

Oceania Chapter
of the System Dynamics Society
Systems Thinking & Modelling Symposium



Challenges in Using System Dynamics to Improve Land Administration in Developing Countries

The Journey so far

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Structure of Presentation

- **The Problem** area – Land Admin in Developing Countries
- **WHY System Dynamics** considered
- **WHAT** was done
- The **RESULTS**
- **CHALLENGES** to getting SD adopted for operational use

An Aside

- Not a SD expert; largely self taught; came to SD late in life
- **want to use SD as a tool to overcome problems;** in an area where SD not used & largely unheard of

The Problem area

Much AID [\$1000s M?] **invested** to improve LA (Land Admin) in developing countries over decades . **Wide spread success elusive.**

[Projects can be \$10-100m; typically 5 yrs;]

Success can be considered as –

- The **achievement of Project Objectives** with AID (often ~ 5yrs; can be longer)
- **The sustainability** of improvement, **post AID** (when funding is solely from in country]

What Land Admin is

The **Laws, Institutions** that set & administer land/**property ownership, use, & tax** (based on property) **& operationally run the system EFFECTIVELY**

Why Land Admin is important

- Provides **security of property** (social benefits) & **a property market** (economic benefits)
- Imagine chaos in Aust if people & banks lost confidence in the “security of property rights”
- In **developing countries**
 - V **large numbers** (70%?) do **not have** any “title” /**security** to their **property**;
 - LA systems tend not to be v effective & only cover some people & some areas

The NEED

- **To increase “success”** - to Achieve Objectives (with Aid) & Sustainability (post Aid)

The NEED I saw

The **ability to numerically “test”** a project design **BEFORE** making the final investment decision

[Called “bench testing” in the old days]

What Led to identifying that Need

After a number of projects, in a number of countries, in a variety of positions, saw-

- The **development logic** was linear, qualitative, many implicit assumptions – using a logical framework matrix & later a theory of change
- been **prior LA projects** where **“stickability of improvements”** was less than hoped for
- That **designing was more art than science** & required hard won experience

Experience & background

20+ yrs in LA in developing countries mid 1990s - ~2010; Prof at UQ early 1980s to mid 90s; academe & private industry; early career, regular army officer

Why System Dynamics considered

- Came across; **did some “exploring models”** using Stella, circa 2005
- **saw considerable merit**; distracted with running a consulting company!

Why Strategy Dynamics used circa 2017

- The logic & **focus, on improving performance in operational businesses**
- Availability and usefulness of **a range of online courses** with examples
- The willingness of Dr Kim Warren to provide advice

Initial Aim

To determine

- **IF** SD could be used to numerically test proposed improvements before investing
 - **WHAT** would be a **methodology** to do so
- (was for my own satisfaction – unfinished intellectual business!)

Initial results

- **Did an example** of a fairly common assistance task
- **Convinced myself of the utility of SD**

Status early 2024

- **8 Illustrative examples** of more complex Land Admin assistance areas
- **All described** Lyons (2022), Land Administration: Improve Performance by Testing, A Strategy Dynamics Approach, Special Reference to Developing Economies. <https://landadminsyste.ms.com> .
- **Results presented at International Conference**; FIG (International Federation of Surveyors) Working Week, June 2023, Orlando Lyons (2023), Simulation Models to Test Improvement Proposals in Land Administration Before Investing, Proceedings of the FIG (International Federation of Surveyors) Working Week, 28 May-1 June 2023, Orlando USA
- **Question Posed** - **SIMULATION USED ELSEWHERE to TEST BIZ PLANS, so WHY NOT in LAND ADMIN?**

THE ILLUSTRATIVE EXAMPLES		
	Title	Focus
1	Remove a Processing Backlog	improve productivity & capacity
2	Increase Quality, Sustainability; get adequate budgets	increase quality; win back lost customers; increase revenue; get adequate budgets; keep backlog low
3	Upgrading Quality - Other Agencies involved	Implications when Quality has subcomponents under the control of different agencies
4	Raising Capital, using a Title as collateral	exploring the quantum of capital that might be raised, under what conditions, & what happens if Quality of Title declines
5	Addressing Informal "Go Fast" fees	Identifying root causes and possible ways to overcome
6	Skills Development	Reorganising skills development, increasing capacity, with low costs; work smarter, not harder
7	Options for the 1st Registration of Property	Examines three options for 1st rego; estimates costs, time & workforce resources required
8	Overcoming Obstacles to large scale 1st registration	Determining a Strategy to overcome obstacles, particularly where changes to law required

