TRAINING IN THE CONCEPTS OF CLIMATE CHANGE IMPACTS AND VULNERABILITY AND USE OF SIMCLIM

Proceedings of the Training Conducted under the APN Project
"Capacity Development on Integration of Science and Local Knowledge for Climate Change Impacts and Vulnerability Assessments"
(CIA2009-02-Pulhin)

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Carolyna Hotel and Restaurant
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INTRODUCTION

Climate change impacts and vulnerability in the Philippines vary depending on the area's geographic location, climate system (the country has four climatic classification), and socio-economic condition. As such, while assessments at the national level give a picture of the overall impacts of climate change in the country, which may thereby result in enabling policies for appropriate plans and actions, responses on the risks and threats need to be area-specific in order to effectively address the climate change-related concerns. Furthermore, with the decentralization policy, the Philippine local government units, particularly at the provincial level, are at the forefront of actions for responding to climate change impacts and risks. It is therefore necessary to capacitate them on how to conduct climate change impacts and vulnerability assessment in their respective jurisdictions to enhance their preparedness strategies. A close collaboration among the scientists/researchers, local government units and the local communities, with the aid of a computer modeling system, is crucial to ensure a comprehensive assessment of the risks, threats and needs.

Climate simulation models are important for enhancing our understanding on past and present climate creating scenarios of future climate change, and examining risks attributed to predicted changes in climate. Results of climate model simulations are useful for improving plans and developing preparedness strategies that aid in increasing resilience on risks posed by the changing climate. This training will use SimCLIM as the climate modeling system for conducting an integrated assessment of the vulnerability to and impacts of climate change in the province of Albay.

SimCLIM is a computer model system for examining the effects of climate variability and change over time and space. This model system has an "open-framework" feature which allows users to customize the model for their own geographical area and spatial resolution and to attach impact models. It has the capacity to assess baseline climates and current variability and extremes. Aside from these, SimCLIM can also be used to: a) assess present and future risks; b) investigate present and future adaptation; c) create scenarios of climate and sea-level change; d) conduct sensitivity analyses; e) project sectoral impacts of climate and sea level change; f) examine risks and uncertainties; and g) facilitate integrated impact analyses. SimCLIM is designed for bridging the gap between science and policy/planning, particularly to support decision making and climate proofing in a wide range of situations where climate and climate change pose risk and uncertainty. (Source: www.climsystems.com/simclim/about.php)

In view of the above, and in order to develop the local capacity of the different municipalities in Albay to conduct climate change impacts and vulnerability assessments, a training in the concepts of climate change impacts and vulnerability, and the use of the SimCLIM modeling system was conducted to:

- Articulate key concepts related to climate change impacts, vulnerability and adaptation;
- Have a working knowledge on the use of SimCLIM modeling system as a tool for vulnerability and adaptation assessments using the case of Albay province; and
- Develop an action plan for the actual conduct of impacts and vulnerability/adaptation assessments using SimCLIM system and participatory assessment tools in selected case study areas

DAY 1 – 26 April 2010

The training opened by welcoming the participants, who were largely composed of the planning development officers/staff from the different municipal local government units of Albay (please see participants list), the SimCLIM trainers from New Zealand, and the staff of Center for Initiative and Research on Climate Adaptation (CIRCA) and University of the Philippines Los Baños (UPLB). The training was part of the project **Capacity Development on the Integration of Science and Local Knowledge for Climate Change Impacts and Vulnerability Assessments"** supported by the Asia-Pacific Network for Global Change Research (APN) and led by the College of Forestry and Natural Resources, UPLB, in collaboration with the Provincial Government of Albay through CIRCA and the University of the Sunshine Coast in Australia, through its partnership with CLIMsystems Ltd.

Dr. Juan M. Pulhin, Professor at the College of Forestry and Natural Resources (CFNR) and the project leader, gave a brief welcome remark and proceeded with the overview of the project. He also explained the objectives of the training and its relevance to the Comprehensive Land Use Planning (CLUP) that the province is currently undertaking. He continued with a presentation on the overview of vulnerability assessment, giving a review on the science of climate change and concepts related to vulnerability. He concluded by emphasizing the importance of vulnerability assessment for enhancing local adaptation as well as the need to combine climate change science/scenario-based analysis with local knowledge for a more robust assessment.

