Innovation Ecosystems: Lessons in Sustainability from Three Decades of Public Sector Earth Observation Service Development in Africa

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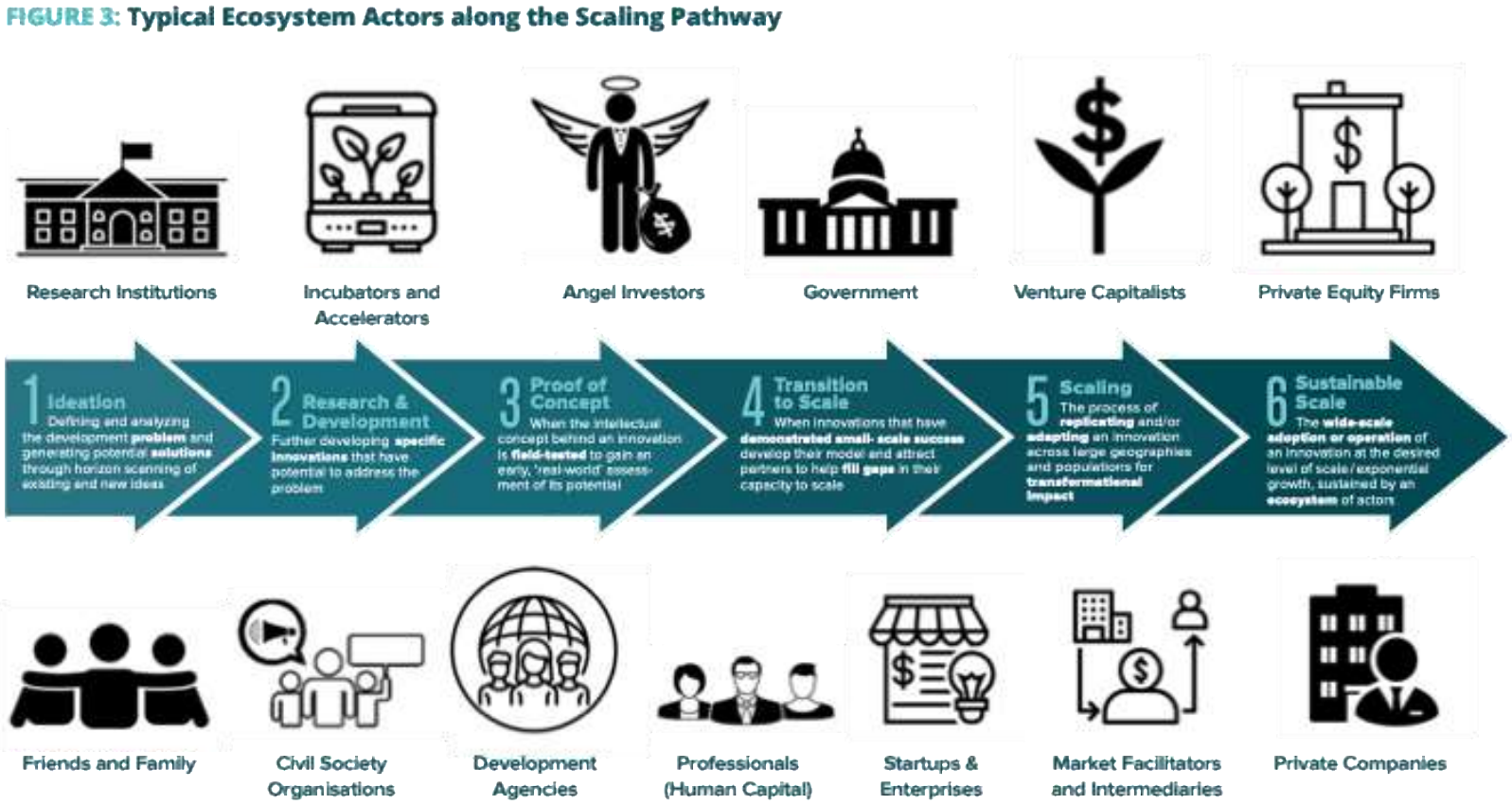
What is an Innovation Ecosystem anyway?

An innovation ecosystem is a dynamic, interconnected network of diverse actors and resources that collaborate to drive innovation and create value (Hobcraft 2025)

"It takes a village to raise a child, and it takes an ecosystem to scale an innovation."



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We are interested in Innovation Ecosystems because…

…these are the structures that could allow us to cross the "Valley of Death" and deliver sustainable Earth Observation services…

Almost all public EO services are necessarily project-based. Such projects can create valuable capabilities, but the time- and budget-limited nature of project resources (and typically poor user willingness-to-pay) often makes these capabilities difficult to sustain.

