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Does Policy Research Really Matter for Local Climate Change Policies?

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ABSTRACT

This paper examines the role of policy-relevant research in climate change policy development. It attempts to address a practically important question: does policy research actually make a difference in the processes of formulating and institutionalizing local climate change policy? Two case studies from Central Java Indonesia are presented. The analysis focuses on the policy development processes in the cities of Semarang and Pekalongan, both of which were based on an urban climate vulnerability assessment. We discuss and compare the policy-making processes in terms of three analytic dimensions: the type of policy measures, agent, and policy approach. We examine the relationship between assessment outcomes and the efforts to institutionalize climate change policy in the two cities. These case studies show that although policy actors in both cities have developed strategies and policy measures for addressing climate change, the quality of policy-relevant research was a marginal consideration in the policy formulation processes. An established agenda within a policy network had greater impacts on policy-making than research outputs, which were articulated and used in the context of this agenda. Advocacy coalitions re-defined and re-interpreted what research has shown. Understanding this ability is key to ascertain why or why not policy-relevant research matters.

本文考察政策研究对气候变化政策发展的影响，试图切实回应以下问题：政策研究是否在　地方气候政策的制定和制度化过程中真正发挥了作用？研究以印度尼西亚中爪哇的两个个案为例，集中分析了三宝垄和北加浪岸两座城市的政策制定过程。这两座城市都被评估为 气候脆弱城市。文章从三个角度探讨和比较了政策制定过程，这三个角度是：政策措施类 型、主体和政策路径，并考察了这两座城市评估结果与气候变化政策制度化的关系。两个 个案研究表明，尽管两个城市的政策制定者都制定了应对气候变化的策略和措施，政策相 关研究的质量却是政策形成过程中并没有发挥重要作用。政策网络内已确立的日程比相关 的研究结果对政策制定的影响更大。倡导联盟重新界定和解释了研究结果。理解这种能力对于弄清政策研究的重要性或其缺失至关重要。

1. Introduction

There is a general consensus that cities can play a key role in addressing the problem of climate change (OECD 2010, UN-Habitat 2011, IPCC 2014). Cities contribute to approximately 80% of global greenhouse gas emissions and are home to more than 60% of global population today and 80% in 2050.

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Without their participation, mitigation targets will be hard to achieve and adaptation measures will produce limited impacts. To move forward, city governments are expected to institutionalize and "mainstream" local climate change policies by developing a set of dedicated strategies on which specific measures for mitigating and/or adapting to climate change are based. There are many challenges ahead, particularly for local governments lacking of resources and expertise.

Betsill and Bulkeley (2007) have suggested that the role of knowledge is one key factor that should be examined in the study of climate policy development in cities. This is made complicated by the Foucauldian belief that accepted forms of knowledge and scientific understanding constitute power (Foucault 1980). The ways in which knowledge is produced, understood, and articulated by political agents crucially determine its effects on policy-making process. It is therefore important to recognize the influence of political agents and their association in the institutional uptake of policy research findings.

One analytical framework that recognizes such influence is the Advocacy Coalition Framework (ACF). At the most fundamental level, the ACF argues that policy actor's beliefs lead to similarity of policy actor's views on the world and this policy beliefs do matters in policy process. It explains policy process by examining how different actors in a policy subsystem form coalitions, based on their understanding of the problem to address, its basic causes, and the implications of proposed solutions (Sabatier and Jenkins-Smith 1999). A policy subsystem, which is referred by other as a policy network (e.g. Rhodes 2006), consists of all policy actors, who are not only limited to the "iron triangle" (e.g. government-legislative-community interests groups), but also private organizations, policy entrepreneurs, research institutions and journalists that actively seek to influence policy-making (Schlager 1995). These actors are recognized in the ACF to the extent in which they hold key roles in the coalition (Sabatier and Jenkins-Smith 1999).

The ACF predicts that the most powerful coalition is likely to drive the content of policy because they are able to influence other coalitions and the wider public. A powerful coalition and its members typically have greater advantages on resources and information than their competitors. In addition to these advantages and their capacity to manipulate contexts and strategies, a powerful coalition may also influence policy narratives and dominate policy debates (Shanahan *et al.* 2011).

Policy research is an important object of inquiry under the ACF, which emphasizes the role of technical information and scientific evidence used by policy subsystems (Sabatier and Jenkins-Smith 1999). Access to information and evidence by policy subsystems is seen as an outcome of various knowledge acquisition processes, which may come from policy research. Sponsored by an active policy subsystem, these processes transfer knowledge to policy-makers who determine policy outcomes. These processes therefore warrant investigation in the study of research impacts on policy-making.

