Communication at the science - policy interface in the forestry sector of ghana

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ABSTRACT

What does the forest science-policy interface in Ghana look like? For some time now policy makers have blamed research scientists for not living up to expectation since they do not see what scientists do and what impact their work has on national development. In other parts of the world, this is also the case where it appears there is poor communication between scientists and the intended users of their research results. The forestry science/policy interface in Ghana has not been systematically examined. To enlighten stakeholders, a study was conducted among forestry research scientists of the Council for Scientific and Industrial Research (CSIR), and some university researchers and policy and implementing partners in the forestry sector. The research focused on communication channels and their effectiveness, institutional arrangements and how they affect the interface between science and policy actors. In Ghana, the Forestry Research Institute of Ghana (FORIG) which mainly hosts forestry scientists is administratively under a different Ministry from the Forestry Commission which is the main client of research results. Interviews were conducted with 82 people; 45% being researchers and 55% being policy actors. Researchers mainly used publications and informal meetings to receive information from policy and end- users while policy actors mainly depended on meetings and official requests in receiving information. The study concludes that institutionalising communication channels such as informal network and face-to-face interaction seems to be more beneficial to both scientists and policy actors than just an administrative integration of their respective agencies.

Keywords: **Science-policy interface, scientific communication, Ghana forest sector, communication channels, effectiveness**

INTRODUCTION

Science and Policy - Making

The science-policy interface or linkage is perceived as the interaction between two systems or boundaries (Verbij, 2008). The paper conceptualises this linkage from the perspective that policy-making involves more than authoritative endorsement of certain decisions. Following the argument by Colebatch (1998), three things are implied when the term 'policy' is used. First, to speak of something as policy implies that it has the endorsement of some authorised decision-maker. In the context of sectors within an economy, especially constitutional economies, this authority is mostly vested in the executive and exercised through various government ministries. Conventionally, Ministers and top-bureaucrats of such ministries have often been referred to as 'policy-makers'. Second, Colebatch (1998) argued that to speak of policy implies expertise, since policy is seen as the process of bringing the power of the state to bear on some particular problem area. The baseline here is that, policy requires specialised

knowledge, both of the problem area and of the things that might be done about it. In this case the emphasis is on the functional areas (e.g. forest policy, trade policy and so on) rather than policy. Third, to speak of policy implies order. This perspective is based on the fact that policy implies systems and consistency and that policy decisions are not arbitrary. Thus, policy sets a limit on the behaviour of officials and at the same time frees them from the need to make choices. This draws a range of activities (such as information dissemination, investigative research and development, decision processing and implementation of the needs of society) into a common framework.

From this 'grand' perspective of policy, one can argue that an 'ideal' policy-making process must take place within an institutional system that ensures the effective integration (order) of knowledge generation (expertise/science) and decision-making (policy authority). From a systems thinking or systems theory perspective, the ordering process provides a super-system which can be called a sector within a political administrative setting of functional areas in an economy that creates interactive mechanisms for the science and authority sub-systems to engage in discourse and interchange. However, the systems thinking approach should not be taken as a rigid construction of a reality that can always be empirically delineated. Building on the notion of boundaries (see Gieryn, 1983; Guston, 2001) as an analytical focus for science and technology studies, Verbij (2008, p26) has argued that "forest sectors for example cannot be solely distinguished through empirical observation but must be seen as socially constructed abstractions." The fact that the domains of science and policy interact and intersect with fluid boundaries is one of the main lessons from the science and policy literature (see Jasanoff, 1987; Turnout, 2003).

In many situations, the 'science' and 'policy' sub-systems or domains are independent in terms of their routine practice and mandate. 'Policy-makers' are there to make decisions that allocate resources (political, economic, institutional) to deal with public problems. 'Scientists' are there to conduct fundamental and applied research to generate 'thought' and develop technologies. The actual purpose for the role of the scientist depends on the epistemological persuasion one takes. The question is 'are scientists supposed to generate knowledge whether or not it is relevant to the requirements of the 'policy-maker' or are they to strictly meet the knowledge need of the 'policy-maker'? It is difficult to give a categorical answer and increasingly, the call for science-policy interfacing has been driven more by moral persuasion.

In their assessment, Cash and Clark (2001) argued that it is the way in which communication is structured that seems to be crucial to the effectiveness of the conversation that promotes sound policy. They described two extreme models that suggest that science/policy interface is a fluid and dynamically shifting boundary constructed by the actors in balancing three tensions; maintaining credibility, assuring practical saliency and legitimising multi-actor process (or legitimizing the process in which multiple actors are involved). At one end is a situation where cloistered scholars reflect on prevailing issues until they are ready to make public a report recommending actions for the policy-maker. At the other end is the model where policy makers consult scientists behind closed doors until they obtain scientific justification for their public statements Janse (2008).observes that few real assessments pursue strategies at either of these extremes. Therefore, it can be more informing to approach a study of communication at the science/policy interface by ascertaining how information is sourced and shared among the actors. In the context of what information may flow and in which direction within the extremes, in specific cases, the science-

