Chapter

Navigating the Future through Experimental Policy Design

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Abstract

Innovative strategies in public policy design are crucial to effectively address the complex and interconnected environmental challenges governments face today. The intricate and uncertain nature of these problems often requires experimental coproduction solutions that integrate and synthesize diverse areas of expertise and stakeholder viewpoints and demand experimental and adaptive capacity to respond in turbulent times. As policy-generative experiments in policy design spread and gain legitimacy, they pose substantial challenges: What challenges do governments encounter in implementing experimental coproduction solutions, and what capacities should public organizations develop to navigate complex and uncertain issues effectively? This article analyses the innovative patterns in policy design experiments and the public sector's capacities to develop in the twenty-first century. It illustrates this discussion with the case of Uruguay's soil conservation management plans (SUMPs) as an example of experimental public policy to address land degradation and promote sustainable land management practices. Through this analysis, this paper aims to contribute to evaluating the coproduction experiments and to current discussions on how governments can foster innovation and navigate change processes to address complex and uncertain issues in sustainability transitions.

Keywords: generative experimentation, co-production, innovation, soil conservation policy, policy design

1. Introduction

Governmental institutions are experiencing profound challenges in responding to critical environmental and societal challenges [1, 2]. The complex nature of these issues challenges the rationale of public administrations since they do not fit neatly into existing institutional arrangements and sectoral divisions [3]. Hierarchical and sectoral structures, along with slow decision-making processes, hinder the ability of governments to respond quickly and effectively to these continuously evolving problems [4].

In this scenario, recent studies on public administration and policy design argue that the intricate and uncertain nature of current problems requires flexible and experimental coproduction solutions to bring together diverse knowledge and collaboratively explore innovative solutions to manage public issues [5–8]. These contributions emphasize that we must move away from unicentric bureaucratic, mechanistic, hierarchical governance models that depoliticize knowledge and ignore

uncertainty, downplaying the democratic deliberation about public values required in policymaking.

Ansell and colleagues [9] argue that public administrations must rethink their governance approaches, develop new paradigms, and adapt to changing conditions. Also, the authors claim that immediate responses to turbulent conditions must be treated as "generative experiments" for longer-term strategic adaptation. Therefore, instead of fearing uncertainty in an ever-changing environment, public organizations can embrace it and learn from each experience. Public administrations might become more flexible and strategic in pursuing long-term goals, requiring the development of flexible and adaptive policy approaches.

Despite a growing interest in coproduction experiments in the public sector, until now, little attention has been paid to exploring the necessary conditions to implement experimental coproduction in established administrative silos as well as analyzing the emergent governance models. As policy experiments spread and gain legitimacy, they pose substantial challenges in implementing experimental coproduction solutions and developing new capacities to effectively navigate complex and uncertain issues.

This article contains an evaluation proposal to understand the contribution of the experimental coproduction innovation process in policy design. We illustrate the potential of applying the proposed approach regarding governments' specific challenges in implementing practical coproduction solutions. With this aim, Uruguay's soil conservation management plans (SUMPs) were identified as an example of a coproduction experiment of public policy to address land degradation and promote sustainable land management practices. Through this analysis, this paper aims to evaluate the coproduction experiments, identify emerging patterns of innovation, and contribute to the discussion on what government capacities can foster innovation and navigate change processes to address complex and uncertain issues in sustainability transitions effectively.

This chapter is structured into three sections. Firstly, it explores the introduction of innovative approaches in experimental coproduction in policy design and examines the evaluation challenges. The second section provides a comprehensive overview of the methodology applied in the case study, focusing on an experimental public policy—the soil conservation policy in Uruguay. Lastly, the chapter discusses how governments can foster innovation and navigate change processes to address complex and uncertain issues in sustainability transitions, identifying emerging governmental capabilities.

2. Generative experimenting in public design and evaluation

Recent approaches to public administration and policy design suggest that complex and uncertain challenges require adaptable and experimental coproduction solutions for more robust and equitable decisions. This innovative process involves integrating diverse knowledge sources, facilitating a collaborative exploration of innovative strategies, and developing creative methodologies for designing anticipatory and experimental public policies [10]. Therefore, a paradigm shift is occurring within public policy formulation, transitioning from conventional modes of planning and execution toward a paradigm of generative experimentation [8, 11, 12].

Generative experimentation seeks to address a problem within its contextual framework, wherein the political solution—a conceptualization, innovation, design, policy, and program is systematically refined through ongoing cocreation and

iterative feedback processes involving pivotal stakeholders. By embracing experimentation, collaboration, and iterative feedback, policymakers can develop more dynamic and flexible policies, treating each step as an opportunity for learning in response to evolving circumstances [13, 14].

Policies are treated as hypotheses, with management actions serving as experiments to test these hypotheses directly within the action process [15]. The continuous refinement through generative experiments involves ongoing negotiation to reach solutions accommodating diverse stakeholder perspectives. Successful progression in a productive experiment requires a shared understanding of the problem and a mutual commitment to the value of learning from it, establishing a shared future vision as a crucial foundation for any public policy experiment [16].

