

**Global Leadership Training Program in Africa**

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**Final Report**

**Filling Gaps for Scientists: New Roles of Research Activities in Climate Adaptation in**

**Ghana**

**Yuki Ohashi**

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**United Nations University, Institute for the Advanced Study of Sustainability**

**MSc. Environmental Governance**

### **Abstract**

Ghana has encouraged the national policy to cope with climate change under the strong political leadership. The policy is funded on the scientific evidences, and scientists contributed to forming the policy direction. Further utilization of scientific knowledge for the policy should be enhanced. This research explored the potential future roles of scientists in Ghana through interviews on scientists, policy makers, UN officers, and local people. Diverse roles of scientists were investigated by identifying structural challenges, satisfaction rate, and expectations from others. I found that scientists work for different levels and various institutions at national level such as providing information for the government, evaluating national policies, and managing the institutional conflicts. Under the political intentions, scientists could be better off for climate policy. However, local communities that have actual challenges such as flood and drought on agriculture due to climate change are lacking scientific support. Limited involvements of scientists to the communities were observed while many researches are already conducted. The opportunities and places could be given for both scientists and local communities under the support of local governments since they have reliance from the residents than scientists. Arrangement of several international programs and NGO activities should be additional possibility to include the scientific knowledge and technology from outside.

## 要旨

ガーナでは、強い政治的なリーダーシップのもと、気候変動に適応するための取り組みが推進されている。その政策の基礎を構成し、方向性を決定する上で科学者の貢献は重要なものであったが、更なる科学的知見の活用が将来的に期待される。そこで、現地の科学者、政策決定者、国連関係者、地元の人々へのインタビューを通して、科学者の多面的な活用の可能性を、組織構造的な問題点、当事者の満足度、外部からの期待という点から考察した。調査の結果、ガーナの国レベルでの科学者の役割は、政策へのインプット、施策の評価、各分野との調整等、多様化されており、政府の意向もあり、今後の発展にも期待できることが分かった。その反面、地方での科学者の気候変動分野での役割は非常に限られており、組織的、地域的に改善の余地が認められた。特に、北部の半乾燥サバナ気候での気候変動による農業被害や水害への対策という点で、住民のニーズや期待は高く、科学者が研究内容をフィードバックする場や、住民との交流を促進する場を設けることで、地域の発展に貢献できる可能性がある。また、ガーナ農村部で同時に展開されている、国際プロジェクトやNGOの活動の連携を促進することも発展への課題として残されている。

## 1. Introduction

Climate and ecosystem changes have influenced the global economy and local livelihood in many ways in the last few decades. The report in 2010 suggested that the total economic loss due to ecosystem change caused by human being is two trillion US dollar every year (TEEB, 2010). Climate impacts will drive 5% loss of global GDP after global temperature increases which is equivalent to the loss from the world war, according to the Stern et al., whereas if the action is taken now it will cost only 1% of it (2006). One main factor of the economic loss is the damage on agriculture since it is vulnerable to the change in nature. The capital for cultivation like water, lands, minerals, and seeds could be harder to gain or use in the same condition than before. As 65% of people live on agriculture in average in developing countries, climate and ecosystem impacts lead to the degradation of their livelihood (UNCTAD, 2010). Farmers earn hardly to sustain their livelihood by just agriculture, so they need to work outside the community as a sideline for adaptive strategy (Smit et al., 2006). They require the technological advancement and knowledge support through policy implementation at the local level to sustain agriculture. The latest IPCC report warns that it is clear that climate change will exacerbate their livelihood on agriculture especially in Africa (IPCC WGII, 2014).

