Public sector organisations as agents of transformations

A framework for analysing structural changes within Public Sector Organisations (PSO)

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Abbreviations

PSO	Public Sector Organisations
UBA	German Environment Agency

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1 Introduction

There is widespread agreement among academics that sustainable development requires a more proactive role for the state, as markets alone cannot effectively address the complex problems we face, such as climate change (Borrás and Edler 2020; Kuhlmann and Rip 2018; Head and Alford 2015; Mayne et al. 2020; Schot and Steinmüller 2018). Central to this argument is the transformative capacity of Public Sector Organisations (PSOs), which requires government agencies to be willing to adapt their structures, understanding and capabilities to address these societal issues in collaboration with other both state- and non-state actors. The latter may include representatives from business, science, regions, cities and civil society. It is therefore clear that a more proactive state is needed to drive the necessary changes (Borras et al. 2023; Janssen et al. 2023).

However, the established rationalities of PSO emphasize hierarchical control, rule-following behaviour and path-dependent development of the organisation. This is in stark contrast to the need for a more active role in transformation processes, which highlights horizontal collaboration across policy areas and sectors. Furthermore, the classical view of PSOs suggests that they are rather incapable of directly influencing society, as they make decisions and interpret problems based on previous decisions and experiences (Luhmann 2019). However, PSOs need to adopt a more outward-looking stance and rethink their authority, skills and knowledge about societal issues with a new problem-solving capacity (Jong et al. 2023; Mayne 2020; Torfing and Sørensen 2019).

The ramifications of this new role necessitate us to evaluate how PSOs address the multifaceted and demanding societal problems at hand (Borras 2019; Damanpour and Schneider 2009; Haddad et al. 2022; Vries et al. 2016; Wolff et al. 2019). However, considering the intricacy of these problems, it is currently unfeasible for PSOs to create the solutions and pathways in detail. Consequently, they should concentrate on the "how" of the transformation, creating potential solution paths experimentally and incrementally, while participating in strategic planning (Arciniegas Pradilla et al. 2022; Grießhammer and Brohmann 2015; Jacob and Graff 2020). In line with earlier arguments, this study agrees that the state's capacity to drive transformations can be attributed to the capabilities of PSOs working with stakeholders to make and implement effective transformation strategies.

This new role could change the way middle and lower level government employees work in the future. It could be assumed that they devote more of their time and intellectual resources to designing, enacting, evaluating and adjusting transformation strategies in collaboration across policy fields and sectors. They also must assume more responsibility for formulating policies that span across sectors and policy fields, thereby modifying traditional governance models (Angeles et al. 2021; Braams et al. 2021).

However, the question is how these PSOs can change their organisational structures to take a more proactive stance in transformation processes (Borras et al. 2021; Mazzucato 2015; Kattel and Mazzucato 2018; Kattel 2022). This new role may entail changes in formal structures or perhaps more subtle shifts in the culture of PSOs, which is why we have developed an analytical framework for identifying such necessary changes by combining the concept of problem-oriented governance with sociological organisation science. Empirical data collected in the context of the German Ministry for the Environment are used to illustrate this framework.

This study is structured as follows: *Chapter 2* provides an overview of how previous research has explored the organisational anchoring of transformative capacities within PSOs. *Chapter 3* introduces this article's own approach, which links the three capabilities of problem-oriented governance with organisation science. *Chapter 4* presents the empirical analysis and chapter 6 the application of the analytical model. Finally, Chapter 7 summarizes the main findings of the study and outlines how the analytical model can be used to compare PSOs.

2   The organisational anchoring of transformative capacities

Regarding the current studies concerning transformations, the organisational structure of PSOs can be analysed from three perspectives in order to reveal the transformative capacities of the state.

