

Integrative Risk and Security Research
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Country Profiles of Climate and Disaster Extremes in 16 Countries

Results of the 2013 DAAD Alumni Summer School

Edited by Christiane Grinda, Celia Norf, Tobias Blätgen & Alexander Fekete



Fachhochschule Köln
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Foreword

Based on experiences with recent droughts, earthquakes, floods and tsunamis, the 2013 DAAD Alumni Summer School conceived effective Disaster Risk Reduction (DRR) and Climate Change Adaption (CCA) as interdisciplinary tasks for social and natural sciences. For accomplishing cross-cultural, cross-disciplinary and cross-institutional learning the organizing institutions, the Cologne University of Applied Sciences (CUAS) and the United Nations University - Institute for Environment and Human Security (UNU-EHS) invited 20 Alumni from 17 different countries but also from different research and practical backgrounds to Bonn and Cologne in November 2013.

We thank DAAD for the funding opportunities, untiring administrative support and invitation to the alumni network and webinar platform. We also thank Prof. Dr. Lars Ribbe and Dr. Udo Nehren from the Cologne University of Applied Sciences - Institute for Technology and Resources Management in the Tropics and Subtropics (ITT) and Prof. Dr. Jakob Rhyner, Dr. Joern Birkmann, Dr. Matthias Garschagen and Dr. Jörg Szarzynski from the United Nations University - Institute for Environment and Human Security (UNU-EHS) for their continuous scientific input before, during and after the seminar. At Cologne University of Applied Sciences we would also like to express our gratitude for enabling such research and seminars to the president, Prof. Dr.-Ing. Christoph Seeßelberg, the International Office, Dr. Elisabeth Holuscha, and, last but not least, the team of students that helped us prepare the event.

We especially thank all participants of this Summer School for making this seminar a fruitful and inspiring experience and look forward to future collaboration.

The second volume of the series "Integrative Risk and Security Research" ties in with the first volume in documenting and thereby sharing some of the research conducted in the context of our 2013 seminar. At the same time, we aim at continuing this excellent starting point in further joint research and networking.

The character of this series aims at addressing research that is 'integrative' in the sense of what is currently termed 'holistic' risk management or risk governance research, but also in what is coined 'inter- and transdisciplinary' research. This integrates natural and man-made types of hazards as well as a perspective on impacts on humans, eco- and social systems, infrastructure and other sectors and organization types. Much of the work we present will be 'work in progress' that invites comments from the reader and shall serve as a stimulus for advancement of the work presented here, but also offers opportunities for further joint authorships.

Please note that the country information given in this volume reflects the participants' personal view and does not represent the opinion of the institution the authors are affiliated to.

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German Academic Exchange Service


Fachhochschule Köln
Cologne University of Applied Sciences

  UNITED NATIONS
UNIVERSITY
UNU-EHS
Institute for Environment
and Human Security

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Introduction

In facing recent natural and man-made disasters effective Disaster Risk Reduction (DRR) and Climate Change Adaption (CCA) calls for integrative thinking and learning across cultures, disciplines and institutions. In times of increasing complexity, insecurity and uncertainty thinking outside the box becomes essential. This second volume of "Integrative Risk and Security Research" invites the reader to look beyond common perspectives of Disaster Risk Reduction (DRR) and Climate Change Adaption (CCA) and relates climate change and natural disasters with interdisciplinary and bottom-up policy making. It is a collection of subjective impressions about the status quo of hazards, disasters and research and practice of participants of the Alumni Summer School. The information given below reflects the participants' personal views, experience and expertise. It does not represent the opinions or argumentations of the institutions or organizations, the participants are affiliated to.

This volume presents a compilation of contributions of the participants of the DAAD Alumni Summer School 2013 produced in preparation of the event. It had been the participants' task to address five major questions asked by the scientific committee, thereby presenting their local, regional or national context of climate change, extreme events and of Disaster Risk Reduction (DRR) measures, whether on governmental or non-governmental level. At the same time, the questions were used to grasp the participants' fields of interest and experienced challenges in current Climate Change Adaptation. The five main questions asked were:

1. *What hazards are related to CC in your country or your field of work?*
2. *Are there adaptation measures that are related to CC?*
3. *Are there other risks/hazards/conflicts that pose a challenge to your country/in your study or working area?*
4. *What is the most burning question you would like to address in the Summer School?*
5. *Could you provide us with a quote, (if you wish a provocative one) on "The current focus on how Climate Change Adaptation is dealt with, lacks, ..."*

The insights and the forms of presentation were as manifold as the participants and their professional and cultural backgrounds. This allowed for a broad view on current on the ground developments in the relevant areas. Compiling the information retrieved from the participants is not only a snapshot of ongoing processes, providing detailed information. At the same time it is a starting point for the more systematic gathering of information on the proceedings in these countries concerning vulnerabilities, risks, disasters, policy change and adaptation measures.

Overview: Country profiles presented in this volume

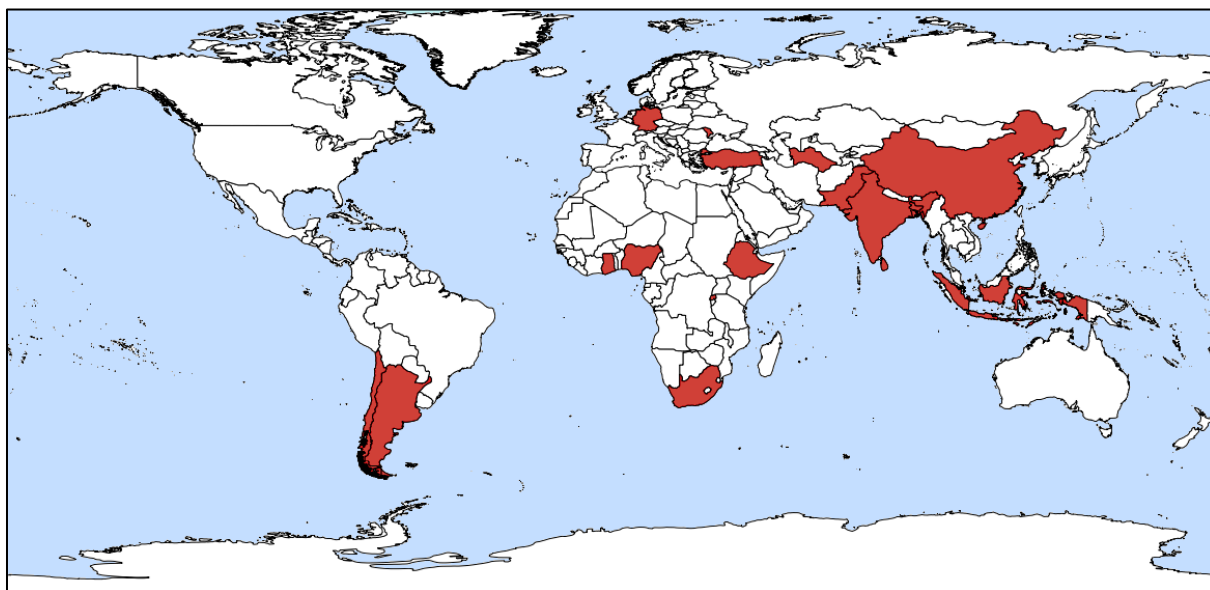


Figure 1: Map of the country profiles presented
Source: Own draft

List of countries and authors (in alphabetic order of countries)

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Argentina



Agustín Miranda (Email: arqamiranda@daad-alumni.de)

According to the report research “DP 12 – Riesgo de desastres en Argentina” (Disaster Risk in Argentina) prepared by the Argentine Federal Ministry of Planning along with other institutions (Barbier et al. 2012), threats can have either a natural or an anthropic origin. Threats with a natural origin can be classified in:

- Geodynamic threats: seismicity, volcanism, mudslides and floods
- Hydro-meteorological threats: severe storms, floods, irregular tides, warm and cold events such as “El Niño Southern Oscillation (ENSO)”, droughts

Among the aforementioned threats, the ones related to climate change are hydro-meteorological threats along with some others of a geodynamic origin, like floods and mudslides resulting from extreme weather events.

There are regional differences representing various risk scenarios. The regions are: the Argentine Northwest (NOA), the Argentine Northeast (NEA), Centre, Buenos Aires’ Metropolitan Area (AMBA), Cuyo and Patagonia. Some risk scenarios related to the effects of climate change are:

- Regional floods
- Urban centres’ floods
- Plains floods
- Severe storms

- Warm ENSO
- Cold ENSO

The different levels of exposure to risk within these scenarios are: very high, high, medium, low, very low, none.

Considering these scenarios and levels of risk exposure, the region most affected by climate change effects in Argentina is NEA, where the level of risk exposure is very high in all of the six risk scenarios. In the second place, we have the Centre region, where Córdoba belongs, facing very high level of risk exposure in four climate change related risk scenarios, and, lastly, Buenos Aires' Metropolitan Area (AMBA) whose risk exposure level in urban centres floods is very high.

If we analyse the risk scenarios and the levels of risk exposure at a regional level, and, specifically, in Córdoba province, it can be observed that the risks resulting from climate change adverse effects which pose a major threat in the region are drought followed by floods as well as forest fires. The first and third threats are related to temperature increase and heat waves associated to climate change and global warming, while, the second results from the changes brought by Warm-ENSO and soil erosion, as well as anthropization through urban development together with other meteorological factors.

Over the last years, there have been several extreme weather events in Argentina related to the negative effects of climate change together with the action of man by means of deforestation, over cultivation of land and soil anthropization derived from the processes of urban growth which have been a distinctive feature of the country over the last 50 years. Among said extreme weather events with serious consequences, we can mention Santa Fe city floods in 2003, which resulted in 30,000 evacuated people, the loss of 22 lives and direct economic damage of ARS 550 million. Another event was La Plata and Buenos Aires floods in 2013 which resulted in 70,000 flooded houses, the loss of 78 lives and economic direct damage loss by ARS 2.5 billion.

From the perspective of theoretical planning and from a scientific point of view, the attention is focused on gradual changes affecting the regions' economic basis. From the point of view of administration and politics, and, due to the Argentine political situation, the attention is centred on short-term policies for sudden, brief extreme events.

The Argentine National Department of Environment and Sustainable Development, in the Manual "Vulnerability and Climate Change Adaptation for the Administration and Local Planning" (Secretaría de Ambiente y Desarrollo Sustentable 2011), recommends the following policies for adaptation to the climate change: "incorporating the adverse effects of climate change into the design criteria in infrastructure developments, mainly those regarding water management and floods-defences; from an environmental perspective, working to prevent climate changes to deepen the processes of biological biodiversity loss and desertification, protecting and preserving natural ecosystems; from a governmental and political viewpoint, adjusting the regulations, setting or withdrawing tax incentives, so that production is adjusted to the new conditions imposed by climate changes; from a social aspect, implementing relocation policies for vulnerable population residing in areas under hydrological risk.

In the specific field of urban and regional planning, there are natural and anthropic risks closely related to social vulnerability. The most vulnerable human groups, socially speaking, who lack education, access to the information, appropriate economic resources and live under deficient housing conditions, face greater risk against extreme weather events, such as floods, environmental pollution from open rubbish dumps, sewage

and industrial waste, etc. This environmental risk condition has a negative impact on those human groups' possibilities of living and development.

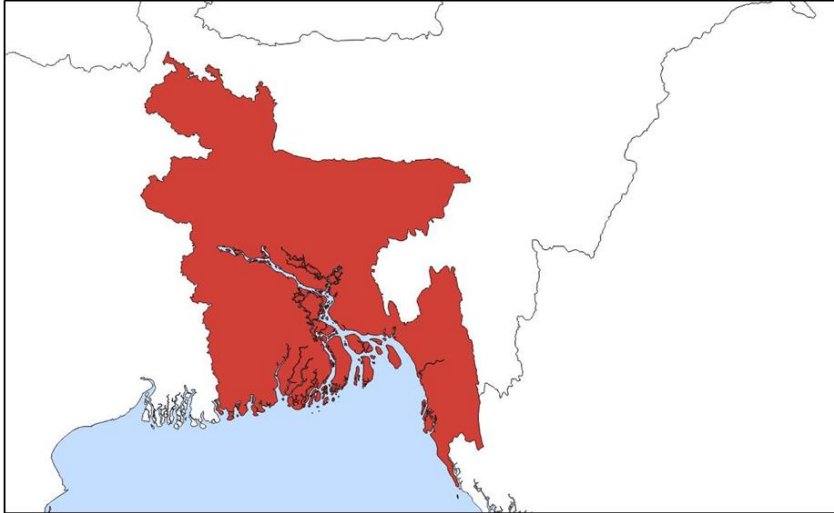
I would like the Summer School to present a methodology for adopting policies regarding climate change adaptation in urban and regional planning in order to reduce the negative effects carried by climate change as well as the risk of disasters. Nowadays, the issue on climate change adaptation remains, in my opinion, at a scientific level. I believe that it is necessary to implement more programs aimed at informing the population of the importance that adjustment policies have on the short and long term. It has been proved, especially in Latin America, that the only projects with a true chance for success are those with a feedback from society, since it is the society who demands its political actors to adopt the necessary policies.

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Bangladesh



Saleh Ahmed (Email: saleh.ahmed@aggiemail.usu.edu)

1. What hazards are related to CC in your country or your field of work?

1a. Generally

Generally, impacts from the changing climate create the major hazards related to climate change in Bangladesh. Sea-level rise, increasing trends with cyclones and floods are among the major events that are related to climate change. Apart from this, northern part of Bangladesh is experiencing a gradual process with desertification.

1b. Any regional differences?

Yes, there are some regional differences with climate change. For example, coastal Bangladesh, more particularly southwest coastal regions are heavily exposed to sea-level rise, salinity intrusion in land and water and extremely vulnerable due to the increasing trends with tropical cyclones.

Northern Bangladesh are exposed to another risks associated with climate change. The region is experiencing desertification. That ends up with regional draughts, less farm productivities as well as loss of local employments.

Almost a century, the people from northwest Bangladesh is experiencing river bank erosion and loss of lands. Different research prognosis highlights, that the trends with river bank erosions are likely to increase in coming years. Even though there is no definite research or findings about the correlation between the regional river bank erosion and climate change, but substantial amount of research highlighted the erratic

pattern of water flow Ganges basin and that could be likely the reason for increasing trends with river bank erosion.

In addition to these, Dhaka, the capital of Bangladesh, exposes with a different dimensions of climate change. Most of the people in different parts of Bangladesh who are exposed with changing climate might migrate towards Dhaka as part of their response and adaptation to climate change. The question is how much Dhaka is prepared to provide urban services to these climate migrants, when the city is already vulnerable to many urban and environmental risks due to its over-populous nature. Dhaka is also exposed to different climate change related risks, such as, floods, overheats and water shortage during the summer months, and is also experiencing with erratic nature of seasons.

1c. Any occurrences of extreme events already attributed to CC?

Yes, extreme events like increasing tropical cyclones and salinity intrusion in land and water often are attributed directly to climate changes.