Ghana is one of many countries in Africa that suffers from negative climate impacts on their communities especially for agriculture. The country has experienced relatively stable economic growth in the last few decades compared to other African countries. Poverty rates halved in ten years from 1990s and the GDP will be doubled by 2015 from the level of 2005 (Breisinger et al., 2008). However, climate impacts started to cast a dark shadow on the future potential of the national development. Although the contribution of agriculture to its economy decreases every year, farming is still one of the main pillars in Ghana. About 30% of GDP came from agriculture and 50% of population lives on farming (De Pinto et al., 2012). However, recent unstable rainfall tendency threatens the agriculture and people living on farming partly due to the climate change (Antwi-Agyei et al., 2012). The government should cope with the climate impacts for agricultural production and local livelihoods by the adaptation policy based on reliable scientific debate.

Science is the primary components of national policy to gain the reliability from people which is crucial for implementation. To take up the scientific knowledge, the institutional opportunities ought to be open for scientists to work with policy at first. Then, the scientists should be independent from the government while doing researches and publicizing so that science cannot be affected by any pressure such as political, organizational and economical ones. As long as they are hired by the government, they would have pressure. Thus, it is essential to hire scientists in different agencies and at different levels as well as to ensure the opportunities to reflect the voices of the third parties such as professors outside the government. Those

considerations are required for not only policy planning at national levels but also in policy implementations at local levels.

Currently Ghana has the governmental structure that containing several entities to act on climate policies (Figure 1). At national level, Ministry of Environment, Science, Technology and Innovation (MESTI), Environmental Protection Agency (EPA), and National Development Planning Committee (NDPC) take major roles under strong leadership of the former president (Hens et al., 1999). While MESTI coordinate the different institutional actions, EPA provides the necessary information for policy planning supported by various national research institutions. Many of governmental scientists work for those institutions as well as NDPC which develop national policy on climate change. At local level, District Assemblies (DAs) take responsibilities for implementing the national policies at local level. National Disaster Management Organization (NADMO) is another key actor to implement working closely with the communities. Although DAs and NADMO have connection with central government in the form of human resource exchange, those have much less opportunities for scientists to tackle the challenges at the local sites.

This research aimed to explore the ways for scientists to expand their roles in climate issues in Ghana by identifying the gaps between the current roles of scientists and expected roles of scientists in the future for climate adaptation. While the interface of policy and science are studied as interdisciplinary area, many are in international context. The relationship of scientists and policy makers might be different in developing countries (Jones et al., 2008). The best and efficient way might be influenced by state's backgrounds as well as effective integration of international cooperation into national implementation and community development for climate change while satisfying both interests. This research would find out challenges and opportunities for the scientists in institutional structure and perception of people in Ghana through interviews.

## **2. Study Area**

This study was conducted in Ghana located in Western part of Africa. The population is about 24million including various tribes. The official language is English whereas many languages are used at local level. The Northern part of Ghana is in dry Savanna area whereas Southern part located in rainy tropical forests. Both have rainy seasons and dry seasons in a year. The economy of Ghana has developed consistently compared to other African countries partly due to the political stability. In this country, two cities were selected for this research to conduct this research, Accra and Tamale (Figure 1). Accra is the capital city located in south end of Ghana which has growing population and economy. Most of the ministry offices and major

private companies are based in Accra as well as the international organizations and foreign companies. This city is literally the engine of development of Ghana. On the other hand, Tamale is a typical rural center of the country. It is located in the Northern state and worked as the center of the North area of Ghana because of the major infrastructures such as the main highway and airport connecting to Accra. Most of the population in this city lives on agriculture, and traditional communities continue their lives in the harsh environment. The climate is Semi-Arid Savanna.

**Figure 1. The map of Ghana.** The study area was capital city of Ghana, Accra at the south end, and Tamale in Tamale in the Northern part (Retrieved from Easy Track Ghana website).



