A conceptual model for enabling sustainable management of soil-sediment-water ecosystems in support of European policy

Loire SSW ecosystem (picture J. Brils)

Jos Brils & **Linda Maring**, Deltares

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Introduction

Societal challenge

- Health of soil-sediment-water ecosystems is under pressure from economic activities and a changing climate

- This decreases health and hampers the service provision capacity of these ecosystems and thus impacts human well-being

- Protecting and where feasible restoring of ecosystem health has currently become the key European environmental policy objective (healthy = having the continued capacity to support ecosystem services)

We state:*

- For achieving of this objective, it is needed to take an entire system approach and engage stakeholders

- 'Entire' means that:

  - soil, sediment and water are regarded as closely interlinked environmental matrices,

  - that need to be managed by taking a 'river (or mountain) to sea' perspective,

  - crossing spatial, discipline, political and cultural boundaries

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Some basics

Model:

- Simplification of reality, created in order to assist in clarifying and understanding some aspect of the real world*

- Almost all models begin life as a conceptual model:

  - some are developed and subsequently expanded into a quantitative model,

  - while others remain as a concept to aid understanding and develop or test ideas

Assumption**

A practical conceptual model for management of soil-sediment-water ecosystems and its building blocks described in a common language facilitates stakeholder engagement in such management

Challenge:

