T01P06 / Designing Policy Mixes for Sustainable Socio-technical Transitions

Topic : T01 / Policy Process Theories

Chair : Araz Taeihagh (National University of Singapore)

Second Chair : Sreeja Nair (National University of Singapore)

GENERAL OBJECTIVES, RESEARCH QUESTIONS AND SCIENTIFIC RELEVANCE

The objective of this Panel titled “Designing policy mixes for sustainable socio-technical transitions" is to further our conceptual and theoretical understanding of policy transitions and policy mixes for sustainable transitions and to provide insights for policy practice by empirically grounding these concepts and frameworks.

Key questions that the panel papers and discussion is expected to address include the following:

- What are the characteristics of policy mixes designed to enable sustainable socio-technical transitions in different policy areas such as energy, water, agricultural production, environment, ICT etc. given the high levels of uncertainty in the future policy context stemming from climate change and rapid technological disruptions?

- What constitute good policy design principles (using conceptual frameworks and empirical evidence) to enable sustainable transitions and transformations?

Relevance

In terms of uncertainty in the policymaking context, there exists a range that moves from total ignorance of reality, to the deepest layer of uncertainty i.e., “unknown unknowns” (Walker et al., 2010). Effective policy mixes are expected to accommodate uncertainties in the future policy context by being flexible and adapt over time in expectation of a range of anticipated and unanticipated conditions (Swanson and Bhadwal, 2009; Taeihagh et al., 2014).

Apart from incremental policy change over time, when large changes are expected in the future policy context, the switch to transformative (completely new) policy options can be facilitated by incorporating these into the suite of policy strategies early on, which can also help “accommodate the long lead-times on associated decisions and actions” (Howden et al., 2010; Park et al., 2012). Planned transitions thus require responses that include both incremental and transformative strategies, though the composition of a policy mix of different alternatives in practice warrants further research (Smith et al., 2010; Park et al., 2012, Taeihagh et al. 2013). The policy literature is, however, inconclusive on whether policymakers prefer incremental changes under conditions of uncertainty or innovation when necessary through radical policy shifts through policy packaging. Crafting of conscious policy choices to enable transitions and transformations while considering the likely changes in the future policy context thus form the motivation for this panel.

CALL FOR PAPERS

Policymakers are continually designing policies to operate under future policy contexts about which they often have little or no information. For example, changes in the climate are impacting different spheres of societal development and, given the uncertainty and likelihood of non-linearity in future climatic changes, these impacts might be manifested to varying extents. Such environmental policy problems such as that posed by climate change challenges conventional decision-making and calls for innovative and sometimes transformative changes in policy design and implementation (Majone 2006; Taeihagh et al., 2009; Pelling, 2011; Smith et al., 2010; Howlett and Lejano 2013). Crafting of such conscious policy choices to enable necessary transitions and transformations while considering the likely changes in the future policy context form the motivation for this panel.

Policy formulation under uncertainty is challenging, given the interdependence and complexity of socio-technical systems (Taeihagh et al., 2009), identified as the interdependent complex of societal and technological development (Geels, 2004). Heazle et al. (2013) argue that incremental changes to current policies are more suitable under conditions of high complexity and uncertainty. In addition to incremental policy changes, transitions and transformations can be facilitated by incorporating relevant strategies into

the suite of policy alternatives early on (Howden et al., 2010; Park et al., 2012). The policy literature is, however, inconclusive on whether policymakers prefer incremental changes under conditions of uncertainty or innovation when necessary through transformative and radical policy shifts.

Recognizing this research gap, this panel invites theoretical and empirical papers that will analyse factors influencing socio-technical transitions and the policy mix of incremental and transformative choices in various sectors likely to face high levels of uncertainty in the future policy contexts. These papers can cover relevant sectors such as energy, water, transportation, agricultural production, urban development and ICT among others.

References

Geels, F.W., 2004, 'From sectoral systems of innovation to socio-technical systems: Insights about dynamics and change from sociology and institutional theory', Research Policy , 33 (6-7), pp. 897-920

Heazle, M., P. Tangney, P. Burton, M. Howes, D. Grant-Smith, K. Reis, and K. Bosomworth. 2013."Mainstreaming Climate Change Adaptation: An Incremental Approach to Disaster Risk Management in Australia". Environmental Science and Policy. 33: 162

Howden SM, Crimp S, Nelson RN., 2010. Australian agriculture in a climate of change. In 'Managing Climate Change: Papers from GREENHOUSE 2009 Conference'. (Eds I Jubb, P Holper, W Cai) pp. 101–112. (CSIRO Publishing: Melbourne)

Howlett, M., and Lejano, R. P. (2013). Tales from the crypt: The rise and fall (and rebirth?) of policy design. Administration & Society, 45(3), 357-381.

