </ul>
Digital archive of land administration records	<ul style="list-style-type: none"> <li>+ Digital backups regularly and frequently updated and stored off-site provide for timely recovery of service following any disaster</li> <li>+ Digital archive of land records facilitates measures to minimize the risk of improper modifications to land transaction records</li> </ul>	<ul style="list-style-type: none"> <li>- Law change to recognize the legal validity and authority of scanned images of historic and new land transaction takes time</li> </ul>
Measures to safeguard Land IT System from local threats	<p>The operation of a Local Area Network (LAN), not necessarily connected to the Internet is an essential feature of many Land IT System, and measures to protect the system include regular database backups, the use of anti-virus software, and acceptable user practices.</p> <ul style="list-style-type: none"> <li>+ Utilizes well known practices and easily available software to implement adequate measures to safeguard the operation of a Land IT System</li> </ul>	<ul style="list-style-type: none"> <li>- Requires technically capable staff who stay up to date on relevant technology developments</li> <li>- Additional expenses will be incurred to implement safeguard measure</li> </ul>
Measures to safeguard Land IT System from external threats	<p>Where a Land IT System is implemented on a network with Internet connectivity additional safeguard measures are required to combat cyber security threats</p> <ul style="list-style-type: none"> <li>+ Standard measures available to minimize these risks</li> </ul>	<ul style="list-style-type: none"> <li>- Requires a higher level of user care and compliance with acceptable practices by land administration staff and a commitment by the land administration agency to maintain this capability</li> <li>- Land IT System software must be updated regularly to resolve any newly identified vulnerabilities in the Land IT System software</li> </ul>
Blockchain	<p>Blockchain is the technology underpinning Bitcoin involving a chain of ideally decentralized data that has been time-stamped and secured by cryptology. To be applied in a land administration registry environment, 7 prerequisites have been identified:</p> <ol style="list-style-type: none"> <li>1.Registries should be as accurate as possible</li> <li>2.Registries must be digitized</li> <li>3.An identity solution is required</li> <li>4.Multiple signature wallets are in place</li> <li>5.Use a private or hybrid blockchain</li> <li>6.Registries have Internet connectivity</li> <li>7.Training of professional community that interacts with registries.</li> </ol> <p>As few, if any, of these prerequisites are likely to be met in future MCC partner countries, blockchain is only applicable in a Land Administration as a Service (LAaaS) implementation or in future, subsequent generations of LRT IT Systems.</p>	



## Software architecture models

Type of Software Architecture	Advantage	Disadvantages	Diagram <sup>1</sup>
<p><b>“Traditional” Monolith</b> (sometimes referred to as “3-N Tier/Layer” architecture) where software is designed as self-contained components (being organized in tiers/layers) that are <b>interconnected</b> and <b>inter-dependent</b>. The architecture has 3 layers:</p> <ul style="list-style-type: none"> <li>• Presentation Layer (the user interface and how the system is “presented” to users)</li> <li>• Business Layer (incorporating business rules and logic)</li> <li>• Data Layer (based on a data model and database schema)</li> </ul>	<ul style="list-style-type: none"> <li>+ Software development teams can quickly and simply create, prototype, and deploy new systems to production. Software developers need only general development skills and can be utilized across any software development task using the same Integrated Development Environment (IDE). Common software elements are encountered across current and previous development projects</li> <li>+ Architecture is clearly understandable by all members of the software development team (because teams consisted of software developer generalists with only minimal, if any, specialized expertise)</li> <li>+ Encourages software code reuse (which was considered good practice in terms of minimizing the amount of code written and ensuring the efficiency of the code which in turn impacts on software performance)</li> <li>+ Facilitates Land Administration Domain Model (LADM) compliance as a consistent foundation for future software extensions and the adoption of international best practice</li> <li>+ Can have better performance than e.g. microservice architectures, due to reduced memory load</li> </ul>	<ul style="list-style-type: none"> <li>– Inherent application interdependencies force significant reworking as new functions are added</li> <li>– No or limited, often cumbersome connectivity, to other systems</li> <li>– Scalability can be an issue, especially when the number of concurrent users increases significantly and where there is heavy use of segments of code (through software code reuse) and these segments of code are modified to handle new functionality</li> <li>– More difficult to update, due to the above disadvantages</li> </ul>	 <pre> graph TD     UI[User Interface] --- BL[Business Logic]     BL --- DB[Database]   </pre>

