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Potential Dimensions of Socio-Environmental Approaches as a Platform for Local Co-Development under Climate Change Variability

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Abstract: The governance of urban processes, in the face of the effects of variability and extremes of climate change, determines the complex approach to address them – especially because of their inherent uncertainty and the high infrastructure cost that their solving entails. The urgency of the responses and actions imposed by extreme weather events transfers additional complexity to less developed societies, given the drift towards sectoral responses and the structural lack of financing at the municipal level. This article proposes a two-pronged approach, linking climate adaptation processes and strategies to local development. This double effect would facilitate the process of adaptation to climate change through the active integration of a wider range of actors in local development, integrating agendas and actions of greater complexity, ensuring a long-term perspective of evolutionary change. The article is defined from a theoretical framework with a transdisciplinary perspective to validate the link between climate change strategies and local development. It is presented through a case study, establishing a framework for possible interventions with integrated objectives, in order to determine policy recommendations and local development strategies within the characteristics and conditions recognised in the case study, and pays special attention to the high level of informal settlements in abandoned areas and the limited economic capacity of the municipality to cope with their needs.

Keywords: Climate Change Adaptation; Transdisciplinarity; Local Development

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Contextualising climate change variability and local development through adaptation

The literature on adaptation to climate change has its basis for discussion in risk management, expanded in the recognition of the levels of vulnerability (social, economic, and environmental) present in each place and defined in its specific conditions. The assessment of these conditions is the fundamental factor in implementing the necessary socio-environmental change. This is more evident in locations that have asymmetric responses to the satisfaction of basic needs, such as the main urban localities of the Reconquista river basin in the Greater Buenos Aires area, considered here as a case study.

[1] This study considers transdisciplinarity from the perspective of D.J. Lang et al., (2012) as a reflective, integrative scientific principle articulated by co-participatory methods that aims to solve or transition social problems and, at the same time, related scientific problems by differentiating and integrating knowledge from various scientific and social disciplines.

One the one hand, the historical socio-cultural conditions of the main inhabitants of the intervened area, shows high levels of poverty, and on the other hand the deviation of responsibilities to the local municipal levels do not match the institutional technical and financial capacities needed to respond to the increased complexity of the urban context. In line with the risk described by Fratini et al. (2012) of the socio-economic decay that characterised the informal areas and its associated municipal governance, there is a recognised gradual loss of tacit knowledge and decreasing social awareness which at the same time are leading to inadequate choices with respect to urban flood risk management and the capacities needed to activate proper strategies to counteract the growing risk of climate change variability.

Recognition of the causes and effects of climate change variability is defined in the complex interrelationships of diverse systems (ecological, social, and physical components under a common decision-making system), so the approach to understanding it is framed as that of a 'complex system.' This is based on the dynamic coexistence of natural and anthropogenic processes in a context of continuous change (Meyer, 2009). The locations of the selected cases are within the Reconquista River basin system and could be conceptualised as part (a subsystem of) an urban delta system (the Paraná delta), which in turn is considered as a complex adaptive system (Dammers et al., 2014) given its dynamic interrelationships between the water system, soil characteristics, its level of urbanisation, its socio-economic conditions, and its production systems, among others.

This article defines a 'systemic interrelationship' as ". . . a complex whole, a set of interconnected things or parts, an organised body of tangible or intangible things that interact to form a whole" (McLoughlin,1969). The city is also understood as a complex system, composed of subsystems, encouraged by general systems theory (McLoughlin, 1969). From the point of view of complexity theory, cities can be understood as open systems because they exchange information with their environment (Portugali, 2006), as well as complex, because they are made up of numerous components or actors with interdependent behaviours, resulting in varied effects (Durlauf, 2005; Portugali, 2006; Zagare, 2018). In this article, the socio-ecological approach is proposed to reveal the interactions of the systems considered and, through it, to define the main challenges to be addressed.

Interrelationships between systems and sub-systems intersect within a non-static equilibrium (Pelling and High 2005; Johnson, 2012), i.e. one that is continuously changing and produces uncertain effects. Even a small change can trigger a qualitative impact on the whole system and thus requires an adaptation process to reach a new equilibrium (Pelling and High 2005). Continuous interactions take place in a non-linear and unpredictable way, so it is necessary for the system to adjust to these changes to reach a non-static equilibrium.

