THIRD KLIMAPOLIS WORKSHOP

21-24 MAY 2019

INSTITUTO DE ASTRONOMIA, GEOFÍSICA E CIÊNCIAS ATMOSFÉRICAS (IAG)

UNIVERSIDADE DE SÃO PAULO (USP)

MITIGATION STRATEGIES IN NORTHEST

MARIA PAULETE PEREIRA MARTINS

INSTITUTO NACIONAL DE PESQUISAS ESPACIAIS
CENTRO REGIONAL DO NORDESTE

HUMAN POPULATION ~ 8 BILLIONS ↑

NEEDS OF FOOD, WATER, HOME, ENERGY ↑

GLOBAL CHANGES

WASTE ↑

NATURAL RESOURCES ↓

LITOSPHERE
PETROLEUM USE
MINING
SOIL CONTAMINATION
GEOLOGICAL SEQUESTRATION
LAND USE
SOIL PHITOREMEDIATION
SOLID WASTE
CONSTRUCTIONS

HIDROSPHERE
WATER BODIES CONTAMINATION
HIDRIC RESOURCES
SAND EXTRACTION
POWER GENERATION
WATER TABLE
DROUGHTS / FLOODS

ATMOSPHERE
CLIMATE CHANGES
GREEN HOUSE GASES
BIOMASS BURNING
CARBON SEQUESTRATION
SOLAR AND EOLIC ENERGY
AIR POLUTION
TRANSPORTATIONS
OZONE LAYER

BIOSPHERE
AGRICULTURAL MANAGEMENT
BIOFUELS
FOOD CAPACITY
BIODIVERSITY LOSS
DESFORESTATION INDUCERS
ECHOLOGICAL-SOCIO-ECONOMIC ZONING
AGROFORESTRY
PESTICIDES
ORGANIC PRODUCTS

PUBLIC POLICIES, TECHNOLOGY/SCIENCE TRANSFERENCE, ECONOMIC VIABILITY, ACTORS SYNERGY

The human being consumes per day around
1.5 kg of food, 2.0 kg of water and 15 kg of air.

We can live 5 or more weeks without food,
5 days without water but do not survive more than 5 minutes without air.

We can refuse water or suspect food, but we can not do the same for the air.

The atmosphere is our greatest good.

Mitigation means changes and technological substitutions that reduce the use of resources and emissions per unit of production, as well as, the implementation of measures that reduce greenhouse gas emissions and increase carbon sinks.

The Brazilian Constitution states in Article 225 that:
"Everyone has the right to an ecologically balanced environment, for a good common use of the people and essential to a healthy quality of life, imposing on the Government and the community the duty to defend it for the present and future generations. "

So, all of us, must to do the best we can.

What can a nation, or even a person, to do on their own to slow or reverse climate change?

- Public policies
- Implement viable changes in some combinations capable of reducing greenhouse gas emissions to more secure levels
- Personal lifestyle changes that a person can promote and that can help to reduce their carbon footprint
- Not all of them are good for everyone, and it is possible that you are already putting some into practice, or that you abominate others.
- But the adoption of some of them can make a difference.

Research on climate change is very importante, mainly coming from observations, mathematical models and the elaboration of future scenarios .

But is also necessary to take into account expectations, longings, satisfactions and dissatisfactions, judgments and conduct of people in relation to their experiences, where the hardships and vulnerabilities are most perceived and felt in the perspective of those who experience climate change.

Sectors for Mitigation

- Education / Social awareness
- Energy
- Mobility / Transportation
- Building
- Industry
- Farming
- Forest / Silviculture
- Waste

Some examples:

- **Abandon fossil fuels**: there is no efficient solution yet, but biofuels are coming. Nuclear energy is an option, but has the problem of radiactive trash. Electric cars are still expensive. Plastics of vegetal origin are being developed. To invest in low carbon industry, eolic and solar energy, and not in shares of petroleum, natural gas and coal.