Achieving an appropriate balance between simplifying and complex reality

* Rocher and Schnell (*sine anno*) Modelling the world

** Brils and Maring (submitted) A conceptual model for enabling sustainable management of soil-sediment-water ecosystems in support of European policy
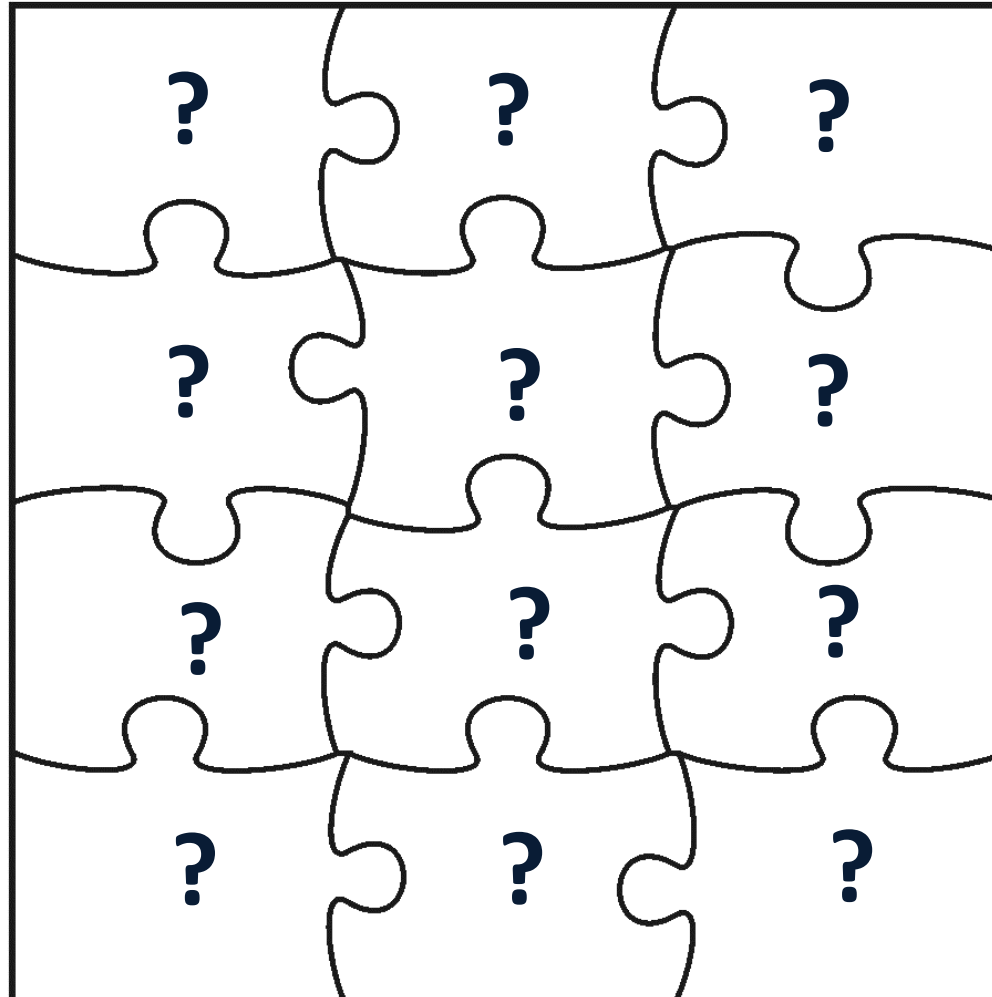
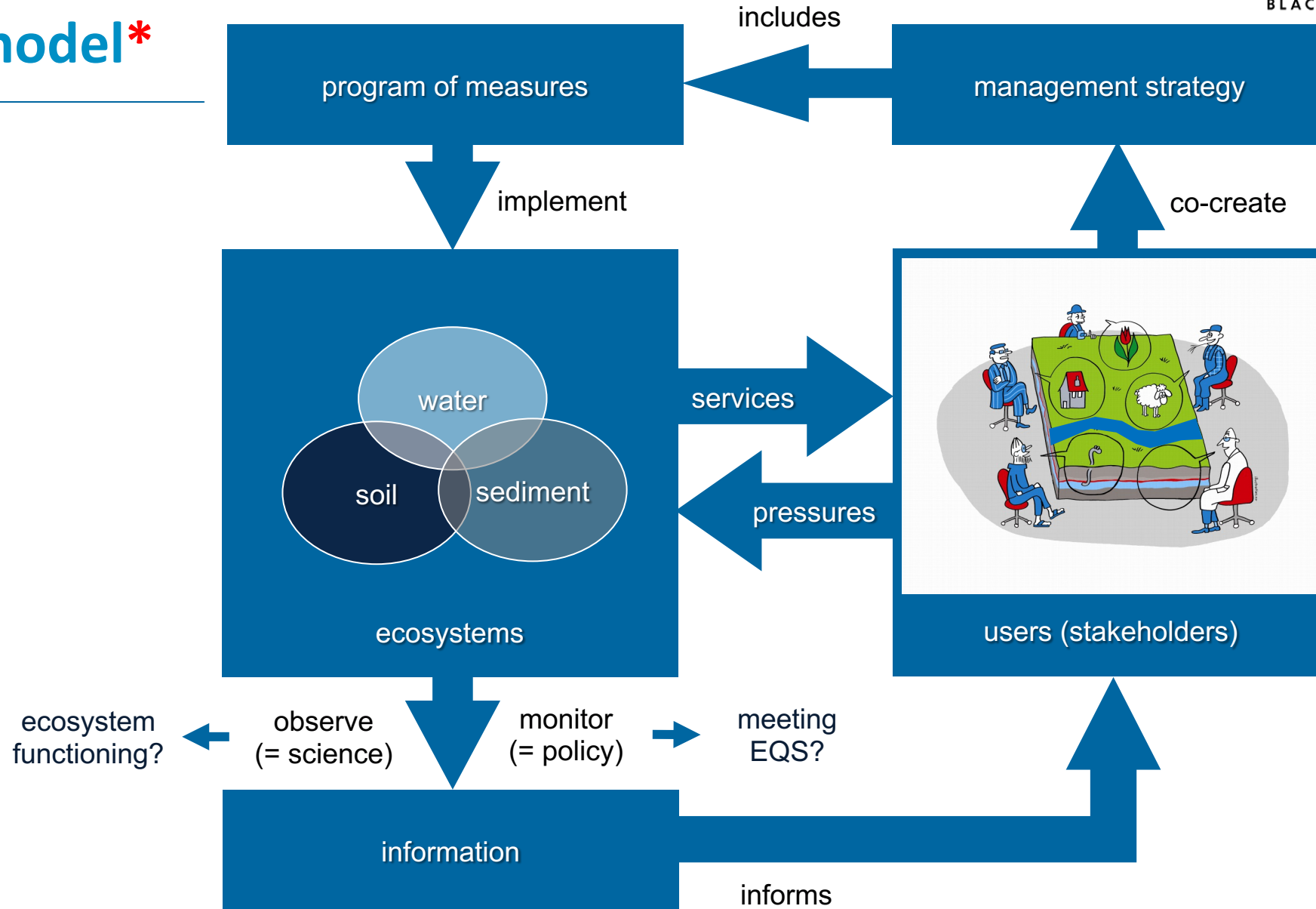# Building of the conceptual model

