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Narrowing gaps between research and policy development in climate change adaptation work in the water resources and agriculture sectors of Cambodia

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Narrowing research and policy, while challenging, is especially important in climate change adaptation work (CCA) due to the high uncertainties involved in planning for climate change. This article aims to seek stakeholders' opinions regarding how research and policy development can be bridged within the Cambodian water resources and agriculture sectors. The study used institutional ethnography methods with informants from government organizations, local academia, and development partners (DPs). This article identifies a number of challenges, and barriers for narrowing research–policy development gaps, including: limited effectiveness of governmental policies and planning; lack of relevant information required to promote evidence-based planning and policy development; and communication barriers. Evidence-based planning is valued by government officials most when there is actual and effective implementation of policies and plans. In practice, this often implies that governmental policies and plans need be scoped and scaled down to meet the available budget, and thus be achievable. In the long term, it also means building the capacity for policy-relevant research on climate change adaptation within Cambodia. Engaging policy stakeholders in research process for co-producing adaptation knowledge, and introducing knowledge intermediaries are suggested by informants as means to narrowing gaps between research and policy development. The presence of the Cambodia's Prime Minister in research–policy dialogues is recommended as important for attracting the attention of high-level policy makers.

Policy relevance

As a least developed and highly climate-vulnerable country, Cambodia has received climate change funding to implement a number of climate adaptation initiatives. Cambodia is likely to receive more climate change finance in the future. This article aims to assist evidence-based planning, in particular, through policy-relevant research on CCA, so that resources for adaptation in Cambodia are used effectively and efficiently. This research also directly benefits the sustainable development of the country.

Keywords: Cambodia; climate change adaptation; research policy

1. Introduction

Planning for climate change adaptation requires a great deal of information (Carter et al., 2007; Moss et al., 2008; UNFCCC, 2006; Veraart & Bakker, 2009). Lebel (2014) argues that the lack of evidence-

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based climate change adaptation practices results from relevant knowledge being inaccessible, unused, or missing. Incomplete knowledge of current vulnerability, uncertainties about projected future vulnerabilities, and the cross-cutting nature of climate change adaptation work (CCA) creates additional information-related challenges for adaptation planning. Gaps between research and policy in these situations are very likely unless there are strong linkages between research and policy communities.

Participatory approaches are important for adaptation planning (Butler et al., 2014; Daniell et al., 2011; Wise et al., 2014) as they can support social learning and lead to co-production of knowledge (Armitage, Berkes, Dale, Kocho-Schellenberg, & Patton, 2011; Preston, Mustelin, & Maloney, 2013). Lemos and Morehouse (2005) argue that the interactions between researchers and stakeholders in the co-production process facilitate their understanding about co-produced knowledge, and its applications and practical value. The interactions also allow stakeholders to exchange information, share learning, and build relationships and trust, thereby promoting collective adaptation actions (Armitage et al., 2011; Lemos & Morehouse, 2005; Yuen, Jovicich, & Preston, 2013).

Introducing knowledge intermediaries is another mechanism to enable the linking of research and policy development. Knowledge intermediaries facilitate the use of available information for policy development (Dobbins et al., 2009; Fisher, 2010; Jones, Jones, Walker, & Walsh, 2009; Meyer, 2010). Knowledge intermediaries may also build the capacity of research and policy communities (Dobbins et al., 2009; Jones et al., 2009), build relationships between researchers and knowledge users as well as with relevant networks (Dobbins et al., 2009; Fisher, 2010; Meyer, 2010), and create a culture of using information for policy development (Meyer, 2010). In the context of climate change adaptation, incomplete knowledge and uncertainties imply a strong need for continual review and learning, as well as robust decision-making strategies (Dessai & Hulme, 2007; Linham & Nicholls, 2010; Veraart & Bakker, 2009). Knowledge intermediaries may be especially important for developing nations in which local research capacity and policy stakeholders' understanding of issues are limited (Jones et al., 2009).

Traditional modes of communicating research to policy stakeholders (such as disseminating research reports), although often ineffective, remain an established practice, due perhaps to their familiarity and the fact that they do not require much additional effort. Finch (1986) indicates three main gaps in the communication process that warrant attention for the effective uptake of research results. The first is an organizational gap that includes the difference in timescale between research activities and the period of time policy makers can wait for information, and the status of the researchers, which may be lower than that of the policy makers, thus making it hard for researchers to influence them. The second is a cultural gap that includes differences in the ways of thinking and the language used by researchers and policy makers. The third is the difference in the interests and concerns of research and policy communities. Finch (1986) suggests that productive personal contact between researchers and influential persons in the policy-making process can result in more effective communication of research to policy.

