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**Presenter Information**

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# A network of transdisciplinary observation mechanisms as a digital source of knowledge on rangeland, to communicate and exchange at local, regional and global scales

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**Key words:** citizen science; open data; sustainable development; observation.

## Abstract

For several decades, interventions geared towards the development of drylands have been the catalysts of much change in a rapidly evolving world, and learning how to build sustainable trajectories that take into account both cultural and contextual variations is becoming of increasingly great import. As local problems become intertwined, and given the difficulty of large-scale collective action, understanding these dynamics requires cognizance of all levels of knowledge governance systems and their interactions. So far as rangelands are concerned, the lack of easily accessible documentation encompassing all knowledge to date is a major impediment to their sustainable development. With this in mind, polycentric governance would allow for centralized decision-making, which would then give rise to solutions that could be adapted to local conditions. Recent advances in technology and the proliferation of data are creating new opportunities for monitoring the progress and performance of multi-scale development efforts, and indeed new and non-traditional data sources will be paramount to the success of such endeavours. For instance, participatory observation is an emerging example of a non-traditional data source that is already making a significant contribution, and has fostered engagement at the community level. We seek to demonstrate the value of implementing transdisciplinary observation mechanisms—here, in relation to Southern Countries’ pastoral systems—and to provide concrete examples of how such mechanisms can be adopted for mainstreaming the use of data from a variety of sources, thereby facilitating the implementation of a sustainable development agenda as part of a continuous learning process. This project has been managed within the framework of the Agadir Platform, infrastructure supported and implemented by Ibn-Zohr University, Morocco.

## Introduction

The last twenty years have witnessed significant advances in environmental governance, such as the recognition of the importance of local resource management institutions, the introduction of laws on the regulation of environmental impacts, the development of community protected areas and common property systems, and increased management of collaborative efforts. Attempts to broaden participation in environmental governance are not only found at the local level, but also at the international level, with the United Nations (UN) driving the impetus.

Since the 1972 United Nations Conference on the Human Environment in Stockholm, global environmental governance has been becoming less State focused. Civil Society has expanded its presence both in the implementation of environmental policy, and in supporting the emergence of new institutions (Bernauer and Klöck, 2012.) It has become evident that engaging Civil Society would be necessary to foster a better-informed community, and to empower citizens to improve their own health and well-being through informed decision-making achieved via a participatory observation process. This form of community-based environmental governance implies the participation of citizens in monitoring the quality of the environment they live in. Indeed, Environmental Governance takes into account the role of all actors that impact the environment. From governments to Non-Governmental Organizations (NGOs), private sector and civil society, individuals and citizen groups, cooperation is critical to achieve the kind of effective governance that will lead the way towards a more sustainable future.

More recently, taking the example of the intergovernmental negotiations for the Sustainable Development Goals (SDGs), the interventions of Civil Society have encouraged a culture of

participation in the creation of global policies on sustainable development. However, it had only a marginal effect on the formulation of the questions, on the stance embraced by governments, and on the final agreement (A. Sénit 2019). Its involvement could, however, still play a role in the implementation of the SDGs by (i) defining national and subnational targets and metrics, (ii) monitoring progress and (iii) implementing the plan of action. In fact, tracking the progress of these efforts requires a breadth and depth of data in areas where data coverage is often particularly weak today. A global sustainability framework would require public engagement to generate the societal transformations necessary to achieve the SDGs.

This is a challenging task for many countries around the world, with clear disparities in the wealth of available data and the ability of each country to provide long-term consistent data. While some indicators require local data, others could benefit from a more regional or global approach, or a combination of the above. Furthermore, for some SDG indicators, data and processes are not yet defined (Tier III)<sup>1</sup>, which makes a one-size-fits-all approach impractical. How indicators are implemented depends on data availability, political and development priorities, capacity, existing data infrastructure, and institutional arrangements within each country. Today, there is an unimaginable range of indicators compiled by a wide variety of producers: civil society; academia; NGOs and the private sector (MacFeely and Nastav, 2019). Bearing this in mind, it is time to consider alternative approaches.