No reason WHY Simulation cannot be used in any area of Land Admin

	What Done	
1	Identified the <u>operating environment</u> and the <u>business needs</u>	The Op Environment
2	• <u>Identified</u> the <u>PIO's</u> (performance improvement objectives) • <u>Sketched</u> their <u>POT graphs</u> (performance over time) for past, desired future and feared future	
3	<u>Identified the main stakeholders</u> , gatekeepers, decision-makers, & what they want to support FFPLA	
4	<u>Compiled a SCS</u> (schematic of the course structure) of the System to be improved <u>Identified</u> major interdependencies & ideas for a Strategy	Compile a Schematic & build a Sim Model
5	<u>Built</u> a simulation <u>model/digital twin</u> using the SCS as a guide	
6	• <u>Tested scenarios</u> (for effectiveness and sustainability) against the desired futures of the POTs of each PIO • <u>Determined the improvement strategy</u> • the model/<u>digital twin provides the core of the business case</u> as it shows WHAT will happen, WHEN, and HOW this leads to the <u>achievement of the PIOs</u>	Test Scenarios; identify Strategy; have a Digital Twin
7	Provided comment	

Above is essentially the order used in previous examples applying the **STRATEGY DYNAMICS (SD) Approach in LA**

Lyons (2022), Land Administration: Improve Performance by Testing, A Strategy Dynamics Approach, Special Reference to Developing Economies. <https://landadminsystems.com>

Lyons (2023), Simulation Models to Test Improvement Proposals in Land Administration Before Investing, Proceedings of the FIG (International Federation of Surveyors) Working Week, 28 May-1 June 2023, Orlando USA

The Major Propositions

1. A simulation model can test various scenarios & determine a Strategy that will likely produce:-
 - a) The **desired Performance Improvement Objectives (PIOs)** (with aid) &
 - b) The **Sustainability of the PIOs** (post aid) – when only in country finance available)
2. That the **model provides a Digital Twin (DT)** of the project
3. That the **model contains the core of the business case** for undertaking the improvement project
4. That the **model can show the likely support levels** from the various stakeholders, gatekeepers, major decision makers, **based on the degree to which their “Wants” are met**
5. That the **Digital Twin & other aids can be used to engage with stakeholders** etc., to explain the project, to modify the strategy as necessary **to gain support so that the project will be approved for implementation**

What Simulation Brings to the Table for Land Admin Improvement

MAJOR

1. Shows simply & numerically; **WHAT** drives **WHAT**; **WHY & HOW** change is happening, to **WHAT** by **WHEN**: & **IF** the desired future/objectives are likely to be achieved
2. Enhances stakeholder understanding, discussion, buy in, by being able to test any scenario, do What ifs, risk analysis
3. Enables a clear understanding of the **CONDITIONS NECESSARY for SUSTAINABILITY post AID** as simulation can extend long after AID finishes [design for sustainability, rather than what can be achieved with AID during Aid period?]
4. Provides Insights & Understanding **better than other methods**

ALSO IMPORTANT

- All aspects are contained in a single model; Easily modified, refined, reworked
- Models or components can be re used/modified in similar or new situations – over time you build up a library - don't have to start from scratch ever time – major time saving
- Can use same models elsewhere in same project- appraisal, M&E, reviews, as well as design – enables those involved to more clearly understand & test modifications if necessary
- Adds value to Approaches such as Logframe, Theory of Change
- Can use with **FELA** (Framework for Effective LA) & **FFPLA** (Fit for Purpose LA)

Insights –Propositions for Discussion

1. Better to Design for **“What a in country Land Agency can Financially Sustain post Aid”** , rather than **what can be achieved with once off Aid** & that may not be sustainable, post AID
2. **Financially Sustainability Post Aid**, is likely to **require increased budgets for the Land Agency**, and a likely source of funding is a small % of the increased revenue from the improvements achieved and sustained - **if there is a history of non-sustainability, Treasury is unlikely agree to increase budgets** [**Keep the Golden Goose well fed & producing golden eggs!**]
3. Improvement projects have a **much greater chance of sustainability WHEN local stakeholders are committed and stronger** than those who wish to retain the status quo
4. **More time** needs to be **spent** on **achieving "commitment and buy in"** & **on consultative design, prior to implementation decision** - Simulation is a useful tool
5. **Success** would be **enhanced IF once off aid projects were longer, slower & less financially intense per year** [Changes in land administration tend not to happen quickly]

