Perspectives on transformational change in climate risk management and adaptation

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Abstract
In the context of strong evidence on mounting climate-related risks and impacts across the globe, the need for ‘transformational change’ in climate risk management and adaptation responses has been brought forward as an important element to achieve the Paris ambitions. In the past decade, the concept has experienced increasing popularity in policy debates and academic discussions but has seen heterogeneous applications and little practical insight. The paper aims to identify relevant perspectives on transformative approaches and transformational change in the context of climate risk management and adaptation to propose an actionable definition for practical application. Using a systematic search and review approach, we review different perspectives across policy and scientific publications, focusing on work published in the past decade and identify common features of what transformational change in the context of climate risk management and adaptation may involve. We show that different perspectives on transformational change in the context of climate risk management and adaptation persist, but certain areas of convergence are discernible. This includes understanding transformational change as part of a spectrum that begins with incremental change; involves climate risk management and adaptation measures focusing on deep-rooted, system-level change and tends to aim at enabling more just and sustainable futures; often oriented towards the long-term, in anticipation of future climate-related developments. In addition, we identify an ‘operationalisation gap’ in terms of translating transformational change ambitions into concrete transformative measures that can be replicated in practice.

1. Introduction

Accelerating climate change and first evidence of adaptation limits, along with rising compound risk, call a sole reliance on conventional approaches for addressing climate-related risks into question (Dow et al. 2013, Colloff et al. 2017, IPCC 2018b, 2019) and create new challenges across all sectors (Nalau and Handmer 2015). While climate risk management and adaptation approaches have become widely accepted as indispensable for managing current observed and future expected negative impacts of climate change (Tesfaye and Seifu 2016, Magesa and Pauline 2019), projected vulnerabilities and risks are increasingly becoming so profound that standard approaches may no longer suffice (Kates et al. 2012, Park et al. 2012, Klein et al. 2017). Calls for transformative approaches to climate risk management and adaptation, including for relevant epistemic approaches (David T’abara et al. 2019) that facilitate ‘radical and fundamental change’ (Feola 2015) for the better (Mustelin and Handmer 2013) are increasingly voiced as the number of disasters associated with climate change increases (Klein et al. 2014, Nalau and Handmer 2015, Mechler and Schinko 2016, Panda 2018, Thomalla et al. 2018, Roberts and Pelling 2019).

Particularly in environmental and development policy and science arenas, the need for a shift towards ‘transformative approaches’ to climate risk management and adaptation to prevent disasters and enable sustainable development pathways is receiving increasing attention (Feola 2015, Godfrey-Wood and Naess 2016), albeit less so still than the parallel mitigation and socio-technical transitions literature. Spearheaded by the Intergovernmental Panel on Climate Change (IPCC), which in several reports referred to the need for transformational adaptation—among others in the Special Report on Managing the Risks
of Extreme Events and Disasters to Advance Climate Change Adaptation in 2012 (IPCC 2012), in the Fifth Assessment Report in 2014 (IPCC 2014) and most recently, in 2018 in the Special Report on Global Warming of 1.5 °C (IPCC 2018b) and the Special Report on the Ocean and Cryosphere in a Changing Climate (IPCC 2019), academic and policy debates have picked up on the concept over the past decade, often presenting transformational change in climate risk management and adaptation as an inherently positive shift (O’Brien 2012, Abeling et al 2018) that harbours ‘the solution to environmental change’ (O’Brien 2013, p 670), a ‘promise of “hail” and success towards climate change resilience’ (Tröger 2016, p 353).

This increasing attention offers opportunities for advancing towards a cogent and actionable conceptualisation of ‘transformative’ approaches to climate risk management and adaptation and the change processes entailed therein, but has also resulted in an array of interpretations across the body of research (O’Brien 2013, Feola 2015, Nalau and Handmer 2015, Godfrey-Wood and Naess 2016, Few et al 2017). A heterogeneous conceptualisation of the term, however, may hamper its potential to unlock deep change towards comprehensive climate risk management and adaptation that addresses the root causes of risks and enables sustainable futures (Mechler et al 2014, Few et al 2017). In addition, objectives and characteristics of such approaches in the climate risk management and adaptation literature rarely feature clear quantitative goals unlike in the parallel mitigation and socio-technical transitions literature (e.g. net zero targets for mitigation), further motivating our research interest in this area.

In this paper, we chart the use of transformative approaches and similar concepts in the context of climate change adaptation and risk management across the literature, focusing on work published in the decade since the publication of the Fourth IPCC Assessment Report in 2007, which called for a step-change in adaptation efforts (IPCC 2007). In line with Vermeulen et al (2018), this article uses ‘transformative’ when describing the change process (e.g. transformative climate risk management and adaptation) and ‘transformational’ when referring to the outcome of the change process itself (e.g. transformational change) for reasons of clarity, but traces both across the literature.

