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# THE UNTAPPED POTENTIAL OF INFORMATION FLOWS FOR LONG-TERM URBAN RESILIENCE POLICY

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## ABSTRACT

Recent decades have seen urban resilience becoming a more popular term internationally both within academic and policy circles. However, relatively little attention has been paid by the literature to the policy implications of striving towards more resilient urban systems and the challenges introduced by the complex, multi-level and multi-actor policy network that forms their context. The central hypothesis of this research is that resilience is a long-term goal, beyond immediate disaster planning and management, and an ongoing process that requires a proactive approach (as opposed to a reactive approach). This builds on the idea that focusing only on the immediate outcomes of extreme events keeps the city on a "catch-up mode", which is both unsustainable and inefficient in the long-term. This research proposes that in order to progress towards resilience that endures, the policies that underpin these efforts must remain effective and "survive" short-term pressures. It attempts to pinpoint the main elements that, if understood and addressed, can help policies withstand sources of stress and remain effective in delivering more enduring or sustainable forms of resilience.

While there are many factors that have already been identified, this paper will explore only one aspect: Information flows. This is a topic that although is often mentioned as "important" in policy literature, it is also rarely explored. The following is the result of a qualitative meta-analysis of over 100 references relating to resilience, sustainability, and multi-actor network and complex problems policy. This paper also includes the results from the first half of a series of interviews with policy experts from industry, government and research from Australia, the UK and the USA.

Key words: resilience, urban policy, information, sustainable, policy framework

# INTRODUCTION

The term resilience has been increasingly used in recent years both in academic literature and urban policies. This is often seen as "*part of a broader drive towards more 'safe' and sustainable communities and in particular is connected to concerns about environmental sustainability"* (Coaffee & Bosher, 2008). In order to progress towards more resilient and sustainable cities, Chelleri et al. (2015) argue that resilience needs to be discussed as a set of principles that form the policy framework within which sustainable development goals and cities are delivered. Resilience is thus a framing mechanism or approach that aims to develop the capacity to cope with uncertainty while "*maintaining the overall system persistence*" (Hassler & Kohler, 2014b). Within this context of uncertainty, persistence may depend on foresight, proactive policies and the capacity to quickly adapt to changes (Moffatt, 2014). Urban policies are a critical factor in moving towards higher levels of resilience and bringing global problems, such as climate change, to a local governance context (Jabareen, 2013).

Hjorth and Bagheri (2006) point out that managing for the future is a "wicked" problem for policy makers and implementers. This is because challenges are constantly changing and it is not possible to discern the ultimate consequences of present actions with certainty. Coaffee and Bosher (2008) further argue that the only way to deliver long-term resilience that is in line with sustainability principles is to include systems of governance that seek to coordinate efforts across organisational boundaries of the policy networks that design and manage cities. The present research adds to this line of argument that for resilience efforts to be effective, the policies that frame those efforts also need to be resilient in order to ensure sustained outcomes over the long term.

### The role of information flows

> *We are living in a world of networks, and these networks are becoming more interdependent every day. Social networks are inextricably entangled with communication networks, transportation networks, logistical networks, and the like. The increasing dependencies and the increasing densities of these networks imply that a disruption in any one affects all the others. For a policy to be effective in such complex systems, response has to be very rapid, but their very complexity makes decision-making difficult and time-consuming.*
>
> (Barrett, et al., 2011)

Like cities, policy processes can be seen as "*a complex phenomenon of continuous interactions involving public policy and its context, events, actors, and outcomes"* (Weible, 2014). These interactions, it is here argued, include the interplay between policy processes and outcomes, politics, institutional and financial arrangements, and societal and socio-technical networks that support all of the above. These interplays are highly dependent on decision-making actors and the information flows that support their actions.

These interactions are however often ignored in academic literature that focuses on complex issues, such as sustainability and resilience, that require sustained action across different levels of governance and time scales (Bulkeley & Betsill, 2005). Nevertheless, understanding this context of local policy-making and the ways in which these forces influence policy choices "*is an important priority for research in this field*" (Vogel & Henstra, 2015).