This inability to scale from demonstration, project-based products or services into sustainable, long-term operational services is a very well-known phenomenon referred to as…

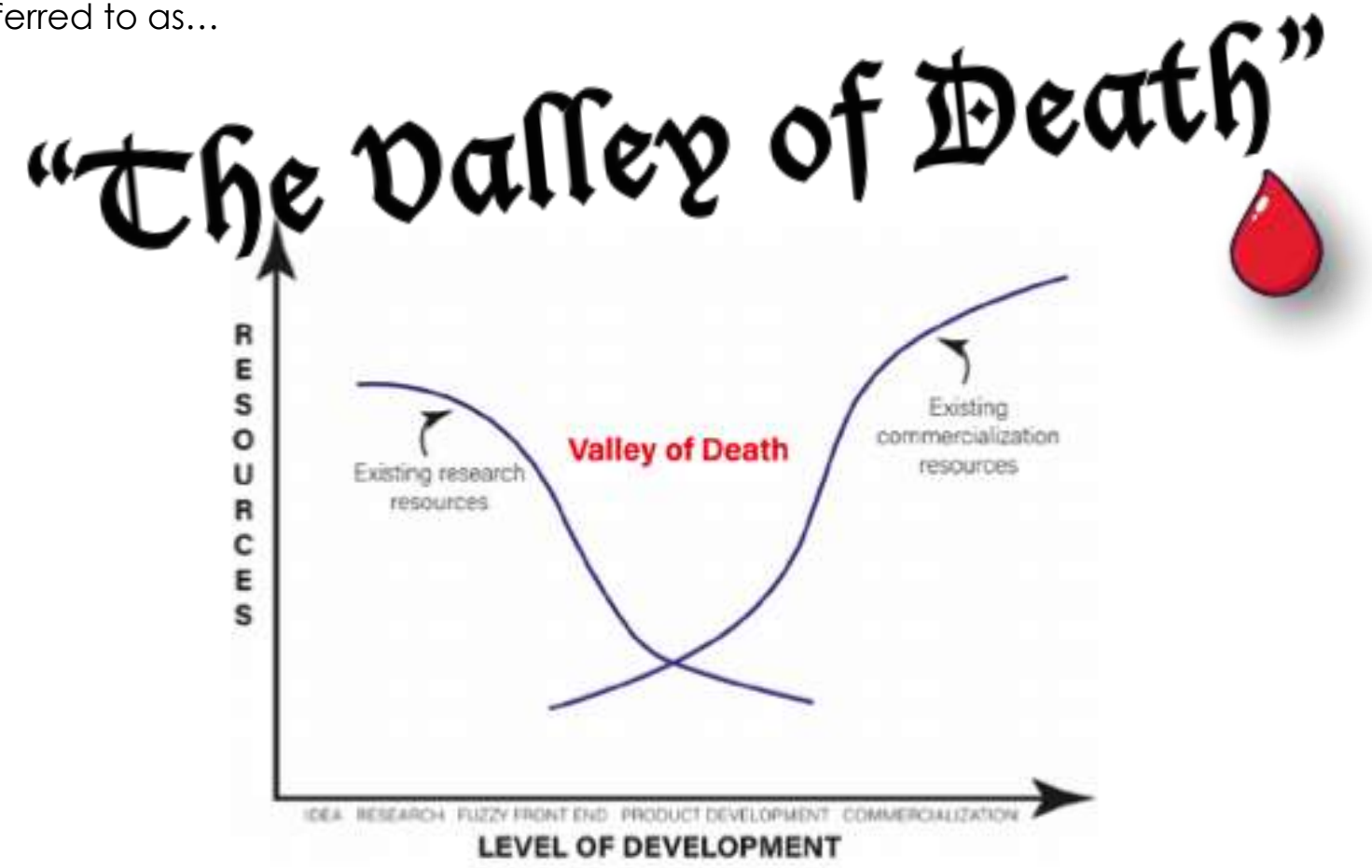


Fig. 1. Valley of Death.

