

OPINION

Transdisciplinarity in climate change adaptation: An agenda for evidence generation

Marta Olazabal^{1,2*}, Cecilia Alda-Vidal¹, Olga L. Hernández-Manrique^{1,3}, Sean Goodwin¹, Ana T. Amorim-Maia¹, Maria Loroño-Leturiondo¹, Pablo Herreros-Cantis^{1,4,5}

1 Basque Centre for Climate Change, Leioa, Spain, **2** Ikerbasque, Basque Foundation for Science, Bilbao, Spain, **3** Ecohydrology and Ecohydraulics Research Network, Bogota, Colombia, **4** Institute of Environmental Science and Technology, Universitat Autònoma de Barcelona, Cerdanyola del Vallès, Barcelona, Spain, **5** Urban Systems Lab, The New School, New York City, United States of America

☯ These authors have contributed equally.

* marta.olazabal@bc3research.org



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1. Making a stronger case for transdisciplinarity

There is a widely shared understanding that transdisciplinarity is essential to solving real-world problems, breaking through traditional ways of decision-making. Transdisciplinarity integrates multiple disciplines with non-academic knowledge along the decision-making process to fit real-world problems and put forward more effective solutions for those affected by them. While scholars have claimed the benefits of transdisciplinary for decades [1], there is still limited implementation across disciplines or societal problems, let alone resources to build appropriate transdisciplinary environments. When transdisciplinarity is emphasised, different forms of knowledge, experiences and expertise are put into conversation on equal footing in an iterative manner to frame and solve a common complex challenge and mutually learn from the process [2,3]. Transdisciplinarity is argued to generate commitment and mutual responsibility, integrate diverse knowledge and values, and generate knowledge that is socially and scientifically robust, all in a process that requires continuous reflexivity [4]. Central to transdisciplinary work is the co-creation of knowledge, often called “co-production”, where researchers and stakeholders collaborate from the outset to identify problems, design research, and develop actionable solutions [5]. Co-producing knowledge may have different purposes and be done differently [6]. But, unquestionably, implementing new ways of generating knowledge, working with others and establishing relationships requires time and commitment from everyone involved. It also entails an act of humility in which the different participants in the process accept and embrace the benefits of interacting with one another to generate more diverse, alternative, context-sensitive, effective, just and sustainable solutions to problems that are collectively recognised. For this reason, transdisciplinarity has been claimed to be particularly effective for grand societal challenges that are highly complex and that require alternative solutions, such as climate change. The emphasis is placed in the integration of scientific and other forms of knowledge for meaningful and practical outcomes [1,7]. While transdisciplinarity is in vogue, in this opinion piece, we argue that it is not that clear what evidence is critical to make a stronger

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case for more commitment, more spaces, and more adequate funding for transdisciplinary projects, especially when it comes to climate change adaptation. The following section seeks to establish an agenda for evidence generation on the impacts of transdisciplinary on adaptation outcomes.

2. Why transdisciplinarity in climate change adaptation? An agenda for evidence generation

Here, we put forward four reasons for which, based on contemporary climate change adaptation thinking, we see transdisciplinarity being especially stimulating to move towards a more transformative and localised adaptation. These elements, explained in more detail below, are: how transdisciplinarity addresses the politics of adaptation, how it integrates and uses multiple forms of knowledge and values, how it enables agreed-upon goals and outcomes and how it addresses reflexivity and relationality. However, these aspects require special attention in terms of evidence generation to build a strong transdisciplinary adaptation knowledgebase that helps decision-makers, funders and scientists worldwide to make a stronger case for transdisciplinarity in their daily decision-making processes and projects. For each of these elements, we have identified signs of change in processes and results (see [Fig 1](#)) for which we recommend more evidence needs to be gathered for stronger and better-supported adaptation work in the future.