Dr. Peter Urich, Managing Director of CLIMsystems Ltd., presented on the origins of the SimCLIM modeling system which started in New Zealand, and how it has evolved through time. He also highlighted the different features of the modeling system, which included multiple runs and sensitivity analysis, easy update, and its being integrated in the decision-making process.

A workshop followed to solicit from the participants the climate related-issues and problems present in their areas and how these are addressed (or their suggestions for addressing these). The participants were grouped according to their provincial district and were given thirty (30) minutes to complete the exercise. Each group was asked to present their outputs.

For District 1, which is composed of the municipalities of Tiwi, Malinao, Tabaco, Malilipot, Bacacay and Sto. Domingo, the climate-related hazards that they experienced are flooding due to torrential rains, typhoon, storm surge and dry spell, which all affect the social,

economic and environment sectors in the areas. These issues are addressed through reforestation of forest and mangrove areas, regular ocular assessment, retrofitting, through information, education and communication (IEC), among others.

In District 2, constituting the municipalities of Legazpi City, Daraga, Camalig, Manito and Jovellar, typhoons and water-related hazards such as tidal surge, flash floods and rain-induced landslides were the main issues identified. Options for adaptation to these events were resettlement of affected residents along the coastline, reforestation, strict implementation of zoning policies and national building code, infrastructure projects (sea wall, elevation of roads, grouted ripraps), among others. The absence of distinct wet and dry season in the district is also seen as a concern which was intended to be addressed through planting of drought-resistant crop varieties and improving the irrigation systems.

Meanwhile, participants from District 3 of the province, composed of the municipalities of Guinobatan, Jovellar, Oas, Ligao, Pioduran, Polangui and Libon, cited five climate-related issues and problems in their areas. These were: drought, typhoon, rat infestation, heavy rains and coral reef bleaching. Rat infestation was seen as a climate-related phenomenon as the hot temperatures drive away their natural predator (the snakes) making the population of these farm pests flourish. Suggested responses for the identified problems are: cloud seeding and planting of drought-resistant crops during drought; upgrading of evacuation centers and re-orientation of MDCCs and BDCCs to prepare for typhoons; intensification of rat control for rat infestation; establishment of flood control facilities for heavy rains; and construction of artificial coral reefs (culverts) for coral reef bleaching.

With the climate-related issues in the different districts of Albay already identified, Dr. Peter Urich oriented the participants on the step-by-step approach to conducting vulnerability and adaptation assessment. He presented the Intergovernmental Panel on Climate Change (IPCC) seven-step process towards impacts, vulnerability and adaptation assessments, as well as the different adaptation frameworks. In ending, he stressed the importance of mainstreaming the results of these assessments through win-win situations by using a variety of tools to reach 'local' goals.

DAY 2 – 27 April 2010

On the second day, new participants from other municipalities in Albay were acknowledged, as well as the presence Dr. Rex Victor O. Cruz, Dean of CFNR-UPLB. The training continued with presentations about the SimCLIM integrated modeling system, creating a synthesis of the assessments, and developing capacity for climate change adaptation through SimCLIM given by Dr. Peter Urich. He explained the uses

of SimCLIM, how it works, the outputs that it generates, and its advantages over other climate models. Dr. Urich also shared the process of making a synthesis and provided a checklist for ensuring its completeness. Meanwhile, with regards to developing adaptation strategies, a methodological framework on climate change adaptation through integrated risk reduction was discussed, as well as the process of its implementation.

After the above presentations, a hands-on training on the use of customized SimCLIM for Albay (called AlbayCLIM) ensued led by the trainers, Drs. Peter Kouwenhoven, CLIMsystems Associate, and Peter Urich. This included exercises on starting the software, familiarization with its interface, exploring the global database, and options for printing and exporting the results to other computer applications. It was also emphasized that trainees should have a clear understanding of the different emission scenarios following the IPCC Special Report on Emission Scenarios (SRES). The participants were given time to explore the modeling system on their own, while the two trainers went around to see their progress as well as to take questions from them.