1d. Are extreme events or gradual changes more in the focus?

Yes, both the extreme events and the gradual changes are more in the focus. It is mostly due to the peoples' exposure to the situation, and media focus on vulnerable communities due to climate change.

2. Are there adaptation measures that are related to CC?

2a. physical/technical

Embankments, roads as well as disaster shelters are among the major physical adaptation measures related to climate change. In addition to this, the government in different levels is trying to adopt the resiliency in their development plans, and projects.

2b. ecological

Climate resilient farming practice particularly in coastal Bangladesh is an important ecological step/adaptation measure confronting climate change.

2c. institutional/organizational/political

I would say that there is not much improvement; however, government has established Climate Change Cell in the Ministry of Environment, which coordinates different climate change related plans, projects and disaster management. I would also like to highlight another critical aspect of climate change adaptation. There is a huge lack of inter-agency coordination on related task, which make the works even harder and complicated than it is. I would not say that there are much political commitments on climate change issues. Like in many developing nations in the Global South, the politicians need to educate themselves by coming beyond from their individualistic choice and preference for the sake of national interest in the long-run.

2d. social/cultural

I would not say anything cultural dimension of adaptation, rather will focus on the social aspect. Socially there are interests for adaptation, but one might argue that the interest is very much place based, such as the region or locality who are exposed to extreme climate events have larger interest or urge for climate change adaptation.

3. Are there other risks/hazards/conflicts that pose a challenge to your country/in your study or working area? If yes, can you provide us with a short description of the impacts?

Apart from the impacts from changing climate, I would like to mention another regional challenge: poverty. Poverty actually plays an important role in shaping the regional dynamics. When people are poor they are more vulnerable to different types of natural or man-made risks. Their resiliency capacity is also poor. Poverty amplifies the impacts due to other environmental challenges.

4. What is the most burning question you would like to address in the Summer School?

I am super excited to ask several questions. Now we are more focused on increased resiliency capacity. But have we ever thought or researched, what are the barriers of developing local or regional resiliency when many things are determined by extra-local institutions. What about the low income developing countries where the governance framework is weak. How the local governance framework can support resiliency framework. What about the funding or knowledge for adaptation for the Global South? What is the political and moral standing of developed and rapidly developing nations who should bear the major responsibility for climate change or carbon emissions? How we can ensure a framework of resiliency where we can hear the voices of women, children, elderly or minority people?

5. Could you provide us with a quote, (if you wish a provocative one) on "The current focus on how Climate Change Adaptation is dealt with lacks..."

Let's write "climate resilience" in Google. I got about 16,900,000 results in 0.28 seconds (09/05/2013; 4:26 PM US Mountain Standard Time). Take a single proposed resiliency strategy and try to make that operationalize in any context. If we do that we will have another level of challenge. We are flooded by information; we are generating these, we are consuming these and we are sharing these. But I believe it would be lot better if we can operationalize at least few of the concepts to tackle a real world with climate challenge adaptation. There is never a wrong time to do the right thing.

Chile



Vicente Sandoval (Email: vicente.sandoval.11@ucl.ac.uk)

1. What hazards are related to CC in your country or your field of work?

In relation to Chile, although there are several natural and human made hazards only few of them could be directly related to CC; increase of droughts and water availability.

1a. Generally

In northern Chile droughts have significantly increased affecting agriculture and particularly wine industry. It is possible that in a short-term, with the increasing of temperatures, droughts will become more intense and recurrent which could expand their effects to other crucial economic areas such as livestock and fisheries. Another concern is the long-term availability of water. As in other Andean countries, most of glaciers have started to melt. Although Chile accounts with an important number of glaciers, the increase of temperatures, reduction of rainfalls and an increased demand for water could create a serious decline in water availability especially in summer.

1b. Any regional differences?

Definitively, Chile has grater meteorological, geological and geographical differences. While in northern Chile predominates deserts in southern Chile archipelagos, lakes, rain forests and glaciers are common. In a tight relation to these physical characteristics, cultural differences are also present and which also produce that different economic activities unfold into each region.

1c. Any occurrence of extreme events already attributed to CC?

No really. In people's imaginary remain earthquakes, tsunamis and volcanic eruptions as most common extreme events. Droughts and water availability are present but due to they are gradual processes people still do not connect them with CC.

1d. Are extreme events or gradual changes more in the focus?

Extreme events are more in the focus, definitively, although these extreme events are often –in the case of Chile– related to natural geo-physical events such as earthquakes and tsunamis but not to CC.

2. Are there adaptation measures that are related to CC?

In July this year, for first time in history, the Chilean government's Ministry of Environment opens plan of climate change adaptation for public consultation. Although there are not many measures taken yet, most of the potential measures will draw on the increase of desertification in Central and Northern Chile. And particularly, on how CC can affect critical environmental and related economic activities such as agriculture, livestock, forestry, biodiversity, fisheries, health, water resources and infrastructure.

2a. physical/technical

As I know, most of physical or technical measures both in North and South of the country are related with an efficient use of water. Some these measures include infrastructure for water collecting and storage and more efficient irrigation systems.

2b. ecological

Not to my knowledge.

In the United Kingdom

2c. institutional / organisational / political

As mentioned above, there is a crescent interest on developing a national strategy for CC adaptation and mitigation which involve institutional capacity building, organisational and political reforms.

2d. social / cultural

Socially speaking, as consequence mainly of economic growth and long-term democracy phase, civil society; people's organisations and other NGOs, are increasingly concerned about the origins and consequences of CC. More than before, there are several NGOs and other community initiatives related to an increasing demand for legislation from authorities on CC's related matters such as CO₂ emissions and deforestation, among others.

3. Are there other risks/hazards/conflicts that pose a challenge to your country/in your study or working area? If yes, can you provide us with a short description of the impacts?

Yes, yes there are. Chile has historically faced extreme natural events such as earthquakes and volcanic eruptions and it is expected they will continue. The problem arises when these 'natural' extreme events combine with progressive or gradual hazards produced by CC. Disasters in Chile, just like in global terms,

have become more recurrent for several combined processes such as uncontrolled urbanisation, unplanned growth or informality, exacerbation in poverty and inequality and so forth. The challenge is how to address 'natural' extreme events and their impacts within a context of gradual CC's processes which, in turn, also threat people's ability to react to and recover from disasters. Impacts of these combinations may include a misunderstanding of the priority measures in order to tackle both gradual and specific hazardous processes.

4. What is the most burning question you would like to address in the Summer School?

Do the root causes of CC matters? I wonder if CC is human induced or a 'natural' process. Does that really matter? Another potential question could be: (even when we know that restrictions are necessary) is fair that growing economies like China, India or Brazil must face contamination restrictions as consequence of CC while now-developed economies like France, UK or Germany did during industrial revolutions without restrictions?

5. Could you provide us with a quote, (if you wish a provocative one) on "The current focus on how Climate Change Adaptation is dealt with lacks ..."

Although Climate Change Adaptation is increasingly on the political agenda of many countries, there will not be a priority if people do not demand for attention and changes. Nevertheless, people's priorities are organised in relation with their needs and aspirations and thus shaped by other processes such as poverty, gender and informality; these issues are also issues of climate change.

China



Yang Deng (Email: phynansa@gmail.com)

1. What hazards are related to CC in your country or your field of work?

1a. General effects of Climate Change on China

- A. Average temperature has rose by $0.5^{\circ}\text{C} \sim 0.8^{\circ}\text{C}$ in the recent 100 years.
- B. Changes in regional precipitation fluctuations significantly in recent 100 years.
- C. There is an evident change infrequency and intensity of the major extreme weather and climate events. Since 1990, the country has above-average annual precipitation mostly and characterized as with complex patter and with more frequent flood in the south and drought in the north.
- D. In the last 50 years, China's coastal sea level rose by an average annual rate of 2.5 mm, slightly higher than the global average.
- E. Glaciers retreat rapidly and the trend is accelerating.

1b. Any regional differences?

China suffers from a variety of disasters including extreme climate changes, floods, storms, storm surges, forest fires, drought, insect damage, landslides and slope failure. Particularly, flood, drought and cyclone give major damages.

Regional difference is evident in CC hazards in China. For example, North and Northeast regions have increasingly heavy drought, whereas Yangtze River Delta and Southeast China have increasing floods.

1c. Extreme events related with CC in China

China is one of the most vulnerable countries to the adverse impact of climate change. Starting in 2011, China has been hit by a series of extreme weather and climate events, including the low-temperature freezing rain and snow in south China, spring and summer droughts in the middle and lower reaches of the Yangtze River, rainstorms and floods in the south, typhoons in coastal areas, autumn rains in western China and serious waterlogging in Beijing. In 2011 alone, natural disasters affected 430 million people and caused direct economic losses of 309.6 billion Yuan (NDRC China, 2012).

2. Are there adaptation measures that are related to CC?

Adaptation measures from the government mainly focus on agriculture, forestry, water resource, oceans, hygiene and health as key focus. These measures also consider ecologically fragile and sensitive areas and enhance capacity building for adaptation to climate change in key areas. This report takes agricultural sector as an example.

In agricultural sector, the government encouraged the large-scale construction of farmland capable of producing stable yields despite drought or flood conditions, developed new large-scale irrigation areas and renovated existing facilities to expand the area under irrigation and improve irrigation efficiency, promoted the cultivation of high quality seed varieties with high yield potential and resistance to drought, flooding, high temperature, diseases and pests. Besides, it encourages innovation in water-saving agricultural technology and promotes their application. It also increased subsidies to accelerate the cultivation, reproduction and dissemination of superior crop strains. Measures are also taken to popularize scientific knowledge on climate change, and create a social atmosphere favouring green and low-carbon development. Diverse media platforms have been used to showcase the policies, actions and achievements by various industries and areas in addressing climate change. High importance was placed on providing NGOs with greater scope for initiative (NDRC China 2012).

3. Are there other risks/hazards/conflicts that pose a challenge to your country/in your study or working area? If yes, can you provide us with a short description of the impacts?

Earthquakes, water pollution and water shortage.

4. What is the most burning question you would like to address in the Summer School?

How to build up social resilience and climate change communication, good practice and experience on water resource management to reduce risk and influence of flood?

5. Could you provide us with a quote, (if you wish a provocative one) on "The current focus on how Climate Change Adaptation is dealt with lacks..."

The current focus on how Climate Change Adaptation is dealt with lacks public communication and participation (in China).

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Pan Tao (Email: Dr.PanTao@gmail.com)

1. What hazards are related to CC in your country or your field of work?

There are many climate disruptions in China e.g. food production decreases, sea level rises, extreme weather events—drought and flood, shortage of power peak in hot summer, loss of biodiversity, etc. For the urban area, flood and shortage of power have huge problems. Last year, a heavy storm caused 79 person deaths in Beijing, the so-call most robust city in China. For rural area, agricultural sector has a big loss. This summer temperature in eastern China region reached the highest level in 140 years record history. The trends of hotter and hotter summer have been attributed to CC by many press articles. However, the Chinese original papers are still insufficient to provide strong evidences linking extreme events with CC.

People are more sensitive towards extreme events rather than gradual changes. Most of public don't aware of the danger of the accelerated melting of Tibet Plateau's permafrost and snow reserve, which will severely impact 1.3 billion populations in the region.

2. Are there adaptation measures that are related to CC?

China central government has released white paper on how to cope with climate change nation-wide. In the relevant sectors such as agriculture, water, forest, seashore, public health, biodiversity, energy, and urban, respective strategies have been studied. In remote western China, huge national programs of forest and pasture restoration are undergoing. Those projects' primary goal is to restore ecosystem, CCA are the secondary objectives. In the densely populated urban area, CCA is falling into the framework of disaster prevention & alleviation.

China has no Climate Act yet. Under the pressure from international communities, Chinese government has promised to cut 40%-45% GHG emission intensity by 2020 comparing to 2005 year level. Many governmental agencies are involved in the climate mitigation and adaptation administration. National Development and Reform Commission (NDRC) is responsible for international negotiation and policy making, China Meteorological Administration (CMA) is responsible for adaptation research and policy support. Many other ministries are responsible for sectorial adaptation work. Currently most of climate change advocacy is done by international NGOs or government-owned NGOs (GONGO), rarely a grassroots NGO focuses on climate issue, partially because of low public awareness. Like all the environmental externality problems, CC is everybody's responsibility, in the reality it become nobody's responsibility. To raise public awareness is a key to the fight against climate disruption.

3. Are there other risks/hazards/conflicts that pose a challenge to your country/in your study or working area? If yes, can you provide us with a short description of the impacts?

There are quite bit political challenges. The performance evaluations of governmental leaders are mostly depending on economic indicators. So far there is no performance indicator on CC/CCA. That is why CC has been not in the governmental top agenda. Nevertheless, the current administration has drawn more and more attention on energy conservation and economic transformation, which has positive impact on Climate

Mitigation. Unfortunately, CCA has NOT been widely discussed among public and politicians to my knowledge.

4. What is the most burning question you would like to address in the Summer School?

I'd like to know how to effectively raise public awareness on CC by linking with public health and life risks, and the cost effective ways of CCA in urban area.

5. Could you provide us with a quote?

I'd like to say that *"The current focus on CCA in China is lack of public awareness. The most effective way of raising public awareness is to cultivate climate-focused NGO sector, which will be the catalyst for driving civic movement towards a better liveable planet"*.

Ethiopia



Emebet Bogale (Email: emebetmasy@yahoo.com)

1. What hazards are related to CC in your country or field of work?

Agriculture: Intense rainfall across Ethiopia will increase soil erosion and crop damage. Ethiopia is particularly vulnerable to accelerated soil erosions because of existing pressures and degradation in most parts of the highlands of the country. There will also be changes in production system viability; cropland area and cropping patterns; pest and disease frequency and distribution brought by changes in seasonality; timing and distribution of rainfall; higher evapotranspiration; drought and flood damage. Productivity of livestock is impacted directly through temperature effects on annual growth, milk and wool production and reproduction; and indirectly by changes in the quantity and quality of pasture, forage, grass and disease and parasites. The periodic drought in Ethiopia causes severe reductions in food availability, causing government expenditures on food aid and emergency drought relief to swell during these periods. In recent years, the Ethiopian government has maintained records of expenditures on vulnerability and food security (VFS), which have typically increased during extreme droughts (e.g., 1999–2000 and 2003–2004). Major floods also occurred in different parts of the country in 1988, 1993, 1994, 1995, 1996, and 2006.

Health: The health impacts of climate change will be felt through six mechanisms:

- Morbidity and mortality through temperature extremes
- Increases in vector borne diseases, such as malaria and bilharzias

- Increases in non-vector borne diseases related to weather conditions, for example diarrheal disease and cholera associated with both floods and drought
- Health problems associated with weather related air quality
- Injury and mortality through floods and storms
- Impacts of climate related influences on food and water supply, for example, malnutrition

McMichael et al. (2004) reported that 36000 lives were already lost each year across East Africa (including Ethiopia) because of climate change. The same study estimates that the greatest future health risks associated with climate change in 2030 will be flooding, followed by malaria, diarrhoea disease, malnutrition and cardiovascular diseases. According to the World Health Organization (WHO), 68% of Ethiopians are already living in areas at risk from Malaria where transmission is unstable and characterized by large scale epidemics. For example, in 2003 large scale epidemics resulted in 2 million confirmed cases and 3000 deaths. The 4th report of the Intergovernmental Panel for Climate Change (IPCC) showed that malaria will expand into the highland areas of Ethiopia by the 2050s, and by 2080 conditions will be highly suitable for malaria transmission.

