

UN-CECAR

University Network-Climate and Ecosystem Change Adaptation Research

Srikantha Herath

Institute for Sustainability and Peace

United nations University

07 October, 2011

Outline

- Background
- Activity Plan
- Introduction to some activities
- Potential for collaboration

Sustainability, Adaptation & Local Action in responding to CC

- Planning specific measures as well as Investment under uncertain future (**scenario** and **model uncertainties**) is extremely difficult, especially for developing countries.
- The best option is to take an adaptive approach **that build climate resilience to development strategies**. **Adapting to What?**
- When resources and services of systems change over time adaptation to change is imperative for sustainability.
- **Adaptation is Sustainability in action**
- Adaptation is primarily local. Depends on local bio-physical and social characteristics
- Solutions must evolve locally.>>
LOCAL CAPACITY DEVELOPMENT

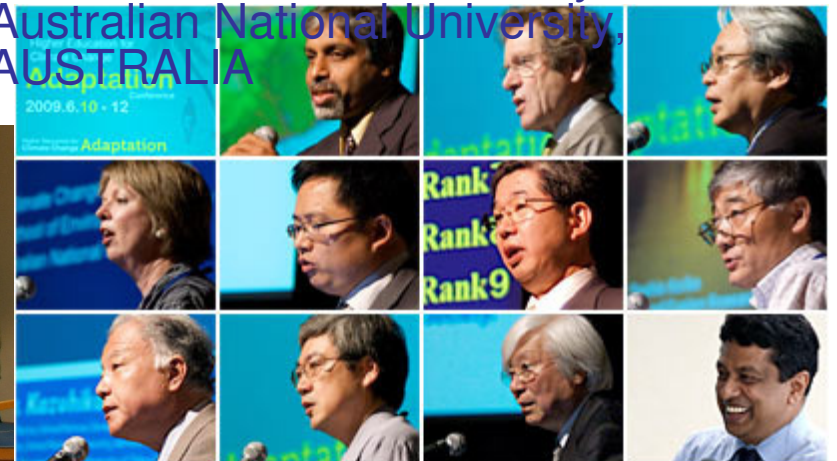


Role of Higher Education in Adapting to Climate Change 2009 June

- Multidisciplinary approach
- Holistic View
- Towards Sustainability
- 19 Universities in AP
- IR3S from Japan

Indian Institute of Technology, INDIA
BUET, BANGLADESH
Institute of Engineering, NEPAL
University of Peradeniya, SRI LANKA
Chinese Academy of Forestry, CHINA
IR3S, JAPAN
Keio University, JAPAN
Kyoto University, JAPAN
Ritsumeikan Asia Pacific University,
JAPAN

Tsinghua University, CHINA
University of Tokyo, JAPAN
UNU-Institute for Sustainability and
Peace (secretariat), JAPAN
Waseda University, JAPAN
Yeungnam University, KOREA
Asian Institute of Technology,
THAILAND
Chula Longkorn University, THAILAND
Gadjah Mada University, INDONESIA
National University of Malaysia,
MALAYSIA
University of Philippines, PHILIPPINES
Viet Nam National University, VIET NAM
Australian National University,
AUSTRALIA



Interactions between climate change, biodiversity and desertification

Impact of climate change on biodiversity

Climate change could alter distribution of species and their habitats and lead to migration of plants and animals if there are corridors

Role of biodiversity in climate change mitigation and adaptation

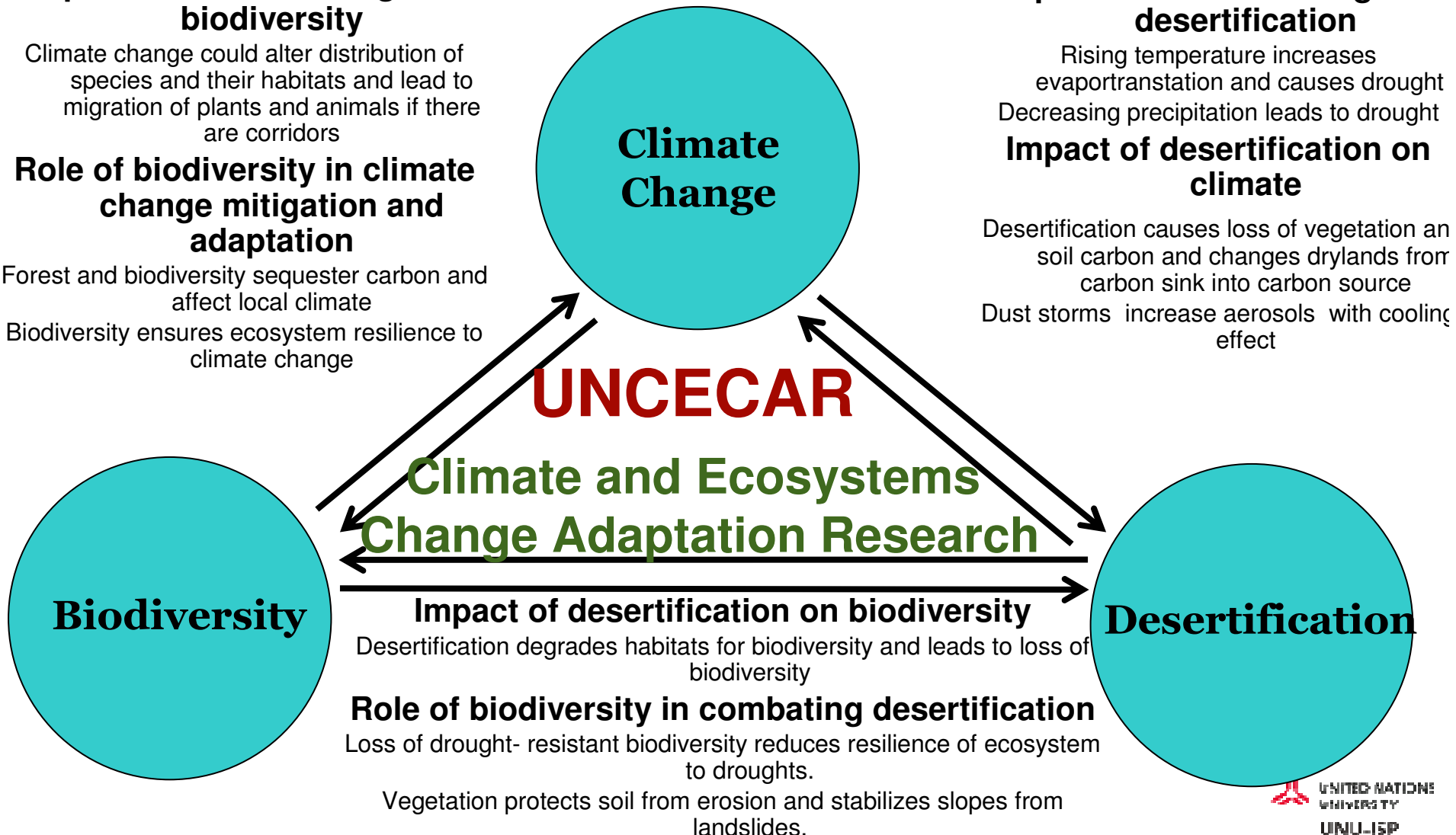
Forest and biodiversity sequester carbon and affect local climate
Biodiversity ensures ecosystem resilience to climate change