The main question we address is whether knowledge acquisition processes actually affect policy outcomes. During the past ten years, many city governments around the world, including some of those in Indonesia, have formulated their climate change policies. Importantly, these policy initiatives were often preceded by, and made reference to, one or more scientific studies commissioned by governments, such as city-wide vulnerability assessments. However, it remains unclear whether such policy-relevant research has contributed to policy change. Our objective is to address this issue in the context of Indonesia. Two Indonesian cities, i.e. Semarang and Pekalongan, are selected as case studies, as they reveal different processes of knowledge acquisition, allowing an intellectually meaningful comparison.

2. The Role of Research in Policy-making Process

2.1. Policy Research: Quality and Utilization

Hove (2007) contends that science and policy do have interfaces and defines the science–policy interface as "social processes which encompass relations between scientists and other actors in the policy process, and which allow for exchanges, co-evolution, and joint construction of knowledge with the aim of enriching decision-making" (Hove 2007, p. 806). At the purest level, science aims to produce

better understanding of the world in the form of reliable knowledge or evidence. The tendencies for evidence-based policy-making have increased the demand for policy research, "policy-oriented research" (Rein 1976), or "policy-relevant research" (Graffy 2008). Policy research in this context is defined as "the output from formal and systematic inquiries generated by government departments, research institutes, universities, charitable foundations, consultancy organizations, and a variety of agencies and intermediaries such as the audit commission" (Davies *et al.* 2000, p. 3). Policy research is expected to strengthen knowledge base and inform actors of the various causes and implications of a given policy issue.

Questions have been raised about the quality of research. For this reason, Haller and Gerrie (2007) draw a distinction between research for policy and pure research, because they are entrenched in different traditions and serve different purposes. There is inevitably a discrepancy between the quality of policy research and that of pure research. What constitute the quality of research for policy-making is highly complicated. As Flyvbjerg (2006) has argued, it is not only about scientific knowledge *(episteme)* and technical knowledge or know how *(techne),* but also *phronesis.* Drawing from Aristotle, *phronosis* is an intellectual virtue or practical wisdom. In further detail Flyvbjerg (2006, p. 372) states:

> Phronesis concerns the analysis of values—'things that are good or bad for man'—as a point of departure for managed action. Phronesis is that intellectual activity most relevant to praxis. It focuses on what is variable, on that which cannot be encapsulated by universal rules, on specific cases. Phronesis requires an interaction between the general and the concrete; it requires consideration, judgment, and choice. More than anything else, phronesis requires experience.

Pronosis serves to balance instrumental rationality, which is mainly shaped by the other two intellectual virtues: *episteme* and *techne* (Flyvbjerg 2006). *Pronosis* is the most important intellectual virtue because there is an inherent limitation of science to provide all necessary information for the decision-making process, particularly on sophisticated issues (Haller and Gerrie 2007). Therefore, it is common for researchers to present inconclusive recommendations due to scientific uncertainties. As a result, there is limited evidence that science is able to deliver ultimate solutions for policy problems. This dilemma reflects Lindblom's (1979) classical bounded rational policy-making, in which the policy researcher offers the best available scientific information and resources, whereas the final judgment rests upon the policy-maker. This complexity can be eliminated if there is a huge accumulation of scientific information available to policy makers. However, the availability of such institutional systems in various policy domains and levels is questionable.

In order to reduce the gap between traditional practice of policy-making and formal research, Krizek *et al.* (2009) suggest to look at the concept of evidence-based practice (EBP) emerging from other disciplines beyond planning and policy. EBP is quite distinctive to evidence-based policy. While evidence-based policy aims to legitimize policy based on intelligent and sound reasoning process, EBP concerns with various evidence and methodology for its production that can be used to inform practice. Davoudi (2015) concurs and argues that improving the knowledge base of planning and policy-making is necessary, but it is problematic to assume that it is the only basis on which the decisions of planners and policy makers are based, particularly when "evidence is often understood as synonymous with facts, [while] robust and credible is interpreted as quantitative and measurable" (p. 317). Evidence itself is not always objective, nor do scientists themselves (Haller and Gerrie 2007). Evidence is constrained by the assumptions made by its providers and the questions they posed. Where the nature of planning and policy-making remains uncertain, Davoudi (2015, p. 317) suggests that evidence "can be best considered as playing an enlightening rather than determining role" and therefore "it is more appropriate to talk about policy being *informed by* rather than being *based on* evidence". At the end, Davoudi (2015, p. 318) proposes planning and policy-making as a practice of knowing: "knowing what (cognitive/ theoretical knowledge), knowing how (skills/ technical knowledge), knowing to what end (moral choices) and doing (action/ practice)", and understanding all these multiple forms of knowing are essential ingredients to practical wisdom or *pronesis.*

Some scholars have identified the key conditions for the outputs of policy research to create policy impacts. For instance, Davies *et al.* (2000) argue that research findings are likely to be employed in

policy-making when, firstly, policy makers and related actors are aware of, and have confidence in, the advantages of using research evidence. Secondly, potential users of research evidence are substantially involved in the process of obtaining evidence. Thirdly, the research is carried out to address issues promptly. Also, the research utilizes relevant and acceptable methodologies. Moreover, the research outputs do not come into conflict with the political ideology of the policy makers. Finally, the research outputs are presented in a convincing way, without many uncertainties, along with sound and feasible solutions that would not pose a significant economic risk if they fail.