policy communication may be characterised by information requisition or dissemination. In the former case an actor takes the initiative to ask for specific information relevant to his work and may make a communicative effort to identify who can provide the information. In this respect, scientists may be expected to ask policy actors about the problems they face that might require scientific investigation. Policy actors, on the other hand, may take the initiative to ask for information to help them to decide on possible solutions. Second, in the case of information dissemination, the actor 'send out' information that he perceives may be useful to others. Here, scientists may be expected to, for example, share scientific knowledge while policy actors share their ideas and problems they encounter in implementing those ideas. All these information needs generate communication encounters that effectively link scientific research and policy processes and establish their mutual dependence. However, Collingridge and Reeve (1986) have concluded their analysis positing that scientific knowledge in policy is treated either over-critically or under-critically depending on whether or not it fits with already existing opinions, fixed interests or established consensus. In this respect, Janse (2008, p184) audaciously reiterated an old scholarly observation that 'to assume that conducting research and disseminating its findings will lead to changes in policies themselves is unrealistically naïve and grossly overestimates the role of knowledge (acquisition) in the policy-change process'.

Communication as a Bridging Mechanism between Science and Policy Institutions

The need to bridge the gap between science and policy is being increasingly emphasised by both scientists and policy actors in developing nations. This is because the trend is for science to impact policy and in many societies this is crucial for national development. Even though communication has been identified as a primary mechanism, communication between scientists and policy-makers has not been effective (Guldin, 2005). This has called for increased effort to bridge science-policy communication gaps in various sectors of national economies. For example, the International Union of Forestry Research Organisations (IUFRO) has responded by forming a Task Force on the subject to develop guidelines for scientists and research organisations to provide effective linkage between forest science and forest policy (Guldin, 2005). However, it should be emphasised that even though communication appears to be an important element in science/policy interfacing, it should not be assumed that effective communication completely resolves the problem. Issues of power and interests come into play in the process of knowledge generation and the strategic use of knowledge (see Collingridge and Reeve, 1986, Turnout 2003) Janz and Persson (2002) observed that there are serious shortcomings in the dissemination and use of information that is required for policy-making in the forestry sectors of developing countries (and often also in developed countries). For example, Acreman (2005) noted that results of scientific studies are not always in the form required by decision-makers. Cortner (2000) argued that this is often the case because there is an imposed demand on scientists to adhere to the attributes of scientific culture. This involves adherence to objective, value-free science; preference for technical solutions as first-order ones; and advancement of the scientific method and rationality as preferred logic.

Following informal discussions with both researchers and policy actors in Ghana, two issues often come up to explain the difficulties involved in communication between scientists and policy makers. First, the isolation of the research and policy institutions within the political-administrative system has been mentioned. For example, institutionally, FORIG, as one of the

public research institutions under the CSIR is administratively under the Ministry of Science and Environment, separated from its major clients, the Forestry Commission and the Ministry of Lands and Natural Resources. This existing institutional arrangement does not create direct official communication links between for example the FORIG and the Forestry Commission and the Ministry.

