

Topics for master theses – ICTA

Possible topics for research

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Sergio Rossi

CENSOR Project

The main target of the CENSOR European project is to better understand El Niño-La Niña impacts on the natural resources that depend on the Humboldt upwelling current. The management of fisheries and aquaculture depend on the productivity of the system, and the ENSO affect such productivity. In particular, the scientific objective of the present proposal will be to analyze the main constituents of the water column particle flux through the chemical composition of the samples and try to identify a relationship with the biogeochemical cycles of carbon and silicon. The activities at the Institut de Ciències del Mar-CSIC (ICM) and Institut de Ciència I Tecnologia Ambientals-UAB are centered in the work with sediment samples obtained off Iquique, Chile. The samples were collected with sediment traps moored at 21°S at several depths within the Humboldt Current System. The participant will learn several methods of chemical analysis and handling of sediment trap samples, and the work will be shared in both institutions (ICM-CSIC & ICTA-UAB). The work is expected to be finished within 4 to 6 months.

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Rainer Zahn

1. Future perspectives for the marine system under a warming climate
An increasingly pressing question in Global Climate Change research relates to the future stability of the ocean circulation. Shifting the globally connected system of ocean currents has implications for climate, marine ecosystems and ocean carbon uptake. This thesis is intended to review and assess the state of knowledge on current ocean trends and future projections, with notable foci on ocean overturning, marine ecosystems and ocean carbon storage.

2. Environmental controls on the ocean overturning circulation
Deep-sea sediments contain chemical and biological imprints that document ocean circulation changes in the past that were of magnitude and rapidity far beyond those recorded in modern instrumental records. The thesis project focuses on sediment materials from the ocean region around southern Africa to assess the role of water transports between the Indian Ocean and Atlantic in regulating the ocean circulation during past climate changes. Candidates with interest in laboratory-based analytical work are particularly encouraged.

Rainer Zahn,

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Graham Mortyn

We are exploring the trace element compositions of surface ocean zooplankton called foraminifera. The "paleo" part of our work is generally directed to reconstructions of upper ocean temperatures and temperature gradients, in order to decipher ocean-climate history from key locations over timescales ranging from interannual to millennial. We are exploring records from study areas that include the NE Pacific, S. Atlantic sector of the Southern Ocean, and the N. Atlantic, among others. We are also analyzing "modern" samples (plankton tow, surface sediments, etc.) in order to refine and validate proxy methods for improved paleoceanographic reconstructions.

David Sauri

Urban water: the challenges ahead

As urban population growth progresses without pause around the globe, water supply and sanitation services (WSS) become more and more critical for achieving sustainability in cities. Several interesting issues worth exploring in this matter are the different ownership systems of WSS (public, private, hybrid forms), the possibility of using alternative decentralized resources such as rainwater or treated wastewater, the pros and cons of desalination, and the relationships between demography, social conditions and water consumption.

J D Tabara

TOOLS AND METHODS FOR REGIONAL CLIMATE CHANGE ADAPTATION AND MITIGATION APPRAISAL

This research should aim at dealing with the following questions, focusing on two selected regions of choice by the student (preferably though, one being Catalonia):

- What tools, methods and procedures are being used by scientific and political regional agents to downscale global climate assessments to the regional level?. And in turn, to upstream to the national level local demands and needs and to integrate climate considerations into development strategies?
- What is the influence of the existing national governance structures in constraining or enhancing the development of capacity of actors/agents to intervene in climate actions and appraisal strategies at the regional level?.
- What changes are being carried out within the regional institutional arrangements in order to accommodate the global climate change challenge in their present organizational structures?
- What is the potential contribution of regional agencies in devising climate strategies that go beyond the compulsory compliance of international commitments –mostly focused on mitigation and largely insufficient in terms of abating climate change?, and in particular, in developing innovative and long-term climate appraising and action processes that integrate and create synergies between adaptation and mitigation strategies?
- What are the gaps in knowledge and agents' capacities to intervene in regional climate policy? How new scientific insights on the current state of the climate and of the institutional and socio-economic dynamics t regional climate actions and appraisals?