Two-way communication – or dialogue – between researchers and policy stakeholders is usually more effective than one-way communication (Geoffrey, 2007; Pretty & Ward, 2001), and is important to the narrowing of research–policy gaps. Science-based stakeholder dialogue is a path for linking research and practice, urging stakeholders to share learning and thinking, and to begin working collaboratively (Welp, Vega-Leinert, Stoll-Kleemann, & Jaeger, 2006). Welp et al. (2006) define science-based stakeholder dialogue as a structured communication processes connecting scientists and policy

stakeholders, for instance, through conferences, workshops, and facilitated discussion. Fussel and Klein (2006) also suggest that it is crucial to maintain constant dialogues between researchers and relevant stakeholders as part of adaptation policy assessment.

Although a national climate change strategic plan has recently been developed in Cambodia to assist in the mainstreaming of climate change adaptation into sectoral development plans, in practice planning remains challenging as a result of limitations such as a lack of relevant information, resources, and cooperation among stakeholders (Dany, Bowen, & Miller, 2014). This article aims to facilitate the strengthening of research and policy development of CCA in the Cambodian water resources and agriculture sectors. It pays special attention to planning processes that take into consideration climate-related vulnerabilities, or climate-informed planning.

The research question is 'How can the linkages between research/science and CCA policy development within the water resources and agriculture sectors in Cambodia be strengthened?' The term 'policy development' in this article refers to the formulation of the policy documents and the implementation of such policies. The term 'policy stakeholders' in this article refers collectively to policy makers, planners, and practitioners.

The remainder of the article discusses three main subjects. In the first, stakeholders' observations and views regarding the present status of research and policy development are presented. In the second, associated barriers and challenges to better linkages are identified. Finally, possibilities for strengthening linkages and narrowing the gaps between research and policy development are explored.

2. Methods

In this research, institutional ethnography – a process consisting of interviews, observations, and document review – has been used, in which individual personal experiences are used as the basis for understanding institutional practices (Babbie, 2005). A total of 41 interviews (generally one-on-one) with 43 informants were conducted between July 2012 and April 2013. Of these informants, 22 were from government organizations (the Ministry of Agriculture, Forestry and Fisheries (MAFF), the Ministry of Water Resources and Meteorology (MOWRAM), the Ministry of Environment (MOE), and the Ministry of Planning (MOP)). MAFF has four technical divisions, of which only two – the General Directorate of Agriculture (GDA) and the Fisheries Administrations (FiA) – were included in this study. Eleven of the interviewees were from academia (local universities and research institutes), while the remainder of the informants were from development partners (DPs), mainly funding and UN organizations.

The informants were selected using purposive and snowballing techniques, starting with the network of the primary author, and through official requests from the Royal University of Phnom Penh to relevant ministries. Purposive sampling is appropriate for an institutional ethnography study because it allows the recruitment of informants who have comprehensive work experience with their organizations and are thus able to share relevant insights and perspectives. The snowballing approach was added in this study to allow the recruitment of additional informants as suggested by informants.

The informants from MAFF and MOWRAM who were targeted were those involved in their respective ministry planning processes – directors and/or deputy directors of departments of planning, as well

as specialized departments (e.g. Department of Rice). The General Directorate of Planning of MOP, which coordinates the development of the national strategic development plan, was also recruited. The Department of Climate Change (CCD) of MOE, which coordinates the development of the national climate change strategy and manages most adaptation resources, was also selected. The selection of academics was based on their relevant specializations (e.g. the Royal University of Agriculture, RUA). The selection of informants from DPs targeted those in key funding agencies for water resources and agriculture and/or adaptation work, and relevant NGOs.

2.1. Data collection

An interview guide was developed to facilitate the interviews. This was developed with the assumption that water resources and agriculture-related stakeholders had used relevant research information to inform policy development and planning. The guide was thus designed specifically to focus on the use of climate-related information. After testing (completing a few interviews), we realized that the assumption was not correct – current planning practices depended very much on experience and observations. Additionally, government informants indicated that they did not have any climate change adaptation projects, so no climate-related information was used. For this reason, we strategically changed the questions to focus on the use of research information more generally (Appendix 1). Only informants who confirmed having used some research information for the development of policies or plans were asked for further details, to explore whether they had used any climate change-related information.

The in-depth interviews were conducted in the Khmer language and generally took place at the informants' offices. After obtaining agreement from the informants, most interviews were recorded digitally. This study was approved by the Bond University Human Research Ethics Committee of Bond University, Australia (Protocol No. RO1430).

