Global regime diffusion in space: a missed transition in San Diego’s water sector

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Abstract: Socio-technical regimes are potentially global sets of highly institutionalized rationalities that have co-evolved with actors, technologies and institutions. Transition studies features an extensive focus on regimes dynamics within specific territorial contexts. However, we know surprisingly little of how regime rationalities are constructed, diffused and reproduced across geographical contexts. This is a key gap in the literature on the geography of sustainability transitions, in explaining why transitions happen in some places and not in others. This paper introduces a conceptual model to analyze transformative opportunities in regions and how regime actors strategically diffuse and implement regime solutions through combinations of discursive- and system building activities. The empirical analysis draws upon a combination of Socio-Technical Configuration Analysis (STCA) of 354 newspaper articles and 10 in-depth 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 transformation pressure.

Keywords: global regimes; regime diffusion; regional discourse dynamics; desalination; San Diego; socio-technical configuration analysis
1 Introduction

Transition studies provide instrumental inputs to conceptualising and understanding deep 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 regional contexts (Coenen et al., 2012; Coenen et al., 2015; Martin and Coenen, 2015). Research on the geography of sustainability transitions have 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 long 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; Duygan et al., 2021), we know surprisingly little about how regime rationalities are constructed, diffused and reproduced across different geographical contexts and scales (Miörner and Binz, 2021; Bauer and Fuenfschilling, 2019; Fuenfschilling and Binz, 2018).

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. For example, the continuous diffusion and reproduction of dominant regime solutions like fossil-fuel based energy systems, car-based urban transportation or centralized water treatment into new contexts may explain why transition trajectories evolve so slowly at a global scale. Transition studies accordingly need deeper conceptual and empirical knowledge about how global regime rationalities are diffused and reproduced across different geographical contexts by regime actors. Put differently, there is a need to explore the inner workings of how the global regime in a sector manages to reproduce the status quo in ever-new contexts, despite substantial niche- 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 that in principle are characterised by favourable preconditions for transitions: regions with considerable grassroots agency in combination with strong exogenous transformation pressures. By combining insights from transition studies and economic geography, we conceptualize ‘regional reconfiguration windows’ (RWW) as periods of transformative opportunity in a given region, resulting from a combination of regional change agency, failures of the incumbent regime, and exogenous ‘landscape’ pressures. We then ask the question how, despite obvious problems and fundamental mismatch between the promise of regime solutions and regional/local 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). By deploying a mixed methods approach combining socio-technical configuration analysis (STCA) (Heiberg et al., 2020; Heiberg et al., 2022) with in-depth interviews, we then conduct an in-depth case study of the diffusion of
desalination technologies into the San Diego region in California, an emblematic ‘extreme case’ for studying the strategic agency of regime actors in diffusing a global regime solution.

San Diego is a region with notorious water shortages that lead to continuous debates about how to reform urban water management (UWM) in more sustainable directions (Williams, 2018a; Williams, 2018b). California at the same time hosts some of the most renowned experts and firms 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 deep transformation of UWM solutions, 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 opportunity, and thereby diffused, reproduced and reinforced the global regime in the region. Our analysis reveals the mechanisms through which regional and extra-regional regime actors may strategically appropriate reconfiguration windows for regime diffusion by deploying a mix of discursive- and system building activities. We conclude by discussing how a better understanding of how global regimes ‘fend off’ pressure to transform or adapt 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 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 substantially 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 new 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, establishing one or few dominating institutional rationalities (Fuenschilling and Truffer, 2014; Thornton et al., 2012). In many sectors, regimes are to some degree 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 functions can be best provided (Kemp et al., 1998; Fuenschilling and Truffer, 2014).

In the sectors analysed by transition studies, the observable variation in regime structures across the world is usually centred around a surprisingly narrow set of technologies and guiding rationalities (Fuenschilling and Binz, 2018). Despite substantial spatial variation in geophysical and socio-economic preconditions, many sectors exhibit more or less identical socio-technical configurations across different parts of the world. In order to explain this pattern, scholars have started to disentangle the geography of socio-technical regimes by conceptualizing 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.” (Fuenschilling and Binz, 2018: 739). The institutional rationalities that have become dominant at the global sector level 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 about how the activities of regime actors may lead to the enactment and reproduction of global regime rationalities in particular regional contexts. In order to understand the potential for transformative change, it is thus crucial to better understand the sources of isomorphism stemming from global regimes and how they entrench prevailing socio-technical systems in regions (Fuenfschilling and Binz, 2018).

