EMECS XI
Special Session of BRICS Countries

Prevention and Mitigation of Natural Risk in Coastal Region

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CEMADEN – BRAZIL

St Petersburg, Russia, August 22-27
BRICS Memorandum of Understanding (MoU) on cooperation in the fields of Science, Technology and Innovation (STI)

The MoU envisages promotion of cooperation in the field of science, technology and innovation among BRICS countries by means of mutually agreed S&T events and activities.

The objectives of the MoU are:
• to establish a strategic framework of cooperation in STI;
• to address the common global, and regional socio-economic challenges utilizing shared experiences and complementarities in STI among the BRICS countries;
• to co-generate new knowledge and innovative products, services and processes etc
• to promote, where appropriate, joint BRICS science, technology and innovation partnerships with other strategic actors in the developing world.
Mechanisms and Modalities of Cooperation

• Short-term exchange of scientists, researchers, technical experts and scholars;
• Dedicated training programmes to support human capital development in science, technology and innovation;
• Organization of science, technology and innovations workshops, seminars and conferences in areas of mutual interest;
• Exchange of science, technology and innovation information;
• Formulation and implementation of collaborative research and development programmes and projects;
• Establishment of joint funding mechanisms to support BRICS research programmes and large-scale research infrastructure projects;
• Facilitated access to science and technology infrastructure among BRICS member countries;
• Announcement of simultaneous calls for proposals in BRICS member countries;
• Cooperation of national science and engineering academics and research agencies.
II BRICS Science, Technology and Innovation Ministerial Meeting: Brasília Declaration
Brasília, Brazil, 18 March, 2015

Following the instructions of the leaders of BRICS member countries, mentioned in paragraph 67 of the Fortaleza Declaration, we express our satisfaction in signing the Memorandum of Understanding on Cooperation in Science, Technology and Innovation (MoU), which establishes a strategic framework for cooperation in priority areas amongst the BRICS member countries.

In order to foster further collaboration and achieve concrete results from the MoU directives, we agree to develop and negotiate a Work Plan 2015-2018, based on the Brazilian proposal, during the Russian presidency of BRICS, to be approved in the next BRICS STI-SOM and signed at the next BRICS STI Ministerial Meeting. The Work Plan will focus on the five priority areas and leadership established previously by each country, namely: (a) prevention and mitigation of natural disasters, to be led by Brazil, (b) water resources and pollution treatment, to be led by Russia, (c) geospatial technology and its applications, to be led by India, (d) new and renewable energy, and energy efficiency, to be led by China, and (e) astronomy, to be led by South Africa. New initiatives agreed by the BRICS countries will also be included in the Work Plan.
We welcome the establishment of WG on BRICS large research infrastructures, the WG on BRICS funding multilateral joint research projects, technology commercialization and innovation.

We take note of the following announcements: India and Brazil host the BRICS thematic Session on Prevention and Mitigation of Natural Disasters during the 6th Annual Conference of the International Society for Integrated Disaster Risk Management in October 2015.
Next Steps for Natural Disaster

Establishment of WG on BRICS Natural Disaster.

Define a scientific agenda.
Prevention and Mitigation of Natural Disasters in Coastal Regions

Brazil’s Experience
Natural disaster of 11-12 January 2011 in the mountains west of Rio: over 900 fatalities, 350 disappearances and thousands left homeless. A catalyst for DRR policies focused on prevention.

Over 5 million people, mostly poor and vulnerable, living in areas of high disaster risk in Brazilian cities.
Significant increase of the risk

Evolution of Natural Disasters in Brazil

RISK = SUSCEPTIBILITY X EXPOSURE
Natural Disasters in Brazil: over 95% of disasters are climate-related

- Forest fires, Floods, Drought, Mass Movements
- Wildfires, Floods, Erosions
- Flash Floods, Wind Storms, Hails, Landslides
- Droughts, Floods, Flash Floods
Natural Disasters in Brazil

<table>
<thead>
<tr>
<th>Disaster Type</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frost</td>
<td>0.12</td>
</tr>
<tr>
<td>Floods</td>
<td>1.32</td>
</tr>
<tr>
<td>Tornado</td>
<td>0.12</td>
</tr>
<tr>
<td>Wildfires</td>
<td>0.48</td>
</tr>
<tr>
<td>Erosion</td>
<td>0.9</td>
</tr>
<tr>
<td>Mass movement</td>
<td>1.79</td>
</tr>
<tr>
<td>Hail</td>
<td>4.2</td>
</tr>
<tr>
<td>Wind Storms</td>
<td>7.07</td>
</tr>
<tr>
<td>Floods</td>
<td>12.04</td>
</tr>
<tr>
<td>Flash Floods</td>
<td>20.66</td>
</tr>
<tr>
<td>Droughts</td>
<td>51.31</td>
</tr>
</tbody>
</table>

Landslides and flash floods cause over 90% of fatalities!
MISSION: develop, test and deploy a police forecasting system of natural disasters in vulnerable areas throughout Brazil.
As CEMADEN works