2.2. Data analysis

Once the interviews were completed, the interview notes and key observations were reviewed and summarized using the interview guide and translated into English. Aspects of the digitally recorded interviews were transcribed where the notes were found not to be fully complete. Follow-up interviews or queries were conducted for a small number of informants where the first interview did not obtain sufficient information. There were also a few informants who had comprehensive knowledge and experience to share that could not be covered within one interview, so follow-up interviews were organized. The interview summaries were sent by e-mail to the informants for feedback and confirmation of their accuracy. In general, the informants agreed with the summaries and answered additional questions if requested. After amendments were made where necessary, the interview information was analysed using the NVivo software program (version 10).

The information was first autocoded according to the questions set in the interview guide. Coding of sub-themes was done according to what emerged from the interview transcripts and was organized according to the themes identified by relevant literature. For instance, strategies in narrowing research and policy include (but are not limited to) the promotion of science-based dialogue and discussion (Bohm, 1996; Jones et al., 2009; Preston et al., 2013; Welp et al., 2006), knowledge intermediaries (Dobbins et al., 2009; Fisher, 2010; Meyer, 2010), and co-production of knowledge (Armitage et al.,

2011; Lemos & Morehouse, 2005; Preston et al., 2013; Yuen et al., 2013). The patterns in responses and views were presented quantitatively and substantiated by pertinent narratives or illustrative quotes.

3. Results

3.1. Observations and views on linkages of research and policy

About two-third of the informants, especially those from DPs and research organizations, indicated that there is a huge gap between research and policy formulation in Cambodia's water resources and agriculture sectors. One academic described 'the two types of bodies [research and policy organizations] are just like water and oil – they always have different interests'. The informant further commented that policy makers perceive that research organizations usually just criticize their work. However, a few informants observed that the gap between research organizations and policy stakeholders was not obvious or did not exist, noting that policy-making individuals and organizations also conduct research projects for their policy development. Most of the departments of MAFF and MOWRAM, for instance, had their own research units, with some functioning and others not due to a lack of resources.

Research and policy implementation were also reported to be very separate. Some 20% of informants indicated that there was little connection between researchers and practitioners. Two informants observed that the gap between MAFF's researchers (and also planners) and companies that import agricultural inputs (e.g. chemical fertilizers and seeds) was very wide. The informants reported that some companies distributed imported seeds to markets before being laboratory-tested and approved by MAFF's specialized departments. They explained that the seeds can be inappropriate for local environments or have negative effects on local species (e.g. through cross-pollination with wild populations), so appropriate laboratory and field tests are required.

Another academic informant considered the lack of engagement of local communities in CCA-related studies as a gap between research and policy development, explaining that research should have an important role in bringing out the voices and experiences of communities. The informant stated, 'sometimes we [researchers] discussed a lot about CCA but important stakeholders were absent, like farmers, who are the most vulnerable group and have generations of experience in addressing climate stresses'.

The connection between research and policy in the agricultural sector, however, was claimed to be good by four informants, all of whom were from MAFF. One informant claimed that the 'Minister of Agriculture, Mr. Chan Sarun, always consults with research institutes – like Cambodian Agriculture Research and Development Institute (CARDI)'. According to this informant, the policy on rice exports introduced new rice varieties and agricultural technologies that have resulted from CARDI's research projects.

Within the fisheries sub-sector, linking of research and policy was reported to occur via the technical working group (TWG) on fisheries (TWG-F). TWG is a government–donor coordination body facilitating the implementation of national strategic development plans and aid effectiveness in Cambodia. TWGs are chaired by key government organizations and facilitated by one of the key funding agencies for that particular sector. It was reported that FiA research institutes always held discussions with the TWG-F's review committee (a project-based committee) regarding study design, methods, analysis,

and the results of studies. One FiA informant further claimed that since the establishment of the TWG-F, harmony has improved among fisheries stakeholders in terms of the integrity of research and transparency in the use of research findings.

Linkages between research and implementation were also reported to occur via applied (pilot and demonstration) research projects where the relevant stakeholders (i.e. provincial agriculture officials, local authorities, and farmers) were jointly engaged in the research process. Three informants from academia, DP, and MAFF reported having participated in a regional research project, 'Developing multi-scale adaptation strategies for farming communities in Cambodia, Laos, Bangladesh and India', implemented by the Australian Commonwealth Scientific and Industrial Research Organisation (CSIRO).