First, it appears that local agencies are the key to transformative capacities. Research has further looked at the role of national regulators, cities and municipalities, and environmental agencies when addressing complex issues. Bowen (2020) considers the capabilities of PSOs to effectively use state power through measures such as information-based regulations. Li and Chan (2009) stress the need for PSOs to collaborate in order to strengthen management and enforcement capacities. An example of this is the Environmental Protection Bureau of Chongqing's Blue Sky Program. Spyrdaki et al. (2020) looked at city governance structures to assess the capacities needed for sustainable energy projects. However, it is not enough for cities to just collaborate with each other; they must also engage with private actors to achieve success. Based on this research, it is clear that local agencies are an essential part of transformative capacities.

The research conducted has highlighted the changing nature of public authorities, which no longer solely lies within a centralized source. It emphasizes the need for PSOs to effectively manage societal problems and engage in collaborations with a variety of stakeholders. However, while these studies emphasize the importance of local agencies in building transformative capacity, our study looks at a broader level of problem solving which is based on policies that look beyond the geographical boundaries of cities or regions.

Table 1   Organisational anchoring of transformative capacities

	Local agencies	**Transformative agency**	**Transformative capabilities**
Anchoring of transformative capacities	Organized interactions between agencies at the local level	Transformative "agency" broadly embedded in a network of actors	Organisational capabilities as part of policy making and sustainability transitions
Main actors in problem-solving	Different agencies at the local level (cities, municipalities)	The state as one co-producer among others of socio-technological change	PSO that design and implement transformative policies
Relevance for this study	Inter-agency collaboration as coordination mechanism	Agency is required to induce change based on networks	Problem-solving capabilities must be anchored in PSOs

Source: Own illustration

Second, it has been suggested that transformative capacity can be embedded in networks and collectives of organisations. By engaging with each other, actors are able to cultivate the necessary influence and capacity to tackle complex problems, known as agency. The state is seen as a central actor in this process, as it plays a key role in the transformation of society, for example in the provision of energy or mobility. Köhler et al. (2019) highlight that sustainability transitions involve multiple actors and have normative goals. Subsequently, frameworks such as transition management and strategic niche management have been proposed to regulate such transitions. The core idea of the so-called transition arenas, which are characteristic of transition management, is to change governance by bringing together representatives from science, politics, civil society and business

and creating cooperative rather than competitive relationships. Strasser (2019) has acknowledged the need for network leadership, while emphasizing the importance of learning processes for the growth of transformative capacity.

To this end, a conceptual framework is proposed to analyse the role and limits of network leadership in promoting learning processes for the development of transformative capacity. Therefore, this second perspective proposes the importance of agency and the need to generate a collaborative capacity with both state and non-state actors to address societal problems. Nevertheless, the concept of agency remains unclear as to the organisational structures in which it is anchored.

A third perspective, which is directly related to this study, focuses mainly on the organisational capabilities of PSOs. Authors have analysed government actions to identify which routines enable these organisations to shift institutions towards sustainable development, thereby improving the policy framework for tackling complex problems (e.g. Borras et al. 2023; Kattel 2022; Kattel and Mazzucato 2018; Mayne et al. 2020). For example, Borras et al. (2023) provided a conceptual framework for understanding the transformative capacity of PSOs based on their organisational roles, resources and capabilities. Similarly, Kattel (2022) aimed to conceptualise dynamic capabilities in the public sector to address climate emergencies and other wicked societal challenges. The paper discusses the origins and elements of dynamic capabilities and how they can be assessed. Meanwhile, Mayne et al. 2020 examine three core conditions conducive to problem-oriented governance.

Overall, it remains unclear from this research what changes in routines within (and across) PSOs might strengthen the state's transformative capacity. In light of this research gap, this study seeks to assess *how organisational structures within PSOs should be adapted to become more actively involved in transformation processes*, thereby potentially enhancing the state's transformative capacity.

3 Combining problem-oriented governance with organisation science

In order to achieve transformative change, PSOs must be equipped to have an effect on society, like the way people work, take in, or do business. Nevertheless, according to the system-oriented concept of organisational theory, PSOs are internally focused and not able to alter society directly, but make decisions and address issues based on their prior experiences and decisions (Luhmann 2019; Kühl and Schmitz 2013).