Given that climate change variability has its most critical expressions on the local level, the main issues to counteract its effects lie in the capacity of territorial decision-making at the municipal level. In particular, those issues that make it possible to deal with adaptive dynamics, (necessary to manage the associated risks and embedded in a longer-term resilience strategy), are the development perspectives, challenges, and actions to address the specific risks associated with the effects of flooding (also considering the lack of water during certain periods of the year).

This article argues that complex adaptive systems are defined by the resilience of the system, which implies its ability to absorb disturbances without being weakened or unable to adapt and learn. Some natural and social systems have the built-in capacity to recover from adverse circumstances, while others have to learn to be resilient.

The article focuses on the role of networks as an interrelated support system and the role of institutions in building resilience in social and ecological systems under a framework of joint municipal territorial management, and relies on their national actors and policies.

Resilience as adaptive capacity

The term 'resilience' is based on three main perspectives: engineering, ecological, and evolutionary. Engineering resilience refers to the ability of a system to return to an equilibrium or steady state after a disturbance (Holling, 2001). Ecological resilience refers to

"the ability of these systems to absorb change [...] and still persist" (Holling, 1973). The main distinction between the two definitions referred to is the maintained efficiency of the function, versus the maintained existence of the function (Schulze, 1996). In the proposed framework, which links territorial decisions with mandatory actions to cope with the effects of climate change, the concept of resilience needs to be broadened in order to apply it appropriately to local development conditions and thus target the necessary change-oriented adaptation. Evolutionary resilience (Davoudi et al., 2013) extends the description of resilience from the engineering and ecological viewpoints of restoring and enhancing, also considering the capacity of complex social-ecological systems to change, adapt, or transform in response to stresses and disturbances (Carpenter and Westley, 2005). The concept of resilience is thus established by thinking about local conditions and enabling the activation of an integrated process of change that integrates local development and adaptation to climate change. This study requires the consideration of local, biophysical, and social conditions, proposing to define as a basis the scalar level of vulnerability of the main system at stake, in this case the water structure, and from there to define the risks associated with other vulnerabilities (social, physical, and economic).

Wisner et al. (2004) define social vulnerability to climate change as "the characteristics of an individual or group and their situation that influence their ability to anticipate, cope with, resist, and recover from the impact of a natural hazard" (an extreme natural event or process). Anderson and Woodrow (1998) expand it to: "long-term factors that affect a community's ability to respond to events or make it susceptible to calamities." It goes on to distinguish between material, physical, social, organisational, motivational, and attitudinal vulnerabilities. According to the latter definition, the appropriate framework for integrating local development into climate change adaptation strategies requires the assessment of existing socio-environmental conditions including the need for forecasting and planning. Furthermore, the proposed theoretical framework seeks to clarify that territorial decision-making, as a vulnerable system, should also be considered within the requested action of change, considering Cutter and Finch's (2008) contribution on defining vulnerability as "the potential damage incurred by a person, asset, activity, or set of elements that are at risk. Risk is driven by natural, technological, social, intentional, or complex hazards with the potential outcome being disaster. In our approach, risk expands to social, economic, political, and cultural conditions and factors in decision-making, i.e. vulnerability is socially constructed."

Returning to Adaptive Capacity

Under the theoretical re-conceptualisation of risk and vulnerability detailed in the previous paragraph, this paragraph seeks to define the next step: adaptation, defined as the actions people take in response to, or in anticipation of, anticipated or actual changes and risks, to reduce adverse impacts or take advantage of opportunities presented by climate change or other recognised risks.

Adaptation is not about returning to an earlier state, because all social and natural systems evolve and, in some respects, co-evolve with each other over time. This is the basis of evolutionary resilience (Davoudi et al., 2013). Evolutionary resilience extends the description of resilience from engineering and ecological views of restoration and enhancement to the capacity of complex social-ecological systems to change, adapt, or transform in response to stresses and strains (Carpenter, 2005), and thus responds to our proposal to link local adaptation strategies with local development. Therefore, the social conditions within resilience can be framed to consider the following:

- Social resilience is often used to describe the capacity to adapt positively despite adversity (Luthar and Cicchetti 2000).
- Social resilience is the ability of groups or communities to adapt in the face of external social, political, or environmental stresses and disturbances (Adger 2000).