Two academic informants mentioned working directly with agricultural students to provide them with agricultural engineering and technological knowledge and skills, such as plant breeding and farming systems, as a means to bridge research (or science) and policy implementation. It was explained that this is because the students are likely be recruited as agriculture officials for governmental or non-governmental organizations after completion of their studies. One of the informants reported that the Centre for Study and Development in Agriculture (CEDAC) works to promote agricultural students who want to become self-employed in agricultural farming businesses by providing them with technical and practical training as well as seed funding support.

Half of the informants agreed it is essential to narrow research–policy gaps. The informants also acknowledged the important role of research organizations in policy development, suggesting that local universities should strengthen their research capacity. One government informant stated that 'if we have relevant information, we will be able to make better decisions in terms of what technologies (e.g. rice varieties, and cropping techniques) should be introduced for specific areas'. Another academic informant agreed, saying that policy development should be informed by scientific studies, giving an example of the newly developed policy on rice exporting:

> The policy sets targets unrealistically because it was not informed by scientific studies and I think it is very likely to fail ... although we have large surface areas for agriculture, we do not have enough irrigation systems – water is abundant in the rainy season but short in dry season. I have also noticed that many irrigation systems in Cambodia are not functional and consist of only main canals. The lack of sub-canals implies water must be pumped from main canals to paddies, thus requiring additional investments (for pumps and fuel) that add to the costs of production, which many farmers cannot afford.

3.2. Barriers and challenges in narrowing the research–policy gap

One of the main findings of this research is that the limited implementation of governmental policies and plans in the water resources and agriculture sectors in Cambodia was one of the major barriers to improving the connection between research and policy. The reason given was that, with little implementation, there is no incentive to seek additional information or to do research. About 50% of the informants, in particular those from government ministries, pointed to the lack of implementation of plans as a main reason for the gap. Because of the low rates of implementation, informants from MAFF and MOWRAM did not feel it was necessary to have evidence-based plans and strategies. They explained that only a limited amount of the annual activities proposed were funded. A small

number of informants reported that they were reluctant to develop plans for their departments as they had not received any money from the government for implementation over the last few years. Experience and observation-based plans were generally perceived to be sufficient in this situation.

In the current planning process, although the development of annual activities plans was informed by the ministries five-year development plan, the proposed activities and projects were based on the experiences and field observations of department planners (directors or deputy directors of departments). One MAFF informant confirmed this, saying that 'because annual agricultural development plans were developed based on experiences and field observations we do not need much scientific information for it'. However, another MAFF informant said 'at the present time, we do not need information to inform the planning process; in the future we may . . . '. Although this informant agreed with others that experience and observation-based planning is sufficient at the present time, she/he seemed to expect that planning practices will become more evidence-based in the future.

About 20% of the informants, especially those from DPs, commented on the lack of suitable information as the reason for the lack of connection between research and policy. One DP informant argued that if Cambodian water resources and agriculture sectors want to apply more climate-informed planning, they will need a great deal more climate-related information, and noted the following:

> Climate change vulnerabilities are different from one region to another thus we need to understand local climate hazards, high risk areas, and adaptation measures. For example, a community may suffer more from droughts than floods, but in reality because flood has more immediate impacts it is 'noisy' making it is easy to call for assistance; drought is 'silent' because it takes time to manifest itself, thus it is harder to get support.

The manner in which current climate-related information is generated, communicated, and used was described by one DP informant as follows:

> The information is scattered and not well organised. It is just like we have ingredients to cook but in some instances they were insufficiently cooked or improperly cooked thus the food were not of reasonable quality, while in other instances, they were cooked but foods were not marketed enough. For example, there was a study to map (index) climate vulnerabilities of 710 communes, but there has been lack of communication to make use of the information, especially in policy and planning development.

The informants further commented on the ineffective and inefficient use of limited research resources, explaining that research projects were implemented by various organizations and individuals and easily duplicated. One academic informant noted that 'many individuals and organizations undertake research studies without knowing who is doing what'. Other informants confirmed that their organizations had implemented small research projects for informing their organizations' policies, programmes, and projects.

About 25% of the informants, especially those from academia and DPs, pointed to organizational and cultural gaps as barriers to linking research and policy development within the Cambodian water resources and agriculture sectors. The organizational issues observed by the informants include the low status of research organizations, and the differences in timescale between research and policy. The cultural gaps as mentioned by informants originate in the fact that policy makers are not

accustomed to evidence-based planning. One DP informant argued that 'even the highest government policies, such as the Rectangular Strategy, were not developed on the basis of any research information'.