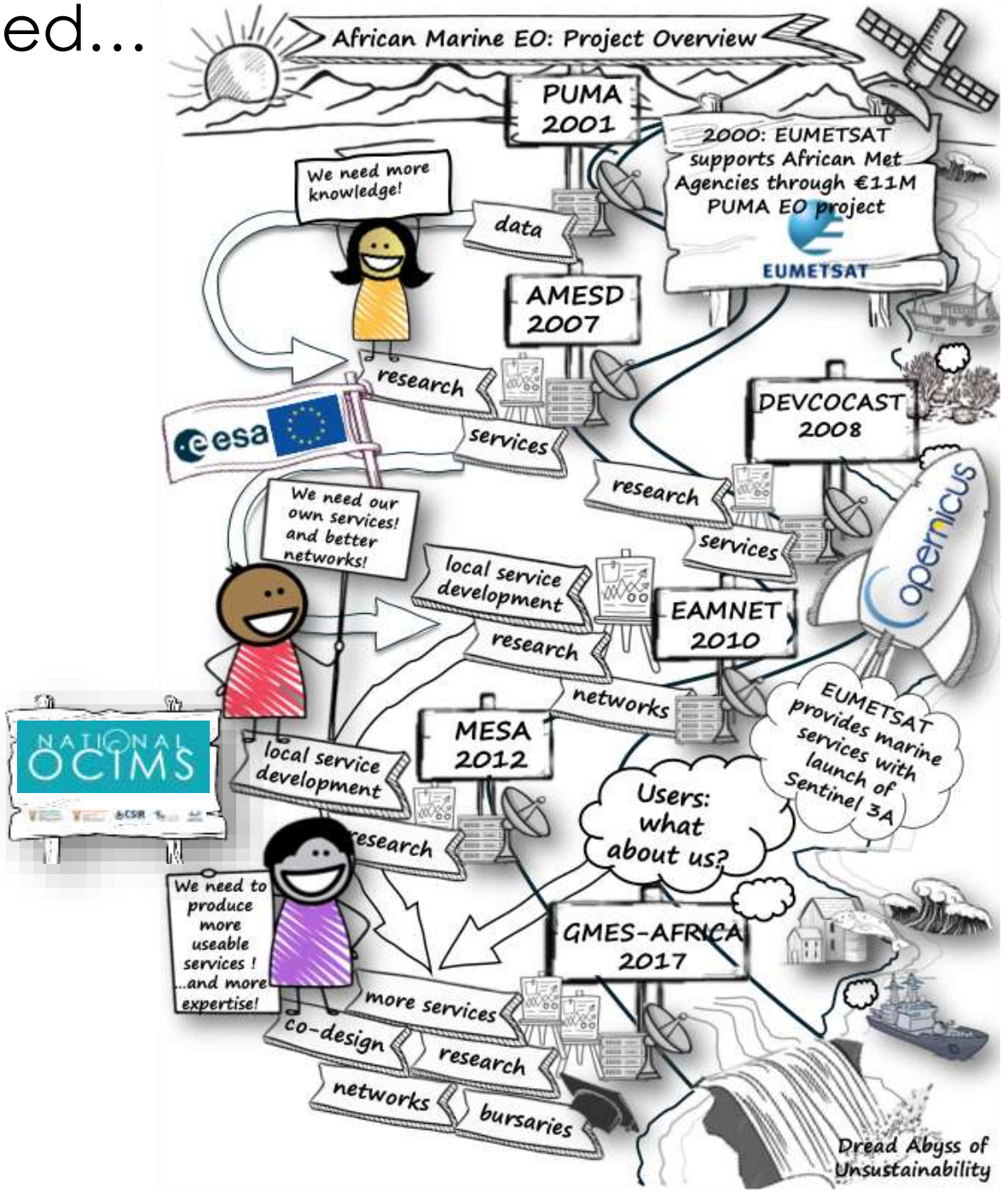
The background and information used…

The thinking expressed here arose out of a study to assess the capacity of marine Earth Observation applications projects in Africa over the last 25 years. These projects have primarily been African-European partnerships. Over the last three decades these projects have aimed to develop capacity across the continent, from facilitating data access to an array of training courses, resource development, and service creation.

Operational services in the marine domain are now established and expanding across the continent. This is most visible in the GMES and Africa Marine services (MarCoSIO and MarCNOWA), and OCIMS in South Africa. This point in time offers an opportunity to reflect and evaluate on what has led to these successes, what could be improved in the future, and what transversal lessons could be learned for other application domains.

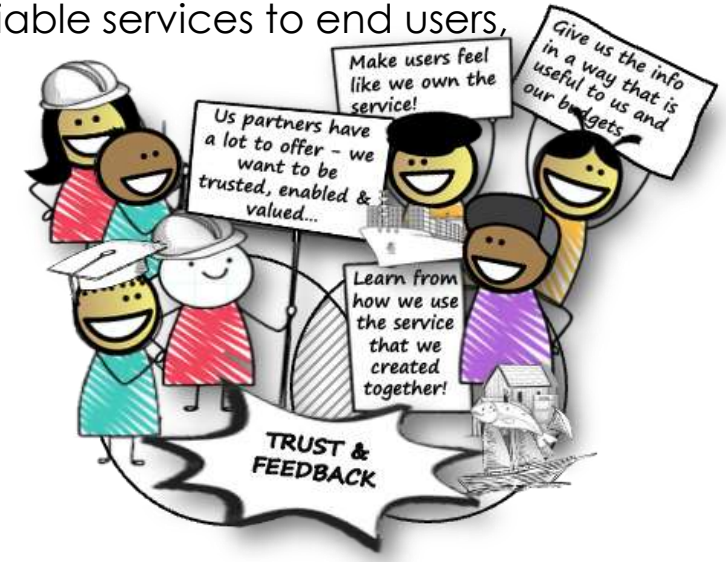
The information and perspectives here came from a series of discussions and workshops with a broad range of African stakeholders.