From this perspective, public policies are seen as learning experiments that demand continuous monitoring, evaluation, and adaptation over time. Consequently, the process of public policy design is not neatly divided into distinct stages; instead, it is an ongoing and iterative process that involves design, implementation, and continuous adjustments. Each management action is considered an opportunity to learn and adapt to changing circumstances, leveraging the characteristics of dynamic learning and collaborative management [17].

Despite the increasing adoption of these approaches, it remains a challenge to evaluate and learn from the failures and successes resulting from the orchestration of these processes, including developing procedural designs, facilitation practices, and material devices (e.g., "intermediate designs") that channel participant engagement and help them reach meaningful outcomes [18]. A significant challenge in assessing cocreation experiments is the pervasiveness of results-oriented evaluation models that need to pay more attention to the value of processes [19, 20]. To overcome this challenge, it proposes an evaluation tool based on the literature on developmental evaluation [20] and reflective monitoring [21–23].

Patton [20] defines developmental evaluation as informing and supporting innovative and adaptive intervention in complex, dynamic environments. This approach seeks to guide the collaborative action of innovative initiatives that face high uncertainty and are characterized by their experimental, cocreation, and social learning nature [22]. Here, the unit of analysis for assessing change is no longer the projector program (as in conventional models) but the system.

Because sustainable transitions unfold over long time horizons, and their elements are constantly changing, an iterative, adaptive, and continuous learning attitude is required as a way to observe and assess change qualitatively to continuously course-correct according to the preferred values, motivations, and future visions or transition pathways that the policy normatively codevelops and recursively analyzes. Developmental evaluation involves ongoing data collection, feedback, and stakeholder collaboration during the development and implementation of policies or programs and the system to ensure their effectiveness. This approach allows for real-time adjustments and improvements and is crucial for enhancing the quality and impact of policies and programs [20].

Reflective monitoring is a more contemplative and introspective approach to assessing and understanding complex processes and systems, emphasizing learning, adaptation, and improvement to ensure that policies and projects are sustainable and can adapt to changing circumstances [21]. It involves continuous assessment and feedback, where stakeholders reflect on their experiences and adjustments are made to improve outcomes. This approach recognizes the importance of understanding the broader context in implementing policies, projects, or innovations, considering the

immediate goals in more systemic and environmental factors that can impact success. It is an iterative and cyclical process. Data are collected, analyzed, and used for reflection and decision-making, leading to adaptations and further data collection. Reflective monitoring is not only about short-term results but also considers long-term impacts and sustainability. It often requires expertise from various fields and encourages the active involvement of stakeholders and participants in the assessment and learning process, valuing their insights and experiences as essential for improving the design and implementation of initiatives.

Thus, inspired by these two evaluation models, it proposes a reflective dimension of coproduction experiments to assess whether the dominant assumptions, practices, and institutions associated with the experimentation process are changed. With that aim, it considers three key dimensions: 1—context in which diverse actors and the public sector, in a generative space, are convened to interact in the design process; 2—governance in the experimental coproduction process; and 3—outcomes, monitoring, and evaluation.

2.1 Context: generative space for policy design

Firstly, the context in which the experimental coproduction experiment occurs predominantly determines the nature of the process and the outcomes. Since coproduction requires expanding the array of participants and expertise beyond normal [18], it is necessary to develop a generative space (tools and principles) that simultaneously maintains orchestration (e.g., procedures, facilitation practices, and material devices) and develop anticipatory capacities and the collective processes to synthesize and disagree in fruitful ways [24].

This generative space will help to handle uncertainties. Decisions in the twenty-first century are made with high levels of uncertainty, and decision-makers must deal with different types of uncertainty with different intervention strategies. On the one hand, incomplete or imperfect knowledge (lack of knowledge or data) can be addressed with more knowledge or research. In this scenario, forecasts, projections, and risk-based knowledge systems are necessary but insufficient to cope with the different uncertainties. Governments must cope with another form of uncertainty inherent to coproduction processes, where there are multiple ways of seeing reality (framing) (conflicting visions of seeing the system Ambiguity) [25]. In order to respond to this type of uncertainty, it is necessary to develop anticipation capacity to address desirable, normative dimensions of visualizing the future, expectations, values, imagination, and desires of society collectively. Anticipation means that the "future" becomes feasible through agreements, attitudes, and social interventions and legitimizes policies and change processes [26]. In this process, it is vital to identify contradictory views on how they imagine the future to manage conflicting views.

The coproduction experiment is always inherently political, involving negotiations between members of different groups and rationales, interests, and values. Researchers and decision-makers must be flexible and adaptable, given that there are different visions for determining which modes of knowledge are preferred to identify the best evidence and how to assess its quality [6]. Therefore, knowledge is constantly recodified in an interactive process among actors, interests, and institutions. Forward-thinking can provide a reflective dialog from an intellectual and emotional perspective, including discovering the different interpretive frameworks (frames) and worldviews underlying the value system that determines our actions [27]. This

further helps mobilize people to identify and transform constructed visions into action collectively. Accepting uncertainty can become crucial in negotiating diverse possible futures about different intervention pathways and their consequences.