However, evidence-based policy-making that heavily involves policy research may create a dilemma. One of the challenges is that decision-making would be perceived as being technocratic and rational, and therefore stands at odds with its highly political and irrational nature in practice. Davies *et al.* (2000, p. 11) respond to this criticism by stating that the goal of integrating policy research into policy-making process is to make policy makers more "evidence-aware". Another challenge is the lack of evidence to demonstrate the impacts of evidence. That is, we do not clearly know whether the extensive use of evidence in policy-making is effective: there is little evidence on which to base such assertion - it remains an act of faith" (Davies *et al.* 2000, p. 352).

Davies *et al.* (2000) also outline some practical issues related to the application of policy research. Firstly, policy research can be very costly. Also, the process of policy research may involve considerable complexities, beyond the control of policy networks and communities. Thirdly, the design and results of policy research may be subject to political distortion. Furthermore, policy researchers fail to deliver when, for example, research objectives are not clearly specified by potential users or the techniques or technologies required not available.

Nonetheless, the biggest uncertainty is how policy research is consumed in practice. Drawing on the work of Weiss (1979), Nutley and Webb (2000, p. 30) summarize six different uses for research in policy-making:

- Knowledge-driven model, where the existence of knowledge creates pressures for its development and use.
- Problem-solving model, involving direct application of the result of a specific study to a pending decision.
- Interactive model, construing researchers as one group of actors among many. The use of research is only part of a complicated process that also uses experience, political insight, pressure, social technologies and judgment.
- Political model, construing research as political ammunition; using research to support a pre-determined position.
- Tactical model, construing research as a delaying tactic in order to avoid responsibility for unpopular policy outcomes.
- Enlightenment model, which emphasizes the indirect impacts of research on the policy-making process. Policy-making process is influenced by the conceptual insights and outputs derived from social sciences. This model is common in practice, but the uptake of policy research by policy makers tends to be a lengthy process.

2.2. Policy Research under the Advocacy Coalition Framework

To address the political complexities of public policy-making, we place these models in a broader conceptual framework, i.e. the ACF. These models describe how policy research is received and used, whereas the ACF offers explanations for their relative importance and deeper insights into the complex nature and wider context of policy-making process. Sabatier (1999) states that a conceptual framework of policy-making must be built on relatively clear and internally consistent concepts and propositions, causal explanations, a scope of analysis that is broad enough to understand different political systems. Also, it "must address the broad sets of factors that political scientists looking at different aspects of policy-making have traditionally deemed important: conflicting values and interests, information

flows, institutional arrangements, and variation in the socioeconomic environment" (p.3). To draw wider implications, our discussion on the practice of policy research institutionalization and its models is informed by the ACF developed by Sabatier (1999).

The first two models (e.g. knowledge-driven and problem-solving models) conceptualize the utilization of research in policy-making process as direct, linear and free of political interests, whereas the others models recognize non-linearity and the politics of decision-making. In considering the nature of the ACF, we suggest that the utilization of policy research is compatible with the later, particularly a combination of the Interactive and Political models. Under the Interactive model, research findings or outputs are only one of the many considerations and have to compete for attention by political coalitions. Their impacts are reduced when they contradict what the influential coalitions embrace. On the contrary, when research outputs or findings are compatible with what the coalitions embrace, the political model prevails. Evidence will then serve as political ammunition to reinforce the position of the coalitions. The ACF entails such a shift between these models, which is driven by the competing and converging interests of political coalitions. The existence of multiple models is common (Nutley and Webb 2000), as policy-making process involves complex overlapping events in significant duration of time, which may produce multiple interpretations.

In analyzing the role of policy research and evidence in the ACF, Burton (2006) suggests four critical elements that should be considered, which are summarized in Table 1. It is argued that policy research cannot be separated from contesting coalitions and their intrinsic value relies on the relative position of the coalition with which it is allied. Then, the intellectual quality and independency of policy research itself is questioned under rivalry reality that over value the status of coalition. To ascertain whether policy research has created impacts on the decision-making of political coalitions, we adopt Burton's (2006) framework in our case studies in Indonesia, which are described in the following sections.