NB for non-marine peoples – the lessons learnt and suggestions for going forward are not-marine specific and highly relevant across all EO domains….



(Some of the) Key challenges and barriers…

- Appropriate partnerships and the potential for institutional and mandate conflict in the service provider ecosystem, particularly around operational mandates,
- The difficulties of transitioning research-led prototype/demonstration services into robust fully operational services,
- Lack of capabilities to quantitatively identify user needs and define user value, from functional, semantic, impact and socio-economic value perspectives,
- Lack of technical capabilities to routinely & robustly provide reliable services to end users,



- Lack of a well-resourced R&D capability to develop optimised services in response to clearly characterized current and future user needs,
- Inaccessible and siloed user communities, typically characterised by security, trust, procurement, proprietal business intelligence and institutional conflict issues,
- An inability to clearly quantify the impact and socio-economic value of emerging and operational services,
- Lack of service and ecosystem sustainability, driven by the necessarily time- and budget-limited nature of finite, limited time-frame project resources and poor user willingness to pay. Subsequent impacts on retaining and developing critical human resources.

We can look at successful or best-practice Innovation Ecosystems to figure out how to optimize the approach…

Structure & Partnerships

- Need for three **explicit capacities/roles for *Research & Development*, *Research to Services*, and *Operational Capabilities*** (adapting the UK Met Office nomenclature). This allows for explicit planning and capabilities around distinct aims in the providing ecosystem, and can allow an iterative transition from research through demonstration prototypes to mature operational service provision.

- There should be **explicit structures and clearly defined institutional/partner roles** for each of the *Research & Development*, *Research to Services*, and *Operational Capabilities* components, with **project-specific formalized agreements**/frameworks between institutional actors, e.g. consortia agreements, to remove barriers around mandate, business model or other sources of conflict.

- There should be clearly defined **frameworks and processes to govern component interaction, ownership, functionality and the transition of emerging services** through the ecosystem, with appropriate development, maturity assessment, and capacity requirement processes.

We can look at successful or best-practice Innovation Ecosystems to figure out how to optimize the approach…

Use & Impact

- Effective services are **designed around stakeholder decision making**. A **use-driven approach** is considered critical for impact and sustainability, and **user-centred design** should have users framing the solution-seeking process.

- **Effective co-design processes** emphasise the importance of user ownership by embedding users in solution identification and service development from very early stages in the development cycle

- Standardised processes and **models should be used to quantitatively identify user needs, define user value and frame service development**: using functional, semantic, impact and socio-economic value perspectives. An example is the Reference Model for Open Distributed Processing. **Agile** or "build–measure–learn feed-back" approaches are also a valuable part of the co-design process.

- A variety of approaches should be used to **bring users into the ecosystem early in the development process**, ideally at the research stage. Market facilitators & intermediaries or **trusted community entry points**, are often a powerful way of gaining access to inaccessible, siloed or distrustful user communities.

We can look at successful or best-practice Innovation Ecosystems to figure out how to optimize the approach…