2.2 Regional Reconfiguration Windows

In this paper, we conceptualize Regional Reconfiguration Windows (RRWs) as situations of high transformative potential in a region, resulting from the interplay of different time- and place-specific factors. It is well established in transitions literature, as well as in economic geography, that certain periods may offer particularly beneficial conditions for engaging in techno-economic change processes, due to temporary weakened regime influence and/or exogenous landscape pressures (Storper and Walker, 1989; Boschma, 1997; Van Den Bergh, 2013).

 Actors in a region are continuously engaging in different types of agency that target the institutional underpinning of the socio-technical system prevailing in the sector (Binz et al., 2016; Fuenfschilling, 2019). We posit that in regions with ‘closed’ reconfiguration windows, agency that maintains existing socio-technical configurations will be most prevalent. In regions with ‘open’ reconfiguration windows, actors may in turn engage in types of agency that target the creation of new institutions or the disruption of existing ones. Those activities will typically lead to open contestation and framing struggles that are captured in public, policy and media discourses (Yuana et al., 2020). However, contestation in and of itself will not necessarily lead to regional transitions. Regional reconfiguration windows are socially constructed and transformation opportunities will 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 take an explicit regime perspective and zoom in on how regime actors navigate transformation pressures to their advantage.

We argue that RRWs hold the most potential for regional transformative change when forces that are both endogenous and exogenous to the region are simultaneously at play. First, RRWs may open due to sudden shifts in exogenous landscape pressures that challenge and de-stabilize established regime configurations. The ‘landscape’ is conceptualized as a cultural, economic, environmental and political ‘backdrop’ that sustains societal structures (Geels and Schot, 2007). Changes in slowly changing landscape features (e.g. climate change), socio-economic development trajectories (e.g. long waves of industrial change) and 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 for solving the problem.

Second, the (apparent) inability of regime solutions to solve particular regional issues may be a source of transformative potential. Highly context-specific issues may be induce experimentation and the development of technologies 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 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 system, to meet the demands for sanitation in the informal settlements of growing megacities (Maurer, 2009; Larsen
et al., 2021; Hoffmann et al., 2020). Such ‘socio-technical 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, the emergence and scaling of local and regional niches is a well-documented source of transformation pressure in transition studies (Kemp et al., 1998; Geels, 2002; Geels and Raven, 2006). The presence of actors with a direct interest in advancing an alternative socio-technical configuration based on new technology or social and organizational innovation may facilitate regional transition trajectories. Such ‘regional change agency’ may originate from local firms, policy makers, grassroots movements (Smith et al., 2016) or different types of system intermediaries with an active interest in shaping 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).

Table 1: Regional Reconfiguration Windows (own elaboration)

<table>
<thead>
<tr>
<th>Source of RRW</th>
<th>Description</th>
<th>Potential effects on regional discursive dynamics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Landscape pressures (exogenous)</td>
<td>Sudden shifts in landscape pressures due to unpredictable environmental or socio-economic events</td>
<td>Give rise to competing interpretations of events and responses, which might lead to major discursive shifts</td>
</tr>
<tr>
<td>Socio-technical failures (techno-material mismatch)</td>
<td>The apparent inability of regime solutions to solve regional issues</td>
<td>Open up for alternative technologies and storylines built around regional issues</td>
</tr>
<tr>
<td>Regional change agency (endogenous)</td>
<td>The presence of regional actors with a direct interest in advancing alternative socio-technical configurations</td>
<td>Facilitate the emergence of explicitly regional discourses, with storylines built around regional context conditions</td>
</tr>
</tbody>
</table>

The structural conditions for regional transition trajectories to materialize are arguably most beneficial when the three sources of transformative potential are present and reinforcing each other, in other words, when regional reconfiguration windows are ‘wide open’. This may give rise to critical discursive moments, 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 potential of RRWs, actors must successfully mobilize discursive shifts that reinterpret the meaning of incumbent regime configurations, re-shape legitimate behaviour and develop new storylines and narratives around alternative socio-technical configurations. These periods are thus crucial moments of contestation, in which both regime- and niche-actors try to shape the regional discourse and engage in system building.