In addition to the above framework for assessing the role of policy research, we also acknowledge that it cannot be isolated from broader influencing factors. The ACF conceptualizes these factors as stable and non-stable parameters (Jenkins-Smith and Sabatier 1999). Other than ACF, Cosio's (1998) capacity analysis model is also a prominent framework to understand such broader influencing factors. Cosío (1998) for example offers a capacity-analysis model, which critically examines the opportunity structures and limitations of capacity building for effective policy process in terms of organizing principles, institutional designs, discursive practices, and mediation arenas. Although all these frameworks have different conceptions in understanding the role of research impacts or knowledge acquisition, they recognize that research impacts are only one input to policy-making.

3. Research Approach and Method

We selected the Semarang and Pekalongan Cities in Central Java for our case studies. One reason is that these two coastal cities are the earliest adopters of formal climate change initiatives among nearly 500 city governments in Indonesia. Also, they have similar geographical characteristics, institutional

Table 1. The role of policy research and evidence under the ACF.

Element	Role of policy research and evidence
Role	• Evidence and ideas are associated with advocacy coalitions and carry weight accordingly
Main problems with role	• Finding an appropriate coalition to join or form that will promote evidence • Intellectual standards of research quality are less significant than status associated with coalition
Solutions to problems	• Striving to maintain objective quality standards of evidence • Becoming more entrepreneurial and aware of political realities
Outstanding issues	• Difficult to maintain commitment to quality standards in the face of political realities

Source: Burton (2006, p. 184)

systems, and legal frameworks. Both of them face challenges of climate change. However, the ways in which local policy-makers utilize policy research vary across the two cities, as our case studies show.

The case studies are based on an extensive analysis of policy documents, records of meetings, research reports, as well as a series of intensive interviews with stakeholders. The interviews involve 39 core members of climate change adaptation policy subsystems in Semarang and Pekalongan, who are involved in different levels of governance (i.e. central, provincial and municipal) and the making of local climate change policies such as donor agencies, donor partners, political executive/ elected officials, professional bureaucrats, academic societies and NGOs.

This paper explores the type, object, and agent of the policy research. The most policy-relevant and comparable research project in the selected cities is the city-level climate vulnerability assessment. We therefore examine the results, the roles and the impacts of climate vulnerability assessments in the processes of climate policy development in Semarang and Pekalongan. The informants were interviewed individually and requested to express his or her views about the processes of policy development and the contributions of these assessments to these processes. Records of these interviews produce two data sets, which allow us to compare how members of the policy subsystems in each city understood and treated the assessment results.

Figure 1 outlines the key elements of the inquiry, which focuses on scientific evidence and technical information, models of utilization, and the role of policy research. The comparison shows that policy research and the evidence generated were utilized in, and impacted, policy-making processes in different ways, to which we now turn.

4. Results

4.1. Climate Policy Research in Semarang and Pekalongan Cities

Table 2 shows a number of research projects supporting the development of climate change strategies of Semarang and Pekalongan. They were completed before these strategies were formulated. Most of them had a strategic focus and were funded by donor agencies or international NGOs, rather than city governments. Research with a strategic focus means that it provides macro level information for principal decision-making than technical research which delivers operational information level for project implementation or direct intervention programs, such as pilot project study, pre-feasibility study or detailed engineering design. Moreover, academic communities were deeply involved and some academics actively worked with donors' national partners and local NGOs. The involvement of local NGOs in policy research was mainly concentrated on action or technical research.

The climate vulnerability assessments are the main focus of our study. Vulnerability assessment is different from risk assessment, as it accounts for the exposure of local population to climate change impacts, urban key facilities and infrastructures, and the city's capacity to respond. The vulnerability
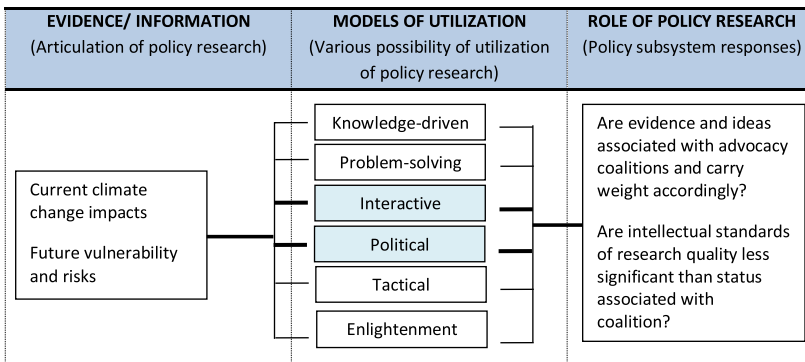

EVIDENCE/ INFORMATION (Articulation of policy research)	MODELS OF UTILIZATION (Various possibility of utilization of policy research)	ROLE OF POLICY RESEARCH (Policy subsystem responses)
Current climate change impacts Future vulnerability and risks	Knowledge-driven Problem-solving Interactive Political Tactical Enlightenment	Are evidence and ideas associated with advocacy coalitions and carry weight accordingly? Are intellectual standards of research quality less significant than status associated with coalition?