<sup>1</sup> Diagrams guided by <https://rubygarage.org/blog/monolith-soa-microservices-serverless> (accessed 17th February 2020)



## Software architecture models

Type of Software Architecture	Advantage	Disadvantages	Diagram <sup>1</sup>
<b>Service Oriented Architecture (SOA) (Monolith)</b> <ul style="list-style-type: none"> <li>Still monolithic, SOA involves the deployment of 'services' – discrete modules that perform a required function and can easily be reused.</li> <li>It does not need to conform to the 'three-layers' of the traditional approach above but does utilize the same principles of 'reuse'<sup>2</sup> of software procedures as used in Traditional 3-N tier Monolith.</li> </ul>	<ul style="list-style-type: none"> <li>+ Adoption of SOA protocols facilitates inter-software application links and communication – e.g. to make data available to NSDI</li> <li>+ Self-contained and loosely-coupled nature of 'service' functional components enable reuse without the same level of interdependencies present in traditional monolith approaches – since each software service is an independent unit, updates and maintenance do not have the same capacity to hurt other services</li> <li>+ More reliable for larger systems than traditional monolith and enables parallel development since services are independent</li> </ul>	<ul style="list-style-type: none"> <li>– Largely as above – the architecture remains complex and can be difficult to manage</li> <li>– Requires significant upfront investment</li> <li>– Places extra load on the system than traditional monolith, as all inputs are validated before one service interacts with another.</li> </ul>	<pre> graph TD     UI[User Interface] --&gt; ESB[Enterprise Service Bus]     ESB --&gt; S1[Service]     ESB --&gt; S2[Service]     ESB --&gt; S3[Service]     S1 --&gt; DB[Database]     S2 --&gt; DB     S3 --&gt; DB   </pre>
<b>Microservices</b> <ul style="list-style-type: none"> <li>Collection of small, autonomous services of interest that can be individually deployed.</li> <li>Involves a series of uniform and predefined (stateless) operations.</li> <li>Functionality delivered via an Application Program Interface (API)</li> <li>Utilized to modernize existing monolith systems</li> </ul>	<ul style="list-style-type: none"> <li>+ Enables system modularity that facilitates code development, making it easy to test and deploy, and increasing agility</li> <li>+ Developers can work on their services independently and quickly</li> <li>+ Service decoupling, which can enable efficiency</li> <li>+ Better allows for scale up, especially with multiple users</li> </ul>	<ul style="list-style-type: none"> <li>– Much more complex to develop, requiring significant planning, team resources and skills. Software developers will need to be much more specialized to deal with this complexity and these skills may not be readily available (and/or taught) in MCC partner countries</li> <li>– Use of Application Programming Interfaces (APIs) can increase security risks</li> <li>– Inter-service calls (communication between the modules providing autonomous services) can contribute significantly to network latency</li> </ul>	<pre> graph TD     UI[User Interface] --&gt; S1[Service]     UI --&gt; S2[Service]     UI --&gt; S3[Service]     S1 --&gt; DB1[Data base]     S2 --&gt; DB2[Data base]     S3 --&gt; DB3[Data base]   </pre>

<sup>2</sup> **Software code reuse** is the practice of using the same software code for multiple software procedures and functions.