Taking a different stance, problem-oriented governance emphasizes the importance of rethinking the way state organisations work in order to effectively tackle complex social issues. According to Mayne et al. (2020), this means making changes to the structure and roles of ministries and public authorities to better respond to the needs of society. PSO's should strive to be more outward-looking, adapting their structures to address public issues that are determined by the public's interests, instead of aligning their structures to problems which they define based on their own experiences and capabilities (Mayne et al. 2020).

Evidently, an outward-looking approach is critical for the management of PSOs that aspire to actively facilitate changes. However, it is important to remember that restructuring of PSOs can have a significant impact on its identity and how its members carry out their tasks. Restructuring cannot just be done by a simple change of the mission statement or by replacing the high-ranking officials. Strategies, procedures, and communication channels must be modified to take on complex social issues, and Human Resources must create new job expectations for middle and lower-level employees as mission statements are usually too general and employees are only judged on their short-term successes. This leaves little room for strategizing. Taking all of this into consideration, it is evident that restructuring must be done carefully in order to be successful.

3.1 Problem-solving capabilities

Upon analysing Mayne et al. (2020), it is clear that the capacity of states to address societal issues is based on the established procedures and practices that PSOs hold a major role in identifying and resolving social issues. To be more involved in transformation processes, it is imperative for PSOs to cultivate problem-solving capabilities in three areas.

Initially, it is essential for PSOs to have the capacity for reflective-improvement so they can investigate complex societal issues thoroughly and develop theories to ascertain how changes can be implemented. This necessitates comprehension of the underlying reasons and effects of the dilemmas as well as devising effective solutions and strategies to carry out them.

Subsequently, PSOs should have the aptitude to work together with other organisations to establish strategic alliances. Through dialogues, the interchange of thoughts and data, the association of assets and the creation of groups with a mutual objective, PSOs can enhance their capabilities in analysing and understanding complex societal issues and in devising solutions. The connections or coalitions may then stretch out over multiple organisational branches, departments, policy areas and industries.

Thirdly, PSOs necessitate a formidable data-analytical talent to enhance their assessment of intricate societal issues. This requires routinely collecting, organizing and deciphering multiple types of data and information which may be implicit or expressed. In this way, both human and machine data processing improves the problem-solving capability. To build up this aptitude, PSOs must set up collaborative arrangements with other internal and external stakeholders who can supply fresh information and data, thus augmenting the understanding of complex matters.

3.2 Expectation structures

A system-oriented view of organisations enables the exploration of how problem-solving capabilities can be incorporated into both the formal and informal structures of a PSO. Consequently, the second lens of our analytical framework considers the expectation structures which are inherent in the regular operations of PSOs. Generally, there are three separate types of expectation structures present in any organisation, regardless of its social ties (Kühl and Schmitz 2013; Luhmann 1999; 2021).

First, *programmes* summarise the criteria by which decisions are made in a PSO. They define what may be done in the PSO without violating the expectations of belonging to the organisation. Programmes can be differentiated according to if-then rules that precisely prescribe the processing of tasks such as processes or workflows (*conditional programmes*). However, there are also so-called *purpose programmes* that leave open how a task is to be completed. Here, for example, goals or strategies that influence decisions are to be mentioned.

Second, *communication channels* determine how communication and decisions are made in PSOs by defining competencies and responsibilities. In this way, communication is formally pre-structured without controlling the informal communication channels through which decisions can be prepared. The communication channels can then be influenced, for example, by changes in the hierarchy, the organisation of project teams or the use of sustainability officers.

Lastly, decisions can also be influenced by the deployment of *personnel*, because depending on the qualifications or experience a person brings to a particular position, he or she can be expected to behave differently in decision-making. Decisions can be influenced by hiring, transfer, dismissal or personnel development.

Combining the three capabilities of problem-oriented governance with the three expectation structures outlined above creates an analytical framework that can be used to assess the PSOs capability to tackle complex societal problems.