Approach chosen:

Cyclic, iterative, learning-by-doing

Building blocks selected:

- soil-sediment-water
- ecosystems
- ecosystem services
- users (stakeholders)
- pressures
- information
- management strategy
- program of measures

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The model*

program of measures — includes → management strategy

program of measures — implement ↓

management strategy — co-create ↑

ecosystems (water, soil, sediment) — services → users (stakeholders)

users (stakeholders) — pressures → ecosystems

ecosystems — observe (= science) → ecosystem functioning?

ecosystems — monitor (= policy) → meeting EQS?
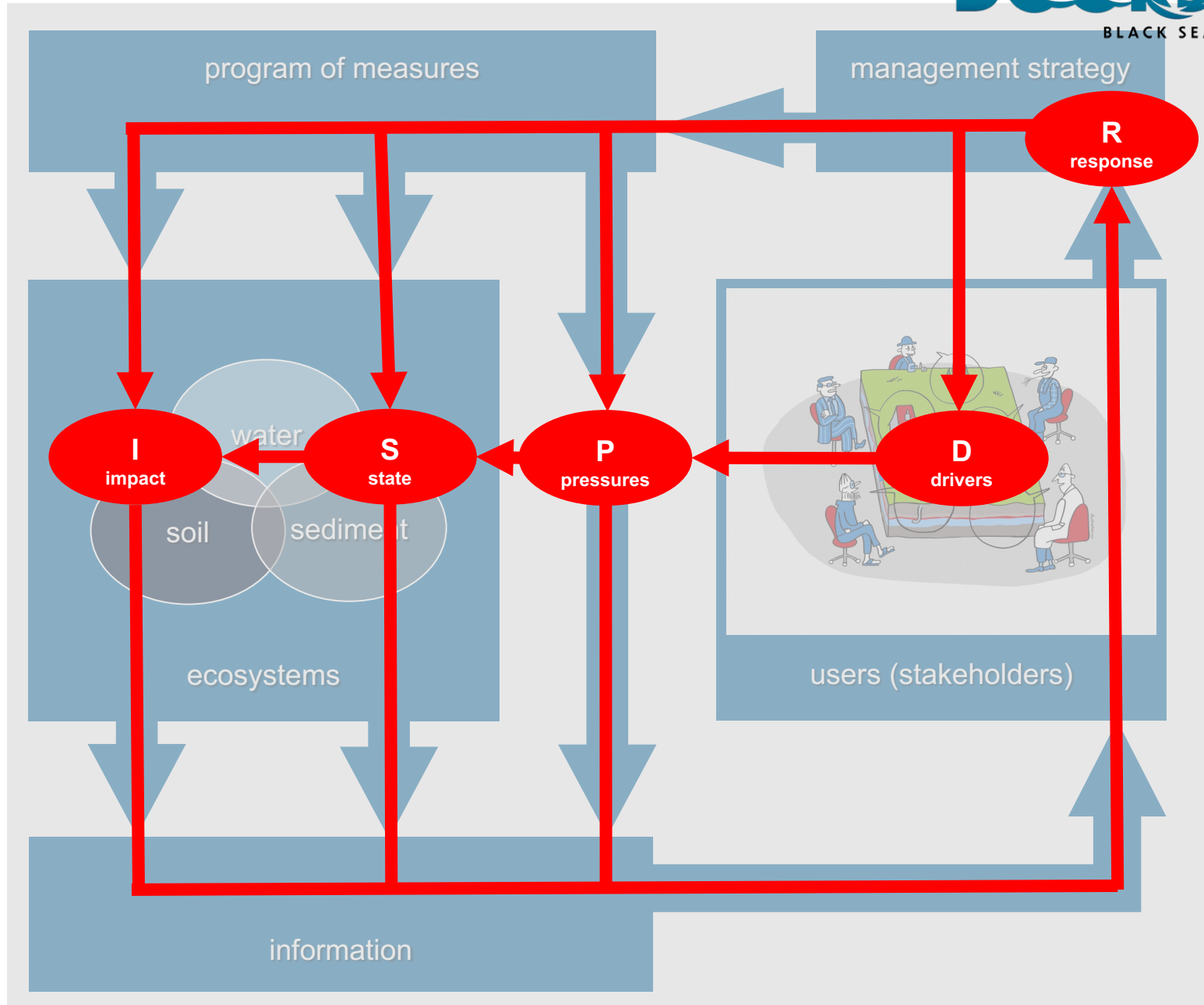
information — informs → users (stakeholders)

