Manifesto for Socio-territorial Science, Technology and Innovation Metrics

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Background

Science, technology and innovation have become a driving force for transformations of all kinds at local and global scales. However, globally unequally distributed resources —such as money, people, infrastructure, among others— have generated disproportionate developments. This is not only a problem of science itself, but also of the way in which societies have developed, the relationships between them, and the role that science and technology have played in the dynamics and development of societies.

Today, in addition to the problems of asymmetries, inequality, exclusion and marginalization, there are pandemics, forced migrations, extractivism and the visible effects of climate change as a generator of local and global transformations and disasters, for which science and technology play a central role in their understanding, mitigation, prevention and solution. Thus, capacity strengthening[1] strategies with knowledge of the local and global distribution of resources for science, technology and innovation, are essential for action in the contemporary world.

[1] Capacity strengthening comes from IDRC´s Framework for Strengthening Organizational Capacity and should be understood as the "ongoing process by which people and systems, operating within dynamic contexts, learn to develop and implement strategies in pursuit of their objectives for performance in a sustainable way" (IDRC, 1995)

In this context, a transformation in science seems to be taking place. The formation of networks, the demand for impact, research through and in virtual and simulated worlds, together with the growing movement for access and open and citizen science, are accompanied by permanent institutional adjustments and redesigns, policy changes, new priorities, instruments and a growing tendency to align, for example, to the Sustainable Development Goals.

In this context, efforts to know, understand and manage science, technology and innovation, through metrics and forms of scientific evaluation, continue to focus on traditional forms and on citation impact metrics which respond to forms of evaluation, financing and spending in transnational publication systems. Local, national and global movements for the opening up of science and its evaluation are increasingly active, and permeate science, technology and innovation policies.

We propose that, in these efforts, we should incorporate a set of principles that allow us to construct metrics and forms of evaluation that consider the characteristics, requirements and socio-territorial demands that should inspire and contextualize our capacity strengthening efforts and initiatives.

Principles for the development of socio-territorial metrics in science, technology and society.

Socio-territorial science, technology and innovation metrics can be defined as a set of guiding principles, concepts and methodologies necessary to elaborate, pilot and implement public policies to understand and manage the relationships between the structure, the resources and the specificities, demands and requirements of local, national and global territorial environments.

We propose that, for the development of conceptual, methodological and technological approaches, the following guiding principles be considered.

1. The complexity of the relationships between science, technology, society and territory: one of the most relevant challenges today is to bring together

networks of specialists, academics, researchers and managers on science, technology and innovation, which are organized in different communities: social studies, scientometric and bibliometric studies, econometric and innovation studies, historical studies, philosophical and epistemological studies. Currently, the challenges of understanding and managing the future require the development of inter- and transdisciplinary efforts for which the relationships between science, technology, society and territory, together with the development of metrics, constitute an opportune, relevant and promising space. The development of metrics should account for these complex relationships through the generation of indicators capable of better capturing these complexities and through the implementation of proven methodologies in the aforementioned studies (interviews, life trajectories, institutional geographies, studies of multidimensional or heterogeneous networks, among many others), which are able to survey, analyze and interpret these complex relationships in the territory in a way that is adaptive to its changes.

2. Recognition of the heterogeneity of capacity strengthening requirements: science, technology and innovation resources are heterogeneous and are expressed as such. They result not only in products such as publications, patents, invention or utility models, but also in the development of training, linkages with the environment, all types of support (services, applied studies, consultancies and advisory services) and the broad spectrum of forms of linkages with policy priorities, specific social and territorial requirements, such as collaborations with social organizations and the provision of research data and scientific information. An appropriate form of measurement must recognize this heterogeneity in the scientific endeavor which must be encouraged, understood and managed. It is necessary to recognize the plurality of ways, means of expression and results of science, technology and innovation in the construction of metrics. This requires adjusting and specifying expectations and social contracts that regulate and guide scientific work, effectively recognizing plurality and heterogeneity. This recognition implies a new notion of quality in evaluation, focused especially on the strengthening of capacities for the articulation and convergence of resources in science, technology and innovation.