Figure 1. Key elements of the inquiry. Source: Adapted from Nutley and Webb (2000) and Burton (2006).

Table 2. Climate adaptation policy research in Semarang and Pekalongan.

Case study and research focus	Level		Actors	
	S	T	Researcher	Funder
Semarang				
Vulnerability assessment	X		Donors' partners; University	Donors
The economic costs of flooding and coastal inundation	X		University	Donors
The robustness of city's master plan drainage in dealing with the future climate variability	X		University	Donors
Gaps between current and expected development indicators after inclusion of climate change variables	X		University	Donors
The implementation six pilot climate adaptation projects		X	Local NGOs; University	Donors
Pre-feasibility on rainwater harvesting projects		X	Local NGOs; University	Donors
Pekalongan				
Vulnerability assessment	X		Donor's partners; University	Donors
Detailed engineering design of polder development		X	Consulting firm	City

Notes: S=Strategic; T= Technical.

assessments conducted by the governments of Semarang and Pekalongan allow for a comparison because they served similar purposes and both were undertaken at the city scale. The main purpose of these assessments was to provide a scientific basis for the development of city resilience strategies. Moreover, as a form of policy research, vulnerability assessment is strategically important as it provides a key reference for other research studies and analyses. In the two cities, these policy research projects were commissioned by international donor agencies and presented to the cities' working groups on climate change, local government agencies, and mayors. The national partners of the donors were responsible for executing the research, with technical support from several universities.

The researchers involved worked closely with local government agencies. In Pekalongan, the Centre for Participatory Planning (P5) and the Kota Kita Foundation (KKF), which are the national partners of the United Nations (UN)-Habitat, executed the vulnerability assessment of the city. These two organizations engaged intensively with the community and the local government agencies, particularly the Environmental Office (KLH) of Pekalongan. For example, some primary data collections were decentralized to a local community organization, while the spatial identification of existing climate-related impacts involved neighborhood leaders. Then, they adopted a participatory process to disseminate results of the study in the most vulnerable sub-district, and communicate with government agencies and other local stakeholders on the impacts of climate change on Pekalongan.

In Semarang, MercyCorps Indonesia (MCI) and the Urban and Regional Development Institute (URDI), which were supported by the Climate Change Risks and Opportunities Management (CC-ROM), were the main national partners of the Rockefeller Foundation (RF), executed the vulnerability assessment. The MCI and the URDI also engaged intensively with the community and the city government of Semarang, particularly the Environmental Board (BLH).

It is worthwhile noting that these actors and institutions (e.g. P5, KKF, MCI, URDI and CC-ROM) act as a climate change advocacy coalition with shared beliefs and interests about climate change. They were engaged by the donors and international agencies (e.g. RF, UN-Habitat) from the very beginning to support climate adaptation programs and initiatives in both cities. Therefore, the goal of the donors' national partners, academic communities, and members of local NGOs as researchers, in this case, was mainly to fulfill the specific requirements of the donors, who funded locally specific climate change research in some Indonesian cities.

The vulnerability assessments included different elements (Table 3). In general, Semarang adopted a more expert-led process and used more advanced modeling techniques than Pekalongan. The vulnerability assessment in Pekalongan tended to be participatory and employed less statistical techniques to climate analysis. For example, simple linear regression models were used to describe the pattern of temperature and precipitation changes in the last thirty years. So, the vulnerability assessment in

Table 3. Different standard of climate vulnerability assessment (VA).

Characteristics of VA	Semarang	Pekalongan
General information		
Researchers/institutions	CC-ROM, MCI, URDI, KKF	P5, KKF
Inputs and process		
Approach	Mainly expert based and less participatory	Mainly participatory and less expert based
Climate data inputs	Climate trends over the last 100 years using the CRU TS2.0	Climate trends in the last 30 years (generated from other climate research)
Climate data analysis	Modelling historical data (RegCM3 and output projection data of 14 GCMs)	Without modelling, basic statistical analysis (e.g. regression)
Social data inputs for climate related analysis	Secondary socio-economic data were converted into a scale for coping index analysis	Secondary socio-economic data and findings from FGD at city level were simply converted and highly used to describe current city's vulnerability
	Findings from FGD at the sub-district level were massive, but less acknowledged in climate analysis	
Framing on city's climate vulnerability	Aggregate of climate risk and coping capacity	Specified or thematic (e.g. physical vulnerability, economic vulnerability, etc.)
Actual time for completion	Longer (6 months)	Shorter (3 months)
Key outputs		
Current climate change related impacts	Yes	Yes
Future climate projection and risks	Yes	No
City vulnerability index in the medium and long term	Yes	No

Notes: CRU.TS2.0 (Climate Research Unit Time Series Version 2.0); RegCM3 (Regional Climate Change Model 3); GCM (Global Climate Model); FGD (Focus Group Discussion).