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 envisioned 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 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 helps actors by serving as a condensed abstraction of reality that can be used 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 are often referred to as advocacy coalitions (Hajer, 1993; Sabatier, 1988) 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), or studied how regional actors absorb and translate international storylines and use them to facilitate structural change in their region (Spåth and Rohracher, 2010; Spåth 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. In other words, regime actors go to great lengths when it comes to adapting their storylines and agency to specific spatio-temporal context conditions. Spatially differentiated discursive dynamics, which still align with the dominant global regime rationality, 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 one or several (functioning) 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 "copy mistakes" 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 in analyzing regime actor’s efforts in resisting change (Geels, 2014; Kungl and Geels, 2018; Trencher et al., 2019) by fending off transformative pressures stemming from the change agency of niche actors (Fischer and Newig, 2016; Foxon et al., 2010). Recent calls in transition studies to extend the perspective on incumbent actors to include the transformational potential they might hold (Berggren et al., 2015; Penna and Geels, 2015; Turnheim and Sovacool, 2020), typically reflect this general proposition. Studies of power in transitions have equally focused strongly on the struggles between incumbent regimes and emerging niches (Geels and Schot, 2010; Avelino and Rotmans, 2011), based on the assumption that these actor groups will have inherently conflicting goals and interests (Geels and Schot, 2007).

Studies have taken a more nuanced approach to regime agency only more recently. Smink et al. (2015) studied the institutional strategies of regime actors in relation to emerging innovations in the energy sector. Drawing on literature from institutional theory and strategic management, they showed how regime actors engaged in both ‘defensive’ institutional work (Maguire and Hardy, 2009) aimed at maintaining the incumbent institutional environment, but also alluded to agency targeting institutional change, such as strategic public outreach, grassroots mobilization and various forms of political work. In addition, Fuenfschilling (2019) called for a social constructivist perspective of
regime dynamics, arguing that they have to be understood in terms of processes of (de-) institutionalization within and outside the regime core.

We posit that regime dynamics are subject to considerable variation when it comes to the strategic agency deployed by regime actors who shape regional institutional environments through various types of institutional work (Garud et al., 2010; Hess, 2014; Rosenbloom et al., 2016). These are not dissimilar to those observed in studies of niche emergence. Regional reconfiguration windows, when they open up, put pressure on both niche and regime actors to adapt their storylines, exploit opportunities for transformation, and/or contend old trajectories. For regime actors, open reconfiguration windows 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.

For the purpose of this paper, we distinguish between two interrelated types of regime agency. First, regime actors may engage in institutional work that puts pressure on the socio-technical system through ‘discursive activities’ in the public arena. The goal of such activities is to create a system environment which selectively reinforces regime strategies, potentially at the expense of diverging 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 activities is not limited to the niche-regime contestation axis (Madsen et al., 2021), but may target fundamental aspects of the regional discourse, such as basic problem definitions, legitimate actions, and future goals and visions.

Second, regime actors may directly target the reconfiguration of elements in the socio-technical system, for example by mobilizing support from selected powerful actors, and identifying and exploiting opportunities for institutional change. ‘System building’ activities (Musiolik et al., 2012; Musiolik et al., 2020) in this paper thus refers to forms of institutional work that deliberately identify and utilize resources in order to shape the trajectory of the regional socio-technical system ‘behind the scenes’, that is, outside the spotlight of the public debate. This analytical distinction enables us to combine a discursive and substantive approach to regime dynamics and thus connects the discursive approach emerging in transition studies with well-established system- and agency-perspectives.

2.5 Conceptual framework: Enactment of global regime dynamics in regional reconfiguration windows

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 contexts with different regional preconditions (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, socio-technical failures or regional change agency (cf. Figure 1). Depending on the content of regional discourses, certain rationalities and technologies may be selected, reified or renounced, leading to outcomes in the regional socio-technical system that may or may not align with the dominant global regime rationality.

We propose to study global regime diffusion processes by zooming in on regional discursive dynamics on the one hand, and regime actors’ system building on the other. Discourse dynamics are place-specific, so regime actors are expected to adapt their storylines to the regional discourse. They typically embed themselves in the discourse by capturing the dominant narratives and trying to construct new storylines that invalidate any critiques of their preferred solutions and disempower
regional advocacy coalitions that propose radically novel rationalities. System building by regime actors, in turn, targets the reconfiguration of the regional socio-technical system with the ambition of reproducing global regime templates. This form of agency involves various forms of institutional work and/or the exercise of different forms of power to entrench the existing regime.

Studying how global regime rationalities are diffused and adapted to regional context conditions through coupled discursive and strategic interventions is thus key for understanding the sources of isomorphism and path dependence emanating from the global regime. 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. The inherent inability of regime actors to completely circumvent or shape the prevailing regional discourse may prevent them from reproducing a full ‘carbon copy’ of the global regime configuration.