Our focus on climate risk management and adaptation implies that our main research interest lies with deliberate transformational change processes (Mechler et al 2014, Feola 2015, Colloff et al 2017, Few et al 2017, Fazey et al 2017) for building development-centred resilience and sustainable futures (Keating et al 2017), although we acknowledge that transformative progress towards resilient and sustainable futures may in some instances be achieved by chance (O’Brien 2013). Using a systematic literature review approach based on a search and review, we trace the development of the concept and identify specific features with a view to bridge existing approaches towards an actionable conceptualisation of transformational change in the context of climate change adaptation and risk management that relates the different conceptions. We argue that such bridging work offers novel insights and encourages a shift in climate risk management and adaptation more commensurate to the scale of action needed in a world headed for 1.5 °C and more global warming (see IPCC 2018b).

2. Methodological approach

We performed a systematic search and review of scientific scholarship (Grant and Booth 2009, Ford et al 2011) on transformational change and similar concepts in the context of climate change adaptation and risk management. A systematic search and review differs from a literature review in that it involves a more rigorous and transparent review, where documents are selected according to systematic and explicit criteria that are fully reported (Ford et al 2011). As its aim, it seeks to map out existing literature with view to identifying commonalities and gaps that may need to be addressed in further research (Grant and Booth 2009).

We reviewed literature published in the decade since the publication of the Fourth IPCC Assessment Report (i.e. 2008–2019), expanded with a hand search of publications from select agenda-setting international organisations published in the same timeframe. The searches were performed between 16 August and 20 September 2019 and calibrated on 16 October 2019.

We opted to use the Thomson Reuters (formerly ISI) Web of Science Core Collection (SCI™ Expanded, SSCI™, ESCI, BKCI-S®, BKCI-SHT®) and Elsevier’s Scopus bibliographic databases to compile a bibliography of relevant literature for their wealth of articles from the environmental and social sciences (Landauer et al 2015, Jurgilevich et al 2017). To capture relevant literature from these databases, we narrowed our search to the following disciplines: Environmental Sciences, Environmental Studies, Development Studies, Urban Studies, Economics, International Relations, Political Science, Public Administration, Social Sciences (other topics/inter-disciplinary), Sociology and multidisciplinary Sciences (Web of Science), as well as Environmental Science, Social Sciences, Earth and Planetary Sciences

1 N.b. Unlike scientific literature, which is collected in centralised databases on which automated searches can be performed, grey literature cannot be retrieved in the same replicable manner. The grey literature featured in this review thus only reflects a proxy snapshot.
2 Articles published after this date are not reflected in this review, the dataset for 2019 thus is necessarily incomplete.
Discussions with experts from the Zurich Flood Resilience Alliance supported the identification of the search strings. The number of words was chosen based on the mean sentence length of academic articles published in English, which ranges between 25 and 30 words per sentence (Moore 2011).

Discussions with experts from the Zurich Flood Resilience Alliance supported the identification of these organisations and retrieved the available bibliometric information, which we then also fed into the Excel 2019 template (Microsoft, Redmond, WA, USA) and into the Mendeley reference manager (Elsevier, London, UK).

Search results were subsequently narrowed down through a check for duplicates and a manual screening of article titles and abstracts, excluding publications that (a) were not actually targeting climate change adaptation or climate risk management as a topic and/or (b) employed the search-terms in an unrelated context (e.g. transform high seas management to build climate resilience in marine seafood supply). Where we were uncertain about the eligibility of an article based on its title and abstract, the decision for inclusion was made on a full-text screening.

All remaining articles were then hand-screened for relevance using expert judgement, with articles that (a) explicitly employ transformation and in the context of climate change adaptation and risk management (see above search strings) and (b) propose an explicit and/or implicit definition and/or specific attributes of ‘transformative adaptation’ or similar concepts and/or (c) outline transformative change in the context of climate change adaptation and risk management included for in-depth full-text review. See figure 1 for the search process, as well as the criteria for inclusion (a) explicit use of ‘transformative adaptation’ or similar concepts as per the above search strings AND (b) definition/attributes of ‘transformative adaptation’ or similar concepts as per the above search strings AND/OR (c) exemplary measures/processes of outlined), based on a hermeneutic approach.

To structure the review, we inductively coded the literature with descriptors, including if it proposes (a) a definition and/or (b) specific features as part of the definition; (c) distinguishes transformational and incremental change in the context of climate change adaptation and risk management; and (d) outlines exemplary measures and processes. The underlying dataset also includes the following bibliographic information: Year and location (country, municipality, city where applicable) of the literature; short description (abstract) and source of publication.