## Software architecture models

Type of Software Architecture	Advantage	Disadvantages	Diagram <sup>1</sup>
<p><b>Serverless</b></p> <p>Cloud computing approach where code execution is managed by a (third-party, cloud) server.</p> <p>Incorporates:</p> <ul style="list-style-type: none"> <li>Function as a Service (FaaS), where developers upload discrete units of functionality and these are executed independently.</li> <li>Backend as a Service (BaaS), where developers outsource backend aspects (including database management, cloud storage, hosting, user authentication, etc.) and these are priced on an execution basis.</li> <li>Client-side logic, which triggers certain functions.</li> </ul>	<ul style="list-style-type: none"> <li>+ Reduced cost (but potentially varying month to month depending on the number of function calls and associated server resources expended, so there is potential greater uncertainty in budgeting)</li> <li>+ Facilitates agile development because of faster setup and turn-around of software releases</li> <li>+ No system administration and easier operational management</li> <li>+ Disaster recovery risk is reduced through being managed by the cloud provider who has specialist expertise in maintaining IT infrastructure</li> </ul>	<ul style="list-style-type: none"> <li>– Immature technology in terms of no standard application protocols to deliver serverless services and few land administration serverless services are thought to be available. (Generally, there needs to be a community of developers developing such services before standards are developed and the technology is considered “mature”.)</li> <li>– Land administration service provider has reduced overall control of the software</li> <li>– Client access is exclusively through private Application Programming Interface (API) (rather than open protocols as in microservices applications)</li> <li>– Architecture is quite complex, which may require additional in-house skills, or complete outsourcing (and hence ‘trust’ of private sector providers)</li> <li>– Depends completely on being connected to the Internet</li> <li>– Function execution duration is capped (i.e. there is the risk of a “hard” timeout)</li> </ul>	





## Software development options

Approach	Advantages	Disadvantages	Relevancy
<b>In-house development</b> (by agency staff)	<ul style="list-style-type: none"> <li>+ Designed to specific client requirements that can be refined throughout development.</li> <li>+ Easier to adopt Agile methodology.</li> <li>+ Results in in-house software support capacity.</li> <li>+ Flexibility to utilize available (commercial, open source, community edition or in-house developed) software modules and components.</li> </ul>	<ul style="list-style-type: none"> <li>– Land administration agency assumes direct responsibility – and risk – for the software development.</li> <li>– Requires sufficient in-house expertise to be retained.</li> </ul>	<p>Contexts where it is feasible to recruit local software developers as land agency staff. This includes both staff with oversight and project management responsibilities, as well as software developers.</p> <p>Typically involves Traditional Monolith and SOA software architectures but can include Microservices architecture where there are designers and developers with appropriate experience (e.g. New Zealand).</p>
<b>Bespoke development</b> (by external providers)	<ul style="list-style-type: none"> <li>+ Designed to specific client requirements</li> <li>+ Flexibility to utilize available. (commercial, open source, community edition or in-house developed) software modules and components.</li> <li>+ Less responsibility pressure on land administration agency.</li> <li>+ Can better enable innovation.</li> </ul>	<ul style="list-style-type: none"> <li>– Can be higher cost (but risks may be easier to manage).</li> <li>– Appropriate planning for future system maintenance and future upgrades is essential.</li> <li>– Still requires internal agency oversight (and skills to do so) to ensure software quality and timely delivery.</li> <li>– Software support expenses may be high and need to be budgeted for.</li> </ul>	<p>Appropriate where an agency has insufficient internal capacity to develop software in-house.</p> <p>Land agency's project manager should ensure client requirements are clearly understood and agreed with service provider and are based on thorough analysis.</p> <p>Service provider should have had some experience in the proposed software architecture as well as in developing land administration related software.</p> <p>Typically involves Traditional Monolith and SOA software architectures but can include Microservices architecture where there are designers and developers with appropriate experience.</p>
<b>Commercial-off-the-Shelf (COTS)</b>	<ul style="list-style-type: none"> <li>+ Very short time to implement.</li> <li>+ Typically includes some external support and software updates/upgrades for a limited time.</li> </ul>	<ul style="list-style-type: none"> <li>– Likely requires alignment of existing business processes to the software (previous approaches require software alignment to business processes). This may require legal reform.</li> <li>– Software licensing and support fees (but these may be comparable to software update and support expenses for a bespoke system).</li> </ul>	<p>Most appropriate where there is a complete match between the stated requirements and the functionality of the COTS software has been identified.</p> <p>Requirements need also to be stable and/or aligned to COTS planned upgrades.</p> <p>Software provider can provide guidance aligning business processes to software functionality.</p> <p>Typically involves SOA software architecture.</p>