2.2 Governance in the experimental coproduction process

Governance is a second key component in coproduction experimentation [28]. Coproduction processes involve adaptive management, planning, and continuous interactions among various actors, including government agencies, communities, and other stakeholders. Thus, embracing an adaptive governance approach to interventions is vital due to its emphasis on flexibility, feedback loops, and responsiveness to changing conditions. It allows for incorporating new knowledge, adjusting strategies and actions based on ongoing learning, and incorporating further information [15, 29]. In the context of coproduction, this means that stakeholders engage in trial-and-error processes to identify practical solutions. This governance approach encourages continuous learning, knowledge sharing, and actor collaboration, recognizing that governance is not a one-size-fits-all and that strategies must be tailored to specific contexts. Additionally, it acknowledges the inherently political nature of coproduction, as power dynamics can shift and new roles can emerge during the collaborative process.

A factor that influences the results of the coproduction process is the ability of users to incorporate new knowledge into their organizations, practices, and work cultures, which is summarized in the concept of absorptive capacity. Organizations need correct (distributed) cognitive structures and learning capabilities to absorb the results of different knowledge coproduction activities, inside and outside their organization, and use existing knowledge fully [30]. In this direction, organizations often need more experience and knowledge infrastructure to absorb the results of different knowledge-production activities.

2.3 Outcomes, evaluating and monitoring

A third factor is the outcomes, the production of knowledge for change. The coproduction process is changing and can be a conflictual process in which different types of knowledge are encoded at various stages in iterative and highly interactive structures governed by multiple actors, networks, and institutions to incorporate the coproduced knowledge sustainably. In their organizations and cultures, they are creating a shared language and the ability to absorb this knowledge. Coproduction experiments can disrupt established patterns and practices in public policy. These experiments are seen as a means to change how policies are designed and implemented. Coproduction outcomes are changes in the behavior, relationships, and actions of the people, groups, and organizations with whom the program or policy works [31]. The consolidation of these changes depends on mechanisms that should be established to embed the outcomes of coproduction in the routines and everyday procedures of relevant organizations and stakeholders, ensuring that the changes become integral to ongoing practices.

In the experimental process, it is fundamental to understand how the outcomes of a complex process are effectively utilized and how altered governance arrangements are implemented within a specific context. The absorptive capacity refers to an organization's ability to integrate and utilize new knowledge effectively. It implies that organizations need suitable cognitive structures and learning

capabilities to fully use the knowledge they acquire. The outcome of the complex process is twofold. First, it involves the sustained use of coproduced knowledge, indicating that the knowledge generated through coproduction efforts remains valuable and relevant. Second, it consists of implementing altered governance arrangements, suggesting that how changes in policies are designed and governed become part of the local context. This process must also go hand in hand with building the capacity to monitor processes and evaluate outcomes with reflective approaches that help recognize both emerging patterns as the intervention unfolds and the inherent unpredictability of any desired change pathway, correcting and redesigning the intervention strategy.

The following section will assess the coproduction experiment through the lens of the three dimensions: context, governance, and results. Through an in-depth exploration of SUMPs, we aim to gain insights into the effectiveness and adaptability of innovative policy design. In particular, we intend to identify the public sector's capabilities to address complex and uncertain problems.

3. The case: soil conservation management plans innovative policy to promote sustainable

In Uruguay, since the beginning of 2000, soil management practices have been dramatically affected by the global rise in raw material prices, the increasing demand for food, the expansion of soybean production, and the rise in the cost of land ownership. In particular, over the last 15 years, the country has witnessed a quadrupling of total grain production, driven by a twofold increase in productivity (tons/ha) and the expansion of agriculture into nontraditional areas. This expansion often encroaches upon the land with inadequate use capacity for intensive agriculture [32, 33].

In this scenario, the Uruguayan Ministry of Agriculture, Livestock and Fisheries (MGAP) developed a series of policies aimed at preventing the soil degradation caused by the continuous expansion and intensification of cropping production [18]. One of the most relevant agricultural policies regarding the conservation of natural resources has been the implementation of the soil use and management plans (SUMP) in 2013. Soil use and management plans (SUMPs) consist briefly of establishing rotations to restore or increase soil fertility, organic matter, and carbon and minimize erosion through conservation practices, considering soil suitability. The policy aims to achieve sustainable production systems with proper use, maintenance, and recovery of soils and to minimize water erosion processes [17].