In the following, the dataset was expanded with the results from a qualitative analysis of the selected literature, during which we extracted descriptive themes until saturation (Saunders et al 2018). During this step, we read and manually coded the publications that provide the basis for the review several times to identify emergent themes and commonalities. We then categorised the themes into conceptual groups to subsequently derive specific attributes of transformational change in the context of climate change adaptation and risk management. As part of this step, we also discerned several conceptual strands within the reviewed literature.
Table 1. Systematic literature review: search strings and results—Web of Science and Scopus.

| Time period | Search strings—Web of Science | Results | Search strings—Scopus | Results |
|-------------|--------------------------------|---------|-----------------------|---------|
| 1 2008–2019 | TOPIC: (((transform∗ OR radical OR fundamental) NEAR/30 ‘climate change adaptation’)) | 63      | TITLE-ABS-KEY ((transform∗ OR radical OR fundamental) W/30 ‘climate change adaptation’) | 107     |
| 2 2008–2019 | TOPIC: (((transform∗ OR radical OR fundamental) NEAR/30 ‘adapt∗ to climate change’)) | 48      | TITLE-ABS-KEY ((transform∗ OR radical OR fundamental) W/30 ‘adapt∗ to climate change’) | 75      |
| 3 2008–2019 | TOPIC: (((transform∗ OR radical OR fundamental) NEAR/30 ‘adapt∗ to environment∗ change’)) | 3       | TITLE-ABS-KEY ((transform∗ OR radical OR fundamental) W/30 ‘adapt∗ to environment∗ change’) | 9       |
| 4 2008–2019 | TOPIC: (((transform∗ OR radical OR fundamental) NEAR/30 ‘adapt∗ to environment∗ change’)) | 8       | TITLE-ABS-KEY ((transform∗ OR radical OR fundamental) W/30 ‘respon∗ to environment∗ change’) | 22      |
| 5 2008–2019 | TOPIC: (((transform∗ OR radical OR fundamental) NEAR/30 ‘respon∗ to environment∗ change’)) | 39      | TITLE-ABS-KEY ((transform∗ OR radical OR fundamental) W/30 ‘climate risk management’) | 75      |
| 6 2008–2019 | TOPIC: (((transform∗ OR radical OR fundamental) NEAR/30 ‘disaster risk management’)) | 2       | TITLE-ABS-KEY ((transform∗ OR radical OR fundamental) W/30 ‘climate risk management’) | 4       |
| 7 2008–2019 | TOPIC: (((transform∗ OR radical OR fundamental) NEAR/30 ‘disaster risk management’)) | 8       | TITLE-ABS-KEY ((transform∗ OR radical OR fundamental) W/30 ‘disaster risk management’) | 14      |
| 8 2008–2019 | TOPIC: (((transform∗ OR radical OR fundamental) NEAR/30 ‘disaster resilience’)) | 6       | TITLE-ABS-KEY ((transform∗ OR radical OR fundamental) W/30 ‘disaster resilience’) | 9       |
| 9 2008–2019 | TOPIC: (((transform∗ OR radical OR fundamental) NEAR/30 ‘climate resilience’)) | 10      | TITLE-ABS-KEY ((transform∗ OR radical OR fundamental) W/30 ‘climate resilience’) | 15      |
| 10 2008–2019 | TOPIC: (((transform∗ OR radical OR fundamental) NEAR/30 ‘disaster risk reduction’)) | 18      | TITLE-ABS-KEY ((transform∗ OR radical OR fundamental) W/30 ‘disaster risk reduction’) | 46      |

Total Web of Science 205 (191 without in-database duplicates)
Total Scopus 376 (348 without in-database duplicates)

3. Systematic search results—bibliometric analysis

The application of the nine search strings to the Web of Science Core Collection and to the Scopus bibliographic databases resulted in a total of 581 publications for the time period (2008–2019) (figure 2), which feature the search strings in either their title, their abstract or their keywords. An additional 15 articles were retrieved through a hand-search of the webrepositories of selected international organisations (table 2). After duplicates were removed, a total of 389 articles remained (figure 3), further narrowed down to 218 after a manual screening of article titles and abstracts and to 101 following a full-text screening for eligibility. The 92 articles that passed the full-text screening were then reviewed and coded in line with the approach presented above.