"*The role and use of information in policy is an ongoing matter of discussion in public policy"* but poor information commonly results in poor policies (Dovers, 2005). Information has a fundamental role to play in policies that deal with problems characterised by complexity and uncertainty (Mintrom & Norman, 2009). This research is underpinned by Dovers' (2005) concept of Type 3 institutional resilience. This is characterised by openness and adaptability within a context of uncertainty and constant change. Although sometimes considered an elusive objective, complex issues such as sustainability and resilience require a great deal of coordination of information, communication and policy efforts across political and governance boundaries (Dovers, 2005). The assessment of the effectiveness of these policies is also "*critically dependent upon the flow of data between information providers and users"* (Vogel, Moser, Kasperson, & Dabelko, 2007). The complexities of the challenges faced by and the technological context of urban environments are proposed to require a new approach of decision-making based on continual information flows. This is "*massive in scale, fine-grained in resolution, and distributed over many data sources"* (Barrett, et al., 2011). The following sections will briefly explore the three main elements related to information that were found in a literature review and the early feedback from resilience experts.

# METHODOLOGY

### Literature review and framework development

This research includes a meta-analysis of resilience, sustainability, and multi-actor network and complex problems policy publications in order to

identify general patterns of what the literature reports as characteristics of effective and ineffective policy strategies. Here effectiveness relates to the ability of a policy to deliver sustained outcomes within and beyond the voting/funding cycle. This meta-analysis followed a similar methodology to that outlined by Carey and Crammond (2015), based on a thematic analysis of published literature that discusses how resilience and sustainability thinking can affect policy development and implementation processes and content. The research focused on answering the question of what processes help deliver policies that can remain effective and proactive over the long term.

The initial search was done through Google Scholar, Scopus and UNSW Library Catalogue, however it was then extended based on references found in relevant publications. The latter is sometimes referred to as snowball sampling technique (Park & Gretzel, 2007). The search terms were: resilience policy, sustainability thinking, resilience thinking, sustainable resilience, proactive resilience, urban policy for complex problems and multi-actor networks, and climate change policy. The inclusion criteria were: academic and policy papers and book chapters that discuss the topics of resilience, sustainability, multi-actor network and complex problems within a policy context; published in English; and published since 1970. This provided 278 papers and book chapters which were considered to be relevant to the study. These were then screened for those that contained specific insight to the topic outlined above. The detailed literature review that informs this research has so far included over 100 references and may be expanded in the future as a result of the interviews. This review was complemented with an online search, via the key words outlined above, of recent (since year 2000) urban resilience programs and initiatives.

**Expert consultation**

The expert consultations are being informed by a series of one-hour interviews, either face-to-face or via telephone/video call. This research activity aims to test the factors found in the literature and gain critical insight into potential missing factors. Experts are divided into three categories, each containing three individuals; these are: Research, Government and Industry. The selection criteria for the interviewees are: (i) ample knowledge about urban resilience/sustainability policy internationally or in Australia; (ii) at least 10 years of experience; and (iii) willingness to participate. This paper includes the results from the first five interviews of two industry and three researcher experts from Australia, the UK and the USA.

# FINDINGS AND DISCUSSION

Policy settings often exist within a context of ambiguity (Storch & Winkel, 2013). However, information flows are proposed here to be a fundamental part of allowing policy systems to remain contextually aware and adaptable. There were three elements related to information found to be highlighted as supporting long term policy adaptability and efficacy, or if missing hindering it: Information infrastructure and ICT, science-practice interface, and information literacy.

The interviews highlighted the importance of availability and accessibility of data and information. Specifically, they pointed out its relevance for innovation, scenario modelling and communication, early detection of issues, and the ability of individuals to self-organise and make informed-decisions driven by resilience-thinking. The interviewees also agreed that information infrastructure and support systems, information/data needs and funding mechanisms for ongoing information flows were areas of importance for resilience policies.