According to the law, producers must develop their responsible soil use and management plan, stating the planned production system based on the types of soils, the sequence of crops and management practices, and the levels of tolerable erosion (determined by an adapted version of the universal soil loss erosion and the revised universal soil loss erosion equations). The plans are monitored and controlled through satellite images [18]. This policy design process resulted from a coproduction experiment through which decision-makers, academics, technicians, and the private sector developed and adapted instruments and protocols. This policy was, as mentioned, one of the main elements behind the high acceptance of public policy among farmers. As a potential case of generative experimentation, SUMP leads us to reflect on the possibilities for emergent models of experimentalist governance based on new capabilities, which we will analyze below.

3.1 The method: unveiling insights from coproduction experiments

The research methodology to evaluate soil conservation management plans (SUMPs) followed a qualitative approach based on the case study methodology developed by Yin [34]. The election of the soil use and management plan (SUMP) as the primary case study was deliberate, given its influential position as a pioneering and experimental public policy in environmental regulation. Policymakers consistently emphasized on this [35].

Based on the interpretive paradigm of policy analysis, our research embraced a comprehensive two-step qualitative design. This encompassed a nuanced array of techniques, including document analysis, participant observation, and 20 in-depth interviews from March 2018 to March 2020. These interviews engaged key stakeholders, such as policymakers, representatives from the private sector, and academics, ensuring a diverse and comprehensive perspective on the coproduction experiment under scrutiny.

In evaluating the information amassed during this research process, it adopted the realist synthesis evaluation approach [36]. Realist synthesis, a robust methodology, delves into the intricacies of complex interventions, providing a nuanced understanding of the interactions between context and outcomes—unveiling not just what works but, crucially, why and how [37]. Through the lens of this methodology, our exploration navigated the developmental trajectory of the coproduction experiment, unraveling the underlying "why" and "how" of interactions and scrutinizing the contextual circumstances that exert influence.

To distill and organize these insights effectively, we meticulously crafted a data collection template, a versatile tool structured around three pivotal dimensions: context, process, and outcome. This template provided a robust framework for evaluating the policymaking coproduction experiment, enabling us to identify discernible patterns. These patterns, in turn, contribute significantly to ongoing discussions about how governments can strategically foster innovation to address the intricate and uncertain challenges inherent in sustainability transitions. As we delve into the subsequent phases of our analysis, this data-driven framework becomes an essential instrument for unveiling the deeper layers of understanding within the landscape of coproduction experiments in public policy design. The iterative-cyclic research process involved continuous triangulation of findings, drawing from document analysis, participant observation, and interviews. This comprehensive approach aimed to develop a holistic understanding of the SUMP and its implications within the broader policy innovation and environmental governance context.

4. Results

In the following sections, we present an account of the three dimensions of the evaluation and consider how each made a difference in the program, particularly in addressing the wicked issue of soil conservation.

4.1 Generative space for policy design

The policy design was the result of multiple interactions. The government worked in close collaboration with a set of academic national institutions, such as the National Institute of Agricultural Research, the Faculty of Agronomy of the University of the

Republic, and the Uruguayan Society of Soil Sciences, as well as with producers, various civil organizations, and information technology companies.

The government created an inter-institutional technical committee with the participation of the National Institute of Agricultural Research (INIA), the Faculty of Agronomy of the University of the Republic, and the Uruguayan Society of Soil Sciences (USCS). The objective of this committee was to advise on relevant decisions regarding the measurement of soil erosion. The decisions made by this committee were tested in the field with producers, and subsequent adaptations resulted from the constant feedback.

To this end, a pilot project was developed (2010–2012), and policymakers worked with producers, experts, and farmers' associations to plan the best productive use of soil based on the equation determining soil erosion tolerance thresholds. Farmers' associations played a crucial role in spreading information and knowledge among their members and improving the implementation of SUMPs.

Multiple communication activities and training workshops on land use regulation and control were also carried out, creating an expanded institutional framework with different government agencies and private actors, including more than 100 workshops with farmers and agronomists to discuss the implementation of the policy. Two types of workshops were held. One type was directed to producers and focused on dissemination, training, and discussion of SUMPs. The other type concentrates on training and building capacities with external technicians responsible for developing and submitting the plans. As a result, a network of diverse actors was strengthened in the "collective construction" of the policy design.

The participation of public, private, and scientific actors went beyond one-way information or consultation on a predefined agenda; instead, a shared understanding took place to forge an epistemic and normative orientation of action research. The iteration and constant adaptation of the plans capitalized on the synergies created between stakeholders' diverse knowledge and technological developments (particularly creating a specific software to submit the plans).

The policy design process included a pilot phase in which collaborative deliberation took place to determine the tolerable levels of oil erosion in the plans submitted by producers. Collaborative networks were created as spaces where different actors (government, academia, business, civil society), through interactive processes, link different perspectives, levels of knowledge, and understanding to reach a shared vision—the action of a complex problem. Therefore, the policy design and implementation process resulted from a collective construction of knowledge but with high levels of experimentalism. For the development of these networks and the creation of productive interactions, it was essential to generate spaces of encounter and experimentation based on principles such as flexibility and reflexivity under the premise that processes are not linear and that the specifications of the contracts must recognize adjustments and changes, as they happened under a context of uncertainty and constant switching—permanent negotiation and communication required amplitude criteria and strategic direction of all actors involved. Rigidity or the narrow bureaucratic control of these processes would have led to failure.