This defines the basic conditions to which a social group needs to respond in order to be resilient.

The components of the applied approach

The theoretical approach presented in this study of modelling adaptive resilience, strategically aligning the management of climate change effects and local development, began by proposing the necessary assessment of the biophysical systems involved (local conditions within various interrelated systems), defining environmental resilience in its main line of argument and revealing its own limitations. It can be agreed that it depends on the capacity of natural systems to absorb change [...] and still persist, "functioning, maintaining its existence, and maintaining a certain level of efficiency of its recovery functions" (Holling, 1973; Schulze, 1996) as a result of which we conclude that the proposed system can be induced by design. To do so, engineering and social aspects must be aligned with biophysical conditions and recognise existing social conditions to trigger change through an institutional perspective. This is proposed by defining an iterative process of opportunities, designed through co-evaluations and strategic alignments over time.

Adaptation to present and future risks is increasingly understood as an integrative process precipitated by the need to cope with extremes, within gradually changing average climatic parameters (Kelly and Adger 2000, Jones 2001).

Current adaptation strategies have recognised in the dynamics of biophysical systems, as well as in green spaces and urban water systems, potentials for enhancing biodiversity conservation and contributing to the solution of societal challenges (Goddard et al., 2010, Cohen Shacham, 2016). Along these lines, the European Community has recognised the functioning of ecosystems as fundamental pillars for the mitigation of and adaptation to climate change (European Commission, 2015). While aligned to local development objectives and recognising their economic and operational constraints, these strategies can generate exponentially expanding environmental resources, economic benefits, and social benefits (Kabish et al., 2015).

Within these strategies, which promote the maintenance, enhancement, and systemic restoration of biodiversity by expanding urban eco-systemic capacity are Nature-based solutions, as well as actions based on "ecosystem-based adaptation," "green infrastructure," "ecosystem-based disaster risk reduction" and "natural water retention measures." All are defined around the search for answers to the various complexities that climate adaptation and local development demand today. These strategies and the concepts that validate them are mostly complementary, and can be and are used in both urban and non-urban contexts. It is important to consider that both nature-based strategies and their associated potential strategies are highly complex to study and evaluate, due to the multi-scalar nature of the dynamics of bio-physical systems, both in their spatial and temporal scales. As they are associated with territorial decision-making systems for its applicability, they require the intervention of various levels of governance, from the purely local to the transnational territory. The local context and its particularities must always be distinguished for their possible implementation, hence the proposal described here is structured on a concrete experience that evaluates and correlates them.

This article argues that adaptive management processes informed by iterative learning about the ecosystem and through a systemic evaluation of the successes and failures of previous management, increases current resilience, which in turn can increase the capacity to respond to climate change threats in the long term.

Thus, a second concept is proposed: the necessary activation of an adaptive management process, where the evaluation of past actions and the level of constraints considered in each time period need to be assessed and revealed in order to define a cumulative knowledge to guide an evolutionary process of change, in the various pathways taken under different levels of risk in order to improve their performance. Again, this is a request for external input.

This type of adaptive management (Lee, 1999) can be used to pursue the objectives of:

- Greater ecological stability;
- More flexible institutions/structures for resource management;
- Recognising and activating the adaptive cycle (Holling, 2001).

As such, evolutionary resilience, understood as a process of cumulative/reflective knowledge, is proposed here precisely to emphasise that the system goes through different stages of change to become adaptive (Schulze, 1996), and that each decision and its context

are important elements to consider in the more holistic decision-making processes proposed as a model of associated objectives.

To fulfil the integration of these objectives, from the environmental to the social sphere at local level, it is necessary to implement a clear organisational structure under the recognised capacities of local government bodies, so the process proposes to include the resources and skills of external bodies, as in this case, academic support for systemic assessments, which are already defined from a socio-environmental perspective.

This would result in a call for a transdisciplinary research approach, where possible changes can be jointly assessed by the various actors involved, at each step of the process, from the main biophysical assessments to the social demands and the various capacities of the local government bodies involved.