### 3. Methods

This research composed of three parts including two questionnaires and individual interviews in Ghana (See Appendix A). First part was on key issues in Ghana; the questionnaire asked people to rank the issues from the list in order of priority they impose for their lives in Ghana. Second part was on main stakeholders; the questionnaire asked people to rank the stakeholders in order of the importance for climate issues. Third part was the semi-structured interviews. Interviewees were asked how they feel the current role of scientists for climate

challenges and future potential of scientists. Questions started from the background story of their life and deepened the questions to the theme based on the answered questionnaires. First two questionnaires provided quantitative data while interviews provided qualitative data describing their perceptions. Main targets of this research were policy makers and scientists in Ghana. I had interviewed 27 people including 10 scientists and 7 policy makers in national and local level. Other 10 people contain a local primary school teacher, one NGO members, one Youth representative, one Embassy officer, two local workers, and three UN officials (Table 1).

**Table1. The number of people interviewed and their occupations under the categories of scientists, policy makers, and others.**

Category	Working at	#
<b>Scientists</b>	University of Ghana	5
	United Nations University, INRA	2
	West African Science Service Center on Climate Change and Adapted Land Use (WASCAL)	1
	United Nations University, ISP	2
<b>Policy Makers</b>	National Development Planning Commission (NDPC)	3
	Tolon District Assembly	1
	National Disaster Management Organization (NADMO)	1
	Ghana Education Services (GES) Office in Tolon District	1
	Ministry of Food and Agriculture, Ghana	1
<b>Others</b>	United Nations Development Programme (UNDP)	3
	NADMO (local volunteer and worker)	2
	Teacher of Primary school at Tamale	1
	UN Food and Agriculture Organization (FAO)	1
	NGO	1
	Youth	1
	Embassy of Japan	1

All interviews were conducted between March 1<sup>st</sup> and March 14<sup>th</sup> in Accra or Tamale while I was staying there. Accra was the capital city developed most in Ghana while Tamale located in Northern semi-arid area of Ghana.

### 3.1. Questionnaire 1: Rank issues in Ghana

Ghana has many problems within the country that threaten their livelihood. To determine the scales of impacts of climate change compared to other important national issues in Ghana, I conducted survey when I visited various organizations for interviews. I handed the paper-form of questionnaire to the interviewees to rank the issues in order of importance; 1 as the most important and 8 as the least (Table 2). Listed issues are climate change, economy, ecosystem change, education, poverty, sanitation/ public health, water, and others. The reasons of ranks were further discussed during the following interviews. The rank was averaged to compare the difference between stakeholders.

**Table2. Issues in Ghana ranked.**

	ISSUES	RANK
A	Climate Change	
B	Economy	
C	Ecosystem Change	
D	Education	
E	Poverty	
F	Sanitation/ Public Health	
G	Water	
H	Others:	

### 3.2. Questionnaire 2: Rank stakeholders in climate issues in Ghana

Climate change is being mainstreamed under the strong political will. Mainstreaming requires the collaboration between stakeholders with the leadership of the main conductor. Effective and efficient implementation of the policy is based on reliability and expectations from local people. Thus, I tried to identify the expected actors for climate issues in Ghana by asking people to rank the stake holders listed in order of expectation; 1 as the most expecting one and 10 is the least (See Appendix A). Listed stakeholders are national government, local government, local community, Citizen (Individual efforts), international organization (e.g. UN), NGOs/ NPOs, Youth groups, Researchers/ Scientists, Diplomatic efforts with other countries, and others. The reasons of the ranks were further discussed during the following interviews. Also, the average rank value was calculated to compare the results between subgroups of



respondents and to interpret how scientists were evaluated among other actors in climate challenges.