## Software development options

<p><b>Configuration<sup>1</sup> of an available (COTS or OS) software package</b></p> <p>Adjustment of existing software settings (with no new version of software resulting).</p>	<ul style="list-style-type: none"> <li>+ Typically undertaken in-house by a system administrator (possibly with support from the software vendor), with the advantage that there is no need to set up a development environment and recompile software.</li> <li>+ Time to deliver computerized solution is faster than customization or Bespoke (hours rather than days or weeks).</li> <li>+ Code base is consistent between all users and updates/upgrades are easier to apply.</li> </ul>	<ul style="list-style-type: none"> <li>– Software license fee (for COTS packages) and support fees/expenses.</li> </ul>	<p>Most appropriate where there is a 95% or better match between the stated requirements and the functionality of the generically configured software.</p> <p>The software package must be configurable.</p> <p>The system documentation must include adequate instructions on how to configure the software.</p> <p>Typically involves SOA software architectures.</p>
<p><b>Software (COTS or OS) customization<sup>2</sup> of existing software package</b></p> <p>Results in a new, distinct version of the existing software package.</p> <p>Customization may be done in-house or outsourced.</p>	<ul style="list-style-type: none"> <li>+ Designed to specific client requirements.</li> <li>+ Time to deliver computerized solution is considerably shorter than bespoke.</li> <li>+ Customization effort can be used to train software developers, if required (either internal to the agency, or external).</li> <li>+ Future updates and upgrades to original (un-customized) software package can be incorporated into the customized version in the future.</li> </ul>	<ul style="list-style-type: none"> <li>– Software license fees (for COTS packages) and support fees/expenses.</li> </ul>	<p>Most appropriate where there is an 80% or better match between the stated requirements and the functionality of the core un-customized software.</p> <p>Existing software package must be customizable.</p> <p>Will require software developers with experience in the software to be customized.</p> <p>Typically involves SOA software architectures.</p>

<sup>1</sup> **Configuration** is where the behavior of a software package is modified by changing system settings so that the package better reflects the requirements of a particular implementation of the software.

<sup>2</sup> **Customization** is where the code of a software package is modified by a software developer to change the original behavior of the package to better reflect the requirements of a particular implementation of the software. Such changes require a new “build” (compilation) using the package’s software development kit (SDK) and results in a new distinct version of the software package.



## Software development options

<p><b>Land Administration as a Service (LAaaS)</b></p> <p>Service is provided by an external service provider and any configuration or customization is undertaken by the service provider</p>	<ul style="list-style-type: none"> <li>+ Matches specific client requirements.</li> <li>+ Very short time to implement (compared to Bespoke).</li> <li>+ Would require 3-6 months of intensive support for the installation and the use of the service and the (new) associated business processes.</li> </ul>	<ul style="list-style-type: none"> <li>– Service fees.</li> <li>– Future service enhancements can be picked up but may require contract revision and fee changes.</li> </ul>	<p>Most appropriate where there is:</p> <ul style="list-style-type: none"> <li>• a complete match between requirements and LAaaS</li> <li>• reliable, affordable Internet connectivity at all service locations</li> <li>• stable or aligned requirements (to LAaaS upgrades)</li> <li>• Limited technical capacity in-house within agencies to oversee software system O&amp;M.</li> </ul> <p>May be possible to implement LAaaS on a partial basis (i.e. meeting 75% of transactions) but there are no known cases of this, and it would be recommended as an interim solution only.</p> <p>Service provider can provide guidance on the implementation of business processes aligned to LAaaS functionality.</p> <p>Typically involves Microservices and/or Serverless software architectures.</p>
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## Factors that determine implementation complexity