![Diagram](image)

**Figure 1: Global-regional regime dynamics (own elaboration)**

3 Case introduction and methods: Desalination in San Diego

In the remainder, we will illustrate the use of our framework with an ‘extreme case’ of a missed transition trajectory in the urban water sector of the San Diego region in California. The water sector is typically characterised by an exceptionally stable and highly globalized socio-technical regime (Fuenfschilling and Truffer, 2014), which has demonstrated a high resistance to transformation globally (Espeland, 1998; Molle et al., 2009; Fuenfschilling and Truffer, 2016). The sector is dominated by a socio-technical configuration promoting centralized large-scale technical infrastructure with the overarching goal of providing water security, reliability and national welfare. Alternative rationales, such as environmental sustainability and economic efficiency, and more small-scale, modular or nature-based technological 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 (Fritzmann et al., 2007). 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 is also often characterized as a technology-driven ‘quick fix’ to water scarcity (Fragkou and McEvoy, 2016; March et al., 2014; McEvoy, 2014) and to territorial contestation over dwindling water supplies (Swyngedouw and Williams, 2016). It has also been identified as a financial accumulation strategy for firms active in the global water industry (Loftus and March, 2016). It 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 technologies as desalination, but is argued to come with fewer environmental risks and a smaller ecological footprint (Kjellén, 2018). It refers to the various ways in which different forms of wastewater can be recycled for direct or indirect potable reuse, or for agricultural purposes (EPA, 2017). While representing a more water-sensitive approach, 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, is developed by private technology companies and paid for by water consumers or local water agencies.

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The potentially most transformative ‘niche’ 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 or in small neighbourhoods, as well as water conservation, which is based on behavioural changes (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 solutions’ (Gleick, 2003) often follow a holistic perspective on environmental and social sustainability, are based on a community logic and are incentivised through public policies and civil society engagement.

3.1 Case sampling and methodology

Our empirical case study (the diffusion of desalination technologies into the San Diego region) was selected based on a theoretical sampling rationale (Sigelkow, 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 well known for high levels of grassroots engagement around environmental issues and is one of the global power houses for radical innovation in the water sector (Hess, 2014; Stokes and Breetz, 2018; Hacker and Binz, 2021b). With recurring droughts since the 1990s, several RRWs emerged in the San Diego region that were arguably wide open for a radical re-orientation of water infrastructure (see section 4). Yet, 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 aligned with the prevailing global regime rationality. The particularities of this case study thus promise unique insights into how the global regime travels, and how it may fend off transformation pressures and prevail even in the most extreme instances of open RRWs.

To analyse the relevant discursive- and system building activities underpinning global regime diffusion, we deploy a mixed methods approach that combines STCA (Heiberg et al., 2022; Heiberg and Truffer, 2021) with qualitative expert interviews. STCA constitutes a novel semi-qualitative methodology developed for the analysis of socio-technical reconfiguration dynamics based on textual data. It is strongly rooted in discourse network analysis (DNA) (Leifeld, 2009; Leifeld, 2013), a method...
developed by political scientists, specifically for the analysis of advocacy and discourse coalitions in policy discourses and which has recently been applied to study transition discourses, too (Leifeld and Haunss, 2012; Brugger and Henry, 2021). In contrast to conventional DNA, focusing on policy discourses, our interest here is centred on the storylines that emerge in wider public discourse around different technologies and associated rationalities, which reflects key actors’ discursive engagement with different socio-technical configurations.

In a first step, 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 broad search strategy, which was based on a simple search string\(^1\). The search string was chosen to identify all discursive activities relating to desalination as well as conventional and on-site wastewater recycling or reuse technologies. The rationale was to capture actors’ associations with legitimizing or de-legitimizing storylines around the regime technology of desalination, and around the most prominently discussed alternatives in California, which are large-scale wastewater recycling and small-scale, onsite water reuse (Binz et al., 2016; 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). This step was followed by a manual in-depth screening of the resulting list of newspaper articles, with one of the authors reading every article and determining its relevance. This resulted in a set of 354 articles that constituted the basis for the STCA. The analysis then aimed to trace the sources of RRWs and regional discourse dynamics throughout three distinct periods (see section 4).