• Operating since December 2011
• Full monitoring regime (24 x 7)
• nearly 1000 cities monitored
• more than 3,000 warnings already issued
<table>
<thead>
<tr>
<th>Natural Disasters Monitoring</th>
<th>Observational Systems</th>
<th>Total Equipments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weather Radars</td>
<td>S Band Radars - Doppler</td>
<td>9</td>
</tr>
<tr>
<td>Community Raingauges</td>
<td>Semi-Automatic Sensors</td>
<td>1375</td>
</tr>
<tr>
<td>Automatic Raingauges</td>
<td>Automatic Sensors</td>
<td>3375</td>
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<tr>
<td>River Monitoring: Overflow and Floods</td>
<td>Hydrological Sensors</td>
<td>301</td>
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<tr>
<td>Agrometeorological Monitoring: Crop Failure</td>
<td>ACQUA Sensors</td>
<td>550</td>
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<tr>
<td></td>
<td>AGRO Sensors</td>
<td>100</td>
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<tr>
<td>Geotechnical Monitoring: Mudslides</td>
<td>Geotechnical Sensors</td>
<td>137</td>
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<tr>
<td></td>
<td>Fully Robotic Stations - FRS</td>
<td>10</td>
</tr>
</tbody>
</table>
Plano Nacional de Gestão de Riscos e Resposta a Desastres Naturais
Rede Observacional Cemaden
26/11/2015
Main Research Areas

- Natural Disasters
- Natural Disasters Modeling
- Hydrology
- Geology
- Meteorology
- Agrometeorology
- Forest Fires
The Oceans to Brazil

- 7,367 km coastline
- 17 Coastal States
- 463 municipalities
- 26.6% of the Brazilian population
- ~4,500,000 km² of EEZ
- High biodiversity in natural ecosystems along the coastal zone
- Requires a Systemic Approach and integrated management
All Brazilian coast and a vast area of the South American continent are heavily influenced by large-scale processes in the South Atlantic

**IN THE SOUTH** - South Atlantic tropical cyclones

**IN THE SOUTHEAST** - Rainfall in southeast Brazil related with South Atlantic Convergence Zone

**IN THE NORTHEAST** - Intertropical Convergence Zone
Hurricane Catarina

The first hurricane ever reported in the South Atlantic

Until 2004, no such storms have been recorded in the South Atlantic. However, on March 25th, 2004, a rare event occurred off the shores of Catarina province in Southeastern Brazil, and that was the development of a rather strong hurricane with 75 knot, or 85 mph winds, which is Category One of the Saffir-Simpson Scale in the Atlantic.
IMPACTS OF CLIMATIC CHANGE

PHYSICAL: EROSION
   COASTAL EVOLUTION
   FLOOD
   INCREASE OF THE SEA LEVEL

CATARINA – THE FIRST HURRICANE IN THE SOUTH HEMISPHERE

BIOLOGICAL: MARINE ECOSYSTEMS
   MARINE PHYTOPLANKTON
   MACROALGAE AND MARINE PLANTS
   CORAL REEFS
   ICHTHYOFANA

ECONOMICS: FISHERIES SOCIO-ECONOMICS
Climate Monitoring in Coastal Zones

Climate Monitoring

“transformation of observations into climate-quality data sets and information products and the interpretation of these products to understand the state, and changing state, of the climate system.”

Challenges
Climate signals (low-frequency) are smaller than weather signals (high-frequency), therefore

• Need more precise measurements;

• Special attention to calibration, bias errors, sampling, processing algorithm, and data quality control (QC);

• Maintenance of stable data sets over the long term due to instrument (and technology) changes and other facts;
Main Goal

- Provide long-term, accurate, and timely climate-related information of the Brazilian coastal zone
- Others
  - Provide continuous and free access to high quality data;
  - Develop tools and educational material to be used by educators;
  - Contribute to the Brazilian government to establish climate-related policies.
Important Questions

How many variables/indicators of climate changes in \textit{terrestrial and marine} Brazilian coastal zones can we monitor \textit{well}?

How to guarantee the \textit{quality} of climate-related data in the long-term run along the Brazilian coastal zone?

How to ensure \textit{long-term investment} in monitoring climate changes in Brazilian coastal zones?
SiMCosta
Brazilian Coastal Monitoring System

• **Initial Phase**
  - 4 buoys in S & SE
  - 12 tide gauges

• **Second Phase**
  - 6 buoys in NE & N
  - 12 tide gauges
ReBentos

Aims

Create and implement an integrated network to study coastal benthic habitats along the Brazilian coast (ReBentos) to establish long time series on benthic biodiversity as an strategy to detect the effects of global climate changes.
Goals

- Stimulate a thematic discussion related to climate changes;
- Establish long time series on biodiversity of benthic coastal habitats;
- Produce knowledge to evaluate the effect of global climate changes and local impacts;
- Capacity building;
- Environmental education and communication.
Potentials

- Adaptation to CCs through monitoring and evaluation of the effects on benthic communities
- Application of the protocols to record exotic species
- Integration with Marine Protected Areas – monitoring
- Awareness of society and decision makers about the importance of marine biodiversity, ecosystem services and impact of climate changes on human well being
- Stimulate the integration between different areas of knowledge
Thank you

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