DAY 3 – 28 April 2010

Invited experts shared knowledge and information on the current practices in the country on climate change modeling and vulnerability and adaptation assessment. Dr. Flaviana Hilario, Weather Service Chief of the Philippine Atmospheric, Geophysical and Astronomical Services Administration (PAGASA), gave a talk on the "Development of Climate Change Scenario in the Philippines". She started with the definition of basic terms used in scenario development and explained the four emission scenarios reported by the IPCC. She also described the basic requirements for running global climate models (GCMs), and the need and methods for downscaling GCM outputs to study the impacts of climate change on a specific area. She shared that the currently available GCM used by PAGASA is **P**roviding **RE**gional **C**limates for **I**mpact **S**tudies (PRECIS), based on the Hadley Centre's regional climate modeling system. It was, however, noted that running such GCM takes close to three months to generate only one scenario (A1B) until the year 2050, and which are many times hampered by power fluctuations.

Dr. Rosalina de Guzman, Assistant Weather Specialist Chief of PAGASA, discussed the climate risks/vulnerabilities and climate change scenario for the Bicol region. According to her, trends of increasing hot days and warm nights, more frequent extreme events, and tropical cyclones with wind

speed greater than 150 kilometers per hour (kph) especially during an El Niño event were among the manifestations of global warming at the local scale. She also highlighted the extreme climate/weather events experienced lately in the Philippines, especially focusing on the climatic trends in the Bicol area. Seasonal rainfall in the Bicol region, based on PAGASA modeling, was projected to change by almost 25% during the wet months of June, July and August in 2050 and by almost -20% during the dry months of March, April and May. A maximum increase of 2.2˚C in the mean temperature during the dryer months was also projected in the Bicol area. Hence, the need for adaptation which requires an understanding of the vulnerabilities and impacts of climate change was stressed.

Former PAGASA Director, Dr. Leoncio Amadore, meanwhile, presented a model for assessing risk to typhoon wind damage through mapping. The framework of risk being a function of hazard (potentially harmful condition) and vulnerability (susceptibility to impact damage) was used to generate a typhoon risk map. The model simulated the location, maximum winds, direction/speed of movement, radius and size/shape of an Idealized Typhoon Damaged Model (ITDM) to come up with a typhoon wind profile which became the basis for the degree of hazard. Vulnerability, on the other hand, was measured in terms of physical, socio-economic and political-institutional factors, which in the case of the above research was indicated by the type of structures at the locality impacted to/by strong winds. A vulnerability map was generated showing areas at the municipal level with the most number of *nipa* houses. The typhoon wind profile simulation was overlaid to the vulnerability map which resulted in a risk map of typhoon wind damage. Nevertheless, Dr. Amadore admitted that such typhoon risk mapping model was limited to wind damage risk, areas on flat/ocean surface and residential structures only. Further improvements to the model could include features to measure damage by storm surge and floods, considering all types of structures and vegetation, among others.

After the three presentations, an open forum ensued which centered on concerns of data and information availability from PAGASA for better assessment and preparation to climate-related hazards. Representatives from PAGASA clarified that they have already given the Legazpi City climatic data, particularly for the SimCLIM training. Meanwhile, with regards to availability of research results/models, Dr. Hilario noted that they wanted the LGUs to utilize these rather than these remain on the shelves, and would work on recommending a capacity building for the LGUs.

A national framework strategy for climate change adaptation and mitigation focused on integrated river basin management was suggested by Dr. Rex Victor O. Cruz, Dean and Professor of CFNR-UPLB, in his presentation. According to him, river basin approach uses hydrologically defined (watershed) land unit for planning and management, jointly with ecologically defined (ecosystem) management unit. He underscored the significance of such

approach as water from watersheds underpins security of human well-being. He also discussed the three-phase procedure for such strategy, which included basin profiling, formation of multisectoral river basin authority, and the integrated basin plan implementation.

Mr. Jose Carlos Torres from the Municipal Planning Development Office of Oas raised that poverty is the reason for our vulnerability and stressed the very urgent need to make decisions with regards to the impacts of climate change. It was also acknowledged that climate change has somehow become a catalyst for the people to take action and to act soon. Meanwhile, Dr. Cruz underscored the significance of CLUP in guiding the actions or responses that we need to take.