Pekalongan did not involve future projection of the climate risks confronting the city, and did not make use of scientifically sound climate data history and analysis.

All of our informants were convinced that both vulnerability assessments were scientifically sound. Methodology was the main source of confidence. Climate modeling, derived from fourteen global climate models (GCMs) to enhance understanding of climate variability variables, was regarded as the most scientific component of Semarang's vulnerability assessment. Although the vulnerability assessment in Pekalongan employed a less sophisticated approach and excluded a rigid feature of future climate analysis, such as future climate modeling, our informants believed that it lived up to scientific expectations and standards. Semarang's vulnerability assessment clearly had a strong technical basis, whereas that of Pekalongan was highly participatory. Nonetheless, the latter was led by a experts from prestigious universities in Indonesia and therefore derived from the latest science in the country.

4.2. Articulation of Vulnerability Assessment as Policy Research

We examined if the utilization of policy research and evidence under the ACF is manifest as a combination of the interactive and political models.

In Semarang, researchers were one of many groups of actors in the policy subsystems. During the development of the vulnerability assessment in Semarang, only four active organizations in the policy subsystems, out of twenty-one, were research agents (i.e. CC-ROM, MCI, URDI, KKF). We expand the category of research agents in this context broader than official research institutions as it also includes actors and institutions, which either perform or fund a particular research. The other ones (e.g. government agencies and local NGOs affiliated as a city working group on climate change) hold different views about how this research should be done and what it should demonstrate. There were serious tensions within policy subsystems concerning one of the assessment outputs—projection of climate vulnerability in 2050. Some members of the policy subsystems questioned and rejected this projection for being not realistic, challenging the common sense or their local experience. Researchers were asked to explain why a particular region is not regarded as vulnerable in the future (when it was

considered by the majority of policy actors to be vulnerable). A sense of frustration was expressed by members of the policy subsystems.

The tensions arose from the following issues. Firstly, the policy researchers were not able to satisfactorily address the question "why do the results look like this?" raised by many policy actors involved in the process. In response, the researchers presented climate scenarios, models, and statistics, which proved difficult for other policy subsystem members to comprehend. Many other cities are caught in the same issue. As Tyler *et al.* (2010, p. 27) have noted, some city actors and states complain that "the results [of the vulnerability assessment] presented were highly technical and inaccessible, and the indicators and data used [were] not transparent to partners".

Secondly, researchers and other policy subsystem members were divided on the very meaning of vulnerability. While the researchers described vulnerability in terms of future uncertainty, most of the policy actors in the City of Semarang understood the concept by making reference to observable, recent evidence. Different temporal scales were employed in understanding and defining vulnerability.

Thirdly, the vulnerability analysis involved the use of disputed socio-economic data. The researchers used official socio-economic data released by the national government, which were, however, regarded by other policy subsystem members as an unreliable source. Tyler *et al.* (2010, p. 27) reported that, "researchers used incorrect or misleading data to characterize [a sub-district] as vulnerable, such that … sub-districts appear to be more vulnerable according to the assessment than they are in reality". The statement of a member of the government, who is a staff member of the climate change taskforce in Semarang confirms this issue:

> … [The vulnerability assessment] was good … It gives evidence for us, showing our changing natural phenomena and the physical changes of our region due to climate change. However, we question the data and information used in the analysis because the result of the scientific process and what is visible in our eyes do not match. (Interview-09)

As a result, evidence derived from the policy-relevant research, which is a projection of city's climate vulnerability in 2050, was not taken seriously during adaptation planning and decision-making processes. Instead, the professional judgment of the rest of the policy actors based on their experience was given priority. Although they appreciated the efforts made by the policy researchers to produce a vulnerability map, they switched to their own climate related risk maps when making decision about where adaptation actions would be implemented. Thus, the cutting-edge knowledge generated from policy research was replaced by a mixed knowledge base derived from science and local experience, which received more recognition from local actors than the research alone.

The Pekalongan case study demonstrated a different decision-making practice. As in Semarang, researchers in Pekalongan was a minority in the policy subsystem. Only two (e.g. KKF and P5) out of fourteen organizations within the policy subsystem were research agents. In contrast to Semarang, although the vulnerability assessment in Pekalongan achieved lower scientific quality, there was no tension in responding to the research outputs, which received widespread acceptance across the policy subsystem. This is because they were compatible with the city's development agenda and the mayor's vision. On the other hand, the quality of policy-relevant research did not appear to be a decisive factor. In Pekalongan, therefore, the uptake of policy-relevant research operated under the political model. There are several reasons for this.

Firstly, the vulnerability assessment did not raise controversies in the projection of the city's future climate and associated risks. Instead, it only emphasized current climate related impacts and used this information to determine the city's vulnerability. There was a misconception by some policy subsystem members about what vulnerability assessment entails, which was nonetheless a "blessing" for climate policy development in Pekalongan. In other words, within the policy subsystems, there was limited contention over the concept of vulnerability.