Most of the inputs to SDG reporting come from traditional sources of data collected nationally by public administrations. Although essential, this method has several limitations, namely (i) coverage: with data often being limited to areas with easy access; (ii) openness: as datasets are managed for internal use; (iii) timing: as data can quickly become outdated. New and non-traditional sources of data are therefore required. For example, data provided through participatory observation mechanisms could be used to complete and ultimately improve the SDG reporting process (S. Fritz et al. 2020). Below, we demonstrate the value of these sources of data through the creation of a network of transdisciplinary observation mechanisms, based on previous research initiatives carried in the southern part of Morocco, the Souss-Massa region. We then inspect the concept of transdisciplinary observation through the prism of learning how to build sustainable trajectories that consider both cultural and contextual variations. Finally, we contend that the direct involvement of ordinary people—not just scientists and professionals—in the collection of data, is key to harnessing the collective intelligence, distributed information, and knowledge and experience contained within individuals and communities, in turn filling the gaps that many regions still face. This analysis relies on initiatives developed in the North of Mexico in the framework of the international network RISZA<sup>2</sup> and implemented within the Agadir Platform, of which the main objectives are to coordinate national participatory research networks as well as collaborative, transdisciplinary research efforts and training opportunities, and to build a cross-regional, coordinated research framework centered around the SDGs and focused on the sustainable development of local socio-ecological systems and the reinforcement of governance systems (A. Rizzo et al. 2020).

## Methods and Study Site

The semi-arid climate of the Souss-Massa region located in south-western Morocco is influenced by three factors: elevation, ocean coast, and the Sahara Desert. The north of the region, dominated by Atlas, is characterized by a semi-arid climate, progressing to a more humid climate as we descend towards the plain. The center of the region, which occupies the southern valley of Atlas and the basins of Souss and Massa, is shaped by an arid climate despite a wide opening on the Atlantic. The southern and south-eastern part of the region which makes up the northern side of the Sahara is governed by the desert's climate.

Precipitation varies highly with time and place, with an average rainfall of 200 mm/year (Bouragba et al. 2011; Seif-Ennasr et al. 2017). Recent studies on the role of decadal and multidecadal variability in the Atlantic Ocean have shown that the modes of multidecadal variability (AMO-Atlantic Multidecadal Oscillation, and NAO-North Atlantic Oscillation) may lead to drought in Latin America (Brazil and Mexico) and Morocco but with very heterogeneous and antiphase expressions (Méndez and

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<sup>1</sup> <https://unstats.un.org/sdgs/iaeg-sdgs/tier-classification/> - Tier III: no internationally established methodology or standards are yet available for indicators, but methodology/standards are being (or will be) developed or tested.

<sup>2</sup> RISZA – Red Internacional para la Sustentabilidad de la Zonas Áridas

Magaña 2010). For example, a positive mode of AMO causes droughts in the Amazon region (Marengo et al. 2011), Northern Mexico, and inundations in Southern Morocco. Bearing this in mind and taking into account that, tourism, agriculture and pastoralism are the major drivers of economic value in the region, and that most rangelands in Morocco are found in arid and semi-arid regions, we have focused our activities in this area. Here, the absence of an easily accessible source of data aggregating all knowledge related to rangeland is a clear obstruction to the definition of sustainable development practices that take into consideration both human and ecological dimensions (D-L. Coppock et al. 2017). This is all the more salient because Morocco is a developing country.

There remain severe doubts with regards to the openness and coverage of some of the official datasets, as nationally reported data cannot, by nature, be exhaustive in capturing variations across the country. Defining coverage as the availability of data, and openness as the level of access to this data, it is evident that the gap in coverage must be filled if it is to be of any relevance. If national statistical capacities are not extensible, other ways ought to be explored to improve upon its local, regional and national accuracy. One possibility resides in the empowerment of individuals and communities in monitoring activities through their participation in the establishment and development of permanent observation mechanisms, especially if we take into consideration that 68% of the environmental SDG indicators lack data. Indeed, participatory observation already contributes or could provide data to 40% of the environmental SDG indicators (D. Fraisl et al. 2020).

Taking the aforementioned into account, we conducted a study of some of the initiatives in participatory science carried out in the south of Morocco over the past few years. For the most part, these consisted of multidisciplinary operational research projects, mainly funded by local governance authorities or organizations responsible for natural resource management. These projects largely focused on the development and management of natural resources, and were generally initiated by state services and communities, sometimes with the support of international cooperation organizations. We focused our analysis on use-cases studied by researchers in humanities and social sciences from the Ibn-Zohr University in collaboration with local actors in charge of natural resource management in the Souss-Massa region.