Impact of Climate change on desertification

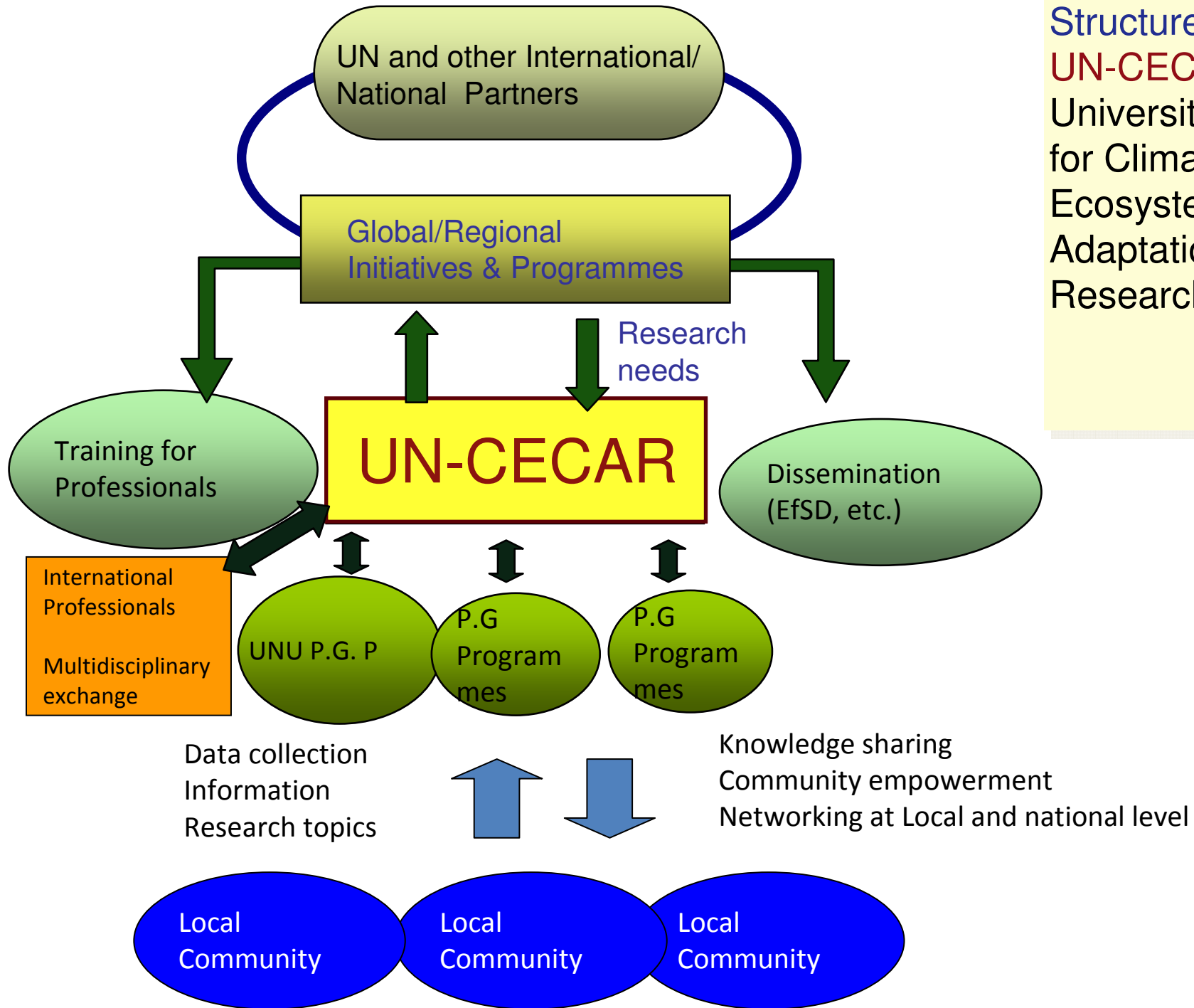
Rising temperature increases evapotranspiration and causes drought
Decreasing precipitation leads to drought

Impact of desertification on climate

Desertification causes loss of vegetation and soil carbon and changes drylands from carbon sink into carbon source
Dust storms increase aerosols with cooling effect



Structure of
UN-CECAR
University Network
for Climate and
Ecosystems
Adaptation
Research



UN-CECAR work plan

Curriculum Development

- Three Themes:
 - Science of Climate and Ecosystems Change
 - Adaptation and Mitigation
 - Impacts and Vulnerabilities
- Each theme will have
 - Fundamental, Specialized and Cross-Cutting themes
- Three task forces produced $6 \times 3 = 18$ outlines: > 2 full courses

Joint Research Project Development (2 themes)

- Rapid Onset Changes; Floods, Cyclones
- Slow Onset Changes; Land degradation, Bio-diversity loss
- Needs Assessment (4 countries)