Service Value and the Value Chain

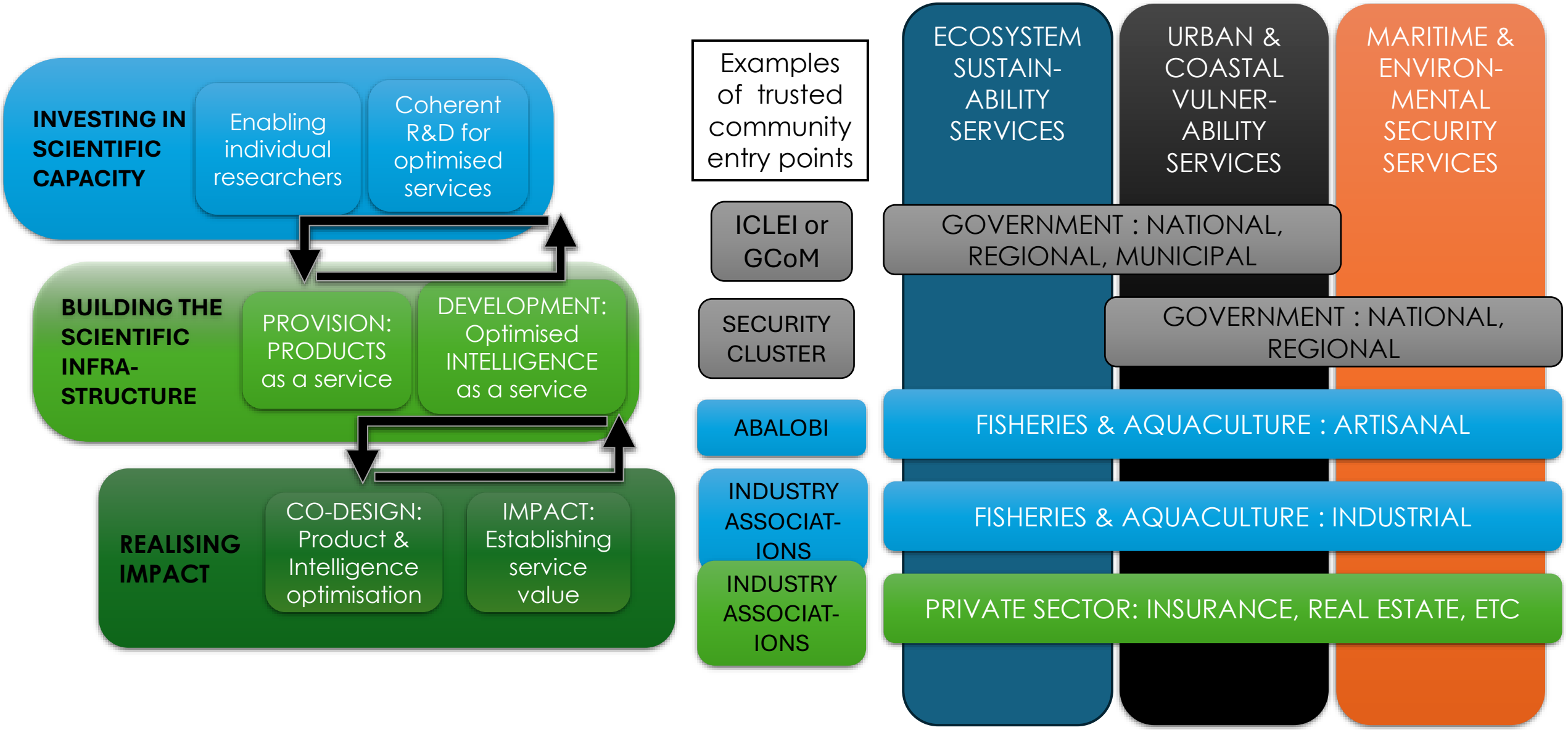
- **Services must be designed for value and impact**. Capacity and mechanisms are needed to determine how critical value is realised in user decision making, and any resultant broader socio-economic impact. **Critical value points should be established in the earliest phases of service design**, with frequent iteration.

- **Value must also be determined for partners** in the provider innovation ecosystem as this is key to effective, efficient and sustainable capacity development.

- Mechanisms and **capacity to clearly quantify the impact and socio-economic value of emerging and operational services** in the entire innovation ecosystem are key to broader value realization and sustainability. Theory of Change and resource economic (e.g. Value-of-Information) approaches to determining service value are potentially critical to sustainability.

- Understanding the **Earth Observation value chain** is key to realizing critical value for EO-derived services, and the value chain should be seen as an important integrator of the various value perspectives used to drive development.