Nevertheless, although the design process of this policy generated a space for participation and articulation within the academic sector, participation was limited to the agronomic academic community, restricting the involvement of other disciplines. A key takeaway from this limitation is the necessity to include diverse perspectives when designing policies, as this diversity can lead to more effective solutions for society. Limiting participation to a specific academic discipline (e.g., agronomists) and type of

stakeholders (e.g., producers and farmers associations) can result in a narrow understanding of the problem and potentially miss out on valuable alternative insights.

Rajagopalan and Midgley [38] pointed out that cocreation without systems thinking can be problematic. Coproduction requires engaging a diversity of perspectives to synergistic innovation that results from this engagement is relevant to innovation. However, a relevant question is how a dialog is constructed, who stakeholders are invited, who are excluded, who are marginalized, and how to handle the marginalization. An important insight is that the not participative process can include possible perspectives: comprehensiveness is impossible, but it is relevant to consider diverse knowledge to improve future solutions to the problem.

4.2 Governance structures in policy design

The design of the policy and the metric definition to evaluate sustainable rates of soil erosion (USLE) and its revised version (RUSLE) resulted from a process in which the government and the academic sector worked together. The depth of collaboration at the science-policy interface was critical to implementing the policy. An academic involved in the process stated: the most relevant decisions regarding the measurement of soil erosion were made by the committee formed by the government and the academy, with representatives from the Faculty of Agronomy, the National Institute of Agricultural Research, and the Uruguayan Soil Science Society. The exchange with the productive sector was also vital, allowing for further research and development in areas where gaps of knowledge were identified (e.g., digital cartography food agricultural practices, among others).

In 2010, the Ministry launched an open call for producers to participate voluntarily in designing the first pilot plan. As a result, 24 companies elaborated their SUMPs with the support of decision-makers and technicians. From May to September 2011, the technical team from the government reviewed the first submitted plans, followed by several feedback workshops with the voluntary companies. This iterative process between the group of experts from the government, the volunteering producers, and external agronomists allowed the adjustment and validation of the methodology to measure soil erosion.

The pilot process of designing the plans showed how scientific and nonscientific bodies of knowledge were integrated to support concrete problem-solving efforts [39, 40]. The implementation of the plans resulted from a process of experimental coproduction of knowledge between the private sector, government officials, farmers' associations, and academics. This network's creation helped respond to the limits of hierarchical organizational structures such as that of the Ministry, overcome the fragmentation of efforts between sectors, and the need for more stimulation and coordination between research and higher education.

A second phase of the design process involved the construction of an online platform to submit the plans between 2013 and 2017. In 2013, a "very precarious" platform was available, as an agronomist involved in the process states. During 2014 and 2015, RENARE worked with the Ministry's IT technicians and a software development company to make the online platform more precise by adding a geographical viewer to draw the agricultural lands in real time. The improved software version posed a relevant problem in migrating information from the original tool to the new one.

Consequently, the government team interacted permanently with external technicians, who provided information about errors and the platform's usability. During this process, technicians from the government tested the analytical tools to assess the plans

and the emerging obstacles. Nevertheless, this second version of the software was inefficient: "The platform was improved, but it was not enough […] the model was still being calculated by the desktop version software and then uploaded to the platform" (technician from the government). Thus, a third stage was needed to improve the software (2016–2017). In 2020, it was decided to develop an entirely new platform. A public tender request created a national consortium. The consortium built the prototype in collaboration with government technicians, which was discussed with the certified agronomists, who validated it after their observations were incorporated. Then, continuous tests were done with government technicians until they became operational. The technical committee approved the final version of the software. With the new platform, the plans were submitted online using Erosion 6.0 (free software) and were controlled and monitored through satellite images. In this way, the computer system and satellite images analyzed the basic information of the submitted plans, allowing the government to oversee their implementation. In particular, the system could identify locations at a higher risk of erosion and locate farmers who were not complying with the crop rotation plans they had submitted (technician interview).

This process of policy design implied a new way of knowledge creation (trans-disciplinary/contextual/ethnographic/experiential/qualitative, first-hand) with a pragmatic approach (knowledge and action, interface between different actors through observation and experimentation) to reach a better understanding of the diverse aspects of soil erosion. In addition, the relationships and interconnections of synthesis of facts, judgments, visions, values, interests, epistemologies, time scales, geographical scales, and worldviews.

In this context, experimentalism presents a new form of experimental governance, a new form of steering that diverges from conventional hierarchical control, the new public management (NPM), or from the bottom up, as in devolved or "interactive" "network" governance. This framework may help to deal with disputed, value-led environmental policy issues and different scientific foundations to solve the problem. In the SUMP, experimentalism emerged during the pilot phase and the development of the online platform. A key learning from this case is that immediate responses to turbulent conditions must be treated as experiments for longer-term strategic adaptation [9]. In other words, government entities should view their endeavors in dealing with uncertainty as chances to experiment with fresh approaches and engage in collaborative innovation.