Joint/Collaborative Research Development

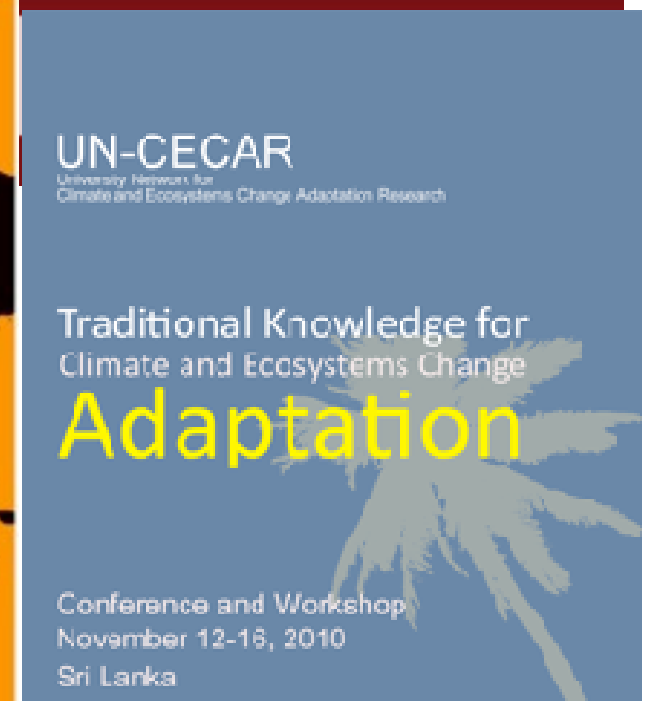
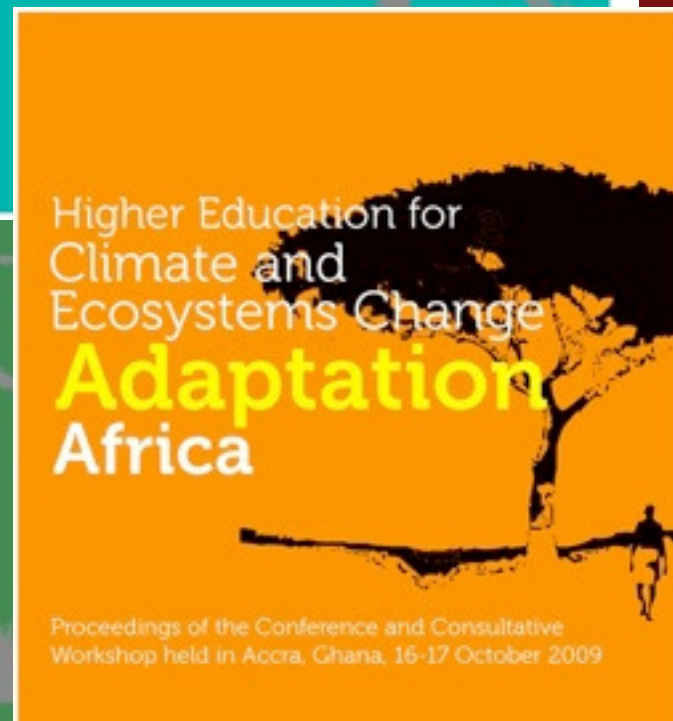
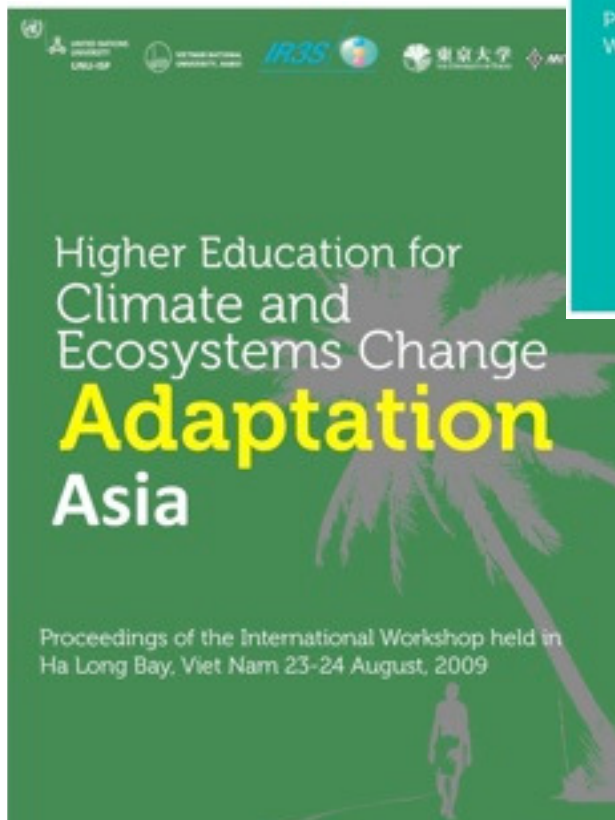
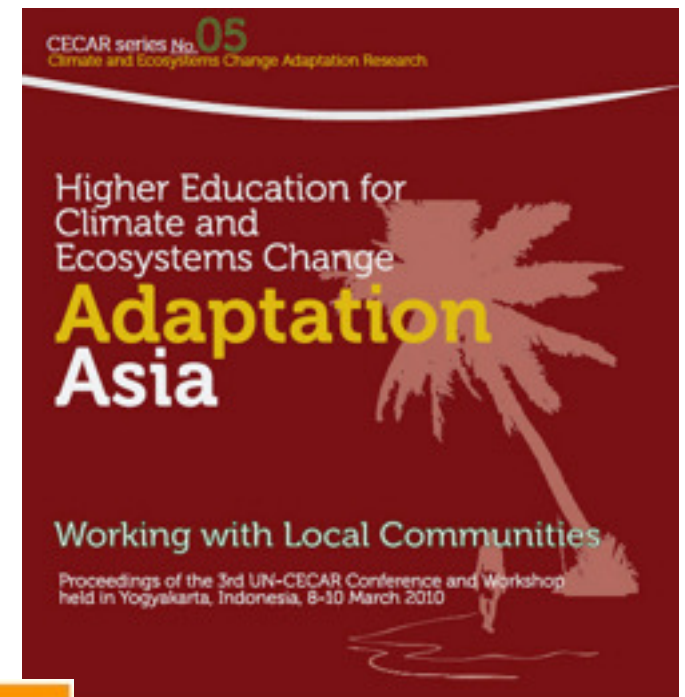
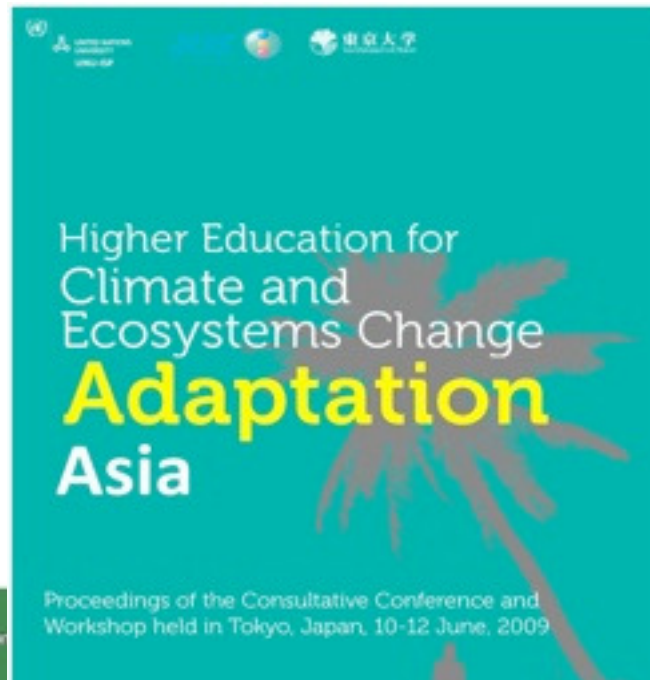
1. **Fast onset:** Disasters from **extreme events** related to climate change (fast change)
 - **Slow onset:** Long term impacts from climate change (**slow change**)
 - **Research Focus**
 - **Phenomena/Physical Characteristics**
 - **Impacts on Landscapes/Ecosystem**
 - **Mitigation Measures**
 - Ongoing
 - Comparative studies on Development Strategies incorporating Adaptation to Climate Change
 - Enhancing Resilience of Asian food production systems incorporating traditional rural and modern agricultural systems in Asia. (Indonesia, Sri Lanka, Viet Nam)
 - Climate Projections Downscaling



UN-CECAR Some Results

- Conference
- Education
- Need Assessment
- Research

Conference Proceedings



Climate change adaptation: Empowering communities

Water harvesting for dry remote area through utilization of renewable energy

Year	2006-2008
Location	Giricahyo, Sub distric Purwosari, Gunungkidul, Yogyakarta
Institutions	Faculty of Engineering UGM; The Institute for Research and Community Service; Team Waterplant Community UGM; Ministry of National Education; Local Government of Gunung Kudul; Ministry of Public Work; National Bank Association, other institutions
Student involvement	About <u>200 students</u> (<u>five period of community service programs, 2006-2008</u>)
Output	Water availability in the dry remote area in Giricahyo village
Sustainability	Self management of water pumping system



UN-CECAR COURSES

Science, Impacts and Vulnerability 2 credits

1. Introduction to the Programme

- Welcome and introductions
- Programme overview and philosophy
- Context of the UNFCCC and IPCC

7. Selecting Appropriate Future Climate Predictions

- Differences in model predictions
- Multi-model ensembles
- Bias correction
- Weather generators from climate forecasts

8. Climate Change Impacts: Ecosystems

- Concept of ecosystems services
- Social, ecological and economic impacts of climate change and their interactions
- Payment for ecosystem services and biodiversity

9. Climate Change Impacts: Water Sector

- Climate change impacts on the water cycle
- Flood discharge modification from climate change
- Cost-benefit analysis of flood risk reduction measures



COURSE II:

Approaches to Adaptation 2 credits

1. Basic Understanding of Key Concepts

- Mitigation and adaptation
- Synergies between top-down and bottom-up strategies

7. Comparing

- Climate
- CVCA p
- Particip
- Policy i

2. Global and National Challenges

- Security issues
- Capacity and awareness issues
- Policy processes and challenges
- Problems at national and local levels
- Local institutions
- Local-level climate change adaptation

8. Comparing

- Steps i
- Metho
- Particip
- Individ
- The 'Ye
- progra

3. Mitigation and Adaptation Practices and Resilience (Urban Areas)

- Introduction: drivers of urban growth

9. Economic

- Basic e

University Network for Climate and Ecosystems Change Adaptation Research

Postgraduate Courses on Building Resilience to
Climate Change
Spring 2011

<http://isp.unu.edu/cecar>

CECAR Postgraduate course- September 2010



- 32 participants from 19 countries
 - Australia (1)
 - Bangladesh(1)
 - Cambodia (3)
 - China(1)
 - Guinea-Bissau(1)
 - India(1)
 - Indonesia(1)
 - Iran(1)
 - Japan(1)
 - Korea (1)
 - Malaysia (2)
 - Nepal (2)
 - Nigeria (1)
 - Peru(1)
 - Philippines(3)
 - Sri Lanka(3)
 - Thailand(3)
 - USA(2)
 - Vietnam (2)

BRCC COURSES - MARCH 2011



CECAR Postgraduate courses

- Building Resilience to Climate Change I and II
 - Completed 2 sessions
 - 68 Master and Ph. D. students took the courses
 - Revised content based on the first offering
- How can the courses be offered by all partners?
 - As postgraduate common elective courses
 - Enabling other institutions to follow
 - Video Conference based teaching, ITC use and Online Modules

Research Programs (1)

Impact of Climate Change Adaptation on Development

Thailand



Mahachulalongkorn University
The Adaptation Response for Flood Management:
Case Study in Sukhothai Province of Thailand



Khon Kaen University
Climate Change Impacts and Adaptation
Assessment on Rice Production in Khon Kaen
Province of Thailand

Vietnam



Can Tho University
Impacts of Climate Change for Rice Production in
Can Tho Province in Mekong River Delta



Vietnam Institute of Meteorology,
Hydrology and Environment
Climate Change Impacts on Water Resource of

Philippines



University of the Philippines
1) Marikupa River Basin Flood Modeling of Climate
Change and Adaptation

2) Assessing the Impacts of Climate Change on Water
Resources and Rice Production in Pantabangan- Carranglan
Watershed, Philippines

Sri Lanka

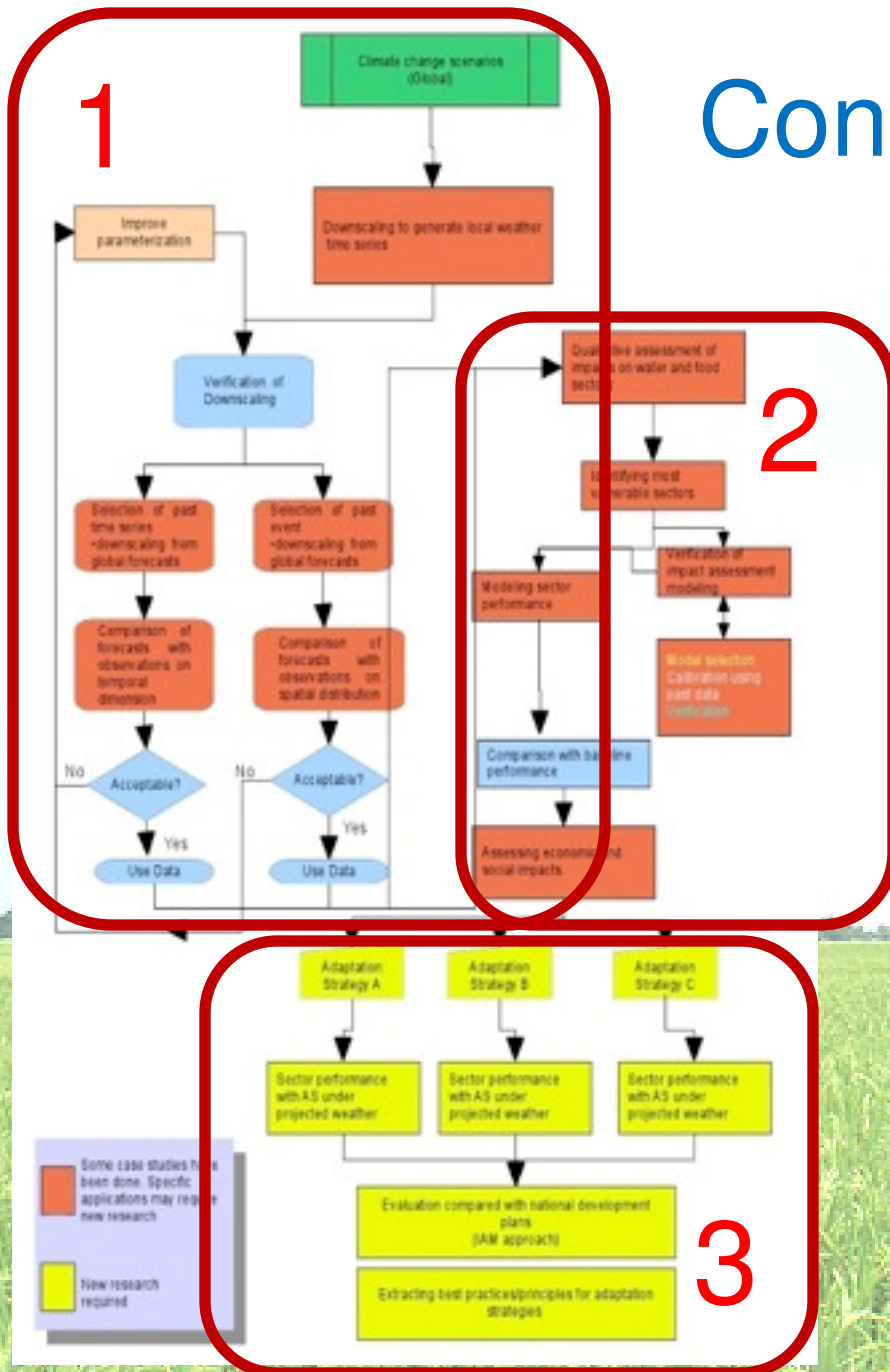


University of Peradeniya
1) Studies to Adapt for Floods in Kelani River Basin
in Sri Lanka due to the Climate Change

2) Adaptation Measures to Sustain the Rice Production in
Kurunegala District under the Impacts of Climate Change

Conceptual Framework

- Downscaling to generate local weather time series
 - SDSM, WRF
- Simulation of impacts on water and food sector through case studies
 - DSSAT (rice), FMS..
- Adaptation strategies
 - Assessment of



Funded by Ministry of Environment, Japan

3 year project under CECAR

Framework



UNITED NATIONS
UNIVERSITY

UNU-ISP

Institute for Sustainability and Peace

Research Programs (2)