Jeroen van den Bergh

1. Perspectives on post-Kyoto

The Kyoto protocol can be seen both as a success and a failure: a success as it was a huge step for mankind to recognize the problem of global warming and in within less than two decades manage to strike a first international agreement; a failure because the agreement is ineffective, inefficient and inequitable. This paper consider the positions and interests of the different countries involved in the negotiations for a

post-Kyoto climate agreement. This involves evaluating the Bali meeting, and taking into account relevant theoretical studies of international agreements.

2. Bounded rationality, behavioral economics and environmental policy

The field of behavioural economics is flourishing. Slowly, it is beginning to influence theoretical studies on environmental policy design and instruments. This paper aims first to assess exciting ideas and developments in behavioural economics. Next it will summarize already documented implications for environmental policy, and outline potential insights for this area of research.

3. How expensive is renewable energy

Various learning curves have been estimated for renewable energy technologies, like wind turbines, water power (various types), biofuels, solar PV, solar heating (including concentrated heat power), etc. This paper summarizes the various facts and insights. Next, it will provide a comparison of the costs and expectations about the pace and direction of technological innovation. In addition, a comparison is made with the expected price path and technological progress of fossil fuels and related technologies (e.g., capture and storage of CO₂).

4. How expensive is safe climate policy?

Many studies have estimated the global cost of what is considered a safe climate policy by IPCC, i.e. stabilizing GHG concentration in the atmosphere at an acceptable level. This paper provides an overview of these studies and critically examines and explains the diversity of estimates. In addition, the distribution of costs among countries is roughly estimated for a number of scenarios reflecting particular agreements on sharing the burden of climate policy (i.e. different combinations or trade-offs of efficiency and equity).

5. Linking international agreements: terrorism, trade and environment

A number of publications argue that the linking or integration of international agreements in different areas, notably trade, economics and environment, can help to overcome barriers and inflexible positions of certain countries. Linking of distinct environmental agreements may be part of such an approach. This idea is supported by the widespread experience on how coalition governments at a national level

function and manage to strike deals, compromises and trade-offs. Linking agreements might thus be seen as a step in the direction of effective international governance. This paper examines these issues from theoretical and empirical angles.

6. Environmental regulation and technological innovation

Many different ideas can be found in the literature on the impact of environmental regulation on technological inventions, innovations and diffusion. This is partly due to different theoretical starting points, such as neoclassical economics, innovation studies, evolutionary theories, sociology of innovation, and recently transition studies. This paper tries to compare and clarify the different theoretical insights so as to arrive at a more complete perspective on how to design public policy so as to stimulate technological change effectively in the direction of a sustainable development.

7. Monitoring and control of environmental regulation: theory and practice

In order to design environmental policy, information and insights are needed about the efficiency, effectiveness and equity implications of particular instruments. But this is not sufficient. What is further required is an understanding of the compliance features of instruments. For this, one has to examine how polluters will respond to different policies, instruments and more generally institutional arrangements, taking into account not only monitoring and control arrangements but also behavioral features of polluters. This paper compares voluntary action and agreements, market-based instruments and command-and-control with regard to compliance, based on a range of positive and normative theories. In addition, it tries to formulate policy design aspects that can optimally address compliance. Possibly, attention will also be devoted to empirical evidence.

8. An evaluation of the functioning of the ETS system

The European permit trading system for GHGs is operating for a number of years and entering its second phase. This paper examines its past functioning as well as expectations about its future functioning, and offers a comparison with other similar systems (notably in the USA). This involves presenting a summary of the theory of tradable permits, an empirical analysis of the facts (e.g., initial distribution of

permits, country specific arrangements and responses, price dynamics of the ETS), and a review of recent evaluations of the ETS by consulting firms, requested by the European Commission.

9. The influence of GDP information on the economy and environment

There is a large literature criticizing the GDP as a social welfare or progress indicator. It suggests that GDP acts as misleading information. This paper examines how large and relevant the impact of GDP information on the environment really is. For this reason, the influence of GDP information on economic decisions by firms, consumers, investors, banks, governments and international agencies (notably OECD and IMF) is studied. Qualitative and possibly quantitative estimates are made, first for the direct impact on the economy and then for the indirect effect on the environment. Relevant literature is reviewed for this purpose.