The Challenges to Getting SD used Operationally for Improving Land Admin in Developing Countries

1. **Simulation /SD use is largely unknown** in the **community of *Land Admin in Development***
2. **Aid Agencies** (National, International) **are large, have tight procedures and methodologies** that are applicable to many different types of aid projects; the **use of SD in Land Admin is unlikely to happen lightly or quickly.**
3. **Can be interests in maintaining the LA status quo** in developing countries. This can **inhibit change.**
4. **A need for an educational institution, with a strong interest in international LA, to expose students** (Post Grad course work masters) **to System Thinking & Dynamics/Strategy Dynamics.**
5. **Need real world data to rework the illustrative examples**

Ways to address challenges being thought through

Importance of Developing a SCHEMATIC of the **SYSTEM** to be IMPROVED *with Stakeholders*

(SCS -Schematic of the Core Structure)

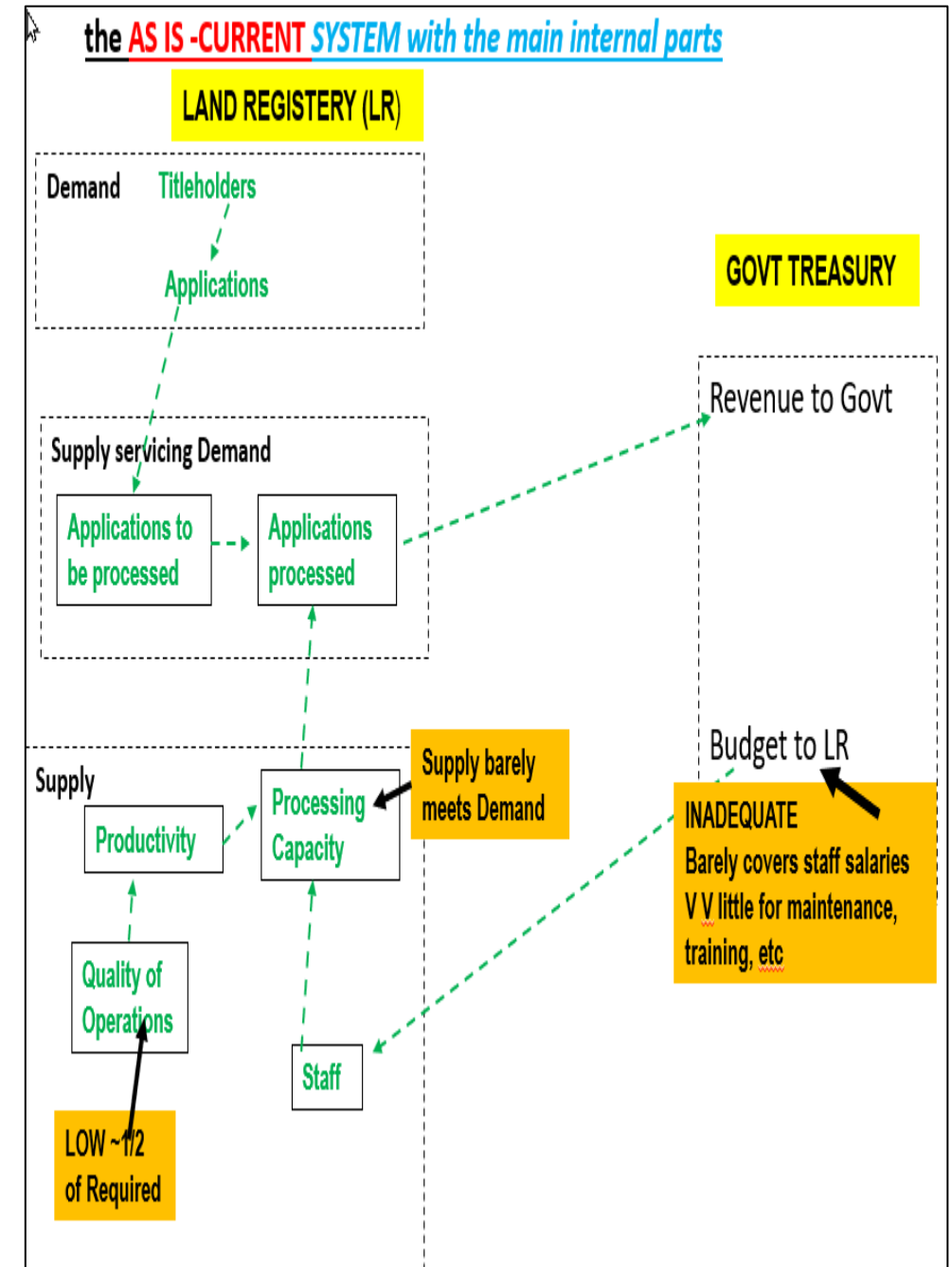
A SCS is analogous to a schematic of a load bearing structure, the mains of a water distribution system, etc