Table 2   **Analysing the problem-solving capability of PSOs**

	Programs	**Communication channels**	**Personnel**
Reflective-improvement capability			
Collaborative capability	What changes in the organisational structures are required in order to strengthen the problem-solving capabilities of PSO?		
Data-analytic capability			

Source: Own illustration

4 Methods and Data

The German Federal Ministry of the Environment and its subordinated authorities, such as the German Environment Agency (UBA), offer an ideal research context to pinpoint the necessary organisational changes that can enhance PSOs' problem-solving capabilities. This setting is particularly suitable for assessing the degree to which PSOs can take on a more active role in transformation processes, as the environmental department has expressed its commitment to a transformative policy approach that prioritize addressing societal problems and shaping transformation processes towards sustainable development of society (BMUB 2016; Messner 2021; Wolff et al. 2019).

A collaborative research project (2021-2024), commissioned by the ministry and UBA and coordinated by Fraunhofer ISI, tries to uncover new working and policy making ways within government agencies aiming to take a more active part in sustainability transformations. The organisations examined in this study are aiming to implement a more transformative environmental policy, which would lead to policies that either contribute to sustainability transformations or decrease the risks of increased energy consumption due to digitalisation (Wolff et al. 2018).

The empirical organisational analysis was conducted through nine semi-structured expert interviews, six of which were with the Ministry of the Environment and three with two of the four specialized agencies (UBA, BASE). The main focus of the analysis was on the organisational aspect.

5 Empirical analysis

This chapter utilizes empirical data to illustrate the analytical framework introduced in Chapter 3. It also assesses the necessary structural changes that should be implemented within the German environmental department to strengthen its capability to solve societal problems and actively drive sustainability transformations.

5.1 Reflective-improvement capability

The German Environmental Department must actively consider the need for reflective-improvement, delving into why transformations are necessary, how they will alter the conditions of local life and economies, and how they can be actualized. Consequently, such theories which encompass causes and consequences of transformations must be generated by political organisations but should remain closely in line with the realities of the situation. Transformations are likely to dramatically alter people's lifestyles and livelihoods, so they must be well-defined, departing from any pre-existing ideas that individuals may hold and adequately convincing citizens and politicians alike to back such a transformation.

It was, therefore, astonishing to learn that, even in the Department of Environment, which is devoted to addressing intricate matters such as climate change, there are hardly any theories that transcend simplistic notions such as energy transition or sustainable development, as one respondent mentioned.

> We don't have a picture of a climate-neutral society. Do we? It's all just numbers and balance sheets and the 1.5 degree target. That won't be enough to get people on board and, above all, to convince politicians to move in the right direction.

Such theories understand the necessity of transformations and how they can be achieved to bring all parties together. In the realm of environmental and sustainability policy, these theories have a powerful role in legitimizing the government. As one interviewee stated, it is about raising awareness among political administrators about the need for transformations.

> That is, my activity consists above all also in making a lot of waves from the ministry in this research field, simply to produce facts, findings, proposals again and again, in order to do something for the awareness and the political perception (...).

The interviews have suggested that reflexivity is a collaborative process that involves people inside and outside of the organisation. This has the potential to alter how PSO are structured. It is important for the organisations to consider the viewpoints of those from different areas, such as municipalities, companies and citizens, to better comprehend the issues and develop effective implementation strategies. Based on these results, it is clear that including these different perspectives in the reflection process is essential.

> If we really want to make and develop transformations for society as a whole, we have to go where it really hurts, and that is always very difficult to develop formats for this, to achieve participation and willingness, and to win over the corresponding mediators.

It is essential for the organisation to include the perspectives of external sources during the entire process, from identifying the problem to deciding on a course of action. This is because they are more likely to possess the knowledge and understanding to recognize difficulties and develop viable solutions.

> All the issues that exist with transformations are best dealt with by the people in the field, because they already know what is good in practical and concrete terms. I would also like to see more of that.

Reflecting on the need for personnel changes, one interviewee used the Digital Services Act as an example of the need for new skills: "It is essential to consider future developments and the potential risks associated with transformative measures to ensure the successful completion of any legislative project." This requires not only anticipating any resistance from society but also reporting to policymakers ahead of time.