Majone, G. (2006). Agenda setting. In Moran et al. (eds.), The Oxford Handbook of Public Policy. Oxford University Press. 228-250.

Park SE, Marshall, N. A., Jakku, E., Dowd, A. M., Howden, S. M., Mendham, E., & Fleming, A.., 2012. Informing adaptation responses to climate change through theories of transformation. Global Environmental Change 22:115–126.

Pelling M., (2011), Adaptation to climate change: from resilience to transformation. Routledge publishers, United Kingdom.

Smith M S, Horrocks L, Harvey A and Hamilton C, 2010. Rethinking adaptation for a 4° C world. Philosophical Transactions of the Royal Society, 2011.

Swanson, D. and S. Bhadwal (Eds.), 2009. Creating Adaptive Policies: A Guide for Policymaking in an Uncertain World, Sage, New Delhi/IDRC, Ottawa.

Taeihagh, A., Bañares-Alcántara, R., and Givoni, M., 2014, A virtual environment for formulation of policy packages, Transportation Research Part A, Volume 60, February 2014, Pages 53–68 http://dx.doi.org/10.1016/j.tra.2013.10.017

Taeihagh, A., Bañares-Alcántara, R., and Millican, C., 2009, Development of a Novel Framework for the Design of Transport Policies to Achieve Environmental Targets, Computers and Chemical Engineering, 2009, http://dx.doi.org/10.1016/j.compchemeng.2009.01.010

Taeihagh, A., Givoni, M., and Bañares-Alcántara, R., 2013, Which policy first? A network-centric approach for the analysis and ranking of policy measures, Environment and Planning B: Planning and Design 40(4) 595 – 616, http://dx.doi.org/10.1068/b38058

T01P06 / Designing Policy Mixes for Sustainable Socio-technical Transitions

Chair : Araz Taeihagh (National University of Singapore)

Second Chair : Sreeja Nair (National University of Singapore)

Session 1Theoretical Discussions

Wednesday, June 28th 14:00 to 16:00 (Li Ka Shing LKS 1 - 2)

Discussants

Kaveri Iychettira

Sreeja Nair (National University of Singapore)

The politics of policy mix evolution: Towards a conceptual framework of policy mix feedbacks in socio-technical transitions

Duncan Edmondson (Hertie School of Governance)

Florian Kern (University of Sussex)

Karoline Rogge (University of Sussex)

The politics of policy mix evolution: Towards a conceptual framework of policy mix feedbacks in socio-technical transitions

Designers of policy mixes aiming to foster sustainable socio-technical transitions face significant challenges, while having to account for uncertainty in a changing social, technical and economic context (Hoppmann et al., 2014; Rosenow 2013). Such changing conditions mean that revisions to policy mixes for socio-technical transitions are often necessary, and that there will be continued policy discussions involving multiple actors over the rate and direction of travel. Policy reformers can aim to foster transitions through supporting novel emergent technologies alongside the current configuration (Smith and Raven 2012) and more radical reforms reducing support for the status quo (Kivimaa and Kern 2016). Sustainability transitions are often politically contested (Smith and Stirling 2010), and commonly feature close relationships between state actors and incumbent industry actors who may lobby to oppose the new direction of travel (Unruh 2000; Walker 2000; Kern and Howlett 2009). Consequently, maintaining political support for transition policies over time is fundamental to enable socio-technical change which can take decades to unfold.

In our paper, we conceptualise these processes by building on insights from policy feedback thinking (Pierson 1993), which draws attention to the continuous interactions between public policy, the outcomes in society, and how these outcomes affect policy actors in ways that influence subsequent policy making (Skocpol 1992; Patashnik and Zeilzer 2013). At the broadest level, policy feedback refers to how policies affect politics over time (Beland 2010). Policies can create self re-enforcing effects (Pierson 1993, Beland 2010, Campbel 2012), which cause the costs of choosing policy alternates to increase markedly over time, creating lock-in and path dependency (Pierson 1993, 2000). We, however, follow a recent line of scholarship which has brought attention to instances where policy may fail to produce self re-enforcing effects (Patashnik and Zeilzer 2013), or may produce effects that may undermine the political support for the policy mix over time leading to policy revision or termination (Oberlander and Weaver 2015). We suggest this analytical focus offers insights to explain the dynamic and recursive nature of how policy mixes and the socio-technical system interact. In doing so, the contribution of the paper is to take a first step towards better conceptualising the co-evolutionary dynamics between policy mixes and socio-technical change, by focusing on the processes which mediate this relationship.