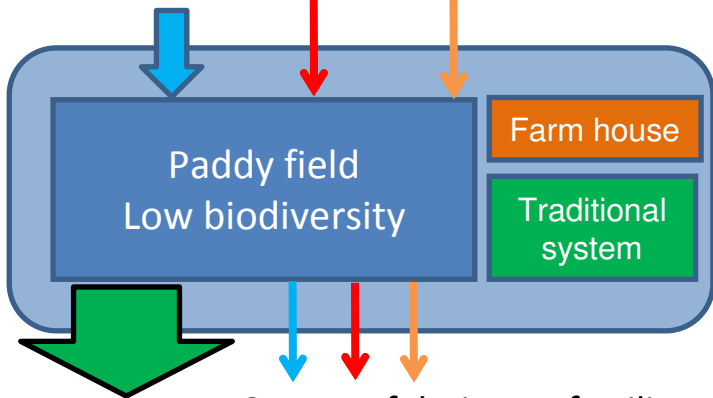
Strategies to enhance resilience to climate
and ecosystem changes utilizing traditional
bio-production systems

Bio-production system in harmony with conservation of biodiversity

Modern crop production system

Large input from outside of the system

Rainfall
Irrigation water Fertilizer Pesticide



Large output Output of drainage, fertilizer, and pesticide to outside

Work together with sub theme 1

Development of technology and social system of low input sustainable production system which prevent catastrophic collapse

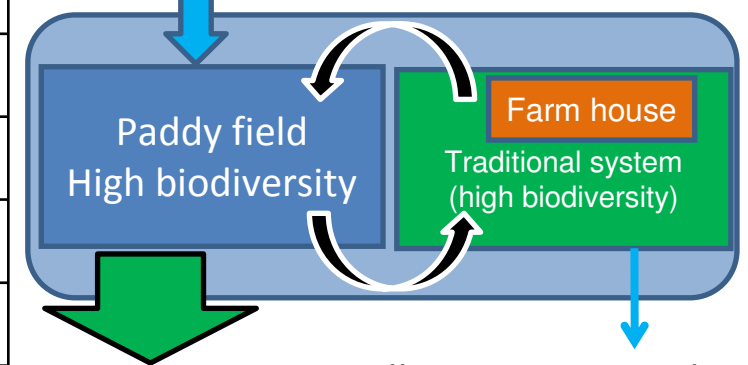
Ecosystem services inventory

Ecosystem service	Index	Flow/ Stock
Provision service	Rice	...
	Orchards	...
	Fishes	...
Adjust service	Water purification	...
Basement service	Material cycle	...
Bio-diversity service	Crops, Orchards, Birds, Fishes, Plants,etc	...

Traditional crop production system

Small input from outside of the system

Rainfall
Irrigation water



Small output Small output to outside

Work together with sub theme 2

Presentation of policy options for the use of local resources through strengthening resilience with scientific evidence

Synthesis between modern and traditional crop production systems

Mosaic crop production system with strengthened resilience



Traditional Bio-production systems

Sri Lanka

- High rural population ratio (85%)
- Two thirds of national land is arid region
- Need effective water management system

Indonesia

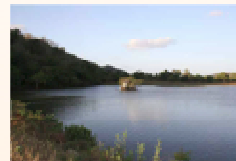
- Conversion from traditional bio-production to extensive plantations
- Forest and biodiversity loss from development

Vietnam

- 2nd largest rice exporting countries
- Sea level rise and sea water intrusion
- Affecting international food security

Tank irrigation system

Irrigation network system with tanks and waterways



Kandyan homegardens

Compound system of diverse trees, crops and husbandry

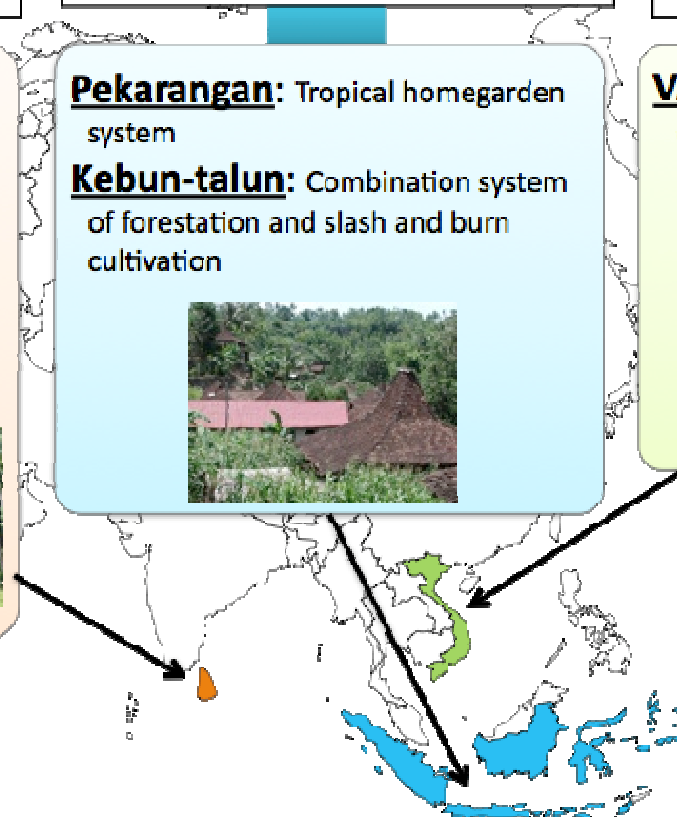


Pekarangan: Tropical homegarden system

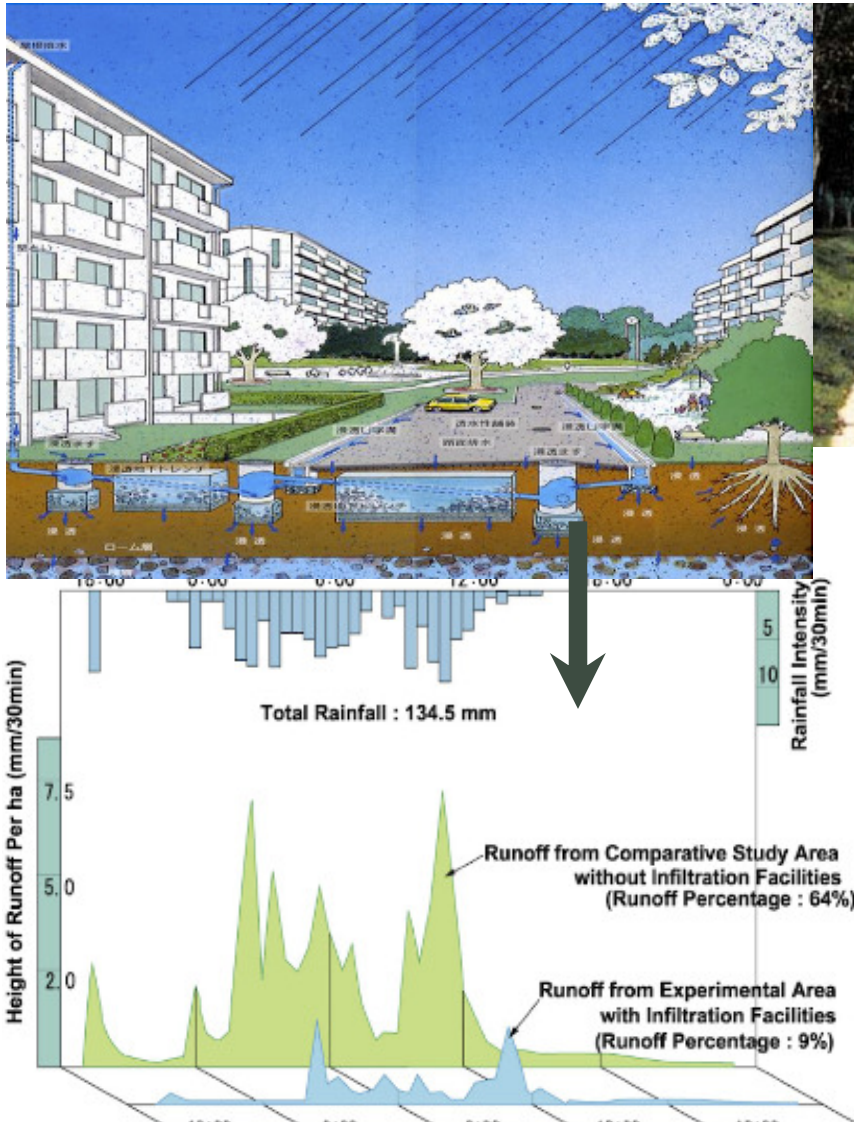
Kebun-talun: Combination system of forestation and slash and burn cultivation