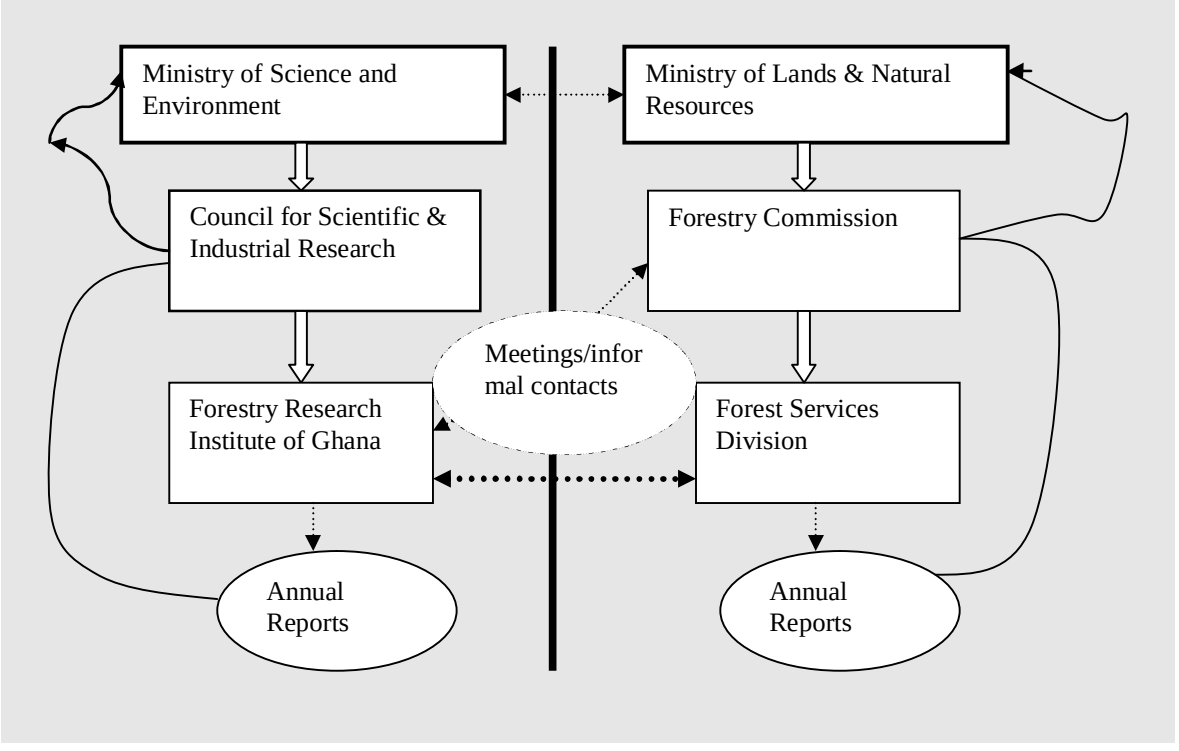

Figure 1: Diagrammatic representation of the forest science/policy institutions in Ghana and lines of official communication flows

As shown in figure 1, the reporting system of FORIG ends up with its sector Ministry while that of the Forest Service Division, as the main implementing agency of sustainable forest management, ends up with the Ministry of Lands and Natural Resources. Against the backdrop of the observation that there is very weak inter-sectoral (inter-ministerial) coordination in Ghana (see Marfo, 2002), communication and exchange of information is effectively curtailed at the top. There is therefore no 'structured obligation' on forestry scientists to communicate their research findings or-policy makers to 'demand' scientific input in their decision-making.

Second, and even complicating the issue, is the fact that 'scientific' communication is the principal bases upon which researchers make

progress. This forces scientists to focus on publishing their findings in refereed journals instead of devoting quality time to communicate their findings also in the form of memoirs and policy briefs to target policy makers and implementers. For example, over the years, FORIG has hosted a refereed journal with average of two issues a year without significant effort to publish Briefs on their research findings for distribution to stakeholders. Thus, while a significant body of science-based knowledge relevant for sustainable forest management exist in the volumes of scientific articles, this has not been translated into forms accessible and easily digestible for policy makers. In effect, scientists and policy actors in Ghana seem to exist without well structured connections to facilitate communication.

Not surprisingly, over the past decade or so, the subject of science-policy linkage has received increasing scholarly attention with a considerable number of publications pointing to the need to improve communication between scientists and policy-makers (see Ellesfon, 2000; Mills and Clark, 2001; Shields *et al* 2002; Guldin 2003; Konijnendijk, 2004; Spilsbury and Nasi 2006; Janse 2008). Of these studies, as observed by Janse (2008), few have attempted to gather quantitative data through surveys that seek an objective assessment of the problem. The purpose of this paper is to explore communication and information exchange at the science/policy interface in the forestry sector of Ghana in order to enlighten both stakeholders and the on-going scholarly discussion of the subject. In particular, the paper seeks to demonstrate, by using a case study of the forestry sector in Ghana, the nature of communication flow and the perception of the actors with respect to how the existing institutional arrangements enhance or constrain such communication. The paper is structured around three main research questions:

- What are the preferred channels of communication for scientists and policy actors in the forestry sector?
- What is the perception of these actors about how the existing institutional arrangements affect communication?
- How can these be explained and what lessons can be learned from these observations to improve communication at the science/policy interface in the forestry sector?

It is argued that the outcomes of the study are relevant in two main respects. First, it enriches ongoing discussion about science-policy communication, especially in developing countries, by providing additional empirical evidence. Second, the study can further enlighten the claim that forestry scientists do not sufficiently impact forest policy and implementation processes in Ghana. Thus, the paper can benefit stakeholders in the forestry sector of Ghana.

METHOD

The study employed interviews and a survey of scientists and policy actors in the forestry sector of Ghana. For the scientists, researchers at the Forestry Research Institute of Ghana were the main targets though some lecturers at the Faculty of Renewable Natural Resources of the Kwame Nkrumah University of Science and Technology who also conduct some research and disseminate knowledge in the sector were also targeted. The authors believe that limiting the sampling mainly to the FORIG was representative as it is the national agency with the mandate to conduct scientific research and technology development to support sustainable forest management. The survey also targeted policy actors, mainly personnel who are regularly consulted or involved in policy decisions, either at the ministerial, corporate or Divisional levels of the forestry

sector. Some NGOs from the Forest Watch Ghana (the umbrella coalition of green NGOs in Ghana) were added due to the increasing level of consultation of civil society in forest policy decisions in Ghana. Out of the 120 questionnaire dispatched, 82 were completed and returned. Table 1 summarises the number of respondents targeted from each actor category.

In the interview respondents were asked to indicate channels of giving and receiving information from each other, give their opinion about the relevance of information received to their work compared to other sources, evaluate the proportion and quality of received information in terms of usability, evaluate the effectiveness of existing institutional arrangement for science/policy communication and to rank their preferred institutional arrangement for enhancing communication and cooperation.