Purpose of a Schematic (scs)

1. **To identify**:- the main components of the system; the main parts of each component; the *main causal connections* within & between components
2. **To build the understanding and consensus** of stakeholders of:- what constitutes **the system**; its **characteristics**; its operational **dynamics** (performance over time)
3. **To generate ideas of proposed improvements** to the system, that might lead to the achievement of the PIOs (Performance Improvements Objectives)
4. **To act as a guide** when building the simulation model – the **model** can then be **used to test the proposed improvements/scenarios**

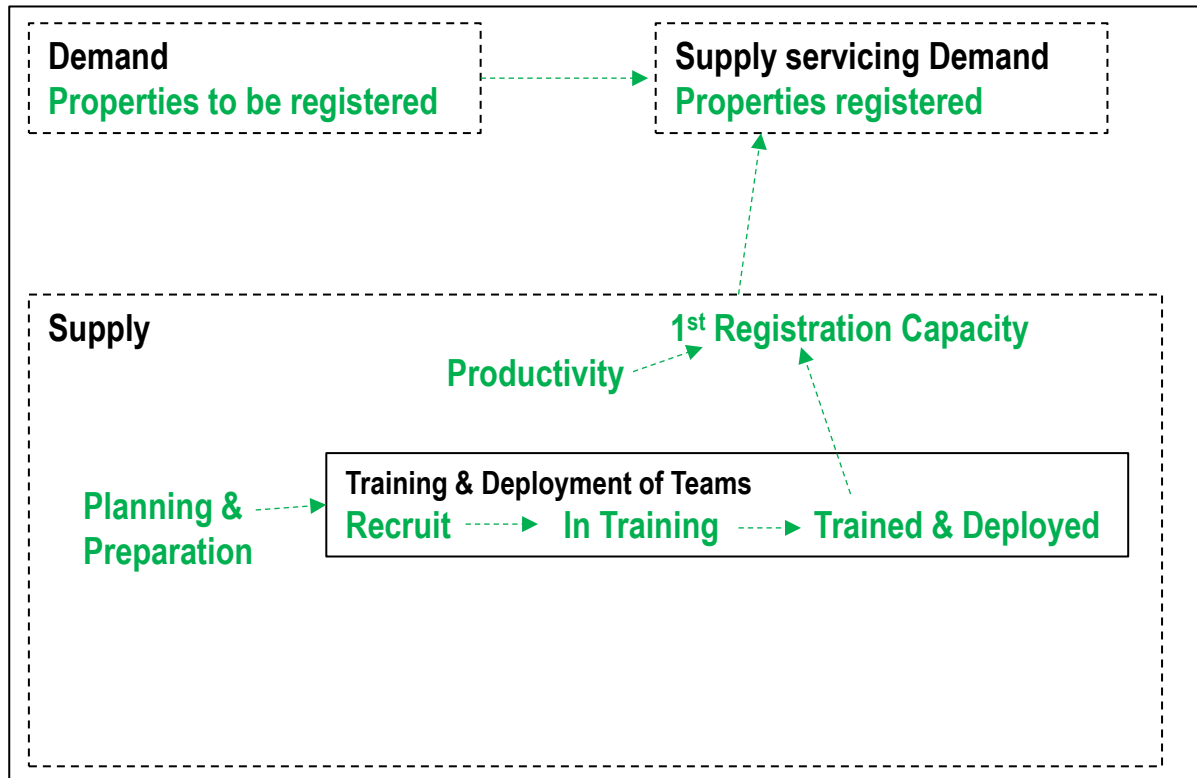
Observations

- The **Current System** can **NOT** cope with a large influx of new **Titleholders** from 1st Registration
- The **Productivity, Capacity & Quality** of the LR needs to be **significantly increased**
- **Budget to the LR** needs to be **increased & include maintenance** so Quality can be sustained (assuming Quality is increased by aid assistance)
- **Increasing Quality etc in LR will need to be the initial priority** **so that** any 1st registration can be efficiently absorbed by the LR, & the subsequent increase in processing, handled.