Transdisciplinarity addresses the politics of adaptation, breaking through the dominance of power, the elite, and technocracy through processes of negotiation

Adaptation is inherently a socio-political process, shaped by contestation, power asymmetries, and governance complexities within polarised and uncertain contexts [8]. While often framed through technocratic and top-down approaches – which frequently sideline local realities – adaptation also involves negotiation, social dynamics, and affective dimensions [9]. Therefore, it should be viewed as more than the adjustment to climate pressures, but as a relational process deeply embedded within socio-political structures. Transdisciplinary approaches help address these dynamics by reformulating how knowledge is produced and whose epistemologies are valued. Such shifts enhance legitimacy and foster more equitable and effective adaptation outcomes.

Transdisciplinarity combines multiple forms of knowledge and values from early stages, expanding the solution space

When tackling the multiplicity of forms of knowledge and values, transdisciplinary processes that are effective for adaptation must reflect the epistemological pluralisms that stem beyond multiple disciplines. Transdisciplinary approaches to climate change adaptation must enable the integration of multiple forms of knowledge and pluralism of values from the early stages of decision-making, including the problem-framing phase, so that emerging adaptation actions account for the uneven, heterogeneous distribution of climate change impacts and a diverse range of

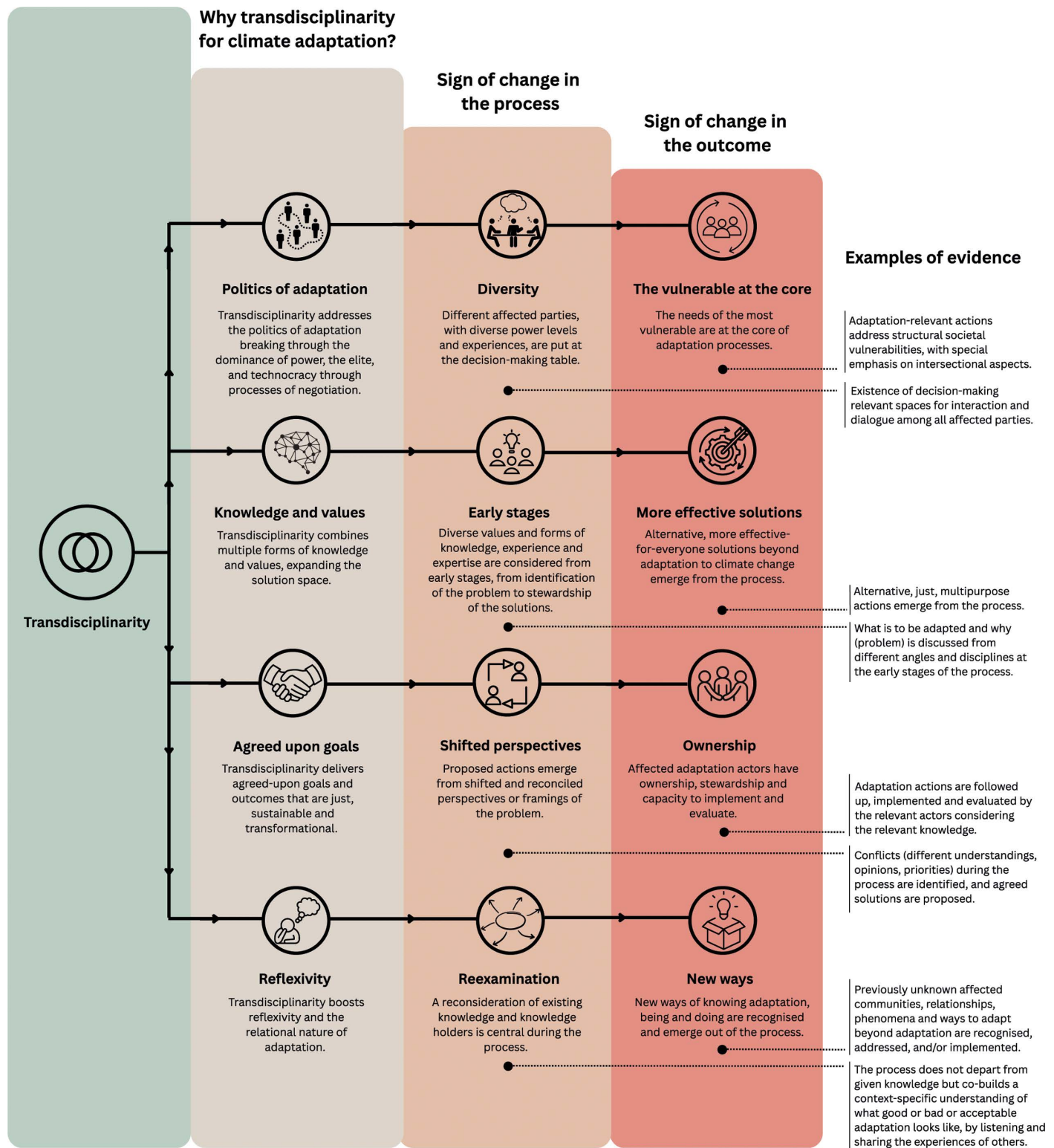


Fig 1. Signs of change and an agenda for evidence generation in transdisciplinary adaptation processes.

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potential solutions that are effective across diverse living systems [10]. Crucially, by expanding the problem space through a recognition of other ways of knowing and valuing, new, more effective opportunities for adaptation emerge [11].

Transdisciplinarity delivers agreed-upon goals and outcomes that are just, sustainable and transformational

In transdisciplinary processes, actors bring different professional and personal positionalities, including beliefs, worldviews, values, emotions, etc., that shape potentially conflicting framings and visions of the problem. Knowledge co-production precisely emphasises finding shared meanings through the reconciliation of different perspectives. The creation of spaces of care and inclusion, in which room is made for marginalised voices, reflexivity, appreciation of others' contributions, critical and constructive dialogue, and empathic and inclusive negotiation is key in a transformational process [6,12,13]. The ambition is that agreed-upon solutions will be more likely accepted as legitimate, and owned, by the different actors, and as a result more likely to be sustainable.