The channels of communication were categorised into four groups, 'Scientific publication', 'Meetings', 'Official requests' and 'Informal networks'. Scientific publications describe all publications such as technical reports, journals, books and periodicals which are primarily targeted at the scientific community. 'Meetings' describe conferences and workshops. 'Official request' is used to describe all information requests that are addressed to a specific recipient in the system. These include memo, policy briefs and official letters written to particular institutions to request for specific information. 'Informal networks' describe the use of actor's own contacts such as friends in other institutions, colleagues and so on for which the response is 'obliged' more on social than official relation.

Additionally, the survey assessed the perception of the respondents about whether the status quo, a partial or full integration of the institutions can potentially enhance effective science/policy communication or not and what specific arrangements must exist. By partial integration, we meant any formal institutional arrangement that will maintain the independence of research and policy and management institutions but establish some obligations for cooperation in terms of information exchange. By full integration, we meant formal arrangement that will eliminate the administrative independence of the institutions and effectively 'collapse' them into one body.

The responses were coded and SPSS software was used to analyse the data to generate frequencies, contingency tables and charts. Where it was necessary to test for significance of differences in observed frequencies, the chi-square test was employed, also with the help of SPSS.

RESULTS

Communicating Information Need (Information Requisition)

Both researchers and policy actors were asked about how they communicate their information needs (demand-side). Researchers were specifically asked to indicate how they identify policy-relevant issues that inform their research. Policy actors were asked how they request for scientific information that informs their professional decisions. Figure 2 shows how the various channels were used and suggests that scientific publications and formal meetings dominate the channels for communicating information needs of both scientists and policy actors.

When the result in figure 2 is separated for each respondent category, the result is shown in figure 3. It shows that scientific publications, informal networks and meetings in that order of importance were the predominant channels for research scientists to receive information relevant for their

work. On the other hand, policy actors predominantly used official requests and meetings as their preferred channels. They patronised informal networks and publications least but about equally.

In general, it appears that scientific publications and informal networks were important channel for both scientists and policy-actors.

Table 1: Summary of number of respondents and their institutions

Category of Respondent	Respondents' Institutions	Number from Institution	Total Per Respondent Category (%)
Scientist	FORIG	32	37 (45%)
	KNUST	5	
Policy actors	Ministry of Lands, Mines and Forestry	10	45 (55%)
	Forestry Commission (corporate headquarters)	10	
	FSD (District and regional managers)	10	
	Green NGOs	15	

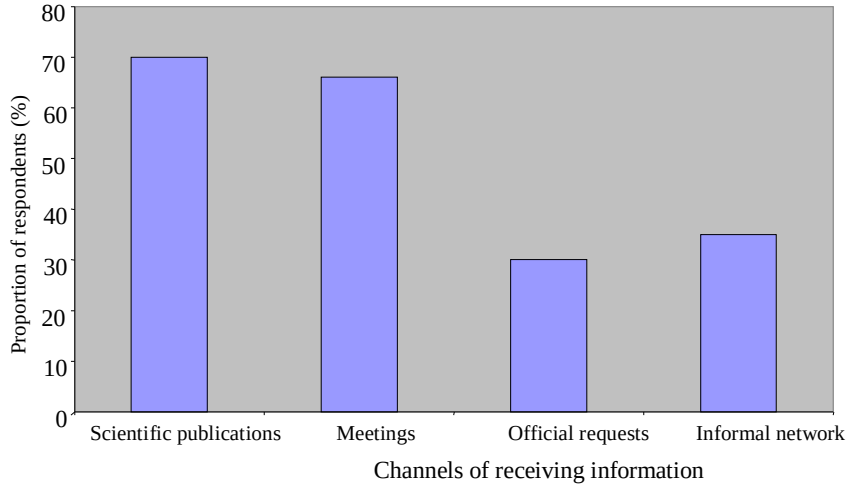

Figure 2: Sources/channels for receiving information by researchers and policy actors (N = 82 and multiple responses observed).

However, it appears that policy actors meetings depended more on official request (about 70%) and official requests (about 60%) than scientists in receiving/obtaining scientific information. Scientists on the other hand indicated that they used more of scientific publications (about 60%) and informal contacts (about 55%) as sources of information for their work than meetings (about 40%) and official requests (less than 30%).

In order to establish whether the significance of the observed pattern, a statistical test (chi-square, *df*= 3, α =0.05) was used to test a null hypothesis that the use of the channels of communication is independent of respondent's profession as a researcher or a policy actor. The test gave a chi-square value (8.27) above the critical value of 5.99 which led us to reject the hypothesis. We conclude that scientists and policy actors significantly differed from the preferred use of communication channel in requesting for information. Thus, it can be said that scientific publication and informal networks are the predominant channels used by scientists to obtain information. Policy actors on the other hand predominantly depend more on official requests and meetings.