The concept of adaptive capacity relates to the potential of a social-ecological system to reduce its vulnerability (the level at which a system is unable to cope with adverse effects) and minimise the risks associated with a specific threat (Adger, Huq, &. Brown, 2003; Adger, 2006; Smit and Wandel, 2006). According to Folke (2005), adaptability is a prerequisite for the resilience of a system, which can be defined as "the ability of a system to absorb disturbances" by reorganising itself to maintain its identity (Folke et al., 2010) before shifting to a radical state. The proposed path for change therefore requires a high level of flexibility and territorial action defined by a constant assessment of the various conditions considered in each system and through their interactions.

The complex interrelationship of the dynamics of the natural and built environment is constantly adapting, which means that the whole process must always be cyclical and evolutionary (depending on gradual changes).

Adaptations depend on each system and its interactions (positive and negative), so the proposed transdisciplinary approach considers the co-evaluation from a scientific perspective of local conditions (including the human and economic municipal resources to support this process).

The adaptations can be seen as opportunities to improve each system and its interrelationships, so the active transdisciplinary approach that proposes various possibilities for change, co-defines its main objectives and scope, needing to align with local governance capacities to result in concrete and feasible strategies (in line with the municipality's development goals) and to effectively integrate local stakeholders in their evaluation.

Following the proposed domains upon which a transdisciplinary approach acts (Fratini et al., 2012), we highlight some essential aspects valued by different stakeholders which come into play when implementing a transdisciplinary approach, linking climate change adaptation to the local development: (1) technical optimisation, dealing with standards and guidelines for urban drainage systems, based on the knowledge transfer that includes different disciplines and local technical knowledge; (2) spatial planning, making the urban area more resilient to future changing conditions, by also including strategic municipal plans; and (3) day-to-day values, enhancing awareness, acceptance, and participation among stakeholders, also within an evolutionary integration within the process and setting the conditions for an active and long-term participation of different stakeholders, with an emphasis on the role of the local inhabitants.

Transdisciplinary process for a new vision of local adaptability - the Arroyo Morón Case

Transdisciplinarity for climate change and local development

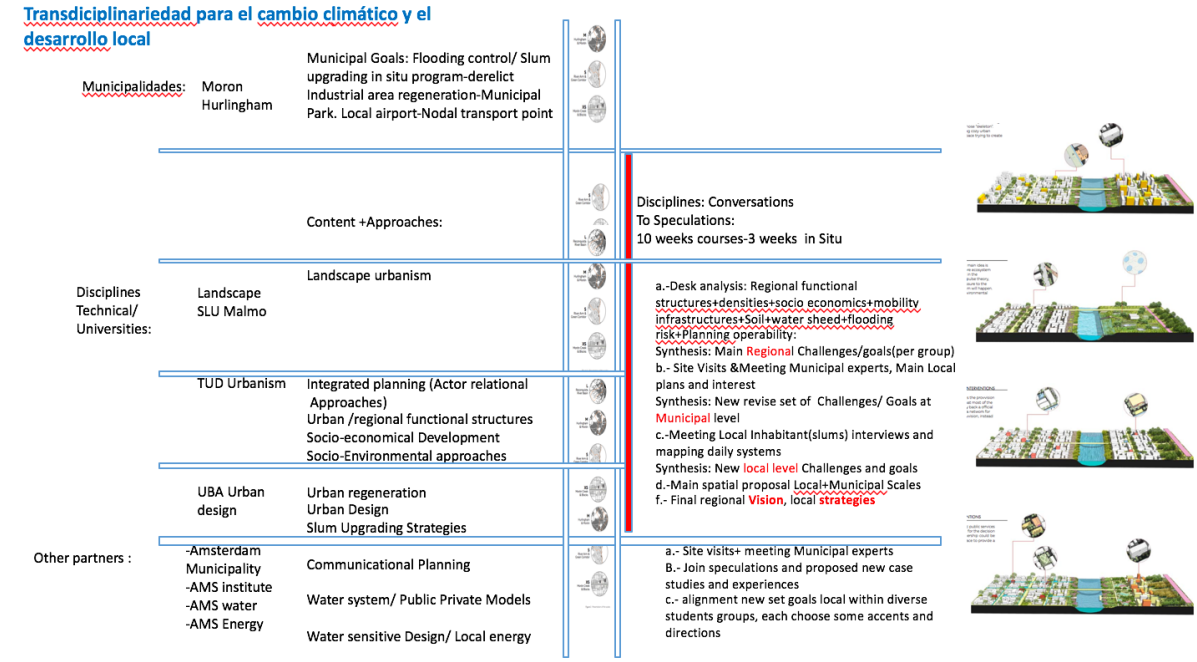

Image 1: Actors and roles in the transdisciplinary programme of the Arroyo Morón case. Authors: Diedrich, Janches and Sepulveda 2018.