Additional Components & main internals of an Improved (To Be) System

Large Scale 1st Registration

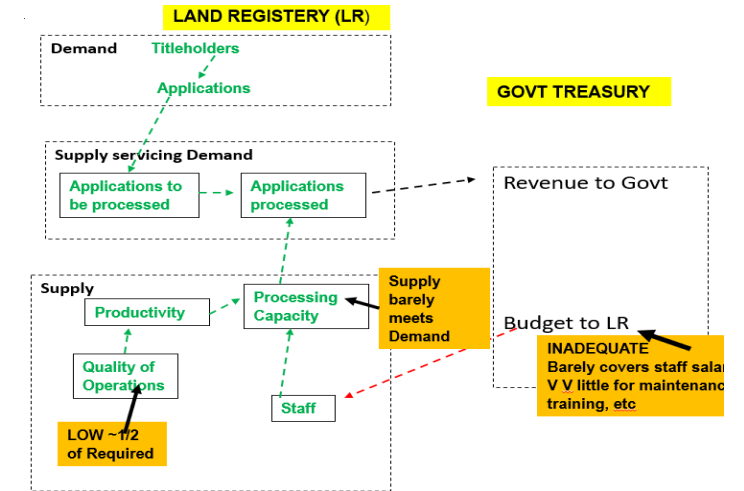


Legal Changes to Allow FFPLA

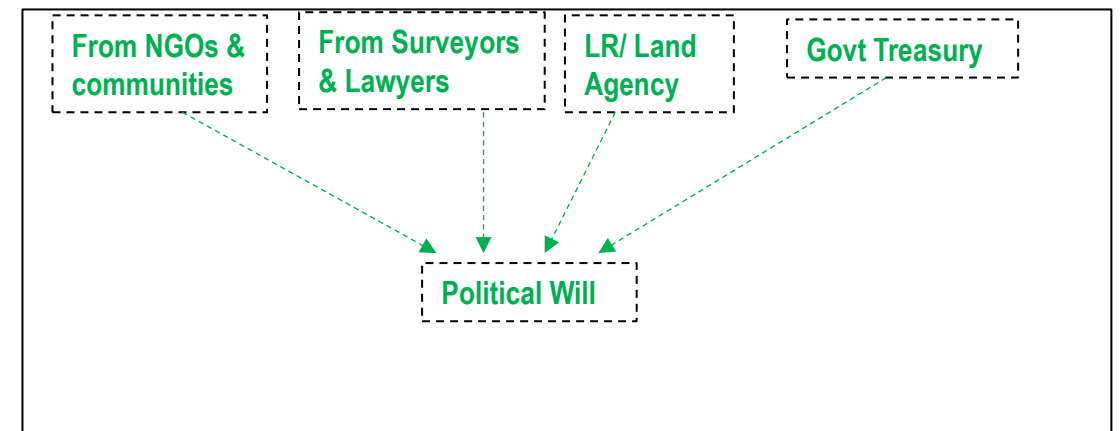
Laws Changed

Temp Once Off Aid

Aid on Site



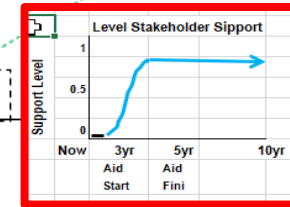