The paper presents a novel conceptual framework for analysis which focuses on actors in the socio-technical system and their incentives to participate in policy making processes. The framework highlights that policy mixes aiming to foster transformative change need to be designed to create incentives for beneficiaries to mobilise support, while overcoming a number of prevailing challenges which may

undermine political support over time. The proposed framework aims to explore how policy mixes for sustainability transitions generate feedback mechanisms that influence subsequent policymaking and the evolution of the mix, and how changing conditions to the socio-technical system strengthen or constrain policy feedback mechanisms.

We demonstrate the usefulness of the framework with an illustration of the zero carbon homes policy mix in the UK, representing an instance of ambitious policy reform which was unsuccessful in stimulating radical change. The paper links with the themes of the panel with a central focus on the design of policy mixes and the changing conditions which influence the coevolution of policy mixes and socio technical change. By better understanding these factors, policy makers can anticipate the challenges that policy reform may face and design policy mixes in ways that can lead to greater chances of reforms to become self-reinforcing and to facilitate transitions.

References

Beland, D. (2010). Reconsidering Policy Feedback: How Policies Affect Politics. Administration & Society, 42(5), 568–590. https://doi.org/10.1177/0095399710377444

Campbell, A. L. (2012). Policy Makes Mass Politics. Annual Review of Political Science, 15(1), 333–351. https://doi.org/10.1146/annurev-polisci-012610-135202

Hoppmann, J., Huenteler, J., Girod, B. (2014). Compulsive policy-making - The evolution of the German feed- in tariff system for solar photovoltaic power. Research Policy, 43(8), 1422–1441. https://doi.org/10.1016/j.respol.2014.01.014

Kern, F., Howlett, M. (2009). Implementing transition management as policy reforms: a case study of the Dutch energy sector. Policy Sciences, 42(4), 391–408. https://doi.org/10.1007/s11077-009-9099-x

Kivimaa, P., Kern, F. (2016). Creative destruction or mere niche support? Innovation policy mixes for sustainability transitions. Research Policy, 45(1), 205–217. https://doi.org/10.1016/j.respol.2015.09.008

Oberlander, J., Weaver, R. K. (2015). Unraveling from Within? The Affordable Care Act and Self-Undermining Policy Feedbacks. The Forum, 13(1), 37–62. https://doi.org/10.1515/for-2015-0010

Patashnik, E. M., Zelizer, J. E. (2013). The Struggle to Remake Politics: Liberal Reform and the Limits of Policy Feedback in the Contemporary American State. Perspectives on Politics, 11(4), 1071–1087. https://doi.org/10.1017/S1537592713002831

Patashnik, E., Zelizer, J. (2009). When policy does not remake politics: The limits of policy feedback. Annual Meeting of the American Political Science Association, Toronto, Canada, 1–39. Retrieved from http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1449996

Pierson, P. (1993). Policy Feedback and Policy Change. World Politics, 45(4), 595–628.

Pierson, P. (2000). Increasing Returns, Path Dependence, and the Study of Politics. The American Political Science Review, 94(2), 251–267.

Rosenow, J. (2013). The politics of the German CO2-Building Rehabilitation Programme. Energy Efficiency, 6(2), 219–238. https://doi.org/10.1007/s12053-012-9181-7

Skocpol, T. (1992). Protecting soldiers and mothers: The political origins of social policy in the United States. Cambridge, MA: Belknap Press.

Smith, A., Raven, R. (2012). What is protective space? Reconsidering niches in transitions to sustainability. Research Policy, 41(6), 1025–1036. https://doi.org/10.1016/j.respol.2011.12.012

Smith, A., Stirling, A. (2010). The politics of social-ecological resilience and sustainable socio-technical transitions. Ecology and Society, 15(1). https://doi.org/10.5751/ES-04565-170208

Unruh, G.C., (2000).Understanding carbon lock-in. Energy Policy 28, 817-830.

Walker, W., (2000). Entrapment in large technology systems: institutional commitment and power relations. Res. Policy 29, 833–846.