Natural resources: Water, soil, land, forests and biodiversity are the foundations of Ethiopia's economic development, food security and livelihood sustenance and each face additional pressures through climate shocks and stresses. Climate change impacts on natural resource; equity of tenure and access; ecosystem range; niche viability and patterns of use threaten long-term degradation and depletion.

Energy sector: 95% of Ethiopia's national energy needs are derived from fuel wood, crop and animal waste and human and animal power. Only 5% comes from electricity and 95% of this is generated by hydro-power. The World Bank suggests that only 2% of Ethiopia's hydro-power potential is developed. The country's reliance on fuel wood and charcoal brings widespread land degradation, exposing bare soil to erosive rainfall and gully erosion. As climate impacts increase, there is likely to be a higher reliance on forest products for livelihoods. For example, reduced power production during drought years already takes a significant toll on the economy. In 2002/3 power supply was lost one day a week over four months because of drought. It was calculated that each day of no power saw a 10-15% reduction in GDP generation. Loss of electricity also impacts on basic services such as schools and hospitals. Ethiopia plans to significantly increase its hydro-electric power production in order to supply its neighbours. Whilst these plans offer huge potential to power low carbon growth in Ethiopia and beyond, they need to carefully consider the implications of future climate change so that benefits can be sustained and conflicts with other water users are avoided.

Transport: Although improvements have been made to Ethiopia's transport infrastructure and road network, of the 56 113 km road network in the country, only 15% is paved and the remaining 85% is unpaved (Ministry of Transport 2008, in: Federal Democratic Republic of Ethiopia). Improvement and maintenance of transport links between urban centres, to and from ports of export and import, and in particular to rural areas are strongly related to economic development. However transport links and both paved and unpaved roads are highly vulnerable to increases in rainfall and temperature which are projected for Ethiopia, with heavy rainfall washing out roads and high temperatures damaging to road surfaces. World Bank study projects that climate change will increase the maintenance costs of the country's road network by between \$10 million to \$21 million, depending on the climate model used. These costs will be reduced and transport links maintained if road, drainage and bridge designs are adapted to new climatic conditions. Maintenance costs of unpaved roads are also high and extending the network of paved roads is likely to be economically beneficial.

2. Are there adaptation measures that are related to CC?

Adaptation is recognized as a critical response to the impacts of climate change, because current agreements to limit emissions will not stabilize atmospheric concentrations of greenhouse gases and climate change. Adaptation can reduce present and future losses from climate variability and change. It is neither a one-off intervention nor a stand-alone activity. It is rather a process that needs to be incorporated in the overall development planning, including the design and implementation of projects and programs across relevant sectors. The Environmental Protection Authority (EPA) has been mandated to co-ordinate the national response to climate change. Through Ethiopia's Programme of Adaptation to Climate Change (EPACC) and emissions abatement initiatives including the Nationally Appropriate Mitigation Actions (NAMAs) the country has made a strong start.

- Increase irrigated area
- Increase research and development for agriculture
- Modify plans for expansion of hydroelectric power (volume or timing of investment)
- Build climate resistant road infrastructure (e.g., increase the capacity of roads and bridges to withstand greater heat and precipitation)
- To strengthen the health system in order to respond to climate change vulnerability with special focus on the priority areas
- Control high population growth rate

Adaptation to agriculture: Taking into account the significant potential for irrigation growth on the one hand, combined with programs in research and development (R&D) and farm management practices aimed primarily at boosting yields in rain fed areas; and, on the other, investments in irrigation and drainage infrastructure. This approach is consistent with recent work on adaptation in agriculture at the global level (Nelson et al. 2009), which analysed R&D, irrigation and drainage as a direct adaptation strategy; and the expansion of rural roads as an indirect strategy. The two pillars of the adaptation approach analysed here (R&D and irrigation/ drainage) are meant to capture key aspects of a strategy capable of tackling the essential features of the climate of the future: i.e., an increase in temperature and changes in precipitation.

Adaptation to road transport: The adaptation considered for Ethiopia's road sector consists of a "design strategy" approach that promotes upgraded design standards for roads and bridges to integrate, through the use of enhanced materials and technologies, the risk of increased climate change-related stressors. This is likely to increase construction costs, but decrease maintenance costs that would have been incurred by using the earlier construction standards.

Adaptation to flooding: Similar to the process used for examining flooding under a maintenance-only the adaptation uses a focus of multiplying a cost per kilometre factor by the actual pool of roads that may be damaged. The higher cost per kilometre pays for interventions such as drainage, road characteristics, and pavements to enhance flooding resilience (COWI Consulting 2010). In order to ensure, anticipate and solve problems or react those natural disaster timely there should be disaster profile, contingency planning and regional connectivity implementation.

3. *Are there other risks/hazards/ conflicts that pose a challenge to your country / in your study or working area if yes, can you provide us with a short description of the impacts?*

Community conflicts driven by competition for scarce water and pasture resources will also increase risk of health and safety.

4. *What is the most burning questions you would like to address in the summer school?*

- Energy generated by hydro-power is also highly vulnerable to fluctuations in rainfall, temperature and evaporation.
- Droughts can result in sharp reductions in agricultural production, and related productive activity and employment.

5. *Could you provide us with a quote on "The current focus on how climate change adaptation is dealt with lacks..."*

- Agriculture, primarily rain-fed and highly sensitive to fluctuations in rainfall, irrigation growth, such an approach combines, on the one hand programs in Research and Development (R&D) and farm management practices aimed primarily at boosting yields in rain fed areas
- Energy production is reduced during drought years, shift from fossil fuel to renewable energy for running engines for transportation and other purposes

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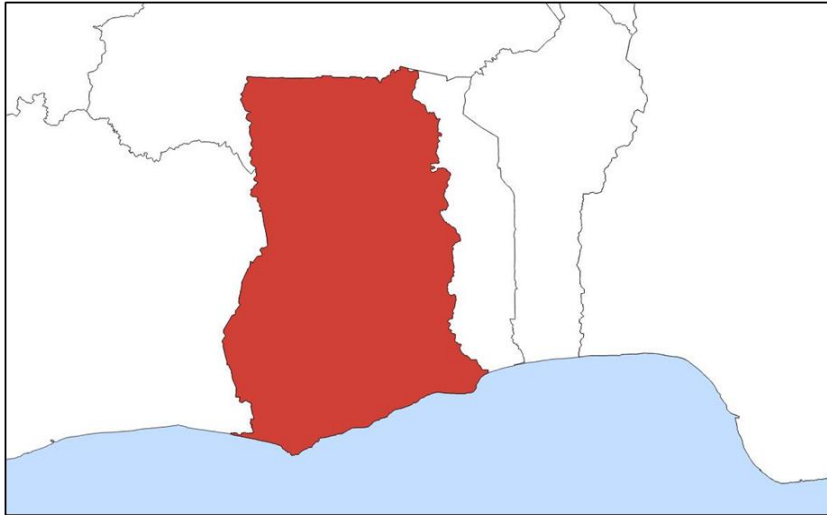
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Ghana



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This text is organized into four paragraphs for addressing the following four questions on climate change in preparation for the DAAD Summer School in 2013, Cologne University of Applied Sciences: what hazards are related to climate change in my country?; are there adaptation measures related to climate adaptation?; are there other risks or hazards that pose a challenge to development in the country; what's is the most burning question I seek to table at the Summer school?; and finally, if I had a provocative statement to sum up my understanding of the issues on climate change in my country.

In the wake of climate change, Ghana's development is challenged by a number of climate related hazards. First, there is increasing incidences of alternating droughts and heavy precipitation. These climatic hazards turn to have enormous negative implications on rain fed agriculture and agro-related industries and livelihoods. Clearly, droughts and particularly, heavy precipitation events adversely affect crop production and lead to low yields and chronic hunger. The impact of these alternating hazards is felt most in rural areas of the country, particularly northern Ghana than urban areas mainly because livelihoods are built around rain fed agriculture and agro-related activities (Yaro 2010; World Bank 2011; Derbile & Kasei 2012). The second, hazard is floods. The incidence of floods is on the increase and has become virtually an annual event. Periodic or annual flash floods affect both rural and urban areas of the country. In urban areas, Accra, the capital is the worst affected city but other smaller cities including regional and district capitals are adversely affected across the country. In the urban areas, floods lead to destruction of the houses and infrastructure such as roads, and water and electricity installations. In rural areas, it destroys houses, crops and livestock and the poultry industry and occasionally leads to diseases such as diarrhoea or cholera. The occurrence of

windstorms is also on the rise and it very often leaves behind trails of destruction in urban and rural areas much the same way as floods do.

Climate change adaptation measures can generally be classified into mitigation and adaptation. In Ghana, a climate change policy was only finalized sometime this year. Prior to that, a few isolated measures such as the construction of the Keta Sea Defence Wall, dredging and construction large drains in urban centres, particularly Accra have been some of the few measures of adaptation put in place. Across many parts of the country, community based dams have been constructed for promoting small scale irrigation and for reducing dependence on rainfall for agriculture. Beyond this, there is little in terms of state policy and interventions for enhancing climate change adaptation across the country. Rather, individuals and or households have found innovative ways to adapt to their livelihoods to climate change and climatic variability. For most part, climate change adaptation is more a personal responsibility and driven more by individual effort rather than through public policy interventions given the evidence on climate change adaptation effort.

In addition to these hazards, there is an increasing incidence of wildfires, domestic and industrial fires that has caused so much destruction in the country in the recent past. Wildfires and or bush fires are common in rural areas in the savannah and the forests belts during the dry season, and or minor season when rainfall is non-existent or insufficient. Aside these wildfires are domestic and or industrial fires that have destroyed a number of markets across the country, compelling the Government of Ghana to seek assistance from The United States of America for investigating the causes of the fires.

The most burning issue I seek to explore at the conference is the issue of differentiation for understanding climate related vulnerability, the role of different knowledge systems and the rural-urban nexus on climate change in an urbanizing world. Thus: How do climate related vulnerability vary between different social groups and or places; How varied are the roles between modern scientific knowledge systems and indigenous knowledge systems of adaptation and how can they be harmonised for enhancing effective climate change adaptation; finally, how is climate change affecting the relationship between rural and urban areas, and what are the implications for both an urbanizing world?

To sum up my text: *The current focus on how climate change adaptation is dealt with, lacks a nuanced understanding and attention to the issue of differentiation in both understanding the impact of climate change and in the policy responses to dealing with climate change.*

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Climate change is a threat to food security and livelihood. Reported projections indicate that with the trend in climate change and variability, the impacts on people's livelihoods will be greatest in Africa, where many poor smallholders largely or totally rely on rain-fed agriculture and have few alternatives (IPCC 2001; Boko et al. 2007), due to high levels of poverty, low levels of human and physical capital, and poor infrastructure (IFPRI 2009).

Studies have revealed a shift in the on-set of the rainy season with delay in the on-set of the season in Ghana. Fosu-Mensah (2012) reported a 6-week delay in the on-set of the rainy season which will result in significant yield reduction of maize in the sub-humid region of Ghana by 2050. In addition, there is high variability in the rainfall pattern hence, high risk of crop failure which is observed in recent time.

Generally, Floods, drought, pests and diseases outbreak are the most occurring hazards in Ghana which are related to climate change. In June/July 2009 for example there has been flooding in seven (7) out of nine (9) regions in Ghana. This flooding affected 51,965 people of which 23 lives were lost. These situations disrupt the daily lives of the affected population, and as a result, basic necessities such as food, shelter, clothing and medical care are required to stabilize the situation.

There are regional differences in the occurrence of these hazards both within Ghana and in West Africa region, for example in the northern region of Ghana, drought spells and floods are the most common hazards which are attributed to climate change while in the southern part of the country, floods, rise in sea levels and tidal waves are the common hazards related to climate change. In mid this year (2013), a community in Accra (Glefe, a suburb of Dansoman) was flooded as a result of tidal waves, leaving the community in fears.

The occurrence of extreme events or gradual changes is more in the focus in Ghana. In recent times there is ongoing discussion on the need to have a third option apart from mitigation for reducing emissions or adaptation for adjusting to climate change. Efforts are being made to reduce the impacts of these extreme events by providing people with timely, reliable and actionable warnings to protect the population against the immediate threat and consequences of climate-related extreme events, such as floods, droughts and heat waves.

The adaptation strategies adopted by farmers to a warmer climate in Ghana are crops diversification, shifting the planting date, change in crops, mulching or water conservation. Ecologically, areas where maize for example was once cultivated is now being used for the cultivation of millet and sorghum as a results of reduced precipitation attributed to climate change. In addition, boreholes and dams have been constructed by the government and some NGOs (only boreholes) in northern Ghana (Northern region, upper east and upper west) which is more prone to drought to serve as source of water for irrigation in the event of drought and during the drying season farming.

There are some institutional adaptation measures to climate change in Ghana. For example Forestry commission is implementing REDD+ concept which relates to reducing emissions from deforestation and

degradation, the role of conservation, sustainable management of forests and enhancement of forest carbon stocks in Ghana.

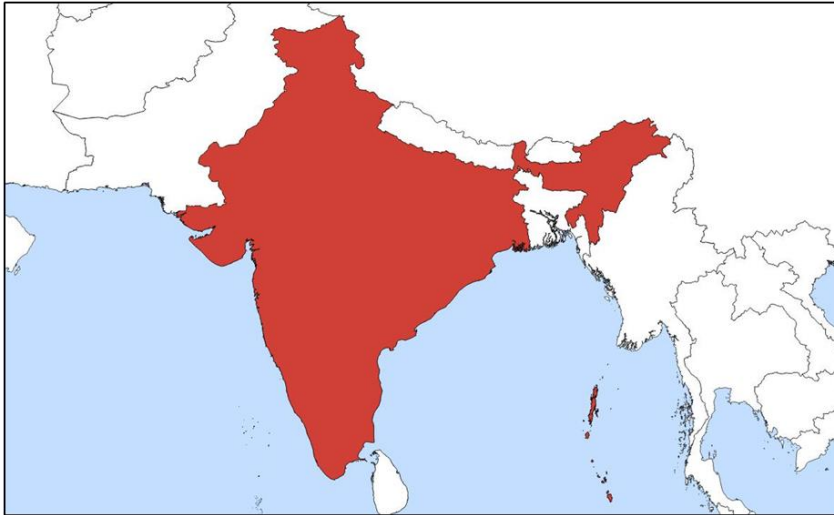
Other hazards that pose challenges in my country are motor / aviation accidents, landslides, markets and bush fires and pest and diseases infestation.

