Governance of Large-Scale Land Regularization Programs: An Integrated Framework between Engineering, Urban Planning, and Stakeholder Management
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Abstract:

Large-scale land regularization programs generally fail less due to a lack of technical capacity and more due to fragmentation between engineering/infrastructure, urban planning, and stakeholder management. The typical effect is predictable and cumulative: inconsistent data, rework, delayed decisions on risk and environmental restrictions, conflicts with utility companies, and instability in the registration interface, increasing costs, time, and litigation. This paper proposes an operational framework "from land to registration" based on six integrated pillars: decision architecture, program PMO, data governance with traceability, contract management and oversight by acceptance criteria, technical-urban-environmental compliance, and stakeholder management with a conflict resolution protocol. The causal chain is controlled by auditable practices: quality gates, versioning and chain of custody of data/documents, decision logs/minutes, and active risk management, including a non-conformity protocol (identify, record, deliberate, correct, and validate). The article outlines verifiable metrics (cycle time, rework, first-pass approval, backlog, and compliance) and a 90-day deployment roadmap to sustain scalability.

Keywords: land regularization; governance; PMO; traceability; stakeholders.

Abstract
Large-scale land regularization programs often fail less due to technical limitations and more due to fragmentation across engineering/infrastructure, urban planning, and stakeholder management. This fragmentation drives inconsistent data, rework, late decisions on risk and environmental constraints, disputes with utilities, and unstable land-registration interfaces, increasing cost, lead time, and litigation. This paper proposes an end-to-end "field-to-registry" operational governance framework built on six integrated pillars: decision architecture, program PMO, traceable data governance, contract/supervision with acceptance criteria, technical–urban–environmental compliance, and stakeholder/conflict protocols. Auditable mechanisms include quality gates, version control and chain of custody, decision logs, and active risk management, supported by a nonconformity protocol (identify, record, decide, correct, validate). The paper outlines verifiable performance metrics (cycle time, rework, first-pass yield, backlog, compliance) and a 90-day implementation roadmap for scaling.

Keywords: land regularization; governance; PMO; traceability; stakeholders.

1. Introduction

Large-scale land regularization is a particular type of public policy: it involves production.

technical, administrative decision, social agreement and permanent legal effects, with multiple

organs and high territorial variability. For the purposes of this article, land regularization is understood as

the coordinated set of legal, urban planning, environmental, and technical measures aimed at recognizing

and integrate informal urban settlements into territorial planning, resulting in security of tenure.

(tenure security) — that is, reducing the risk of arbitrary removal and use, transmission and protection of

rights of occupation or ownership.

In practice, programs fail for a recurring reason: the "end product" (registration, certification,

or another recognized form of formalization) depends on a chain of technical deliverables and decisions.

interdependent. When governance is weak, this chain ceases to operate as an integrated flow.

and begins to produce inconsistencies that accumulate and reappear belatedly. Surveys,

Data, geospatial databases, and documents circulate without chain of custody, metadata, or control.

of version, which favors perimeter discrepancies, inconsistencies in comparison, and overlaps.

At the same time, critical restrictions—such as geotechnical risk, Permanent Preservation Areas—

(APP), right-of-way, infrastructure easements and network interference — are frequently

dealt with too late, when the cost of correction is already high, requiring redoing steps and redesigning.

perimeters and reopen social work.

This dynamic is exacerbated by contracting and oversight models that fail to address

Properly integrate the interfaces between urban planning, engineering, environment, and registration requirements. Scopes

that prioritize volume over verifiable quality, SLAs (Service Level Agreements)

nonexistent or unfeasible and measurements disconnected from "suitable for registration" acceptance criteria.

They tend to push rework to the end of the cycle, precisely where correction is most expensive and most time-consuming.

slow. In parallel, the absence of a consistent protocol for agreement and conflict resolution between

stakeholders — communities, municipalities, state agencies, concessionaires, Public Prosecutor's Office,

Public defenders, notaries, and suppliers — this increases the likelihood of disputes being transferred to [other locations].

Final stages, with higher political costs, greater reputational exposure, and a higher risk of litigation.

The central question is: how to structure operational governance "from the ground to the registry" that

Reduce rework, accelerate delivery cycles, improve technical quality, and decrease litigation.

Maintaining auditability at scale? The contribution of this article is to propose an applicable framework.

