

Environmental Virtual Observatories for Connective Action (EVOCA)

Responsible life-sciences innovations for development in the digital age:

Environmental Virtual Observatories for Connective Action in crop, water, livestock and disease management in Africa

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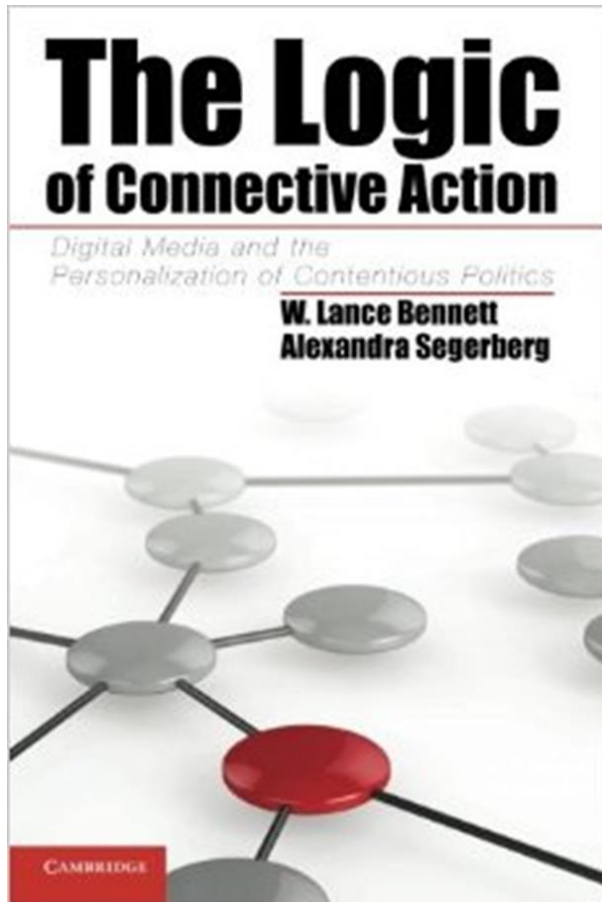


What are EVOs?

- New approach to environmental management, stemming from **citizen science**
- Citizen science:
 - gathering, processing and distribution of scientific knowledge **with and by ordinary people**;
 - bottom-up practice that takes into account local needs, practices and values
- EVOs represent an emerging suite of information **gathering, processing and dissemination** technologies (ICTs, software, hardware)

(Karpouzoglou, T., Zulkafli, Z., Grainger, S., Dewulf, A., Buytaert, W. & Hannah, D. M. 2015, Haklay 2013, Bonney et al. 2009, Shirky 2008, Buytaert et al. 2014, Silvertown 2009)