## Results

Transdisciplinary observation was always a fundamental consideration in previous research efforts concerned with the orchestration of development projects. With the interactions between researchers and stakeholders in mind, transdisciplinary groups of observers were often set up during the preliminary stages of the strategic planning process. Sessions aimed at conveying the results of the research to Civil Society were carried out for the sake of reorienting and supplementing the diagnosis.

Owing to the different circumstances and challenges at play, there is still an obvious discrepancy between theory and practice on the question of data coverage. Generally, data reported nationally, such as the RGPH<sup>3</sup> and the RGA<sup>4</sup>, is structured based on municipalities, which are little more than national administrative breakdowns of the land. Any attempt to adjust them to accurately reflect spatial variation across the country would be a challenge, if not outright impossible. Thus, to complement this data at a more relevant and adequate scale, the participatory approach was used to glean information at the level of individual households and indigenous communities. Peculiar to Moroccan rural areas are the *douar* (village) for sedentary groups and the *frig* (group of tents) for mobile groups, nomads or transhumant communities. Due to accessibility issues and the limited time allocated to this type of research, observers often adopted the so-called RRA<sup>5</sup> approach, recommended by the FAO since the '80s.

Projects implemented during the last thirty years in the southern regions of Morocco—those with bioclimatic characteristics from semi-arid to hyperarid—were mainly concerned with local development dimensions related to the emergence of local governance systems for natural resources management and sustainability as well as the realization of infrastructures needed for improving living conditions (roads, sanitation, electricity). In principle, all Moroccan planning and development institutions have fairly detailed data repositories detailing their activities or areas of action, but they remain sectoral and

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<sup>3</sup> RGPH: *Recensement Général de la Population et de l'Habitat*

<sup>4</sup> RGA: *Recensement Général de l'Agriculture*

<sup>5</sup> RRA: Rapid Rural Appraisal

difficult both to consolidate and to homogenise. In addition, these databases are generally not open sourced and their costs are too high for academic purposes.

## Discussion

The Dubai Declaration, drafted at the conclusion of the 2018 UN World Data Forum acknowledges “that the data demands for the 2030 Agenda require urgent new solutions that leverage the power of new data sources and technologies through partnerships between national statistical authorities and the private sector, civil society, and the academia and other research institutions”. The implementation of transdisciplinarity as a research model on sustainability can be a solution, but it poses various challenges: the inclusion of non-academic actors throughout the research process, the integration of different types of knowledge and worldviews, the development of appropriate quality criteria, and proper sensitivity to normativity. Observatories should enable participation and then contribute to environmental governance by providing relevant data and information that will help decision-makers to make sound judgements globally, regionally and locally. Scientifically speaking, linking transdisciplinarity to participatory observation mechanisms is essential to go beyond disciplinary perspectives to establish holistic patterns taking systemic dynamics into account.

To develop a participatory observation tool, it seems necessary to improve the particular channels and mechanisms that underpin environmental-social-political actions in a way that facilitates society’s ability to influence environmental governing priorities and processes. Bearing this in mind we argue for the need to build a long-lasting federated infrastructure that uses open and FAIR standards. The repository should be widely accessed, extended and maintained, and should be seen as a governance enabler rather than a project-specific outcome. This proposal envisages the creation of a regulated market place, where collectors try to enrich the governance indicators. Concerning the data produced by participatory observation, the following areas should receive careful consideration: (i) Data and metadata quality, especially when comparing crowd-sourced and reference data, as defined by standard organizations; (ii) Data privacy and security, as sharing data requires strong ethical and security considerations, especially when it is produced by citizens; (iii) Data interpretation, with qualitative indicators developed in parallel with more quantitative indicators not solely based on individual perception.

The resulting network of transdisciplinary observation mechanisms rests on a peer-to-peer architecture based on open standard components. Linked data allows for publishing data in a standardized way and connecting it to other data sources, complementing it and thus providing a wider context for it. The ontology developed into the framework of a network of participatory observatories should be used to annotate the data gathered through these different sources, with the aim to publish this annotated dataset as open data, relating it to other linked datasets. It can provide a standard way to expose, share and connect data on global, regional and local scales. Generally, these data are not necessarily interoperable with systems officially employed. Further developments are necessary in data collection and analytical tools, data validation processes, and interoperability to ensure that the data are structured in a way that is of high quality, comparable, and could inform policy.

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