VAC System: Combination system consisting of homegarden, aquaculture pond, livestock barn

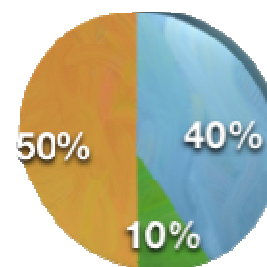


Onsite facilities (Research 3)

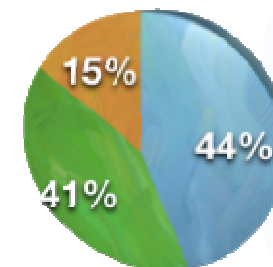


● Evaporation ● Surface Runoff ● Groundwater flow

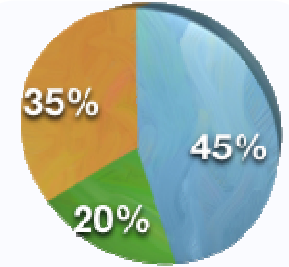
Pre-Change



Post-Change



Recovery



Infiltration systems for urban areas



Association for rainwater storage and infiltration technology

Downscaling - Research (4)

Mapping one distribution onto another can be used to correct bias of monthly and daily GCM precipitation data (Ines and Hansen, 2006).

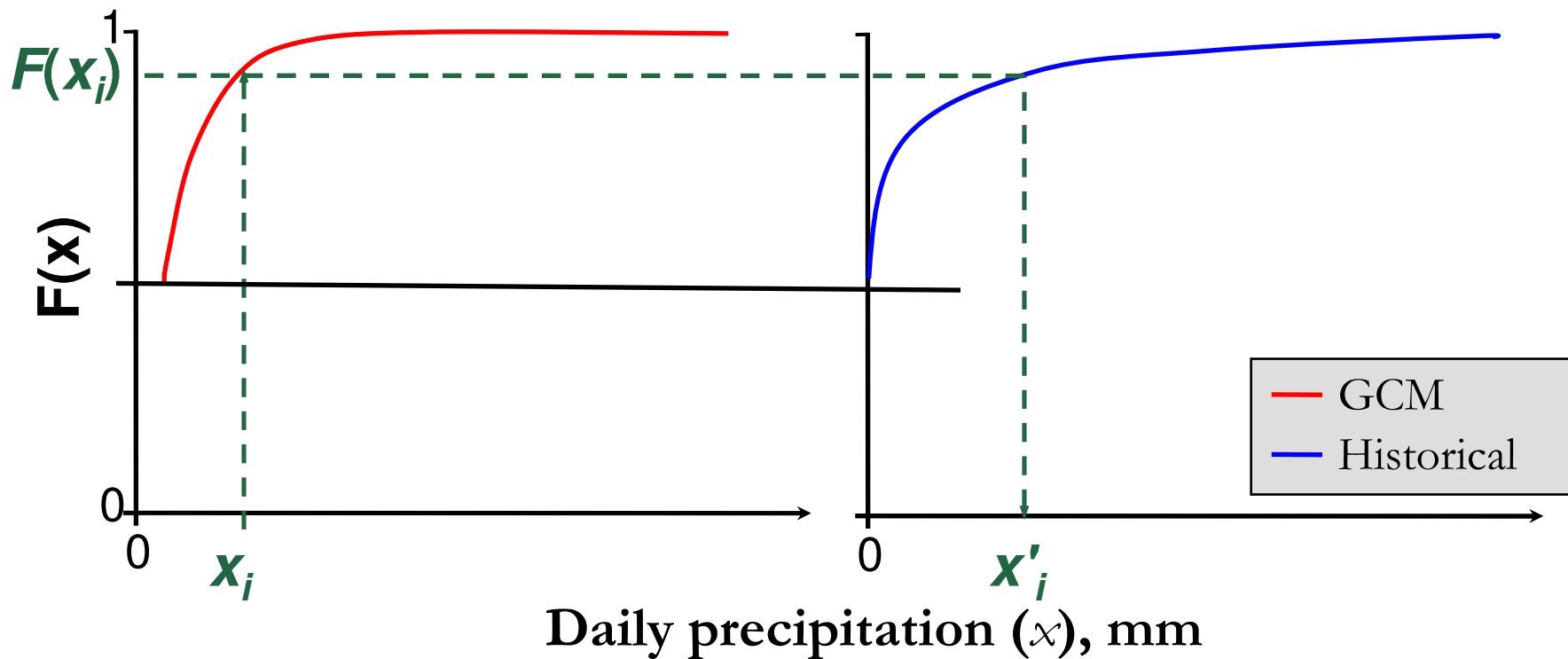
In this approach, bias correction of daily rainfall is based on following two considerations:

First, it corrects the bias of the rainfall frequency by truncating the empirical distribution of the GCM daily rainfall based on the non-exceedance probability, $F(x_{\text{historical}}=0.0)$,

Then, it corrects the rainfall intensity by cumulative distribution functions (CDFs) of the truncated non-zero rainfall days (i.e. $\text{CDF}_{\text{gcm}} \rightarrow \text{CDF}_{\text{historical}}$)