Three informants mentioned the resistance of policy makers to research results, especially for issues relating to transparency and accountability in policy implementation. One academic informant stated that 'the gaps between researchers and policymakers were wider once research projects uncovered sensitive issues, for instance, related to land and forest concessions'. This suggests that concerns with transparency and accountability in policy implementation could be one of the underlying barriers to linking research and policy. Consistent with this interpretation is the view of some informants that there is high interest and willingness of policy makers to take on research results related to technological options that do not deal with sensitive issues, such as new rice varieties that are more tolerant to floods and droughts.

Two DP informants also observed the frustration felt by policy makers who want to achieve results to showcase to the public for political motives (e.g. election campaigns) but have to wait for supporting evidence. For this reason, the informants thought that policy makers are unlikely to practise evidence-based planning as this takes longer than conventional planning. One informant noted that 'policymakers want to see the results quickly, they cannot wait for long, say 10 or 20 years, while climate-informed planning could take considerable time to see the impacts or benefits'. The informant explained that evidence-based planning needs more time as it requires more stakeholder consultation and research. Another informant explained evidence-based planning as a combination of newly conducted research and implementing a project or programme based on those findings. This explanation is consistent with common practice in development projects in Cambodia, where research is undertaken to inform project implementation. However, this perspective can be misleading, as it is unnecessary to conduct research for every project – using available research information, where it is available, is more resource-effective.

3.3. Addressing the challenges

In order to strengthen evidence-based planning in the Cambodian water resources and agriculture sectors, informants (especially those from DPs and academia) proposed a number of measures. The majority suggested that local research institutions be strengthened so as to be able to provide more accurate and appropriate information to policy stakeholders. Informants also pointed to the need to improve research communication skills, the co-production of knowledge in CCA work, and the establishment of climate change knowledge intermediaries (Table 1).

The low capacity and status of local research organizations was acknowledged by nearly 60% of informants. One government official even predicted that research capacity within the water resources and agriculture sectors will be weakened in the future, because many students like to take up management courses. In relation to the low status of research organizations, one MAFF informant said 'local research institutes and universities can only provide minor assistance to policy development because they lack resources', while another DP individual stated that 'some research provides inappropriate recommendations'. The informants therefore thought it was critical that local academia and individual researchers strengthen their research capacity. It was explained that, by doing so, research organizations would gain credibility, thus building trust about the services they provide to policy stakeholders.

Table 1. Informants' suggestions for bridging research–policy development gaps in Cambodia

Suggestions	Percentage of informants ($n = 28$)
Strengthening research capacity of local universities	57
Strengthening research communication skills	39
Co-producing CCA knowledge	29
Establishing CCA knowledge intermediary	11

Nearly 40% of the informants pointed to the need to improve research communication strategies as a way to enhance the use of research for policy development. One academic informant stated that 'researchers should have good communication skills and be patient'. The informant further suggested that research reports should be written in a language that does not sound critical, otherwise policy makers will resist or ignore it. With balanced, objective, and neutral language, research organizations and researchers can build good relationships with government ministries, and thus be able to inform policy development with their evidence-based findings. The Cambodian Development Resources Institute (CDRI) was mentioned as having done well in this respect.

There were two main research communication strategies commonly in practice, as indicated by informants whose organizations implemented research projects (including academia, government, and DP organizations). Disseminating research reports to policy stakeholders was mentioned by more than 80% of informants, and research–policy dialogue events (e.g. dissemination workshops, seminars, and conferences) were mentioned by more than 60% of them. According to the informants, dissemination workshops were generally organized when funding was available. Personal contact and engaging policy stakeholders in research projects were mentioned by some informants from academia.

Disseminating policy briefs instead of full research reports was reported to be a recent practice by some local research organizations like CDRI. The informants observed that the approach was effective and suggested it be applied more widely. They stressed that the policy briefs should be between two and four pages in length, and written in local and simple language that can be easily understood by policy stakeholders. Most government informants, especially senior officials, indicated a printed document was appropriate for them because they had limited access to the Internet and were not accustomed to downloading and reading online.

According to the informants, research–policy dialogue in Cambodia was less effective because, in general, technical officials were sent to attend dialogue events. Getting policy makers to participate in such dialogues was claimed to be difficult. Another academic stated that '. . . A key challenge here is that we [dialogue organizer(s)] were not able to access to high-level policymakers'. The informants observed that the presence of the Prime Minister (PM) in research–policy dialogue was influential in attracting the attention of high-level policy makers (e.g. ministers and the secretary of state of line ministries). However, the PM was only present at large events such as the 'development forum' and 'national climate change forum', which were organized only infrequently.