Transdisciplinarity boosts reflexivity and the relational nature of adaptation

Adaptation is increasingly framed as a learning process. To enable learning, adaptation must confront power, embrace knowledge pluralism, foster bottom-up coalitions, and make space for trade-offs, surprises, and change [14]. Strong relationships among key actors facilitate these requirements, aligning with calls for a “relational turn” in adaptation. This perspective emphasises that adaptation is not just about responding to climate hazards but also about building and strengthening relationships both among key adaptation actors (especially beneficiaries) and with nature [15]. Learning for transformative adaptation depends on relationships that enable learning—fostering trust, sharing experiences, and re-examining beliefs and practices that shape understandings of climate impacts and the options that emerge for transformative action.

3. Ways forward

A growing body of literature highlights the benefits of transdisciplinarity in adapting to climate change. In this opinion piece, we outline why transdisciplinarity is essential for fostering more effective, just, sustainable, and transformative adaptation. We have identified key signs of change and presented examples that can guide future efforts to generate systematic evidence on this topic. Our hope is that this contribution, along with the next steps taken by the adaptation community, will serve as a pivotal moment for funders and stakeholders, encouraging them to recognize and support the cognitive and time-intensive processes involved in our transdisciplinary efforts.

Author contributions

Conceptualization: Marta Olazabal.

Funding acquisition: Marta Olazabal.

Investigation: Marta Olazabal.

Methodology: Marta Olazabal.

Project administration: Marta Olazabal.

Supervision: Marta Olazabal.

Visualization: Marta Olazabal, Maria Loroño-Leturiondo.

Writing – original draft: Marta Olazabal, Cecilia Alda-Vidal, Olga L. Hernández-Manrique, Sean Goodwin, Ana Terra Amorim-Maia, Pablo Herreros-Cantis.

Writing – review & editing: Marta Olazabal, Cecilia Alda-Vidal, Olga L. Hernández-Manrique, Sean Goodwin, Ana Terra Amorim-Maia, Maria Loroño-Leturiondo, Pablo Herreros-Cantis.

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