(not just conceptual), with roles, cadences, quality gates, data discipline, control

contractual and conflict resolution protocol, describing measurable and verifiable mechanisms for improvement.

2. Theoretical Framework

This article adopts a concise set of fundamentals to support governance decisions.

applicable to large-scale land regularization. The framework integrates five axes: (i)

land management and security of tenure; (ii) Fit-for-Purpose approach; (iii) governance of

programs and benefits management; (iv) quality, traceability and compliance; and (v) management of

Stakeholders, legitimacy, and collaborative governance.

In the field of land administration, the set of

processes and institutions aimed at determining, recording, updating and disseminating information about

rights, restrictions and responsibilities associated with land, connecting the legal dimension to the dimension

spatial. In regularization, this axis is crucial because it establishes the conditions for information

territoriality is converted into an administrative decision and legal effect with low ambiguity, reducing

Disputes over perimeter, confrontations, and eligibility. Tenure security, by

In turn, it is treated as a verifiable public outcome: stability and predictability regarding usage.

permanence and protection of the right of occupation or ownership, with a direct impact on the reduction of

conflicts and the State's ability to govern the territory.

The Fit-for-Purpose Land Administration (FFP LA) approach provides a reference.

operational for scale by emphasizing systems fit for public purpose, rather than calibrated systems.

exclusively for maximum standards of precision, cost, and time. In massive programs, its

The contribution lies in enabling incremental and scalable solutions, with varying levels of accuracy.

compatible with the risk and purpose of the registration, provided that minimum criteria exist.

Explicit guidelines, quality governance, and update mechanisms. This avoids both...

"Paralyzing perfectionism"—which makes coverage impossible—as well as prolonged informality—

which perpetuates insecurity and litigation.

Through the lens of program governance, large-scale regularization is treated as

program — a coordinated arrangement of projects and operations aimed at delivering benefits and

changes — and not as an isolated project. This framing shifts the focus away from mere production.

technical specifications for territorial prioritization, sequencing of work fronts, and dependency management

and the discipline of decision-making. The program PMO (Project Management Office) emerges as a unit of

Standardization and integration: defines routines and acceptance criteria, consolidates indicators, controls

Changes and stabilizes institutional interfaces, creating predictability between teams, contracts and

agencies involved.

However, governance can only be sustained on a large scale when it is anchored in quality and...

Traceability. Quality gates are formal checkpoints that authorize the passage to the next phase only.

when minimum requirements are met, preventing inconsistencies from progressing and becoming...

Late rework. Traceability is the ability to reconstruct, in an auditable way, the chain of...

Data and document custody: how they were collected, processed, versioned, and used for

final decisions and documents. This arrangement enhances technical and administrative defensibility and reduces

procedural vulnerabilities, especially when combined with risk management guidelines

as a continuous process of identification, analysis, treatment and monitoring, incorporated into the cycle

of the program.

Multi-stakeholder programs depend on legitimacy and structured management.

Stakeholders are groups and institutions that affect or are affected by the program.

communities, municipalities, state agencies, concessionaires, registry offices and system actors

of justice, among other things. Governance needs to recognize power asymmetries, incentives, and risks.

reputational issues, translating them into protocols for engagement, agreement, and conflict resolution.

Evidence from the literature on collaborative governance and participation indicates that operational rules

clear, transparent procedures and response mechanisms (including formal handling of

Complaints and deadlocks reduce coordination costs and decrease the likelihood of disputes.

migrating prematurely to litigation.

3. Methodology

The methodology is a narrative review with an analytical scope, suitable when the objective is not...

The goal is to estimate "average effects" through meta-analysis, but to explain mechanisms that are transferable across contexts.

heterogeneous. The corpus combines peer-reviewed literature (land administration, governance).

urban planning, program management, stakeholder theory, collaborative governance) and documents

High-level technical experts (FIG/UN-Habitat, FAO VGGT, World Bank, OECD, standards and guidelines)

(management).

To reduce common biases in narrative reviews, the design adopts five precautions: (1)

explicit question and delimitation of the object; (2) inclusion criteria with priority for sources

traceable; (3) triangulation by source types (academic, institutional, normative); (4) synthesis by

mechanisms (operational causality) and not by "list of good practices"; (5) proposition of

A framework with auditable and measurable components is incorporated into this article.

of "critical interpretative synthesis", in which concepts guide the reading of the evidence and are adjusted

Therefore, it is operationally observable in real-world programs.