**Table3. Stakeholders for climate issues in Ghana ranked.**

	Stake Holders	Rank
A	National Government	
B	Local Government	
C	Local Community	
D	Citizen (Individual Efforts)	
E	International Organization e.g. UN	
F	NGOs/ NPOs	
G	Youth Group	
H	Researchers/ Scientists	
I	Diplomatic Efforts with other countries	
J	Others:	

### 3.3. Semi-Structured Interviews to identify the gaps on scientists' roles

Based on two questionnaires above, I made individual interviews with people to explore roles of scientists in Ghana on climate issues. 20 out of 27 people had chance to answer the interviews which consist of 6 scientists, 6 policy makers, and 8 others. Specific reasons why they rank climate change and other issues in Ghana as such were sought during interviews to identify what kind of obstacles that Ghana should deal with before climate policy would be implemented and mainstreamed. Also, particular reasons why they choose the stakeholder as the most important was asked. Other stakeholders and their ranks are sought accordingly especially for scientists. I also asked them actual face-to-face experiences with researchers and opinions on the role of scientists. Separately from the questionnaire, I sought the educational and occupational background to consider the influence of it on their perceptions. Thoughts gained through the interviews were analyzed in terms of institutional capacity to hold scientists and make use of scientific knowledge. Responses were recorded as permitted.

In addition, during my stay at Tamale, I had chance to join the program called Climate and Ecosystem Changes in Semi-Arid Africa (CECAR-Africa) Project which was the collaborating efforts between Japanese universities and Ghanaian institutions to tackle climate change in local areas to establish resilience. I spent two days with them doing focus group discussions for local communities in Tolon district as an observational participation. This experience made it possible

for me to analyze how scientists outside the government of Ghana could contribute to the challenges as well as how Japan could support their efforts by sending scientists to Ghana.

### 3.4. Research Limitations

Due to the time constraints of the staying, I could interview with limited number of people reflecting less representations of various stakeholders. Also, the list of issues and stakeholders are not systematically structured based on previous research, so the list might confuse people. The responses to the questionnaire 1 and 2 might be biased. In questionnaire 1, I ask them to rank climate change among other issues after telling them I am doing the research on climate change. In questionnaire 2, I asked some to rank scientists in front of scientists. Those facts might make them biased on the results of questionnaires. That could be avoided by distributing the questionnaire through emails before interviews. This research should have been conducted and analyzed well after understand the role of each institution in Ghana government to enhance the appropriate questions for the interviews.

## 4. Results

### 4.1 Issues in Ghana Recognized important

I found the gap between two stakeholders; policy makers and scientists in perception about the important issues in Ghana. Whereas policy makers tend to put more importance on economy and climate change, researchers weighted more on education and water problems (Table 1). The evaluation was calculated based on average of ranks in each group of stakeholder. That is, higher value means higher priority for Ghana. Policy maker valued 3.4 for climate change as the second important issue on average, while scientists valued it 5.8 as ranked 7<sup>th</sup> out of 8 issues. Other 10 people valued climate change 4.0 on average.

**Table4. Important issues in Ghana for different stakeholders.**

Rank	Scientists			Policy makers			Others		
	Issue	Ave	Std	Issue	Ave	Std	Issue	Ave	Std
1	Education	2.9	1.20	Economy	3.1	2.01	Poverty	2.8	2.44
2	Water	3.4	1.71	Climate Change	3.4	1.99	Education	3.2	1.87
3	Sanitation/ Public health	3.7	2.06	Sanitation/ Public health	3.8	2.12	Climate Change	4	2.49
4	Poverty	3.8	2.78	Education	4.3	1.89	Water	4.4	2.11
5	Economy	4.5	2.72	Poverty	4.3	2.63	Sanitation/ Public health	4.4	1.43
6	Ecosystem Change	5	1.83	Water	4.5	1.76	Ecosystem Change	4.9	1.67
7	Climate Change	5.8	1.03	Ecosystem Change	4.6	1.84	Economy	5	1.70
8	Other	6.9	2.13	Other	8	0.00	Other	7.4	1.90

#### 4.2 Main stakeholders perceived important in the climate issues

I found similar tendency on the expected stakeholders for climate change. On contrast with the important issues in Ghana, policymakers, scientists, and others chose same stakeholders as expected actor in climate issues; national government, local government, and local community (Table 2). However, ranks of those three were not coincident to each other. Local government was ranked lower than local community by researchers. The variance between top 3 ranked stakeholders is relatively small for policymaker and big for others. Scientists were ranked following those three actors.