Figures (a)–(c) illustrate the distribution of reviewed records by year of publication. Overall, the number of records has increased consistently over the time period reviewed in this article, with a majority published in the year 2014 or later. The publication of the 2012 IPCC Special Report ‘Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation’, which highlighted that effective climate risk management and adaptation will increasingly require ‘transformation or fundamental change’ (IPCC 2012, p 1) and the first international research conference specifically on transformation in...
Table 2. Grey literature search and results—web repositories of selected international organisations.

| Organisation/repository | Time period | Search strategy | Relevant results |
|-------------------------|-------------|----------------|------------------|
| IPCC: Reports Repository | 2008–2019   | Hand-search of all listed reports | 5                |
| UNEP: Knowledge Repository | 2008–2019 | Hand-search of all accessible publications retrieved with the search string 'climate change adaptation' | 0                |
| UNFCCC—Documents and Decisions Repository | 2008–2019 | Hand-search of all accessible publications retrieved with the search strings 'transform adaptation', 'transform risk management' and 'transformation' | 1                |
| UNDRR: Global Assessment Reports | 2008–2019 | Hand-search of all listed reports | 2                |
| OECD: Publications on climate change | 2008–2019 | Hand-search of all listed publications | 3                |
| World Bank: Research and Publications | 2008–2019 | Hand-search of all accessible reports and working papers retrieved with the search string 'transform adaptation', 'transform risk management' and 'transformation' | 4                |

Records identified through database searches: n = 581
Additional records identified through other sources: n = 15

Records after duplicates removed: n = 389

Eligible records after title and abstract screening: n = 218

Eligible records after full-text screening for eligibility: n = 101

Records included in in-depth full-text review: n = 92

Records excluded by title and abstract: n = 171

Full-text articles excluded, with reasons: n = 117
- no explicit use of 'transformative adaptation' or similar concepts AND
- no definition/attributes of 'transformative adaptation' or similar concepts AND/OR
- no exemplary measures/processes outlined

Identification

Automated Screening

Eligibility

Data Extraction

Figure 1. Literature selection process, adapted from the preferred reporting items for systematic reviews and meta-analyses (PRISMA) flow diagram. Note: Adapted by permission from BMJ Publishing Group Limited. [The PRISMA Statement for Reporting Systematic Reviews and Meta-Analyses of Studies That Evaluate Healthcare Interventions: Explanation and Elaboration, Liberati et al (2009)].
a changing climate hosted by the University of Oslo and co-sponsored by the IPCC in 2013 parallel the mounting interest in the topic (University of Oslo 2013).

Figure 3 shows that most of the assessments were from the field of environmental science, followed by the social sciences as another recurring field. Records from economics and multidisciplinary assessments were substantially less represented. Within our honed list of disciplines the by far most popular search terms were ‘(transform* OR radical OR fundamental) W/30 ‘climate change adaptation’) with a total of 170 hits across the two databases, followed by ‘(transform* OR radical OR fundamental) W/30 ‘adapt* to climate change’ with 123 hits and ‘(transform* OR radical OR fundamental) W/30 ‘respon* to environment* change’ with 114 hits. Search strings that linked the adjectives transform* or radical or fundamental with climate or disaster risk management, disaster risk reduction or resilience were much less represented (see table 1). The lower representation of articles from the disaster risk management/reduction and resilience fields compared with climate change adaptation literature coincides with the attention given to transformative approaches within the respective field’s agenda-setting publications at the international level: while the IPCC since 2012 has paid increasing attention to the need and potential to link transformation with climate change adaptation, the 2015 and 2019 UNDRR Global Assessment Reports on Disaster Risk Reduction do not feature similar articulations.

3.1 Systematic search results—qualitative analysis

In this systematic review, we aimed at reviewing the diverse perspectives on transformative approaches and transformational change in the context of climate change adaptation and risk management across scientific and selected grey literature with view to discerning key attributes that help to better relate its different conceptions in a way that lends itself to consideration for in climate risk management projects, plans and policies.
At its core, ‘transformation’ and ‘transformative’ approaches to climate risk management and adaptation are understood to be about change but not congruent with change. Across the reviewed literature, authors share the view that in one way or another, transformation entails qualitative shifts towards a more resilient state (see e.g. Folke et al 2010, Pelling 2011, IPCC 2014, Pokrant 2016) and a more desirable future (see e.g. O’Brien 2012, Jakku et al 2016, Abeling et al 2018). Often, the change resulting from transformative approaches is perceived as inherently positive across much of the literature, and named key for achieving sustainable futures, along with prosperity and equity goals (see e.g. Folke et al 2010, Pelling 2011, Faldi and Macchi 2017, Bosomworth 2018). Some publications, however, are less prescriptive and do not go so far as to argue that positive outcomes are necessary for change to identify as transformational. Instead, this second strand acknowledges that potentially non-desirable directions or maladaptation may qualify as transformational change, too (see e.g. Marshall et al 2012, O’Brien 2012, Tröger 2016, Blythe et al 2018) and caution of the inherent uncertainties of change efforts (see e.g. Manuel-Navarrete and Pelling 2015).