Preparing for socio-technical transitions: Opportunities and challenges for policy design

Sreeja Nair (National University of Singapore)

Araz Taeihagh (National University of Singapore)

Effective policy mixes are expected to accommodate uncertainties in the future policy context by being flexible and adapt over time in expectation of a range of anticipated and unanticipated conditions (Swanson and Bhadwal, 2009; Taeihagh et al., 2014). In response to shifts in the future policy context, while policy changes can manifest as increments to status quo over time, policymakers may also need to face the possibility of making major policy shifts in order to enable transition into more appropriate policy regimes. In the context of socio-technical (the interdependent complex of societal and technological development (Geels, 2004)) transitions this can include shifts towards sustainable futures for example by aiming at sustainability of resources such as energy and water.

When large changes are expected in the future policy context, the switch to completely new policy options can be facilitated by incorporating these into the suite of policy strategies early on, which can also help “accommodate the long lead-times on associated decisions and actions”, such as policy responses taken to address climate change (Howden et al., 2010; Park et al., 2012). Planned transitions thus require responses that include both incremental and radical strategies, though the composition of a policy mix of different alternatives in practice warrants further research (Smith et al., 2010; Park et al., 2012, Taeihagh et al. 2013). This paper focuses on integrating policy design thinking into the crafting of conscious policy choices and mixes to enable socio-technical transitions while considering the likely changes in the future policy context.

References

Geels, F.W., 2004, ‘From sectoral systems of innovation to socio-technical systems: Insights about dynamics and change from sociology and institutional theory’, Research Policy , 33 (6-7), pp. 897-920

Howden SM, Crimp S, Nelson RN., 2010. Australian agriculture in a climate of change. In ‘Managing Climate Change: Papers from GREENHOUSE 2009 Conference’. (Eds I Jubb, P Holper, W Cai) pp. 101–112. (CSIRO Publishing: Melbourne)

Park SE, Marshall, N. A., Jakku, E., Dowd, A. M., Howden, S. M., Mendham, E., & Fleming, A.., 2012. Informing adaptation responses to climate change through theories of transformation. Global Environmental Change 22:115–126.

Smith M S, Horrocks L, Harvey A and Hamilton C, 2010. Rethinking adaptation for a 4° C world. Philosophical Transactions of the Royal Society.

Swanson, D. and S. Bhadwal (Eds.), 2009. Creating Adaptive Policies: A Guide for Policymaking in an Uncertain World, Sage, New Delhi/IDRC, Ottawa.

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Of Technocrats and Believers - Factors Driving Instrument Selection in Complex Transitional Settings

Lorenz Kammermann (Eawag & University of Bern)

Karin Ingold (University of Bern)

In the wake of the COP21 conference in Paris global warming and a transition to an alternative energy supply are as some of the most central issues on the political agenda. In order to achieve the newly formulated goals nation states need to adopt ambitious measures for the development and deployment of low-carbon technologies. Recent studies about renewable energy transitions mostly cover the impact of these policies on the outcome, i.e., the production of renewable electricity or the decrease in carbon emissions. However, much less is known about what factors drive the selection and implementation of policy instruments in such transformational settings. In these highly complex situations, measures for the promotion of low-carbon technologies might be added to the policy mix because political actors consider them to be effective and/or efficient. However, policy instruments not only have to fit those criteria they also

need to be accepted by the political elite in order to be selected, and by the public to be successfully implemented. This paper explores the nexus between criteria of policy design (e.g., effectiveness or efficiency) and criteria that form the political actor's preferences (e.g., environmental preservation or social justice). We therefore ask what factors drive instrument selection in the context of complex transitional settings? By answering this question, we also try to conceptually clarify what combinations of factors make a 'good' policy mix for the successful transition to more low-carbon technologies. We argue that 'good' policy mixes do not only score high with the technocratic criteria of policy design but that they are also legitimized by the acceptance of political elites and the public. We also expect among others that the relevant criteria for instrument selection depend on the type of actor involved in the policy process.

To answer those questions, we focus on the Swiss case. Federalist Switzerland is interesting for several reasons: first, Switzerland knows a strong climate mitigation policy since the beginning of the 20th century. This might create an overall favorable context for the promotion of a carbon-free energy supply. Additionally, after the Fukushima incident in 2011, the Swiss government decided the nuclear phasing out. This move might give renewable energy supply a particular boost. Third, being a federalist country, the subnational states are the implementing force behind the energy transition. Due to their similarity we can adopt a most similar case design for their comparison. We collected extensive survey data among the political actors in the subnational states that cover their preferences regarding current and potential future instruments enabling a renewable energy transition as well as their political beliefs. The policy design criteria are derived from an in-depth literature analysis and are validated by policy experts. In order to understand the connections between the before mentioned factors we innovatively combine social network analysis (SNA) with multi-criteria decision analysis (MCDA).