- **Update the infrastructure**: The buildings contribute to 30% of GHG emissions. Use of thermal isolation and natural ventilation reduce the energy necessity. Better highways decreases the consumption of fuels. Find a substitute for cement that pollutes a lot.

- **Reduce the mobility emissions**: Transportation is the second highest source of GHG emissions.To live close to job and work from home some days of the week, walk, bikes and buses are better options. Let the airplane travels only for long distances. Replace trucks by trains.

- **Less consumption**: Buy less things, choose more durable products, consume things from local producers and with low environmental impact.

- **Stop deforestation**: Every year 13 millions hectares are deforestated, with 1,5 tons of CO2 emissions only in tropics. The land used by herds could be reforested and used to carbon sequestration. Improve agricultural practices. Recycle and reduce paper uses, use of certified wood and buy used furniture are good practices. The forest management is a very importante task. Clean Development Mechanisms projects.

- **Smart food**: Reduce the distance between producers and consumers. Reduce the use of fertilizers and pesticides. Expand communities vegetables gardens in cities. Strengthen organic products and agroforestry systems. Eating meat produces 1,5 tons of GHG more than eating vegetables.

- **Foment efficiency:** Promote the efficient use of natural, scientific, technological and human resources.

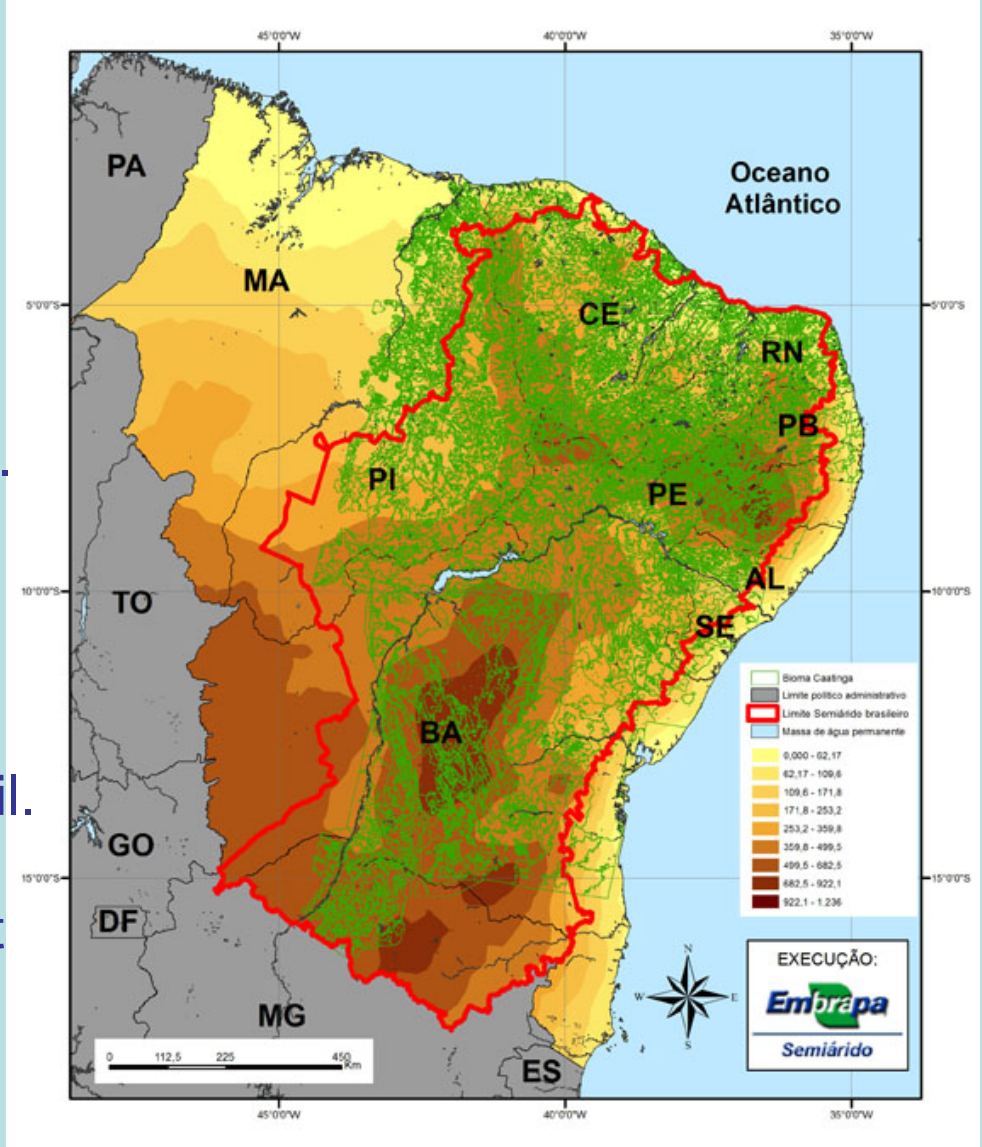
which has also been degraded over the centuries