The afternoon of Day 3 was devoted to more hands-on training on the AlbayCLIM, focused on sea level rise. Dr. Peter Kouwenhoven explained that the threat of sea level rise comes from the melting of the ice caps and due to thermal expansion. He, however, emphasized that some places would experience higher rise in sea level than others due to another factor, i.e., tectonic activities or vertical land movement. Such factor is already incorporated in the SimCLIM modeling system.

For the modeling exercise, Dr. Kouwenhoven, together with Dr. Urich, led the participants to creating a sea level rise scenario. First he guided the participants to importing the Legazpi City climatic data into the AlbayCLIM. Using the impact models, the sea level rise trend in Legazpi City was generated and graphed. The trainers also walked the participants through generating a sea level rise scenario for 2050. After the guided exercise, the participants were again given time to explore sea level rise scenarios in different periods using different emission scenarios. Participants were then asked to think about the implications of such results in their own districts, as well as their suggestions for potential adaptation strategies.

The representative from District 1 reported that based on the sea level scenario generation exercises that they performed, a 1.3-m sea level rise would put the entire district into a disaster, with the lush agricultural production areas, fishing districts, commercial centers and tourism areas all endangered. Among the sectors that would be affected are the social (settlement, institutions, utilities), economic (agricultural, commercial and industrial areas), and environmental management sectors. Some of the adaptation strategies that they proposed were: relocation of settlement sites, land use regulation, construction of sea walls and shoreline buffer zones, provision of livelihood, massive mangrove reforestation, and intensive solid waste management program.

For District 2, impacts of sea level rise and potential adaptation measures were assessed in terms of its effects on the socio-economic, biophysical, and institutional sectors. On the socio-economic side, potential risks were identified to be water-borne diseases, loss or damage to life and properties, decreased value of tourism sites, intrusion of sea water into potable water sources, and adverse effect

on freshwater fish production. Adaptation measures suggested for these issues were: making medicines available, establishment of additional health centers in safe locations, tapping alternate water sources, and providing livelihood options. Impacts on the biophysical aspect were noted to be the damages on infrastructure, mangroves and coral reefs. Among the responses for these were strict enforcement of zoning policies, conservation of mangrove and protected areas, provision of relocation sites, and construction of seawalls and other infrastructures. The group also provided an institutional approach in addressing the above problems through IEC on climatic risks and hazards and providing risk sharing safety nets for possible affected areas.

In the meantime, District 3 representative explained that a sea-level rise of 0.5 meter by 2050 would mean a need to relocate the main road in their district. Such measure would also mean livelihood generation in their area as traversing the road itself could become a tourist attraction as it passes through Burias Pass, a known tourist spot. Another representative from the group also presented pictures that showed how vulnerable the district would be to potential sea level rise, and the current efforts to prevent such through construction of sea wall and conservation strategies.

DAY 4 – 29 April 2010

SimCLIM hands-on training continued on Day 4 with focus on extreme event analysis and water tank model. With the use of extreme event analysis, extreme daily rainfall event, extreme daily mean temperature (including extreme minimum and maximum temperatures) can be historically observed, together with their return periods. Results from such analysis were seen important in, for instance, anticipating the occurrence of such extreme events (such as high temperature or excessive rainfall) within a certain time frame. The probability of such events happening within a suggested period (say in 10 years) can also be calculated.

The water tank model, on the other hand, “simulates the performance of a water tank system using time-series rainfall data” and analyzes “the adequacy of design features of water tank system”. By specifying in the “model inputs” the daily water consumption, water tank size and water catchment area, the number of longest dry periods can be calculated as well as the number of dry period larger than the critical dry period. The user could also change the features of the inputs above as adaptation options to reduce risks of the tank running dry.

After the exercises on the extreme event analysis and water tank model, Dr. Urich presented on the topic of coast care as a potential adaptation strategy for sea level rise, sharing the case of the Bay of Plenty in New Zealand. He highlighted that coastal systems are at “front line” of climate change and climate-related risks are often increased by unsound development. He cited the problem of sand erosion in New Zealand which was resolved through the introduction of native dune binding plants. The approach for addressing such problem was community-based in nature and required long-term

commitment, but such efforts already paid off in the area. The said adaptation strategy was proven to be not only cost-effective, but successful in increasing the dune and beach areas. A simulation of the impacts of sea level rise under A2 emission scenario until 2100 also showed its resilience to sea level rise.

