



## 1<sup>st</sup> BRAZILIAN WORKSHOP ON CLIMATE CHANGES IN COASTAL ZONES: CURRENT KNOWLEDGE AND RECOMMENDATIONS

UNIVERSIDADE FEDERAL DE RIO GRANDE (FURG)

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### RIO GRANDE DECLARATION

The impacts of Global Climate Change on the environment and society represent the biggest challenge for human civilization in the twenty-first century. Scientists around the world are working intensely to understand the climatic processes involved and the possible consequences of climate change at global, regional and local levels. Governments of different countries have initiated studies of vulnerability to climate change and adopted mitigation and adaptation measures to face this new reality.

The establishment of the Brazilian Research Network on Global Climate Change (*Rede CLIMA*) and the implementation of the National Institute of Science and Technology (INCT) for Climate Change, were important initiatives to adequately address these issues in Brazil; since these organizations involve scientists of different disciplines. One of the main objectives of *Rede CLIMA* is to significantly increase the knowledge on the impact of climate change and to identify key vulnerabilities in different Brazilian sectors and systems. Coastal Zones stand out as an important system due to its environmental and societal significance.

Large cities and populations are concentrated near rivers and in low altitude regions (fertile valleys) within 100 km of the coastline, and population density of the coastal zone is likely to more than double by 2050. Impacts of climate change and urban development will triple the number of people exposed to coastal flooding by 2070. Goods and services from coastal ecosystems valued by society represent about 33 trillion dollars globally. Coastal zones are therefore, among the most vulnerable areas to global climate change impacts, since they will be directly affected by the increase in the average sea level, exposure to extreme storms, changes in discharge regimes of rivers, elevation of sea surface temperature, ocean acidification and other events. However, potential impacts of climate change, both physical and biological, will vary considerably among coastal regions, according to their natural characteristics and the degree of environmental degradation. Therefore, understanding the impacts of global climate change in every region is essential for strategic planning and decision-making by the government and the Brazilian society.

During the "First Brazilian Workshop on Climate Changes in Coastal Zones" in Rio Grande (RS), scientists from around the country assessed the current state of knowledge on impacts of climate change on Brazilian coastal zones and discussed procedures to standardize protocols and strategies for networking observational studies. About 200 university professors, graduate and post-graduate students attended the event. Among these, thirty-five were invited speakers from *Rede CLIMA* and the National Institute of Science and Technology (INCT) for Climate Change. Thirty-eight research papers (among oral and panels) were presented, representing 121 authors from different Brazilian institutions and regions. Based on the current state of knowledge and the discussions held during the workshop, the participants believe

that it is still possible to save the coastal ecosystem and its environmental assets (ecological, social and economic) against scenarios of climate change, although urgency and determination are required to achieve this task.

In order to adequately assess and monitor the effects of climate change on coastal ecosystems in Brazil, in an objective and regional manner, the following scientific goals have to be achieved urgently:

- 1) Validation of regional climate models based on local observational data;
- 2) Geodetically controlled measurements of sea level accompanied by altimetric surveys, integrating terrestrial and nautical cartography of important coastal regions of Brazil with scenarios for the twenty-first century;
- 3) Acquisition of long and sustainable time series of physical, chemical and biological processes in coastal waters;
- 4) Greater understanding of factors controlling the processes of erosion and coastal progradation;
- 5) Evaluation of the potential consequences of climate changes on aquatic biogeochemical cycles;
- 6) Analysis of the responses of physiological and ecological populations, marine, estuarine and freshwater communities and ecosystems on climate change;
- 7) Assessment of variability in fish stocks and other natural resources of economic importance;
- 8) Evaluation of social and economic vulnerability of coastal populations, particularly those that directly depend on coastal resources and traditional activities.

The advances in scientific knowledge on coastal ecosystems, with emphasis on the topics outlined above, will lead to better insights of the effects of climate change on coastal regions. Investments in environmental sciences in coastal areas, with emphasis on climate change are essential, therefore, for greater understanding of these important ecosystems and their vulnerabilities.