In a second step, the analysis of discursive dynamics was combined with the analysis of data from 10 semi-structured interviews (see section 3.3) to provide contextual knowledge to the three phases of development, additional insights with regards to RRWs, and to map (behind-the-scenes) system building by regime actors that is typically not covered in newspaper articles. This step was further complemented with analysing the quite extensive secondary (grey) literature that is dealing with this case.

As such, the methodological approach goes beyond a mere triangulation of findings (Denzin, 1970; Nielsen et al., 2020) as it combines methods to illuminate different aspects of our conceptual framework.

### 3.2 STCA

The application of STCA in this paper involves a two-mode network analysis approach to study the dynamic evolution of advocacy coalitions around all legitimizing and de-legitimizing technology-related storylines. The first mode captured are the actors that use specific storylines in the newspapers, and the second mode are the storylines they use. 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 reuse technologies (Binz et al., 2016; Hacker and Binz, 2021a). Two additional storylines were classified inductively as they emerged from the data as potentially relevant after test-coding an initial sample of the database, namely a legitimizing and a de-legitimizing storyline around nature conservation efforts (see Tab. 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).

\(^1\) The search strings used were “desalination” and “water AND recycling OR reuse” respectively.
Table 2: Coded storylines.

<table>
<thead>
<tr>
<th>Storyline</th>
<th>Description</th>
<th>Relationship with global regime</th>
<th>Prevalence in the discourse</th>
</tr>
</thead>
<tbody>
<tr>
<td>Legoitizing desalination</td>
<td>Positive statements about desalination technology and its implementation in San Diego.</td>
<td>In line with global regime rationalities</td>
<td>High</td>
</tr>
<tr>
<td>De-legitimizing desalination</td>
<td>Negative statements about desalination technology and its implementation in San Diego.</td>
<td>No inherent relationship (depends on alternatives advocated)</td>
<td>High</td>
</tr>
<tr>
<td>Legoitizing wastewater recycling</td>
<td>Positive statements about large-scale wastewater recycling.</td>
<td>In line with global regime rationalities</td>
<td>High</td>
</tr>
<tr>
<td>De-legitimizing wastewater recycling</td>
<td>Negative statements about large-scale wastewater recycling.</td>
<td>No inherent relationship (depends on alternatives advocated)</td>
<td>Very low</td>
</tr>
<tr>
<td>Legoitizing conservation</td>
<td>Positive statements about conservation as a response to water issues.</td>
<td>Breaking with global regime rationalities</td>
<td>Medium</td>
</tr>
<tr>
<td>De-legitimizing conservation</td>
<td>Negative statements about conservation as a response to water issues.</td>
<td>No inherent relationship (depends on alternatives advocated)</td>
<td>Non-existent</td>
</tr>
<tr>
<td>Legoitizing on-site solutions</td>
<td>Positive statements about on-site water solutions (e.g. on-site sanitation, water reuse).</td>
<td>Breaking with global regime rationalities</td>
<td>Very low</td>
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<tr>
<td>De-legitimizing on-site solutions</td>
<td>Negative statements about on-site water solutions (e.g. on-site sanitation, water reuse).</td>
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<td>Non-existent</td>
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The two-mode networks of actors and storylines 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 of analysis. 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, 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-minimization layout algorithm (Brandes and Pich, 2009) to make clusters of actors easily detectable visually. We further follow a recent example by Markard et al. (2021a) and color all linkages that reflect congruence based on a unique storyline, facilitating the visual identification of advocacy coalition clusters. Eventually, we calculate the network density, which is defined by the share of all possible links that are actually present in the graph (Wasserman and Faust, 1994). In our application, network density measures may be used to capture the coherence (relatively high density) or conflictuality (relatively low density) of the overall discourse during different periods of time.

3.3 Interviews and qualitative content analysis

In order to zoom in on the non-discursive strategic agency, we complemented the STCA with 10 semi-structured in-depth interviews. Interviews lasted between 45 and 90 minutes and were conducted during January through August 2021, using video conferencing software. The interview partners were identified based on the STCA, which allowed us to identify the most vocal opponents and proponents of desalination, as well as through subsequent snowballing sampling (Valentine, 2005) (see Appendix 1 for an anonymised list of interviewees). Interview guidelines were designed to focus on the activities by regime actors and the (potential) responses and activities by actors advocating other solutions.