The result is a framework designed for use in public programs: it defines roles,

Routines, gates, metrics, protocols, and risk types allow different entities to adapt the arrangement.

without losing comparability and auditability.

4. Integrated framework "from land to record" and its application

The framework starts from an operational premise: in large-scale regulation, quality

It is not an attribute of the "final package," but a result of the flow. Most delays and costs

Additional issues and episodes of litigation do not stem solely from technical errors, but from three failures of

Governance that reinforces itself: inconsistencies that advance undetected, decisions

criticisms that remain pending until the most costly moment for correction, and conflicts that are not...

processed by bodies with authority and clear rules. To govern, in this context, means

Organize delivery as a failure prevention system: detect early, decide at the right time,

Document choices and maintain traceability of data to the document.

The program's "from field to registration" cycle can be described in six macro-stages. A

The usefulness of this breakdown is to identify where the process tends to break down and what the minimum requirements are.

They need to exist before the program can move forward.

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The first major step is the territorial diagnosis and registration, which brings together geospatial data,

Surveys, physical and social registration, and preliminary delimitation. On a larger scale, the recurring flaws.

These problems arise when boundaries vary between teams and contracts, and when data circulates without...

metadata (origin, method, date, accuracy, and responsible party) and when there is no consistency between

geometry and alphanumeric registration. The result is usually the impossibility of reprocessing.

or an audit, because the production method was not sufficiently documented to reconstruct

the chain of custody.

The second major stage is the urban and environmental framework, which converts guidelines and

restrictions on applicable criteria (urban planning parameters, protected areas, risk classification and

(conditions). The typical point of failure is treating this framework as a "final signature":

Decisions regarding Permanent Preservation Areas (APP) and geotechnical risk are arriving late, forcing the redesign of perimeters and reopening.

Regarding social work, it is also common to issue guidelines with low operational effectiveness —

"Stamps" without technical basis or explicit criteria for exceptions — which weakens the

The defensibility of the act creates instability throughout the cycle.

The third major stage is urban engineering and infrastructure, involving alternatives.

Roads, drainage, sanitation, energy/telecommunications, and interference compatibility. In programs

massive, the most costly flaw is the absence of a formal interface with concessionaires, which transforms

Networks and easements become "surprises" along the way. Without minimal compatibility, projects become

Rework and contractual measurements by volume (instead of technical acceptability) amplify the

Problem: a lot is given, but almost everything is returned.

The fourth macro-stage is social work and engagement, which should not be understood as

Peripheral communication, but as governance of legitimacy and stability. The recurring failures

These are mobilizations without any connection to decisions (listening without feedback), ungoverned promises and

Conflicts accumulate and explode during the registration phase, often resulting in capture by leaders.

or through litigation due to a lack of mechanisms for agreement and response.

The fifth macro-stage is the consolidation of documents and the registration interface, where the following are structured...

Memorials, plans, reports, lists, and administrative documents required for formalization. On a large scale.

On a large scale, the most common bottleneck is the production of formally "well-presented" documents, however.

inconsistent with each other, with discrepancies between the plan, the report, the registration, and administrative acts, in addition to

absence of a decision-making process that justifies exceptions. When notarial requirements are discovered.

only at this point, the correction is usually massive because the origin of the error is in the registration and

in previous decisions.

The sixth macro-stage is post-regularization monitoring and data maintenance, stage

Often overlooked. When the base "dies" at the end of the contract and there is no custody.

Institutionally, the program loses the central asset it produced: a registry capable of guiding policies.

public works and prevent regression (new occupations, construction, changes in ownership, and adjustments). Without

In the process of updating and controlling changes, regularization once again generates uncertainty and conflict.

Integrated governance acts on this cycle through six components. To maintain fluid reading,

The components are presented as articulated operational mechanisms: each one establishes

objective, authority, routines, minimum passage criteria and typical responses to risk, always with

Emphasis on evidence and auditability.

4.1 Institutional Architecture and Decision-Making Discipline

The first component is the decision architecture: who decides, with what authority, and on what basis.

At what point and with what minimum evidence. In large-scale regularization, the absence of an arrangement

clear decision-making produces two effects: (i) critical decisions are pushed to later stages, when the

The cost of change is high; and (ii) decisions are made informally, which weakens defensibility.

administrative and makes auditing difficult.

