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How global regimes diffuse in space – Explaining a missed transition in San Diego's water sector

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ABSTRACT

Socio-technical regimes are highly institutionalized rationalities that have co-evolved with actors, technologies and institutions over extended periods of time and become taken for granted across geographical contexts. Transition studies feature an extensive focus on regime dynamics within specific territorial contexts. However, we know surprisingly little of how regime rationalities are constructed, diffused and reproduced across space. This is a key gap in the geography of sustainability transitions literature. This paper introduces a conceptual model to analyze transformative opportunities in regions and how regime actors strategically diffuse and implement global regime solutions through combinations of discursive and substantive system reconfiguration activities. The empirical analysis draws upon a combination of Socio-Technical Configuration Analysis (STCA) of 354 newspaper articles and 10 in-depth expert interviews to illuminate how regime actors prevailed in diffusing and legitimizing the water sector's dominant socio-technical configuration in San Diego during a period of substantial transformative opportunities.

1. Introduction

Transition studies provide instrumental inputs to understanding the structural transformations of sectors. An emerging strand of literature is paying increasing attention to the spatial dimension of transitions, arguing that the preconditions for transformative change differ across urban, regional, or national contexts (Coenen et al., 2012; Coenen et al., 2015; Martin and Coenen, 2015). Research on the geography of sustainability transitions (GeoST) has also started to explore the multi-scalar properties of transition trajectories, highlighting how transitions depend on complex multi-scalar interactions between change dynamics at sub-national (territorial) and supra-national (sectoral) levels (Coenen et al., 2012; Binz et al., 2020; Miörner and Binz, 2021).

A core idea in transition studies is that socio-technical systems exhibit strong path dependencies and considerable stability over time (Kemp et al., 1998). This is attributed to the existence of socio-technical regimes (Kemp et al., 1998; Markard and Truffer, 2008; Smith et al., 2010), understood as a set of highly institutionalized rationalities that have co-evolved with actors, technologies and institutions over extended periods of time (Fuenfschilling and Truffer, 2014; Fuenfschilling, 2019). Recently, socio-technical regimes have been conceptualized as potentially global constructs (Fuenfschilling and Binz, 2018). While there has been an extensive focus on how regimes are maintained and destabilized within specific regions or countries (Geels et al., 2016; Turnheim and Geels, 2013;

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Duygan et al., 2021), we know surprisingly little about how regime rationalities are being constructed, diffused and reproduced across different geographical contexts and scales (Miörner and Binz, 2021; Bauer and Fuenfschilling, 2019).

This is a highly relevant shortcoming, since the spatial diffusion of regime solutions is arguably a key element in explaining why sustainability transitions happen in some places, while they fail in many others. Transition studies accordingly need deeper conceptual and empirical knowledge about the inner workings of global regimes and how regime actors manage to reproduce the status quo in ever-new contexts, despite strong niche- and/or landscape pressures. In this paper, we seek to fill this gap by investigating how regime actors manage to strategically diffuse and implement regime solutions in geographical contexts where the prevailing socio-technical system is under considerable pressure to transform. By combining insights from transition studies and economic geography, we identify three factors that shape the transformative potential in a given regional context: landscape pressure, failures of the incumbent regime solutions in solving a given problem, and pressure from niche dynamics. We then ask the question how, despite obvious problems and fundamental mismatch between the promise of regime solutions and local/regional preconditions, regime actors can still prevail in diffusing and legitimizing the sector's dominant socio-technical configuration?

In elaborating our conceptual approach, we draw inspiration from recent discursive and institutional approaches to transition studies (Fuenfschilling and Truffer, 2016; Rosenbloom et al., 2016; Fuenfschilling, 2019; Yuana et al., 2020; Heiberg et al., 2022; Simoens et al., 2022). By deploying a mixed methods approach combining socio-technical configuration analysis (STCA) (Heiberg et al., 2020; Heiberg et al., 2022) with expert interviews, we then conduct an in-depth case study of the diffusion of desalination technologies into the San Diego region in California, an emblematic case for regime actor's successful strategic agency in diffusing a global regime solution.

San Diego is a region with notorious water shortages that lead to continuous debates about how to direct urban water management in more sustainable directions (Williams, 2018a; Williams, 2018b). California at the same time hosts some of the most renowned actors in the water sector that are developing innovative solutions to recurring water crises (Hacker and Binz, 2021b; Sedlak, 2014). Yet, in the case of San Diego, the response to droughts was not a transformation of the urban water system, but rather a direct transposition of globally dominant regime solutions – i.e. the construction of a major seawater desalination plant. By drawing on a combination of secondary information, an analysis of 354 newspaper articles using STCA, and a qualitative analysis of 10 in-depth interviews, we investigate how regime actors appropriated the regional discourse during periods of transformative pressure, and subsequently diffused, reproduced and reinforced the global regime in the region. Our analysis reveals the mechanisms through which regional and extra-regional actors may strategically appropriate transformative pressure through a mix of discursive and substantive system reconfiguration activities. We conclude by discussing how a better understanding of how global regimes 'fend off' pressure to transform could be decisive for policy makers, niche actors and civil society when it comes to facilitating (local or regional) transition trajectories.

2. Conceptual framework

2.1. Global socio-technical regimes

One of the most fundamental features of socio-technical systems is their rigidity and long-term stability, which is typically attributed to the presence of socio-technical regimes that have stabilized into locked-in trajectories that are difficult to transform (Kemp et al., 1998; Markard and Truffer, 2008; Smith et al., 2010). Regimes promote incremental innovation and gradual adaptations of core technologies and institutions, rather than the development of radically novel solutions (Geels, 2002; Markard and Truffer, 2008). The stability of a socio-technical regime comes from the existence of highly institutionalised formal and informal rules that have co-evolved with technologies and actor networks over long periods of time, thus firmly establishing one (or several) dominating institutional rationalities (Fuenfschilling and Truffer, 2014; Thornton et al., 2012). In many sectors, regimes are semi-coherent, bringing together a diverse set of actors, institutions and technologies into different socio-technical configurations 'that work', and which compete with each other on how basic societal functions can best be provided (Kemp et al., 1998; Fuenfschilling and Truffer, 2014).

In the sectors typically analysed by transition studies, considerable differences exist when it comes to the sources and strengths of lock-ins and path dependence (Klitkou et al., 2015; Jain, 2020). Some lock-ins are more or less pervasive across different countries and regions, while others are more context-specific (Klitkou et al., 2015). Considerable variation also exists in the strength and prevalence of lock-ins between sectors (Miörner et al., 2021; Markard, 2011). In sectors like water, energy, or waste management, regime structures across the world are centred around a surprisingly narrow set of technologies and guiding rationalities (Fuenfschilling and Binz, 2018; Miörner et al., 2021). In order to explain this mimetic isomorphism, scholars have started to conceptualize regimes as multi-scalar or even global constructs. 'Global regimes' have been defined as "the dominant institutional rationality in a socio-technical system, which depicts a structural pattern between actors, institutions and technologies that has reached validity beyond specific territorial contexts, and which is diffused through internationalized networks." (Fuenfschilling and Binz, 2018: 739). The institutional rationalities that have become dominant in a global sector is continuously diffused and reproduced through institutionalisation and re-scaling processes taking place in various regions around the world (Miörner and Binz, 2021), giving rise to local routines, practices, technologies and standards which reflect the dominant global regime rationalities.

However, little is known about the dynamic interplay between global (sectoral) and territorially embedded (national, regional, urban, etc.) transition dynamics, and in particular how the activities of regime actors may lead to the enactment and reproduction of global regime rationalities in particular regional contexts (Miörner and Binz, 2021). In order to understand the potential for transformative change, it is therefore crucial to better understand the sources of isomorphism stemming from global regimes and how they

entrench prevailing socio-technical systems in ever new regions (Fuenfschilling and Binz, 2018). In the remainder, we will employ a regional focus, as most relevant conceptual approaches in economic geography assess transition trajectories through this scalar lens, but discuss multi-scalar interactions wherever they are relevant.

2.2. Regional transformative potentials

When it comes to factors influencing regional regime dynamics, we begin with the premise that regions differ in their generic transformative potentials (Miörner, 2020). Some regions are characterised by socio-technical systems with extremely stable trajectories and an absence of transformation pressure. In other cases, there might be significant pressure on regime actors to defend, adapt or transform their internal structures and proposed solutions. In this paper, we will analyse the regional variation of transformative pressures by directing attention to a set of different time- and place-specific factors that shape niche- and regime-dynamics alike.

It is well established in the literature that certain periods offer particularly beneficial conditions for engaging in transition processes, due to temporary weakened regime influence and/or strong exogenous landscape pressures (Storper and Walker, 1989; Boschma, 1997; Van Den Bergh, 2013; Geels and Schot, 2007). In regions with stable socio-technical system trajectories, agency fending off transformative solutions (such as local niche development or the importation of novel ideas from outside the region) are likely most prevalent (Jolly et al., 2020). In regions under some degree of transformative pressure, however, actors may turn to types of agency that promote system reconfiguration. Those activities will typically lead to open contestation and framing struggles that are captured in public, policy and media discourses (Yuana et al., 2020). Nevertheless, public contestation in and of itself will not necessarily lead to transitions. Regional transformative potentials have to be acted upon to be realised (Fuenfschilling, 2019; Rosenbloom et al., 2016). While transition studies have focused primarily on how niche actors act upon such opportunities, we here zoom in on how regime actors may navigate transformative pressures to their advantage.

Based on insights from transition studies and economic geography, we identify three broad factors that shape the transformative potential in a given regional context. The analysis must arguably not be limited to regional factors and conditions, as the regional context for transitions is shaped by multi-scalar dynamics and the region's position in supra-regional, or even global, regime and niche or innovation system structures (Sengers and Raven, 2015; Binz et al., 2016b; Fuenfschilling and Binz, 2018; Miörner and Binz, 2021). First, transformative potentials may originate from (sometimes sudden) shifts in exogenous landscape pressures that challenge and de-stabilize established regime configurations. The 'landscape' is typically conceptualized as a cultural, economic, environmental and political 'backdrop' that sustains societal structures (Geels and Schot, 2007). Changes in slowly evolving landscape features (e.g. climate change), socio-economic development trajectories (e.g. long waves of industrial change), or sudden, exogenous shocks (e.g. natural disasters, wars, economic shocks) can open windows of opportunity for destabilizing regimes and institutionalizing radically novel socio-technical configurations (Turnheim and Geels, 2013). Translated to regional contexts, changes in the landscape might induce controversial discourses that weaken the institutionalization of regime solutions vis-à-vis alternative socio-technical configurations.

Second, the (apparent) inability of regime solutions to solve particular regional issues may be a more endogenous source of transformative potential. Highly context-specific issues may be induce experimentation and the development of technologies and values that radically diverge from established regime solutions (Carvalho et al., 2012; Dewald and Truffer, 2012; Loorbach et al., 2017). In some regions, there are prevalent issues related to particular geophysical, cultural, economic or social context conditions, which cannot easily be accommodated by conventional regime technologies. For example, studies have demonstrated the inability of the current global sanitation paradigm, built around centralized sewage systems, to meet the demands for sanitation in quickly growing megacities (Maurer, 2009; Larsen et al., 2021; Hoffmann et al., 2020). Such 'regime failures' may increase the political awareness and will to explore radically different approaches, with regional discourses opening up for alternative narratives and storylines (Späth and Rohracher, 2010; Yuana et al., 2020).

Third, niche dynamics are a well-documented source of transformative pressure in transition studies (Kemp et al., 1998; Geels, 2002; Geels and Raven, 2006). The development of viable alternatives to regime configurations which promise more sustainable ways of providing societal functions, may facilitate regional transition trajectories. Niche alternatives can emerge as a result of regional change agency by local firms, policy makers, and grassroots movements (Smith et al., 2016), who actively shape regional discourses and introduce new narratives and storylines focusing on regional characteristics and perceived issues (Späth and Rohracher, 2010; Kanda et al., 2020; Kivimaa et al., 2019). On the other hand, niche configurations may also develop in other regions and exert transformation pressure through legitimizing narratives that are diffused across (possibly distant) locations (Heiberg et al., 2020).