Papers widely agree that transformative approaches in the context of adaptation and climate risk management can take place at systems of ‘any level, from the individual through to the collective, industry or region’ (Park et al 2012, p 199), as well as across multiple dimensions and contexts (see e.g. O’Brien 2012, Feola 2015). Examples of loci and settings where transformational change may occur may entail a whole society or functionally more delimited systems (see e.g. Feola 2015), and include governance regimes and power structures, group and network dynamics, ecological, agricultural, economic and social systems, livelihood schemes, as well as development paradigms, values and worldviews (O’Brien 2012). As a common denominator, these loci and settings share characterisations as complex, multi-tiered and dynamic, requiring change processes at scale (see e.g. Kates et al 2012, Feola 2015), although some papers, such as Nalau and Handmer (2015, p 355) caution ‘for a careful consideration of what exactly needs to be changed and how’.

In most papers, transformational change tends to be describe the depth of change (see e.g. Pelling et al 2015): large-scale, profound and deep-rooted (see e.g. Kates et al 2012, O’Brien 2012, IPCC 2014, Feola 2015, Nalau and Handmer 2015) changes that ‘fundamentally alter the entire system’ (Fedele et al 2019, p 116) in question and result in ‘changes that affect the socio, cultural, political and structural conditions’ (Fazey and Carmen et al 2018, p 37). Charged with reviewing and assessing the relevant literature, the IPCC (2018a, p 542) confirms this understanding with its definition of transformative adaptation as ‘adaptation that changes the fundamental attributes

| Table 3. Descriptive and analytical themes and relative importance in terms of number of papers. |
|---------------------------------|---------------------------------|
| Descriptive themes | Analytical themes |
| 33 | Anticipatory/long-term view |
| 19 | Innovative |
| 29 | Novel |
| 20 | Planned/directed/deliberate/strategic |
| 16 | Co-generation/co-production |
| 19 | Empowerment of marginalised, vulnerable groups |
| 14 | Reconfiguration of social networks and patterns of interaction |
| 42 | Inclusive, participatory processes |
| 12 | New institutional arrangements and regulatory frameworks |
| 49 | Shifts in power relations/governance structures |
| 40 | Learning and reflexive capacity oriented |
| 5 | Experimental Learning Process |
| 10 | Positive, normative futures |
| 30 | Equitable, just futures |
| 18 | Sustainable futures |
| 50 | Large-scale, fundamental, deep-rooted |
| 38 | Paradigm shifts (changes in behaviour, values, priorities, and norms) |
| 52 | System-wide |
| 47 | Addresses underlying vulnerabilities and root causes of risk |

For this, we extracted descriptive and analytical themes until saturation across the reviewed literature (Saunders et al 2018)—distinct features of transformative adaptation and similar concepts, which differ in relative importance, i.e. ratio of publications referring to a theme. In table 3, the descriptive and analytical themes established across the reviewed literature are depicted. Some of the themes stand out as comparatively more important than others, based on the number of references across the reviewed literature. In a next step, we moved to extracting conceptual strands (‘perspectives’) across the reviewed literature, as depicted in table 4. Many of the themes we identified are shared across the conceptual strands, with deep-rooted, fundamental change towards change of the system rather than change within the system stressed particularly often (see e.g. Park et al 2012, Armitage et al 2017, IPCC 2019).
of a socio-ecological system in anticipation of climate change and its impact.

Often, transformational change is listed at the higher end of a change aspect (see figure 4) that entails various phases along a continuum from incremental to transformational (see e.g. Rickards and Howden 2012, Jakku et al 2016, Termeer et al 2017), where the two ‘opposing’ ends of the spectrum can be differentiated by the ratio between continuity and change. For transformative approaches, the ratio between ratio of change and continuity would be low: ‘more of the system is changed than continued as is’ (Rickards and Howden 2012, p 242), while incremental approaches as the opposing end of the change spectrum would focus on maintaining a system’s essence, thus at the system level less is changed than is kept as it was and only small changes to existing practices are performed (see e.g. IPCC 2012, 2018a, Park et al 2012, Rickards and Howden 2012, Lauer and Eguavoen 2016, Young and Essex 2019).

Incremental change in such a dichotomy (see figure 4) thus would take place within the existing structures and objectives of a system as ‘homeostatic change’ that enables a system to ‘keep its identity while adjusting to changes within its environment’ (Manuel-Navarrete and Pelling 2015, p 560), whereas transformational change entails profound changes of the system, challenging its status quo (see e.g. Park et al 2012, Armitage et al 2017). Yet, given the often vastly different loci of change, the level of change that may qualify as ‘transformational’ nevertheless remains relative and contextual (see e.g. Rickards and Howden 2012, Termeer et al 2017). Some go so far as to caution that there is a need to go beyond the incremental-transformational change dichotomy (see e.g. Termeer et al 2017), as ‘in some cases, incremental adaptation can accrue to result in transformative adaptation’ (IPCC 2018a, p 542).