**Table 5. Expecting stakeholders in Ghana for climate challenges.**

Rank	Scientists			Policymakers			Others		
	Stakeholder	Ave	Std	Stakeholder	Ave	Std	Stakeholder	Ave	Std
1	National Government	2.3	1.44	Local Government	3.5	1.61	National Government	1.8	1.87
2	Local Community	3.1	1.85	National Government	3.7	3.21	Local Government	3.2	1.69
3	Local Government	3.6	1.71	Local Community	4.1	1.97	Local Community	4.6	2.22
4	Researchers/ Scientists	4.2	2.66	Citizen (Individual Efforts)	4.9	2.69	Researchers/ Scientists	4.7	2.21
5	Citizen (Individual Efforts)	5.3	2.00	Researchers/ Scientists	5.2	1.22	International Organization e.g.UN	4.9	2.28
6	International Organization e.g.UN	5.4	2.17	Youth Group	6.1	1.59	Citizen (Individual Efforts)	5	1.70
7	NGO/ NPOs	6.4	2.12	NGO/ NPOs	6.4	1.75	NGO/ NPOs	5.5	1.96
8	Youth Group	6.7	1.29	International Organization e.g.UN	6.4	2.95	Youth Group	6.9	1.52
9	Diplomatic Efforts with other country	8.2	2.21	Diplomatic Efforts with other country	6.9	2.81	Diplomatic Efforts with other country	8.4	1.58
10	Other	10.0	0.16	Other	7.9	3.45	Other	10	0

#### 4.3 Interview results

I made 23 individual interviews for people with the questionnaires. Each interview took 30 minutes and 14 interviews were recorded. I summarized the main point on the Table 6 below. Details and additional points would be further discussed in later section.

**Table 6. Main points mentioned by each group of people during semi-structured interviews.**

Scientists	Policy makers	Others
<ul style="list-style-type: none"> <li>▪ Roles of scientists are limited to only advising</li> <li>▪ Only a few could success in influencing policies</li> <li>▪ Scientists need more places and opportunities to talk with policy makers</li> <li>▪ Water issue and climate issues are connected</li> <li>▪ Education is the most effective investment to climate challenges</li> </ul>	<p><b>[National Level]</b></p> <ul style="list-style-type: none"> <li>▪ Policy makers are making good use of scientists through national research institutes</li> <li>▪ New platform for climate change must enhance the roles of scientists</li> </ul> <p><b>[Local Level]</b></p> <ul style="list-style-type: none"> <li>▪ Local officers had no contact with scientists in their jobs</li> <li>▪ Direction, advices and information came from central government but not from scientists.</li> <li>▪ Environmental policy was not coordinated with education policy</li> </ul>	<p><b>[Local people]</b></p> <ul style="list-style-type: none"> <li>▪ Local people have no contact experience with scientists but saw scientists doing researches</li> <li>▪ Local people emphasize scientists' roles but cannot explain the specific activities of scientists</li> <li>▪ Local people do not believe they are getting the feedback from those researches</li> </ul> <p><b>[UN agencies]</b></p> <ul style="list-style-type: none"> <li>▪ UN respect national sovereignty, so they would help national efforts but not voluntarily</li> <li>▪ Better to grow Scientists network inside the local communities</li> </ul>

## 5. Discussion

### 5.1 Great Deal for scientists at national level

National climate policy has been successful in integrating scientists into the policy processes under the strong political leadership in Ghana. Ministry of Environment, Science, Technology, and Innovation (MESTI), Environmental Protection Agency (EPA), and National Development Planning Commission (NDPC) are the three main organizations in charge of climate policy at national level whereas many other ministries and agencies would have interests in climate change. Scientists are allocated in each organization, but most of the governmental scientists are working in the research institutes under the national authority. Their main roles are to conduct researches contributing to the national policies. Some of the outcomes are used as input to make policies, and some help interpret scientific data for policy makers. In the interviews, a few (not working in the institute though) mentioned that some of the scientists in national institutes see themselves as policymakers rather than scientists because they have chances to get involved in national policy processes. Their roles tend to be separated from those of the administrative officers inside the government