Personal contacts were also used to reach high-level decision makers. One academic informant reported having successfully organized a policy roundtable discussion with relevant policy makers

by using their personal contacts. Similarly, two other academic informants reported using relationships with influencers as a channel to communicate research results to policy makers. One of them said that 'the research team aimed to convey the research results to MAFF's Minister, but we could not access to him, so I took the result to discuss with my rector who had good relationship with him'. Another informant reported having used the secretariat office (recruited by the funding agency) as a channel, saying that 'we kept the secretariat office informed about the research: design, analysis and results because they have more access to policymakers'.

Nearly 30% of the informants, mainly from academia, pointed out that it was effective to communicate research information to policy stakeholders by engaging them in the research process. One informant argued that 'it is important to engage policymakers in the research process; this approach is highly effective in informing policymakers'. Along this line, another informant observed that MOP tended to use research information more when engaged in the research process. Another informant reported having engaged policy makers as project steering committee members in research projects as a way to share research information with them. Engaging policy makers in the research process creates shared learning and common interest, as well as opportunities to co-produce knowledge.

To strengthen connections between research and practice, about half of the informants suggested that research projects should engage sub-national government, especially agricultural extension workers who work directly with farmers in vulnerable communities. Some of the informants also suggested that local academia should assist water resources and agricultural specialized departments, including the Department of Agricultural Extension in disseminating research results.

Three DP informants suggested that knowledge intermediaries be developed to assist with collating relevant information and communicating it to relevant stakeholders. One proposed that the CCD work as this bridging body as it has relevant expertise. Funding agencies were mooted as a possible option by two other informants. However, no specific funding agency was named.

Research informants also suggested a number of enabling factors that would facilitate more evidence-based planning in Cambodia. For example, a 'result-based approach', already piloted by some ministries including MAFF, was mentioned by 25% of the informants. One academic informant argued that 'as the government has introduced results-based approach there will be more demand for research because research will direct them towards results'. Two academic informants noticed an increasing interest by funding agencies in promoting evidence-based planning in Cambodia, giving the example of the World Bank's support for strengthening the research capacity of local universities. This research capacity strengthening enables local academia to produce more accurate research information for policy stakeholders, thus building their credibility as a knowledge provider to these policy stakeholders. In addition to these ongoing efforts, about 70% of informants suggested 'mainstreaming CCA into development policies' in order to facilitate climate-informed development. Furthermore, some 50% of the informants suggested providing CCA-related capacity building for relevant stakeholders to enable them to practice climate-informed development planning.

4. Discussion

Although contrasting viewpoints were expressed by informants, overall the study found that evidence-based policy development is limited in the Cambodian water resources and agriculture sectors. This is

not a surprising finding, however, given that Cambodia is a least developed country with poorly developed local research and science facilities (Kian-Woon et al., 2010; Schwab, 2012). A broader study investigating research–policy linkage in developing countries produced similar results (Jones et al., 2009).

There are suggestions that Cambodian planning practices will become more evidence-based. Such a change will be facilitated by ongoing initiatives such as the introduction of a results-based approach and an increasing interest of funding agencies in narrowing research and policy gaps by supporting the strengthening of local research capacity. The government's commitment to good governance, thereby improving transparency and accountability, is also supportive of such a change. Moreover, some stakeholders valued evidence-based planning and seemed to have prepared for it.

Different stakeholders' groups pointed to different challenges in connecting research and policy development in Cambodia. Informants from government organizations pointed to the lack of implementation of development plans as a reason for the gap between research and policy, while those from DPs commented on the lack of relevant information as a key challenge. Informants from academia generally pointed to issues relating to the communication of research.

The lack of implementation of development plans has several causes, but is primarily an issue of funding. Due to insufficient funding, governmental plans were only partly implemented. For this reason, government informants did not see the necessity to have evidence-based planning. This finding suggests that the water resources and agricultural development plans were unrealistic, with a large mismatch between proposed activities, projects, and programmes and available budgets. Although one may argue that the water resources and agricultural development plans – and the national development plans overall – also aim to guide overseas development assistance (ODA) to Cambodia, this mismatch remains a concern. First, it undermines the value and credibility of government plans and policies. Second, it weakens the motivation and legitimacy of government officials.

In current planning, the government budget covers only about 10% of the total amount required to implement the national development plans (Sato, Shiga, Kobayashi, & Kondoh, 2011), so it is assumed that the remaining 90% will be covered by ODA. However, securing ODA is a challenge. The relevant officials (e.g. department planners) need to have appropriate knowledge to do it, and many in this study appeared to lack these skills. It is therefore important to build the capacity of departmental directors, deputy directors, and key officials with planning and fundraising roles so they will be able to secure external funding support to implement their plans. Furthermore, given that only a limited budget is available for implementing policies concerning water resources and agriculture, ministry plans should be scoped and scaled down to be realistic and implementable.