- The Northeast region of Brazil is composed of 1,135 municipalities present in nine states where live about 32 million people (IBGE, 2017).

- The Caatinga is an important biome that covers 11% of the Brazilian territory and 70% of the Northeast region.

- With an area of 826,411 km^2, this biome is considered of biological importance, since it is the only one of geographic occurrence restricted to Brazil.

- At the shore there is the atlantic forest which has also been degraded over the centuries.



The Caatinga biome is the one that has suffered most with the consequences of climate change, resulting, in recent years, in an increase in temperature, low rainfall index and high dryness index in geography of the semi-arid region of Northeast Brazil (INSA, 2013).

Among the states of the Northeast, Rio Grande do Norte has stood out, because it has the largest área, that is, about 93.4% of its territory affected by the overwhelming desertification process, which may be of echological origin, through climatic variability or anthropogenic disturbances, such as the degradation of soil and vegetation cover, inadequate soil management and fires.

Of the 167 municipalities, 147 of them are part of the semi-arid of Rio Grande do Norte.

The climatic situation has not only resulted from the lack of rainfall, but from its distribution, associated with high temperatures (annual averages of about 27.6 ° C), high evapotranspiration rate, low relative humidity (around 68.3%) that result in a drought phenomenon.

In addition, in this geographical area the aridity index is up to 0.5, calculated by the precipitation and potential evapotranspiration, as well as presenting drought greater than 60%.

generating public health problems, air pollution and even transport problems

The main problems in Northeast region are:

- Semi-aridity
- Water sortages
- Desertification
- Impossibility of raising animals and planting crops
- Socio-economic vulnerability
- Waste

According to PNUMA in 2025 will be produced 2,2 bilions tons of waste by the cities around the world, generating public health, air pollution and transport problems.

Mitigation strategies:

- There is not much investiment in the northeast region.
- The projects and collaborations are scarces.
- The water is the main focus and the actions of adaptive nature.
- Rainwater harvesting, construction of cisterns and artezian wells, distribution of water by kite cars mainly during the drought of the reservoirs are examples.
- Desalination of sea water is a new front (Partnership with Israel Government)
- The government programs of seed distribution to farmers have not been effective since they did not germinate due to water scarcity and inadequate management.

- Eolic and solar energy are importants contributions of northeast region. About 85% of the eolic energy generated in Brazil come from the northeast. The Rio Grande do Norte has 146 eolic parks with 3.9 GW of power generation, Bahia 133, with 3.5 GW and Ceara 80, with 2 GW.

- The military command of the northeast has the project of installing 200 artesian wells moved by solar power.

The problem of climate change will only have solution when there will be guidelines or procedures with broad participation of governments, businesses and ordinary citizens, each fulfilling its part, demonstrating social responsibility and sustainability in their attitudes.

That is, it is important the implementation of public policies and new decision-making by the of public managers and of society in general, in relation to the development of economic activities that reduce the emission of greenhouse gas emissions.

But above all, to provide training and promotion of climate change education, with strategies for mitigation and adaptation to the local population. This will help to raise awareness related to natural resources.

Thank you very much!

maria.paulete@inpe.br