A renewed outlook for administrative staff is being advocated for. It is being suggested that they transition from simply following orders from higher-ups to becoming real agents of change. One interviewee expresses that if colleagues are open to new ideas and can make decisions independently, this new model can be successful. Another interviewee goes on to add their thoughts.

> We must learn to forge a process out of this dynamic. I think that's the most important message. It's not about the method set or anything. It's simply about legitimisation. Many people say yes, but my legitimisation is not transformation, but stabilisation.

This change in expectations has led to a shift in the power dynamics, allowing for more autonomy and decision-making at the lower levels of PSO. As one individual described it, this has been a significant change.

> Organisations would have to look more closely at how to design certain processes and procedures so that decisions can also take place at a level below.

5.2   Collaborative capability

To effectively address environmental problems, the collaborative capability plays a vital role. This involves having access to all the relevant data for identifying these environmental problems and jointly devising appropriate solutions. Research has demonstrated that successful collaboration requires cooperation among different departments, ideally with a shared recognition of the need of altering established lifestyles, work practices and consumption patterns. Consequently, it is not unsurprising that our interviews revealed certain challenges related to collaboration.

> In the past, we always had the impression that the Ministry of Economics was not interested in what we were working on. The Ministry of Transport was actually more of a counterpart to us. The Ministry of Food and Agriculture was also more of a hostile post. (…) In the Ministry of Economics, there was no contact person at all for this field. They simply ignored the issue.

It is unsurprising that the capability to work together for achieving sustainability transformations is deeply entrenched in the interactions of PSOs with the society. Only through such collective efforts can PSOs effectively involve those affected by transformation strategies implemented within the policy process.

> Sustainability policy is very dependent on the interaction between people, between those affected by decisions and those preparing decisions; sustainability policy is very critically successful, dependent on an open, partly also open-ended multi-stakeholder setting; sustainability policy is very centrally dependent on the existence of informal formats of interaction in addition to the formal formats of interaction, which are usually negotiation formats.

An interviewee pointed out that although it is beneficial to work together across silos, organisations, departments and society, it is unnecessary to speed up the work of experts for transformations

within the administration. Instead, they argued that taking away opportunities for participation would lead to an even slower process.

The interviews also revealed that collaborative capability relates to the operational level of working together to speed up the process of designing strategies and policies that potentially promote transformations. This minimises the chance that these measures lose effectiveness due to lengthy coordination within the hierarchy. To achieve this, it is proposed that such measures should be decided on the operational level before they are delegated to the higher-ups. In the interviews, one expert uses the term "agility" to describe this idea. The aim of these "agile" collaborations is to minimize administrative coordination by enabling direct communication between the experts, as he pointed out:

> (...) I understand this to mean working out important points in order to then come to decisions that are also decided or where it is said that we do not dare to do this politically. In such cases, you can also leave it alone to some extent. But in an administration, we can spend an eternity on notes, draft laws, etc., and then, in case of doubt, things move at a snail's pace.

In this context, enhancing the ability to collaborate would involve delegating responsibilities for the design, enactment, evaluation and adjustment of potentially transformative policies to lower levels of PSO's hierarchies. As the authors of this study suggest, this would be accompanied by more personal forms of collaboration that are less formal.

This setup also means that organisations in the environmental department will need to adjust to new expectations for lower and middle-level managers and specialists. Previously, much of the coordination and decision-making was done through writing, but now those personnel within the relevant organisations and departments will need to communicate with each other in a less structured and more direct way, which could be facilitated by new methods.

> So, methodically, something would have to change massively in the cooperation. As a rule, however, all those who can decide and take responsibility for this have not experienced this in their lives. They can't do it themselves, and that's why they don't do it. And they do not work with it themselves.

5.3   Data-analytic capability

Environmental department organisations need access to relevant data and information to identify existing environmental problems and their potential impacts. Within this political department, one of the four authorities, namely the UBA could play a central role in setting up a new data-driven policy advisory function for the department.