<b>Initial software scope</b>	How 'big' is the software development project? (Is there an existing basis, which land administration functions (and institutional users) are included, etc.?)
<b>Upgrade likelihood</b>	Is significant new functionality or upgrade likely to be necessary in the first 5 years of operation?
<b>System Integration</b>	How compatible are the different components/systems to the solution's software architecture?
<b>Legal framework reform</b>	Does the current legal framework significantly constrain business processes and operations? How likely is legal framework reform during or following software development? Does the legal framework recognize the digital record?
<b>Pre-development business process re-engineering (BPR)</b>	Has a BPR process already been undertaken (possibly using Business Process Model and Notation, BPMN)? How complex are the proposed processes to keep Land IT System records up-to-date? Can the records be kept up-to-date through data from the processing of land administration transactions? How much flexibility has been built into the initially redesigned processes to cater for further refinements later in the implementation?
<b>LADM compliance</b>	Is the Land IT System database structure LADM compliant? How difficult will it be to migrate data from existing digital systems into the new Land IT System database?
<b>Solution maturity</b>	How mature are the new software features, methodologies, and associated technologies (for instance, is the solution attempting to implement a 3D cadastre in a country where there is not yet a consistent and stable digital 2D cadastre)?
<b>Available and affordable expertise</b>	Are there software developers available with the necessary expertise to be involved in the initial software implementation? Are these software developers available to maintain the more complex features of the software beyond the initial implementation? Are there sufficient financial resources to fund development and maintenance? Is there a strong local labor market for IT professionals to join development/roll-out teams? What are the cost implications of future skill dependencies likely to result from the adopted software development approach?



## Policy, advantages/disadvantages and safeguards for alternative modes of delivery

Option	Policy requirements	Advantages	Disadvantages	Safeguards
Delegate responsibilities to local government	<b>Adequate Capacity</b> <ul style="list-style-type: none"> <li>• Agreement to delegate responsibility</li> </ul> <b>Very Low-Capacity/ Infrastructure</b> <ul style="list-style-type: none"> <li>• Agreement to a low-technology approach</li> </ul>	<ul style="list-style-type: none"> <li>+ Responsibility assigned to prime user of spatial data</li> <li>+ Reinforces principles of subsidiarity</li> <li>+ Services closer to users</li> </ul>	<ul style="list-style-type: none"> <li>– Requires clear definition of standards and guidelines</li> <li>– May require financial and technical support from central government</li> <li>– Not all local governments may have capacity/interest to assume responsibility</li> <li>– Requires oversight and guidance from national/regional government</li> </ul>	<b>Adequate Capacity</b> <ul style="list-style-type: none"> <li>• Quality control system such as system to license surveyors</li> </ul> <b>Low-Capacity/ Infrastructure</b> <ul style="list-style-type: none"> <li>• Guidelines for simple, clear procedures</li> <li>• Secure, low-cost land records systems with cross-indices</li> <li>• Capacity building</li> <li>• Public awareness and information</li> </ul>
Delegate responsibilities to private sector service providers	<ul style="list-style-type: none"> <li>• Adequate legal framework for public service outsourcing, concession arrangements, etc.</li> </ul>	<ul style="list-style-type: none"> <li>+ Reduced cost to central government</li> <li>+ Private sector better placed to respond to market needs</li> <li>+ Services more accessible to users</li> </ul>	<ul style="list-style-type: none"> <li>– Need to establish oversight board/council</li> <li>– Requires clear specifications and instructions and ability to enforce these</li> <li>– Requires a process for private surveyors to access records and a system to examine submitted information</li> <li>– Possible increased costs to users</li> </ul>	<ul style="list-style-type: none"> <li>• Establishment of system to register and oversee notaries, lawyers and others providing land administration services</li> <li>• Establishment of body to register and oversee private surveyors</li> <li>• Formal audit and reporting structure</li> </ul>
Crowdsourcing land administration data	<ul style="list-style-type: none"> <li>• Legal and institutional basis for ensuring that crowdsourced data has authenticity</li> </ul>	<ul style="list-style-type: none"> <li>+ Build community and stakeholder support</li> <li>+ Reduced cost to government in data capture</li> </ul>	<ul style="list-style-type: none"> <li>– System needs to be established to ensure data authenticity</li> <li>– Difficulties in keeping the data updated (process to collect transaction data through crowdsourcing unproven)</li> <li>– Risk of raising expectations beyond ability to deliver</li> </ul>	<ul style="list-style-type: none"> <li>• Be involved and share control</li> <li>• Be honest, transparent, and responsive</li> <li>• Acknowledge users and follow through on obligations</li> </ul>





## Brief Glossary

Key definitions are largely set out in the State of Practice paper and not repeated here. The following identifies key definitions for the purposes of completing the worksheets.