Building on the notion of system change as a key characteristic of transformative adaptation and risk management, many authors underpin that transformative approaches would go beyond addressing the proximate causes risk by addressing the underlying, social, cultural and economic root causes of risk (see e.g. Pelling 2011, O’Brien 2012, Tschakert et al

| Framing | Examples |
|---------|----------|
| Qualitative change | ‘Transformative adaptation: adaptation that involves transforming toward more sustainable and just futures by addressing the structures of development and overarching political–economy regimes that maintain our currently unsustainable and inequitable trajectories.’ (Bosomworth 2018) |
| System change | ‘Adaptation that changes the fundamental attributes of a social-ecological system in anticipation of climate change and … characterised by system-wide change or changes across more than one system, by a focus on the future and long-term change, or by a direct questioning of the effectiveness of existing systems, social injustices and power imbalances.’ (IPCC 2019, p 678) |
| Profound, large-scale change | ‘At least three classes of adaptations that we describe as transformational: those that are adopted at a much larger scale or intensity, those that are truly new to a particular region or resource system, and those that transform places and shift locations’ (Kates et al 2012, p 7156) |
| Spectrum of change | ‘“Transformative adaptation” as the more radical end of a spectrum of change that begins with incremental adaptation (…) and extends through systems adaptation (…), mapped against an increasing degree of climate change.’ (Rickards and Howden 2012, p 242) ‘Transformation, by definition, transcends incremental adaptation and requires new and novel interactions between the social and ecological subsystems.’ (Joyce et al 2013, p 522) |
| Focus on root causes | ‘Transformative adaptation emphasizes a need to shift our foci from proximate causes of vulnerabilities, risks, inequalities and unsustainability to their structural, sociopolitical root drivers’ (Bosomworth 2018) |
| Governance change | ‘Adaptation as transformation is composed of adaptive acts that consciously target reform in or replacement of the dominant political-cultural regime as primary or secondary goals’ (Pelling 2011, p 69) |
| Development pathways | ‘Fundamental change … to shift existing systems (and their component structures, institutions and actor positions) onto alternative development pathways, even before the limits of existing adaptation choices are met’ (Pelling et al 2015, p 114) |
| Paradigm change | ‘Transformation: A change in the fundamental attributes of a system, often based on altered paradigms, goals or values.’ (Bartlett and Satterthwaite 2016, p 18) |
| Resilience as transformation | ‘Resilience—when understood as concept to deal with changes in a transformative way towards a new (future) status of the system—including as core building stone its resourcefulness, including the capacity to learn and to progress’ (Abeling et al 2018, p 464) ‘… adaptive and transformative capacity as elements of resilience. The distinction between adaptation and transformation depends on the degree of change, with transformation becoming clearer when the system is fundamentally changed or dismantled to create a new system’ (Manyena et al 2019, p 6) |
| Novel and innovative adaptation | ‘Three levels of adaptation: (1) incremental—moderate changes are made to existing actions and behaviours; (2) systemic—changes are made at the system or structural level; (3) transformational—large scale, novel responses create a fundamentally new system or process’ (Dowd et al 2014, p 558) |
2013, Bahadur and Tanner 2014, Pelling et al 2015, Bosomworth 2018), taking the work into the social development sphere. Several authors qualify those adaptive measures as transformational that shift systems onto alternative development pathways towards socially just, equitable and sustainable development; even before existing adaptation options have been fully exhausted (see e.g. Bahadur and Tanner 2014, Pelling et al 2015).

Many papers refer to agency and power relations and explicitly note challenging and overstepping authorities and hierarchies towards a change in governance regimes, institutional arrangements, community dynamics and power structures, as appurtenant to transformative adaptation and risk management (see e.g. Bahadur and Tanner 2014, IPCC 2014, 2018b, Feola 2015, Manuel-Navarrete and Pelling 2015, Campos et al 2016, Fazey et al 2018, Magesa and Pauline 2019). This framing of transformational change as somewhat ‘rebellious’ is also ascertainable in several papers that note transformative approaches as challenging existing norms, values and world-views, resulting in a fundamental paradigm change process away from the status quo (see e.g. Pelling 2011, O’Brien 2012, O’Neill and Handmer 2012, Bartlett and Satterthwaite 2016, Magesa and Pauline 2019). However, some papers differentiate between transformative climate risk management and adaptation as a functionally or spatially more narrow change process and ‘societal transformation’ as one that encompasses radical societal redesign (see e.g. O’Brien and Barnett 2013, Feola 2015).