Since its founding in 1972, the UBA has already been established as a scientific policy advisor organisation and has worked to create the necessary information and data resources. Going forward, as one interviewee from the UBA points out, environmental policy advice must be increasingly based on digital data and data-driven evidence to better understand the intricate problems, their manifestations and their impacts.

> Our field of activity is science-based policy consulting. Digitisation plays a major role in this, of course. Why? Because it also defines a new mode of steering politics, namely the question: What do I represent in what evidence? Actually, you could say that you're depicting the present, whether in terms of environmental issues or the constitution of society.

Reflecting on this context, this capability could mean that environmental problems including their future development are digitized, resulting in improved policy recommendations for tackling such problems. Data models and future scenarios for environmental problems could provide a powerful

basis here for policymakers and public administrations to direct their resources and structures to-ward addressing these problems. At the same time, the UBA is actively undertaking measures to develop these new digitalisation capabilities. For instance, an AI lab has been established to create and test new digital solutions for more effective environmental and sustainability policies.

This structural shift in policy advice could also alter the work of transformation specialists. For ex-ample, during their daily work as experts on the ministry's operational level, information gaps are often revealed that must be filled rather quickly. To do so, collaborations with research institutes are often necessary to obtain data that can be used to justify political interventions that might change society.

> You realize that you don't always have the right data for a certain, very specific question. Then you actually have to sift through data stocks again, create data stocks, in order to really be able to do small-scale modelling, so to speak.

Nevertheless, it was apparent during the conversations that the digitalisation of ecological regula-tion is still in its early stages. An interviewee indicated that the inquiry of how to improve environ-mental policy by utilizing digital techniques remains unsolved.

> Now, after the first year and a half, a kind of platform has emerged where the very different needs and strategic issues are somehow jointly configured. This has also led to the devel-opment of a separate "capabilities" agenda, also with a view to more effective environmen-tal policy. Digitisation is not only understood as a kind of organisational efficiency, but the topic of "digitisation" can ensure improved efficiency of environmental policy.

6 Discussion

The evidence presented has demonstrated the need for the Department of the Environment to become a more active participant in transformation processes, acting as an agent of transformation. This chapter will explain how the analytical framework from Chapter 3 can be used to better understand the required changes to organisational structures.

Table 3 indicates that the problem-solving capability of the department can be improved by introducing new programs, such as transformation strategies or processes, establishing new communication channels, like collaborating with those impacted by transformations, and setting higher standards for personnel, such as self-reflection, anticipation, and increased accountability.

Table 3   Required changes of organisational structures within the department

	Decision programs	**Communication channels**	**Personnel**
Reflective-improvement capability	The PSOs have processes in place to develop their own theories of how transformations can be realized on the ground	The organisation incorporates input from actors in the field (regions, municipalities, cities) to come to more legitimate strategies	Administrative staff have the skills and authority to critically reflect organisational structures that hinder transformations
Collaborative capability	The administration has processes in place for how it implements transformation projects together with other departments	The authority for developing and coordinating transformative policies is shifted to lower levels of the administration (communities of practice)	Collaboration between administrative units particularly beyond the department runs more informally (e.g., fixed contact persons, less text-based)
Data-analytic capability	The organisation uses digitized images of environmental problems that serve as a basis for strategy development and the justification of policies	The organisation has access to internal or external digitisation competencies (data, modelling) needed for strategy development and justification of policies	For analysing data on environmental problems and modelling transformation strategies, the administration is building new digital skills

Source: Own illustration

To strengthen their reflective-improvement capability in the area of environmental and sustainability policy, organisations within the department must have procedures for designing, enacting, evaluating, and adjusting theories for making changes in response to societal problems on the ground. These processes must consider the input from actors in the field, such as regions, municipalities, and cities, to create more valid strategies. This puts new demands on administrative staff, requiring them to have the necessary qualifications and power to establish organisational structures for strategizing and execution.