Secondly, the process in which vulnerability assessment was developed engaged with local policy actors. Trust and legitimacy were established in this process, effectively reducing misunderstanding about data and analysis. Thirdly, the main assessment output, i.e. identification of the city's vulnerable areas, was consistent with the experience of many policy subsystem members. Indeed, the areas

identified as vulnerable happened to be those of the city government's concern before the vulnerability assessment was undertaken.

There were also other factors influencing the formulation of climate change strategies at the city level, such as competing local government priorities and limited resources. Indonesian city governments are often subject to tight financial constraints in undertaking their development programs, especially those that do not deliver immediate and direct benefits. Climate change policy is one of these programs, as its benefits tend to be indirect and long-term. The following statement from a member of a local NGO working in both case study cities illustrates this fact:

> They [city governments] lack a budget. The most strategic thing for them is how to get the money. So many agencies … if they hear about a certain package or project from the national government level, they will go for it and get it. Even if they do not have a required strategic plan, they will create it later. (Interview-32)

As a result, city governments are keen on seeking opportunities for accomplishing their development goals against financial constraints. In both case studies, the vulnerability research was perceived by city governments as a means for paving the way to secure additional resources to recover its development deficits. An interview with an elected official confirms this point:

> Then, it is important that we [the city government] can show it [the vulnerable assessment and proposed actions resulted from the assessment] to our networks at provincial and national levels. If these efforts continue, we expect that either the UN-Habitat or the GIZ - [A German-based International Company for German-Indonesia Bilateral Cooperation] - will promote this [proposed actions resulted from the assessment] to their networks. They can more easily influence people at the national and provincial level since they are known as credible institutions. (Interview-26)

5. Discussions

Both case studies show that there was no clear linkage between the quality of policy-relevant research and local government's decision to develop local climate change policy. In other words, their decisions were not a function of the quality of policy-relevant research. The quality of policy research does not appear to be an important consideration in the process of climate change policy-making in the two Indonesian cities.

Both city governments formed advocacy coalitions with local actors and researchers, who shared interests in addressing climate change and were all involved in local climate policy development. However, the ways in which the local policy subsystems understood and used scientific evidence and technical information have demonstrated decisive differences. Morgan (2014) suggests that the interaction between policy networks and science depends on the nature of them both. Our case studies support this view by showing that an established agenda within a policy network had greater impacts on policy-making than the outcomes of research, which were interpreted and used in the context of the established agenda. A number of senior bureaucrats stated:

> It is possible to say that the city team [city's working group for climate change] actually represents various agencies. So, in the selection process, it is necessary to find the *right people*, who indeed can be invited to think in more progressive and future-oriented ways. (Interview-04; emphasis added)

> Climate change associated policies that we have developed were originally not intended to address climate change itself or purely in the context of adaptation. On top of that, the primary objective was in order to give service to the community because they are the most affected [group]. (Interview-28)

This does not mean that the quality of policy research played no role. In fact, we have found problems concerning the lack of information and different conceptions about climate change. An urban social practitioner working in Semarang and Pekalongan expressed his view:

> There isn't really information out there that allows in a form that is accessible to all people, easy to understand and look at. You know how this might represent different kinds of dynamics and issues in the cities. … A lot more complicated [than climate change vulnerability assessment] is the political economy in the issue of poverty and vulnerability where the people are exposed. So talking about climate change only completely removes the focus of what they are experiencing because they have been systematically exposed. It's about the market, it's about privatizing dimensions, it's about all these things that have put them at risk. I think there are many layers and

many things that lead to exposure and risk, and climate change is just one of these. So, they [people in Semarang and Pekalongan] don't really talk about climate change as the main cause of their vulnerabilities. (Interview-32)

We have also observed problems concerning resource constraints and the lack of capacity, which crucially affected the decision of local policy subsystems. A city government officer and a senior climate change policy advisor of an international agency working in both case study cities, who has experience in delivering similar climate change programs in eight other city governments, also confirmed this view respectively:

On one side we have a strong decentralization spirit, on the other side we lack capacity, and do not know what we should do [in responding to new tasks]. So, we only do things when a clear guideline from central government is available. (Interview-14)

I think the situation is like this: most of our city governments will receive a project or a program offered to them. (Interview-31)

The case studies show that research supporting city-level climate change policy development is likely to have impacts if they meet at least three criteria. Firstly, such research involves locally produced data, especially from local government agencies, rather than from national government sources, even though the latter are reliable. In other words, co-production of data with local government agencies is essential. Secondly, the key outputs of research are consistent with the common sense or the local experience of the majority of the policy subsystem members. Oulahen *et al.* (2015) have similarly suggested that "ground truthing", a social vulnerability index as a process for considering the input of local practitioners, is important. It is a method to verify scientific analysis output, which particularly is conducted by external agents, with local practitioners' knowledge. Thirdly, the research shows a consistent and logical linkage between identified problems and policy recommendations. These three criteria are among the six factors identified by Davies *et al.* (2000) that are key conditions for policy-relevant research to have higher potential to be adopted in the policy-making process.