The most burning question I would like to address in the Summer School is impact of climate change on crop production and the available adaption strategies in Sub-Sahara Africa. I will also like to address issues of possible ways to have early warning systems to provide people with timely, reliable and actionable warnings to protect them against the immediate risk of climate-related extreme events.

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India



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In developing countries like India, global climate change has been the most burning issue! Although by virtue of demographics, topography and geography, India is ground zero for climate change (Padukone 2010). With about 1.13 billion people, India has the largest population in the tropical, equatorial region in which it is located far more than west Asia's 211 million, south-east Asia's 554 million, or even all of Africa's 922 million (United Nations 2009). India is also home to a third of the world's poor, the population that lives on less than one dollar a day, which constitutes over 40% of India's population (Shaohua & Ravallion 2008).

In the present times, India is confronting numerous issues in the garb of climate change impact, where the natural resources and the human habitation are at loggerheads with regard to exploitation and appropriation by the latter in a reckless and avaricious manner. India is already experiencing a warming climate and a decline in monsoon rainfall since the 1950s has already, been observed (World Bank 2013).

An abrupt change in the monsoon could precipitate a major crisis, triggering more frequent droughts as well as greater flooding in large parts of India. India's northwest coast to the south-east coastal region could see higher than average rainfall whereas others might experience just the opposite. More than 60% of India's agriculture is rain-fed, making the country highly dependent on groundwater. Even without climate change, 15% of India's groundwater resources are overexploited (Ibid). Although it is difficult to predict future ground water levels, falling water tables can be expected to reduce further on account of increasing demand for water from a growing population, services sector and industry. Another alarming trend is of the Himalayan glaciers - where a substantial part of the moisture is supplied by the summer monsoon - have been retreating

over the past century; the loss of snow cover over the Himalayas are expected to threaten the stability and reliability of northern India's primarily glacier-fed rivers, particularly the Indus and the Brahmaputra. The Ganges will be less dependent on melt water due to high annual rainfall downstream during the monsoon season. Alterations in the flows of the Indus, Ganges, and Brahmaputra rivers could significantly impact irrigation, affecting the amount of food that can be produced in their basins as well as the livelihoods of millions of people (209 million in the Indus basin, 478 million in the Ganges basin, and 62 million in the Brahmaputra basin in the year 2005) (World Bank 2013).

On the other hand cities like Mumbai, has the world's largest population exposed to coastal flooding, with large parts of the city built on reclaimed land, below the high tide mark. Rapid and unplanned urbanization further increases the risks of seawater intrusion. With India close to the equator, the sub-continent would see much higher rises in sea levels than higher latitudes. Sea-level rise and storm surges would lead to saltwater intrusion in the coastal areas, impacting agriculture, degrading groundwater quality, contaminating drinking water, and possibly engendering public health and water borne disease crisis. Another city Kolkata—densely populated—is also particularly vulnerable to the impacts of sea-level rise, tropical cyclones, and riverine flooding. Preventive measures in the form of Coastal embankments will need to be built where necessary, and Coastal Regulation Zone codes enforced strictly.

Agriculture is another area of concern! The Indian Agricultural Research Institute study estimates that with every one degree Celsius rise in global temperature, India will lose four to five million tonnes in wheat production (Sharma 2008). Climate change would substantially affect food availability and supply systems by direct and indirect effects on crops, livestock and fisheries and, on their inter-relationships with the human environment. Climate change will dramatically alter the natural balance of local and global ecosystems and will infringe on human settlements. Consequently, vulnerable groups such as poor will face food insecurity, loss of livelihood, hardships due to environmental degradation and extreme events such as droughts, floods, storms and cyclones.

Crop diversification, more efficient water use, and improved soil management practices, together with the development of drought-resistant crops can help reduce some of the negative impacts. Improvements in irrigation systems, water harvesting techniques, and more-efficient agricultural water management can offset some of these risks. In my current capacity at IWMI, our research in West Bengal, India is looking at these alarming trends and drastic changes being encumbered by farmers as agriculture productivity has gone south, due to irregular monsoons and drought phenomena.

As an adaptive strategy, there is a need for an increased support to adaptation research; developing regionally differentiated contingency plans for temperature and rainfall related risks; enhanced research on seasonal weather forecasts and their applications for reducing production risks; and evolving new land use systems, including heat and drought tolerant varieties---adapted to climatic variability and changes and yet meeting, food demand. On the social-cultural side, we should strengthen the existing institutions and policy process by supporting community partnerships in developing food and forage banks to manage scarcity during projected increased periods of drought and flood.

South Asia is also a key 'hotspot' for the migration of people from disaster-affected areas to other national and international regions. The Indus and the Ganges- Brahmaputra-Meghna Basins are major transboundary rivers, with tensions among countries over its water sharing (India-China over Brahmaputra and Teesta-Farakha issue between India and Bangladesh, and Indus water sharing between India and Pakistan).

Climate change impacts on agriculture and livelihoods can increase the number of climate refugees.

Regional cooperation on water issues will be needed for also bolstering energy security in the sub-continent viz hydel power and thermal plants feeding the growth story of India. To sum up, there is some serious realisation at the government institutional level in the form of National Disaster management authority and PM action plan on climate change, but a lot leaves desired in its coordination with the civil society with regard to public disclosure of facts and the sustainable development conundrum. In my recent memory, the latest natural disaster in the

Indian hill state of Uttarakhand, due to cloud burst, which has been referred as the 'Himalaya Tsunami' caused massive damage of lives (both human and animal) and property sums up the bleak picture of climate change adversity. Majority of the India's poor live in rural areas that are directly dependent on climate-sensitive resources such as agriculture, forests, deserts, even tourism and coastlines-means that climate change would affect different regions in different ways, and single across-the board responses may not work. Thus in this summer school, I would like to address how the coping strategies should be, keeping in line with the socio-cultural-ecological aspect.

This is the quote for your question no.5: The current focus on how climate change adaptation is dealt with lacks, "tempo for turning down the heat, because climate-change-talks like to play it cool!"

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Indonesia



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1. In each part of the world, anomaly or variability in climatic conditions is already resulting in big impacts. These impacts are diverse and wide ranging. Climate variability is already being observed to be increasing, although there are still large uncertainties about the link to climate change.

As Indonesia is known as the world's largest archipelagic state, where more than 17.000 islands are inhabited or non-inhabited and 80.000 kilometres of coastline cover, nearly 2.000.000 kilometres landmass of this country are covered by tropical rainfall forests which create a mega biodiversity. Approximately 250.000.000 inhabitants will be affected by climate change due to high population density and rapid industrialization. Threats occur are the results of forest fire, very large and intensive deforestation, land conversion, habitat deterioration, over-exploitation of coastal and marine resources, the use of non-environmentally chemicals for agricultures. These make Indonesia extremely vulnerable to the effects of climate change.

Climate anomalies and changes have been exacerbating many of hazard risks which Indonesian people are facing currently. During the last decades, floods, droughts, forest fires, landslides, etc. have been posing the greatest threats to livelihoods, human health, economic growth, and environmental sustainability. Many evidences show that climate change has been approaching. Climate change effects in Indonesia receiving many attentions from people as this country is well-known as the world's third largest greenhouse gas producer, as the consequences of forest fire which happens every year during dry season, and environmental degradation. Extreme weather and climate events cause serious floods, drought and wild fires in Indonesia. Climate change will bring serious impacts on the availability of water, on the security of agriculture products,

and on the existence of certain types of forests. Life and livelihoods of millions of Indonesians will be affected accordingly.

Many reports showed that these events have caused serious impact on Indonesian economy and human living. The annual mean temperature has increased by circa 0.3 centigrade as it is written in 1900 and made Indonesia becomes warmer. Annual rainfall decreased from 2 to 3 percent over the last century. Nevertheless, some spatial changes imply. Seasonality shift of rainfall also occurs, i.e. increasing of wet season rainfall in southern part of Indonesia, while decreasing of dry season in northern part. Wild fire occurred in 1997 has caused huge economic loss and damaged people's livelihoods – increasing poverty rates by one-third or more. As we know that, the emissions resulting from forest fire and environmental degradation are more five times greater than those ensuing from non-forestry emissions.

2. Based on Indonesia's National Action Plan Addressing Climate Change, the national adaptation agenda is needed. It is supposed to be focused on water resources, agriculture, fisheries, coastal and marine ecosystems, infrastructure and settlement, human health and forestry sectors. Indonesia makes considerable efforts in combining and integrating environmental issues into development agendas or plans, particularly, in association with respect to mainstreaming climate change forward to national development strategies. Indonesia is also committed to mainstreaming effective, efficient and equitable adaptation interventions into development plans.

Adaptation is a matter of building resilience by: reducing exposure (reducing reliance on agriculture; diversifying economy; avoiding construction in floodplains, etc.), reducing sensitivity (selecting more robust crops, planning for disasters, increasing margin of safety in infrastructure design, etc.), and increasing adaptive capacity (education, economic diversification, information/warnings).

As UNFCCC (2006) suggested, adaptation measures are being implemented, i.e. reactive and anticipatory. In IPCC's fourth assessment report there were suggestions to apply adaptive responses, such as technological, behavioural, managerial, and policy.

Reactive, autonomous adaptation in ecosystems is closely related to the concepts of resilience and ecological reorganization that are being used for reactive adaptation. Ecological resilience is dealt with the continuity of ecological processes at smaller and larger scales. The pervasive impacts of global change threaten to reduce ecological resilience at local to global scales, producing ecosystems that are increasingly brittle and sensitive to disruption. Anticipatory adaptation comprises diverse measures such as early-warning systems, incentives for relocation or purchase of insurance. Whereas the ecological, social, and economic costs of relying on autonomous adaptation can be substantial, anticipatory adaptation provides the opportunity to avoid or decrease those costs by planning ahead of time. Currently, Indonesia implements the systems proposed by the Global Environment Facility (GEF) to develop adaptation strategies for vulnerable regions subject to climate change for coping with climate change impacts based on current exposure to extreme events. An integrated approach is aimed at, which treats coping with present climate variability as an effective way to reduce longer-term vulnerability to climate change. Integration in this context assumes the uncertainty augmented assessment of both mitigation and adaptation measures.

3. During 1992 – 2003 many parts of Sumatra and Java were affected by the uncertainty of wet season, whereas 20 days later than the average compared to 1960 – 1990. In 1997, big flood hit Jakarta and impacted 80 districts, destroyed circa 100.000 houses, killed dozens of inhabitants, and expelled more 500.000

inhabitants, and caused ca. USD 500.000.000. Overall, annual precipitation in Indonesia has decreased by 2 – 3 %. Global sea-level rise is currently increasing at about 2 mm per year which can cause significant losses of Indonesia's 80.000 km of coastline and thousands of islands and the associated marine resources (e.g. coral reefs, fisheries, mangroves, et cetera). The mean sea level in Jakarta Bay will rise as much as 0.5 cm annually and the land surface will decline as high as 0.8 cm per year. During El Niño effect in 1997, in Indonesia over 2.000.000 hectares of peat swamp regions are burnt. An estimated 1.000 out of 40.000 Orang Utans (2.5 %) died. A rise in severe respiratory problems follows an increase in the frequency and spread of regularly forest fires which release toxic gases, such as carbon monoxide, nitrogen dioxide and hydrocarbons. El Niño droughts destroyed 426.000 hectares of rice field and lowered soil fertility by 2 to 8 % which caused rice yield by 4 % and maize yield by 50 %. Four thousands disasters occurred in 2001 - 2007: 37 % were flood, 24 % were drought, 11 % were landslides, and 9 % were windstorms.

4. What actions or approaches should be taken into consideration to support and disseminate climate change adaptation in the natural hazard arena?

Institutional Capacity Building and Pro-poor Programs should be prioritized and strengthened in preparing the holistic and integrated systems to cope with Climate Change hazards by involving the various actors, e.g. stakeholders, civil society or community, non-governmental organizations, academicians, native people, and government, in dialogues and discussion and program and actions establishments.

The accomplishment of this assignment was enriched by some literature which is available on request.

Moldova



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Country Profile

The Republic of Moldova is a landlocked country in Eastern Europe located between Romania to the west and Ukraine to the north, east, and south, and separated from these countries by two rivers. The mild and sunny climate, as well as the fertile soil makes the area of the country ideal for agriculture and food processing, which, according to official statistics, accounts for about 40% of the country's GDP. The agricultural land represents approximately 59.3% of the total area of the country.

Having a total surface of 33,483 km² and a population of approximate 3,560 thousands (as of 1 January 2011), Republic of Moldova is included in the category of small countries, but despite of this fact, the territory of the Republic of Moldova is often subject to many disasters (natural and manmade) and exceptional situations, which, given the economic circumstances of the country (Moldova is considered to be the poorest country in Europe), have greater impact on country's economy if not prevented and handled correspondingly.

1. Hazards related to Climate Change in the Republic of Moldova

According to the study "State of the environment in the Republic of Moldova" (Republic of Moldova 2005) (the last exhaustive official report available) conducted by the Ministry of Environment of the Republic of Moldova and the Institute of Ecology and Geography of the Moldavian Academy of Science under financing

of UNDP, the number and frequency of the hazards has significantly increased during the last years both globally and regionally. The total number of the dangerous phenomena has increased from 150 cases in 2007 to 288 cases in 2010, and the total number of natural hazards increased from 2 in 2007 to 70 in 2010.

1a. Generally, the territory of the Republic of Moldova is exposed to the following hazards:

- Drought - the most common type of hazard with the greatest impact on the agricultural activity
- Hail - the second greatest factor which generates losses. On average, there are 3 to 5 cases of strong hail during the year in Moldova, which impact negatively thousands of acres
- Floods - usually caused by heavy rains (during summer), and melting of snow and ice (during early spring), are also transboundary in nature
- Frost - occurs often, and the temperatures of -20° to -31°C have negative impact on the spring and autumn cultures
- Heavy snow - is characterized by abundant snow falls, lasting several hours to several days

Heavy snow causes emergency situations, paralyzes transport/utilities/energy/telecommunications and agricultural sites. From the point of view of Risk Management of financial institutions, the majority of hazards impact negatively the activity of economic agents and absence of a Business Continuity Strategy decreases the chances to access to financing. For the financial institutions as such, hazards represent an operational risk which might transpose into loss of facilities and further unearned profits.

1b. The regional difference of occurrence of hazards lies in the diversity of Moldova's relief and placement on the geographical map. Droughts are characteristic for central and southern regions, floods usually occur near the rivers, and Frosts in northern regions. But it sometimes happens that the hazards occur in neighbour countries, but impact our territory. So that it sometimes rains or snows in Ukraine, but Moldova is flooded while the entire country prays for rain due to the drought.

1c. According to the above mentioned study conducted by the Ministry of Environment of the Republic of Moldova, the weather changes in the Republic of Moldova match current global trends. The increase in the average annual air temperature by almost 1°C in the last century shows the maintenance of the same rapid pace of weather warming as in the rest of Europe. The values of atmospheric precipitation in the territory of the republic register an increase of the annual figures by 100 mm during the 20th century. The changes in regional weather, which are from thermal and atmospheric precipitation measurements, led to the frequent alternation of the antipode periods "cold-hot" and "dry-wet" in the last few years.