The minimum recommended arrangement combines three levels. A public sponsor (authority)

(plaintiff) upholds priorities and resolves high-impact impasses, especially those that

These factors involve resources, intersectoral coordination, or political risk. A governance committee functions...

as a periodic instance for interface decisions (urban planning–engineering–environmental–registry),

preventing each discipline from imposing its logic in isolation. An executive coordination of

The program integrates various departments, manages dependencies, and maintains the production flow, supported by units.

technical aspects (registration, urban planning, engineering, environmental, social and legal/registry) and a function of

control and compliance when applicable (internal audit or independent verification by

sampling).

Decision-making discipline is sustained by short and stable cadences: a weekly meeting of

Operational integration for roadblocks and productivity; a bi-weekly meeting for decisions.

interface (perimeters, risk, APP, networks and exception criteria); and a monthly meeting for prioritization.

Territorial, contracts, critical risks, and sensitive stakeholders. The gain is not in the quantity of

meetings, but in the fact that each meeting produces a verifiable artifact: a recorded decision,

Responsible party, evidence used, and stated impact.

The decision gates, here, function as "brakes" that prevent unfounded progress.

Decisions regarding perimeter, risk, and riparian buffer zones should not proceed without minimal geospatial evidence.

Alternatives considered (even if summarized) and justification linked to the responsible party. Similarly

Form changes, scope changes, or changes in criteria require updated requirements and formal communication.

to the teams, accompanied by a minimal impact on time/cost/risk. This mechanism is

especially relevant for mitigating two typical risks: political capture (reduced by criteria

public and decision-making process) and late decision (reduced by maximum deadlines and staggered decisions)

automatic).

4.2 Program PMO and Territorial Portfolio Management

The second component is the program PMO, responsible for transforming multiple fronts.
in a predictable flow. On a large scale, the operational question is not "how many territories to open," but
"How many territories can be closed with quality per unit of time," respecting capacity.
of review and consolidation. The PMO governs the portfolio through territorial prioritization,
Wave sequencing and change control.

The PMO standardizes deliverables and acceptance criteria, consolidates indicators, and maintains baselines.
(versioned baselines) and organizes systematic reviews. Territorial implementation is coordinated by
Managers by clusters (groupings by urban typology, risk, density and conflict), which reduces
Variability and allows for specific patterns. Benefits management comes in as a discipline: it defines
What results are expected and how will they be measured without relying on unauditable assumptions?

The typical cadence includes quarterly planning by waves with monthly review and a "war".
"Weekly room" for backlog, bottlenecks, and first-pass quality. The central point is to avoid
that the work queue doesn't become a stockpile of problems: the PMO should limit simultaneous tasks and
to ensure that integrated review and correction occur within the cycle, not after accumulation.

The flow gates are simple and effective. A territory only goes into production when there is a base.
validated minimum geospatial framework, preliminary urban-environmental criteria, interface plan with
Dealerships and engagement strategy. A package only goes to the registration interface when
achieves consistency between geometry, registration, and administrative documents — a condition that can be
expressed as "first-pass yield," measured by returns and by
Critical nonconformities. In terms of auditable metrics, the PMO operates with cycle time per
macro-stage and territory, rework rate by type, backlog by queue, and compliance with checklists.
minimums. The value of these metrics lies in the possibility of auditing: entry/exit dates, logs of
Returns, non-compliance records, and associated data versions.

4.3 Data governance and traceability: from collection to final document

The third component is data governance, which underpins the entire defensibility of
program. In regularization, the fragility of the data directly translates into fragility of the program.
document and, consequently, in registration returns and litigation. Therefore, data governance.
It's not an "IT issue"; it's part of the program's core governance.

The basic requirement is to ensure that data and documents are technically reproducible and
Auditable. To achieve this, the program operates with clear definitions and routines: geodata as information.

spatial (boundaries, road axes, networks), metadata as source and method information,

Version control as change control and chain of custody as the complete trail from collection

even for use in decisions and documents.

The minimum arrangement includes a data steward (curator) responsible for standards, nomenclature,

Metadata and integrity validations; field and office producers who collect and process

following protocol; and validators that check topological consistency, registration completeness and

Documentary coherence. The program should operate an ingestion checklist: without minimal metadata, the

The data does not enter the official repository. Monthly sample audits test reproducibility by

Reprocessing of selected areas. Before the registration package, a freeze occurs.

of the territory's version, preventing ungoverned alterations.