3. Transcend the notion of the impact of science, technology and innovation: impact transcends citations or co-authorships, it permeates the processes, results, achievements and effects generated through science, technology and innovation. It is essential to converge quantitative, qualitative and participatory approaches and methods to understand the contribution and social, cultural, political and environmental transformations, and not only observe them as impacts on scientific productivity or productive competitiveness. The social and territorial contribution made by science and technology to the development of problems, demands and requirements should respond to and be respectful of the environments of scientific activity. Institutions responsible for policies and management, whether public or private, academic or other, should collect and generate processes to incorporate alternative or complementary forms of evaluation of the impacts of their work in order to manage and enhance its own capacity strengthening initiatives. Taking into account the heterogeneity of scientific work, its manifestations, forms of organization, results, achievements and effects, it becomes essential to achieve a convergence between the aforementioned approaches and methods in order to fully understand the contribution and transformations that this work entails, both in culture and in society, politics and the environment.

4. Identification, recognition and management of territorial science, technology and innovation agendas: shared agendas —understood as organized sets of research lines, programs and networks of heterogeneous actors that converge in a sustained manner—include cultural and linguistic identities that are historically related in a territory. In a globalized world, shared agendas tend to internationalize through complex and asymmetric forms of scientific and technological leadership. It is essential to generate metrics that make it possible to identify and assess the leadership and socio-territorial linkage of research agendas that converge sustainably as a form of expression and articulation of STI resources. The complexity and integrality of knowledge generation processes –circulation, transfer and appropriation- should be reflected in metrics that are not based on a model of inputs and outputs. A territorial agenda can thus respond to society's pressing problems. Forms of

evaluation and metrics are necessary for its identification, understanding and strategic management.

5. Collaboration and construction of participatory territorial networks for the design and analysis of metrics: for the design, piloting, evaluation and implementation of experiences in socio-territorial metrics, it is essential to form inter-institutional collaboration networks between researchers linked to or responsible for territorial agendas with specialists in metrics: public, private and social actors linked to the problems and contents that they want and need to know. This will facilitate the generation of agreements with respect to cross-cutting and specific contents, appropriate methodologies and the generation of participatory instances of analysis and the consequent generation of recommendations. In this way, the processes will not only be based on theoretical approaches and robust methodologies, but also on political-technical-territorial agreements. This requires the articulation of quantitative, qualitative and participatory methodologies and the training of specialists in order to promote adaptation and institutional scaling-up processes.

6. Heterogeneous data, governance and transparency: in socio-territorial matters, it is not only a question of research data and scientific information, data or metadata for research on science itself, but also of public, private and social datasets whose dispersion and lack of standardization detracts from the interest of managers and researchers. A shared challenge, for which solutions need to be communicated, is the development of methodologies and technologies for their processing, analysis and dissemination. Specialists in science studies can contribute in a robust way to design, process, analyze, understand and generate learning in networks.

7. From data management for the visualization of the territorial distribution of resources to the indexing and understanding of territorial capacity strengthening requirements: today, efforts are being made to move from the definition of centralized priorities to sectoral priorities, the construction of agendas and policies that attempt to reflect territorial specificities, demands and

requirements. The design, consolidation and opening of information infrastructures for the construction of indicators is required. To this end, these infrastructures must include the management of data derived from research, as well as the methodologies and technologies developed in a way that makes the forms of access to them transparent.

8. Openness of methodologies, technologies and solutions: the type of development faced in dealing with public problems and dilemmas generates the need for local, national and global actors to share and access not only the results of knowledge, their research data and scientific information, but also the methodologies and technologies developed. Furthermore, it is essential that these methodologies, technologies and solutions are less dependent on initiatives from countries in the Global North. It is essential that there be sovereignty for Latin American countries to create their own knowledge and scientific evaluation infrastructures, thus ensuring significant autonomy in the production and application of knowledge in the Latin American region.

9. Visibility and circulation of knowledge: the territorial issue and regional asymmetries play a significant role in scientific visibility and production, influencing the dissemination of knowledge. Frequently, less developed regions face structural challenges that limit access to resources, infrastructure and research opportunities, which can result in lower visibility of their scientific contributions. Regional disparities impact the ability to actively participate in scientific production and dissemination, exacerbating inequalities in the visibility of knowledge generated from different geographic areas. Therefore, it is necessary to make visible scientific knowledge, but also cultural or local knowledge that has been built on the margins and peripheries and/or has been marginalized. It is essential to take measures to reduce these territorial disparities, promoting a more equitable representation of scientific diversity and ensuring that valuable contributions from less visible regions are recognized and shared globally.

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