The findings of a lack of adequate relevant information for planning and weak research capacity of local academia were not surprising. Previous studies (Dany et al., 2014; Kian-Woon et al., 2010; Schwab, 2012) have also highlighted these difficulties, not only for issues related to climate change, but also for other sectors in Cambodia. These issues need to be addressed in order to promote evidence-based planning in Cambodia. Given that the government does not allocate any budget for research and science, strengthening the research capacity of local academia is a great challenge, and it may take time for them to be able to provide quality services to policy stakeholders. It is suggested that funding agencies support some selected public universities (e.g. the RUA) to develop relevant research programmes that are necessary for agriculture development – especially to take into considerations climate vulnerabilities. Lebel (2014) argues that developing appropriate and relevant research agendas for CCA is a critical challenge. It is therefore suggested that the development of the CCA research agenda in Cambodia be

performed in close consultation with respective ministry long-term development policies and national and sectoral climate change strategies.

Another challenge is the need to use the available resources for research more effectively. This is a challenge because research projects in Cambodia are implemented by many organizations under different programmes and collaborations. One way to reduce duplication would be to revise organizational roles and mandates, for example by allocating research work to local academia rather than government ministries or DPs. Another way would be to develop a collaborative research programme, as some informants suggested, including, for example, CARDI, RUA, and GDA.

Only a few informants suggested knowledge intermediaries for facilitating evidence-based planning in Cambodia; this is an unexpected finding. Building the capacity of local academia requires extensive resources and time, so introducing knowledge intermediaries to facilitate research and policy is seen as necessary (at least in the short term). It is necessary for several reasons: (1) there is a demand for relevant, quality information for water resources and agriculture development, especially in the face of climate change; (2) there is limited local information available, in general, and even less that is CCA-specific (e.g. climate change and impacts projections for water resources); (3) local research capacity is limited and has progressed slowly; and (4) the lack of experience in evidence-based planning of Cambodian policy makers requires proactive and constant communication and dialogue. The modest level of support for the notion of knowledge intermediaries may be due to stakeholders' unfamiliarity or limited understanding of the concept.

In practice, both international and local consultants have played roles as knowledge intermediaries sharing knowledge (Fisher, 2010; Jones et al., 2009; Meyer, 2010) with relevant policy stakeholders. They have assisted policy stakeholders in developing policies, plans, programmes, and project documents, as well as implementation in some cases. A prime concern about using consultants is that they are temporary and rely on external funding support. Additionally, to be effective, knowledge intermediaries require appropriate skills and competencies, especially the ability to interpret and apply research findings and build positive relationships and trust with relevant stakeholders (Dobbins et al., 2009). These requirements cannot always be expected from consultants. Therefore, additional types of knowledge intermediary are needed. Research informants pointed to the CCD or funding agencies as suitable candidates. Members of Climate Change Technical Committee (CCTC) could also be potential candidates as knowledge intermediaries.

The co-production of knowledge by engaging policy stakeholders in the research process has been demonstrated in Cambodia, e.g. in an international research partnership implemented by CSIRO (Roth, 2010; Roth & Grünbühe, 2012). Research informants also mentioned other ways of engaging policy makers in the research process, e.g. as members of project steering committees. The participation of policy makers in research projects is expected to increase their understanding of science, as well as the understanding of policy problems by researchers, creating opportunities for learning and co-production (Larsen et al., 2012; Lemos & Morehouse, 2005; Yuen et al., 2013). Such interactions would also enable more evidence-based planning.

Given the important role of department planners in ministry and national planning processes, engaging these officials in relevant research is essential. In the present planning process, officials facilitate the development of their department plans, forming the basis for ministry and national development plans. Also, it is important to appropriately engage members of national and technical climate change committees in relevant research projects to enable them to effectively participate in climate change

policy development. Stakeholders should also be provided with some training on evidence-based planning and climate change mainstreaming to improve their planning skills, thus enhancing the chance of using research evidence.

Local academics should be engaged in CCA projects, programmes, and policy development, given that they are more available, at least at present. The CCTC and the TWGs, as key formal institutional platforms, should also include local academics. Academics who are included can share their expertise to assist policy development – taking on the role of knowledge intermediaries – and also use the platforms to access data and information required for research (Welp et al., 2006). In this way, research and policy stakeholders can jointly identify priority research topics, as well as help interpret, translate, and validate research results. Such practices are already common in the fisheries sector under the TWG-F, suggesting it is also plausible for other working groups dealing with climate change adaptation issues.