This study is based on joint research between different institutions that bring together various disciplines with the aim of improving local development, coordinating agendas and actors to respond to the effects of climate change, and the environmental crisis on the local scale. This is in addition to the concepts of evolutionary adaptation activated by participatory processes, those that integrate local, public, and private actors, academia and various disciplines to facilitate the processes of evaluation, implementation, and monitoring of alternatives for institutional, social, and environmental change. These are recognised as systems whose effects must be assessed in their interrelationships, interdependencies and capacities, in order to define a plan of integrated actions in sustainable processes that increase their local impact.

From this perspective, during two three-month periods in 2018 and 2019, a research consortium called "transdisciplinarity for climate change in complex areas" was formed, which offered the municipalities of Hurlingham and Morón in the periphery of Greater Buenos Aires to jointly define a possible framework of ideas for a strategic action plan towards climate change.[2] This exercise was carried out as part of the activities of the Master's degree courses in urban and landscape architecture from three universities: Master of Landscape Architecture (SLU Malmo, Sweden), Master of Urban Design (University of Buenos Aires), and Master of Urban Planning (Delft University of Technology).

The basic local conditioning factors of these two municipalities were evaluated from the disciplines of urban planning, ecology, landscape, anthropology, and governance, recognising that: 1) the natural features present in both territories are part of the Reconquista River basin, a tributary of the Paraná River and interrelated with its deltaic dynamics, and 2) that the quality of the local tributaries combined in the Arroyo Morón reveals high levels of pollution, and that flood control infrastructure is urgently needed. At the same time, the social conditions of the area were considered, which feature a large number of informal settlements in flood-prone and polluted areas where the poverty rate is high, and informal employment is the main source of income for most of the population located in irrigated areas.

[2] The full study forms a part of the research project "Tactics and Strategies for the Integral Improvement of the Urban-Water Landscape in the Area of the Reconquista River Basin, Flavio Janches and Juan Carlos Angelomé [authors]." Strategic Development Project 2018/2019, University of Buenos Aires, Department of Science and Technology, Faculty of Architecture, Design and Urban Planning, Higher Institute of Urban Planning.

In addition, the good level of connectivity and mobility at metropolitan level was recognised, allowing for the possibility of growth and densification, so that in a first meeting the guidelines for the development of the project were agreed. In this way, the operational framework of a support agreement was followed that sought to bring together strategies for local adaptation in response to climate change and local inter-municipal development possibilities, enhancing the objectives of local development plans, while recognising the functional interrelationships at the scales of intervention (spatial and temporal).

The operational framework of this exercise was defined as transdisciplinary and structured according to the process defined by Diedrich, Khan, and Lindholm (2015) as "beyond best practices" as a participatory dialogue, involving inhabitants, municipal specialists, and academic disciplines of landscape/ecology, urbanism/urban design/governance, anthropology, and urban design as a platform for co-evaluation and participatory design, in order to facilitate, understand, and coordinate the complexities of climate change and spatial planning at the local level.

The design of this interdisciplinary activation framework was defined as a speculative process that coordinated a way of creating, of deliberation, and possible decision-making as a testing ground for the definition of critical responses and evolution of the knowledge framework, particularly adapted to the strategic guidelines of climate adaptation, environmental improvement, and socio-spatial integration.

Through the results obtained in each phase of the exercise and from the re-evaluation of the processes and projects developed, it would be possible to redefine the framework of theoretical, technical, and methodological reflection, in order to promote new integrative proposals and provide specific disciplinary responses to each systemic feature to be considered. This is essential because of the complexity of the problems to be tackled, which require new approaches to help transform complex urban landscapes into more sustainable environments (F. Janches et al., 2019).

The exercise described here is structured within this design in a non-linear and interactive process of agreements, proposals, co-evaluations, measurements, and adjustments, concluding with concrete possibilities, to discuss possible development strategies with multiple actors, and thereby define the specific strategies to follow, improving and expanding the objectives of existing strategic plans, from a process that is not linear, but instead iterative and incremental.