It is beyond the scope of this paper to assess the relative importance of the different factors, and we do not posit a linear relationship between the prevalence of the sources of transformative potential in Table 1 and the 'strength' of the transformative pressure being put on the existing socio-technical system. However, we argue that when several of these pressures coalesce in a region and actors act upon the resulting transformative potentials, critical discursive moments may occur. Such moments have been defined in previous studies as "a particular time and place where dominant discourses are questioned and consequentially dislocated or 'unhinged', which, potentially, allows for the shift to a new order of discourse" (Yuana et al., 2020:157). In order to exploit the transformative potential in a region, actors must successfully reinterpret the meaning of incumbent regime configurations, re-shape legitimate behaviour and develop new storylines and narratives around alternative socio-technical configurations. Critical discursive moments are thus periods, in which both regime 'proponents' and 'opponents' try to shape the regional discourse and engage in reconfiguration activities geared at either reproducing the status quo or legitimizing transformations.

Table 1
Factors shaping regional transformation potential.

Source of transformative potential	Description	Potential effects on regional discursive dynamics
Landscape pressures	Shifts in landscape pressures due to environmental or socio-economic changes and/or events	Give rise to competing interpretations of events and responses, which might lead to major discursive shifts
Regime failures	The apparent inability of regime solutions to solve regional issues	Open up the discourse for alternative technologies and storylines built around regional issues & solutions
Niche dynamics	Pressure from transformative alternatives to existing regime configurations, developed within our outside the region	Facilitate the emergence of regional discourses favouring alternative solutions

Source: own table.

2.3. A discursive approach to global regime dynamics

Previous work in transition studies has laid the groundwork to the discursive approach to regime dynamics employed in this paper (Geels and Verhees, 2011; Teschner and Paavola, 2013; Smith et al., 2014; Rosenbloom et al., 2016; Yuana et al., 2020; Heiberg et al., 2022). Particular attention has been given to discursive dynamics (Simoens et al., 2022), in terms of the emergence, substitution and disappearance, of narratives that legitimize or de-legitimize certain socio-technical configurations through the development of 'storylines' (Rosenbloom et al., 2016). A storyline is a collection of statements used to summarize a broader narrative and in discussions between actors (Hajer, 2006). A storyline serves as a condensed abstraction of reality that can be used by actors to understand, and give meaning to, complex socio-economic processes (Rosenbloom et al., 2016). Storylines are made up of different elements that support a common understanding of a phenomenon, including metaphors, ideological propositions, and opinions, but also scientific facts, statistics and depictions of real-world events (Stone, 1997; Wood and Kroger, 2000). These elements are enacted by actors with the purpose of communicating a coherent pattern, forming the storyline as a whole (Rosenbloom et al., 2016).

In many cases, dominant storylines are intimately associated with groups of actors who share similar perceptions of current configurations and future development trajectories in a socio-technical system. These can be referred to as 'advocacy coalitions' (Hajer, 1993; Sabatier, 1988; Markard et al., 2021) and play a major role in both the emergence of new storylines and the reproduction of existing ones. Studies have zoomed in on the development of alternative storylines by niche actors (Raven et al., 2016), the interaction between niche and regime storylines in competing advocacy coalitions (Markard et al., 2021), or how regional actors absorb and translate international storylines and use them to facilitate structural change in their region (Späth and Rohracher, 2010; Späth and Rohracher, 2012; Heiberg et al., 2020). However, the focus of transition studies has been primarily on niche-regime dynamics (Rosenbloom et al., 2016; Markard et al., 2016) and how niche configurations get legitimized by adapting storylines to fit with prevailing regimes (fit-and-conform) or to trigger change in existing selection environments (stretch-and-transform) (Smith and Raven, 2012).

The existence of a global regime in a sector does not imply that the storylines advocated by regime actors remain constant over time or that they are homogenous across places. We rather argue that the enactment of global regime rationalities is subject to considerable spatial variation and adaptation to local context conditions. Regime actors usually go to great lengths when it comes to adapting their storylines and agency to specific spatio-temporal contexts (Mackinnon et al., 2021). Spatially differentiated discursive dynamics, which still align with the global regime, may thus be an important source of isomorphism. Inevitably, regime actors will have to make concessions when there is strong regional opposition against particular regime solutions, or when the region features (experiments with) one or several alternative socio-technical configurations. Moreover, the translation of global regime rationalities into regional contexts will in most cases not be a one-to-one transposition, but include adaptations or even 'copymistakes' that may become nuclei for radical innovation and change (Fuenfschilling and Binz, 2018).

2.4. Strategic agency by regime actors

Transition studies have a long tradition of analyzing regime actors' efforts in resisting change (Geels, 2014; Kungl and Geels, 2018; Trencher et al., 2019) and how they actively fend off transformative pressures stemming from the agency of niche actors (Fischer and Newig, 2016; Foxon et al., 2010). We argue that when actors identify and act upon regional transformative potentials, they put pressure on opponents to correspondingly adapt their storylines, exploit opportunities for transformation, and/or contend old trajectories. For regime actors, transformative pressure may thus serve as both a challenge, in terms of pressure put on prevailing regime trajectories, but also an opportunity to further entrench and reify the very same. Their agency is contingent not only on internal resources and intentions, but conditioned by regional factors and conditions (Grillitsch and Sotarauta, 2020).

For the purpose of this paper, we distinguish between two types of regime agency. First, regime actors may engage in institutional work that defends the dominant socio-technical configuration through 'discursive' activities in the public arena. The goal of such activities is to create a system environment which selectively reinforces regime configurations, potentially at the expense of emerging alternatives (c.f. 'system selectivity' in Miörner, 2020). Regime actors will thus be involved in "discussing, promoting, framing, theorizing, refuting, legalizing, banning or challenging perceived problems and potential solutions" (Fuenfschilling, 2019: 23). The focus of regime actors' discursive system reconfiguration activities is not limited to niche-regime contestation, but may target fundamental aspects of the regional discourse, such as basic problem definitions, legitimate actions, and future goals and visions (see also Grillitsch et al., 2019).

Second, regime actors may target the more 'substantive' reconfiguration of elements in the socio-technical system, for example by mobilizing support from selected (political) actors, and identifying and exploiting opportunities for implementing novel technologies. Substantive system reconfiguration activities in this paper thus refer to deliberate activities that identify and utilize resources in order to shape the trajectory of the regional socio-technical system outside any clearly delimited discursive arena. These activities typically target the creation and removal of system elements (such as regulations, technologies, policies, supporting infrastructure, funding, etc.) by deploying internal resources or by mobilizing others to do so. Examples include lobbying activities targeting regulatory change and the creation of regional support infrastructures such as training programs for technical staff, making arrangements for land deals and securing other physical and immaterial resources, mobilizing local businesses and experts through traded and untraded interdependencies, and establishing relationships with regional advocacy organizations (e.g. unions, environmental groups, business communities).

This analytical distinction enables us to establish a link between a discursive approach to regime dynamics, concerned primarily with analyzing socio-technical regimes through the lens of discourses and the discursive strategies of key actors (e.g. legitimation, framing, and sense-making activities in the public arena) (Fuenfschilling and Truffer, 2016; Rosenbloom et al., 2016; Fuenfschilling, 2019; Yuana et al., 2020; Heiberg et al., 2022; Simoens et al., 2022), and approaches found in innovation system perspectives, which emphasize the active build-up and reconfiguration of system structures (e.g. system building, system-level agency, system resource formation, etc.) (Musiolik et al., 2012; Binz et al., 2016b; Musiolik et al., 2020; Hoogstraaten et al., 2020; Trippl et al., 2020).

2.5. *Conceptual framework: global regime diffusion*

Based on the above elaborations, we perceive the global regime as holding a template for a socio-technical configuration that regime actors seek to advance across spatial contexts (Fuenfschilling and Binz, 2018). When entering a new context, global regime rationalities are exposed to regional 'flavors' of problem framings and actor constellations, which may be under more or less pressure to transform due to landscape pressures, regime failures and/or niche dynamics (cf. Fig. 1). Depending on the content of regional discourses, certain rationalities and technologies may be selected, reified or renounced, leading to outcomes in the region that may or may not align with the global regime rationality.

We accordingly propose to study global regime diffusion processes by zooming in on regime actors' discursive and substantive system reconfiguration activities. Discursive dynamics are place-specific, so regime actors are expected to strongly adapt their storylines to the regional discourse, while at the same trying to shape it to their advantage. They typically embed themselves in the discourse by capturing the dominant (media or expert) narratives and try to construct new storylines that invalidate any critiques of their preferred solutions and disempower regional advocacy coalitions that propose alternative solutions. Substantive system reconfiguration activities, in turn, target the reconfiguration of more tangible elements in the regional socio-technical system with the ambition of reproducing global regime templates.

Studying how global regime rationalities are diffused and adapted to regional context conditions through coupled discursive and substantive interventions is thus key for understanding the isomorphic process that translates path dependence emanating from the global regime into regions. At the same time, our model also provides an explanation for the source of spatial variation when it comes to concrete manifestations of global regime rationalities in different regional contexts, as the inherent inability of regime actors to

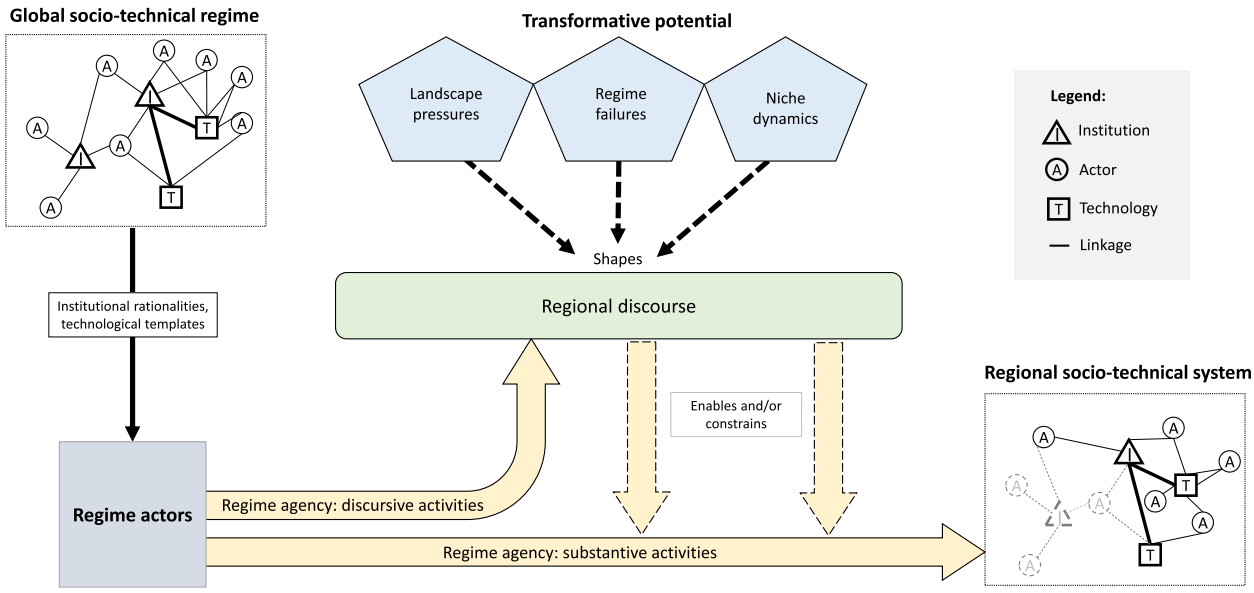

Fig. 1. Global-regional regime dynamics. Through discursive and substantive system reconfiguration activities, regime actors seek to reproduce global regime templates in a regional context. Source: own figure.

completely circumvent or shape the prevailing regional discourse may prevent them from reproducing a full 'carbon copy' of the global regime configuration.

3. Case introduction and methods: desalination in San Diego

In the remainder, we will illustrate and validate our framework with a case study of regime diffusion in the urban water sector of the San Diego region in California. The water sector is typically characterised by a stable and globalized socio-technical regime (Fuenfschilling and Truffer, 2014; Miörner and Binz, 2021), which has demonstrated a high resistance to transformation (Espeland, 1998; Molle et al., 2009; Fuenfschilling and Truffer, 2016). The sector's dominant regime configuration promotes centralized large-scale technical infrastructure with the overarching goals of providing water security, reliability and national welfare. Alternative rationalities, such as environmental sustainability and economic efficiency, and more small-scale, modular or nature-based solutions have only emerged more recently and are less deeply institutionalized globally (Fuenfschilling and Truffer, 2014; Fuenfschilling and Truffer, 2016; Heiberg et al., 2022).