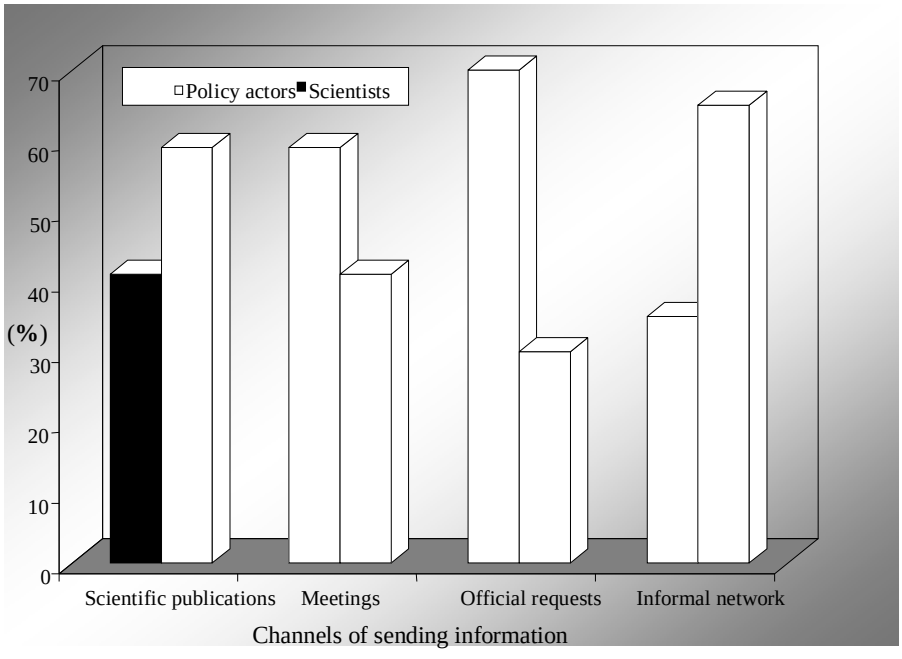

Figure 3: The channels indicated by policy actors and scientists as means of receiving information to support their work

Communicating Research Results (a case of Information Dissemination)

On the information supply side, researchers were asked how they communicate research results to policy actors. Table 2 shows their response. A cross tabulation of actors and the use of these channels shows that apart from meetings, scientists and policy actors differ sharply by the type of channel they use to communicate their results/concerns (Figure 4).

While scientists relied heavily (about 90%) on the use of scientific publications, policy actors indicated that they communicate frequently using official requests (over 90%). Again, this is supported by results from a chi-square (df = 3, a = 0.05) test[1] which led us to accept the hypothesis that the preferred communication channels depended on respondents profession.

Table 2: Summary of frequency of use of indicated channels of sending information by respondents. Some respondents indicated more than 1 means of communication (N=82)

Channel of sending information	Frequency of use	Percentage
Scientific publications	33	40%
Meetings	62	76%
Official notice	14	7%
Informal contacts	-	-

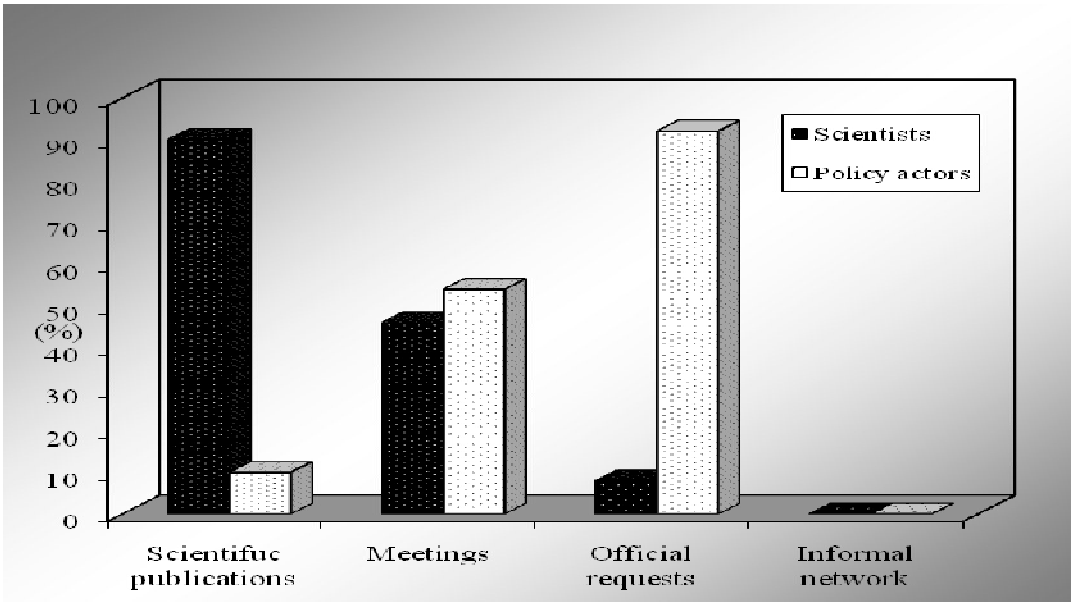

Figure 4: Channels used for sending information (supply) by scientists and policy actors

The Usage and Quality of Scientific Information (Policy Actors)

Policy-actors were asked to evaluate the proportion of research results from the Ghanaian scientific community (mainly FORIG) that informs their professional decisions (relevance). Figure 5 shows their responses. In general, at least 75% of them do not seem to use scientific information from researchers in at least one out of every 2 (50%) professional decisions they make. In fact, only 4% indicated usage as high as 80% to 100% of scientific information and 11% never base their decisions on it.