### Information infrastructure and ICT

Meerow et al (2016) and Sanchez et al (2016) highlight that socio-technical networks have significant impact on the resilience of the cities they are embedded in. These are networks where technologies and technological functions closely interact with social functions and social interests (Hodson & Marvin, 2010; Kling, McKim, & King, 2003). Considering these networks as part of the fabric that makes cities means reconceptualising "*cross-scale interactions as interdependencies between technical and social networks*" (Ernstson, et al., 2010). This emphasises that cities are formed by multiple networks (social, ecological and technical) whose functioning depends on the sharing of information.

Information communication in general is also a key part of the principles of cohesion and coordination of the sustainable resilience concept proposed by Sanchez et al. (2016). ICT tools used "*to promote citizen participation in planning decision making and more active contributions to the planning process* have *huge significance for pursuing the principle of collaboration needed to make progress toward resilience"* (Collier, et al., 2013). This appears especially relevant now that information and communication technologies (ICT) continue to gain a centre place in policy delivery. However, "*while the amount and diversity of data continue to proliferate, along with their increased accessibility, the information and procedures that satisfy the level of detail and contents needed for addressing urban resilience are sparse and unsystematic at best"* (Collier, et al., 2013). Collier et al. (2013) further suggest that

certain information infrastructure needs to be established to ensure the relevance and interoperability of datasets that can underpin integrated and accessible information systems that support progress towards achieving long-term, complex policy goals. Standards that outline issues such as language, scope, scale, attributes and formats are therefore suggested to be fundamental components of such information infrastructure.

Part of this information infrastructure may include data portals and urban information modelling. Sanchez et al. (forthcoming 2017) further explore the implications of this component for sustainable resilience policy.

The experts interviewed highlighted the importance of maintaining systems that allow free access to longitudinal records that are available to decision makers, and especially regarding information that can be used for purchasing decisions and by local residents. One of the research experts who had considerable prior experience working with governments in Australia and the USA pointed out how for city planning, comprehensive and integrated databases of prior policy decisions and their results across jurisdictions supports better future decision making.

The use of smart city programs to support information sharing across urban jurisdictions, the ability to make this information open source through open platforms were also mentioned as positive steps towards establishing better information infrastructure for more effective resilience planning. These kinds of systems were seen as potentially disrupting the traditional policy and funding cycle to identify issues faster and promote innovation from other sectors. One of the challenges raised was the privatisation of infrastructure and the lack of leadership from the public sector in making sure data owned by the private sector that is relevant to urban resilience is available to decision-makers and the broader public. Examples included risk, post disaster and other relevant data owned by insurance companies; and private infrastructure information flows. The literature adds to this the difficulties already involved in accessing information owned by public entities, see for example Bettencourt (2015).

Besides information systems, the interviewees mentioned as critical areas:

- the smart design of contracts to ensure information flows are maintained,
- embedding data flows as routine/automated part of existing and well-established processes by apolitical institutions; for example, the bureau of statistics gathering and publishing certain information as part of their annual statistics reports,

- systems that support information coordination across complex networks
- processes that support the scalability of data/information,
- using regional associations formed by multiple actors to leverage limited local funds in order to fund information systems and make them more politically and economically stable, and
- mapping the information needs of those involved in the policy network that will enable the long-term delivery of policy programs.

**Science-practice interface**

*"Policy processes draw on information from many sources within government circles, the community and specialist sources such as research bodies"* (Dovers, 2005). In countries such as Norway, one of the main barriers for effective climate change adaptation policies has been found to be the lack of familiarity with relevant data, lack of data itself and lack of local expertise (Amundsen, Berglund, & Westskog, 2010). Given the emerging nature of complex challenges, Amundsen et al (2010) highlight the need to ensure useful scientific knowledge reaches municipalities and other decision-makers. Research and information are however often not a deliberate part of the policy process (Weiner, 2011).