1d. It is difficult to assess whether the extreme events or gradual changes are more in focus, because there are mainly two government bodies responsible for these aspects: Ministry of Internal Affairs is mostly involved in prevention and remediation of sudden extreme events, and the Ministry of Environment is more focused on the analysis and management of gradual changes. Nevertheless, in the last years overall attention is focused on the gradual CC. In this sense, Republic of Moldova has recognized the importance of the Copenhagen Accord by joining it.

2. Adaptation measures related to Climate Change

Promoting green economic development was supported within the National Policy Dialogue on Environment and Development and within the National Environmental Strategy for the period 2012-2022. The Ministers Declaration emphasizes the importance of long-term green development: as the Declaration states, "green development will remain relevant even after the current crisis." The Declaration also warns society as a whole not to use the crisis "as an excuse for delaying crucial [environmental] decisions concerning the future of our planet."

2a. The technical and physical adaptation measures related to CCA depend on the type of hazard which is coped with: droughts are mainly coped with irrigation and restoration of the ecological imbalances (afforestation, arrangement of land lakes); Hails are prevented by launching anti-hail rockets; Floods are diminished by building of drains and dams, strengthening of roads and bridges; The Exceptional Situations Department of the Minister of Internal Affairs is in charge of monitoring the situation and adaptation of measures to be implemented in order to diminish the related risks.

2b. From the point of view of Ecologic Management, adaptation to CC is transposed into a a complex approach regarding elaboration and realisation of the ecologic policy through an integral system. Given the orientation of Moldova to European Union, the ecological management activities have been brought to the level of EU requirements, and UN documents and principle of sustainable development. The Ministry of Environment of the Republic of Moldova pays special attention to projects focused on using renewable energy for sustainable provision of energy in the country, and a decrease in the negative environmental impacts. Currently, the projects that make use of wind, solar energy, and biofuel are favoured.

Of great importance for ecological agriculture is to maintain a steady pace of development in ecological agriculture, and this pace is kept in the Republic of Moldova, although it is a rather slow one.

2c. During the last years the Ministry of Environment has fortified and expanded its infrastructure, and currently is built of dedicated subdivisions according to different fields: water, geology, mineral resources, regulation of nuclear activities, ecologic inspectorate, etc. According to its Regulation, the Ministry of Environment elaborates and promotes State's policy in the environment protection and rational utilisation of natural resources.

Major importance is granted to integration of ecologic management in national economy, but as for now a poor coordination of local, regional and inter-sectorial activities is to be stated.

3. Other risks/hazards/conflicts that pose a challenge to Republic of Moldova are as follows:

- Earthquakes, as the Republic of Moldova is in an active seismic area in the Carpathians, which are steadily growing young mountains.
- Landslides are characteristic for slope regions. There are about 15000 portions subject to landslides, representing around 64% of the localities.
- Fires are of incontrollable nature, especially those happening due to high temperatures, and occurring on extended agricultural spaces like wheat crops.
- Radioactive contamination still represents a risk for Moldova, despite of the fact that no nuclear installations are located on its territory. This is due to the fact that there are a series of Atomic Electro Stations near our borders (ex: Catastrophe from Chernobyl).

- Social-biological exceptional situations like epidemics, pandemics, intoxications (aliments, water), etc.
- Freezed conflicts with Russian Federation related to Transnistrian Region, where the 14th Soviet Army is still placed.

4. So, in the context of the above stated information, my most burning question I would like to address in the Summer School is:

What are the tools to be implemented at entity levels in order to better adapt to disaster risk mitigation necessity, and how could the government promote these tools?

5. Is it too late to start preventing Climate Change, or do we still have a chance? If we do have a chance, what would it be? And what would be the deadline? I guess too many questions is an alert that it is time to „get something done”, and do not wait the governments to „do something”. I believe in nature and I hope to preserve it, and this is the greatest motivation to start preventing Climate Change and reducing the risks.

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Nigeria



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Agriculture is highly dependent on meteorological parameters for their growth and development. As such, hazards of hydro-meteorological origin are the most common in the domain of Agriculture. According to UNISDR Terminology on Disaster Risk Reduction 2009, hydro-meteorological hazards are caused by atmospheric, hydrological, and oceanographic processes thereby causing losses, damage to lives and properties. Changes in meteorological parameters such as increase or decrease in the average annual and seasonal rainfall and/or temperature variability can lead to climate extreme events such as floods, drought, heat wave, etc. It is observed that climate extremes happen either rapidly within a short time (e.g. flood) or occur slowly over a very long time to the extent that it can occur without been noticed for some time (e.g. drought).

In the case of flood, the value of the climate variable is above the threshold range of observed values. This implies availability of excessive water resources than it is required at any given period.

Drought occurs as a result of deficiency in rainfall (as source of water) precisely in relation to the timing of occurrence, distribution, duration, and intensity of the deficiency in relation to water availability, demand and supply. Drought occurs in almost all climatic regions, but its characteristics differ from one country to the other depending on the environmental conditions, agronomic condition of soil, crop type, and the capacities of each country to respond to drought effects. Droughts are grouped into four categories such as: Meteorological drought, Agricultural droughts, Hydrological drought and Socio-economic drought. Figure 1 shows the relationship between types of drought and their consequence impact.

Climate extremes such as floods and drought cause direct and indirect effects. The different sectors of the economy are vulnerable to the impact of climate extremes. However, the Agricultural sector is the most vulnerable economic sector to climate extremes in Africa. Examples of such impact include alteration of growing seasons, crop calendar, water availability deficiency, evapotranspiration and photosynthesis, land suitability for agricultural production, pest, weed and disease challenge. Prolonged drought could also result into famine, death, soil salinization, loss of biodiversity resources.

Adaptation options differ from region to region depending on the level of severity, frequency of the hazard, environmental and infrastructural and socioeconomic abilities of the region to the hazards.

In other to tackle climate change impacts to food security risks, some examples of adaptation options in the field of agriculture include: adjusting the cropping calendar, developing and promoting of new improved varieties (high yielding and drought resistant varieties), assessing and determining suitable land areas for cultivation of different crops based on their climatic and environmental needs, wetland restoration, planning and conservation, maximizing the potential of wetland areas for agricultural production, use of bunds, reforestation and agroforestry practice. Measures are been developed and improved to enhance water catchment management, harvest water during the rainy seasons, protect crop lands from soil erosion, conserve ground water supplies.

In addition, the development and the implementation of early warning system (EWS) help to facilitate adaptation to climate variability issues such as drought and floods. With an early warning system, current climate condition and future climate projection can be assessed to determine the patterns of inter-annual and intra-seasonal climate variability and extremes. Prompt detection of drought onset is facilitated. The implementation of a EWS would require the integration of climatic, hydrologic, and soil variables. Drought and flood are spatial and dynamic problems. As such, continuous and real-time data of spatial attributes will be potent to study, monitor and mitigate these climate disasters and crucial to the development of EWS as well.

Remote sensing techniques provide the possibility to acquire real time, continuous data rapidly over a large spatial scale by means of sensors mounted on an either aircraft or satellite platform. The use of remote sensing based indices has now become a widespread tool and approach for drought assessment and risk management. Remote sensing based indices are useful for detecting and studying the onset, trends, severity, magnitude and frequency of drought and flood. Time-series data showing changes over time and spatial drought map can be generated at local, regional or global scales.

Several international communities have raised to the challenge to tackle climate change issues towards food security for example UN, FAO, World Food Programme (WFP), USAID, etc. They achieve this feat through the development of crop models, platforms, methods, software and tools to facilitate the availability of useful climate data, information system toward disaster risk management and monitoring for the different regions especially for Africa. Examples of such platforms are the Famine Early Warning System Network data (FEWS NETS) and the Global Information Early Warning System on Food and Agriculture (GIEWS). Also, there are on-going research work and projects that are carried out by national and international research organization to foster food security. Also, in few African countries for example South Africa, they have developed institutional framework and support toward Disaster Risk Management.

Question: Several research works are ongoing in the area of disaster risk assessment and management, and climate change adaptation; how can researchers synergize research works and real world realities?

Quote: The concept of climate change adaptation is not new. Adaptation to climate change has been practiced for several years in the past in the Agricultural domain through several imbibed traditional knowledge and indigenous practices. The only difference from the past and the present is that the rate of climate change variability is more intense and identifiable. Traditional knowledge integrated with scientific knowledge can improve Disaster Risk Reduction and Climate Change Adaptation.

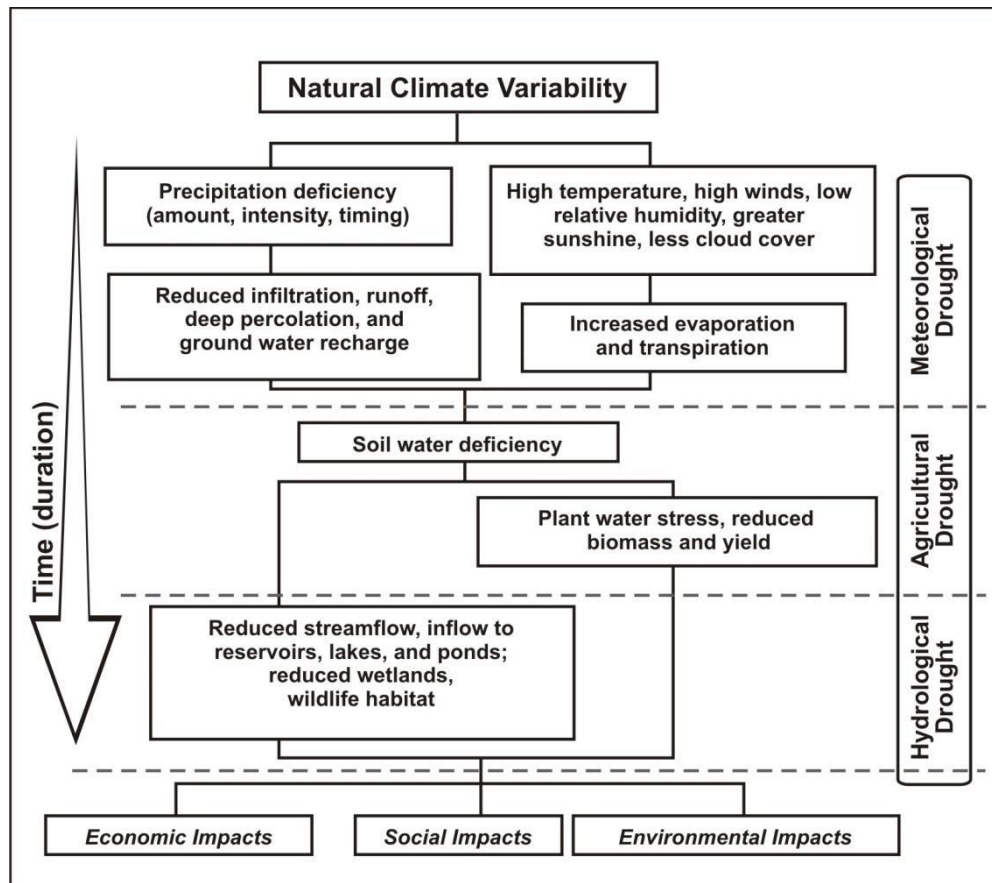


Figure 2: Relationship between meteorological drought, agricultural drought, and hydrological drought
Source: National Drought Mitigation Center

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1. What hazards are related to CC in your country or your field of work?

1a. Generally

Nigeria still depends to a large extent on traditional energy sources such as fuel wood, bagasse and crop residue for its domestic energy needs. Biomass, consisting mainly of fuel wood, dominates the structure of energy consumption in the country. Nigeria's fuel wood consumption is estimated at about 80 million cubic meters (about 25 million TOE). Fuel wood is widely used for heating and cooking, cottage industrial applications and food processing. Currently, these traditional energy sources account for about 55 percent of Nigeria's primary energy requirements, even though they are usually not included in a country's commercial energy consumption calculations. Overdependence on biomass energy depletes natural forests which act as sink for carbon dioxide and other greenhouse gases. The depletion of the forests through wood collection and logging adversely affects the environment and climate change effects like flooding, desertification and erosion are increasing at an alarming rate. Oil industry activities such as gas flaring in the Niger Delta region of the country contributes to climate change and generally addresses global concern relating to Carbon emissions as provided in the UN Framework Convention on Climate Change. All this factors notwithstanding, Nigeria is ill prepared to deal with climate change induced disasters.

1b. Any regional differences?

Climate change hazards vary across regions in Nigeria. The southern states are inundated with flooding especially during the rainy season while states in the eastern parts of the country are affected by erosion and landslides. On the other hand, desert encroachment is the bane of the northern states.

1c. Any occurrences of extreme events already attributed to CC?

The year 2012 will remain an unforgettable year in the lives of most Nigerians. Most parts of the country were ravaged by flooding, normally peculiar to coastal communities. Not even the usually dry northern states were spared as a result of rise in the level of water bodies like the river Niger coupled with poor water management in Nigeria and neighbouring West African countries like Cameroun. This led to loss of lives and livelihoods, as well as displacement of millions of people across the country. According to figures released by the National Emergency Management Agency (NEMA), 7.7 million people were affected by the flood between July 1 and October 31, 2012. In addition, 363 people lost their lives, 18,282 were injured and 2.1 million people were displaced in the 2012 flood disaster in Nigeria.

1d. Are extreme events or gradual changes more in the focus?

Nigeria has annual deforestation rate of about 3.5%, approximately 350,000-400,000 hectares per year. The Food and Agriculture Organization of the United Nations (FAO) in its report of a data collected between 2000

to 2005 stated that Nigeria has the world's highest deforestation rate of primary forests, with the country reported to have lost 55.7 percent of its primary forests mainly due to activities such as logging, subsistence agriculture, and the collection of fuel wood for domestic energy needs (FAO 2005). Thus, Nigeria is set to experience many of the negative impacts of climate change; one of the most affected areas is the north of Nigeria where desertification and increasing water scarcity will make agriculture, the main source of income for the majority of the population, increasingly difficult. In addition, the 2013 Annual Flood Outlook (AFO) for Nigeria by the Nigeria Hydrological Services Agency (NIHSA), 31 out of the 36 States in Nigeria will experience severe flooding this year. This forecast is based on the Nigerian Meteorological Agency (NIMET), 2013 Seasonal Rainfall Prediction (SRP) which indicates that high rainfalls are to be expected in most parts of the country in 2013.

2. Are there adaptation measures that are related to CC?

2a. physical/technical

Shoreline protection and control of coastal erosion in coastal areas especially in Lagos State and irrigation farming in the northern part of Nigeria

2b. ecological

Promotion of community based forest conservation.

2c. institutional/organizational/political

Early warning system and disaster risk reduction management through the Nigerian Meteorological Agency (NIMET), the Nigeria Hydrological Services Agency (NIHSA) and National Emergency Management Agency (NEMA) and other relevant government agencies.