These spaces made possible social experimentation in a concrete context, particularly learning on the go and openness to creative discoveries. Any conclusion was provisional and revised in action in uncertain and complex conditions. By creating these spaces for interaction and experimentation, the public sector tapped into 50 years of agronomic research in the country. Nevertheless, simultaneously exploring the possibilities in the current moment by applying past knowledge to enhance future productivity in policymaking underscores the creative aspect of action. This approach also underscores the importance of experimentation and the adaptive governance of public policy.

4.3 Outcomes: the iterative process of creating, refining, and improving the policies

The third factor evaluated has been the development of mechanisms through which the results of experimental coproduction are integrated into routines and practices of the public sector and absorption capacities are strengthened. The

coproduction experiment has led to the development and installing a land use plan management systems platform called the use plan management system. This system is crucial in land use planning and management, making it more efficient and accessible for producers and technicians. This platform serves as a tool to work daily, where new usage plans can be declared and previously submitted ones updated as necessary.

At the same time, it serves as an intelligent system for managing policy and an integral part of the National Agricultural Information System, mainly providing monitoring capabilities. In the first year of implementation, in 2017, the platform successfully managed 15,467 plans, covering a land area of 1,536,084 hectares, representing nearly 100% of the total area that requires planned activity.

The online platform to submit the plans is in a continuous process of improvement. In 2022, a new platform was being developed to improve operations with farmers. According to the current director of the Direction of Natural Resources, the technical modifications will improve processes and make them more friendly. The most significant changes that the platform presents are technical, but they also include some administrative ones. He clarified that there are adjustments of all kinds and changes in digitization, georeferencing, and measurements.

For the government, it introduces a new, more efficient technology for soil monitoring erosion. The software system allows the government to monitor if producers comply with their plans. This platform is crucial in managing land use policies and activities.

5. Discussion

Recent public administration and policy design studies have shown that experimental policy design can be associated with better results. However, more evidence is needed on introducing these practices into policy design and how an experimental culture can be embedded in public organizations. This study contributes to the existing literature on experimentation in public policy by providing an empirical example of what capabilities need to be developed. Much of the current literature deals with conceptual frameworks; however, there needs to be more empirical studies illustrating how to apply these models in practice. This case's evaluation helped identify the capacities public organizations should develop to navigate complex and uncertain issues effectively.

6. Summary of key findings

6.1 Discussion

Recent public administration and policy design studies have shown that experimental policy design can be associated with better results. However, more evidence is needed on introducing these practices into policy design and how an experimental culture can be embedded in public organizations. This study contributes to the existing literature on experimentation in public policy by providing an empirical example of what capabilities need to be developed. Much of the current literature deals with conceptual frameworks; however, there needs to be more empirical studies illustrating how to apply these models in practice. This case's evaluation helped identify the capacities public organizations should develop to navigate complex and uncertain issues effectively.

7. Summary of key findings

7.1 Anticipatory capacity: long-term vision with broad political support

In the design of police processes, where complexity demands the participation of multiple actors to achieve better results, the government's first challenge is generating anticipatory capacity. When various stakeholders participate in coproduction processes, each has their belief systems, points of view, preferences, and interests and, therefore, their interpretations of the problem. This gives rise to a new type of uncertainty: ambiguity, a situation in which the decision-maker does not have a single and complete understanding of what he must manage. To overcome these difficulties, anticipatory thinking can provide a reflective dialog about different interpretative frameworks (framings) and worldviews to mobilize people to generate a joint vision for action.

7.2 Synthesis capacity: bridge the gap between science and politics

The design of coproduction policies on complex problems involves continuous interaction between actors from different social subsystems (research, politics, civil society, private sector) to link different perspectives and types of knowledge (scientific and experiential) in order to achieve a deeper understanding of the problem and generate a roadmap for better decision making. This implies relating and interconnecting facts, judgments, visions, values, interests, epistemologies, time scales, geographical scales, and world visions that are not exempt from conflicts. Governments must increasingly work with interdisciplinary teams and move toward integrating practical knowledge, whether tacit or codified, for a deeper understanding of a problem, legitimizing decision processes for action. Another significant challenge for decision-makers in accelerating transitions is the integration of various forms of knowledge in a way that can support policy and practical practice. These processes also require a particular transformation of the existing knowledge infrastructures to move toward the production of interdisciplinary knowledge (integrating knowledge from different disciplines) and transdisciplinary knowledge (integrating scientific and non-scientific knowledge).