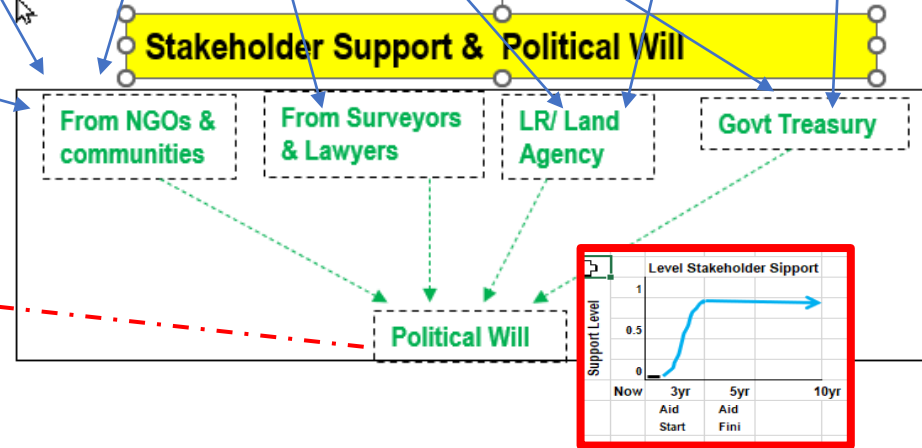
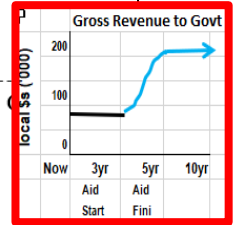
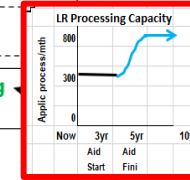
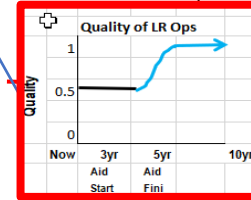
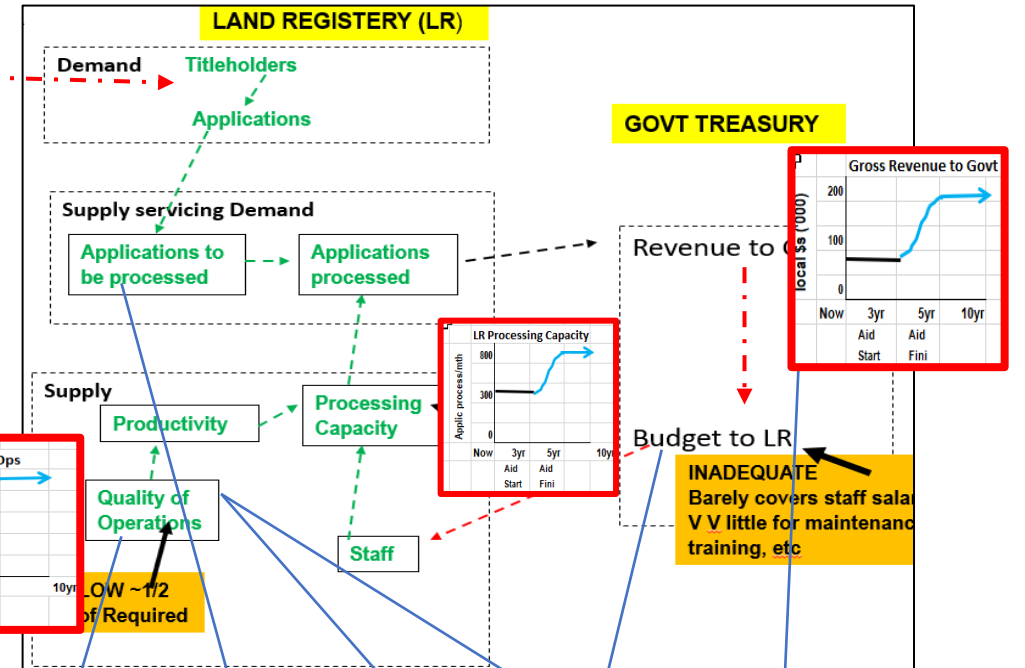
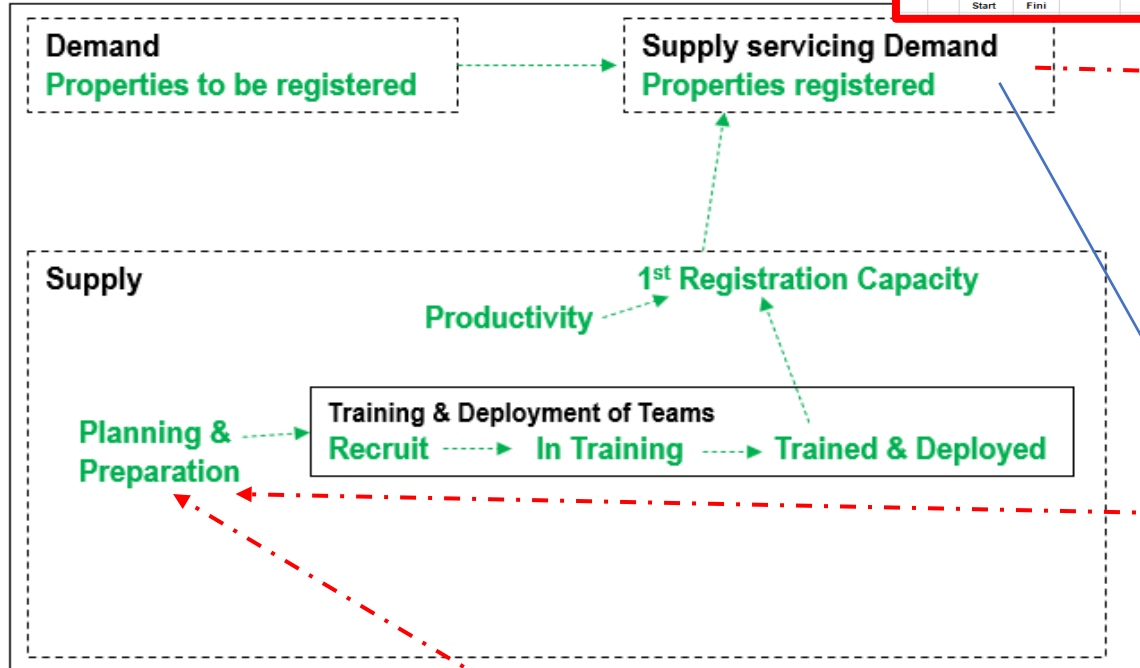
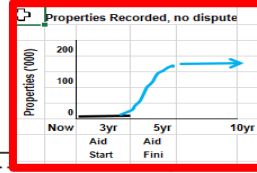
Stakeholder Support & Political Will