2d. social/cultural

A lot of local communities in Nigeria practice water harvesting, construction of earth dams, dry season irrigation, adoption of improved seeds and early maturing crops, use of fuel efficient woodstoves, bee keeping, snail farming, tree planting, erosion control, sand dune stabilization, establishment of fodder production farms, and fish farming to adapt to climate change effects.

3. Are there other risks/hazards/conflicts that pose a challenge to your country/in your study or working area? If yes, can you provide us with a short description of the impacts?

Variable weather patterns such as unpredictable and compressed growing season makes planting decisions more problematic for farmers and can reduce farm yield thereby posing threat to food security. Displacement of people due to climate disasters also results in conflicts for scarce resources.

4. What is the most burning question you would like to address in the Summer School?

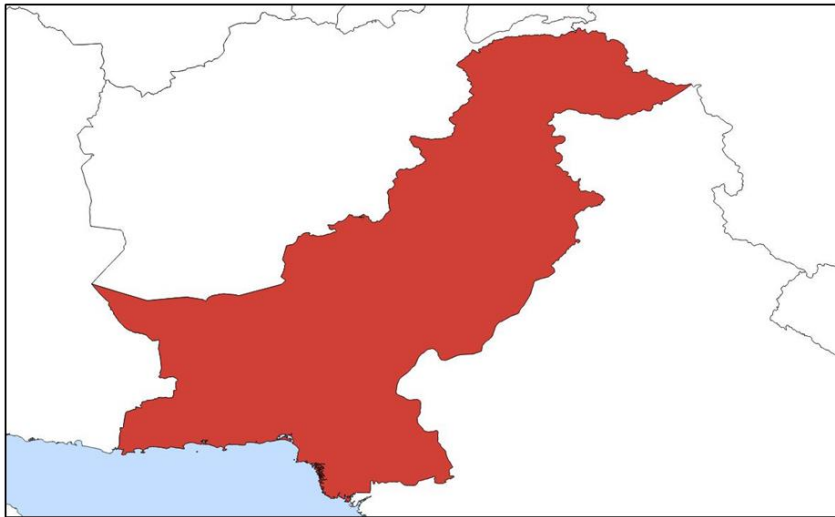
How can climate change be demystified in a way that makes it easy for local communities to adapt to and mitigate the impacts of climate induced disasters?

5. *Could you provide us with a quote, (if you wish a provocative one) on "The current focus on how Climate Change Adaptation is dealt with, lacks proper delivery of information to local communities in a way that is simple to comprehend and thus, inhibits resilience to climate induced disaster..."*

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Pakistan



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Climate change is threatening the livelihoods of more than 70 % poor people living in rural areas of Pakistan. There are several indicators which show that the adverse impacts of climate change have already caused disasters. These include water related issues i.e., either there are extreme floods or there are extreme droughts, shifting of warm and cold days which in turn is affecting the sowing dates of different crops and plants, change in rainfall patterns, and greenhouse gas emissions from farmers' fields. Although federal government of Pakistan has recently developed climate change study centre but till today there are no policy to mitigate the adverse effect of climate change on irrigated agriculture.

The most important issue is dealing with climate change at farmers' fields. The gaseous exchange between soil and atmosphere (e.g. fluxes of CO₂, CH₄, and N₂O) play a major role in the carbon balance (CO₂) and greenhouse gas emissions, which are strongly related to Climate Change. Carbon dioxide is released largely from microbial decay or burning of plant litter and soil organic matter. Methane is produced when organic materials decompose in oxygen-deprived conditions, notably from fermentative digestion by ruminant livestock, stored manures and rice grown under flooded conditions. Nitrous oxide is generated by the microbial transformation of nitrogen in soils and manures, and is often enhanced where available N exceeds plant requirements, especially under wet conditions.

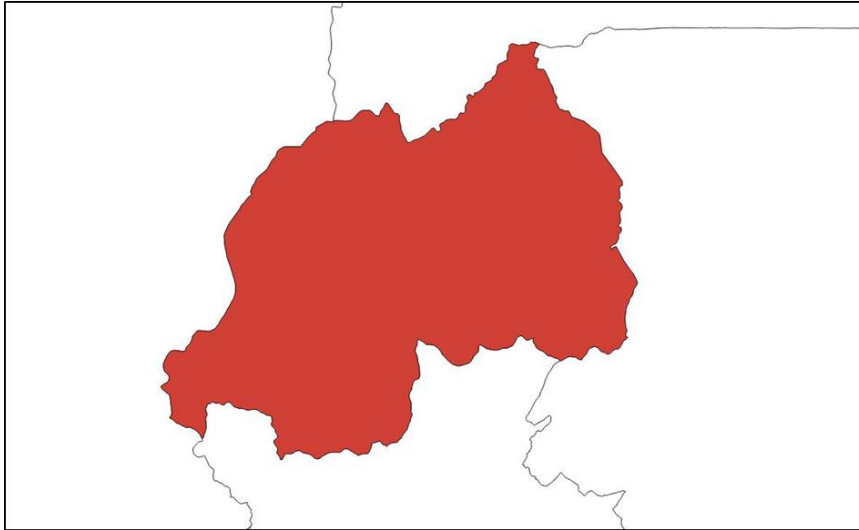
European agriculture and forestry play a positive role in managing and enhancing the natural environment and to deliver sufficient food, fibre and raw materials for human consumption, is increasingly recognized. It includes food and energy security, the impact of agriculture on Europe's environment, the role of new technologies in enhancing sustainable production and future land use requirements in Europe. In considering these issues, it is evident that no single farming approach can address successfully the dual requirements of production and environmental management and that a mixture of both intensive and extensive production systems will be required. To achieve this, a range of policy interventions will be needed, not least to ensure that farming systems that maintain valued landscapes, ecosystem services and biodiversity remain economically viable and deliver a reasonable quality of life for farmers. Therefore a simulation tool that includes the maintenance of the systems to assess the effect of innovations on farm level and to elaborate on the re-design of the GHG emissions and reduce the risk of pollution in eco system is of paramount importance.

Greenhouse gas (GHG) fluxes are complex and heterogeneous, but the active management of agricultural systems offers possibilities for mitigation. Many of these mitigation opportunities use current technologies and can be implemented immediately. The large datasets and new techniques are require to make first estimates of agricultural GHG mitigation potential that include all GHGs with breakdowns for all global regions and all gases.

The fluxes of these gases can be reduced by managing more efficiently the flows of carbon and nitrogen in agro ecological systems. For example, practices that deliver added N more efficiently to crops often suppress the emission of N₂O and managing livestock to make most efficient use of feeds often suppresses the amount of CH₄ produced. The approaches that best reduce emissions depend on local conditions and therefore vary from region to region.

"The current focus on how Climate Change Adaptation is dealt with lacks inclusion of activities at farmers' fields which is an important catalyst of climate change. For more grains per unit land, we are using abundant fertilizers and are adopting modern techniques which in turn are threatening the sustainability of ecosystem and food security."

Rwanda



Nanou Kone (Email: nanoukone@gmail.com)

Nanou Kone is from Ivory Coast but due to her working experience in Rwanda she presents experience from this country.

Situated in the Great Lakes Region, Rwanda is a landlocked country in East Africa, characterized mountainous landscape recognized by the United Nations Framework Convention on Climate Change (UNFCCC), and the Intergovernmental Panel on Climate Change (IPCC), as ecosystem which is particularly vulnerable to climate change. Rwanda's location in the Eastern Rift Valley and the effect of the Inter Tropical Convergence Zone (ITCZ) on the continent, in addition to the mountain chains that form the divide between the Nile and the Congo watersheds, Rwanda is vulnerable to both natural disasters emanating from seismic disturbances and climatic change. Some of these disasters include landslides, earthquakes, droughts, and floods.

Over the last decade, the frequency and intensity of natural hazard-induced disasters, particularly floods and droughts, have significantly increased. These disasters have caused the loss of lives, the displacement of affected population as well as damage to infrastructures (roads, bridges, houses, schools, and other properties), crops and serious environmental degradation. Owing to a confluence of factors such as the fast-phased development trend trekked by the country, rapid urbanization (though both are positive elements if viewed from a development lens), the growing population, and the escalating impacts of climate change evidenced by extreme weather events and erratic climatic conditions; Rwanda's disaster risk profile has increased significantly.

In order to adapt to the impacts of climate change and to mitigate disaster in the country, Rwanda developed its twin strategy of disaster risk reduction and climate change adaptation mitigation. DRR and CCA have since been mainstreamed in the Country's second Economic Development and Poverty Reduction Strategy (EDPRS II) as a cross cutting theme. Under EDPRS II, DRR and CCA and mitigation are captured in all priority areas, including agriculture, infrastructure, education, environment and natural resources, private sector development, energy sector, I.T. and youth and social protection. This places DRR and CCA at the forefront of Rwanda's development priority.

Compared to neighbouring East African countries (Uganda, Tanzania, Malawi, Kenya and Burundi), Rwanda established in 2010 the Ministry of Disaster Management and Refugee Affairs, the nodal ministry of disaster management (MIDIMAR). The Ministry's mandate is to establish appropriate policies and institutional arrangements for dealing with disaster risks more effectively. In 2011, the National Disaster Management Policy was revised to reflect new approaches to disaster risk management. The policy also mandated the creation of the National Platform for Disaster Risk Reduction (NPDRR), the national coordination mechanism for disaster risk reduction in the country. Simultaneously, the country also developed its National Disaster Management plan that frames key strategies and activities for preparedness, response, mitigation and recovery and rehabilitation.

Other than legal policy development for DRR and CCA and mitigation, other ecological and social structures that have been implemented include local community involvement in DRR and CCA, for example, teaching local communities to implement simple measures such as putting gutter of water on houses in order to collect water from roofs during rainy seasons, digging trenches for water collection, tree planting on steep slopes, avoiding to build houses or settling on steep slopes or close to mountain edges, or in active flood-plains, and finally reducing floods by building dams and levees in flood-prone areas.

Other risks/hazards/conflicts that pose a challenge to Rwanda are geologically induced disasters such as volcano eruptions and earthquakes. For example the eruption of the Nyiragongo volcano in Eastern DRC in 2002 threatened the country with massive influx of Congolese population seeking refuge in Rubavu District bordering Goma. Unfortunately there was no adequate preparedness and contingency measures to tackle impacts of DRR on human migration. Secondly, in 2008, Rusizi and Nyabihika (both in the western province) were severely hit by a 5.9 earthquake causing 39 deaths, more than 600 injuries and more than 2000 people were left homeless. This goes to show that despite risk reduction measures such as public awareness and training, reduction of structural vulnerability through the construction of resistant shelters, based on enforceable building codes, earthquakes and/or volcano warnings and preparedness programs have not yet been developed limiting the resourcefulness of the state when responding to the aftermath impacts of disasters.

A burning question that could be addressed in the summer school is how to couple both climatic and geologically induced disasters when developing mitigation measures and policies for vulnerable countries such as Rwanda. This is taking into account that the technical capacity of government to manage such disasters is limited.

Quote: "Climate change focus needs to shift gear from the macro level to the micro level.

CCA & DRR in

South Africa



Alanna Rebelo (Email: alanna.rebelo@gmail.com)

"South Africa is a dry country with a mean annual rainfall of about 490 mm (half the world average) of which only 9% is converted to river run-off. The overall impact of climate change on water resources is uncertain, and will vary significantly from place to place within South Africa." - Colvin et al. 2009

1. Climate Change hazards in South Africa

South Africa is experiencing rapid urbanisation; however this is mostly the immigration of poor people into unplanned, informal settlements resulting in many risks associated with low standard housing as well as the occupation of unsuitable land (Roth & Bekker 2011). Roth & Bekker (2011) point out five key challenges that South Africa needs to address in order to decrease disaster risk: community growth, lack of land, politics, institutional capacity and community risk behaviour. They suggest that DRR is a development problem and will only be solved if all administrative levels and sectors of government in South Africa work together: towards not only economic growth, but sustainable development, with long-term strategies.

South Africa has a heavy dependency on coal for energy production, and the country's total emissions in 2000 were estimated to be 461 million tonnes of carbon dioxide equivalents (CO₂e). In terms of emissions by sector, 83% of emissions are from energy supply and consumption, 7% from industrial processes, 8% from agriculture, forestry and land-use, and 2% from the waste sector (DEA 2011). Major greenhouse gases emitted in South Africa are Carbon dioxide, Methane and Nitrous oxide.

The South African interior is projected to warm by up to 7°C by 2100. Rainfall is projected to decrease in frequency and increase in intensity of events in summer rainfall regions, whereas in winter rainfall regions rainfall is projected to decrease. These changes are particularly worrying as large areas of South Africa rely on rain fed agriculture.

The major direct impacts of CC in South Africa are expected to manifest in an increase in extreme floods, droughts, heat waves, wildfires and storm surges. The indirect environmental impacts that can be expected would be an increase in sediment erosion, the spread of invasive alien species, toxic algal blooms, crop failure and loss of livestock. On the other hand, some scientists have predicted an increase in groundwater recharge due to increased intensity of rainfall events (Colvin et al. 2009). The indirect impacts of CC to society and the economy would be to local food security and food markets; it would affect human health and livelihoods, and peoples purchasing power.

South Africa has considered challenges of CC to 7 different spheres: water, agriculture and commercial forestry, health, biodiversity and ecosystems, and human settlements (urban, rural and coastal). South Africa has focussed on both extreme events and gradual changes that could be expected from CC.

2. What adaptation measures exist for CC in South Africa

South Africa is a water-scarce country and the impact of CC on water resources remains uncertain, however it is expected that the country as a whole will get hotter resulting in a reduction in available water and an increase in algal blooms (Colvin et al. 2009). South Africa has maps of modelled predictions of likely rainfall changes due to CC e.g. Schulze et al. 2005, but actual impacts are hard to predict due to tipping points of ecosystems. South Africa has also produced a map of groundwater storage (DWAF 2005). Suggested CCA strategy will be to increase drought resistant water storage, improved understanding of our water balance, water demand management and strengthening engineering and community-based capacity to respond to new water supply challenges (Colvin et al. 2009). The CSIR aims to produce a South African Risk and Vulnerability Atlas (SARVA).

In addition, South Africa has produced a National Climate Change Response White Paper (NCCR) which uses a risk-based process to identify and prioritise short- and medium-term adaptation interventions. South Africa's response to CC has two main objectives: firstly to manage CC impacts through interventions to build resilience, and secondly to decrease carbon emissions contributing to the global problem. In addition, South Africa has a well-developed Disaster Management Act (Act 57 of 2002) and Framework (Roth & Bekker 2011). One aim of the NCCR White Paper is for Government departments to start communicating with citizens about climate change to inform and educate them and to influence their behavioural choices. However according to Chagutah 2009, local measures for public awareness in South Africa are currently weak. The White Paper also places emphasis on monitoring and evaluation.