Another important factor that warrants attention is the different framings of vulnerability that dominate the policy subsystem, either in terms of context or outcome (Fünfgeld and McEvoy 2014). While the outcome-based interpretation of vulnerability assessment is shaped by a top-down process and guided by quantitative and reductionist approach for comprehending climate change impacts and their consequence to urban systems, the contextual vulnerability framing is shaped by a bottom-up process and guided by predominantly qualitative or constructivist approach that puts emphasis on the integration of climate change ideas into existing problems and challenges faced by urban systems. The case study in Semarang shows that, in practice, while the group of scientists was bound to the outcome-based interpretation, the rest of the policy subsystems framed vulnerability in contextual terms. This explains why tensions in the policy-making process were higher in Semarang than in Pekalongan. The policy subsystems in Pekalongan presented similar framings of vulnerability.

Ass a key element of policy-relevant research in climate change, vulnerability assessment significantly facilitates climate policy development in the two Indonesian cities. Both city governments have eventually formulated their own climate change strategies. Comparing them with other Indonesian cities confirms this view. Vulnerability assessment is the first stop of climate adaptation policy development, but hundreds of other city governments in Indonesia have not conducted a vulnerability assessment, leading to delays in developing their own climate change policies and strategies. In the absence of a national mandate, conducting climate policy research is important element for fostering climate policy development at the city level. However, this finding does not mean to justify an oversimplified model of policy-making conceptualizing policy as a straight-forward linear process, from vulnerability assessment to policy development.

That said, undertaking vulnerability assessment does not always lead to progress in policy development. There is a dilemma in driving climate change policy research at the city level. Policy subsystems tend to resist policy-relevant research that involves highly complicated techniques, reveals considerable uncertainties, and adopts a long time frame (for instance, risks projections five decades into the future). To the contrary, members of policy subsystems at the city level are more likely to receive research that involves a simple, participatory process and focuses on immediate issues (for instance,

existing vulnerabilities). Therefore, the main challenge is one of articulating research results in terms that are intelligible to local policy-makers and compatible with their pre-existing priorities, without compromising the scientific integrity of research.

One suggestion for dealing with this challenge is to improve communication between policy researchers and prospective end-users of knowledge (Moser 2004, 2006, Palutikof 2014). A participatory research approach is recommended. Involving local researchers is as important as involving the rest of the climate policy subsystems. Also, improving the capacity of city governments to understand the essence of vulnerability and adaptation to climate change is imperative. This can help reduce misunderstanding between scientists and other policy actors within the policy subsystems.

Another challenge is related to post-research commitments. The city governments, particularly in developing and the least developed countries, will in all likelihood not be able to follow up on every policy recommendation - even though they agreed to act, due to the lack of resources and power. City governments struggle to deal with current development deficits. For example, the city government of Semarang was aware that upgrading the city's drainage master plan was essential to reducing flood risks arising from climate change, but budget constraints discouraged the government from doing so. The grave shortage of resources makes some of the policy-relevant research eventually not impactful.

6. Conclusion

This paper described how climate vulnerability assessments were understood and used in climate policy development in two Indonesian cities, and how members of policy subsystems responded to research outputs. Based on the analytical lens of advocacy coalition, both case studies suggest that evidence from policy-relevant research played limited role in the policy-making process, regardless of research quality. The potential contributions of research was overshadowed by other factors, such as local experience and trust in experts. Rather than suggesting that policy research was not important, the case studies showed that it was understood and used in both interactive and political ways. The results of the two case studies indicate an issue of concern pointed out by Burton (2006), who suggests that policy researchers struggle to maintain research quality when developing connections with a political coalition is more important than the research itself.

The ACF is useful for examining the actual impacts of policy-relevant research as it recognizes the role of the political coalition in the production and use of knowledge. The coalition has the ability to re-define and re-interpret what research has shown, and this process is key to understand why or why not policy-relevant research matters. Certainly some research agents have greater influences than others, particularly if they are associated with influential institutions that can advance the interests of the coalition or the main actor. Thus, the impacts of policy-relevant research highly depend on the parties who acquire the knowledge, rather than the knowledge itself.

Future research addressing the tension between science and policy practice should account for variations in the quality of policy-relevant research. We did not focus on such variations, which might derive from the research process and methods used, and this might contribute to a limitation of our study. Comparative case studies involving major cities with greater capacity and resources for conducting vulnerability assessment and communicating results with knowledge end-users and those with limited capacity and resources would be particularly illuminating.

Disclosure statement

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