<b>Business process</b>	For the purposes of this toolkit, business process is deemed synonymous with transaction type. This is because the core scope of land records and transaction systems in the context of an MCC program is to support secure tenure and undertake transactions to facilitate a sustainable land administration environment. Core business processes then align with transaction types.
<b>Fiscal impact</b>	The fiscal impact of a given project or policy change is the change in government expenditure against changes in government revenues that results from the project or policy change.
<b>Functional and Non-functional specifications</b>	In the context of ICT systems, functional requirements define specific behaviours or functions and are articulated in a system design. Non-functional requirements specify criteria used to judge the operation of a system and are detailed in a system architecture, and may extend to include procurement specifications. These terms are standard terms used in the ICT sector.
<b>ICT environment</b>	In the context of the toolkit, the ICT environment includes: the hardware and software in use within the land agency; the level of ICT competency in the different ICT roles both existing and likely to become important within any new Land system; any government systems or policies that could impact on the implementation and operation of a new Land system.
<b>Land Agency</b>	A government agency with statutory responsibilities for a land administration function. Typically, the lead land agency is the responsible for land registration and, ideally, the oversight of cadastral mapping and surveying. Land agencies are the focus and key stakeholder for this work, but information may also be sought, and consultations conducted with adjacent agencies including planning, finance and local government.
<b>Land Administration</b>	Is the set of systems and processes for making land tenure rules operational. It includes the administration of land rights, land use regulations, land valuation and land taxation and may extend across both formal and informal sectors. For the purposes of this toolkit, the focus is on the formal sector and on IT support tools for operations rather than preliminary than information gathering.
<b>Land IT system</b>	A land records system incorporates more than simply a title or deeds register. It may include: <ul style="list-style-type: none"> <li>• a chronological index of dealings/requests (often called an entrance book);</li> <li>• copies of application forms and supporting information (deeds, survey plans etc.) submitted for a transaction that may be stored chronologically, based geographic location/administrative area, on a parcel basis or other alternative arrangements;</li> <li>• information on citizens (which may include links to a national ID system, links to business registration system, names index, thumb prints register, biometric data register, etc.);</li> </ul>
<b>Land records and transaction system</b>	<ul style="list-style-type: none"> <li>• a parcel register (perhaps linked to survey and map data);</li> <li>• survey and map data (charting maps, cadastral maps, survey plans, survey marks, geodetic control, etc.);</li> <li>• valuation data (valuation rolls, tax maps and other supporting data)</li> <li>• administrative records (receipt books, monthly reports, etc.)</li> </ul>
<b>LRT IT System (Land Records and Transaction System IT)</b>	<p>In this tool we typically use 'land records and transaction system' but occasionally replace this with land IT system. We use and distinguish these terms to:</p> <ol style="list-style-type: none"> <li>i) Highlight that the focus of our review of land records systems is on the transaction component, so we are only interested in those land records systems that have a role in recording transactions.</li> <li>ii) Distinguish between digital and analogue land transaction systems; whereby we use LRT IT system to categorise those land records systems/land transaction systems that are completely digital or have one or more digital components.</li> </ol>
<b>National Spatial Data Infrastructure (NSDI)</b>	Spatial data infrastructures describe the fundamental spatial data sets, the standards that enable them to be integrated, the distribution network that provides access to them, the policies and administrative principles that ensure compatibility among jurisdictions and agencies, and the people, including users, providers and other stakeholders. A national SDI describes the national system, but subnational systems may also exist.
<b>Total Cost of Ownership (TCO)</b>	In the context of this study, TCO includes not only the costs to develop and implement a new Land IT system but also the budget line expenses the Land Agency will need to cover for the life of the system as well as any budget arrangements to offset those expenses (such as retention of revenue from land administration fees received and government budget support for the provision of land administration services to the public). TCO will be used to assess the financial sustainability of different land administration technology investment options to be considered and to identify financial and budget arrangements the government will need to commit to.
<b>Training Needs Assessment</b>	A form of analysis that identifies gaps in skills within an organization (in this context, to implement and operate a Land IT system) and identifies training strategies to remedy those gaps in skills.