Seawater desalination (hereby referred to simply as desalination) refers to the removal of mineral content from saline seawater in order to produce potable water. Desalination can be categorised as a regime solution in the water sector, since it is perfectly compatible with conventional, centralized, supply-side water technologies and drawing on established 'hydraulic' and 'market-based' regime logics (Fuenfschilling and Truffer, 2016). The technology has also been characterized as a technology-driven 'quick fix' to water scarcity (Fragkou and McEvoy, 2016; March et al., 2014; McEvoy, 2014) and is often associated with territorial contestations over dwindling water supplies (Swyngedouw and Williams, 2016). The technology has increasingly developed into a one-size-fits-all solution to water scarcity in coastal areas and while plants may differ in terms of their organizational set-ups and financing arrangements, they are often nearly identical when it comes to process design, technology and operational protocols (Williams, 2018a; Williams, 2018b).

Alternatives to desalination include both supply- and demand-oriented solutions. Centralized, large-scale wastewater recycling typically relies on similar technology, but may come with a smaller ecological footprint than desalination (Kjellén, 2018). It refers to the various ways in which wastewater can be recycled for direct or indirect potable reuse, or for agricultural purposes (EPA, 2017). Centralized wastewater recycling is most often aligned to the same regime rationality as desalination, representing a supply-side fix, where recycled water is more or less directly fed into existing large-scale water supply systems, and is developed by private technology companies together with local water agencies.

The potentially most transformative configurations in the water sector are those that contradict the taken-for-granted focus on supply-side, large, centralized infrastructures. They comprise nature-based solutions, variegated on-site, small-scale, modular, or non-grid solutions that treat and reuse wastewater directly inside buildings, as well as water conservation, which is based on behavioural changes on the 'demand-side' (such as using local plants in gardens, using water-saving showers or toilets, refraining from filling swimming pools, etc.). Such 'water-sensitive' (Wong and Brown, 2009) or 'soft-path' (Gleick, 2003) solutions often follow a holistic perspective on environmental and social sustainability, are based on a community logic and are incentivised through public policies and broad civil society engagement (Fuenfschilling and Truffer, 2014).

3.1. Case sampling and methodology

Our empirical case study focuses on the diffusion of desalination technologies into the San Diego region and was selected based on a theoretical sampling rationale (Siggelkow, 2007), where the analysis of an 'extreme' case (Flyvbjerg, 2006) is used to shed light on issues of theoretical interest (Yin, 2013). The desalination project in Carlsbad (a coastal city close to San Diego) has been labelled as the potentially most contested desalination facility in the history of the water industry (Williams, 2018b). California is also well known for high levels of grassroots engagement around environmental issues and the nearby San Francisco Bay Area is a global power house for transformative innovation in the water sector (Hess, 2014; Stokes and Breetz, 2018; Hacker and Binz, 2021b). The San Diego region also suffers from recurring droughts and its water system was subjected to recurring regime failures. As we will outline in more detail later (cf. Section 4), the region held considerable transformative potential in the early 2000s. This notwithstanding, as our analysis will show, regime actors entering the region managed to navigate and capture the discourse during critical moments and to diffuse a solution that perfectly aligns with the prevailing global regime rationality. This case study thus promises unique insights into how the global regime travels across spatial contexts and how regime actors may exploit critical moments even in regions with relatively strong transformative pressures.

To analyse the relevant discursive and substantive system reconfiguration activities underpinning global regime diffusion, we focus on a 15 year period leading up to the construction and start-up of the Carlsbad plant in 2015. We deploy a mixed methods approach that combines STCA (Heiberg et al., 2022; Heiberg and Truffer, 2021) with qualitative expert interviews. STCA is a novel semi-qualitative methodology developed for the analysis of socio-technical reconfiguration dynamics based on textual data. It is rooted in discourse network analysis (DNA) (Leifeld, 2009; Leifeld, 2013), which has recently also been applied to study transition dynamics (Leifeld and Haunss, 2012; Brugger and Henry, 2021; Markard et al., 2021). In contrast to conventional DNA, our interest here is on the storylines that emerged around different technologies and associated institutional rationalities, reflecting key actors' discursive

Table 2
Coded storylines.

Storyline	Description	Relationship with global regime	Prevalence in the discourse
Legitimizing desalination	Positive statements about desalination technology and its implementation in San Diego.	In line with global regime rationalities	High
De-legitimizing desalination	Negative statements about desalination technology and its implementation in San Diego.	No inherent relationship (depends on alternatives advocated)	High
Legitimizing wastewater recycling	Positive statements about large-scale wastewater recycling.	In line with global regime rationalities	High
De-legitimizing wastewater recycling	Negative statements about large-scale wastewater recycling.	No inherent relationship (depends on alternatives advocated)	Very low
Legitimizing conservation	Positive statements about conservation as a response to water issues.	Breaking with global regime rationalities	Medium
De-legitimizing conservation	Negative statements about conservation as a response to water issues.	No inherent relationship (depends on alternatives advocated)	Non-existent
Legitimizing on-site solutions	Positive statements about on-site water solutions (e.g. on-site sanitation, water reuse).	Breaking with global regime rationalities	Very low
De-legitimizing on-site solutions	Negative statements about on-site water solutions (e.g. on-site sanitation, water reuse).	No inherent relationship (depends on alternatives advocated)	Non-existent

Source: own table.

engagement with different socio-technical configurations.

We constructed a dataset of newspaper articles mentioning desalination or wastewater recycling in the San Diego region. Newspaper articles were accessed through the online repository NexisUni. Articles were selected through a search strategy based on a simple search string[1]. This broad search string was chosen in order to identify all discursive activities relating to desalination as well as conventional and on-site wastewater recycling technologies. The rationale was to capture actors' associations with legitimizing or de-legitimizing storylines around desalination, as well as around alternatives discussed most prominently in California, which are large-scale wastewater recycling, small-scale/onsite water reuse, and water conservation (Binz et al., 2016a; Harris-Lovett and Sedlak, 2015). We then filtered our search results to only include content referring to the region of San Diego (CA) using geographical metadata available at the document level. The resulting list of articles were from different, primarily local, newspapers which allowed for triangulation between outlets with different political standpoints. This step was followed by a manual in-depth screening of the resulting list of newspaper articles, with the main author reading every article and removing the ones that had no relevance for the case[2]. This resulted in a set of 354 articles that constituted the basis for the STCA. The analysis then aimed to trace transformative potentials and regional discourse dynamics as they unfolded throughout three distinct periods (see Section 4).

This analysis of discursive dynamics was combined with information from 10 semi-structured expert interviews. This step aimed at providing contextual explanations for the shifts observed between phases of development, additional insights with regards to transformative potentials, and to map (behind-the-scenes) substantive system reconfiguration activities by regime actors that are typically not covered in newspaper articles. This step was further complemented by triangulating with the quite extensive secondary (grey) literature concerned with the history of desalination in the San Diego region (see Section 3.3 and Appendix 1).

3.2. Socio-technical configuration analysis (STCA)

The application of STCA in this paper involves a two-mode network analysis of the advocacy coalitions that emerged around legitimizing and de-legitimizing storylines related to desalination technologies. The first mode are actors that use specific storylines in newspapers, and the second mode are key arguments and rationalities they use in their statements. We anticipated six storylines which we deduced from the literature on the Carlsbad case and the wider literature on water technology discourses in California, namely a 'legitimizing' and 'de-legitimizing' storyline respectively around desalination, large-scale wastewater reuse, and onsite water reuse technologies (Binz et al., 2016a; Hacker and Binz, 2021a). Two additional storylines were classified inductively after test-coding an initial sample of the database, namely a legitimizing and a de-legitimizing storyline around water conservation efforts (see Table 2 for a list of all coded storylines). Fig. 2 exemplifies how we moved from coding statements in Nvivo to deriving two-mode networks of actors and storylines for further analysis in R and visualization in Visone software (Baur, 2008).

These two-mode networks were consequently projected into one-mode actor congruence networks, revealing advocacy coalitions around specific storylines (Leifeld, 2013). In actor congruence networks, two actors are connected if they have used the same storyline during a specific period. Thus, their linkage is based on ideational congruence. To ensure that individual actors who repeatedly use the same storylines in different newspaper articles do not inflate congruence among actors, we remove duplicate codes within each period,

[1] The search strings used were "desalination" and "water AND recycling OR reuse" respectively.

[2] First, we reviewed the newspaper outlets to ensure a basic editorial quality of the articles included in the dataset. Second, as a result of the broad search string, some articles had no relevance for the case. For example, the search string captured articles that discussed potential water contamination at a material recycling plant, captured by "water AND recycling". These articles were removed from the dataset.

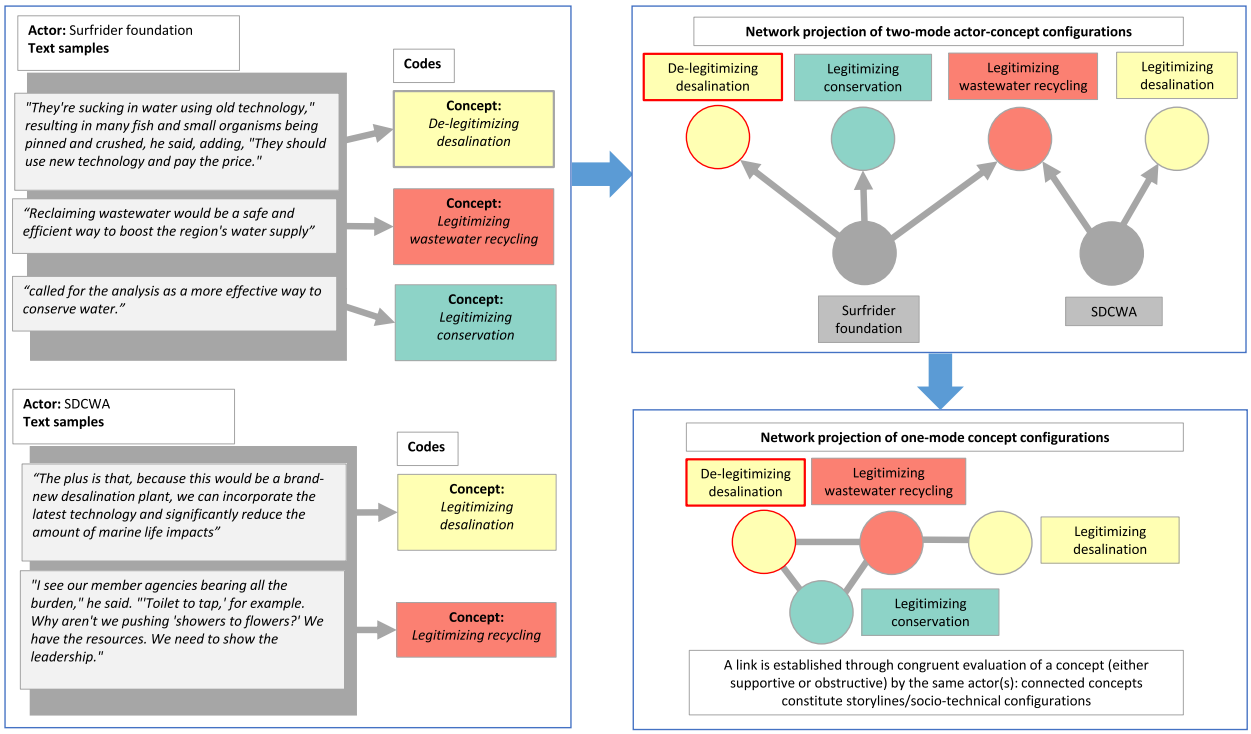

Fig. 2. STCA coding and network projections. Source: own figure.

by counting any actor-storyline association only once per period investigated. The resulting networks are unweighted, meaning any link carries the weight of 1. Hence, in the actor-networks, actors are linked if they share at least one storyline. In the network visualizations, we deploy a stress-minization layout algorithm (Brandes and Pich, 2009) to make clusters of actors easily detectable visually. We further follow a recent example by Markard et al., (2021) and color all linkages that reflect congruence based on a unique storyline, facilitating the visual identification of advocacy coalition clusters. Eventually, we calculated the network density, which is defined by the share of all possible links that are actually present in the graph vs. the theoretically possible maximum number of links (Wasserman and Faust, 1994). Network density here indicates the coherence (relatively high density) or conflictuality (relatively low density) of the overall discourse during different time periods.