On the question of perception of the quality of research conducted by FORIG as compared to other sources of information that meet their professional needs, 46% of the policy actors (Figure 6) indicated that it was of good quality while 28% indicated that it was fairly good. Those who found the results from FORIG to be excellent constituted 4% of the respondents (policy actors).

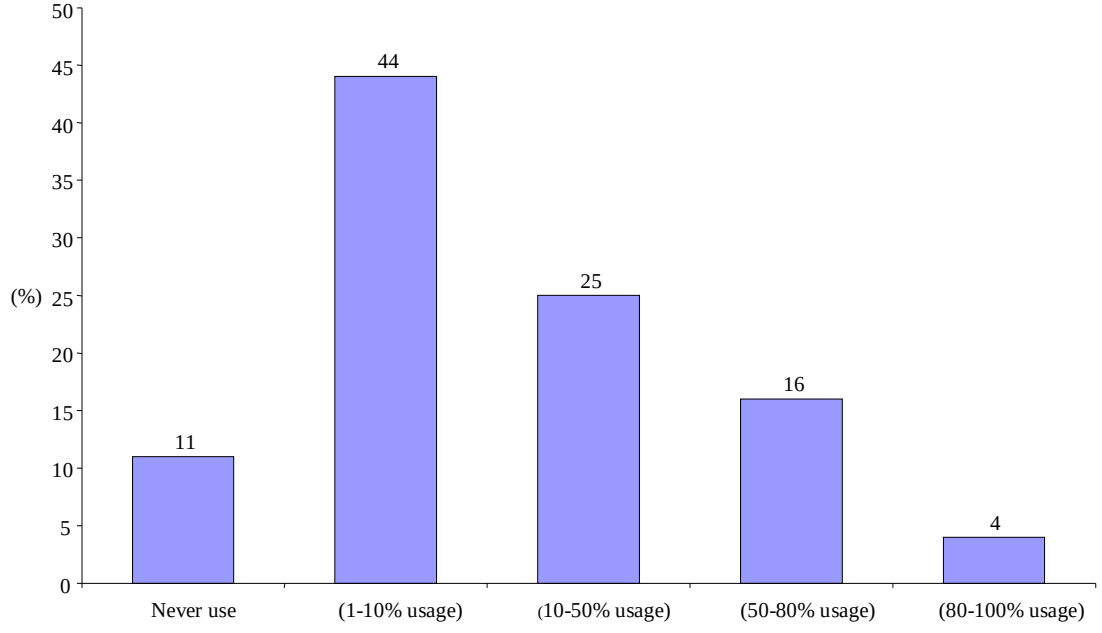

Figure 5: Proportion of usage of scientific information by policy actors

Institutional Arrangement and Science / Policy Communication

All the interviewees (scientists and policy actors) were asked to evaluate the effectiveness of the existing institutional linkage (as in figure 1) or cooperation between science/policy agencies in facilitating communication between policy makers and 'their' scientists. Figure 7 summarises their responses. Majority of respondents (56%) said that the existing institutional arrangement was poor in facilitating effective interface between scientist and policy actors or users. About 30% said that the arrangements were satisfactory and only 9% said it was good.

Various factors such as dispersed location of sector institutions, fear of expert domination and limited need for research result were identified as reasons contributing to the ineffective cooperation between science/policy institutions.

Figure 8 summarises the responses. Individual attitude of personnel in all the sectors was identified by 35% of respondents as the topmost factor preventing effective institutional cooperation among scientific and policy institutions and departments in the forestry sector. This is followed by the fear of loosing institutional autonomy, (23%), the fact that institutions are not located in the appropriate ministries or departments (22%) and limited need for scientific information by some institutions or respondents (14%). About 6% of respondents said that the fear

of experts (scientists) dominating decisions was the reason for poor cooperation and interaction within the system.

With respect to responses on the best institutional arrangement for effective communication, 59% preferred partial integration as against 41% who preferred full integration. The details of the suggested arrangements are summarised in Table 3.