Data gates are objective: geometric consistency (coherent topology, without

improper overlaps and unjustified gaps), consistency with registration (link between

cadastral unit and geometry, with minimum documentation), and explicit traceability (the document

(The final part points to the version of the source data used). Typical risks — parallel spreadsheets,

Duplicate databases and informal perimeter shifts are mitigated with a single repository.

Publishing rules, change logs, and formal approval.

4.4 Contract management and oversight focused on results "eligible for registration"

The fourth component is contract management. In massive programs, many failures occur.

Quality issues are, in fact, flaws in the incentive design: if the measurement rewards volume and not...

Acceptability: The program produces correction stock. Governance needs to convert requirements from

End-to-end cycle based on applicable and verifiable contractual criteria.

The minimum arrangement involves a contract manager (changes, risk and performance), and a technical supervisor.

(product and process compliance), PMO (standards and integration with program metrics) and

Supplier team (deliveries and evidence). The operation should include bi-weekly contract meetings.

For performance and non-conformities, monthly measurement linked to acceptance by gate and audits of

Field and documentary sampling.

Three contractual criteria are particularly effective at scale. First, accept

Subject to quality and traceability checklists, reducing subjectivity. Second,

Payment is per "ready-to-move-forward package" (per phase), not per individual piece, to force integration.

and reduce the incentive to deliver disconnected components. Third, time-bound SLAs

Correcting returns and rework rates creates an incentive for quality on the first pass.

Typical risks include scopes that ignore interfacing with utility companies and registration and

Weak document oversight. Both are mitigable: the first with coordination clauses and

integrative deliverables (evidence of compatibility and compliance with criteria), and the second with

Audits and objective acceptance criteria.

4.5 Technical-urban-environmental compliance as a governed interface

The fifth component governs the interface between disciplines which, when uncoordinated,

They generate the most expensive rework: urban planning, environment, engineering, and legal/registration. The problem

The central issue is not the existence of restrictions, but the timing of when they are addressed and the quality of the process.

decision. On a large scale, restrictions "discovered late" require redoing registration, redesigning and renegotiating.

with the community.

The governance of this interface is organized with clear roles: urban planning defines parameters and

Design alternatives; environmental factors define restrictions and constraints; engineering proposes solutions.

feasible and compatible with networks/costs; legal/registry assessment evaluates defensibility and adherence to requirements.

Formalization process; and an interface committee deliberates on exceptions and trade-offs with explicit documentation.

The gates here are straightforward: a territory doesn't advance without a consolidated map of restrictions and

Preliminary treatment decision ("critical constraints"); design is not frozen without demonstration.

of physical and institutional feasibility ("viable solution"); and decisions that affect rights or impose

Relevant restrictions must be justified and documented ("defensibility"). This arrangement reduces

The incidence of phased reopening improves the stability of decisions in the face of questioning.

4.6 Stakeholder management and conflict resolution with a verifiable protocol

The sixth component treats stakeholders as part of the governance system, not as...

"Support." In large-scale regularization, conflict is expected; what defines stability is the capacity.

to process conflicts with rules, deadlines, and records. Without this, disputes migrate to the system of

justice or oversight bodies, halting the cycle.

Stakeholder governance requires three coordinated fronts: social management (listening,

communication, validation and feedback), institutional coordination (liaison with bodies,

dealerships, Public Prosecutor's Office/Public Defender's Office and notary offices) and an instance for mediation of disputes with registration

and deadlines (conflict committee, or equivalent procedure). Operationally, this materializes in plans.

engagement by territory — with objectives, messages, channels, and decision-making moments — and in

An agenda for agreement with institutional actors, with flows, deadlines and points of contact.

The program needs to keep a record of conflicts: type, parties involved, impact.

(Deadline/Cost/Risk), Status, and Decision. The minimum legitimacy gate is clear: do not proceed to the next phase.

registration when there is an open critical conflict without a documented treatment plan — even if

Even if the final decision is to "accept the risk," this acceptance needs to be explicit, justified, and communicated.

Non-conformity protocol: the mechanism that ties together flow, data, contract, and decision.

To reduce rework and prevent hidden corrections, the framework adopts a single protocol.

of non-conformities (NC) applicable to data, documents, and decisions. NC is any deviation from

established criteria (gates, checklists, contractual requirements) or any inconsistency that

compromise registrability, technical quality, or defensibility.