What an idealised Innovation Ecosystem might look like…



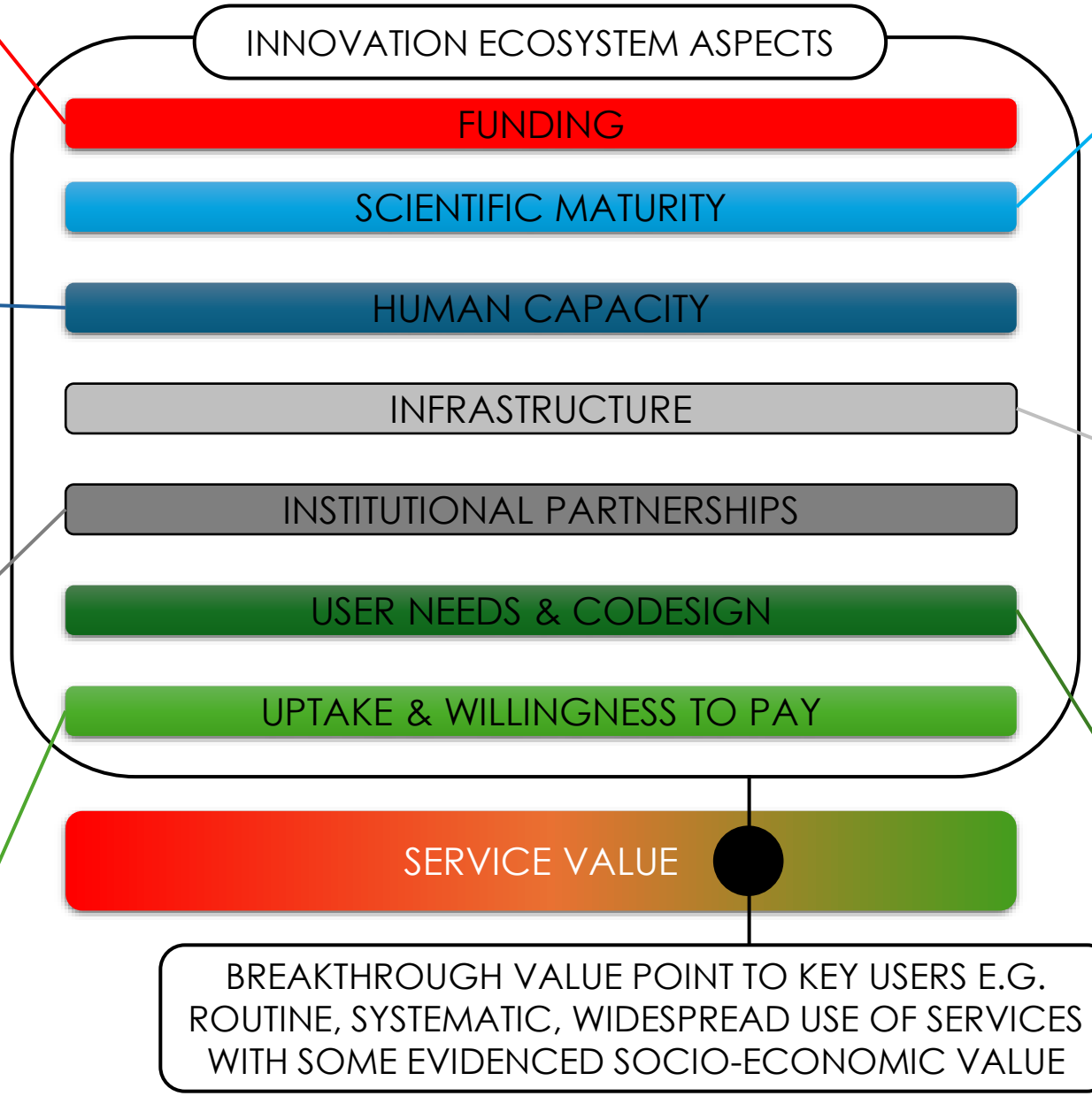
Some typical impact/sustainability issues using the innovation ecosystem model….

FUNDING : typically lack of sustainable funding post-project, e.g. due to lack of realizable value, or insufficient budget allocation in-project to realise service breakthrough value…

HUMAN CAPACITY : typically lack of sufficient technical support to realise service value, or lack of investment in R&D leading to poor retention and skills pipeline….

INSTITUTIONAL PARTNERSHIPS: typically institutional conflict through lack of formalised agreements resulting in mandate or commercial service conflicts, lack of data/service sharing etc…

UPTAKE & WILLINGNESS TO PAY: may follow from lack of early user engagement and/or enablement **or** that users don't have the funding or business model to transition from freely available services….