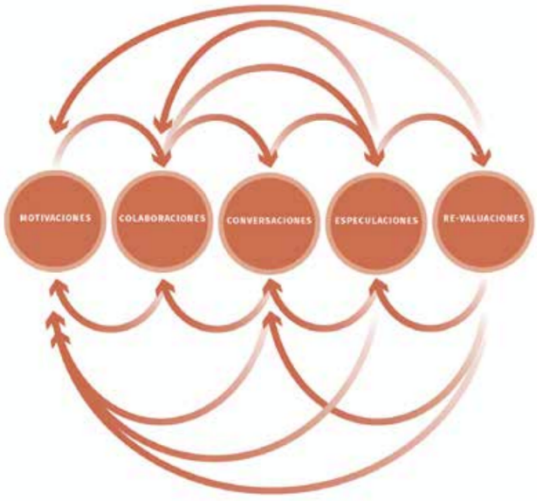

Image 2: Iterative process that structures and defines the transdisciplinary methodology implemented in the Arroyo Morón project. Author: Lisa Diedrich 2018

We now go on to describe the phases of the exercise, its actions, and the actors involved in the transdisciplinary process. These defined the operational framework of the

exercise, the systems considered, and the possible interrelationships between them. Through their spatial definition, possible potentials were detected, which in turn revealed possible paths, which were re-evaluated by the local actors involved, from the economic and technical capacities of the municipalities, to the possible spheres of participation of private actors, among other issues:

Phase 0: Systemic (prior) analysis and background review.
Strategic guidelines predefined by both municipalities:
Short-term objectives: Flood control/Formalisation of marginal areas, industrial regeneration and activation programme, urban regeneration programme-Municipal park.
Medium-term objectives: Co-evaluation of strategic guidelines for the reconversion of a disused airport into a regional airport focused on the development of a multimodal metropolitan transport hub.
Actors: Academics, municipal officials, inhabitants, and non-governmental organisations.
Actions: At the invitation of the municipalities, the strategic guidelines are jointly reviewed through discussions/interviews with the different stakeholders, the areas, the systems to be considered, and their levels of risk and urgency are co-defined.
Product: The framework programme of the challenges to be considered, the map of actors and the urgent needs to be considered.

Phase 1: Categorisation and prototypical proposal (integrating systems)
Objective: To define the systems at stake, their possible interrelationships and to determine a prototypical synthesis of possible local solutions before approved and similar constraints.
Actors: Academics, municipal officials,
Actions: Re-evaluation of the system and its environmental impact, rainwater and sewerage management, socio-economic mapping, and integrated re-mapping. Speculations from possible solutions based on the study of past actions and impact assessment.
Output: Prototypical proposal of integrated local solutions.

Phase 2: Presentation of prototype proposal (integrating systems) to local stakeholders. Selection and review of technical feasibility, decision-making, and management capacity.
Objective: To evaluate the potentialities and limitations of the “speculations” presented as tools or previous solutions from the economic and technical capacities of the municipalities and local actors involved.
Actors: Academics, municipal officials, inhabitants, and non-governmental organisations.
Actions: Implementation of three discussion tables, coordinated according to urgent problems, where prototypes of possible solutions are presented and discussed by each group of actors, to later define the possible frameworks and their limitations.
Product: Definition of possible solutions from concrete strategies aligning the diverse interests of the stakeholders involved.

Phase 3: Adjustment of the prototypical proposal recognising technical feasibility and decision and management capacity.
Objective: Detailed review of the technical feasibility required by the proposals and joint review of the institutional support system (financial and programmatic).
Actors: Academics, municipal officials.
Actions: Presentation of detailed reports of the proposals, evaluation, and discussion of their possible operability.
Output: Assessment of possible actions, potentials, and constraints, both operational and in terms of decision-making and competence.

Phase 4: Spatial contextualisation and co-selection of possible strategic actions.
Objective: Quantification of possible actions, spatial expression, special impact, and co-definition of strategic actions.
Actors: Academics, municipal officials, inhabitants, and non-governmental organisations.

Actions: Implementation of three discussion tables coordinated by actions, where prototype strategies are presented and discussed by each stakeholder group, and then hierarchies of interests are defined by possible agreements of their impacts.
Output: Selection of local strategic plans in stages.