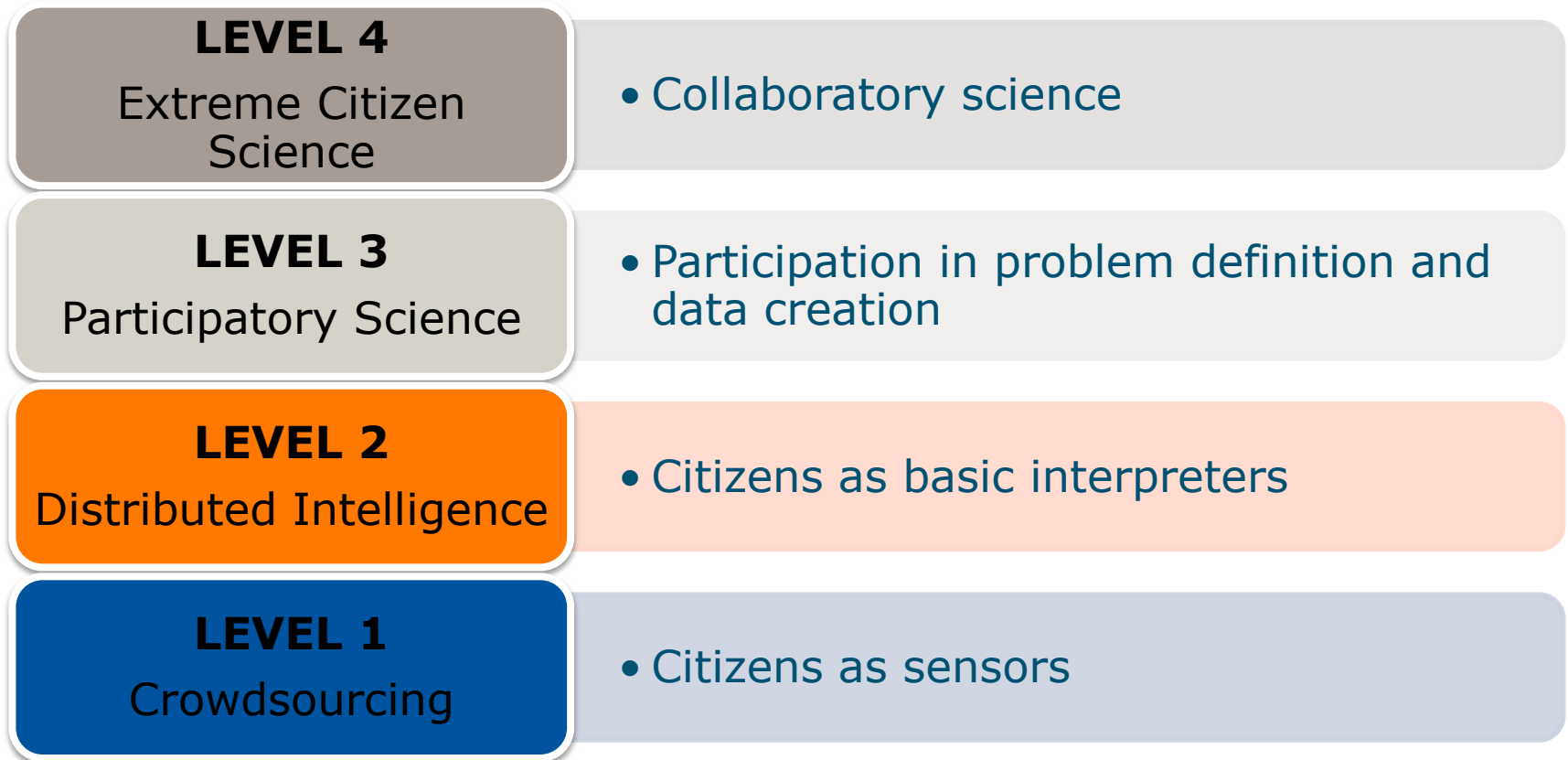
Connective action



Collective engaging in targeted action, shaped through connecting: the uploading and sharing of information, images or frames

- Minimal need for formal organization
- Fast, low-cost, large scale access to and exchange of information
- Peer-to-peer mobilization through personal networks

Citizen Science – Levels of Participation



Classification of citizen science projects; after: Haklay, M. (2013). Citizen Science and Volunteered Geographic Information – overview and typology of participation. In: Sui, D.Z., Elwood, S. and M.F. Goodchild (eds.), 2013. Crowdsourcing Geographic Knowledge. Berlin: Springer.

Problem-driven project



Case 1

A crop and disease management system in potato production in **Ethiopia**



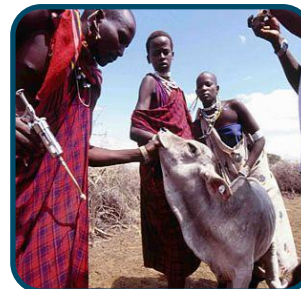
Case 2

Water monitoring and irrigation management for food production in **Ghana**



Case 3

The malaria mosquito radar as a digital citizen science platform in **Rwanda**



Case 4

Tick-borne disease and livestock-wildlife management in **Kenya**



Case 5

Sustainable intensification of cocoa and food crop farming systems in **Ghana**

Example case 3:

Wildlife – livestock conflict and tick management in Kenya

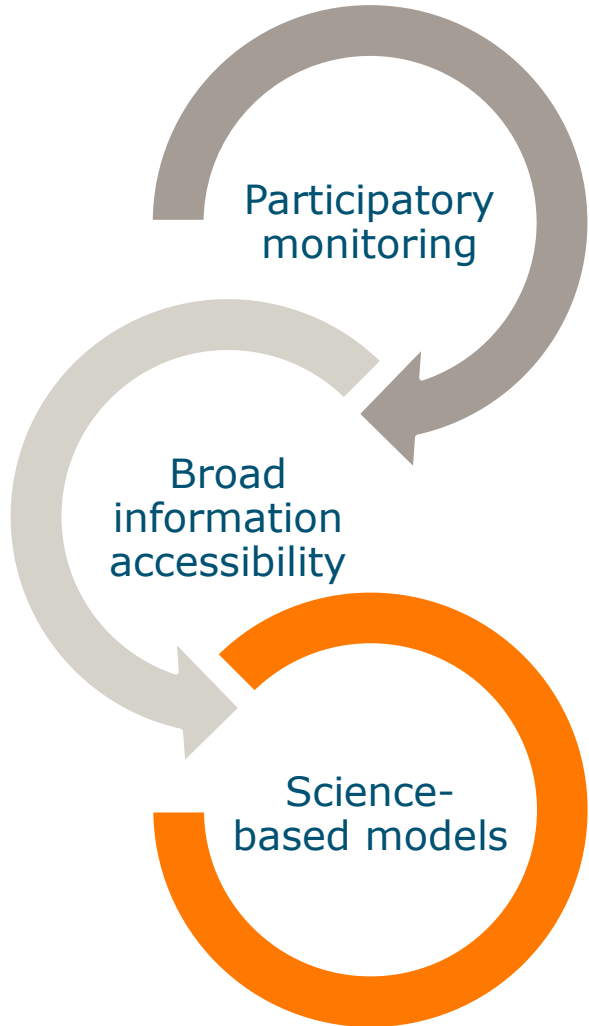
- Laikipia National Park
- Wildlife and livestock share grazing pastures
- Tick transmission – impossible to eradicate through traditional methods: dipping, spraying, separation – farmers turn to burning bush



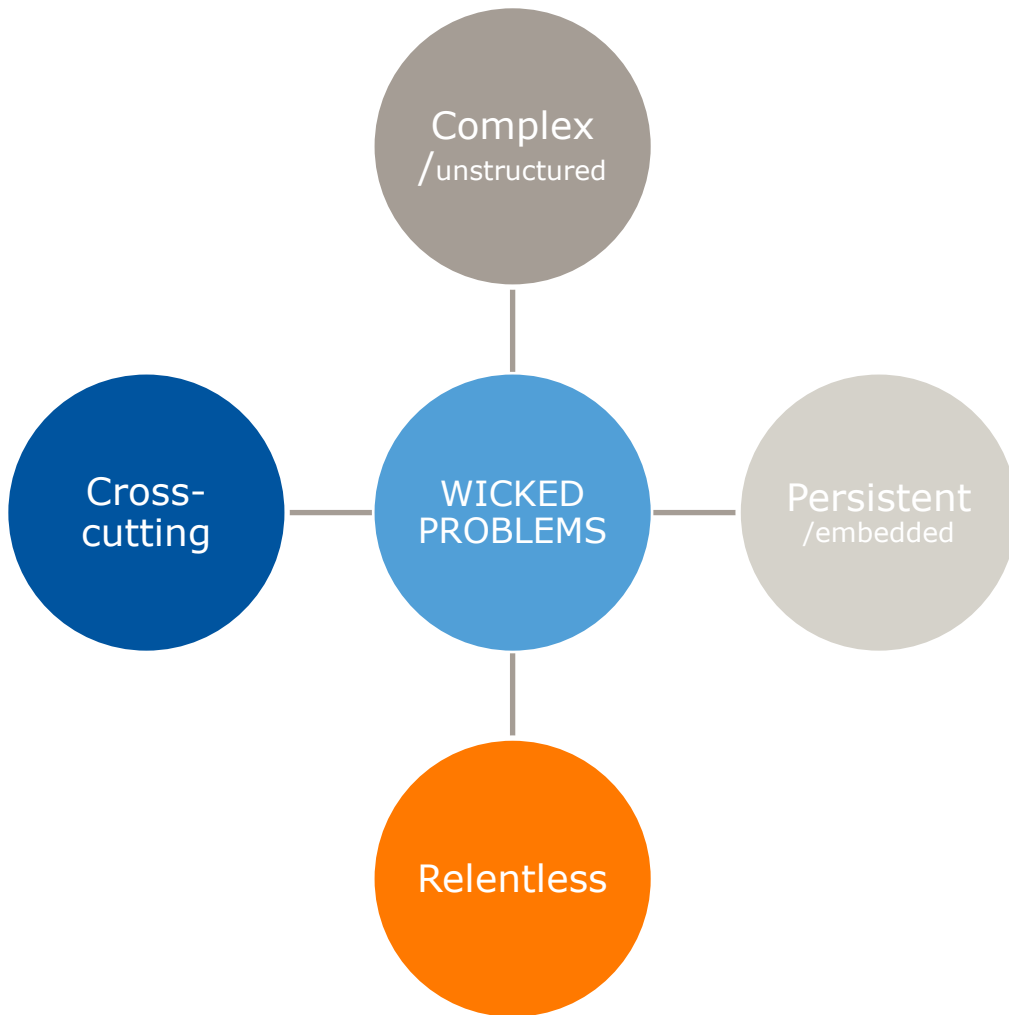
Environmental Virtual Observatory: farmers report the number of ticks observed on animals, GPS signal tracking, interactive map of the most tick infected areas