All interviews were recorded and transcribed. Both interviews and secondary material were then coded using a combination of theory-driven (Boyatzis, 1998) and inductive categories. As a first step, we coded the material based on an inductive coding scheme, identifying system building activities and outcomes for each of the three phases of our case. This also served to identify a division and distinct characteristics of three phases in our analysis. In a second step, 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. When formulating the final case narrative, we juxtaposed and triangulated our insights extensively with secondary material such as scientific publications, reports, legal documents, mail correspondence between public officials, and additional newspaper articles not included in our dataset.

4 Results: How the global regime in urban water management was replicated 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 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 to San Diego 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 socio-technical failure, which put pressure on regional water providers to find ways for tapping into new water sources.

In the remainder, we focus on three periods before (2000-2007), during (2008-2010) and after (2011-2015) a state-wide drought which led to a proclamation of emergency in California, and to significant public attention on water related issues, giving 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 the socio-technical failure of over-reliance on water imports, triggered regional actors to engage in change agency that explored alternative water options. This caused intense contestation between different actors in the public discourse and a general sense of urgency when it came to increasing the resilience of the water system in San Diego. Regional actors explored additional water supply options such as desalination, wastewater recycling and other ways to diversify into new water sources, as well as efforts to conserve and save water. In the mid- to late 2000s, a RRW for exploring alternatives to the prevailing regime solution was thus wide open in San Diego’s water sector.

In the period between 2011 and 2015, landscape pressures somewhat faded, as the region entered a short period with relatively favourable water supply conditions. Furthermore, the supply diversification strategy of regional water agencies had started to bear fruit (Fig. 4), with new sources being added to the regional ‘water portfolio’, thus slightly reducing overall reconfiguration 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 a severe drought again, 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 recycling) options in the region had even further entrenched the prevailing global regime logic, which locked out any other, more water-sensitive solutions from being a viable alternative.
4.1 The Carlsbad desalination project

The plans of the Carlsbad desalination plant concretised at the beginning of the 2000s, when an external firm, Poseidon Water (a Stamford-based\footnote{Poseidon Water has since moved their headquarters from Stamford (CA) to Boston (MA).} desalination project developer) entered the region. The company initially teamed up with local entities who had explored the possibility of regional or local desalination plants before (Williams, 2018a), most notably the City of Carlsbad, the City of Oceanside and SDCWA. 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 pre-existing water intake and outfall infrastructures of those power plants (Williams, 2018a). The ambitious plans by Poseidon triggered intense and organized opposition by environmentalists and other advocacy groups, who highlighted key environmental issues with desalination. Parts of this regional resistance included public campaigning activities, and parts were concerned with legal appeals and litigations against the project. 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 of the project. 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 throughout 2015 illustrate how regional reconfiguration windows opened up in the region, but instead of substantially transforming the regional socio-technical system, they were captured by regime actors who successfully navigated contested regional discourses and strategically incorporated a new regime technology that further entrenched the globally dominant technology template and guiding rationality around centralized,
supply-side solutions. In the next section, we will zoom in on the discursive dynamics first during two periods with open RRWs (2000-2007 and the critical discursive moment of 2008-2010 respectively), followed by a period characterised by an increasingly settled alignment between desalination and centralized water recycling technologies (2011-2015).

4.2 Dynamics of regime reproduction in three phases

Phase 1 - Contestation: Competing actor coalitions for or against desalination (2000-2007)

Our STCA reveals that an immediate reaction to Poseidon’s plans of constructing a desalination plant was the formation of an opposing actor coalition that framed a storyline that was actively de-legitimizing desalination (Fig. 5). The regional discourse 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 a set of 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/regional 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 during the early permitting process.

On the supportive side, we identify two broad storylines which are both strongly aligned with prevailing regime rationalities favouring large-scale water infrastructure and supply-oriented approaches. One storyline was legitimizing desalination, framing it as a cost-effective and environmentally friendly solution, while another one was concerned with legitimizing (large-scale) wastewater recycling by framing it among other things 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 (more transformative) on-site wastewater recycling and other small-scale solutions are in turn virtually absent from the discourse. Both desalination proponents and advocates of wastewater recycling are also occasionally positively framing conservation, but this appears as a rather marginal feature in the overall discourse.

The main advocates of both these regime-compatible storylines (desalination and recycling) in the period of 2000-2007 were public actors, primarily water agencies, who typically favoured either one or the other technological solution. The strong contestation of desalination in this first phase hints to a need for regime actors to engage in strategic agency to improve this solution’s legitimacy in the region. The main actors in the storyline 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 were positive toward desalination as a technology, they were ambivalent with regards to specific aspects of the Carlsbad project. Our interviews with representatives of 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 ultimately led SDCWA to withdraw from negotiations with Poseidon in 2005. Our interviews with desalination experts 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. This meant that 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. It is, according to our interviews, highly unusual for a developer to engage in a desalination project of this size without having an established “off-taker”, a water purchase agreement with local water authorities, at the beginning of the project.