3.3. Interviews and qualitative content analysis

In order to zoom in on the non-discursive strategic agency (substantive system reconfiguration activities), we complemented the STCA with 10 semi-structured in-depth interviews, which lasted between 45 and 90 minutes and were conducted during January-August 2021, using video conferencing software. Based on the STCA results, we identified the actors that were involved in the most important discursive shifts and selected them for a first set of interviews. These interviews allowed us to analyse the substantive activities that could provide additional explanations to the observed discursive shifts. Additional interview partners were identified through snowball sampling (Valentine, 2005) (see Appendix 2 for an anonymised list of interviewees).

We coded the material based on an inductive coding scheme, identifying substantive system reconfiguration activities and outcomes for each of the three development phases. This also served to identify the division and distinct characteristics of three phases in our analysis. We then re-coded the material by using categories established in the STCA. This allowed us to link strategic agency identified in the first step, to the storylines revealed by the STCA.

4. Results: how the global urban water regime was reproduced in the San Diego region

The state of California is regularly struck by droughts and the San Diego region is particularly vulnerable to supply shortages. The San Diego region has no groundwater aquifers and has historically relied on ‘water imports’ as the primary source of water. At the beginning of the 1990s, 95% of water used in San Diego was imported from the Colorado River and northern California, through agreements between San Diego County Water Authority (SDCWA) and the Metropolitan Water Districts (MWD), a regional wholesaler of water for Southern California. In 1991, when local water agencies, after five years of drought, had started to exhaust local supplies and demanded increased water imports, the MWD was forced to cut deliveries by a third (SDCWA, 2021). At this point, the region’s over-reliance on a single water source (MWD imports) was revealed as a key regime failure, which put pressure on regional water providers to find ways for tapping into new water sources. In 1999, initial plans for combating water scarcity with a large-scale,

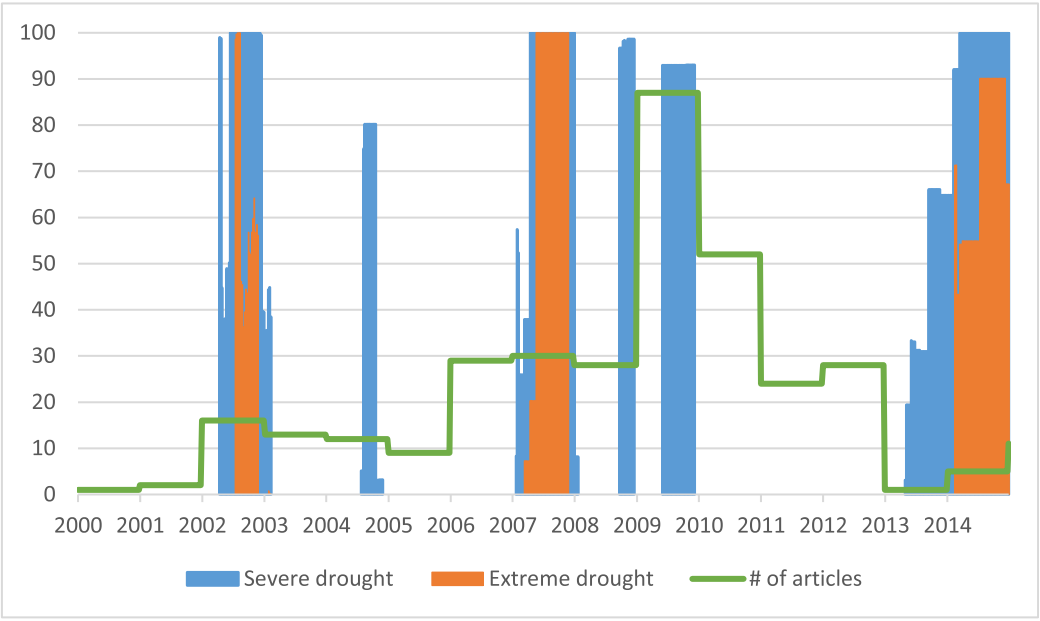

Fig. 3. Drought conditions in San Diego County 2000-2015 and number of newspaper articles in the dataset (per year). Drought values indicate the percent of area falling under the U.S. Drought Monitor Categories for severe and extreme drought respectively. Source: own graph based on data from National Drought Mitigation Center (2021) and our newspaper article dataset.

centralized water recycling plant failed spectacularly in an outcry of organized public opposition (Binz et al., 2016a). Water transfers and centralized recycling thus both showed clear limitations when it came to addressing regional water issues.

In the remainder, we focus on three periods before (2000-2007), during (2008-2010) and after (2011-2015) a subsequent statewide drought which led to a proclamation of emergency in California and to significant public attention on water related issues. This gave rise to a 'critical discursive moment' with intense debates in regional media outlets (Fig. 3).

During 2000-2010, landscape pressures from recurring droughts combined with broadly discussed regime failures, triggered regional actors to explore alternative water sources. This caused intense public contestation between different actors and a general sense of urgency around exploring additional water supply options such as desalination, wastewater recycling, as well as efforts to conserve and save water. In addition, even though regional niches were largely absent, niche dynamics playing out in other parts of the state of California added to the transformative pressure in the San Diego region. Other cities like San Francisco started experimenting with onsite non-potable water reuse schemes and major think tanks and environmental activists strongly promoted 'soft-path' solutions focused on nature-based solutions and water conservation measures (Hacker and Binz, 2021b; Gleick, 2003). Some key change

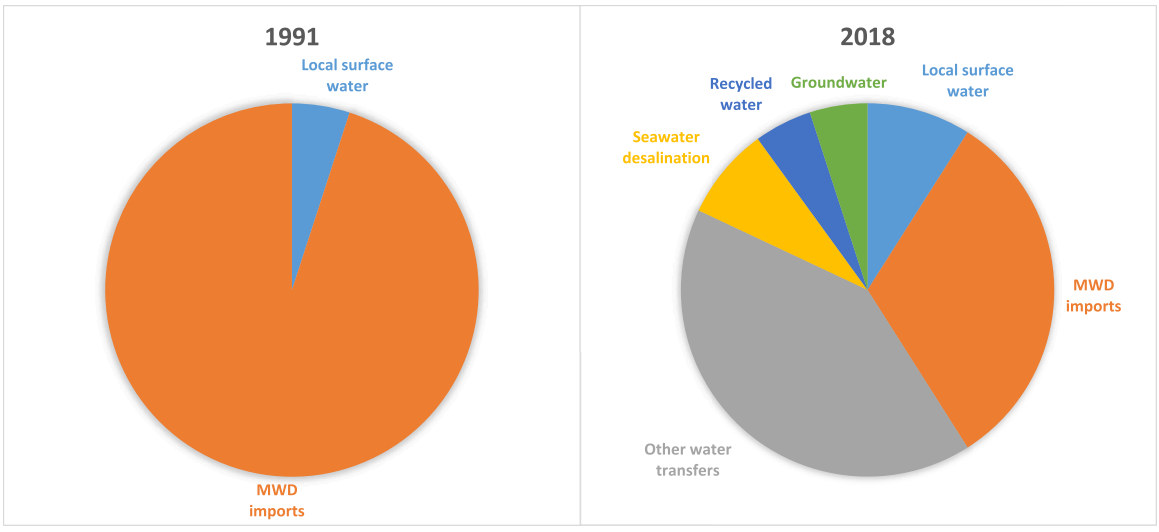

Fig. 4. Water sources in San Diego. Source: adapted from SDCWA (2021).

agents like the Pacific Institute were also very active in the San Diego region in this early phase and major water agencies in California coined a new concept called 'One Water', which encouraged utilities to develop an integrative, broad portfolio of water sources, including conventional and more 'soft-path' solutions (Luthy et al., 2020).

In the period between 2011 and 2015, landscape pressures faded somewhat, as the region entered a short period with relatively favourable water supply conditions. The supply diversification strategy of regional water agencies also started to bear fruit (Fig. 4), with new sources being added to the regional 'water portfolio', thus slightly reducing overall transformative pressures. One core element of this diversification strategy was the construction of a large-scale desalination plant in the city of Carlsbad, a city approximately 50 km north of San Diego.

After 2015, when the region was hit by another severe drought, there was still no trace of an imminent transition in the region. On the contrary, we will argue that the introduction of desalination (and later centralized water recycling) in the region further entrenched the prevailing global regime logic, which locked out any other, potentially more transformative solutions.

4.1. The Carlsbad desalination project

Plans for building the Carlsbad desalination plant concretised at the beginning of the 2000s, when an external firm, Poseidon Water (a Stamford-based[3] desalination project developer) entered the region. The company initially teamed up with local entities, most notably the City of Carlsbad, the City of Oceanside and SDCWA, who had previously explored the possibility of building regional or local desalination plants (Williams, 2018a). Poseidon entered the region with the idea of constructing a series of desalination plants co-located with existing power plants along the Californian coast. Drawing on previous experience from a desalination project in Tampa Bay during the 1990s, the company signed contracts with a large number of coastal power plants in Southern California, securing exclusive access to their pre-existing water intake and outfall infrastructures (Williams, 2018a). Their ambitious plans immediately triggered intense and organized opposition by environmentalists and other advocacy groups, who highlighted complex environmental issues with desalination. Parts of this regional resistance included public campaigning activities, and parts were concerned with legal appeals and litigations. In total, at least 14 appeals and litigations were brought against the project, making it one of the most contested in the history of desalination (Williams, 2018b).

At the height of intensity in the public discourse, during the drought period of 2008-2010, it became increasingly obvious that the attempts by environmentalists and other desalination opponents to stop the Carlsbad plant would not prevail. The two most important permits, the discharge permit issued by the Regional Water Quality Control Board and the coastal development permit issued by the California Coastal Commission, were both approved in 2009. In 2010, the SDCWA signed a water purchasing agreement with Poseidon, essentially giving them green light to start construction. Much of the contestation taking place in the permitting arena was thus fading, and discussions about desalination and the Carlsbad plant significantly calmed down and shifted to financial aspects, followed by a general decline in local media coverage after 2013 (Fig. 3). Regional change agents subsequently shifted their efforts away from contending desalination toward promoting alternatives to desalination, in particular large-scale wastewater recycling.

Overall, the developments in San Diego in the period from 2000 to 2015 illustrate that significant transformation pressures existed in the region, in terms of landscape pressures, regime failures and niche dynamics emanating from other places in California. Yet, the regional transformation potential was not captured by local change agents, but by regime actors who successfully navigated contested regional discourses and strategically incorporated a new regime technology that further entrenched the global regime in the region. In the next section, we will explain this outcome by tracing the interlinked discursive and substantive system reconfiguration dynamics throughout three development phases.

4.2. Regime diffusion dynamics

4.2.1. Phase 1 - Contestation: competing actor coalitions for and against desalination (2000–2007)

The results of the STCA (Fig. 5) reveal that an immediate reaction to Poseidon's plans was the formation of an opposing actor coalition that framed a storyline actively de-legitimizing desalination. The regional discourse in this first phase was split into two opposing camps, with one side (Poseidon and a selection of local water agencies) framing the idea positively, and the other (mostly environmental NGOs) mobilizing concepts that emphasized the negative aspects of desalination, such as being *harmful to the marine environment*, links to *negative aspects of (economic) growth* and being an *expensive and unaffordable* alternative to other (albeit largely unspecified) solutions. An actor coalition dominated by environmental NGOs such as local chapters of Sierra Club and the Surfrider Foundation, championed this anti-desalination storyline, but also other actors like the Coastal Commission, an important regulatory body, highlighted issues with the Carlsbad project in this early phase.

On the supportive side, we identify two broad storylines which are both strongly aligned with prevailing regime rationalities favouring large-scale water infrastructure. One storyline was legitimizing desalination, framing it as a *cost-effective* and *environmentally*

[3] Poseidon Water has since moved their headquarters from Stamford (CA) to Boston (MA).