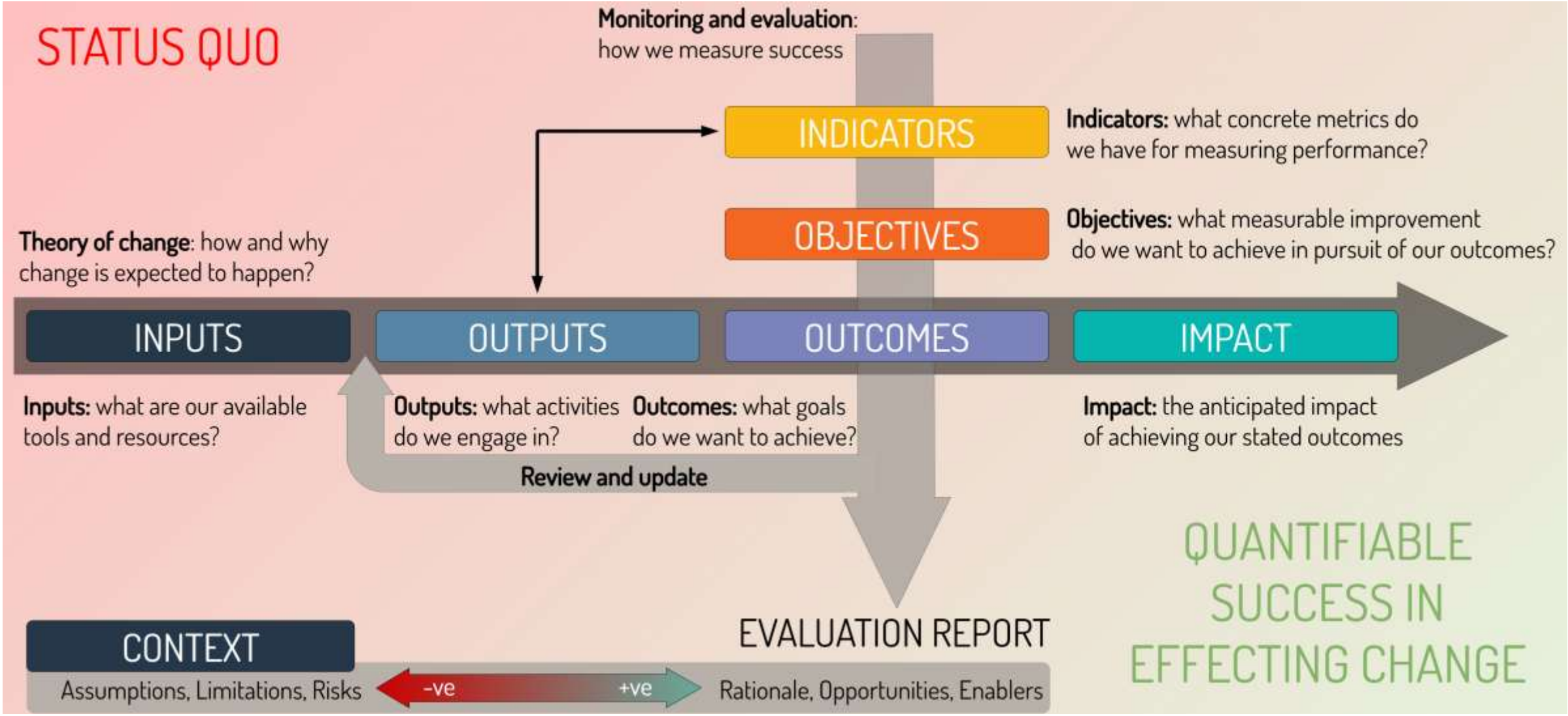


SCIENTIFIC MATURITY : typically lack of investment in R&D to innovate successfully (short- & long-term), or insufficient scientific maturity in-project to realise service breakthrough value…

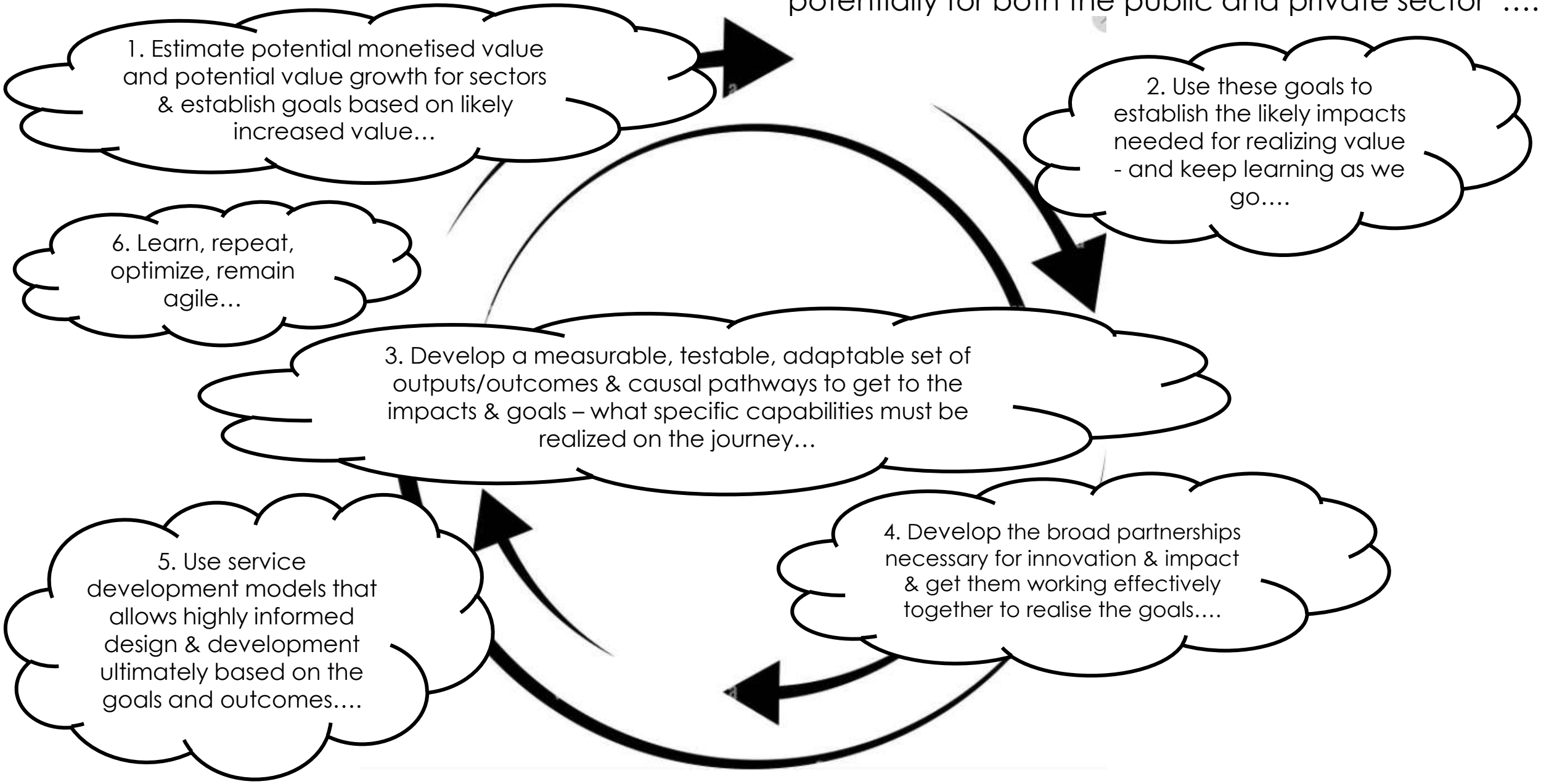
INFRASTRUCTURE: typically degradation of critical infrastructure post-project, or unreliable infrastructure due to lack of technical resources & resultant loss of user trust…