NDPC on the other hand, wants to hire people who have strong scientific background for the position of planning. The institution also provides opportunities for officers to raise their ability of science interpretation. NDPC is responsible to make national development policies, and climate impact is one of the important factors to be integrated into them to reflect social needs of sustainable lives of local people affected. MESTI coordinates the efforts between main actors, ministries and related agencies. Also, they have established the platform of communication between scientists and policymakers to make diverse and appropriate use of academic outcomes for the policy. This platform is expected to enhance communication between policy makers and scientists outside the government. Details of platform are not available in public, but this is good sign that government side have will to reflect opinions from outside. Although whether this works efficiently should be evaluated, as a national system fighting with climate challenges, it seems that scientists already have diverse roles inside at different levels of national climate governance inside and outside. In addition, the Ghana government has been tackling the climate issues with the third party, United Nations University, Institute for Natural Resources in Africa (UNU-INRA) to enhance evidence-based climate policy and leadership in African region (myjoyonline, 2014). As institution has structural capacity, the next steps would be to ensure establishing the relationship with scientists so that scientific knowledge would work best without bias due to any pressure.

Regarding to the perception and satisfaction, researchers outside the government still have dissatisfaction for their roles to join the national efforts. Some claimed that the ways to contact the government policies are hard and far away for them even if they would like to contribute. As

the platform can take only some portion of them, and researchers' positions are full at national level, their roles should be found at different level of climate governance.

## **5.2. Future Opportunities at Local level**

Local governments and communities have much more opportunities for scientists to jump into the policy implementation than at national level. As a local authority, District Assemblies (DAs) have big responsibility for the local livelihoods through Regional Office of Environment (ROEs) and Special Environmental Programs (SEPs). EPA provides the necessary information to implement the national policies at the local communities with scientific advises, if appropriate. However, DAs rarely requests the scientific and technical assistance for the higher authority. They have few scientists inside and so do the most of the local communities except for the local universities. Thus, they do little understand what scientists do. As an evidence, local people and DAs officers interviewed could not answer how scientists are important although they refer to them "important." They failed to describe the possible contributions of scientists to agriculture and water supply like those mentioned in the national level. It becomes problematic when new policy requires science literacy to interpret for implementation. This trend is in common with the other main actor in climate implementations at local level, National Disaster Management Organization (NADMO). They are in charge of providing coping strategy against harms caused by climate change and other events for local communities. They may suggest changing crop species more adaptive to the harsh climate condition to farmers for their future sustainable income. Damage reduction due to floods and droughts is taught to the team of people inside the community who are expected to spread the information for neighbors. However, NADMO has similar problem that they have insufficient capacity to completely understand the science based order from Ministry of agriculture. Also, community would just follow the instruction under the authority without through understanding. That could undermine the effectiveness of the policy.

Scientists can contribute to those challenges by providing the interpretation on agricultural knowledge and disaster adaptation from scientific view. One former-executive of local NGO suggested that each community should have scientists inside. One possible idea is to educate a few motivated farmers to be a local interpreter of science. Scientists might be the patron for them to teach regularly at communities in a certain area. It is not reasonable to spare the human resources from national research institutions or national governments because they are in duty and working in the capital city. Another way is to make platform at the local level too to exchange information of local agriculture, regional climate change, and national adaptation strategy. Stakeholders can discuss how to establish local resilience at the community level in that meeting. Both cases require local support from and collaboration with District Assemblies

and NADMO because local governments are relied from both scientists and local people in Ghana.