The treatment should follow a standardized sequence: identify the nonconformity through audit,

Return of registration, inspection or formal complaint; register with ID, category, impact,

evidence and accountability; analyze root cause (method, lack of data, late decision, failure of

integration or unmapped requirement); deliberate on treatment and priority, recording trade-offs.

When they exist; correct them with version control and dependency updates; validate them via gate.

(with independent sampling when critical); and document, transforming the occurrence into improvement.

of standards, checklists, and training. On a large scale, the benefit of the protocol is not just "fixing," but

Reduce recidivism and stabilize the chain of custody.

5. Practical recommendations, discussion and conclusion

The implementation of governance in large-scale land regularization programs.

It needs to be treated as a management intervention with measurable effects on the flow: it reduces variation,

anticipates critical decisions, stabilizes institutional interfaces, and improves technical quality "suitable for

"Record." What follows is not a generic roadmap, but a set of measures that...

When combined, they create the minimum conditions for the "from land to registration" cycle to operate with

Predictability, traceability, and risk control.

5.1 What to implement in the first 90 days

In the first 30 days, the focus should not be on "producing volume," but rather on installation.

Minimum discipline to ensure that future production does not become a stock of returns. The first measure

It's about formalizing the mandate and responsibility: appointing the sponsor, executive coordinator, and PMO, with

Explicit responsibilities regarding prioritization, standards, acceptance criteria, and change management. In

In parallel, it is essential to establish a single repository for data and documents, with a standard.

Minimum metadata and versioning; without it, the chain of custody breaks down early, and auditing becomes difficult.

It becomes opinion-based. During this same period, the program should publish gate checklists by

A major step is to adopt a single protocol for non-conformities regarding data, documents, and decisions.

avoiding informal corrections and recurring errors. Finally, it is advisable to map stakeholders.

Critical and create institutional focal points (municipalities, state agencies, concessionaires, Ministry).

Public Defender's Office and Notary Offices), not as a list of names, but as a functional map of departments.

and risks. A quick inventory of existing contracts completes the cycle: identifying gaps in

Scope, measurement criteria, interface risks, and dependencies between deliverables.

Between the 31st and 60th, the priority is to align the workflow with the "ready for registration" logic, reducing the...

Incentives for disconnected deliveries. The program's cadences need to be operational with

Documentary discipline: weekly meetings for operational integration, bi-weekly meetings for decision-making.

interface and monthly meetings for replanning and critical risk assessment, all with minutes and decision logs linked to

evidence. Subsequently, contracts and audits should be recalibrated to prioritize quality.

In the first pass: measure and accept by phase (integrated packages) and not by isolated parts.

linking payment to checklists and traceability. In this interval, it is recommended to perform a

pilot in one or two territories of distinct typologies, with the explicit objective of calibrating gates,

Data standards and matching routines, not prematurely "proving scale." The matrix

Operational risk management should be implemented immediately, because the program needs to learn how to make decisions based on...

Uncertainty, recording trade-offs and responses (mitigate, transfer, accept) before risk turns into crisis.

From days 61 to 90, the work becomes consolidating learning and stabilizing the standard before...

accelerate. Lessons from the pilot program should become operational requirements: adjustments to checklists, updates to

metadata standards, strengthening criteria for version freezing, and refining the routine of

non-conformities. The territorial portfolio should then be sequenced in waves with criteria of

Stricter entry and exit procedures: limiting simultaneous work fronts and reducing work-in-progress is usually more effective.

more effective than "opening many areas" in parallel. Finally, continuous sample auditing — of data,

Documents and decisions — this should be established as a routine part of the program, with internal reports of

Compliance measures are used to guide corrections and reduce variation between teams and suppliers.

5.2 Minimum governance requirements to sustain scale

Large-scale programs degrade rapidly when they attempt to compensate for structural flaws with

Additional production effort. There is a set of minimum requirements that, if absent, tends to generate rework.

cascading and increasing exposure to litigation.

The first minimum requirement is a documented decision: critical decisions need someone responsible.

Justification and evidence are needed. It's not about creating bureaucracy, but about preventing relevant choices from being made.

They lose out in informal communications, weakening their defensibility.

The second minimum is data chain of custody: metadata and versioning are not.

"Technical perfectionism" is the mechanism that allows for efficient auditing and correction, reducing

Disputes and returns.