On the other hand, several publications approach the role of agency through a focus on capacity and social learning as drivers of transformational change (see e.g. Marshall et al 2012, Aall et al 2015, Manyena et al 2019, Morthen et al 2019, Mummery and Mummery 2019). Several stress long-term ‘triple-loop’ learning processes that involve ‘people, institutions and policies, and discourses’ (Aall et al 2015, p 405) with view to enabling fundamental change in the status quo (see e.g. O’Neill and Handmer 2012, Govind et al 2018, Manyena et al 2019, UNDRR 2019) as a key feature of transformative approaches. Matyas and Pelling (2015, p 12) add that in addition to behaviour changes linked to learning, learning ‘can be about excising unwanted dimensions, processes or attributes’.

Several papers also include novelty and innovation as a differentiator between incremental and transformative approaches (see e.g. Kates et al 2012, Park et al 2012, O’Brien et al 2013, Dowd et al 2014, Abeling et al 2018). Innovations and novel approaches can range from practical innovations such as innovative or new technological and management approaches to addressing risk and resilience challenges (see e.g. Gillard et al 2016), to political innovation, for example in the form of novel governance arrangements that enable participatory and inclusive visioning and decision-making (see e.g. Wamsler 2017, Ajibade and Egge 2019). For some, innovations may also involve changes in behaviour, values and worldviews (see e.g. Gillard et al 2016), while others highlight that innovations as an aspect of transformative approaches need to ‘produce significantly new patterns of viability’ (Fazey et al 2018, p 37) or ‘new and novel interactions between the social and ecological subsystems’ (Joyce et al 2013, p 522).

Much of the reviewed literature suggests that transformational change can result from both exogenous and endogenous processes (see e.g. Feola 2015). Many papers focus more on deliberate and actively initiated (see e.g. O’Brien 2012, O’Neill and Handmer 2012, Eriksen 2013, Fedele et al 2019) or forced (see e.g. Folke et al 2010) transformational change processes in adaptation and risk management efforts, with many underscoring a more anticipatory and long-term oriented vision as characteristic, noting that transformational change does not happen overnight and may occur in nonlinear ways (see e.g. Campos et al 2016, Dowd et al 2014, Noblet and Brisson 2017, Termier et al 2017, Thomalla et al 2018, World Bank 2019a). Others recognise that transformational change may also come about by chance as an unintended outcome of a process or event (see e.g.
In terms of drivers of change, Fazey et al. (2018, p 37) remind that ‘there are no magic bullets for working towards transformations, which are usually highly contested and counter cultural’ and curtailed by barriers linked to deep uncertainties, locked-in practices (e.g. land use and resource management) and societal features and opposition (see e.g. Kates et al. 2012, IPCC 2014, Tröger 2016, Mummery and Mummery 2019). Other hurdles may involve costs, trade-offs, as well as ‘hesitation within … agencies to expose structural inequalities, ethical limitations …, and often entrenched dependencies’ (Tschakert et al. 2016, p 184).

Several enablers of successful transformational change are listed across the literature, sometimes also referring to the organisational adaptation literature. Given the trade-offs involved in transformational change in the context of climate risk management and adaptation, societal readiness to initiate and accept change is often listed as an important success factor for transformational change processes along with the presence of incentives (see e.g. IPCC 2012, O’Brien 2012, Pelling et al. 2015, Morchain et al. 2019, Mummery and Mummery 2019). Other factors referred to across the literature include ‘applying practices that unleash human potential’ (Fazey et al. 2018, p 37) and creativity, learning capacities, regular monitoring and evaluation of progress towards change, but also strategic approaches that include short-term goals and low-regret anticipatory interventions and assess trade-offs and thresholds, visionary leadership and individual change champions, broad stakeholder engagement and collaboration in change coalitions, as well as sufficient access to resources and effective communication (see e.g. Moser and Ekstrom 2010, Kates et al. 2012, O’Brien 2012, Jakku et al. 2016, Wamsler 2017, World Bank 2019b).

When it comes to practical examples of transformative approaches to climate risk management and adaptation, however, the literature becomes much scarcer, with only few listing specific examples. Across the literature, relocation—both actual and planned—is most commonly cited as an example of transformative approaches to managing climate-related risks (see e.g. Kates et al. 2012, IPCC 2014, Thomalla et al. 2018, World Bank 2019a). Some papers also refer to specific processes, such as Oxfam’s Vulnerability and Risk Assessment methodology (Morchain et al. 2019) or the mainstreaming of climate risk management and adaptation (Wamsler 2017), as examples of transformative approaches, connoting its potential to foster more inclusive, development-centred approaches to climate risk management and adaptation. Others suggest that transformational approaches entail ‘a complete change in direction … [as for example] drought-resilient crops may be of no use if the site is not fit for’ (World Bank 2019a, p 18), changes in livelihood strategies following continued crop loss due to changing rain patterns or a shift to addressing the underlying drivers of risk, which in the case of flood risk could entail a shift from sea walls to a change in city planning and flood water management (IPCC 2018b). Several others caution that while linear measures may suggest major change (e.g. changes in regulatory frameworks), on their own they may not be able to unleash transformational change (Nalau and Handmer 2015), alluding to the complexities surrounding an identification of measures as transformative.
4. Discussion and conclusions