In this context, we recommend to the government and organized society that actions be created or strengthened to promote:

- The immediate reduction of emissions of greenhouse gases (GHGs) in order to contribute to slowing down global warming;
- The immediate deterrence of deforestation in different regions of the country;
- Advances in scientific knowledge on coastal ecosystems, with particular emphasis on topics already presented above, through the induction and effective support for research in these subject areas;
- The strengthening of the monitoring system of the Brazilian Coastal Zone;
- The development and implementation of management plans that promote the use, conservation and restoration of coastal ecosystems, considering climate change scenarios, thus strengthening existing and incidental public policies on this zone (National Coastal Management Program, “Orla” Project, Sector Plan for Sea Resources, National Plan for Water Resources, The Conservation National System, Local Agenda 21);
- The promotion and encouragement innovative solutions and actions that encourage adaptation measures in coastal cities and towns facing the new climate scenario;
- The expansion of the critical insight and awareness of society regarding the Climate Change, through formal education (via educational institutions) and non-formal (via the media, nongovernmental organizations, civil organizations etc.), with dissemination of clear and contextualized information about scientific aspects of the topic in the appropriate language.

For the implementation of these recommendations to be successful, depend on decision from local, State and Federal public policies engaged to Climate Change. Agility and long-term commitment are essential requirements to support and encourage the efforts of science and technology to confront and adapt to the challenges posed by climate change.

Rio Grande, October 20<sup>th</sup> 2009.

*Declaration approved by 124 scientists linked to 20 federal and state institutions (distributed in eight states of the Brazilian coast) and three foreign institutions, belonging to leading groups in research on issues related to the sciences of the sea.*

**Researchers from Rede Clima and National Institute of Science and Technology (INCT) for climate change**

- ABDALAH, Patrizia - Universidade Federal do Rio Grande, RS
- ALBERTONI, Edélti - Universidade Federal do Rio Grande, RS
- ARAÚJO, Francisco Gerson - Universidade Federal Rural do Rio de Janeiro, RJ
- CALLIARI, Lauro Júlio - Universidade Federal do Rio Grande, RS
- CAMPOS, Edmo - Universidade de São Paulo, SP
- CASTELLO, Jorge Pablo - Universidade Federal do Rio Grande, RS
- COPERTINO, Margareth da Silva - Universidade Federal do Rio Grande, RS
- CIOTTI, Áurea Maria Ciotti - Universidade Estadual de São Paulo, SP
- DA SILVA, Mário Pereira - Universidade Federal do Rio Grande do Norte, RN
- DOMINGUES, José Maria Landim - Universidade Federal da Bahia, BA
- FARACO, Luís Francisco Ditzel - Instituto Chico Mendes, PR
- FARIAS, Julyana Nóbrega - Universidade Federal de Santa Catarina
- FERNANDES, Elisa Leão - Universidade Federal do Rio Grande, RS
- GARCIA, Alexandre Miranda - Universidade Federal do Rio Grande, RS
- GARCIA, Carlos Alberto Eiras - Universidade Federal do Rio Grande, RS
- GHERARDI, Douglas - Instituto Nacional de Pesquisas Espaciais, SP
- GHISOLFI, Renato - Universidade Federal do Espírito Santo, ES
- GIANESELLA, Sônia Maria Flores - Universidade de São Paulo, SP
- GONÇALVES, Gláuber Acunha - Universidade Federal do Rio Grande, RS
- HELLEBRANDT, Dênis - University of East Anglia, UK
- HELLEBRANDT, Luceni - Universidade Federal do Rio Grande, RS
- HORTA, Paulo Antunes - Universidade Federal de Santa Catarina, SC
- KLEIN, Antônio Henrique da Fontoura - Universidade do Vale do Itajaí, SC
- KIKUCHI, Ruy Kenji Papa - Universidade Federal da Bahia, BA
- KRUSCHE, Nísia - Universidade Federal do Rio Grande, RS
- LANA, Paulo - Universidade Federal do Paraná, UFPR
- LEÃO, Zelinda Margarida Nery - Universidade Federal da Bahia, BA
- LEMOS, Ângelo Teixeira - Universidade Federal do Espírito Santo
- LUZ, Roberto Teixeira - Instituto Brasileiro de Geografia e Estatística, RJ
- MACHADO, Arthur Antônio - Universidade Federal do Rio Grande, RS
- MARQUES, William - Universidade Federal do Rio Grande, RS
- MÖLLER, Osmar Olinto - Universidade Federal do Rio Grande, RS
- MUEHE, Dieter - Universidade Federal do Rio de Janeiro, RS
- MUELBERT, José Henrique - Universidade Federal do Rio Grande, RS
- NOERNBERG, Maurício Almeida - Universidade Federal do Paraná, PR
- NOBRE, Carlos Afonso - Instituto Nacional de Pesquisas Espaciais, SP
- NOBRE, Paulo - Instituto Nacional de Pesquisas Espaciais, SP
- OLIVEIRA, Marília de Dirceu Machado de - Universidade Federal da Bahia, BA
- PAES, Eduardo Tavares - Instituto Nacional de Pesquisas Espaciais, SP
- PEREIRA, Natália - Universidade Federal do Rio Grande, RS
- SOARES, Helena Cachanhuk - Instituto Nacional de Pesquisas Espaciais
- SIEGLE, Eduardo - Universidade de São Paulo, SP
- SILVA, Cléber Palma - Universidade Federal do Rio Grande, RS
- TURRA, Alexander - Universidade de São Paulo, SP
- TROTTE-DUÁH, Janice - DHN/ GOOS BRASIL
- VASCONCELLOS, Vivian Soares - Universidade Federal da Bahia, BA
- VIEIRA, João Paes - Universidade Federal do Rio Grande, RS
- VITAL, Helenice - Universidade Federal do Rio Grande do Norte, RN