EVOs' components



Socio-environmental problems – wicked problems



Wicked problems cannot be resolved – they must be tamed, or managed (Cooke 2004)

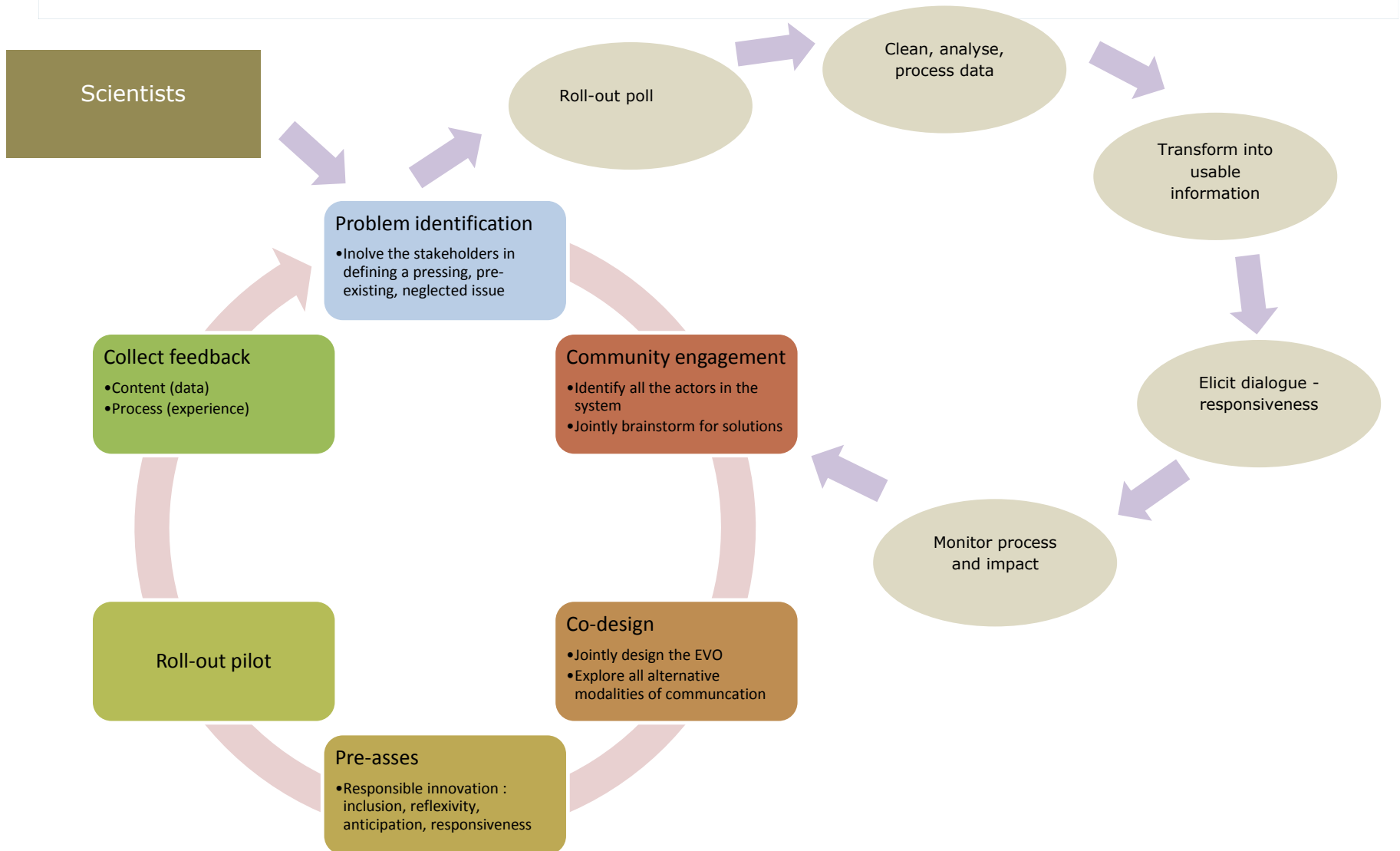


citizen science

- Participatory monitoring
- Community-based management
- Collective action

Brown et al. 2012, Norton 2012, Ozerol 2012, Conklin (2006)

EVO Design Scheme



How to innovate?

RESPONSIBLE INNOVATION RECOMMENDATIONS

- 1. Design with the User**
- 2. Understand the Existing Ecosystem**
- 3. Design for Scale**
- 4. Build for Sustainability**
- 5. Be Data Driven**
- 6. Use Open Standards, Open Data, Open Source, and Open Innovation**
- 7. Reuse and Improve**
- 8. Do no harm**
- 9. Be Collaborative**

The United Nations Responsible Innovation Guidelines 2015

Challenges ahead? EVO - sceptics

- Is citizen science data 'professional' enough?
- How do we arrive at 'actionable knowledge'?
- Reliability?
- Validity?
- Does citizen science create a different kind of knowledge?
- Democratization of science?

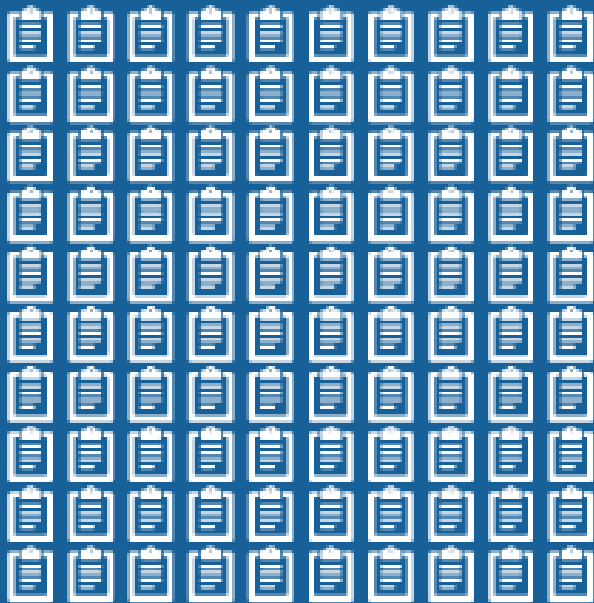
But Does it Even Work?

Reef Covertypes	Volunteer Collected Data	PI Collected Data
Hard Coral	7,7%	7,2%
Algae	82,1%	84,3%
Soft Coral	5,6%	4,9%
Sand	1,3%	1,1%
Rock	2,8%	2,9%
Sponge	0,4%	0,5%
Other (e.g., tunicate, etc.)	0,1%	0,0%
N	2031	597

Rollino, J. (2012). Reliability and long-term monitoring using citizen science – a case study. Earth Watch Institute Research Project: Bahamian Reef Survey

EVO Trivia

More than 100 studies
have been published in recent years that
relied on citizen scientists for data gathering.



**Citizen scientists
helped discover**



of tracked North American birds
had moved their ranges
northward by an average of

**35
miles**

Cross-cutting themes

- EVO/citizen science as a new tool/methodology for socio/environmental research for development? (Shirk et al 2012)
- Changing modalities of knowledge production and utilization; democratization of science (Jalbert and Kinchy 2015, Stilgoe et al. 2014, Raman and Mohr 2014, Schut et al. 2013, Feldman and Ingram 2009).
- Collective action through connective action: the role of ICTs in governing the commons (co-management of the commons), Osrom 1990, 1998, 1999, 2010, 2016; Fischer et al. 2014; Ngadendra et al. 2012)
- ???