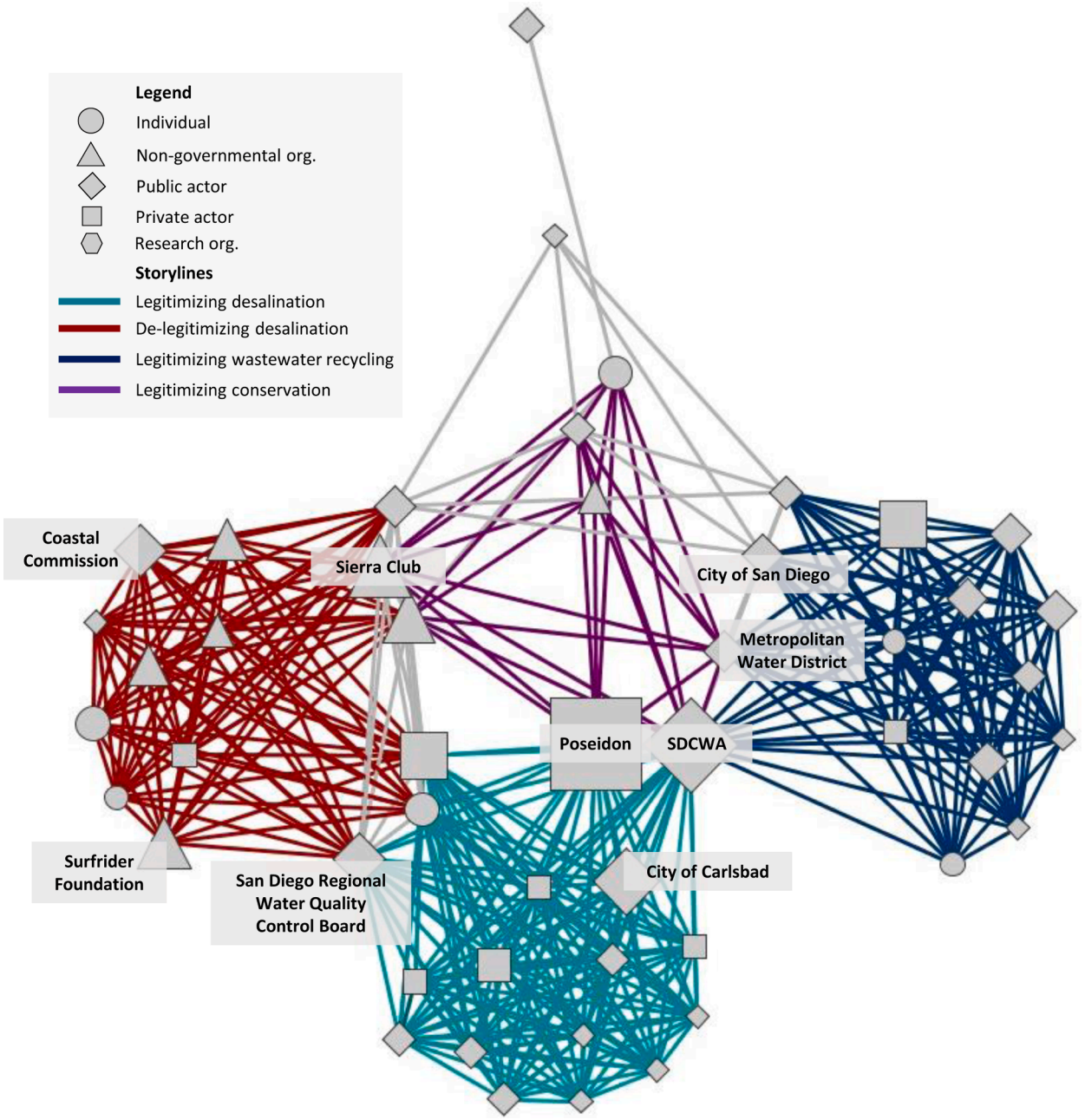

Fig. 5. Actor-network for 2000-2007. Size of nodes indicate the number of text fragments coded per actor (salience in discourse). Source: own figure.

friendly solution, while another one was concerned with legitimizing large-scale wastewater recycling by framing it as a way to *free-up drinking water* and as *environmentally friendly*. While there were occasional arguments raised against wastewater recycling by desalination proponents, we do not observe strong contestation between these two storylines. Arguments related to on-site water reuse or other 'soft-path' solutions were in turn virtually absent from the discourse. Both desalination proponents and advocates of wastewater recycling were occasionally positively framing water conservation, but this appears as a rather marginal feature in the overall discourse.

The main advocates of regime storylines in the period of 2000-2007 were public actors, primarily water agencies, who typically favoured either desalination or centralized wastewater recycling. The strong contestation of desalination in this first phase at the same time hints to a need for regime actors to engage in strategic agency to improve this solution's legitimacy. The main actors legitimizing desalination included Poseidon, who were indiscriminately positive towards desalination, the City of Carlsbad, and a select number of local water agencies. During this first period, actor-links between the two regime-compatible storylines were limited primarily to SDCWA who framed wastewater recycling and desalination as complementary alternatives. Our interviews reveal that while SDCWA was positive toward desalination, they were ambivalent with regards to specific aspects of the Carlsbad project. The interviews with SDCWA make it clear that in this early phase, they were satisfied with the outcomes of their own, and Poseidon's, environmental reviews. However, the agency was concerned about the financial risks of the particular project:

> "[…] there were a lot of discussions about the cost of the project, the terms of the contract, how water was going to be paid for, what the risk transfer provisions were, what risks we were taking on…" (Interview 6)

This factor combined with organized local opposition ultimately led SDCWA to withdraw from negotiations with Poseidon in 2005. Our interviews stress how remarkable it was that Poseidon continued to pursue the Carlsbad project even after the initial failure to secure a water purchasing agreement with SDCWA. From the mid-2000s on, Poseidon took the whole development risk, including the risk of failure with regards to permitting and securing contracts with public agencies that were supposed to buy the desalinated water. This situation pushed Poseidon to also engage in more substantive system reconfiguration activities. One strategy that was highlighted by several interviewees was that Poseidon strategically hired regional and international consultants. Reportedly, Poseidon hired "*just about everybody*" (Interview 8, also 3, 4, 7) for various roles in the project planning phase. This included, for example, consultants for doing feasibility studies, environmental impact assessments and technology reviews. Interviews with desalination opponents reveal that they had issues when they tried to mobilize experts for activities intended to challenge the issuance of permits through litigations and appeals. One went so far as to say that:

> *"We had a really hard time finding experts that hadn't already signed a contract to do something with Poseidon, even very small little projects included […] non-disclosure provisions, and they were prohibited from working with us*" (Interview 5)

This strategy had an indirect, albeit strong, impact on subsequent opportunity spaces for regional change agency. Above all, it became a crucial advantage for Poseidon when it came to subsequent lobbying and advocacy activities targeting local water agencies. Two interviewees, one opponent and one proponent of the Carlsbad project, both expressed that Poseidon managed to secure political support for their project with rather limited efforts, by targeting local politicians who were not used to corporate attention. For example, a representative of an environmental NGO, stated that:

> *"[…] these water agencies are small enough, so they're fairly easy to capture. I mean, you can capture them through a couple of election cycles with very limited money put into those elections. […] You weren't going to overcome that political foundation*." (Interview 5)

4.2.2. Phase 2 – Obfuscation of the discourse and strategic lobbying (2008-2010)

The outcomes of the above discursive and substantive system reconfiguration activities are exposed in the actor network of the subsequent period, which represents the height of public debates at the most decisive moment in the process (Fig. 6).

With Poseidon successfully capturing local water agencies, local opposition groups losing crucial litigation processes and water agencies in California increasingly promoting a 'water portfolio' approach, the discourse in this phase got increasingly obfuscated as many actors no longer adhered to only one or two, but sometimes three or even four storylines in parallel. This obfuscation is visible in Fig. 6 but is also reflected in higher density measures of the overall network in the second period[4].

In this second phase, key actors, such as SDCWA, the City of Carlsbad and a number of local water agencies increasingly engaged in an, in their own words, more "balanced" discussion of pro's and con's with different water supply options. This is reflected in their central network position in Fig. 6, at the interface of different storylines. In addition, a number of local water agencies now changed their position, being simultaneously positive and negative to desalination and/or positive to wastewater recycling. The storyline legitimizing conservation moved to the fringes of the discourse and we also see that environmental NGO's are no longer exclusively interested in de-legitimizing desalination. For example, the Surfrider Foundation and San Diego Coastkeeper now form a bridge between the storyline legitimizing centralized recycling and de-legitimizing desalination.

[4] Network density is an indicator of overall coherence/obfuscation of the regional discourse and a higher density value indicates an increase in discourse obfuscation. This value increased from 0,33 to 0,43 between phase 1 and 2, and decreased to 0,32 in phase 3.

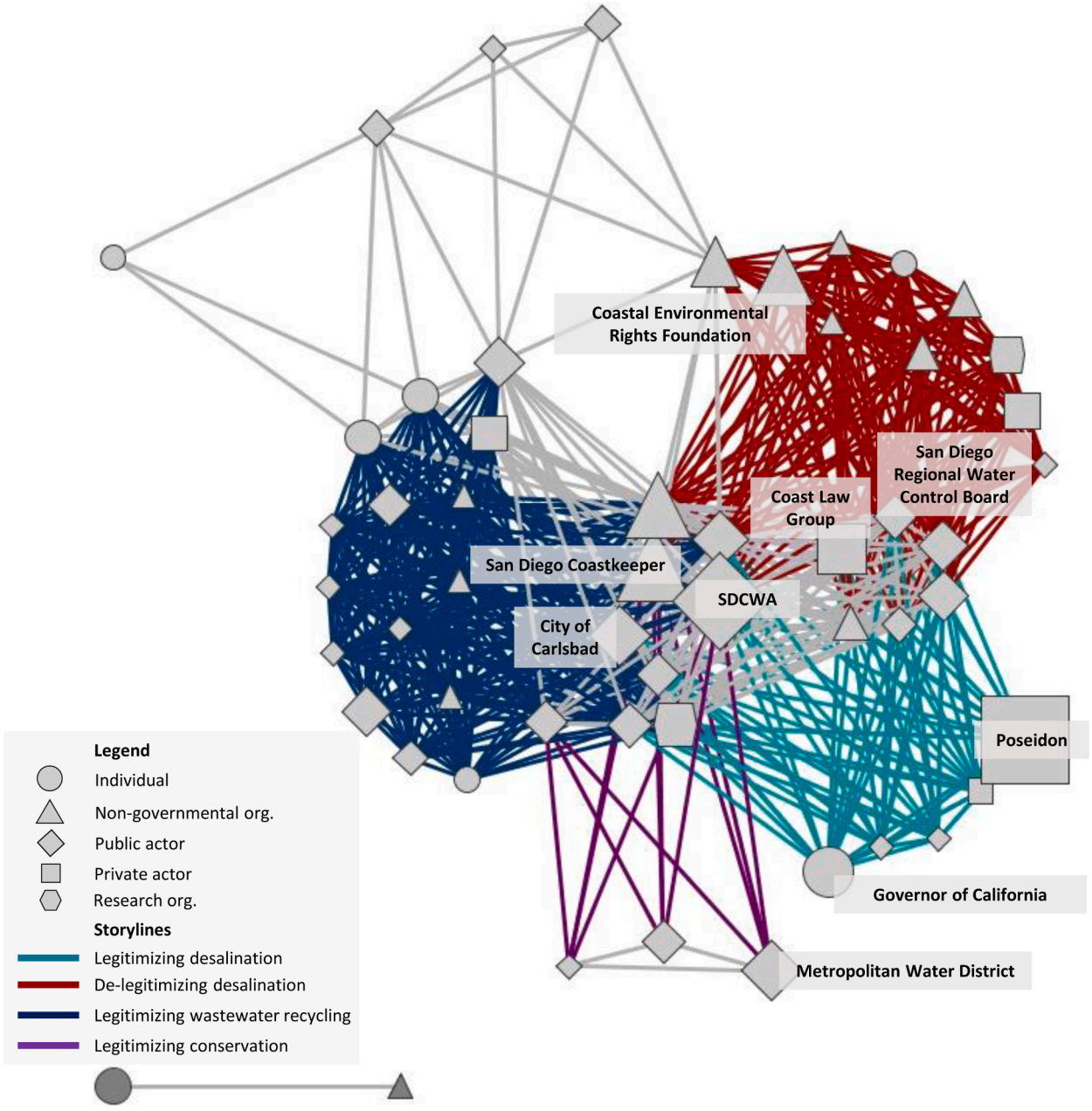

Fig. 6. Actor network for 2008-2010. Size of nodes indicate the number of text fragments coded per actor (salience in discourse). Source: own figure.