The evolution and effects of policy mixes for low-carbon energy transitions

Tobias Schmidt (ETH Zurich)

Sebastian Sewerin (Delft University of Technology)

Mitigating climate change, ocean acidification, and other environmental issues related to carbon emissions requires a fast and substantial transformation of the energy, transport and several industry sectors. Two important insights from the literature analyzing policies' effects on technological transitions emerge: First, the design of policies is often more important than the instrument types chosen; and second, a focus on individual instruments and their interplay might be too narrow as policy mixes generally reveal a far greater complexity. Thus far, however, these two insights have seldom been brought together in empirical studies so that until now specific design features of complex policy mixes have not been analyzed systematically. In this paper we take a first step to address this research gap by assessing the evolution of one important design feature – technology-specificity –using a modified version of the Index of Policy Activity. Applying this approach to renewable energy policy mixes in nine countries, we find that strong differences in terms of their technology-specificity exist between countries and over time. We then use panel regression analysis to estimate the effect of technology-specificity of policy mixes on the diffusion of different renewable energy technologies. Our dataset covers 562 policy instruments in 9 countries and over 16 years. We find that less mature technologies are significantly dependent on policy mixes with a high technology-specificity, whereas more mature technologies are dependent on less technology-specific policy mixes. Our findings can serve as a basis for improving strategies for 'patching' existing policy mixes. By providing a better conceptualization and measurement of policy mix characteristics that combines insights from innovation and transition studies, policy design and policy mix literature we help bridging archipelagos between these communities and derive avenues for future research into policy mixes' impact on socio-technical transitions.

T01P06 / Designing Policy Mixes for Sustainable Socio-technical Transitions

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Session 2Applied Cases

Wednesday, June 28th 16:15 to 18:15 (Li Ka Shing LKS 1 - 2)

Discussants

Duncan Edmondson (Hertie School of Governance)

Towards a comprehensive policy for electricity from renewable energy: A Structured Design Approach

Kaveri Iychettira

In energy policy analysis general equilibrium models and optimization models are the preferred tools. However, the outcomes depend heavily on underlying assumptions about reality, so much so, that their applicability to policy-making has been questioned (Riley 2015). Nonetheless, their status quo is strengthened by the neo-classical school of thought in policy design, at least in Europe. This is evident in the Guidelines for incentivizing Renewable Energy Sources from Electricity (RES-E) by the European Commission: the State Aid Guidelines, which promote all renewable support having the form of competitive bidding (European Commission 2014). The important question to be addressed here, is whether such a strategy is indeed appropriate to achieve the predefined goals of competition, affordability, and sustainability.

For answering this question a structured approach to policy design of a Complex Adaptive System (CAS) such as the electricity sector is needed. This would facilitate the representation and analysis of real-world policy choices better than existing mainstream approaches. A formal approach would not only help analyze existing policies and their impact on the CAS, but also allow the exploration of the full policy design space in a structured fashion. This is achieved by incorporating the institutional context into the analysis.

This paper presents a formal approach to RES-E policy design based on Design Theory (Herder and Stikkelman 2004), the Institutional Analysis and Development (IAD) Framework(Ostrom 2005), and Agent Based Modelling and Simulation. Given a certain frame of analysis, we propose that it is theoretically possible to identify the complete policy design space. Crucially, this aspect potentially opens up to the policy analyst new avenues for intervention, and allows her systematically explore, given a range of uncertainties, which element(s) of intervention is(are) the most vital to achieve the goals of the community.

Its empirical applicability is demonstrated by representing and differentiating between six RES-E schemes from Western Europe in terms of the design elements; a model-based validation demonstrates the value of this approach to quantitatively analyse the impact of design elements. The implementation of the modelling framework, the analysis and results have been described in detail in (Iychettira et al. 2017).

In the present paper we demonstrate the structured design approach which contributes to a more comprehensive policy design. By this, we pave the way towards a more informed governance of the energy transition in Europe.

References

European Commission. 2014. “A Policy Framework for Climate and Energy in the Period from 2020 to 2030.” European Commission. Nov 2014. http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52014DC0015.

Herder, Paulien, and Rob M. Stikkelman. 2004. “Methanol-Based Industrial Cluster Design: A Study of

Design Options and the Design Process." Industrial & Engineering Chemistry Research 43 (14): 3879–85. doi:10.1021/ie030655j.