Superimposing some PIOs & Their POTs for Past performance & Future Desired performance

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Large Scale 1st Registration



What the qualitative SCS is indicating re determining a STRATEGY

1. Commencing Implementation is dependent on legal changes to allow FFPLA, & on AID assistance
2. Initially focus should be on the LR-
 - a) increasing the quality, productivity & capacity of the LR so that it can cope with the large numbers of 1st registration as they arrive
 - b) Ensuring the LR has an adequate budget which includes maintenance, training etc, so that the improvements in quality etc can be sustained post aid, only using incountry funding [consider using some of the increase revenue that the LR collects]
3. Commence 1st Registration when LR quality & capacity are on a firm improvement trajectory,
 - a) Commence planning, preparation, recruitment & training of the 1st registration team
 - b) Conduct 1st Registration, ensuring that the output rate of 1st registrations is within the absorption capacity of the LR

What a Quantitative simulation model/ DIGITAL TWIN adds

- **WHAT** will be achieved, (for the PIOs, KPIs/PIs) and **by HOW much**, over time (via POT graphs); PIO=performance improvement objectives; POT=performance over time)
- by **WHEN** (via POT graphs)
- **HOW** & **WHY** (the causal logic is explicitly shown by connectors through the model)
- The **means to easily TEST any number of Scenarios**, What Ifs, sensitivity testing
- **A STRATEGY** to consider **for Approval** for Investing
- **The DIGITAL TWIN contains the core of the business case**

NB

- The Digital Twin can also be **used during Implementation** by **tracking actual progress against planned** & testing changes
- More on the simulation model further on
- *Sim is used in Biz to “TEST” improvements BEFORE investing, so WHY NOT use in Land Admin?*

FINAL THOUGHTS

- **SIMULATION USED ELSEWHERE to TEST BIZ PLANS, WHY NOT in LAND ADMIN?**
- **Would close a CAPABILITY GAP in LA & be a New Tool in LA Toolbox**

**Thank You
Questions**

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