To support this obfuscation of the previously highly polarized discourse, desalination proponents continued to push the idea that the region was in a *water supply crisis*, which required a move beyond "standard" solutions. Further, they argued – in line with other Californian water agencies – that the *diversification of water supply* should be a core strategy for dealing with the ongoing drought crisis. These concepts stood somewhat uncontested in the discourse, and were eventually repeated by both desalination proponents and opponents. In essence, regime actors brought forward "irrefutable" problem definitions by framing the ongoing drought as first and foremost a *water supply crisis*. The storyline legitimizing desalination was consequently built around the core idea that desalination is a *cost-effective solution to secure future water supplies*. This was combined with direct counter-arguments to the objections raised in the anti-desalination storyline, framing desalination as *environmentally friendly* and *energy efficient*.

Our interviews reveal details about substantive system reconfiguration activities that accompanied (and were enabled by) this obfuscation of the discourse. For example, demand forecasting performed by consultants, hired by Poseidon and local water agencies, was an important mechanism for pushing supply-oriented perspectives and the need of developing a broadened regional water portfolio. Actors de-legitimizing desalination in the first phase were consequently pushed to adopt a position which acknowledged that landscape pressures and regional regime failures essentially related to a *supply problem*, which could only be solved through a diversification of water sources. This had an immense effect on the discursive strategies of desalination opponents throughout the remaining periods. Fig. 6 shows the close alignment that now emerged between the anti-desalination storyline and the storyline legitimizing wastewater recycling; from being largely disconnected in the first period, desalination opponents increasingly embraced large-scale wastewater recycling as their go-to alternative.

Several interviewees highlighted the inability of regional change agents to push back on the overall problem definition as a key factor for why large-scale wastewater recycling became closely linked to the storyline de-legitimizing desalination. One interviewee from an environmental NGO stated that:

> "*Well, we would have preferred smaller, more local scale [solutions] to avoid moving water such long distances. But when they were proposing these larger recycling plants in the city of San Diego, it was like, 'that's better than not doing it at all.' So we supported that.*" (Interview 8)

When posed with framing of *desalination as the future of water supply*, desalination opponents now brought up the *financial risks* and high costs associated with desalination and juxtaposed the costs of desalination with the *affordability of (large-scale) wastewater recycling*. This also served desalination proponents well, as the core of the discourse increasingly revolved around desalination vis-à-vis other regime solutions, rather than the core issues with desalination per se or the introduction of alternative solutions building on radically different, demand-focused rationalities.

The obfuscation of the regional discourse also proved supportive for Poseidon in pushing the Carlsbad project forward through substantive system reconfiguration activities. For example, they engaged in lobbying activities targeting key actors ranging from local unions to high-level politicians. Interviews with former employees of Poseidon, representatives of an environmental NGO, and a former representative of a local water agency, all detailed how Poseidon managed to capture the political power of the local construction workers union through strategic lobbying efforts. Furthermore, some of our interviewees indicated that even the governor of California was pushed into supporting desalination by substantial behind-the-scene lobbying efforts.

Another form of substantive system reconfiguration activities was supporting regulators in the permitting process. Our interviews highlight how Poseidon produced executive reports of technical studies performed by public actors throughout the permitting process. They also offered to fund staff hours so that regulators had the necessary resources to process the information provided to them by the company. One consultant working with Poseidon at the time expressed that:

> "*We [Poseidon] realized that not only do we have to produce the technical information, we have to digest it for them, because they really just don't have the depth or time […] to do it. And Poseidon in some cases said, 'Well, tell us how much staff time you need, and we will fund it for you.*'" (Interview 7)

By the end of this development phase, Poseidon had secured the necessary permits for the project. SDCWA thus decided to resume negotiations about a water purchasing agreement. They did so after having explored opportunities to develop a desalination plant on their own, which proved impossible due to the monopoly-like conditions that Poseidon had created through a series of exclusive co-location contracts with coastal power plants (Interview 6).

4.2.3. Phase 3 – Entrenchment (2011-2015)

Once the decision to construct the Carlsbad project had been taken, the STCA shows an increasing entrenchment of regime solutions, combined with a strong decline of contested discursive activities. Looking at the network in Fig. 7, a major difference to prior phases is that the number of actors concerned with legitimizing desalination is substantially reduced, indicating that the affair lost salience in public discourse. A few select actors were still very active in the discourse, primarily Poseidon and SDCWA, and focused their framings on financial and societal aspects. For example, to counteract further organized opposition, desalination was framed as *financially viable* and as such *not posing financial risks for society*. Individual politicians also became increasingly involved in the coalition legitimizing desalination, discussing financial aspects as well as positively framing the *possibility of future desalination plants*.

Actors de-legitimizing desalination continued retracting their position from the front of contestation and further blended with the water recycling storyline. Through interviews, we find that opponents of desalination had become concerned with their public image and started to focus their efforts on presenting *viable solutions* to the (now established) water supply problem, rather than pursuing a more radical change agenda:

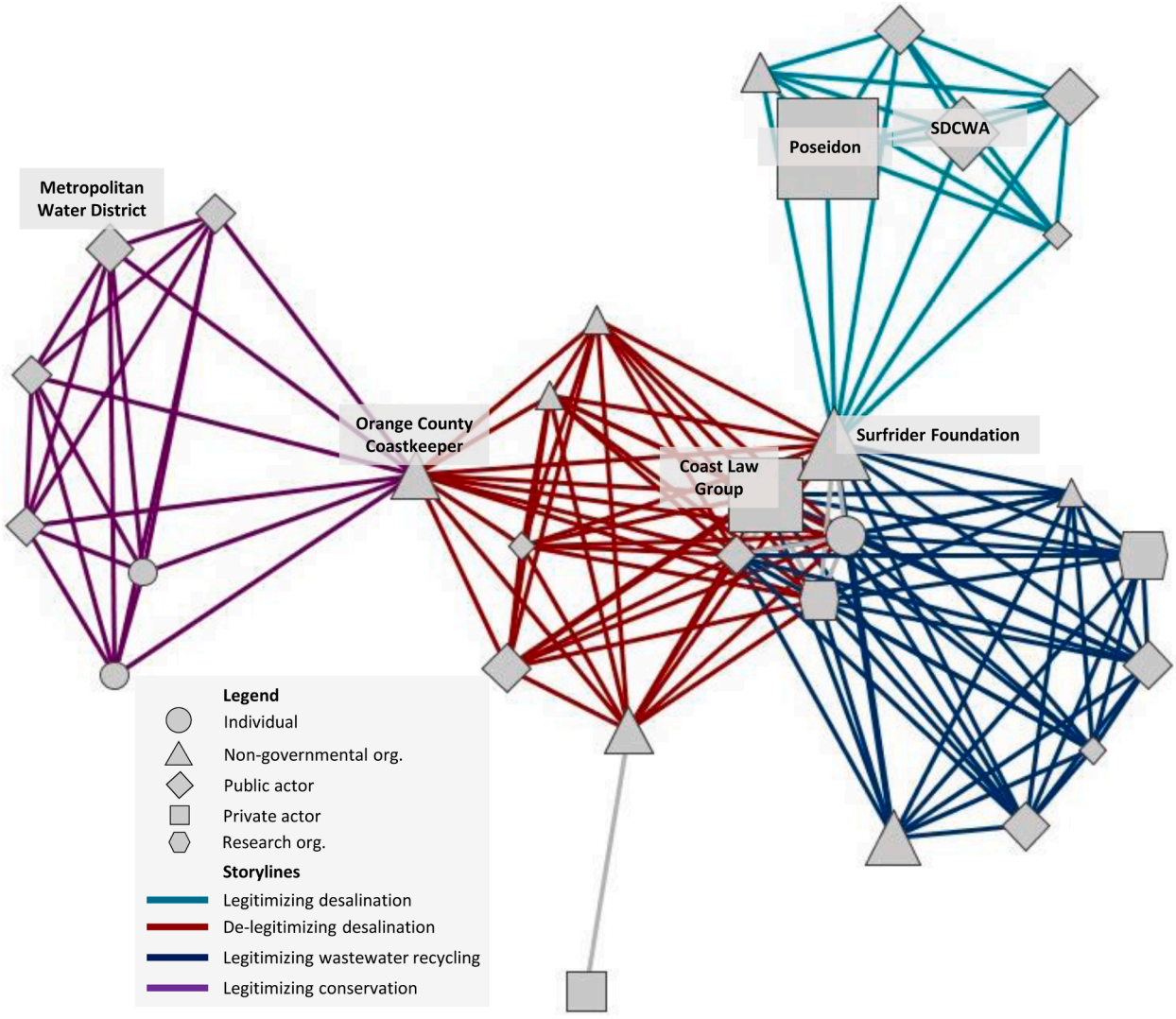

Fig. 7. Actor network for 2011-2015. Size of nodes indicate the number of text fragments coded per actor (salience in discourse). Source: own figure.

> "*I think there's a lot of pressure to be 'reasonable' [...] and not just be opponents of everything. There's a lot of groups that just oppose everything. I think [opponents of desalination] are trying to come across as reasonable.*" (Interview 4)

The advocacy coalition opposing desalination thus continued framing centralized water recycling as a *viable alternative to desalination,* with its core actors (the Surfrider Foundation and Coast Law Group), moving to the interface between the storylines legitimizing wastewater recycling and de-legitimizing desalination. Desalination opponents seem to have embraced large-scale wastewater recycling as 'the' alternative to desalination and critique against desalination has been converted into arguments for water recycling, with the construction of desalination plants increasingly taken as a matter-of-fact.

Conservation, in turn, moved from being scattered around the discourse in the first period, to be reduced to 'wishful thinking' during the second period, to a more salient fringe discourse in the third phase. Our results indicate that conservation is now being seen again as a viable 'third way' (or complement) to supply-oriented regime solutions. The conservation storyline is also associated with a dedicated advocacy coalition, consisting mainly of local water authorities that have successfully implemented conservation programs and use these as illustrative examples in the regional discourse.

Overall, at the end of this last phase, regime actors seem to have managed to capture and reframe the regional discourse in a way that it 'closed' out potential transition trajectories. For example, in relation to the potential of on-site recycling, one desalination opponent expressed that they were unable to shape the regional discourse in a way that more radical trajectories became conceivable:

> "*[on-site water recycling] wasn't on the table. […] Opportunities to support something like that never really came up. And still haven't.*" (Interview 8)

Regime actors had thus successfully narrowed down the regional discourse to reinforce established regime trajectories at the expense of the legitimacy of more transformative solutions. Despite landscape pressures, regime failures and niche dynamics in neighbouring places, the story of the San Diego region is thus not one of a structural transformation, but one of regime actors exploiting transformative opportunities to further entrench the global regime rationality locally. Poseidon as an external regime actor (with the support of local water agencies) successfully navigated and influenced the regional discourse in a way that resulting water issues were framed as essentially a problem of water supply, which can be solved through diversifying the regional portfolio of centralized water solutions. With desalination being successfully institutionalized as a key water diversification route, the directionality of the regional water system got locked-in to dominant global regime solutions for decades to come.

5. Conclusions

In this paper, we set out to investigate how (global) regime rationalities are diffused and reproduced across geographical contexts. We identified factors that shape the transformative potential in a given region and asked the question of how actors may strategically diffuse and implement regime solutions through combinations of discursive and substantive system reconfiguration activities.

Our findings show that in the diffusion process of desalination into the San Diego region, regime actors focused their discursive system reconfiguration activities on pushing storylines that could be agreed upon by a large number of regional actors, which obfuscated the clear boundaries between regime-compatible and transformative socio-technical configurations and their guiding rationalities. From being centered on the axis of 'for or against' desalination during the early period of our analysis, the regional discourse came to revolve around creating a 'portfolio' of different technologies with the same guiding rationality (desalination and large-scale wastewater recycling) with no advocacy coalition bringing forward transformative alternatives (e.g. on-site water reuse or water conservation). These discursive activities were complemented by substantive activities targeting a direct reconfiguration of socio-technical system elements in the region, through for example lobbying efforts, strategic deployment of consultants, political work and ultimately the construction of the Carlsbad desalination plant. Our findings thus illustrate how substantive system reconfiguration activities co-evolve with regional discursive dynamics, and that change agents cannot go directly against the prevailing regional discourse.