Iychettira, Kaveri K., Rudi A. Hakvoort, Pedro Linares, and Rob de Jeu. 2017. "Towards a Comprehensive Policy for Electricity from Renewable Energy: Designing for Social Welfare." Applied Energy 187: 228–42. doi:http://dx.doi.org/10.1016/j.apenergy.2016.11.035.

Ostrom, Elinor. 2005. Understanding Institutional Diversity. Princeton, New Jersey: Princeton University Press.

Riley, Brook. 2015. "What VW and the EU's Climate Models Have in Common." Energy Journalism. Energy Post. October 19. http://www.energypost.eu/volkswagen-eus-climate-models-common/.

Designing policy mixes for complementariness: Lessons from building energy efficiency programmes in New York, Tokyo, Seoul and Sydney

Gregory Trencher (Tohoku University)

Cities are crucial sites for achieving socio-technical transitions in key infrastructure systems. Raising building energy efficiency through new construction or retrofitting holds particular relevance to sustainability transitions since this requires diffusion of new technologies and energy management practices. In pursuit of this, city policymakers around the world are increasingly utilising mixes of multiple policy instruments. The idea that interactions occur across instruments is integral to understanding policy mixes. Positive interactions that enhance the outcomes of other instruments or even the entire mix can be conceived as complementarities. Whilst previous research has focused on how policy mixes can be assembled, knowledge on how exactly complementarities may arise, and what different types are possible, has been limited.

Addressing this gap, we set out to understand how complementariness between different instruments in a policy mix can be achieved. In studying policy mixes designed to promoted building energy efficiency and retrofitting in New York, Seoul, Sydney and Tokyo, our analysis unearthed five distinct kinds of complementarities: coverage, temporal, facilitation, functional and synergistic. Our multi-case analysis illustrates how these arise in practice, also examining conditions that affect the ability of policymakers to successfully design complementarities and achieve enhanced results in mixes.

Shifting gears to post carbon living: tracking the socio-technical transitions in renewable energy policy in Australia

Yvonne Haigh (Murdoch University)

Renewable energy policy in Australia is part of the nation's approach to addressing de-carbonisation; the policy context also provides some means to meet the commitments of the Paris Agreement to maintain temperature below 2° C by 2030. The policy context in Australia has suffered from a series of conflicts, expansions and subsequent contractions that has resulted in policy stagnation in some areas and radical innovative approaches in others. This paper contributes to understanding these fluctuations and explains the transition pathways undertaken in both cases. The Australian political system incorporates a hybrid Westminster Parliamentary system with elements of the US style federalism that comprise a national level government, six State level governments and two Territory level governments. These political institutions add complicating factors in all attempts to implement effective and coherent renewable energy policy. Moreover, the policy area is framed by Australia's historical and cultural acceptance of natural resource exploitation, an emphasis on economic benefits and resource security for incumbent industry sources. This situation has resulted in a disparity between the national government's energy policy approach and respective State government approaches. This paper examines these policy contexts by reviewing government legislation, institutions and policy initiatives at the national level and in each respective State and Territory. The comparison between the various policy contexts identifies both conservative, incremental policy design features at the national level and innovative and transformative design approaches at some State based levels. The paper applies Cherp et al's framework for analysing low-carbon transitions based on the interplay of techno-economic, political and socio-technical processes (Cherp et al 2017). The paper draws on a range of Australian government energy statistics, the Renewable Energy Target initiative, departmental reviews of the Australian National Energy Market and the Western Australian Energy Market, stakeholder engagement submissions and academic books and articles. The paper makes two contributions to the study of socio-technical transitions in renewable energy: first, both incremental and transformative policy choices can function simultaneously in a multi-level system of government; and second, policy design features need to enable alliances between incumbent energy sources and new players in the field.

Connecting policy for a low carbon future

Alastair Stark (University of Queensland)

The necessity of moving towards a low-carbon society is recognised at the international level by organisations ranging from the EU and the OECD to the UN. Yet national policy makers in Australia have struggled to develop integrated policy solutions that connect different socio-technical systems together so that climate change can be properly addressed. The central research question tackled in this paper is therefore; how do we institutionalise an *integrated* transition to a low-carbon society through public policy? This paper addresses this question through a study that analyses the ways in which social policy, urban planning and environmental policy solutions can be integrated through the mechanisms of deliberative democracy and participatory governance.