**Guests**

- GARCIA, Virgínia Maria Tavano - Universidade Federal do Rio Grande, RS
- MATA, Maurício Magalhães - Universidade Federal do Rio Grande, RS
- SOARES, Ivan Dias - Universidade Federal do Rio Grande, RS
- VASCONCELLOS, Marcelo - Universidade Federal do Rio Grande, RS

**Other authors and co-authors of presented papers**

- ABREU, Paulo César - Universidade Federal do Rio Grande, RS
- ALMEIDA, João - Universidade de São Paulo, SP
- AMADO FILHO, Gilberto - Jardim Botânico do Rio de Janeiro, RJ
- AMARAL, Antônia C Z - Universidade Estadual de Campinas, SP
- AMARAL, Waldemar J A - Universidade Federal do Rio Grande, RS
- ARAÚJO, Rafael Sperb - Universidade do Vale do Itajaí, SC
- ARAÚJO, Renato - Universidade Federal de Santa Catarina, SC
- ARIGONY-NETO, Jorge - Universidade Federal do Rio Grande, RS
- AZEVEDO, Márcia Cristina Costa - Universidade Federal Rural do Rio de Janeiro, RJ

- BAISCH, Paulo Roberto Martins - Universidade Federal do Rio Grande, RS
- BARROS, Marcos P F - Universidade Federal do Rio de Janeiro, RJ
- BEMVENUTTI, Carlos Emílio - Universidade Federal do Rio Grande, RS
- BERCHEZ, Flávio - Universidade de São Paulo, SP
- BERGESCH, Marli - Universidade Federal do Rio Grande, RS
- BERSANO, José G F - Universidade Federal do Rio Grande, RS
- BIANC, Andre De Pieri - Universidade do Vale do Itajaí, SC
- BRUNO, Marcelo A - Universidade Federal do Rio Grande, RS
- CABRAL, Débora - Universidade Federal de Santa Catarina, SC
- CAMARGO, Maurício - Universidade Federal do Paraná, PR
- CAPPELLETTO, Eliane - Universidade Federal do Rio Grande, RS
- COIMBRA, Franciane - Universidade Federal do Rio Grande, RS
- COLEPICOLO, Pio - Universidade de São Paulo, SP
- COLLING, Leonir André - Universidade Federal do Rio Grande, RS
- CORRÊA, Iran Carlos S - Universidade Federal do Rio Grande do Sul, RS
- COSTA, César Serra Bonifácio - Universidade Federal do Rio Grande, RS
- DENADAI, Márcia F - Instituto Costa Brasilis
- DONNANGELO, Alejandro - Universidade Federal de Santa Catarina, SC
- ESTEVEZ, Francisco de Assis - Universidade Federal do Rio de Janeiro, RJ
- FREITAS, Domínio - Universidade do Vale do Itajaí, SC
- FUJI, Mutue - Instituto de Botânica do Estado de São Paulo, SP
- FURLANETTO, Leonardo - Universidade Federal do Rio Grande, RS
- GIACOMINI, Yara B - Universidade Federal do Rio Grande, RS
- GIANASI, Bruno Lainetti - Universidade Federal do Rio Grande, RS