In 2011 South Africa published its Second National Communication under the UNFCCC. It focusses on emissions and removal of greenhouse gases, as well as on details regarding implementation, including the South African situation, vulnerability and adaptation to CC in key sectors, technology transfer, education, training and public awareness. The official status is that South Africa is well positioned to fulfil its mandate in assisting vulnerable communities to reduce risks of negative CC impacts. Interest in CCA is increasing.

It has been recognised that South African adaptation will need to account for a wide range of uncertainty; therefore flexibility and adaptive management will be important components of any strategy. The South African National Biodiversity Institute (SANBI) has been involved in CCA research for the past 20 years. During

2011 SANBI was accredited as South Africa's National Implementing Entity for the Adaptation Fund. SANBI has developed strong working relationships across sectors and between government, civil society and the private sector to develop a CCA strategy. SANBI initiated two concepts or projects as the NIE "Building resilience in the greater uMngeni catchment, South Africa" and "Taking adaptation to the ground: a small grants facility for enabling local level responses to climate change in South Africa (the Namakwa and Mopani Districts)".

South Africa also has a National Long Term Adaptation Scenarios (LTAS) programme that looks at the socio-economic and environmental implications CC and CCA response options. One of South Africa's aims is to focus on and strengthen the green economy through job creation and incentives.

According to research done at the CSIR, South Africa is poorly capacitated in the fields of environmental and resource economics to deal with CCA research. The current research focus is mainly on mitigation, and the area of adaptation is poorly researched, fragmented and uncoordinated. This is troubling because the poor in South Africa are highly vulnerable and contribute little to global carbon emissions, and therefore it is argued that most of our efforts should be focussed on adaptation, specifically enabling impoverished communities to be able to adapt.

South Africa has developed 8 programmes to address near-term CC priority issues. They are: the Climate Change Response Public Works Flagship Programme, the Water Conservation and Demand Management Flagship Programme, the Renewable Energy Flagship Programme, the Energy Efficiency and Energy Demand Management Flagship Programme, the Transport Flagship Programme, the Waste Management Flagship Programme, the Carbon Capture and Sequestration Flagship Programme, and the Adaptation Research Flagship Programme. Adaptation measures have also been integrated into six sectorial plans: namely those addressing water, agriculture, biodiversity, health, sustainable human settlements, and disaster risk management.

South Africa has pledged several key responses to CC:

- Continue to develop early warning systems
- Collaborate with neighbouring states; information sharing
- Promote the development of Risk and Vulnerability Service Centres at universities
- Facilitate use of seasonal climate forecasts (Agricultural and Water Sectors)
- Maintain, update and enhance SARVA
- Collaborate with social networks: community organisations, NGO's to raise awareness, transfer technology, and build capacity.
- Develop mechanisms such that poor are able to recover after disasters (micro-insurance)

3. Other risks/challenges for South Africa

Being a developing nation with high levels of poverty, other key challenges facing South Africa include rural and urban poverty and other development challenges.

In terms of natural heritage, South Africa is one of the richest countries in the world in terms of diversity of plants and animals (marine and terrestrial), and levels of endemism. Three of 34 biodiversity 'hotspots' identified internationally are in South Africa. This presents a very special challenge for South Africa in terms of CC and protecting biodiversity. There are many factors threatening biodiversity, key among them habitat change and destruction, the spread of invasive

alien species, all of which are predicted to increase with CC.

4. *My most burning question*

How are other countries addressing CCA and DRR? Are they effective in their implementation? Are there significant differences in the level of priority CCA and DRR are given between developing vs developed nations?

5. *Quote*

"South Africa may have one of the most sophisticated policy frameworks for disaster risk reduction in the world, but its implementation is difficult in a situation where the identified challenges require such fundamental developmental changes." (Roth & Bekker 2011)

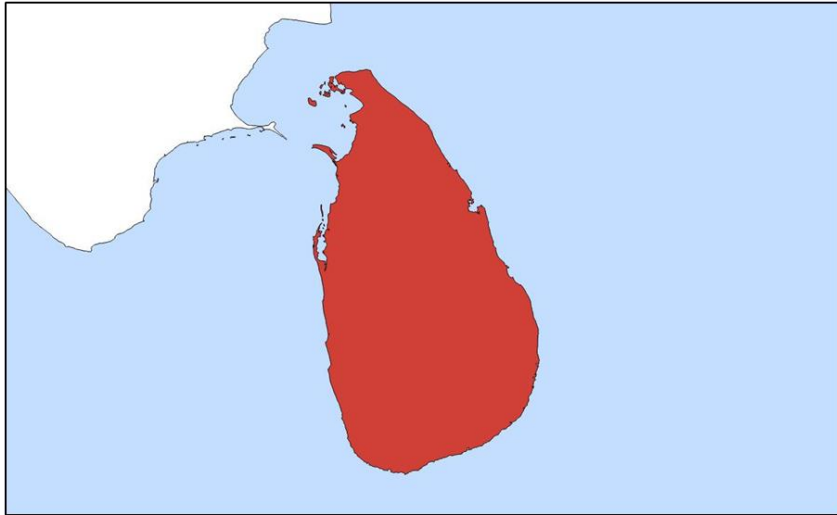
"It is clear from the study conducted that the recommended funding arrangements included in the National Disaster Management Framework for South Africa, to cover the cost of the different disaster risk management activities, are not applied in practice by the different spheres of government that should assist municipalities with funding." (van Niekerk & Visser 2010)

My quote: It would appear that South Africa has excellent strategies, policies and frameworks in place, however we have failed at a government and municipal level to implement these policies and to provide support and communicate with impoverished communities, those who are most vulnerable to CC and who most need information on how to adapt.

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Sri Lanka



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Sri Lanka is a lower middle-income country (US\$1,036 to US\$4,085) with a total population of 20,277,597 (Department of Census and Statistics 2011). Of this, 3418 persons are homeless – without a place of usual residence (Department of Census and Statistics 2011). 33% of the population is engaged in agriculture (rice, tea, rubber and coconut cultivation) and fisheries related livelihood activities which are labelled as climate sensitive livelihoods. 25% of Sri Lanka's population lives in coastal areas and coastal communities both rural and urban, is at the risk of sea level rise, increasing temperatures, disasters and issues such as salt water intrusion (Jayatilleke 2008). In other words, as a developing island nation, Sri Lanka is vulnerable to climate change as it threatens to have serious consequences in sectors such as water (quantity and quality), agriculture (raised temperature and unpredictable monsoon rains), health and geographic locations such as the coastal belt. As stated before, tourism, fisheries and agriculture play a substantial role in livelihoods of coastal communities and are directly or indirectly exposed to coastal vulnerability. These threats in turn no doubt impact on national economy, social stability, human health and even the national security (GOSL 2000).

Sri Lanka is already experiencing the impacts of climate change: changes and greater unpredictability in rain fall patterns, increases in temperature and gradual rise in sea levels and changing weather patterns are an indication of the long term changes in climate. For instance, the rain fall pattern in the dry zone (with an average rainfall of 1750mm) where 70% of paddy cultivated shows an increasing number of consecutive dry days due to rainfall variability. Increasing prolonged droughts in the dry zone could lead to reduce agriculture productivity in rain fed and minor irrigated paddy lands. On the other hand, soil moisture stress

coupled with less rain, creates conditions of salinization that have implications for productivity of agriculture lands especially in the dry zone. As a small island, sea level rise is one of the major concerns of climate change that can lead to salt water intrusion and erosion that reduces the productivity as well as the amount of arable land available for agriculture (Athulathmudali et al. 2011). It is reported that climate change will also have impacts on production, availability and breeding patterns of fish.

Sri Lanka is an active participant in international responses to climate change covering both mitigation (reducing the emission of greenhouse gases that cause global warming) and adaptation (living with the impacts that are inevitable in the coming years). In the global context, Sri Lanka's contribution of greenhouse gases is very small and the ability to mitigate is therefore very limited. However, scientists have argued that much effort, time and funds should be invested in climate adaptation. Therefore, a climate change adaptation strategy has been developed by the Climate Secretariat operated by the Ministry of Environment. The five areas this strategy is based on are given below:

1. Improve climate resilient and healthy human settlement Includes housing, urban development and planning, public health, drainage, drinking water, urban wetlands, waste management, pollution control.
2. Minimize climate change impacts on food security: Cultivation of crops based on agro-climatic conditions and promoting agro based industries, conserve the existing water resources, promote participatory irrigation management, promote organic and bio-fertilizer by gradually reducing chemicals, promote efficient water management techniques, promote land conservation etc.
3. Improve climate resilience on key economic drivers: Include tourism, transport, power, commercial agriculture, etc.
4. Safe guard natural resources and Biodiversity from climate change impacts: Includes water resource management, bio-diversity conservation etc.
5. Mainstream climate change concerns in to national planning and development: Includes cross cutting policy measures, capacity building, safeguards, monitoring programs, coordination mechanism, etc. (National Climate Change Adaptation Strategy for Sri Lanka 2011-2016).

Increased incidences of disaster events such as flooding, storm surges and landslides have been reported in Sri Lanka. In 2011, a total of 689,924 people were displaced (3.23% of total population) mainly due to floods (IDMC, 2011). Sudden increase in landslides between the years of 2003-2008 especially in the months of November, December and January is noteworthy. Most landslides appear to occur in the districts of Badulla, Matale, Ratnapura, Nuwaraeliya, Matale and Kegalle. Most of the damage and destruction to houses has been due to floods (232,236) and wind events (201,793) (UNDP 2009). In this context, there is a great need to reduce peoples' exposure to the above mentioned natural hazards by adopting and implementing a sustainable early warning system on one hand and other disaster risk reduction methods to secure their livelihoods.

Forced relocation of families who live in underserve settlements mainly in flood prone areas in the city of Colombo to ten relocation settlements under Colombo city urban renewal project as a strategy to upgrade the lives of the poor to secure their livelihoods from floods could be a challenge to the present and future governments. Relocation of urban low income families into unplanned or partially planned settlements could lead to relocation failures and could be categorized as a "development disaster".

By briefly stating the Sri Lankan situation in relation to CCA and DRR, as an applied social scientist, who has been researching on the topics of livelihoods, disasters, coping and forced relocation, I would like to learn more on various impacts of climate change on different communities on one and on adaptive strategies (for different sectors) and capacities of such communities on the other. These would be the most burning questions that I would like to address in the Summer School.

Quote: "The development to be truly sustainable, the livelihoods of poor and marginalized communities should be secured from natural and manmade disasters which is not an easy task."

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Turkey



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Climate change has been observed in Europe and central Asia (EcA) through higher temperature, changing precipitation and runoff patterns, and extreme weather, leading to reported increasing incidences of weather-induced disasters in many countries of the region, such as floods, droughts, wild fires, strong winds, and heat and cold waves. Projected impact of climate change, the reduction of current and future vulnerabilities to climate change risk should build on and expand existing disaster risk management efforts.

1. What hazards are related to CC in your country or your field of work?

The climate of Turkey; The southern and western coastal areas have a Mediterranean climate, but further to the east and north a number of factors make the climate more complex. These factors include extremely varied topography, an inland sea (the Black Sea) to the north and, beyond that, the vast Russian plain which, in winter, acts as a close source of very cold air. Contrastingly, the east of Turkey adjoins Syria and the Middle East which become very hot in summer and the southern coastline is only around 500km across the Mediterranean from the hot continent of Africa. Most of Turkey is high plateau and the terrain becomes increasingly mountainous towards the east. Even in the lower-lying west the terrain is mostly hilly (MET Office 2011).

Climatic disasters which effect Turkey are: Flood, Landslide, Extreme temperature, Wind storm, Cold wave and Wild fire (Westphal 2008).

Regardless of the accuracy in climate change predictions, reduction of current weather-related disaster risk will reduce losses and initiate necessary actions for climate change adaptation. Planning for extreme weather events also supports preparedness for a variety of other emergencies and, therefore, brings additional benefits.

1a. Generally

The most prominent feature that one can observe is the widespread increase in summer temperatures. Summer temperatures increase mostly in the western and south western parts of Turkey. Urban heat island studies (4) indicate that temperature rise as a result of urbanisation is most notable in summer in Mediterranean cities when the region comes under the influence of high pressure systems. Thus, widespread increase in temperature in western stations in Turkey may be mainly related to this phenomenon (2).

The trend for Turkey is relatively large over summer at 0.34°C per decade (5).

Several municipalities in Turkey, particularly those most vulnerable to hazard risk, carried out multi-hazard risk analyses, hazard mapping, loss estimations, and development of mitigation plans. The purpose of this work is to improve land use plans based on the particular risk of a given municipality, allowing the locality to make informed decisions about their urban development.

1b. Any regional differences?

In the case of increases in the global temperature of up-to 2°C; the expected impacts in the Mediterranean Basin of which Turkey is situated in, show the extent to which measures taken against the impacts of climate change need to be programmed. In the Fourth Evaluation Report of the IPCC it is indicated that a 1°C - 2°C increase in temperatures in the Mediterranean basin would be observed, that aridity will be felt in an even wider area, and heat waves and the number of very hot days will increase especially in inland regions. For Turkey, on the other hand, the average increase in temperatures is estimated to be around 2.5°C - 4°C, reaching up to 5°C in inner regions and up to 4°C in the Aegean and Eastern Anatolia. The IPCC report and other national and international scientific modelling studies demonstrate that Turkey in near future will get hotter, more arid and unstable in terms of precipitation patterns.

Turkey's First National Communication on Climate Change prepared in 2007 indicates the impacts of climate change in Turkey as; increasing summer temperatures, decreasing winter precipitation in western provinces, loss of surface water, increased frequency of droughts, land degradation, coastal erosion and floods. This situation is expected to have; negative impacts on water and soil resources that are necessary for food production and security and therefore on development estimates in *rural areas*, and; gradual increase of these impacts' severity. For example it is anticipated that 50% of the surface waters in the Gediz and Greater Menderes Basins will be lost by the end of the century and that water scarcity will be faced in agricultural, domestic and industrial water usages.

Although the impacts of climate change in Turkey seem to pose a serious threat in the future, it is also envisaged that these impacts will bring with them some opportunities if planned carefully. It is crucial that this situation is addressed in terms of the pressures on natural resources and water resources in particular and in terms of the bottlenecks or opportunities in the development of climate-dependant sectors.

Turkish National Climate Change Adaptation Strategy and Action Plan (2011) focuses on five important fields which are supported by technical and scientific studies and participatory processes.

- Water Resources Management
- Agricultural Sector and Food Security
- Ecosystem Services, Biodiversity and Forestry
- Natural Disaster Risk Management
- Public Health

1c. Any occurrences of extreme events already attributed to CC?

While the key natural hazard to Turkey is earthquake, the coastal plains are also vulnerable to flooding. On average, one huge flood strikes Turkey each year. In May of 1998, Turkey experienced one of the worst floods in the past 100 years. Floods damaged north western Anatolia, affecting 4 cities, 10 towns, and 110 villages with 30 people dead and over one million people impacted. The floods destroyed or badly damaged 2,200 houses and estimated losses went as high as US\$ 2 billion (Gurer & Ozguler 2004).