Our study is among the first ones to explore the spatial diffusion of global regime dynamics and the mechanisms through which global regime solutions are replicated even in regional contexts that feature considerable transformative potentials. This continuous diffusion of regime rationalities into ever new regional contexts can be seen as a form of 'regime resistance' that has largely been neglected in transition studies. Correspondingly, 'shielding' a region from global regime pressures may be an important policy strategy that has been overlooked in the literature. The spatialized regime perspective and methodological approach brought forward in this paper thus comes with several opportunities to improve our understanding of regime reproduction in space, which might inform policy makers and transition scholars alike and lead to highly promising avenues for future research.

First, our results confirm recent studies (Geels, 2014; Fuenfschilling and Truffer, 2016; Markard et al., 2021) in demonstrating that transformative pressures may serve not only the interests of change agents, but also of regime actors, which can exploit them for further reifying global regime logics. Future studies could be designed to illuminate under which conditions transformative potentials can be exploited by niche or regime actors, respectively, and zoom in on the potential discursive contestation that may emerge when, in contrast to the case in this paper, one or several niche experiments exist in the focal region. We expect the existence of regional niche experiments that have already been institutionalized to a certain degree to be a key limiting factor for the ability for regime actors to exploit transformative potentials. The case of the Bay Area may provide an interesting counterfactual example here. This region started experimenting with transformative system alternatives (on-site water reuse) already in the mid-2000s, and indeed induced a transition trajectory that looks very different from the on in the San Diego region (Hacker and Binz, 2021a). Elucidating how cultural preconditions (apart from the presence of regional niches) influence transition trajectories would be another highly interesting avenue of future research here.

Second, our case study vividly exposes how potential change agents may be steered towards solutions that are in line with the prevailing global regime. This type of, predominantly discursive, 'niche capture' by regime actors may be a key explanation for why radical departures from established regime trajectories fail to materialize despite transformative pressures. Regional change agents may get driven to react to regime actors' diffusion strategies by aligning with solutions that appear intuitively transformative, such as centralized large-scale wastewater recycling, but which actually reify the underlying regime logics in the long term, making truly transformative change even harder to achieve. Future studies should be concerned with finding ways to disentangle emerging socio-technical configurations inherent transformative, or 'conservative', potentials.

Third, we have contributed to an ongoing epistemological and methodological shift in transition studies, which is employing a new generation of semi-quantitative methodologies for tracking socio-technical reconfiguration dynamics in space and time (Rosenbloom et al., 2016; Yuana et al., 2020; Heiberg et al., 2020; Heiberg and Truffer, 2021). The STCA method applied here represents a key contribution to the institutional (Fuenfschilling, 2019) and discursive (Rosenbloom et al., 2016; Simoens et al., 2022) turns in transition studies, as it offers a more standardized and replicable approach for tracing transition dynamics in general, and regime diffusion in particular. The specific combination of STCA and qualitative expert interviews was employed for the first time here and proved very effective for exploring the interface of discursive dynamics with substantive forms of system reconfiguration. This approach also opens for a configurational perspective on agency in transition studies, which could be further substantiated by systematically cross-comparing cases set in different geographical and sectoral contexts. Ultimately, this approach could lead to new ways of theorizing ideal-type transition trajectories and their key enabling factors.

Last but not least, due to the nature of a single case study, we do not claim statistical generalizability for our results, but rather

maintain that the presented framework and methodological approach are analytically generalizable to other studies. The case of desalination in the San Diego region was selected as an extreme case to study regime diffusion in a context with particularly strong transformation pressures. Future studies will have to test the results' replicability in other regional contexts with weaker/different transformative pressures. Furthermore, the water sector arguably features a particularly strong global regime with a strong impetus for regime diffusion across geographic contexts (see Miörner et al., 2021). Future research should accordingly study regime dynamics also in other sectors, which are characterised by weaker/different global regime configurations. If applied properly, our approach could inspire a very generative research agenda on the spatial dynamics around regime reproduction and diffusion.

Declaration of Competing Interest

The authors have no conflict of interests to declare.

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Appendix

Tables A1 and A2

Table A1
Summary of data sources.

Type	Description	Number
Newspaper articles – STCA	Newspaper articles coded and analysed with STCA	354 articles
Newspaper articles – qualitative content analysis	Newspaper articles analysed qualitatively and used for developing case narrative and triangulation	~20 articles
Interviews	Interviews with key actors and experts	10 interviews
Academic papers	Previous research used for developing case narrative and triangulation	Luthy, R. G., et al., (2020); Williams, J. (2018a); Williams, J. (2018b); Binz, C., et al., (2016); Harris-Lovett, S. R., et al., (2015); Harris-Lovett, S. and D. Sedlak (2015), etc.
Secondary material	Grey literature, reports, legal documents, mail correspondence between public officials	~25 documents

Source: own summary.

Table A2
List of interviews.

No.	Interviewee	Date
1	Academic researcher; Expert on the Carlsbad project	January 2021
2	Desalination expert; Formerly Poseidon	January 2021
3	Desalination expert; Consultant	June 2021
4	Water expert; Researcher from California	June 2021
5	Environmental activist; Surfrider Foundation	June 2021
6	Agency staff; SDCWA	July 2021
7	Environmental researcher; Hired by Poseidon	July 2021
8	Environmental activist	July 2021
9	Agency Staff; California Coastal Commission	July 2021
10	Environmental activist; San Diego Coastkeeper	July 2021

Source: own summary.

References

Bauer, F, Fuenfschilling, L, 2019. Local initiatives and global regimes – Multi-scalar transition dynamics in the chemical industry. J. Cleaner Prod. 216, 172–183.
Baur, M, 2008. Software for the Analysis and Visualization of Social Networks. Fridericiana University Karlsruhe Karlsruhe.
Binz, C, Coenen, L, Murphy, JT, et al., 2020. Geographies of transition—From topical concerns to theoretical engagement: a comment on the transitions research agenda. Environ. Innov. Societal Transitions 34, 1–3.
Binz, C, Harris-Lovett, S, Kiparsky, M, et al., 2016a. The thorny road to technology legitimation — Institutional work for potable water reuse in California. Technol. Forecast. Social Change 103, 249–263.

Binz, C, Truffer, B, Coenen, L, 2016b. Path creation as a process of resource alignment and anchoring: industry formation for on-site water recycling in Beijing. Econ. Geogr. 92 (2), 172–200.
Boschma, RA, 1997. New industries and windows of locational opportunity: a long-term analysis of Belgium (Neue Industrien und das" windows of locational opportunity"-Konzept. Eine Langfrist-Analyse Belgiens). Erdkunde 5 (1), 12–22.
Brandes, U, Pich, C, 2009. An Experimental Study on Distance-Based Graph Drawing. Springer Berlin Heidelberg, Berlin, Heidelberg, pp. 218–229.
Brugger, H, Henry, AD, 2021. Influence of policy discourse networks on local energy transitions. Environ. Innov. Societal Transitions 39, 141–154.
Carvalho, L, Mingardo, G, Van Haaren, J, 2012. Green urban transport policies and cleantech innovations: evidence from Curitiba, Göteborg and Hamburg. European Plann. Studies 20 (3), 375–396.
Coenen, L, Benneworth, P, Truffer, B, 2012. Toward a spatial perspective on sustainability transitions. Res. Policy 41 (6), 968–979.
Coenen, L, Moodysson, J, Martin, H, 2015. Path renewal in old industrial regions: possibilities and limitations for regional innovation policy. Regional Studies 49 (5), 850–865.
Dewald, U, Truffer, B, 2012. The local sources of market formation: explaining regional growth differentials in German photovoltaic markets. European Plann. Studies 20 (3), 397–420.
Duygan, M, Stauffacher, M, Meylan, G, 2021. What constitutes agency? Determinants of actors' influence on formal institutions in Swiss waste management. Technol. Forecast. Social Change 162, 120413.
EPA, 2017. Potable Reuse Compendium - EPA/810/R-17/002. Reportno. Report Number|, Date. Place Published|: Institution|.
Espeland, WN, 1998. The struggle for water: Politics, rationality, and identity in the American Southwest. University of Chicago Press.
Fischer, L-B, Newig, J, 2016. Importance of actors and agency in sustainability transitions: a systematic exploration of the literature. Sustainability 8 (5).
Flyvbjerg, B, 2006. Five misunderstandings about case-study research. Qual. Inquiry 12 (2), 219–245.
Foxon, TJ, Hammond, GP, Pearson, PJG, 2010. Developing transition pathways for a low carbon electricity system in the UK. Technol. Forecast. Social Change 77 (8), 1203–1213.
Fragkou, MC, McEvoy, J, 2016. Trust matters: Why augmenting water supplies via desalination may not overcome perceptual water scarcity. Desalination 397, 1–8.
Fuenfschilling, L, 2019. An institutional perspective on sustainability transitions. Boons F and McMeekin A Handbook of Sustainable Innovation. Edward Elgar Publishing, pp. 219–236.
Fuenfschilling, L, Binz, C, 2018. Global socio-technical regimes. Res. Policy 47 (4), 735–749.
Fuenfschilling, L, Truffer, B, 2014. The structuration of socio-technical regimes—Conceptual foundations from institutional theory. Res. Policy 43 (4), 772–791.
Fuenfschilling, L, Truffer, B, 2016. The interplay of institutions, actors and technologies in socio-technical systems—An analysis of transformations in the Australian urban water sector. Technol. Forecast. Social Change 103, 298–312.
Geels, F, Raven, R, 2006. Non-linearity and expectations in niche-development trajectories: ups and downs in dutch biogas development (1973–2003). Technol. Anal. Strategic Manage. 18 (3-4), 375–392.
Geels, FW, 2002. Technological transitions as evolutionary reconfiguration processes: a multi-level perspective and a case-study. Res. Policy 31 (8), 1257–1274.
Geels, FW, 2014. Regime resistance against low-carbon transitions: introducing politics and power into the multi-level perspective. Theory, Culture & Society 31 (5), 21–40.
Geels, FW, Kern, F, Fuchs, G, et al., 2016. The enactment of socio-technical transition pathways: A reformulated typology and a comparative multi-level analysis of the German and UK low-carbon electricity transitions (1990–2014). Res. Policy 45 (4), 896–913.
Geels, FW, Schot, J, 2007. Typology of sociotechnical transition pathways. Res. Policy 36 (3), 399–417.
Geels, FW, Verhees, B, 2011. Cultural legitimacy and framing struggles in innovation journeys: a cultural-performative perspective and a case study of Dutch nuclear energy (1945–1986). Technol. Forecast. Social Change 78 (6), 910–930.
Gleick, PH, 2003. Global freshwater resources: soft-path solutions for the 21st century. Science 302 (5650), 1524–1528.
Grillitsch, M, Hansen, T, Coenen, L, et al., 2019. Innovation policy for system wide transformation: the case of strategic innovation programs (SIPs) in Sweden. Research Policy 48 (4), 1048–1061.
Grillitsch, M, Sotarauta, M, 2020. Trinity of change agency, regional development paths and opportunity spaces. Prog. Human Geogr. 44 (4), 704–723.
Hacker, ME, Binz, C, 2021a. Institutional barriers to on-site alternative water systems: a conceptual framework and systematic analysis of the literature. Environ. Sci. Technol. 55 (12), 8267–8277.
Hacker, ME, Binz, C, 2021b. Navigating institutional complexity in socio-technical transitions. Environ. Innov. Societal Transitions 40, 367–381.
Hajer, MA, 1993. Discourse coalitions and the institutionalization of practice: the case of acid rain in Great Britain. Fischer F and Forester J The Argumentative Turn in Policy Analysis and Planning. Duke University Press. pp.0.
Hajer, MA, 2006. Doing discourse analysis: coalitions, practices, meaning. In: van den Brink M and Metze T (eds). Netherlands geographical studies (ISSN 0169-4839). Koninklijk Nederlands Aardrijkskundig Genootschap.
Harris-Lovett, S, Sedlak, D, 2015. Chapter 10. The History of Water Reuse in California. In: Allison, L (Ed.), Sustainable Water: Challenges and Solutions from California. University of California Press, pp. 220–243.
Heiberg, J, Binz, C, Truffer, B, 2020. The geography of technology legitimation: how multiscalar institutional dynamics matter for path creation in emerging industries. Econ. Geogr. 96 (5), 470–498.
Heiberg, J, Truffer, B, 2021. Overcoming the harmony fallacy: How values shape the course of innovation systems. Reportno. Report Number|, Date. Place Published|: Institution|.
Heiberg, J, Truffer, B, Binz, C, 2022. Assessing transitions through socio-technical configuration analysis – a methodological framework and a case study from the water sector. Res. Policy 51 (1).
Hess, DJ, 2014. Sustainability transitions: a political coalition perspective. Research Policy 43 (2), 278–283.
Hoffmann, S, Feldmann, U, Bach, PM, et al., 2020. A research agenda for the future of urban water management: exploring the potential of nongrid, small-grid, and hybrid solutions. Environ. Sci. Technol. https://doi.org/10.1021/acs.est.9b05222.
Hoogstraaten, MJ, Frenken, K, Boon, WPC, 2020. The study of institutional entrepreneurship and its implications for transition studies. Environ. Innov. Societal Transitions 36, 114–136.
Jain, S, 2020. Fumbling to the future? Socio-technical regime change in the recorded music industry. Technol. Forecast. Social Change 158, 120168.
Jolly, S, Grillitsch, M, Hansen, T, 2020. Agency and actors in regional industrial path development. A framework and longitudinal analysis. Geoforum 111, 176–188.
Kanda, W, Kuisma, M, Kivimaa, P, et al., 2020. Conceptualising the systemic activities of intermediaries in sustainability transitions. Environ. Innov. Societal Transitions 36, 449–465.
Kemp, R, Schot, J, Hoogma, R, 1998. Regime shifts to sustainability through processes of niche formation: the approach of strategic niche management. Technol. Anal. Strategic Manage. 10 (2), 175–195.
Kivimaa, P, Hyysalo, S, Boon, W, et al., 2019. Passing the baton: How intermediaries advance sustainability transitions in different phases. Environ. Innov. Societal Transitions 31, 110–125.
Kjellén, M, 2018. Wastewater governance and the local, regional and global environments. Water Alternatives 11 (2), 219.
Klitkou, A, Bolwig, S, Hansen, T, et al., 2015. The role of lock-in mechanisms in transition processes: The case of energy for road transport. Environ. Innov. Societal Transitions 16, 22–37.
Kungl, G, Geels, FW, 2018. Sequence and alignment of external pressures in industry destabilisation: Understanding the downfall of incumbent utilities in the German energy transition (1998–2015). Environ. Innov. Societal Transitions 26, 78–100.
Larsen, TA, Gruendl, H, Binz, C, 2021. The potential contribution of urine source separation to the SDG agenda – a review of the progress so far and future development options. Environ. Sci. 7 (7), 1161–1176.
Leifeld, P, et al., 2009. Die Untersuchung von Diskursnetzwerken mit dem Discourse Network Analyzer (DNA). Politiknetzwerke. Modelle, Anwendungen und Visualisierungen. Springer, Berlin, pp. 391–404.