Phase 5: Final selection according to technical feasibility, decision-making, and management capacity.
Objective: Definition of the local strategic plan for the specific framework of the transdisciplinary plan to be developed.
Actors: Academics, municipal officials, non-governmental organisations.
Actions: Summary report of the actions to be developed, possible impacts, cost, and time.
Product: Full report of the local strategic plan to be developed.

Phase 6: Co-evaluation of socio-environmental impact.
Objective: the implementation of a Socio-environmental Impact Co-evaluation System.
Actors: Academics, municipal officials, non-governmental organisations.
Actions: Implementation through participatory scenario system of the co-evaluations, from the more technical framework to the social impact.
Product: Socio-environmental co-evaluation report.

Phase 7: Co-definition of strategic actions in critical areas and possible phases of evolutionary change.
Objective: Once a local strategic plan has been defined and agreed upon, its stages are defined and agreements are made for specific goals over time.
Actors: Academics, municipal officials, non-governmental organisations.
Actions: Creation of two moderated discussion tables to jointly define the objectives by stages.
Product: Local strategic plan, stages, goals, and possible funding.

Phase 8: Detail of actions for cost definition.
Objective: To define the estimated costs of each stage, recognising possible governmental and cooperation agency plans for potential implementation.
Actors: Municipal officials.
Actions: Municipal, inter-municipal assessments and possible review at regional level.
Output: Cost plan by stages.

Phase 9: Local level, visualisations of integrated systems and their possibilities. Second presentation to the community.
Objective: To generate spatial visualisations of possible proposed changes and their spatial outcomes, as a means of communication and dissemination for discussion among various actors and strengthening of possible guidelines.
Actors: Academics, municipal officials, non-governmental organisations.
Actions: Iterative process of visualisation, understanding and detailing.
Product: visualisations and systemic-functional details of selected actions.

Phase 10: Speculations. Detailed strategic adaptive proposal.
Objective: From the definition and detail of the possible local strategic plans presented as opportunities, determining the territorial changes linked to the socio-technical capacities of the actors, defining from the operative limitations possible strategic adaptations.
Actors: Academics, municipal officials, non-governmental organisations.
Actions: Two evaluation roundtables.
Product: Final report of possibilities and adaptations of the decision framed with possible financing.

In each phase, the proposed processes were defined as “conversations” where the framework consisted of proposals executed by the students, discussed/evaluated by the

municipal experts and enriched by discussions with the different parties, from the inhabitants to the different stakeholders within the river area between the two municipalities. It culminated in a revised and delimited proposal of possible evolutionary plans for the implementation of an inter-municipal development framework.

Some final observations

The possibilities proposed in this study link local adaptation strategies with local development strategies, which responds to the strategic adaptation platform and its specific theoretical foundations. The implementation possibilities of the case study are reinforced by the values of empowering local capacities and co-assessing the main causes and effects of an aligned two-pronged strategy.

The role of a more academic environment in facilitating systems assessments has been established to validate the need for a transdisciplinary research approach while offering different development alternatives. This is a crucial enabling role in the local adaptation process that aims at a long-term perspective and meets the definitions of the abovementioned socio-environmental theories and approaches. The demands of flexible regulatory systems and the inclusive perspective of stakeholders, aligned on their shared development objectives, are fundamental to visualise co-defined assessments and opportunities.

The presented study case experiences, in particular reveals two main critical points to consider, the necessity to incorporate the spatial planning perspective within, so as to be able to project and embed the local strategies for climate change adaptation within a broader developing perspectives, under the specific capacities and vision of the local governance body. So, with this, the possible expansion to new and more powerful actors on the development should be included. In contrast, the activations of a more socio-cultural recognition on the process of local actors' awareness towards active involvement need to recognised on the transdisciplinary process steps, so to be able to keep the people's attention and through that facilitate the evolutionary involvement and validation of the inhabitant voices and engagement within.

Active strategies of co-definition, co-evaluation and co-design to face complex and highly uncertain problems appear as a significant milestone for water management and local development. The challenges are open and the possible activation for change from different concrete and evaluated development possibilities is clearly a new opportunity for municipalities in delta conditions with a development that is conditioned by a lack of resources.

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