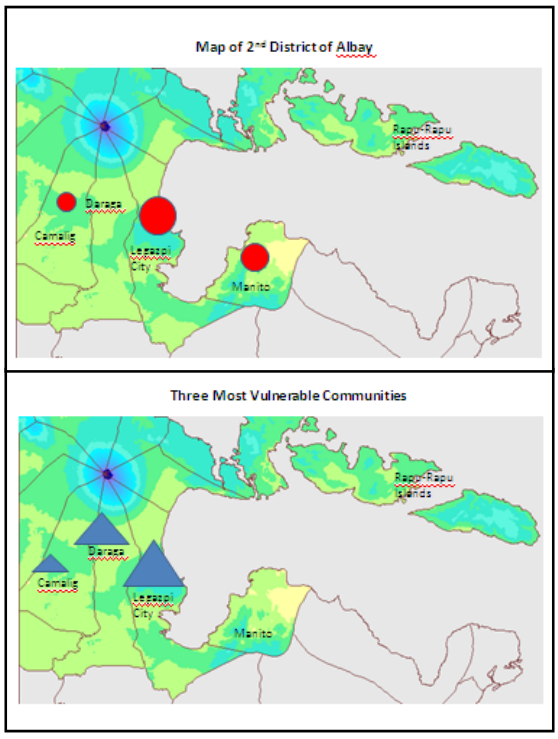
Following the "science/scenario modeling" part of the vulnerability and adaptation assessments to climate change using SimCLIM, Dr. Pulhin presented another assessment method which involves local knowledge through participatory techniques. Different participatory/exploratory and modeling/decision support tools were enumerated that could solicit valuable information from the people, and how some of these were used for climate change and impacts assessments in Pantabangan-Carrangalan Watershed, in Nueva Ecija, Philippines. Based on information gathered from such approaches, vulnerable places and people were mapped, degree of impacts of climate extremes and vulnerabilities to various people groups were described, and their adaptation strategies identified. It was underscored that "combining participatory methods with modeling/decision-support tools provides a more robust vulnerability/adaptation assessment for more effective planning".

The participants again grouped themselves according to their district to conduct a climate change impacts and vulnerability assessment in their respective areas using participatory techniques. Using "local expert's judgment", they were asked to identify the top-three most vulnerable areas and people in their district with the degree of vulnerability indicated by the size of different shapes (circle for area and triangle for people). In District 1, the municipality of Malinao was identified as the most vulnerable due to exposure to storm surges and high precipitation. People living along the coasts, many are found in Tiwi, Malinao and Tabaco City, were also seen as highly susceptible to climate-related risks.

Typhoons, floods and landslides were among the climate-related risks of high concern in District 2. Among the municipalities in the area, however, Legazpi City, Camito and Camalig were identified by the participants as the top-three most vulnerable to these events. On the other hand, people from Legazpi City, Daraga and Camalig were the most vulnerable, according to the participants.

The local assessment of District 3, in the meantime, named Pioduran, Pulangui and Libon as the highly vulnerable municipalities to climate-related risks, particularly to flooding. The vulnerable people were found in Guinobotan, Ligao, Oas, Polangui and Libon based on the participants' analysis of the extent of damage in these areas. Many of these people at risks are also located along the coastline.

After training the participants on both "science/modeling-based" and "participatory-oriented" approaches to impacts, vulnerability and adaptation assessments to climate change, Dr. Pulhin presented the major activities that still need to be done, particularly for the provincial



Results of group exercise of District 2 showing the top three most vulnerable areas and communities.

assessment as part of the project, and in relation as well to their ongoing CLUP revision. Deadlines were also set for the completion of outputs for each task ahead.