### **5.3 Broader Implication for Researchers outside the countries**

Roles of domestic scientists at local and national levels are explored in the sections above. However, many other scientists outside the country are involved and interested in the researches in Ghana as experts to fight for local adaptations. The country should take those human resources as its additional fuel to the national and local efforts against climate change. Not small number of researchers focuses on agricultural and water challenges under the changing climate at the local communities. Some are working for the ODA projects, and others might be in NGO aiming to sustainable livelihood of local communities. However, those various efforts are not effectively returned to the local community as a feedback. Interviews revealed that local people see that scientists come to conduct researches, but scientists rarely contact to the majority of the local people. As a normal trend, researchers contact local leaders and a particular local government to obtain permit for the researches at the sites, but do not meet other local people. Outcomes are rarely shown for the local communities whereas they are shared within science community through publication.

The governments especially, local governments do not have ability to find the articles in scientific journals despite they are mentioning their local communities. Assuming researchers in national institutions are collecting articles referring to climate changes in Ghana at national level, this might be another opportunity for the scientists in the local universities to identify the related articles and share the information with the local governments and communities. At the same time, scientists working for the local community in Ghana should have chances to share their outcomes with local people. If it is difficult for them to arrange, local researchers and local officers should help them since they have close relationship with and sound reliability from local people. Increasing interactions must benefit both sides as effective feedback from actual demands for scientists and sustainable livelihood for local communities.

## **6. Conclusion**

Ghana is promoting the policy with scientists to cope with the ongoing global issue, climate change. At national level, the roles and opportunities of scientists are widely spread and diversified. If those human resources are utilized to integrate scientific knowledge appropriately into policy, Ghana can overcome climate challenges that would block the further economic and social development of the country. On the other hand, there are much more rooms are available for scientists to get in climate adaptation at local level. Scientists in the universities and farmers can work together at local level to establish resilient communities to climate impacts if the

opportunities are given under the support of local governments. NGOs and international assistance are the reinforcements for those efforts at local levels when they are well coordinated.

## 7. Reflection

Global leadership cannot be fostered in one-time experience in Africa. I understand that the key objective of this program would be to sophisticate the insight towards global issues at local level in Africa. This was my first trip to developing country despite my long-standing interests in sustainable development and environmental issues in Africa in the context of Japanese contribution to their development. After my experience in Ghana on potential diversification of scientists' roles in climate adaptation, I have found it interesting that my premises changed.

First, how I saw the problem of Ghana was slightly but significantly different from the local perception. I did not realize the plastic flowers bloom in the Northern part of Ghana as I assumed they would have been living without them. It seems this was more issue than climate when came to Tamale at the first time from Japan. The climate issue was hardly recognized at the local areas which must be more affected than Japan. This was because of education; lack of opportunities to learn the issue that many interviewees recognized as the issue. When we claim the purpose of the research, we have to mention it as in the word of their actual needs and problems. Agenda is not set yet for climate change although they can see the problem in their life. This was opposite to Japan; it is hard to see the actual climate challenges while we discuss the issues anywhere in our life. We need to start from understanding the perception gap when we think about climate issues in Africa.

Secondly, I doubted the meaning of the "international" cooperation when I came back. It was quite clear that it is important. But while national efforts are taken under the strong political will, it should be reconsidered why the international assistance is needed and how it should be like. It may disturb their national efforts unintentionally. Also, when people mention "international" it seems they are always bilateral relationship. The researches for sustainable development supported by ODA are partnered with an organization in Ghana but never with other developed countries. NGOs might want to stick with one community to develop; not so much with the government. UN agencies assist national governments for macro policies. These individual efforts guarantee the diverse assistance and stable development. However, those could be better off if they are well coordinated and collaborated to reduce unnecessary overlaps whereas I saw some inefficiency during my visit.

