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# The Process of Co-Production of Knowledge in the Field of Climate Services

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## Abstract:

Climate services provide climate information to facilitate informed decision-making, risk management, adaptation, and resilience in a changing climate and hydroclimatic hazards events. The concept of climate services first emerged in an international context in 2009 at the United Nations World Climate Conference, after which the Global Framework for Climate Services (GFCS) was developed in 2011. The information provided by climate services is produced and delivered in accordance with the specific requirements of end users. These needs relate not only to the information itself, but also to the frequency with which it should be provided and the channel through which it should be disseminated, which may include websites, bulletins, text messages, smartphone applications, radio, etc. These services offer substantial benefits in several sectors, including agriculture, water resources, energy, health, and disaster risk management.

To ensure the information is useful to the end user, climate services must be co-produced between the relevant actors, namely the National Meteorological and Hydrological Services (NMHS) and the end users. This allows for services that give the end users the ability to act upon the information given. Moreover, a tailored approach is essential, with a specific case, sector, and service being provided for each case study. Co-production should occur throughout the entire process, from the initial acquisition of climate information to its ultimate delivery. This approach facilitates the establishment of trust in the service and in the NMHS, as end users are engaged and become active participants in the process. The development of climate services through a co- production process reduces the use of a top-down approach, where institutions create and deliver services without consideration of the user.

In this context, studies that assess the socioeconomic benefits of these services are of great importance, as they determine the value of these services by quantifying both tangible and intangible benefits. Such studies facilitate the justification of investments in NMHS, while also enabling a deeper comprehension of the requirements of climate services and the means of enhancing them to the needs of users.

Despite its increasing prevalence and considered fundamental in climate services, the concept of co-production remains without a clear definition in the field. In contrast to conventional, top-down methodologies, knowledge is collectively constructed by all stakeholders, thereby ensuring that the resultant climate services are tailored to the specific requirements and contexts of end-users.

The ENANDES “Enhancing Adaptive Capacity of Andean Communities through Climate Services” and ENANDES+ “Building Regional Adaptive Capacity and Resilience to Climate Variability and Change in Vulnerable Sectors in the Andes” projects are situated in the Andes region of South America. Their objective is to enhance the region's resilience in a multitude of sectors through the provision of climate services. It entails a collaborative effort between various countries and

institutions. The participating countries in the Andes region are Argentina, which has both a NMHS and a Regional Formation Center (CRF), NMHS Bolivia, NMHS Chile, NMHS Colombia, NMHS and CRC Ecuador, NMHS and CRF Peru. In addition, there is a Regional Expertise Hub (NUREX), which consists of a virtual platform for sharing information created for the project and managed by Peru. Moreover, other institutions are involved, including the NMHS Switzerland, which contributes its prior expertise, the Bern University of Applied Sciences (BFH), which provides assistance in SEB methodologies, the International Research Centre on El Niño (CIIFEN) with the Regional Climate Center of western South America (CRC-OSA), the Regional Climate Center for the south of South America (CRC- SAS), and the World Meteorological Organization (WMO).

This elaborate interchange between institutions allows to incorporate viewpoints, competencies, and experiences to confront the multifaceted climate change. Co-production enables the integration of diverse perspectives, expertise, and priorities, which is crucial for effectively addressing the heterogeneous climate challenges encountered. By uniting a multitude of actors from disparate countries, co-production facilitates the formation of a unified understanding and collective ownership of the project, thereby enhancing its overall effectiveness and sustainability beyond the project's duration. In addition to the co-production between the institutions, it is also necessary to prioritize the co-production of services with the end user.

Nevertheless, the organization of co-production across different institutions, interfaces, levels, and objectives presents a number of challenges. It requires the establishment of transparent communication channels, the delineation of shared objectives, and a mutual comprehension of the role and contribution of each stakeholder. For this to be effective, a standardized approach for co- production must be established.

Furthermore, it is important to recognize that co-production should not be viewed as a one- time activity, but rather as a continuous process that evolves throughout the lifecycle of a project. This aspect is of vital importance for the establishment of trust between the institutions involved, as well as with the end user. It is essential to ensure that the information provided by climate services is responsive to the needs of the end user and that it is effectively utilized.

The ENANDES and ENANDES+ projects serve as a fertile environment to define what is co- production in the context of climate services and multi-institution projects and to define a framework that allows for this process to occur.

The value of co-production is particularly evident in its capacity to bridge the gap between scientific knowledge and practical application, thereby enhancing the usability and impact of climate services. By incorporating the participation of all relevant actors, institutions, countries, and regions throughout the process, co-production guarantees that the advantages of climate services are effectively disseminated to the final recipients.

In conclusion, it is important that climate services adopt a co-production approach as a dynamic practice in order to ensure their success and the delivery of benefits for adaptation, resilience and decision-making to end users. As climate challenges continue to intensify, particularly in vulnerable regions like Latin America, the necessity for efficacious and inclusive co-production processes will become increasingly apparent. This approach serves to reinforce the development and implementation of climate services while simultaneously reinforcing the regional cooperation of countries confronted with analogous climate challenges. These are ICA guidelines for submitting abstracts to supplement ICA guidelines for the preparation of papers. All abstracts for abstract-only submission to ICA-event must follow these guidelines and be written using this template. The ICA-event organizers may omit any paper that does not conform to the specified requirements.