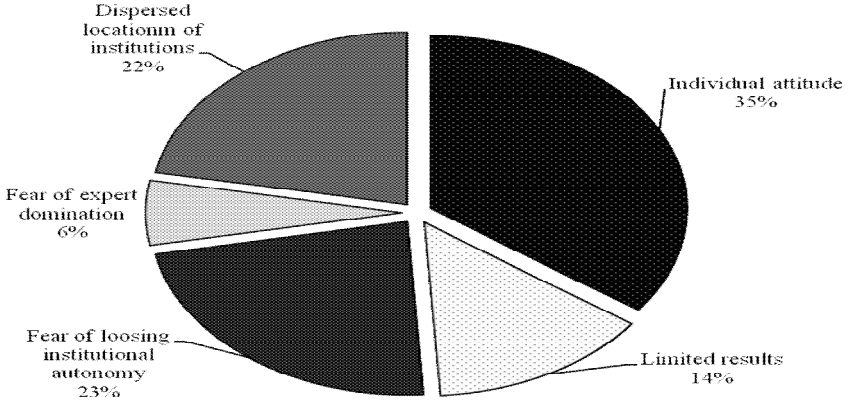

Figure 6: Policy actors' evaluation of the quality of scientific information obtained from FORIG

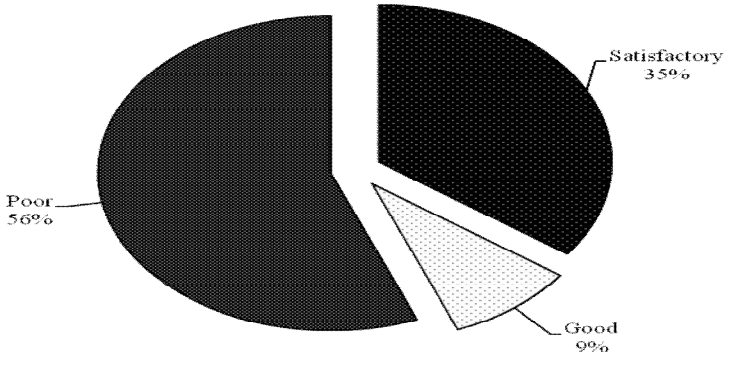

Figure 7: Assessments of respondents on the effectiveness of existing institutional arrangements in the forestry sector in facilitating effective communication at the science-policy interface

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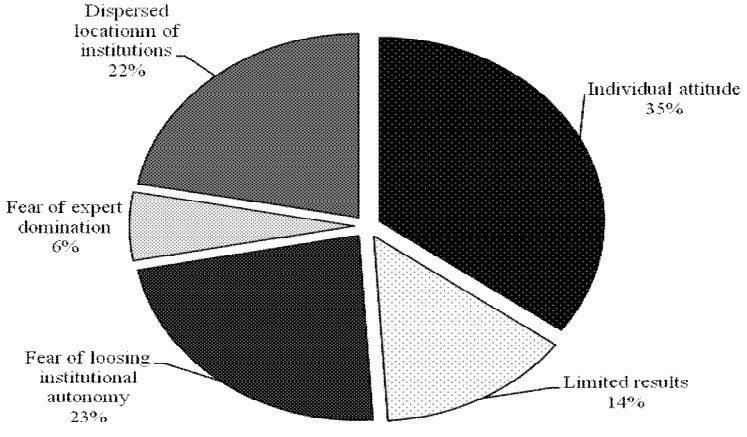

Figure 8: Respondents' evaluation of the factors that negatively affect institutional cooperation and communication in the forestry sector

Table 3: Suggestions for integrating sector institutions to enhance cooperation and science-policy interfacing as given by the respondents

Suggestion	Percentage of responses
Partial integration of FORIG with the Ministry and Forestry Commission using MOU	59
Move FORIG to Ministry of Lands and Natural Resources	17
Move FORIG to Forestry Commission	24

DISCUSSION

The results from the survey presented above give a first-hand overview of the situation of science/policy interfacing in the forestry sector in Ghana. The response sizes, 37 out of 60 for scientists and 45 out of 60 for policy actors is believed to be large enough to draw some relevant general conclusions on the perceptions and experiences of scientists and policy actors in Ghana.

Even though some studies have shown that the three most preferred channels of information requisition by policy makers is e-mail, telephone and face-to-face meetings (Otronen, 2003; Janse 2006), it is not too surprising that the first two did not feature as preferred channels. This can be attributed to the relatively low Information and Communication Technology (ICT) infrastructure, especially within public and civil service institutions in Ghana. However, the observation that over 70% of policy-actors use official requests through memoranda, letters etc indirectly goes to confirm the results of these earlier studies. As a country with less developed ICT infrastructure in the public sector, it is natural to expect that officials would rather resort to paper work than electronic mails. Moreover, the results from this study confirm that face-to-face meeting is an important channel for policy-makers as about 60% of them used this. The results also confirm the observation by Janse (2006) that publication is the least preferred channel used by policy-actors to make inquiries. In this study, compared to other channels, the least utilised channel was scientific publications which were used by about 40% of the policy-actors. The predominant use of scientific publications by scientists as source of information is comparable to observations made by Phelen (2000). While Phelen (2000) observed that scientific publication was more preferable, the study by Janse (2008) suggested that in 80% of the cases, personal contact was more preferable. This study, observing that 70% and 65% of scientist used scientific publications and informal networks (personal contacts) respectively can therefore build on the results of Phelen (2000) and Janse (2008) to confirm that these two are almost of equal importance as preferred sources of information for scientists.