Lastly, I came to believe I limited myself to the "research" in this program, although this program did not seek research-like. Once I took away from the "research", I could see various opportunities to widen your views such as youth networking, diplomacy, and local businesses in Ghana. For example, I visited my friends in Ghana whom I met in 19<sup>th</sup> Conference of Parties for



UNFCCC in Warsaw last year. I was able to share my experiences of climate actions, Power Shift Japan held a month before the visit, for their input for Ghana Power Shift event. Thus, the relationship has further developed between Asian youth and African youth for climate change. Economy of shea butter might be interesting theme to connect local business and sustainable livelihood of Ghana in the context of agriculture facing climate change as well as the gender problem. I saw women take main role for the sideline when I visited the local production sites of shea butter. Climate challenges in Africa have multiple aspects to tackle from international scale to local scale. My vision could not expand that way if I stayed in Japan instead of taking this opportunity of GLTP in Africa. This program has diversified my views in addition to addressing the original question how scientists can contribute further for climate challenges in Ghana.

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**Appendix A1. Interview Sheets**

Interview Questions

March \_\_, 2014.

Interviewee \_\_\_\_\_

**Interview Overview**

1. Climate Change Perception (Common )
2. Expected solutions (Common)
3. Specific Questions

Interview Questions

1. Climate Change Perception
  - 1-1. Do you see any evidence of climate change in your life? For example?
  - 1-2. Do you see any movement on climate change within the government ?
  - 1-3. Could you rank the list of issues in your country? (1-5)

1: Most important issue for you-- 5: Least important issue for you

	<b>ISSUES</b>	<b>RANK</b>
A	Climate Change	
B	Economy	
C	Ecosystem Change	
D	Education	
E	Poverty	
F	Sanitation/ Public Health	
G	Water	
H	Others:	

## 2. Expected Solutions

2-1. Who do you think has the responsibility of the climate change?

2-2. Who do you think should deal with/ solve the climate issues internationally?

2-3. Who (Which sector) do you think should deal with/ solve the climate issues within your country?

2-4. Could you rank the list of stake holders with regard to your expectations. (1-10)

1: Most expecting this stake holders to solve the climate issues

10: Not expecting this actor to solve the climate issues

	Stake Holders	RANK
A	National Government	
B	Local Government	
C	Local Community	
D	Citizen (Individual Efforts)	
E	International Organization e.g. UN	
F	NGOs/ NPOs	
G	Youth groups	
H	Researchers / Scientists	
I	Diplomatic Efforts with other country	
J	Other:	

### 3. Specific Questions

#### 3-1. Background

- Where do you grow up
- How long are you working on
- What is your specialty
- Why did you become an officer

#### 3-2. Role of scientists/ researcher

- What do you think is the role of scientists to solve the env issues
- Have you ever seen any challenges when communicate science with people/  
researcher
- Do you think you understand science? Do you think other people do?
- How could you improve the role of researchers

#### 3-3. About Japan

- What do you think Japan as the player of climate issues
- Do you know the 2020 mitigation target

**Appendix A2. Questionnaire**

Interview Questions

March \_\_, 2014.

Name: \_\_\_\_\_

Age (if available) \_\_\_\_\_

Could you rank the issues in Ghana in order of priority?

1: Most important issue for you-- 5: Least important issue for you

	<b>ISSUES</b>	<b>RANK</b>
A	Climate Change	
B	Economy	
C	Ecosystem Change	
D	Education	
E	Poverty	
F	Sanitation/ Public Health	
G	Water	
H	Others:	

Could you rank stakeholders in order of importance and expectation in climate challenges?

1: Most expecting this stake holders to solve the climate issues

10: Not expecting this actor to solve the climate issues

	Stake Holders	RANK
A	National Government	
B	Local Government	
C	Local Community	
D	Citizen (Individual Efforts)	
E	International Organization e.g. UN	
F	NGOs/ NPOs	
G	Youth groups	
H	Researchers / Scientists	
I	Diplomatic Efforts with other country	
J	Other:	