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Model building blocks described in a common language*

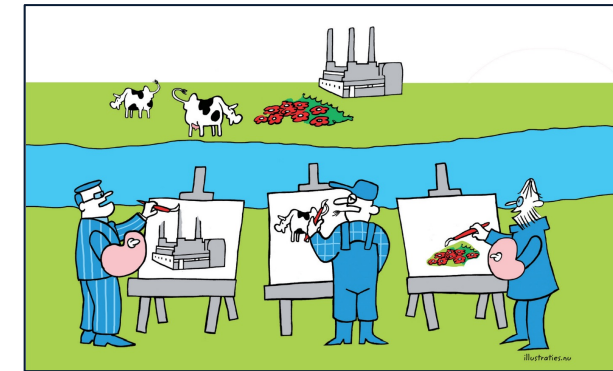| Building block	Described in common language	Source
Ecosystem	A dynamic complex of plant, animal, and micro-organism communities and their non-living environment interacting as a functional unit	United Nations, 1992
Ecosystem services	Services provided and the benefits people derive from these services, both at the ecosystem and at the landscape scale, including public goods related to the wider ecosystem functioning and society well-being	Haines-Young and Potschin, 2018
Information	Organized, structured, interpreted, summarized data	Baskarada and Koronios, 2013
Management	The application of measures to achieve healthy ecosystems	This publication*
Management Strategy	Sets out how users will work together to achieve healthy ecosystems	This publication*
Measure	Action aimed to achieve healthy ecosystems	This publication*
Pressures	The use of ecosystem services and the release of substances (emissions), physical and biological agents which impacts ecosystem health	Modified version EEA glossary
Program of measures (PoM)	Set of actions aimed to achieve healthy ecosystems	This publication*
Sediment	Suspended or deposited solids, of mineral as well as organic nature, acting as a main component of a matrix, which has been, or is susceptible to being transported by water	Brils, 2004
Soil	Upper layer of the earth in which plants grow	AGROVOC
Users (stakeholders)	Those who are affected in their interest or concern by changes in soil-sediment-water management	This publication*
Water	A colourless, transparent, odourless liquid that forms the seas, lakes, rivers, and rain and is the basis of the fluids of living organisms	Lexico, Oxford English dictionary

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Model & DPSIR*

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How to make the model work in practice?

By testing in Living Labs and hereby apply common sense, i.e.*:

- Speak the language of the stakeholders

- Take the time to understand from stakeholders how they are affected

- Take an entrepreneurial approach:

  - leave comfort zones

  - take an adventurous road

  - learn together to manage together

  - consider other than only command-and-control solutions

- Spend ample time in defining understandable, SMART targets

- Clear consequences, and for whom, if targets are not met

- Provide facilitative leadership: authorities can play a key role:

  - by acting less like a 'controller or regulator'

  - and more as an 'enabler, persuader, motivator, or mediator'.