Leifeld, P, 2013. Reconceptualizing Major Policy Change in the Advocacy Coalition Framework: A Discourse Network Analysis of German Pension Politics. Policy Studies Journal 41 (1), 169–198.
Leifeld, P, Haunss, S, 2012. Political discourse networks and the conflict over software patents in Europe. Eur. J. Political Res. 51 (3), 382–409.
Loorbach, D, Frantzeskaki, N, Avelino, F, 2017. Sustainability transitions research: transforming science and practice for societal change. Annu. Rev. Environ. Resour. 42 (1), 599–626.
Luthy, RG, Wolfand, JM, Bradshaw, JL, 2020. Urban water revolution: sustainable water futures for california cities. J. Environ. Eng. 146 (7), 04020065.
Mackinnon, D, Karlsen, A, Dawley, S, et al., 2021. Legitimation, institutions and regional path creation: a cross-national study of offshore wind. Regional Studies 1–12. https://doi.org/10.1080/00343404.2020.1861239.
March, H, Saurí, D, Rico-Amorós, AM, 2014. The end of scarcity? Water desalination as the new cornucopia for Mediterranean Spain. J. Hydrol. 519, 2642–2651.
Markard, J, 2011. Transformation of infrastructures: sector characteristics and implications for fundamental change. J. Infrastruct. Syst. 17 (3), 107–117.
Markard, J, Rinscheid, A, Widdel, L, 2021. Analyzing transitions through the lens of discourse networks: Coal phase-out in Germany. Environ. Innov. Societal Transitions 40, 315–331.
Markard, J, Suter, M, Ingold, K, 2016. Socio-technical transitions and policy change – Advocacy coalitions in Swiss energy policy. Environ. Innov. Societal Transitions 18, 215–237.
Markard, J, Truffer, B, 2008. Technological innovation systems and the multi-level perspective: towards an integrated framework. Research Policy 37 (4), 596–615.
Martin, H, Coenen, L, 2015. Institutional context and cluster emergence: the biogas industry in Southern Sweden. European Plann. Studies 23 (10), 2009–2027.
Maurer, M, 2009. Specific net present value: An improved method for assessing modularisation costs in water services with growing demand. Water Res. 43 (8), 2121–2130.
McEvoy, J, 2014. Desalination and water security: the promise and perils of a technological fix to the water crisis in Baja California Sur, Mexico. Water Alternatives 7 (3), 518–541.
Miörner, J, 2020. Contextualizing agency in new path development: how system selectivity shapes regional reconfiguration capacity. Regional Studies 1–13. https://doi.org/10.1080/00343404.2020.1854713.
Miörner, J, Binz, C, 2021. Towards a multi-scalar perspective on transition trajectories. Environ. Innov. Societal Transitions 40, 72–188.
Miörner, J, Binz, C, Fuenfschilling, L, 2021. Understanding transformation patterns in different socio-technical systems – A scheme for analysis. GEIST – Geography Innov. Sustain. Transitions 2021 (11).
Molle, F, Mollinga, PP, Wester, P, 2009. Hydraulic bureaucracies and the hydraulic mission: Flows of water, flows of power. Water Alternatives 2 (3), 328–349.
Musiolik, J, Markard, J, Hekkert, M, 2012. Networks and network resources in technological innovation systems: towards a conceptual framework for system building. Technol. Forecast. Social Change 79 (6), 1032–1048.
Musiolik, J, Markard, J, Hekkert, M, et al., 2020. Creating innovation systems: how resource constellations affect the strategies of system builders. Technol. Forecast. Social Change 153, 119209.
National Drought Mitigation Center (2021) *National Integrated Drought Information System*. Available at: https://www.drought.gov/states/California/county/San%20diego.
Raven, R, Kern, F, Verhees, B, et al., 2016. Niche construction and empowerment through socio-political work. A meta-analysis of six low-carbon technology cases. Environ. Innov. Societal Transitions 18, 164–180.
Rosenbloom, D, Berton, H, Meadowcroft, J, 2016. Framing the sun: A discursive approach to understanding multi-dimensional interactions within socio-technical transitions through the case of solar electricity in Ontario, Canada. Res. Policy 45 (6), 1275–1290.
Sabatier, PA, 1988. An advocacy coalition framework of policy change and the role of policy-oriented learning therein. Policy sciences 21 (2-3), 129–168.
SDCWA (2021) *Supply Reliability*. Available at: http://carlsbaddesal.sdcwa.org/supply-reliability/ (accessed 2021-05-20).
Sedlak, D, 2014. Water 4.0: The Past, Present, and Future of the World's Most Vital Resource. Yale University Press.
Sengers, F, Raven, R, 2015. Toward a spatial perspective on niche development: The case of Bus Rapid Transit. Environ. Innov. Societal Transitions 17, 166–182.
Siggelkow, N, 2007. Persuasion with case studies. Adcad. Manage. J. 50, 20–24.
Simoens, MC, Fuenfschilling, L, Leipold, S, 2022. Discursive dynamics and lock-ins in socio-technical systems: an overview and a way forward. Sustainability Sci. https://doi.org/10.1007/s11625-022-01110-5.
Smith, A, Hargreaves, T, Hielscher, S, et al., 2016. Making the most of community energies: three perspectives on grassroots innovation. Environ. Plann. A 48 (2), 407–432.
Smith, A, Kern, F, Raven, R, et al., 2014. Spaces for sustainable innovation: solar photovoltaic electricity in the UK. Technol. Forecast. Social Change 81, 115–130.
Smith, A, Raven, R, 2012. What is protective space? Reconsidering niches in transitions to sustainability. Res. Policy 41 (6), 1025–1036.
Smith, A, Voß, J-P, Grin, J, 2010. Innovation studies and sustainability transitions: The allure of the multi-level perspective and its challenges. Res. Policy 39 (4), 435–448.
Späth, P, Rohracher, H, 2010. Energy regions': the transformative power of regional discourses on socio-technical futures. Res. Policy 39 (4), 449–458.
Späth, P, Rohracher, H, 2012. Local demonstrations for global transitions—Dynamics across governance levels fostering socio-technical regime change towards sustainability. Eur. Plann. Studies 20 (3), 461–479.
Stokes, LC, Breetz, HL, 2018. Politics in the U.S. energy transition: Case studies of solar, wind, biofuels and electric vehicles policy. Energy Policy 113, 76–86.
Stone, DA, 1997. Policy Paradox: The art of Political Decision Making. ww Norton, New York.
Storper, M, Walker, R, 1989. The Capitalist Imperative: Territory, Technology, and Industrial Growth. Blackwell, Oxford.
Swyngedouw, E, Williams, J, 2016. From Spain's hydro-deadlock to the desalination fix. Water Int. 41 (1), 54–73.
Teschner, N, Paavola, J, 2013. Discourses of abundance: transitions in Israel's energy regime. J. Environ. Plann. Policy Manage. 15 (3), 447–466.
Thornton, PH, Ocasio, W, Lounsbury, M, 2012. The Institutional Logics Perspective: A New Approach to Culture, Structure, and Process. Oxford University Press on Demand.
Trencher, G, Healy, N, Hasegawa, K, et al., 2019. Discursive resistance to phasing out coal-fired electricity: narratives in Japan's coal regime. Energy Policy 132, 782–796.
Trippl, M, Baumgartinger-Seiringer, S, Frangenheim, A, et al., 2020. Unravelling green regional industrial path development: regional preconditions, asset modification and agency. Geoforum 111, 189–197.
Turnheim, B, Geels, FW, 2013. The destabilisation of existing regimes: Confronting a multi-dimensional framework with a case study of the British coal industry (1913–1967). Research Policy 42 (10), 1749–1767.
Valentine, G, 2005. Tell me about…: using interviews as a research methodology. Flowerdew R and Martin D Methods in Human Geography, A guide for students doing a research project. Pearson, Harlow.
Van Den Bergh, JCJM, 2013. Economic-financial crisis and sustainability transition: Introduction to the special issue. Environ. Innov. Societal Transitions 6, 1–8.
Wasserman, S, Faust, K, 1994. Social Network Analysis: Methods and Applications. Cambridge University Press, Cambridge.
Williams, J, 2018a. Assembling the water factory: seawater desalination and the techno-politics of water privatisation in the San Diego–Tijuana metropolitan region. Geoforum 93, 32–39.
Williams, J, 2018b. Diversification or loading order? Divergent water-energy politics and the contradictions of desalination in southern California. Water Alternatives 11 (3), 847–865.
Wong, THF, Brown, RR, 2009. The water sensitive city: principles for practice. Water Sci. Technol. 60 (3), 673–682.
Wood, LA, Kroger, RO, 2000. Doing Discourse Analysis: Methods for Studying Action in Talk and Text. Thousand Oaks, California.
Yin, RK, 2013. Case study research: Design and methods. Sage publications, London.
Yuana, SL, Sengers, F, Boon, W, et al., 2020. A dramaturgy of critical moments in transition: understanding the dynamics of conflict in socio-political change. Environ. Innov. Societal Transitions 37, 156–170.