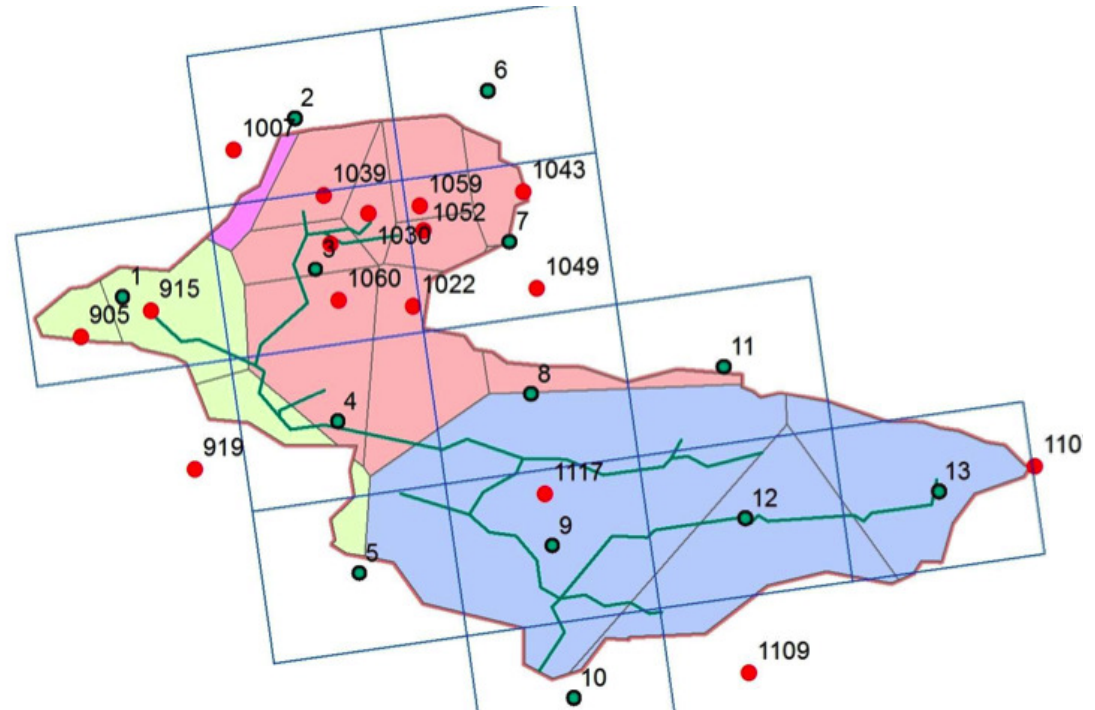
Correcting Bias in Daily GCM Output: precipitation Intensity

$$x'_i = F_{obs}^{-1}(F_{GCM}(x_i))$$

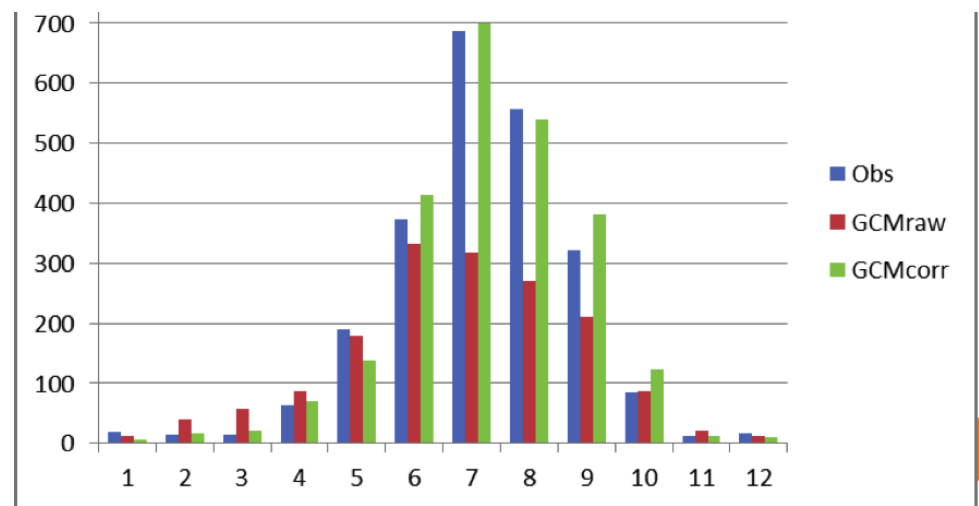


Similarity of Parameters at regional Scale

stn/para	annual μ	annual σ
905	0.12	40.21
915	0.10	40.29
919	0.14	42.51
1007	0.22	35.90
1022	0.17	31.12
1029	0.15	21.91
1030	0.15	26.61
1039	0.15	26.80
1043	0.17	29.65
1049	0.14	28.37
1052	0.15	27.79
1059	0.19	25.56
1060	0.13	29.83
1107	0.14	54.73
1109	0.10	54.65
1117	0.11	58.92

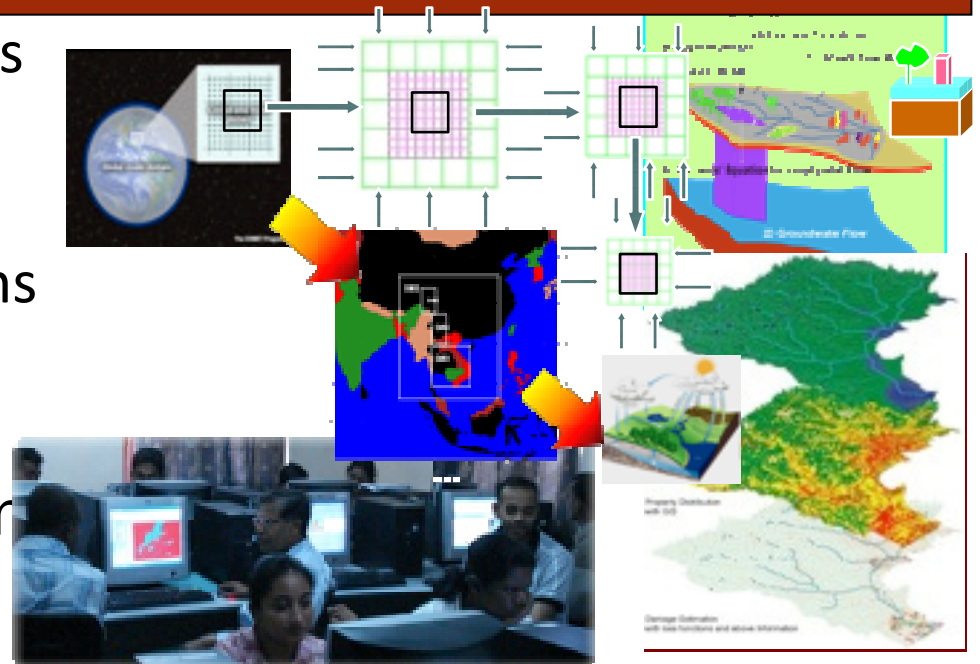


Monthly Rainfall Estimate Corrections



Training programs on DRR and Climate Change

- Promote data and practical needs flow between professionals and universities; rapid application of current research to field problems
- Rainfall downscaling (forecasting), Inundation modeling and Loss assessment
- **Economic Risk Assessment**
 - Weather forecasting model
 - GIS system
 - Flood inundation and economic loss assessment
- Roving seminars in Sri Lanka, Viet Nam and Nepal