10. Advertisement as an externality

Advertisement through various channels thrives on our human nature to be sensitive to status derived from positional goods. This paper examines the scarce theory on this issue, as well as empirical evidence. The latter involves, among others, data on (relative) outlays by large firms or industries on advertisement and marketing in general. Relevant insights from marketing research will be studied, as this field has collected a tremendous amount of statistical and potentially relevant information over the years.

Other ideas (not yet elaborated):

11. Perspectives on the transition to sustainable energy

12. Policy for non-point source pollution

13. Sustainable city: an oxymoron?

14. The Role of Multinational Corporations in Global Environmental Politics: New Solutions or Green Windowdressing?

15. An evaluation of voluntary agreements

16. The cost of extreme climate change

Xavier Gabarrell / Joan Rieradevall

1. Adapting methods and data for urban fabric

The aim of the task is to adapt existing methods and data for the urban system analysis. These tools include for example MFA, LCA or exergy analysis, which has been widely used for products, processes and more recently for services. In this stage methodologies will be adapted to the characteristics of the processes and present artefacts in the urban system. The idea is to make these tools more applicable in situations where the decision making problem is complex and the available time is scarce. To facilitate the decision making it will be a key point to be able to clearly define the data and sensitivity analysis. The data will probably consist from combination of production, consumption or waste data. In other processes or products, the use phase is very clearly identified; but in the urban processes and services the use phase is dynamic, and can generate contradictions. A development of the methodology is required for analysis of complex systems as buildings or neighbourhoods, and their associated processes and artefacts. Therefore, the methodology based on the exergy analysis applied to neighbourhoods and cities will be developed and checked. This task will make methods of environmental analysis suitable to study internal urban metabolism and will prepare the basis for other tasks.

2. Environmental impacts of urban networks

The aim this task is to apply methods adapted and developed in Task a) to urban supply and transport networks. To a great extent, urban metabolism is determined by large supply systems for transport, mobility, energy, water, housing etc. These supply systems are based on a technology-resource mix and on large investments. Their turnover rates are slow but their impact on the urban user's consumption patterns and the bulk resource flows in the city are tremendous. Having a focus on these supply systems helps to understand that social metabolism is organised at the system level of a city and is an emergent property of governance, planning and

working and living of people in cities. This task will address impacts of supply networks in an urban fabric.

3. Developing urban footprint methodology

The objective of this part is to develop an innovative methodology for the assessment of the footprint of urban metabolism. The aim is to propose an innovative methodology to assess the impacts issued from the urban metabolism. This new methodology will be applied to case studies for cities selected within the project. This key part is to develop a methodology to assess the urban footprints enabling to integrate requirements of urban metabolism. Having identified relevant indicators of urban metabolism, there is a need to convert these indicators into impacts. Impacts from urban metabolism are occurring at various scales: temporal scales (short term impacts as air or water pollution, long term impacts such as land take or climate change) and spatial scales (local, national or global scale). Attempts to aggregate society's metabolic flows at all scale have been initiated and one of the best example is the ecological footprint concept. The concept of ecological footprint is a quite widely known concept and used quite thoroughly at national level with the assessment of country ranks or individual ranking level (calculation of your consumption pattern into your own footprint). However, it is quite a controversial concept as it relies on the conversion of energy consumption and crop productions yield into a virtual spatial unit correlated to CO₂ emissions. Such conversion is often criticized as it is based on questionable assumptions. The main criticism of this approach is that it doesn't address impacts issues such as biodiversity, raw materials depletion and human toxicity for example.

The overall goal of this task is to enhance ecological footprint methodology and adjust it to account also for important impacts of urban metabolism. Development of an aggregated impact indicator will rely on scaling methodologies. Different strategies of scaling will be investigated, including distance to targets methods (for example, distance from a given non renewable energy fraction target) or normalization (when considering benchmarking 16 within a sample of cities for example). Scaling each impact will enable the development of a global indicator

through an aggregation step and is the base of a spatial analysis supported by a GIS solution developed.