In this paper, we have systematically reviewed literature on transformational change and transformative approaches in the context of climate risk management and adaptation across academic and selected grey literature, focusing on work published in the decade since the publication of the Fourth IPCC Assessment Report (i.e. 2008–2019), expanded with a hand search of publications from select agenda-setting international organisations published in the same timeframe. Our review was driven by the ambition to arrive at an actionable conceptualisation of transformational change in the context of climate risk management and adaptation that accounts for a rapidly changing climate and compound risk.

We note that in the decade since the publication of the Fourth IPCC Assessment Report, there has been a rapid increase in the number of publications, contributing to a better understanding of the concept. While different perspectives on transformational change in the context of climate risk management and adaptation persist, that are not necessarily reducible to one another, certain areas of convergence are discernible amongst perspectives on transformational change in the context of climate risk management and adaptation. Figure 5 illustrates these areas of convergence, which we identify as common features of transformational change in the context of climate risk management and adaptation. It illustrates the transformational change spectrum that begins with incremental change and has transformational change at its upper end, the pathway to which involves transformative measures and action that focuses on deep-rooted, system-level change that addresses the root causes of risk with view to enabling more just and sustainable futures.

In terms of the focus of change, we discern from the literature that transformative approaches in the context of climate risk management and adaptation focus on addressing the underlying, social, cultural and economic root causes of risk (see e.g. Pelling 2011, O’Brien 2012, Tschakert et al 2013, Pelling et al 2015, Bosomworth 2018), including challenging existing power and governance structures, norms, values and world-views (see e.g. Pelling 2011, O’Brien 2012, O’Neill and Handmer 2012, Bartlett and Satterthwaite 2016, Magesa and Pauline 2019).

In line with the broad approach taken in many of the papers, where often some or a combination of several properties and criteria rather than a requirement for all to be met if featured (see e.g. Kates et al 2012, Garschagen et al 2018), we conclude that transformational change most commonly takes place at the system level as the loci of change (see e.g. Kates et al 2012, O’Brien 2012, Park et al 2012, Feola 2015, IPCC 2019)—from functionally more delimited systems such as a single community or industry to whole societies. Reflecting the focus on deliberate and actively initiated (see e.g. O’Brien 2012, O’Neill and Handmer 2012, Eriksen 2013, Fedele et al 2019) that may result from exogenous drivers, such as in reaction to shock events, including a breach of adaptation limits (e.g. Kates et al 2012, Marshall et al 2014, Mechler and Schinko 2016, Thomalla et al 2018), or endogenously, e.g. in anticipation of future climate-related developments and long-term oriented (see e.g. Dowd et al 2014, Campos et al 2016, Noblet and Brisson 2017, Terme et al 2017, Thomalla et al 2018), enabling more sustainable, equitable futures is often listed as the objective for change (see e.g. Folke et al 2016, Pelling 2011, Bahadur and Tanner 2014, Faldi and Macchi 2017, Bosomworth 2018).

We also conclude from the reviewed literature that for change to qualify as ‘transformational’ in the context of climate risk management and adaptation, it entails large-scale, profound and deep-rooted (see e.g. Kates et al 2012, O’Brien 2012, IPCC 2014, Feola 2015, Naulau and Handmer 2015) changes of the system, challenging its status quo (see e.g. Park et al 2012, Armitage et al 2017). To bring about such transformational change, transformative approaches to climate risk management and adaptation may draw on innovative and learning capacities, broad stakeholder engagement, regular monitoring and evaluation, and strategic leadership, amongst others (see e.g. Moser and Ekstrom 2010, Kates et al 2012, O’Brien 2012, Jakku et al 2016).

In terms of practical applications, our reading of the reviewed literature on transformational change and transformative approaches in the context of climate risk management and adaptation finds a clear ‘operationalisation gap’ in terms of translating transformational change ambitions into concrete transformative measures that can be directly replicated in practice, as cautioned previously by Feola (2015), Godfrey-Wood and Naess (2016) and Tschakert et al (2016), among others, and also illustrated by the comparatively small number of grey literature on the topic. While we do not necessarily view that as a handicap per se, further investigation in this regard would be useful to prevent a tokenistic use of the concept and instead enable policymakers and practitioners to deliver the radical change needed to achieve sustainable futures and build resilience in the face of intensifying climate change (Feola 2015, Few et al 2017, Fazey et al 2017).

Data availability statement

The data that support the findings of this study are available upon reasonable request from the authors.

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