Vogel et al (2007) propose that science-practice can no longer be a linear, unidirectional process. Instead, they argue that the interface between information, knowledge and policy needs to become "*a multi-level system of governance and knowledge production among a range of actors engaged in understanding and managing environment–society interactions"*. Where actors can work together in a coordinated way in order to maintain the sensitivity of the system to context changes and quickly adapt as required. Within this context, knowledge flows in many directions; "*scientific input can occur at any or all stages"* of policy decision-making. This process may be able to continually support decision-makers by creating lines of communication that ensure scientific information meets their information needs. It may also help avoid issues such as that highlighted by a UK study by Davoudi et al. (2013) where an interviewee expressed that the unprecedented pace at which science and understanding is currently moving is a critical barrier to keeping policies relevant.

The interviewees agreed on the importance of establishing more dynamic ties between research and practice. One interviewee from the financing sector mentioned its role in driving change through experimentation. Another interviewee from the research sector highlighted that co-production of knowledge is also an area that remains mostly unexplored within the urban context. This however can be significantly challenging

due to the large number of actors but with potentially considerable rewards in terms of developing enduring policies.

### Information literacy

This relates to whether resilience policies also consider the information literacy of their target audience. This *is "an understanding and a set of abilities enabling individuals to recognise when information is needed and have the capacity to locate, evaluate, and use effectively the needed information"* (The University of Sydney, 2016). Information literacy has been directly linked to empowerment of individuals and society as well as life-long learning (Weiner, 2011). Young and Middlemiss (2012) suggest that policies that aim to influence attitudes and change behaviours, should consider instruments that ensure information provided is transparent, unbiased and can be easily related to the target's personal context.

One of the interviewees highlighted that this aspect needs to be more developed in resilience policies, creating an understanding of the information literacy of different levels of decision making, especially around resilience benefits. This was supported by an industry expert who highlighted this as an improvement area for most resilience policies. Another research sector interviewee highlighted the relevance of having processes that support decision-makers' ability to understand and create knowledge based on existing information flows and that without this ability information is meaningless.

## CONCLUSIONS

Although the role of information flows and its practical implications are often overlooked by policy frameworks, this research suggest that three elements may be important when designing new policies that aim to deal with long-term, complex goals. These are: information infrastructure and ICT, science-practice interface and information literacy. These are here argued to have the potential to support more adaptive, flexible, efficient and effective urban resilience policy. Future research will continue to explore these elements through more expert consultations and case studies of resilience policy development and implementation.

## REFERENCES

Amundsen, H., Berglund, F., & Westskog, H. (2010). Overcoming barriers to climate change adaptation: A question of multilevel governance? *Environment and Planning C: Government and Policy, 28*, 276-289.

Barrett, C. L., Eubank, S., Marathe, A., Marathe, M. V., Pan, Z., & Swarup, S. (2011). Information integration to support model-based policy. *Innovation Journal, 16*(1), 1-16.

Bettencourt, L. A. (2015). Cities as complex systems. In B. A. Furtado, P. A. Sakowski, & M. H. Tóvolli (Eds.), *Modeling Complex Systems for Public Policies* (pp. 217-236). Brasília: IPEA.

Bulkeley, H., & Betsill, M. M. (2005). Rethinking sustainable cities: Multilevel governance and the 'urban' politics of climate change. *Environmental Politics, 14*(1), 42 – 63.

Carey, G., & Crammond, B. (2015). What works in joined-up government? An evidence synthesis. *International Journal of Public Administration, 38*, 1020-1029.

Chelleri, L., Schuetze, T., & Salvati, L. (2015). Integrating resilience with urban sustainability in neglected neighborhoods: Challenges and opportunities of transitioning to decentralized water management in Mexico City. *Habitat International, 48*, 122-130.

Coaffee, J., & Bosher, L. (2008). Integrating counter-terrorist resilience into sustainability. *Proceedings of the ICE: Urban Design and Planning, 161*(2), 75 - 83.