- GIANUCA, Dimas - Universidade Federal do Rio Grande, RS
- GIOVANINI, Renata M. Bretz - Universidade Federal do Rio Grande, RS
- GOULART, Elaine - Universidade Federal do Rio Grande, RS
- GUIMARÃES, Sílvia Pita - Instituto de Botânica do Estado de São Paulo, SP
- HIRATA, Fernando Endo - School of Earth and Atmospheric Sciences, EUA
- JORGE, Daniel F Schroeder - Universidade Estadual Paulista, SP
- LESSA, Guilherme - Universidade Federal da Bahia, BA
- MACHADO, Maria Isabel - Universidade Federal do Rio Grande, RS
- MACHADO, Luis Eduardo - Universidade Federal do Rio Grande, RS
- MAIA, Natan - Universidade Federal do Rio Grande, RS
- MARANGONI, Juliano C - Universidade Federal do Rio Grande, RS
- MARINHO, Cláudio C - Universidade Federal do Rio de Janeiro, RJ
- MARTINS, Aline - Universidade de São Paulo, SP
- MEDEANIC, Svetlana - Universidade Federal do Rio Grande do Sul, RS
- MENEZES, João Tadeu - Universidade do Vale do Itajaí, SC
- MONTEIRO, Patricia C - Universidade Federal de Santa Catarina, SC
- MORAES, Leonardo E - Universidade Federal do Rio Grande, RS
- MELO FILHO, Eloi - Universidade Federal do Rio Grande, RS
- ODEBRECHT, Clarisse - Universidade Federal do Rio Grande, RS
- OLIVEIRA, Joyce A - Universidade Federal do Rio Grande, RS
- PEREIRA, Pedro - Universidade Federal do Rio Grande, RS
- PEZZI, Luciano - Instituto Nacional de Pesquisas Espaciais, SP
- PINTO, Camila - Universidade do Vale do Itajaí, SC
- RECHIA, Rafael - Universidade Federal do Rio Grande, RS
- RUGNA, Rafael C - Universidade de São Paulo, SP
- SALDAÑA-CORRÊA, Flávia M P - Universidade de São Paulo, SP
- SANCHES, Paola - Universidade Federal de Santa Catarina, SC
- SANTOS, Margaret B - Universidade Federal do Rio Grande, RS
- SEELIGER, Ulrich - Universidade Federal do Rio Grande, RS
- SERRA, Sérgio Pastor - Universidade do Vale do Itajaí, SC
- SHROEDER, Fábio - Universidade Federal do Rio Grande, RS
- SILVA, Maira S M - Universidade Federal do Rio Grande, RS
- SILVA, Maristela B - Universidade Federal do Rio Grande, RS
- SISSINI, Marina N - Universidade Federal de Santa Catarina, SC
- STIVE, Marcel - Delft University of Technology, Holanda
- TOLDO, Elfrio - Universidade Federal do Rio Grande do Sul, RS
- YOSHIMURA, Cristalina - Universidade Federal de Santa Catarina, SC
- ZANANDREA, Ana - Universidade Federal de Santa Catarina, SC
- ZANELLA, Nicolas Paolo - Universidade Federal do Rio Grande, RS