The third minimum is a quality gate: no checkpoints with explicit criteria.

As inconsistencies progress, the cost of correction shifts to the end of the cycle, when the correction is...

slower and more expensive.

The fourth minimum is phased acceptance-oriented hiring: when the contract remunerates

volume encourages the production of a stock of inconsistencies; when it rewards acceptability, it induces...

Integration and quality on the first visit.

The fifth minimum is conflict resolution protocol: conflict without an instance, deadline, and record tends to...

to migrate to the justice system or to oversight bodies, interrupting the flow and making

more defensive and belated decisions.

5.3 Recurring errors and operational prevention

Some errors appear with high frequency in large-scale regularization programs and

They usually originate from governance issues, not from a lack of individual competence.

One of them is to treat critical constraints as a final step. APP, geotechnical risk, right-of-way.

Network interference needs to be addressed early in the decision-making chain, with specific gates and alternatives.

treatment; early decision-making rarely eliminates conflict, but reduces the cost of correction and improves the outcome.

The predictability of social engagement.

Another mistake is promising solutions that lack technical or institutional feasibility. Social engagement

It needs to be coupled with the discipline of decision-making: what is possible, what is conditional, and what is...

If the decision is deemed unfeasible, it should be communicated with feedback and documentation, reducing frustration and disputes.

It is also common to produce documents disconnected from the source data. Prevention is

Simple yet demanding: traceability and version freeze per registry package, so that

Any subsequent changes should be governed and visible.

There is also the "notary surprise": when the notary's office only gets involved at the end of the process.

Demands are materializing as massive returns. The registration interface needs to be incorporated.

Early on, with a standard package per type and agreed-upon checklist, although subject to adjustments.

Finally, political discontinuity often destroys the capacity for execution when standards are broken.

Institutional records and memory were not kept. Logs, repositories, criteria, and indicators create

Resilience: it doesn't prevent agenda changes, but it reduces the risk of starting from scratch.

5.4 Discussion and limitations

The proposed framework assumes a minimum institutional capacity: a qualified team.

Sufficient technical skills to operate gates and audits, a clear mandate to decide on trade-offs, and the discipline to...

Maintain cadences and records. In low-capacity contexts, implementation should be gradual:

Start with reduced standards, but preserve traceability, essential gates, and a non-violent protocol.

compliance, because these mechanisms prevent flow collapse. There is a risk of capture by

Local interests and distortion of priorities; therefore, procedural transparency and a decision-making process.

They are part of the design, not an add-on. Measurement also has limits: indicators can

can be manipulated or interpreted out of context if there is no sample audit and chain of control.

custody; the answer, therefore, is to combine metrics with independent checks and critical review.

Periodic. Furthermore, litigation can occur even with good governance when conflict arises.

Land tenure is a structural issue involving historical disputes; nevertheless, governance tends to improve.

administrative defensibility, reducing procedural vulnerabilities and decreasing the probability

due to work stoppages caused by technical or documentary inconsistencies.

5.5 Final Considerations

Large-scale land regularization requires governance that treats the program as a...

An integrated and auditable system, not simply the sum of departmental deliverables. When engineering,

Urban planning, environment, social work, and registry interface all operate with data and decisions.

Disconnected, the cost appears as rework, returns, delays, and litigation. The framework

The proposal seeks to address this dynamic by organizing governance "from the ground to the registry" by

six operational components: decision architecture, program PMO, data governance and

Traceability, contract management oriented towards acceptability, interface compliance and protocol.

of stakeholders and conflicts. The causal chain does not depend on an abstract promise of efficiency,

but with verifiable mechanisms: quality gates, chain of custody, decision logs, handling of

Nonconformities, flow metrics, and sample auditing.

As for the improvement agenda, three areas stand out. The first is to advance in

Standardization of "recordable packages" by territorial typology, reducing variation and increasing

Predictability in the registration interface. The second is to evaluate, in a comparative way, models of

coordination with concessionaires and environmental agencies, identifying arrangements that anticipate

Compatibility adjustments without halting workflow. The third is to institutionalize post-maintenance routines.

regularization, preserving the informational assets produced and preventing the territorial base from being lost.

usefulness at the end of contracts and government cycles. These fronts, when combined with

Minimum governance discipline tends to sustain scale with better technical quality, greater

Institutional stability and reduced exposure to rework and litigation.

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