## References

### Key existing tools and documents:

<b>CoFLAS</b>	<b>Costing and Financing of Land Administration Services, decision support tool developed for UN-Habitat Global Land Tool Network</b> 2015 original report: <a href="https://www.landequity.com.au/wp-content/uploads/2020/06/CoFLAS-Report-FINAL.pdf">https://www.landequity.com.au/wp-content/uploads/2020/06/CoFLAS-Report-FINAL.pdf</a> 2018 Framework Guide <a href="https://gltn.net/download/framework-for-costing-and-financing-land-administration-services-coflas/">https://gltn.net/download/framework-for-costing-and-financing-land-administration-services-coflas/</a>
<b>IGIF</b>	<b>Integrated Geospatial Information Framework, developed by the UN Statistics Division.</b> The Policy and Legal chapter and appendices are particularly relevant. General IGIF homepage: <a href="https://ggim.un.org/IGIF/">https://ggim.un.org/IGIF/</a> 2018 Strategic Framework: <a href="https://ggim.un.org/meetings/GGIM-committee/8th-Session/documents/Part%201-IGIF-Overarching-Strategic-Framework-24July2018.pdf">https://ggim.un.org/meetings/GGIM-committee/8th-Session/documents/Part%201-IGIF-Overarching-Strategic-Framework-24July2018.pdf</a> 2019-2020 Implementation Guide, links to individual chapters <a href="https://ggim.un.org/IGIF/part2.cshtml">https://ggim.un.org/IGIF/part2.cshtml</a>
<b>LGAF</b>	<b>Land Governance Assessment Framework</b> LGAF tool: <a href="https://openknowledge.worldbank.org/bitstream/handle/10986/2376/657430PUB0EPI1065724B09780821387580.pdf?sequence=1">https://openknowledge.worldbank.org/bitstream/handle/10986/2376/657430PUB0EPI1065724B09780821387580.pdf?sequence=1</a> Link to country reports: <a href="https://www.worldbank.org/en/programs/land-governance-assessment-framework#2">https://www.worldbank.org/en/programs/land-governance-assessment-framework#2</a>

### Other references:

<b>Doing Business</b>	<b>World Bank's Ease of Doing Business Registering Property:</b> <a href="https://www.doingbusiness.org/en/doingbusiness">https://www.doingbusiness.org/en/doingbusiness</a>
<b>Fit for Purpose Land Administration:</b>	<b>Joint FIG/World Bank Publication 60 "Fit for purpose land administration" 2014 -</b> <a href="https://www.fig.net/resources/publications/figpub/pub60/Figpub60.pdf">https://www.fig.net/resources/publications/figpub/pub60/Figpub60.pdf</a>  <b>Guiding principles for country implementation</b> Report 2/2016 (GLTN) <a ?wpdmdl='7979&amp;ind=0"' fit-for-purpose"-land-administration-guiding-principles-for-country-implementation="" href="https://gltn.net/download/">https://gltn.net/download/"fit-for-purpose"-land-administration-guiding-principles-for-country-implementation/?wpdmdl=7979&amp;ind=0</a>
<b>PPPs</b>	<b>World Bank Public Private Partnerships in land administration analytical and operational frameworks</b> <a href="https://www.worldbank.org/en/topic/urbandevelopment/publication/ppps-in-land-administration">https://www.worldbank.org/en/topic/urbandevelopment/publication/ppps-in-land-administration</a>
<b>Academic papers and available laws online</b>	