USER NEEDS & CODESIGN: typically lack of needs- and impact- driven user requirements and/or lack of co-design & co-development with resultant poor uptake and service demand e.g. "build it and they will come"…

The Theory of Change, a good way to plan for impact & value …

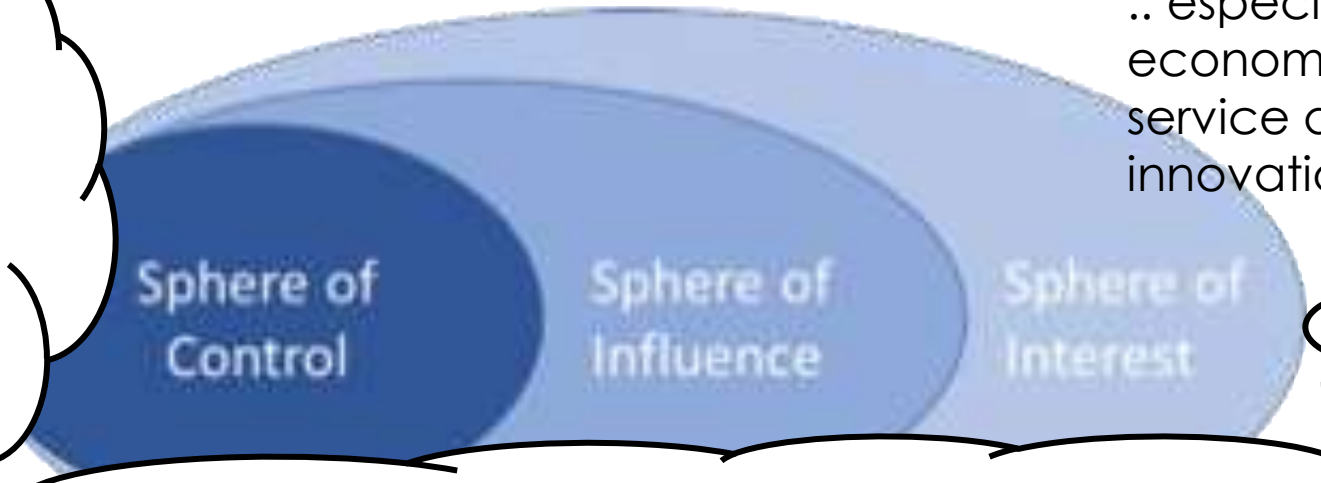


We can join up all of this thinking to create very powerful new ways to create value through Earth Observation services, potentially for both the public and private sector ….



.. especially when coupled to resource economics, theory of change, and service development models through innovation ecosystems…

5. **RM-ODP:** Use service development models that allows highly informed design & development ultimately based on the goals and outcomes….



2. **VOI/ToC:** Use these goals to establish the likely impacts needed for realizing value - and keep learning as we go….

3. **ToC:** Develop a measurable, testable, adaptable set of outputs/outcomes & causal pathways to get to the impacts & goals – what specific capabilities must be realized on the journey…

Inputs → Activities → Outputs → Outcomes → Impacts/ Goal

Increased socio-economic value

Innovation Ecosystem Providers

Innovation Ecosystem Users

4. **Innovation Ecosystems:** Develop the broad partnerships necessary for innovation & impact & get them working effectively together to realise the goals….

Service Development Model (RM-ODP) - – Requirements, Co-design etc

Value of Information models

Value of Information

Value and △Value of resources

DESIGN FOR VALUE

1. **VOI:** Estimate potential monetised value and potential value growth for target sectors & establish goals based on likely increased value…

AGILE Development Cycles

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Thank You!

Many thanks to EUMETSAT and Copernicus as study funding sources and for allowing presentation of emerging material