This situation thus further pushed Poseidon to engage in agency that would dismantle any arguments favouring deviations from regime solutions in general and desalination in particular. One strategy that was highlighted by several of our interviewees was that Poseidon strategically hired regional and international consultants. Several interviewees mentioned how the company 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 actors that were opposing the Carlsbad project reveal that they had issues when they themselves tried to mobilize experts for their activities intended to block 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 system building by a resourceful regime actor had an indirect, albeit strong, impact on subsequent opportunity spaces for regime opponents. Above all, it became a crucial advantage when it came to system building in the form of lobbying and advocacy activities, targeting local water agencies. For example, Poseidon strategically focused their political work on local water agencies, building bottom-up political influence. Two interviewees, one opponent and one proponent of the Carlsbad project, both expressed that Poseidon managed to secure political support for their project with very limited efforts, by targeting local politicians who were not used to the attention. For example, the aforementioned desalination opponent, 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)

Phase 2 – Obfuscation (2008-2010)
The outcomes of the above discursive and more substantive activities are vividly exposed in the actor network of the subsequent period, which represents the height of public debates at the most ‘critical’ moment in the regional transition process (Fig. 6).

With Poseidon successfully capturing local water agencies to support desalination, local opposition groups losing crucial litigation processes and water agencies in California increasingly promoting a ‘water portfolio’ approach, the discourse in this phase got highly 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 (Fig. 7).

![Network density](image)

*Figure 2: Density as an indicator of overall coherence/obfuscation of the regional discourse. A higher density value indicates an increase in discourse obfuscation.*
In this second phase, key actors such as SDCWA, the City of Carlsbad and a number of water agencies increasingly engaged in, in their own words, more “balanced” discussions of pro’s and con’s with different water supply options. This is reflected in their central position in the network in Fig. 6. In addition, a number of local water agencies now moved to the centre of the network, being simultaneously positive and negative to desalination and/or positive to wastewater recycling. The storyline legitimizing conservation has moved to the fringes of the discourse and we also see an increasing dissolution of environmental NGO’s exclusive interest in de-legitimating desalination. E.g. the Surfrider Foundation and San Diego Coastkeeper now form a bridge between the storyline legitimizing recycling and de-legitimating desalination.

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, related to intense pressure
from an overreliance on MWD water imports, which required a move beyond “standard” solutions. Further, they argued 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 system building activities that accompanied (and profited form) this obfuscation of the discourse. For example, demand forecasting performed by consultants, hired by Poseidon and local pro-desalination water agencies, was an important mechanism for pushing supply-oriented perspectives and the need of developing a broadened portfolio of regional water supplies. Actors de-legitimizing desalination in the first phase were consequently pushed to adopt a position which acknowledged that landscape pressures and regional socio-technical failures were essentially 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 now 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.

For Poseidon, the obfuscation of the regional discourse served as an enabling factor for continuing to push the Carlsbad project forward through other forms of system building. 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 the governor of California at the time was pushed into supporting desalination with substantial behind-the-scenes lobbying efforts.

The company also ramped up their system building activities by 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, to communicate the main points in an easily digestible format accessible to civil servants and politicians involved in 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)

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 secured through a series of exclusive co-location contracts with coastal power plants. One interviewee who worked with the SDCWA at the time expressed that:

“There was a window of opportunity that presented itself when the stars were aligned, if you will, when Poseidon had secured the permits, [and] they had secured a lease for the property. Everything was aligned then to move forward with that project.” (Interview 6)


The third phase starts after 2011, when the decision on constructing the Carlsbad project had been taken. It shows an increasing entrenchment of regime solutions, combined with a strong decline of discursive activities. Looking at the network in Fig. 8, a major difference to prior phases is how the number of actors concerned with legitimizing desalination is substantially reduced, indicating that, as the Carlsbad plant was being constructed, the affair had 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 have also become 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:

“I think there's a lot of pressure to be 'reasonable’ [...] and not just be opponents of everything.” (Interview 4)

The advocacy coalition opposing desalination thus introduced framings of 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. The increased alignment of the conservation storyline in the third period may signal that conservation is 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 water discourse.