The training concluded with Dr. Juan Pulhin, Dr. Peter Urich, and Mr. Nong Rangasa of CIRCA, thanking and congratulating the participants for a very successful capacity development on the methods of climate change impacts, vulnerability and adaptation assessments through the use of SimCLIM and participatory techniques. It was underscored that this is another significant step in the aim to climate-proof the province of Albay, and it was ensured that the team from UPLB, CLIMsystems and CIRCA would fully support the LGUs, and the province at large, towards such end throughout the completion of the project and beyond. Meanwhile, each trainee received a "Certificate of Completion" in recognition of their participation in the training.

With the promising results of SimCLIM, discussions are now ongoing to use the modeling system to conduct climate change impacts and vulnerability assessment nationwide. If this pushes through, the Philippines would be the first to conduct such as assessment in Southeast Asia using SimCLIM combined with participatory techniques.

ACKNOWLEDGMENT OF SUPPORT/CO-FUNDING

This training demonstrated not only the development of the capacity of the provincial government of Albay in carrying out climate change impacts and vulnerability assessments with the ultimate aim of climate-proofing the province, but also the strong partnership among the collaborators that led to the resounding success of this activity. Indeed, the conduct of the training would not have been possible without the generous support received from the Provincial Government of Albay through the Center for Initiatives and Research on Climate Adaptation (CIRCA) headed by Mr. Nong Rangasa, for shouldering the meals and accommodations of some of the participants throughout the duration of the training. This, together with their in-kind contributions such as providing training supplies, logistical support and human resources, is roughly estimated at US$ 8,000-10,000.

The team of Dr. Peter Urich and Dr. Peter Kouwenhoven from CLIMsystems Ltd. also contributed tremendously by sharing their expertise and training the participants on the use of SimCLIM for free, installing licensed AlbayCLIM softwares to 33 users without additional cost (one license costs US$ 5,000), and shouldering the round-trip ticket of Dr. Peter Kouwenhoven. Such huge support readily comes close to US$ 200,000.

Thanks are also due to all the speakers for sharing their time, knowledge and expertise, particularly the representatives from PAGASA for providing at no cost the climatic data for Legazpi City in Albay. The smooth operation of the training was also owed to the assistance provided by the staff of CFNR-UPLB and CIRCA, and more importantly the cooperation of all the participants from the different municipalities in Albay.

MORE PHOTOS FROM THE TRAINING

Dr. Juan Pulhin and Dr. Peter Urich interviewed by the local media before the training…

Participants registering as they arrive (left) and those eagerly waiting for the start of the training (below)

Dr. Pulhin giving the welcome remarks

Participants taking down notes and attentively listening to the speakers…

Group exercises and presentations…

Hands-on training on the use of SimCLIM…

Graduation…

LIST OF PARTICIPANTS

No.	Name	Designation	Office Address
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2	Annalie de Guzman		LGU - Tiwi
3	Antonio B. Cabais	CPDO Staff	LGU - Tabaco
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20	Herbert Ramasanta	Administrative Aide	LGU - Sto. Domingo
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23	Jose Carlos C. Torres	Municipal Planning Development Officer	LGU - Oas
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33	Maria Soledad T. Prena		LGU - Ligao City
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35	Michael Margallo	Administrative Aide IV	LGU - Daraga
36	Miladee N. Azur	RESD	LGU - Legazpi City
37	Neil Redada	Municipal Planning Development Staff	LGU - Oas
38	Nick Sebastian		LGU - Pioduran
39	Noel Ordona		LGU - Pioduran
40	Nong Rangasa		CIRCA, Albay
41	Olivia Mediado	CPDO Staff	LGU - Tabaco
42	Percival De Villa	Agriculturist II	PAS-DA Albay
43	Peter Kouwenhoven	Associate	CLIMsystems, New Zealand
44	Peter Urich	Managing Director	CLIMsystems, New Zealand
45	Priscilla Galicia		LGU - Legazpi City
46	Rex Victor O. Cruz	Dean and Professor	CFNR-UPLB
47	Rey Nasol	Journalist	Inquirer
48	Rodel Purcia		CIRCA - Legazpi City
49	Romeo B. Cabria	Municipal Planning Development Coordinator	LGU - Sto. Domingo
50	Romeo SJ Tolosa	MDCC	Polangui
51	Rosalina de Guzman	Assistant Weather Specialist Chief	PAGASA
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