With respect to information dissemination, the pattern of the use of communication channels for information requisition by scientist was similar to that observed for communicating results from their end. For example, almost 90% of scientists communicate research results using scientific publications and about 50% also use face-to-face meetings. It is not surprising that scientific publication is predominantly used because, as also observed by Phelan (2000), most scientists are rewarded for producing documents to transfer knowledge. For example, to be promoted as scientists in the Council for Scientific and Industrial Research of Ghana, one needs some

minimum number of publications in refereed journals. This requirement is automatic and cannot be cancelled or outweighed by any other achievements such as service to society, amount of research fund raised for the Council or even amount of popular writings that stand to one's credit.

Following the pattern of communication used, it is not surprising that less than only about one-third of policy-actors indicated that their professional decisions were somehow significantly affected by research results from the scientific community. Corroborated with the assessment of respondents about the effectiveness of institutional arrangement for science/policy communication The results suggest that there is an institutional failure in the sector to create effective science/policy interfacing. Admittedly, the respondents ranked among the factors contributing to non-cooperation, the need for scientific information as the least important. This suggests that both scientists and policy actors agree on the need for communication and exchange between them. The problem as observed from this study is how to create and institutionalise communication channels, especially those that are preferred by both sides as a means of exchange of information. Therefore, rather than pursuing the debate that a physical integration of the 'dislocated' science/policy agencies within specific sector ministries will resolve the poor science/policy interfacing, it may be useful to focus on institutionalising communication channels. Not surprisingly, most scientists and policy actors in this study did not agree that a total integration such as, for example, bringing FORIG directly under the Ministry of Lands, Forestry and Mines, will resolve the problem.

Several studies have made recommendations that are largely supported by the observation in this study (Guldin *et al.*, 2005; Carrada, 2006; Janse, 2008). Guldin *et al.*, (2005) recommended that scientists should focus research on policy relevant issues, conduct research in a communicative and collaborative manner, understand and engage in the policy process and create organisational capacity and culture that enables work at the science-policy interface. Carrada (2006) made a useful contribution by focusing on the political side of the issue and encouraging scientists to go beyond the stage of merely translating research results into popular languages to that of strategising to catch the attention of policy makers with their research findings and developments. In this respect, face-to-face interaction and informal networking can be very useful strategies.

From the foregoing, the guidelines recommended by the IUFRO Task Force on Forest Science-Policy Interface are well supported as a first step for researchers to move forward on bridging the communication gap. IUFRO recommends that researchers should be:

- Focusing research on questions that are relevant to policy issues;
- Conducting research in a communicative and collaborative manner;
- Understanding, serving and engaging in policy processes; and
- Creating organisational capacity and culture that enable and encourages work at the science-policy interface (IUFRO, 2005)

CONCLUSION

The study sought to explore science/policy interfacing in the forestry sector of Ghana and to examine how information exchange flows. Several general conclusions can be drawn.

First, face-to-face meetings and informal networks are two strategic channels that can harness effective communication between forest scientists

and policy actors. It may therefore be useful to deepen the level of involvement of both researchers and policy-actors in the meetings, workshops, seminars and conferences organised by either party. In Ghana, this is particularly crucial as the main public 'forestry' research institutions (FORIG and FRNR) are administratively located outside the Government Ministry which hosts the Forestry Commission. It is expected that such platforms will provide policy actors with the opportunity to seek scientific information to support or inform their decisions while scientists take advantage to build their networks and appreciate information needs of their colleagues. The process of deepening such face-to-face interaction can be supported through institutional collaboration using soft agreements like Memorandum of Understanding.

Second, to continue to utilise their traditional or preferred sources of inquiry, institutional measures that enhance the use of official requests can be streamlined. For example, creating a database of forest scientists and their fields of specialisations and making this available on the computer or central telephone desk of the Ministry and Commissions can be a practical step. This can enhance easy access to scientific information. At the same time, it can be recommended that the reward system associated with publication of scientific information can move beyond technical 'journal-style' writings to more popular forms like policy briefs. This can motivate scientists to communicate more effectively with 'their' policy-makers without deviating too much from their 'traditional' communication culture.

Third, even though institutionalisation of research and policy agencies seems to appear as important, it does not seem that it will automatically resolve the myth but building capacity for informal networking and face-to-face interactions may help actors overcome their prejudices and thereby engage more in information exchange.

Admittedly, these strategies can be implemented through an ordering process both within the science and policy sub-systems and within the entire sector or 'system'. An advocacy for such an ordering may be needed to quick-start some changes that can result both in some institutional arrangement that integrates science/policy interfacing as a priority and correct some impressions that cooperating with each other will lead to some form of domination. Specifically, establishing an inter-ministerial working group on forestry can for example bring researchers and policy actors together. Moreover, another strategy could be to build both actors' capacity to informally network. The forestry sector would benefit from taking these recommendations to action.

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