Collier, M. J., Nedovic´ -Budic, Z., Aerts, J., Connop, S., Foley, K., Newport, D., . . . Verburg, P. (2013). Transitioning to resilience and sustainability in urban communities. *Cities, 32*, S21–S28.

Davoudi, S., Brooks, E., & Mehmood, A. (2013). Evolutionary resilience and strategies for climate adaptation. *Planning, Practice & Research, 28*(3), 307–322.

Dovers, S. (2005). *Environment and Sustainability Policy: Creation, Implementation, Evaluation.* Leichhardt, Australia: The Federation Press.

Ernstson, H., van der Leeuw, S. E., Redman, C. L., Meffert, D. J., Davis, G., Alfsen, C., & Elmqvist, T. (2010). Urban transitions: On urban resilience and human-dominated ecosystems. *Ambio, 39*(8), 531-545.

Hassler, U., & Kohler, N. (2014b). Resilience in the built environment. *Building Research & Information, 42*(2), 119-129.

Hjorth, P., & Bagheri, A. (2006). Navigating towards sustainable development: A system dynamics approach. *Futures, 38*(1), 74-92.

Hodson, M., & Marvin, S. (2010). Can cities shape socio-technical transitions and how would we know if they were? *Research Policy, 39*, 477-485.

Jabareen, Y. (2013). Planning the resilient city: Concepts and strategies for coping with climate change and environmental risk. *Cities, 31*, 220-229.

Kling, R., McKim, G., & King, A. (2003). A Bit More to It: Scholarly Communication Forums as Socio-Technical Interaction Networks. *Journal of the American Society for Information Science and Technology, 54*(1), 47-67.

Meerow, S., Newell, J. P., & Stults, M. (2016). Defining urban resilience: A review. *Landscape and Urban Planning, 147*, 38–49.

Mintrom, M., & Norman, P. (2009). Policy entrepreneurship and policy change. *The Policy Studies Journal, 37*(4), 649-667.

Moffatt, S. (2014). Resilience and competing temporalities in cities. *Building Research & Information, 42*(2), 202–220.

Park, Y. A., & Gretzel, U. (2007). Success factors for destination marketing web sites: A qualitative meta-analysis. *Journal of Travel Research, 46*, 46-63.

Sanchez, A. X., Osmond, P., & van der Heijden, J. (forthcoming 2017). Resilient Policies for Wicked Problems: Achieving resilience in a complex and uncertain world through information integration . In A. X. Sanchez, K. D. Hampson, & G. London, *Integrating Information in the Built Environment* (p. in press). London: Routledge.

Sanchez, A. X., van der Heijden, J., Osmond, P., & Prasad, D. (2016). Urban Sustainable Resilience Values: Driving Resilience Policy that Endures. *CIB World Building Congress.* Tampere: CIB World Building Congress.

Storch, S., & Winkel, G. (2013). Coupling climate change and forest policy: A multiple streams analysis of two German case studies. *Forest Policy and Economics, 36*, 14-26.

The University of Sydney. (2016). *Information Literacy Policy Statement*. Retrieved April 20, 2016, from https://www.library.usyd.edu.au/skills/infolitpolicy.html

Vogel, B., & Henstra, D. (2015). Studying local climate adaptation: A heuristic research framework for comparative policy analysis. *Global Environmental Change, 31*, 110-120.

Vogel, C., Moser, S. C., Kasperson, R. E., & Dabelko, G. D. (2007). Linking vulnerability, adaptation, and resilience science to practice: Pathways, players, and partnerships. *Global Environmental Change, 17*, 349-364.

Weible, C. M. (2014). Advancing policy process research. In P. A. Sabatier, & C. M. Weible (Eds.), *Theories of the Policy Process* (pp. 391-407). Boulder: Westview Press.

Weiner, S. (2011). How information literacy becomes policy: An analysis using the multiple streams framework. *Library trends, 60*(2), 297-311.

Young, W., & Middlemiss, L. (2012). A rethink of how policy and social science approach changing individuals' actions on greenhouse gas emissions. *Energy Policy, 41*, 742-747.