Research informants suggested organizing policy briefings, disseminating summaries for policy makers, and organizing dissemination conferences as ways to communicate research results to policy stakeholders. One of the key challenges identified by this study is gaining access to policy makers at high levels. It was evident that the presence of the PM in dialogue was influential in gaining the participation and attention of other senior officials. In dealing with sensitive issues it is important that research reports and policy summaries be written in a non-provocative way, otherwise the information is likely to be resisted. Personal contacts to appropriate channels can also help convey research results that are sensitive.

5. Conclusions

Although domestic research capacity remains very limited, and evidence-based planning is not yet the dominant paradigm, there has been some progress. Various initiatives are under way to facilitate research as well as the use of research and other evidence for policy development in Cambodia. Some key stakeholders already acknowledge the benefits of improved research–policy development linkage. Regarding communication strategies, for instance, researchers have applied various document and event or dialogue-based approaches. These indicate the growing interest in informed multi-stakeholder deliberation as an input to evidence-based planning and policy development.

This study has identified several challenges to narrowing research and policy development in Cambodian water resources and agriculture sectors that need to be addressed. The challenges are classified into three categories: lack of implementation of government plans, lack of relevant information, and social and cultural barriers. Specific responses to the challenges are proposed in Table 2. Many of the proposals deal with improving institutional capacity, arrangements, and approaches. Although they are practical and implementable, commitments from relevant stakeholders are required.

Further research on knowledge intermediaries is suggested. It is important to examine its institutional forms, who should be involved, what roles or functions they should have, what capacity and skills are required, and where the capacity building can be obtained. Cambodia will benefit from the available information (e.g. from the Intergovernmental Panel on Climate Change (IPCC) and other organizations such as the United Nations Development Programme (UNDP), the United Nations Framework Convention on Climate Change (UNFCCC), the United Nations Environment

Table 2. Challenges and recommendations for narrowing research and policy development in Cambodian water resources and agriculture sectors

Challenges	Recommendations
Lack of implementation of government plans:	Ministry plans should be scoped and scaled down to be realistic and implementable
Development funding highly dependent on ODA	Department planners should be provided with some training on proposal writing for fund-seeking
Lack of relevant information:	Selected public universities should be supported (by funding agencies) to develop targeted research programmes
Research capacity of local academia is weak	New collaborative research programmes are needed, e.g. among CARDI, RUA, and GDA
Research networks are driven by available funding opportunities, and not responding to local needs	
Social and cultural barriers:	Policy stakeholders, especially department planners and members of climate change committees, should be engaged in the CCA research process
Policy stakeholders are not accustomed to design evidence-based policy and planning	Policy stakeholders should be provided with training on evidence-based planning
Conveners of research dialogues find it difficult to access policy makers at higher levels	Local academia should be engaged in CCA projects, programmes, and policy development; they should also be included in existing institutions such as TWGs and climate change committees
	Conveners need to make better use of personal contacts and improved communication techniques to attract senior officials to research dialogue events

Programme (UNEP), and other academic papers) if appropriate knowledge intermediaries are developed. There is also a need to draw on lessons learned elsewhere about how to strengthen the linkages between research and policy development, and to experiment with some of these options in the Cambodian context to identify those that are institutionally, socially, culturally, and economically acceptable and affordable.

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Appendix 1. Interview guide

1. What difficulties and challenges may your or (water and agriculture related) organizations have in order to access and apply relevant information and knowledge into existing planning process?
2. What mechanism would you propose in order to assist your or (water and agriculture related) organization to better access and benefit from available information?
3. In what ways (Internet/e-mail, hard copy reports/publication, workshops . . . etc.) do you think that your or (water and agriculture related) organization can best receive (with existing capacities) climate-related information needed for adaptation planning?
4. In what ways would local research institutes and networks assist your or (water and agriculture related) organization towards implementing climate-informed decision making and planning?
5. How can the interface between research/science and CCA policy making and planning within water and agriculture sectors in Cambodia be narrowed?
6. How can the interface between research/science and CCA implementation (practitioners) within water and agriculture sectors in Cambodia be narrowed?
7. What would you comment in terms of effectiveness of the communication strategies you and your organization have used to communicate research results to:
    (a) Planners and policy makers
    (b) Practitioners
8. What strategies do you think would be the most effective way to communicate research results to:
    (a) Planners and policy makers
    (b) Practitioners