Regarding the collaborative capability, it is clear that the department must have measures in place to create and enact transformation strategies with those departments relevant to problem diagnosis. This is necessary because these strategies must be rooted in a collective understanding of how to change society shared by the entire government. At the same time, the authors suggest that the

responsibility for pre-designing transformation strategies can be shifted to lower levels of the administration. To reduce the risk that potentially transformative policies are not followed up due to barriers of hierarchy or other departments' political priorities, the experts should establish cross-departmental communities of practice. Here, they can exchange knowledge more informally and establish trust among members from different departments (Brown and Duguid, 1991). This also puts new demands on the experts from all the relevant departments to work more directly and informally, to break down the formal barriers of collaboration between ministries.

It is becoming more and more vital to incorporate the use of data-analytic capabilities into the organisation. Transformation strategies should be based on digital twins of current societal problems and digitized scenarios of the potential consequences on society if no political intervention occurs. This capability requires staff to possess the new skills to access and analyse data on complex environmental problems as well as their potential effects if left unaddressed. This would place the department in a favourable position to better advice policymakers and provide more reasons for justifying transformations.

7 Conclusion

This research has shown that in order to strengthen problem-solving capacity, both the formal and informal structures of PSOs must be changed. Indeed, PSOs need to develop new organisational structures in order to effectively tackle complex problems and be better equipped to play a more active role in transforming society. The ability to play the role of 'problem solver' would put the PSOs in a position as change agents and significantly enhance the transformative capacity of the state.

In fact, our research has shown that we are talking about organisational changes that help PSOs to establish new organisational systems between the relevant governmental and non-governmental organisations. Within these new organisational systems, however, it would be imperative to ensure that the appropriate departments and experts are provided with the necessary skills and responsibilities to design, implement, evaluate and modify transformation strategies. There is no need to completely reorganize the way ministries or agencies work, but rather to identify the departments and experts that need to be more closely involved.

In short, it is essential to make changes in the organisational structures of PSOs in order to enable organisational systems to emerge from new collaborative problem-solving activities. Based on our empirical analysis, it is therefore important to consider the following changes.

- The department must introduce new programs for designing, enacting, evaluating and refining collectively binding strategies that could potentially result in regional, municipal and urban transformations.
- This also requires new communication channels. The department needs to engage with actors who may be affected by the transformation. Establishing such communication channels between the department and external actors will ensure that their opinions are heard and taken into account, which could increase the legitimacy of transformation strategies.
- There is also a need for cultural change in the way PSO staff works. It is important to work more informally and collaboratively to get buy-in from other PSOs for change strategies more quickly. By bringing together experts from different departments, they can jointly work on how to implement and communicate such changes.
- With regard to personnel, it is also imperative that organisational structures that are making the designing and implementation of transformation strategies hard must be removed. The authority to make such changes should be delegated to lower levels with better insights into how daily routines hinder transformations. Those individuals should be given the necessary skills to instigate these organisational changes.
- The utilisation of digital technologies is essential to properly diagnose environmental problems and provide valid justifications for political interventions. This is necessary to properly inform policy-makers and society.

Strengthening the problem-solving capability necessitates a re-evaluation of the department's organisational structure. It would entail formulating new collectively binding transformation strategies, increasing exchange and engagement with stakeholders, acquiring new skills, and introducing new digital technologies.

However, strengthening this capability does not mean to completely redesign organisational structures, but rather to introduce additional ones that replace the existing structures. Instead, it means to add organisational structures which better channel resources to the designing, implementation, evaluation and adjusting of transformation strategies (layering) (Mahoney and Thelen 2010).

Following the understanding of complex social systems, this change might be necessary because it increases the organisational system's complexity, which is necessary when the environmental complexity grows in the face of intricate problems (Ashby 1958).

The framework presented in this study has demonstrated its effectiveness in identifying organisational structural changes within and between PSOs, enabling them to assume a more proactive role as agents of transformation. However, applying a similar analysis to other departments could reveal variations in organisational changes. This highlights that there is no one-fit-all solution and the need for a more accurate assessment of how different departments can enhance their capacity to drive transformation initiatives.

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