4. Visualization of urban impact indicators and developing an interactive web Server

A key issue when assessing urban impacts is the need to develop a specific analysis to assess impacts at various temporal and spatial scales (where are the impacts located?). Impacts are not limited to the urban territory considered and occur also at other even quite remote locations (waste disposal in other regions for example or depletion of raw materials elsewhere).

This spatial analysis will be supported by a GIS solution with the visualization of urban indicators such as the raw material flows (location of the raw material origin, track of the transport routes) and the waste flows and material reuse (within or outside the urban perimeter). Availability of the origin and destination of material flows might affect the range of indicators taken into account before.

The second objective is aimed at developing an interactive map server in order to provide all cities partner's performances. A specific server will be developed enabling for each city use case to visualize the cities urban footprint at several levels:

- For each individual impact indicator (GHG emissions, waste indicators, non renewable energy consumption, etc.);
- At a more global view through the new urban footprint approach developed

5. Ecodesign a new product

6. Comparative of winter rape (*Brassica napus*) cultivations as energy crop to produce Biodiesel in a southern Europe.

The aim will be an assessment that analyses the viability of *Brassica napus* as an energy crop destined to produce biodiesel in southern Europe. The proposed methodology assessment will combine physic variables such as: grain production

and agroclimate conditions with environmental analysis (LCA) in order to determine which Mediterranean agroclimates areas could be cultivated for non-food purposes and which transport distance would be appropriate to ensure a suitable environmental performance of the biodiesel system.

7) Tools development and application in the biomass energy systems.

To develop and to apply tools capable to analyse the biomass energy systems in all aspects of the sustainability: environmental, economic and social. And determining potential national scenarios of biomass production and consumption in Spain.

- To apply, in an integrated way, tools for the evaluation of global environmental, economical and social impacts such as Life Cycle Assessment (LCA), Exergy Analysis (ExFa), Material Flow Analysis (MFA), Life Cycle Cost (LCC), Societal Life Cycle Assessment (SLCA), in order to analyze the life cycle of the energy production considering land data and using different biomass sources (energy crops, forestall biomass, residual biomass).
- To make available indicators for the quantification of local environmental factors associated to energy crops and forestall biomass, such as: biodiversity and soil erosion and risk assessment.
- To build a user-friendly Expert System to decide the best production method of renewable energy from biomass sources considering all aspects: economic, social and environmental.
- To determine potential national scenarios that are more sustainable (environmentally, technologically, socially, and economically) by analyzing all the stages of the life cycle of the biomass (crop, harvest, transport, conversion process, and consumption) and the land uses of the soil using Expert System and GIS.

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Joan Martínez Alier

Applications of the Methods for the Study of Social Metabolism (material and energy flows, human appropriation of net primary production, "virtual" water accounting") in order to understand the causes of Ecological Distribution Conflicts. We have research projects on mining and deforestation conflicts in Latin America and Africa, also on oil extraction in the Amazonia of Peru and Ecuador. This research pays also attention to the languages of valuation deployed in such conflicts, this might include application of participatory multi-criteria evaluation methods. In the European project CEECEC (Civil Society Engagement with Ecological Economics) we are doing research also in rural India. Master theses could also be written on selected topics of environmental history.

Patrizia Ziveri

For the past half-million years or so, ice cores provide high resolution and accurate records of atmospheric CO₂ concentrations, which can be used with other geochemical records to derive reasonable estimates of ocean carbonate chemistry. These estimates indicate that at the onset of the industrial revolution, ocean pH and carbonate mineral saturation states were already at or near their minimum values; hence, the industrial revolution occurred at a time when these ocean chemical parameters were particularly susceptible to being pushed outside the range of natural variability. Calcareous phytoplankton is an important component of the marine carbonate system and dominates carbonate deposition since the Triassic (~220My).

The possible master research projects include:

1. Past episodes of global warming and ocean acidification should be reflected in the paleobiological record because it is dominated by the skeletons of calcifying organisms. A real challenge with interpreting these past records is to uniquely relate effects to causes. Still, the uncertainties about future biological response to

ocean acidification and other climate-related changes encourage us to refine our understanding of these past events. What can we learn from past changes in the Earth system to better understand the consequences of ongoing ocean acidification?