➡ paradigm shift!
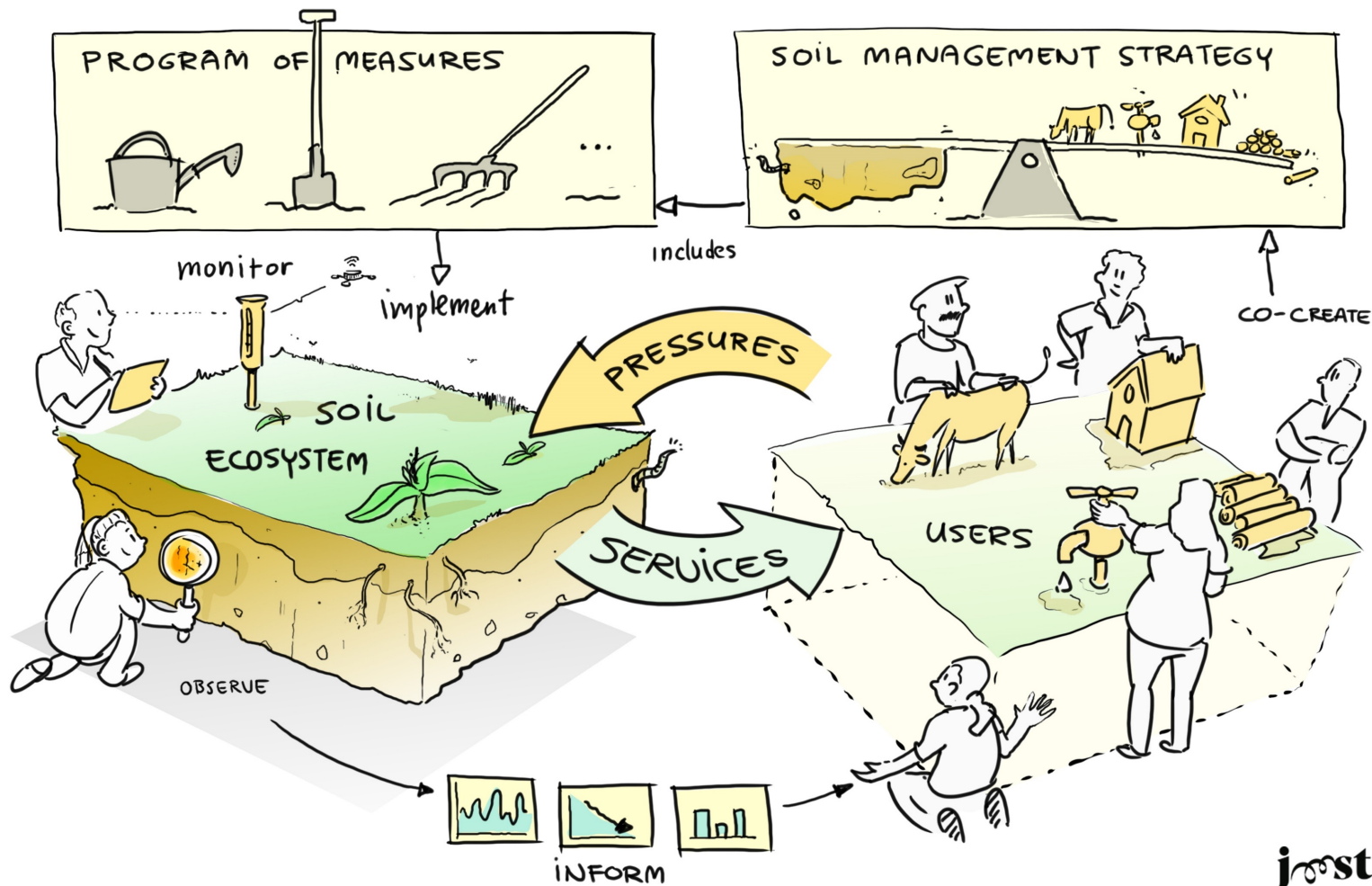

'leave comfort zones'

'learn together to manage together'

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* Brils, Appleton, van Everdingen, Bright (2015) Key-factors for successful application of ecosystem services-based approaches to water resources management

Model already successfully applied in some EU Soil Mission projects

Applied in:

- **SMS**:
  Soil Mission Support
  (Horizon 2020)

- **PREPSOIL**:
  Preparing the European
  Mission towards healthy soils
  (Horizon Europe)

- **ISLANDR**:
  Information-Based Strategies
  for Land Remediation
  (Horizon Europe)

* Source drawing: Nougues and Brils (2022) Soil and Land Management Ontology Reference document (Drawings: Joost Fluitsma)

THANK YOU FOR YOUR ATTENTION

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