7.3 Adaptive capacity learning by doing

Governments must introduce adaptive capacity, a strategic approach used in decision-making, especially in complex and uncertain contexts. The main idea is to recognize the uncertainty inherent in many problems and situations and to continually adjust strategies and actions based on feedback and acquired knowledge. Instead of following a rigid, predefined plan, adaptive management allows teams to learn from practical experience and adapt as policy develops. Adaptive management is based on the premise that effective solutions can only sometimes be foreseen in advance and that flexibility and responsiveness are essential to address complex and dynamic problems. This involves constantly monitoring and evaluating progress, identifying changes in the environment or conditions, and adjusting strategies accordingly.

7.4 Evaluation and monitoring capacity

The evaluation and monitoring capacity is crucial for policies that face uncertainty and are characterized by their experimental and co-creation nature that confront

situations in which conditions and results may vary, which requires continuous adaptation of strategies and approaches. Therefore, the learning capacity and the reflective and critical culture that allow organizations and individuals to improve their policies and actions based on the results and lessons learned are critical. Therefore, it is vital to develop formative evaluations during policy implementation, which allows for faster decision-making adapted to changing circumstances. In this process, the participation of stakeholders in the evaluation and monitoring process encourages continuous feedback and collaboration, allowing for better implementation and effectiveness of policies. Therefore, the capacity for evaluation and monitoring allows organizations and policies to adapt and progress in uncertain environments.

In a scenario characterized by high levels of uncertainty, it is imperative that government institutions not only review but transform their governance strategies. This reexamination process must include the adoption of new paradigms and constant adaptation to ever-changing conditions. The ability to adjust to this uncertain environment will strengthen public administrations' resilience and enhance their agility and long-term strategic vision. This approach implies formulating policies that are flexible and inherently adaptive, with the ability to respond effectively to changing dynamics and emerging challenges in the complex government landscape. Ultimately, this transformation process will enable government entities to survive in an uncertain environment and thrive and lead initiatives that benefit society as a whole.

Conflict of interest

The authors declare no conflict of interest.

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References

[1] Rockström J, Gaffney O, Rogelj J, Meinshausen M, Nakicenovic N, Schellnhuber HJ. A roadmap for rapid decarbonization. Science (1979). 2017;**355**(6331):1269-1271

[2] Rockström J, Gupta J, Qin D, Lade SJ, Abrams JF, Andersen LS, et al. Safe and just Earth system boundaries. Nature. 2023;**619**(7968):102-111. Available from: https://www.nature.com/articles/s41586-023-06083-8

[3] Rittel W, Rittel WM, Horst WJ. Dilemmas in a general theory of planning. Policy Sciences. 1973;**4**(2):155-169

[4] Huntjens P, Kemp R. The importance of a natural social contract and co-evolutionary governance for sustainability transitions. Sustainability (Switzerland). 2022;**14**(5):1-26

[5] Ansell C, Torfing J. Co-creation: The new kid on the block in public governance. Policy and Politics. 2021;**42**(2):211-230

[6] Turnhout E, Metze T, Wyborn C, Klenk N, Louder E. The politics of co-production: Participation, power, and transformation. Current Opinion in Environment Sustainability. 2020;**42**:15-21

[7] Tiitu M, Viinikka A, Ojanen M, Saarikoski H. Transcending sectoral boundaries? Discovering built-environment indicators through knowledge co-production for enhanced planning for well-being in Finnish cities. Environmental Science & Policy. 2021;**126**:177-188

[8] Dekker R, Geuijen K, Oliver C. Tensions of evaluating innovation in a living lab: Moving beyond actionable knowledge production. Evaluation. 2021;**27**(3):347-363

[9] Ansell C, Sørensen E, Torfing J. Public administration and politics meet turbulence: The search for robust governance responses. Public Administration. 2023;**101**(1):3-22

[10] van Buuren A, Lewis JM, Guy Peters B, Voorberg W. Improving public policy and administration: Exploring the potential of design. In: Policy-Making as Designing [Internet]. Policy Press; 2023. pp. 1-17. Available from: https://bristoluniversitypressdigital.com/view/book/9781447365952/ch001.xml

[11] Kimbell L, Bailey J. Prototyping and the new spirit of policy-making. CoDesign [Internet]. 2017;**13**(3):214-226. DOI: 10.1080/15710882.2017.1355003

[12] Khine PK, Mi J, Shahid R. A comparative analysis of co-production in public services. Sustainability. 2021;**13**(12):6730. Available from: https://www.mdpi.com/2071-1050/13/12/6730/htm

[13] Ansell CK, Bartenberger M. Varieties of experimentalism. Ecological Economics [Internet]. 2016;**130**:64-73. DOI: 10.1016/j.ecolecon.2016.05.016

[14] Popa F, Guillermin M, Dedeurwaerdere T. A pragmatist approach to transdisciplinarity in sustainability research: From complex systems theory to reflexive science. Futures. 2015;**65**:45-56

[15] Folke C, Hahn T, Olsson P, Norberg J. Adaptive governance of social-ecological systems. Annual Review of Environment and Resources. 2005;**30**(1):441-473

[16] Zurbriggen C, Lago MG. An experimental evaluation tool for the public innovation lab of the Uruguayan government. Evidence and Policy. 2019;**15**(3):441-473

