Climate Change, Global Change — The role of individuals

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1 Introduction

Earth's Natural systems all tend to equilibrium. Perturbations of these equilibria lead to unprecedented disruptions of the natural cycles. Human activity is perturbing Earth's energy budget by increasing greenhouse emissions which in turn warm the atmosphere. The carbon concentration has been consistently increasing since the industrial revolution, and similarly global average temperature records show a steady increase.

A warmer atmosphere leads to sea level rise, changes in plants' primary production, water availability issues, oceans acidity, increase of vector diseases, degradation of natural ecosystems, increases in the frequency of extreme events such as droughts, floods, wildfires, typhoons and hurricanes. Sea level rise has been responsible for the extinction of livable islands such as Tuvalu, creating climate refugees. On the other hand, droughts and floods increase the migration of agricultural communities. These movements of people generate social tensions. In addition, most of the anthropogenic emissions have been generated by the most developed countries, which are not the ones suffering the most striking consequences of the climate change.

Climate change is a complex problem at a global scale, with many layers of interaction. All parties should take action. However, the solutions to this problem rely greatly on the diplomatic and politic agreements, as they requires a deep energy transition which implies costs. The transition is highly based on the technology, but also on policy that enables technology deployment, which in turn depends on political and strategic programs that depend on peoples votes, that depend on peoples education and awareness, which in turn depend on the communities and on the enterprises.

All these aspects together—Economy and social human environment — interact with the natural world, it is a "system of systems" and therefore climate change is a "problem of problems". Fortunately there are solutions, let's be part of them!

2 Program

- Climate change basics: the physics of climate
  - Earth energy budget
  - Carbon cycle
  - Historical and current CO_2 concentration
  - Disputed and undisputed knowledge: what do we know and do not know about climate change
  - Anthropogenic Greenhouse gases and the energy system
  - Direct and Indirect impacts
- Policy: Global solution for a global problem
  - Organizations: UNFCCC and IPCC
  - What has been done? From Kyoto to Paris and agenda 2030 (the SDGs)
    - Top-down vs Bottom-up
    - Policy tools: Clean development mechanism, emission trading, joint implementation, green fund, REDD, carbon price ...
    - Heterogeneity of Impacts, responsibility, equality, fairness and burden-sharing
  - Possible Futures, RCPs and SSPs
- Solutions: From Global to individual efforts
  - Mitigation, adaptation and negative emissions
    - Energy system, demand and supply
    - Landuse
    - Co-benefits
  - Taking decisions under uncertainty
  - Technology
    - Barriers: costs and markets, circular economy, life-cycle, process design
    - Disruptive technologies, technological breakthroughs, technology lock-in and the rebound effect.
  - Politics and socioeconomic development
    - Competitiveness and labor, education, green jobs, new skills, ...
    - Green growth
    - Policy: Access to finance, taxes and subsidies, green bounds, white certificates, labeling,...
  - Behavioral change

    - buy-back, sharing, prosumers, ...
    - Citizen activism and local-scale action have a powerful impact on environmental issues
    - Solutions can be designed by envisioning the future and using anticipatory thinking
  - Awareness and perception
  - Examples

3 Suggested material

- Film 'Demain'
- Book: The Economics of Climate Change: The Stern Review by Nicholas Stern
- Book: How Bad Are Bananas? by Mike Berners-lee
- Book: Fixing Climate: The Story of Climate Science - and How to Stop Global Warming by Robert Kunzig and Wallace S. Broecker
- Book: Tales From an Uncertain World: What Other Assorted Disasters Can Teach Us About Climate Change by L. S. Gardiner