2. Are there adaptation measures that are related to CC?

2a. physical/technical

Economic losses resulted by climate change induced floods has reached economic losses from earthquake damages in Turkey. Each year 100 million US Dollars economic losses occur as a result of about 200 flood disasters happening.

Forest fires destroys about 450 ha forest area each year in Turkey. There is an increase in the number of forest fires since 2007. It has been concluded that large scale floods and drought that conventionally occurs in every 100 years are expected to occur in every 10 to 50 years up to 2070 in Turkey.

2b. ecological

Prediction of Climate Change: For the Caucasus states mean annual temperature is expected to increase by 1.7°C. Much like the Baltics, the Caucasus states and Turkey will see a decrease in frost days and an increase in heat waves by 2050. Climate models disagree on mean annual precipitation, however, models concur that annual runoff will decrease. Meanwhile, precipitation intensity and precipitation per extreme event will increase.

2c. institutional/organizational/political

Since the Ministry of Environment and Urbanization is the National Focal Point of the UNFCCC, this Ministry is also the institution that coordinates activities for adaptation to climate change at first hand. Moreover there are many relevant Ministries, institutions and organizations indirectly responsible for adaptation activities. With the new arrangements made regarding restructuring of Ministries, some Ministries took additional responsibilities in the fight against climate change.

Many important institutions such as, the Ministry of Environment and Urbanization, the Ministry of Forestry and Water Works, the Ministry of Food, Agriculture and Livestock, and the main units of these Ministries (General Directorate of Environmental Management, General Directorate of Water Management, General Directorate of Plant Production, General Directorate of Agricultural Research and Policies and their subordinate organizations (General Directorate of State Hydraulic Works, General Directorate of Meteorology, General Directorate of Forestry etc.) began to strengthen their policies regarding adaptation to climate change and increase projects and activities in this field.

Under the General Directorate of Environmental Management, which is subordinate to the Ministry of Environment and Urbanization, the Climate Change Department, in charge of all issues concerning fight against climate change was established in 2009. First established in 2001 and restructured in 2004 the "Coordination Board on Climate Change (CBCC)" that is responsible to take necessary measures to prevent adverse effects of climate change, ensure coordination and distribution of tasks between public and private sector institutions and organizations, and determine domestic and foreign policies considering the conditions of our country regarding this issue was restructured in 2010.

Coordination Board of CC Technical Working Groups in Turkey:

- TWG 1: CC impact research– General Directorate Meteorology
- TWG 2: Greenhouse Gas Emission Inventory- Turkish Statistical Institute
- TWG 3: Greenhouse Gas Reduction in Industry, Housing, Waste Management and Service Industry- Ministry of Energy and Natural Resources
- TWG 4: Greenhouse Gas Reduction in Energy Sector- Ministry of Energy and Natural Resources
- TWG 5: Greenhouse Gas Reduction in Transportation - Ministry of Transportation, Maritime Affairs and Communications
- TWG 6: Land Usage, Land Use Change and Forestry- General Directorate of Forestry
- TWG 7: Politics and Strategy Development- Ministry of Environment and Urbanization
- TWG 8: Trainings and Public Awareness- Ministry of Environment and Urbanization
- TWG 9: Adaptation to Climate Change- General Directorate of State Hydraulic Works
- TWG 10: Finance and Technology Transfer- Ministry of Development
- TWG 11: Carbon Markets- Ministry of Environment and Urbanization

Legal Framework: Turkey became a party of the United Nations Framework Convention on Climate Change in 2004¹⁵. In the 7th Conferences of the Parties (COP7) meeting held in Marrakech in 2001, the special conditions of Turkey which has a different position than the other countries in the Annex-I list of the Convention, were recognized and it was decided that its name will remain on the Annex-I while it will be removed from the Annex-II list.

2d. social/cultural

Culture has always played a role in informing human practices connected with global change. It can be viewed as a cause of climate change, for example, the impact of the culture of consumption, but also as something that can be itself affected by climate change, for example, the demands for changing current patterns of energy consumption. In Turkey there are many community awareness workshops have been done.

3. Are there other risks/hazards/conflicts that pose a challenge to your country/in your study or working area? If yes, can you provide us with a short description of the impacts?

- Earthquakes
- Landslides
- Floods
- Rock Falls

- Fires
- Avalanches

4. What is the most burning question you would like to address in the Summer School?

Is awareness to the Climate Change is still less in developing countries?

Does climate change effects are more effective in rural areas than urban areas?

Do climate change based compulsory mass migration and relocation events will increase?

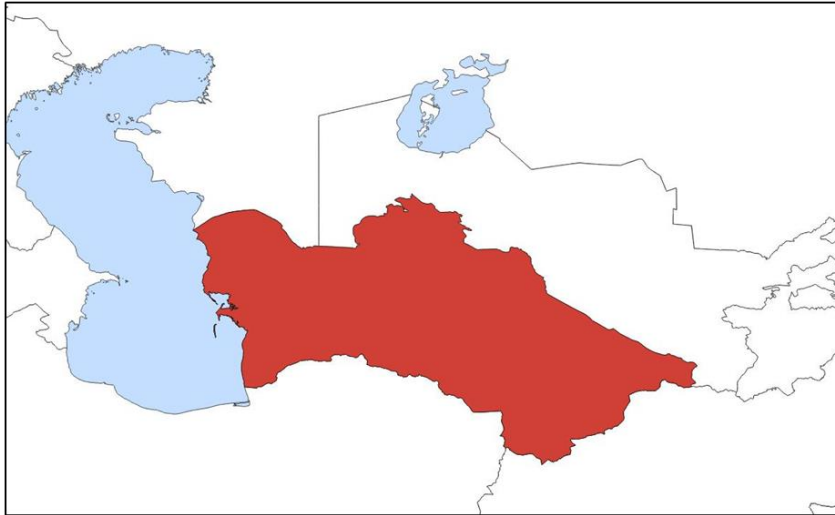
5. Could you provide us with a quote, (if you wish a provocative one) on "The current focus on how Climate Change Adaptation is dealt with, lacks ..."

Turkey aspires to integrate its climate change policies into development policies; enhance the use of clean and renewable energy sources; participate actively in the international negotiations on climate change within the scope of its 'special circumstances', and in doing so, become a country that provides her people with high living standards and welfare with a low carbon intensity. With this perspective, Turkey continues its march towards its set goals. Within the scope of the Climate Change Action Plan, we are preparing a road map that covers all sectors and identifies our short, medium and long-term targets for combating climate change. Our aim in preparing this action plan that foresees year 2023 is to integrate Turkey's future development and environmental plans and to proceed seamlessly, and without losing pace.

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Turkmenistan



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1. What hazards are related to Climate Change in Turkmenistan?

Turkmenistan is faced with serious environmental threats in the light of climate change. The country's vulnerability and adaptation to climate change focuses on the following aspects, in order of priority:

Public health – temperature is likely to increase by 2-3° C (optimistic scenario) or by 6-7° C (pessimistic scenario). Together with sudden variations and increased frequency of extreme weather events, could have negative consequences;

Agriculture – about 90 per cent of agriculture in the country is irrigated, and can only take place along rivers. Increased evapotranspiration, accompanied by a possible decrease in water availability, will affect production. Precipitation is expected to decrease by 8-16 mm by 2100, which will induce a grassland productivity decline of 10-15 per cent, due to the moisture stock decrease in the top 0-20 cm soil layer;

Water resources – the central problem is increased water scarcity; climate change will reduce the amount of water available in Central Asia while at the same time increasing water demand;

Coastal zones – the Caspian Sea is an economically important zone, where about 70-80 per cent of the oil reserves are concentrated; the oil refinery, and other large infrastructures, such as ports, is located there. Besides, the country intends to develop tourist resorts in the area. Hence, the concerns relate mostly to sea-level variations (which have already occurred up to 2003);

Preservation of soil and land resources, and natural ecosystems: flora, fauna and forests – forests provide

crucial environmental services, by helping with the regulation of several ecosystems. Forest conservation and additional afforestation efforts would thus contribute to climate change adaptation and mitigation;

According to Hydromet, the number of hot days is projected to increase under global warming, in a country that already registers maximum temperatures of 50°C in the shade and 60-65°C in the sun. Turkmenistan also registers a high soil surface absolute maximum temperature of 77°C, and the temperature of sand in the Karakum Desert may reach 80°.

Earthquakes are the dominant risk in Turkmenistan resulting in an annual average economic loss of US\$ 72 million, followed by floods at US\$ 7 million. The 20year return period loss for all hazards is US\$ 433 million (1-3 per cent of annual GDP).

1a. Generally

Turkmenistan is a landlocked country in Central Asia, with a continental climate and an insufficient constant surface water flow, bordering with Iran, Afghanistan, Uzbekistan, Kazakhstan and the Caspian Sea coast.

The Environmental Performance Review (ERP) of Turkmenistan began in November 2010. It analyses the progress made in Turkmenistan from 2000 on environmental protection and proposes recommendations on how the country can improve its environmental management and address upcoming environmental challenges.

1b. Any regional differences?

The country has a wide range of elevation extremes. The highest point, Mount Ayrybaba, which is located in the Koytendag Range of the Pamir-Alay chain in the south-east of the country, rises 3,139 metres above sea level, while the lowest point, in Lake Sarigamish, which has a fluctuating water level, is around 100 metres below sea level. The average elevation level, however, is relatively low, ranging from 100 to 220 m. The Kopetdag mountain range on the frontier between Turkmenistan and Iran extends about 650 km along the border. The dominant feature of the landscape is the Karakum Desert, which occupies some 70 per cent of the country's territory.

Large, marshy salt flats exist in many depressions, including the Garabogaz-gol, which occupies 1,500 sq.km. in the north-west of the country.

1c. Any occurrences of extreme events already attributes to Climate Change?

There are two primary seismic zones in the country, located under the Turkmenbashi and Ashgabat regions. An earthquake of magnitude 7.2 in the Ashgabat region on 5 October 1948 reportedly killed 110,000 people and caused an economic loss of US\$ 25 million. An earthquake of magnitude 7.1 struck on 5 January 1929, killing 3,257 people. The only recorded flood disaster was in January 1993, when 420 people were affected, and reported economic loss amounted to US\$ 100 million. Landslides are not a significant hazard, and occur mostly in sparsely populated mountain areas. Reportedly, mudslides have not been registered for more than 60 years, and there are no records of snow avalanches affecting the population. Usually channels have been built in population settlements, towns and cities that can withstand water hazards. The only reported disaster caused by a technological hazard was a transport accident in the Vatutino region, which killed 40 people on 18 September 1998.

1d. Are extreme events or gradual changes more in the focus?

Shifting winds create sand dunes that can be 20 metres high and several kilometres long. Common natural features include chains of such mountains, steep elevations and smooth, concrete-like clay deposits formed by the rapid evaporation of flood waters in the same area over a number of years

2. Are there adaptation measures that are related to Climate Change?

Mitigation and adaptation measures are not explicitly mentioned in legal acts, but some laws contain provisions that facilitate the implementation of climate-change-related measures. A major gap overall at present is that the methodology used to conduct ecological expertise does not address CO₂, as these gases are not considered pollutants.

The 1996 Law on Protection of Atmospheric Air establishes that among the main activities of the State on air protection are prevention, reduction and cessation of GHG emissions into the atmosphere.

The 2008 Law on Hydrocarbon Resources contains the legal basis for hydrocarbon-related operations. As a very important mitigation measure, the contractor is required to take all necessary measures, including the use of modern technology, to prevent emissions into the atmosphere of burning natural gas.

The 2011 Forest Code establishes that the use of forests should take into account their global environmental significance, which includes climate change.

The draft Law on Pastures takes a precautionary approach that would contribute to adaptation to climate change.

2a. physical /technical

Most of the country's territory lacks constant surface water flow. The main rivers are located in the south-eastern corner of the country. The most important is the Amu Darya River (744 km), which begins as a border river between Tajikistan and northern Afghanistan then flows through south-eastern Turkmenistan and crosses finally to Uzbekistan. Other major rivers are the Tejen River (1,124 km), the Murgab River (852 km) and Atrek River (660 km). Water from the Amu Darya river is used for irrigation, which has had an effect on the amount of water reaching the Aral Sea, causing severe environmental impact on the Aral Sea.

2b. ecological

The major sources of greenhouse gas (GHG) emissions are the oil and gas industry, the electricity subsector and the transport sector. Inefficient management of energy resources and the use of obsolete technologies add to this problem

Turkmenistan is also vulnerable to droughts, since more than 10 per cent of the population lives in high vulnerability zones, and another 10 per cent in moderate vulnerability zones. Moreover, the country is highly dependent on the Amu Darya River, which itself has very high vulnerability.

2c. institutional /organizational /political

Turkmenistan ratified the United Nations Framework Convention on Climate Change in June 1995. In September 1998, Turkmenistan signed the Kyoto Protocol, and in December 1998 the Parliament adopted a resolution ratifying the Protocol. The Turkmenistan State Commission on Climate Change was established in April 1997. In May 1999, the State Commission of Turkmenistan for Ensuring Compliance with Commitments under United Nations Conventions and Programmes on Environmental Protection was established. In

September 2001, changes were made in the structure of the State Commission, profiling the Ministry of Environmental Protection as responsible for the Convention on Climate Change and the Minister as the National Focal Point of the Convention on Climate Change.

The year 2000 was the starting point for the development of Turkmenistan's environment-related programmes and plans. The National Environmental Action Plan (NEAP), which covered the period 2002-2010, was the main instrument assisting the implementation of environmental strategies.

As environmental legislation consists of key legal acts regulating the use of natural resources and their protection, the Ministry of Nature Protection (MoNP) created a working group. In March 2011, on improving national environmental legislation in order to complement existing legislation and improve environmental management in Turkmenistan.

3. Are there other risks / hazards / conflicts that pose a challenge to your country?

First of all, speaking of Turkmenistan, the Aral problem has affected the north of the country. Dashoguz region suffered from the negative effects of environmental catastrophe of Aral Sea, which brings along the acute problems associated with the provision of clean drinking water and salinity control of cultivated land.

Secondly, the main impacts will be temperature increase and reductions in humidity and rainfall, and as well as in available water resources. Average annual temperatures range from highs of 16.8 degrees Celsius in Ashgabat (south) to lows of -5.5 degrees Celsius in Dashoguz on the Uzbek border in north-central Turkmenistan. The highest temperature recorded in Ashgabat is 48.0 degrees Celsius and Kerki, an extreme inland city located on the banks of the Amu Darya River, recorded 50.1 degrees Celsius in July 1983.

4. What is the most burning question you would like to address in the Summer School?

Integration of Climate Change concept and principles into DIPECHO VIII initiative in Turkmenistan? Points of contact? Best practices?

5. Could you provide us with a quote, (if you wish a provocative one) on "The current focus on how Climate Change Adaptation is dealt with lacks ..."?

UNICEF in Turkmenistan is considering an issue of Climate Change Adaptation in Turkmenistan from DRR perspective i.e. within the implementation of DRR initiative in the framework of potential DIPECHO VIII project.

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