[17] Zurbriggen C, González-Lago M, Baraibar M, Baethgen W, Mazzeo N, Sierra M. Experimentation in the design of public policies: The uruguayan soils conservation plans. Iberoamericana - Nordic Journal of Latin American and Caribbean Studies. 2020;**49**(1):52-62

[18] Hyysalo S, Marttila T, Perikangas S, Auvinen K. Codesign for transitions governance: A mid-range pathway creation toolset for accelerating sociotechnical change. Design Studies. 2019;**63**:181-203

[19] Luederitz C, Abson DJ, Audet R, Lang DJ. Many pathways toward sustainability: Not conflict but co-learning between transition narratives. Sustainability Science. 2017;**12**(3):393-407

[20] Patton MQ. Qualitative Evaluation and Research Methods. Third edition. Thousand Oaks, CA: Sage; 2015. pp. 1-690

[21] van Mierlo B, Regeer B, van Amstel M, Arkesteijn MCM, Beekman V, Bunders JFG, et al. Reflexive monitoring in action. A guide for monitoring ... [Internet]. 2010;(June 2014):3-104. Available from: http://www.falw.vu.nl/en/Images/ReflexivemonitoringinAction BvanMierloandBRegeer2010_tcm24-399363.pdf

[22] Arkesteijn M, van Mierlo B, Leeuwis C. The need for reflexive evaluation approaches in development cooperation. Evaluation [Internet]. 2015;**21**(1):99-115. DOI: 10.1177/1356389014564719

[23] van Mierlo B, Beers PJ. Understanding and governing learning in sustainability transitions: A review. Environmental Innovation and Societal Transition. 2020;**34**(October 2018):255-269. DOI: 10.1016/j.eist.2018.08.002

[24] Valve H, Lazarevic D, Hyysalo S, Lukkarinen J, Marttila T. The interrupting capacities of knowledge co-production experiments: A sociology of testing approach. Environmental Science & Policy. 2023;**147**:255-264. DOI: 10.1016/j.envsci.2023.06.019

[25] Brugnach M, Henriksen HJ, Van Der Keur P. Uncertainty and Adaptive Water Management Concepts and Guidelines. 2009

[26] Muiderman K, Zurek M, Vervoort J, Gupta A, Hasnain S, Driessen P. The anticipatory governance of sustainability transformations: Hybrid approaches and dominant perspectives. Global Environmental Change [Internet]. 2022;**73**(January 2021):102452. DOI: 10.1016/j.gloenvcha.2021.102452

[27] Schön AD. The reflective Practioner. Journal of Chemical Information and Modeling. 1983;**53**:160

[28] Miller CA, Wyborn C. Co-production in global sustainability: Histories and theories. Environmental Science & Policy. 2020;**113**:88-95

[29] Folke C. Resilience (republished). Ecology and Society. 2016;**21**(4):88-95

[30] Belcher BM. Understanding and evaluating the impact of integrated problem-oriented research programmes: Concepts and considerations. Annual Review of Environment and Resources. 2020;**30**:441-473

[31] Brix J, Krogstrup HK, Mortensen NM. Evaluating the outcomes of co-production in local government. Local Government Studies. 2020;**46**(2):169-185. DOI: 10.1080/03003930.2019.1702530

[32] Foucher A, Tassano M, Chaboche PA, Chalar G, Cabrera M, Gonzalez J, et al. Inexorable land degradation due to agriculture expansion in South American Pampa. Nature Sustainability. 2023;**6**(6):662-670. DOI: 10.1038/s41893-023-01074-z

[33] Baraibar M, History E, Relations I. The Political Economy of Agrarian Change

[34] Yin RK. Case Study Research and Applications: Design and Methods. Los Angeles: SAGE; 2018. 1-319 p

[35] Hill IAM, Clérici IAC. Setiembre 2011-Revista INIA 65 PLANES DE USO Y MANEJO DEL SUELO [Internet]. Available from: www.mgap.gub.uy/renare

[36] Pawson R, Greenhalgh T, Harvey G. Walshe K. Realist synthesis: An introduction

[37] Odume ON, Amaka-Otchere AB, Onyima BN, Aziz F, Kushitor SB, Thiam S. Pathways, contextual and cross-scale dynamics of science-policy-society interactions in transdisciplinary research in African cities. Environmental Science & Policy. 2021;**125**:116-125

[38] Rajagopalan R, Midgley G. Knowing differently in systemic intervention. Systems Research and Behavioral Science. 2015;**32**(5):546-561

[39] Pohl C, Klein JT, Hoffmann S, Mitchell C, Fam D. Conceptualising transdisciplinary integration as a multidimensional interactive process. Environmental Science & Policy. 2021;**118**:18-26. DOI: 10.1016/j.envsci.2020.12.005

[40] Bammer G. Integration and implementation sciences: Building a new specialization. Ecology and Society. 2005;**10**(2):546-561