At the end of the three phases of development, regime actors seem to have managed to capture and reframe the regional discourse in a way so that it ‘closed’ out other 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 so 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 hasn’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 like water conservation or on-site water reuse. Despite massive landscape pressures, regime failures and change agency, the story of the San Diego region is thus not one of a structural transition towards a more sustainable regional water system, but one of regime actors using an open RRW to further
entrench the global regime. Poseidon as an external regime actor (with the support of local water agencies) has 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 the diversification of 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 was arguably locked-in to dominant global regime solutions for decades to come.

5 Conclusions
In this paper, we set out to investigate how regime rationalities are (re-)constructed, diffused and reproduced across geographical contexts. We conceptualized Regional Reconfiguration Windows as place-specific periods of increased transformation potential in a regional socio-technical system and asked the question how regime actors can strategically diffuse and implement regime solutions in such settings through combinations of discursive- and system building activities.

Our analysis draws upon a combination of Socio-technical configuration analysis (STCA) and in-depth expert interviews to illuminate how regime actors prevailed in diffusing and legitimizing a typical regime solution in the San Diego region during a period of substantial transformation pressure. The findings show that in terms of discursive activities, regime actors focused their activities on pushing concepts and storylines that could be agreed upon by a large number of regional actors and that obfuscated the clear boundaries between different 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 different technologies with the same guiding rationality (desalination and large-scale wastewater recycling) with no advocacy coalitions bringing forward more transformative alternatives (e.g. on-site water reuse or demand oriented innovations). Regime actors’ discursive activities were complemented by system building 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 support the conceptual argument that system building is enabled, and shaped, by regional discursive dynamics and that change agents cannot go directly against the prevailing regional discourse. Our findings also show that the skillful navigation of the regional discourse by regime actors, can create favorable conditions for them to engage in system building and thus have a direct impact and diffuse regime rationalities even in regions with reconfiguration windows that are wide open.

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 struggle with strong reconfiguration pressures. This continuous diffusion of regime rationalities in space can thus be seen as a key form of ‘regime resistance’ that has largely been overlooked in existing transition studies. We argue that the spatialized regime perspective brought forward in this paper comes with several crucial contributions to transition studies and potential avenues for future research.

First, in line with recent calls to study factors and actor strategies that undermine transition potentials (Geels, 2014; Markard et al., 2021b) we have demonstrated that contrary to conventional wisdom, regional reconfiguration windows present opportunities not only for change agents operating in niches, but also for regime actors, which can use them for further reifying global regime logics. Future studies could be designed to illuminate under which conditions those windows lead to more or less transformative outcomes. Based on the insights provided in this paper, we expect that regime actors are likely to ‘overcompensate’ when it comes to regime diffusion in contexts with open RRWs. This means that transformation opportunities, if left unrealised, may actually lead to a greater
lock-in if acted upon by regime actors, than when regime rationalities are diffused to regional contexts with closed RRWs. Further, we expect that a key factor for whether or not RRWs lead to transitions is whether the region hosts alternative socio-technical configurations that have already been institutionalized to a certain degree. In the case brought forward in this paper, no transformative ‘niche’ alternative was available, so change agents could not capture the discourse by promoting a legitimate alternative to supply-side regime solutions.

Second, our study challenges a tunnel vision leading to an overemphasis on niche-regime contestation as the primary dynamic of interest in transition studies. As our findings show, niche strategies focusing only on opposing regime reproduction will not suffice, but they have to propose alternative solutions ‘that work’. Our case study vividly exposes how potential niche actors 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 during open reconfiguration windows. Future studies should be concerned with further disentangling these complex processes, necessitating a deep understanding of the sector’s inner working and the spatially unequal distribution of discursive dynamics around niche alternatives.

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 system 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) 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 in this paper and allowed us to explore the interface of discursive dynamics with more tangible forms of system building. This approach opens for a more configurational perspective on agency in transition studies and opens up a number of important avenues for further theorizing and empirical studies. Above all, cross-comparisons between cases set in different geographical and sectoral contexts could provide inroads for more systematic typologizing of transition trajectories and improved theorizing resulting from it.

Last but not least, due to the nature of a single case study, the direct generalizability of the presented findings are of course limited. The case of desalination in the San Diego region was selected as an extreme case to study regime diffusion in a context characterized by a particularly high degree of transformation pressures and ‘wide open’ reconfiguration windows. This limitation notwithstanding, the results clearly illustrates the value of the conceptual and methodological approach and as such provide an analytical generalizability of great value for future research endeavors.

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