UNITED NATIONS
UNIVERSITY

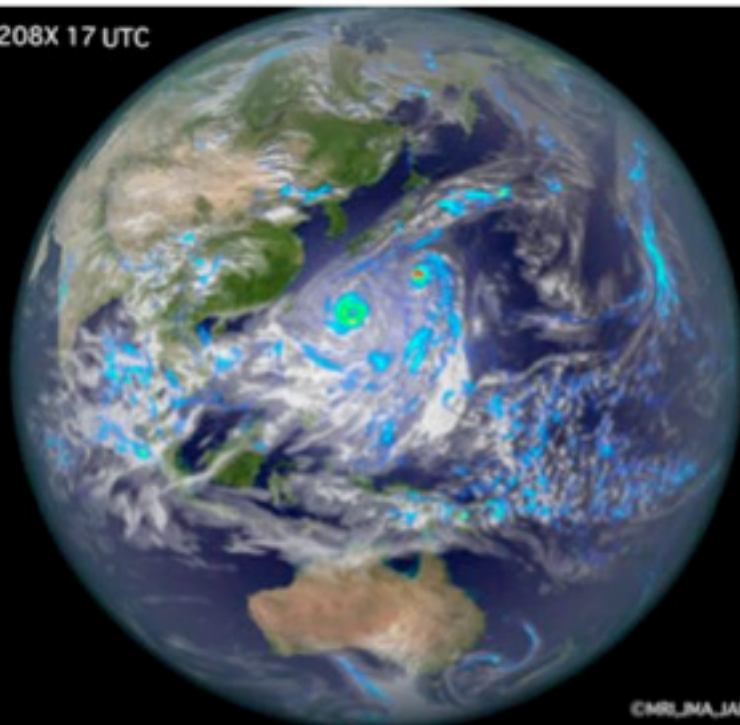
UNU-ISP

Institute for Sustainability and Peace



University Network
for Climate and Ecosystems Change Adaptation Research

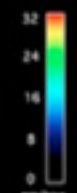
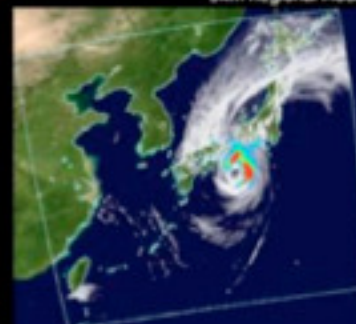
13 Sep 208X 17 UTC



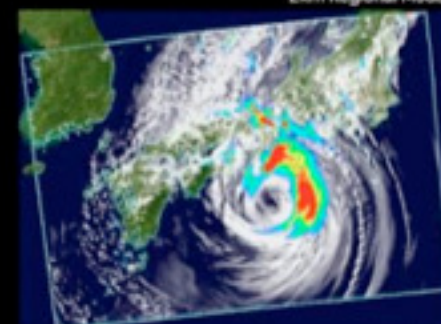
©MRL, JMA, JAMSTEC, MEX



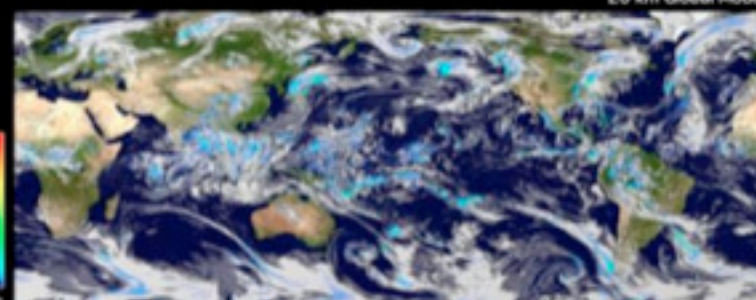
5km Regional Model



2km Regional Model



17 Sep
208X
21 UTC



©MRL, JMA, JAMSTEC, MEX

University Network for Climate and Ecosystems Change Adaptation Research

Training Programme on Climate Change Downscaling Approaches and Applications

9-14 November 2011

<http://cecar.unu.edu>

Training module details

- 4 days common
 - Climatology: IIT, Delhi
 - [Dynamic Downscaling with WRFC](#), Dynamic Downscaling (WRF) by NCAR, implementation University of Nebraska, USA
 - 20km Global model forecasts by MRI, Japan
 - Statistical downscaling by University of Tokyo
 - Risk Assessment and GIS (UNU, AIT, Nippon Koei)
- 2 day programmes (3)
 - Climate Extended, IDF and Extremes (UP, UNU)
 - Impact on rice production (UNU, IIT, TH, SL)
 - Flood Impacts (UNU, NK, SL, TU)
 - Communicating Results (ISET)



CECAR Collaboration Potential

- Global change, both climate and ecosystems, bring new challenges to sustainability of production systems and infrastructure.
- Flexible adaptive measures - adaptive adaptation - is the way forward. Innovative holistic approaches based on risk assessment are needed to achieve this.
- **Close collaboration** among **professionals** and **academics** is needed for tight **integration** of **research** and **implementation** - Objective of UNCECAR is to facilitate this

WEB Portal

- Use WEB portal as a collaborative tool
- Web based mechanism for applying and submissions of research projects

The screenshot displays the UN-CECÂR website interface. At the top, there is a navigation menu with links for Home, About, Research, Courses, Events, News, and Resources. Below the menu is a large banner with the text "UNIVERSITY NETWORK FOR CLIMATE AND ECOSYSTEMS CHANGE ADAPTATION RESEARCH" and a list of member institutions. To the right of the banner is a section titled "ABOUT UN-CECÂR" with a play button icon. Below the banner are three columns: "Research" (Program Development Ongoing Collaborative), "Courses" (Building Resilience to Climate Change), and "Events" (12 Oct 2011 10th Int'l Symposium on New...). To the right of these columns is a "Stay Updated" section with social media icons for Facebook, Email, Twitter, and RSS. Below the banner are two more sections: "OUR NETWORK" listing member universities (Waseda University, Australian National University, Asian Institute of Technology) and "LATEST NEWS" with three news items. At the bottom right, there is a box for "NOW TAKING ASSOCIATE MEMBERSHIP APPLICATIONS" and contact information for the CECAR UNU-ISP Secretariat.

global change ar x global change ar x Climate Change x GAR 2011 - Dov x www.prevention x UN-CECAR x

cecar.unu.edu

Google News Popular UNU DIY Water travel Software/OS SnowLeopard Latex Other Bookmarks

Sitemap Contact Login

UN-CECÂR
University Network for
Climate and Ecosystems Change Adaptation Research

Home About Research Courses Events News Resources

UNIVERSITY NETWORK
FOR CLIMATE AND ECOSYSTEMS CHANGE ADAPTATION RESEARCH

ASIAN INST OF TECH, AUSTRALIAN NATL U, BANGLADESH U OF ENGINEERING AND TECH, CHINESE ACADEMY OF FORESTRY, GADJAH MADA U, INDIAN INST OF TECH, IRSS, KEIO, KYOTO U, INST OF ENGINEERING, NATL U OF MALAYSIA, U PERADENIYA, U-PHILIPPINES, RITSUMEIKAN ASIA PACIFIC U, U OF TOKYO, TSINGHUA U, UNU-ISP SECRETARIAT, VIETNAM NATL U, WASEDA U, YEUNGNAM U

ABOUT UN-CECÂR

The University Network on Climate and Ecosystems Change Adaptation Research is an Institutional platform for universities across the Asia Pacific to strengthen education and research on adaptation to climate change and ecosystems change, and to build the emerging sustainability science discipline.

1 2 3

Research Courses Events

Program Development
Ongoing Collaborative

Building Resilience to Climate
Change

12 Oct 2011 10th Int'l
Symposium on New...

Stay Updated

f e t p r

OUR NETWORK

Tokyo, Japan
Waseda University

Canberra, Australia
Australian National University

Pathumthani, Thailand
Asian Institute of Technology

more

LATEST NEWS

6 Oct 2011 5th UN-CECÂR International
Conference

23 Sep 2011 5th International Conference on
Flood Management

8 Sep 2011 Training Programme on Climate
Change Downscaling Approaches
and Applications

more

NOW TAKING
ASSOCIATE
MEMBERSHIP
APPLICATIONS

CECAR UNU-ISP Secretariat
5-53-70 Jingumae, Shibuya-ku, Tokyo, JAPAN
Tel:81(0)3-5467-1212 Fax:81(0)3-3499-2828

PageTop

Thank you



University Network
for Climate and Ecosystems Change Adaptation Research



UNITED NATIONS
UNIVERSITY
UNU-ISP