2. In the Late Quaternary record of the Eastern Mediterranean basin, sapropel horizons indicating periodic anoxia have long been recognised. Recent research has shown that these form in response to natural fertilization of the Mediterranean Sea and occur every 23,000 years, suggesting that the forcing mechanism is a precessional modulation of monsoon strength. We aim to reconstruct both, the extent of the response in marine productivity and the supporting nutrient fluxes to climate change. In addition, we monitor changes in the carbon system by analysing a key Mediterranean calcifying marine phytoplankton, coccolithophores. This will be part of a collaborative research project

supported by the European Science Foundation (ESF) (Marine Ecosystem Response to Fertilization, MERF) (<http://www.esf.org/activities/eurocores/programmes/euroclimate/projects/merf-fp35.html>; <http://www.gpi.uni-kiel.de/~sm/Meier/MERF.html>).

3. Coccolithophore-based marine proxies of surface ocean climate change (e.g. $\delta^{18}O$, Sr/Ca) need constant refinement in comparison to other systems (e.g. organic alkenone techniques and planktonic foraminiferal Mg/Ca). We will explore the covariance of these systems in key global ocean areas to ascertain how well they are each recording temperature, plus how they can be used collectively to record related parameters, such as salinity and water column stratification. The culture experiments will be carried out at the Alfred Wegener Institute in Bremerhaven, Germany.

Antoni Sanchez

NANOCLEAN Project

The main objective of this project is to evaluate the potential toxicity of several types of nanoparticles in selected environments. Standard toxicology methods such

as Microtox, biogas potential and germination index will be used. The evaluation of the possibilities of other standard toxicology methods to be included will be experimentally studied. According to the results obtained, one selected nanoparticle (the least toxic) will be assayed for the cleaning of pollutants such as nitrates and phosphates. The work is expected to be finished within 4 to 6 months and will be entirely developed in the Department of Chemical Engineering of UAB, in collaboration with the ICN (Catalan Institute of Nanotechnology).

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Françoise Breton

At the ETC-LUSI, one of our working direction is in the development of adaptation schemes in the Mediterranean basin, identifying some vulnerable areas (or target groups) as pilot for which or where to develop adaptation schemes at the face of climate change impacts(eg. planning, sectoral activities, water management and biodiversity). We are also looking at which kind of initiatives Med countries are developing in this direction to get a better picture of the situation in the Mediterranean basin. We can receive a student to work in a PhD on one of these or other related issues. The work should be done in a spatial and temporal multi-scale perspective highlighting what is relevant at local, regional, national and Mediterranean, even EU scales, and how actions should be coordinated, putted in synergies, etc. The use of the knowledge base developed in our center such as the LEAC accounting methodology, assessment works on EU policies and literature for Climate change impacts and adaptation, GIS techniques, etc will be specially valued.

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M.Rosa Rovira

Keywords: Corporate social responsibility, business environmental management, business sustainability reporting.

Research developments and society enlightenment have moved the challenging topics from environmental management to sustainability and corporate social responsibility. Pioneers business companies have been adapting to continuous environmental requirements the last twenty years, from legislation to stakeholders pressures. Those companies who reached a certain level of development in sustainability and corporate social responsibility issues are now pressing and helping their supply chain to follow the same way. It is a long process to move organisations from the economic performance paradigm to broad one which also includes environmental and social performance.

This project's aim is to investigate the role and the contribution of the process of sustainability reporting as a catalyst for upgrade business companies to a less unsustainable stage.

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	Lliurament de la documentació i la resolució del consorci a l'EP	Revisió de la documentació i elaboració de la resolució	Introducció a sigma i traspàs de matrícula	Tramesa a resolució de la GA	Matriculació	Pagaments
Responsable	ICTA	EP	EP/GA	EP	GA	GE EP
"1 ^a tanda" amb beca	31/03/08	03/04/08	EP 7/04/08	EP 7/04/08	Després de la publicació del Decret de taxes (sempre després del 15.07.08)	15/10/08 (conjuntament amb la 2 ^a tanda)
"2 ^a tanda"	31/07/08	02/09/08*	EP 4/09/08	EP 4/09/08	Abans del 30/09/08	15/10/08
"3 ^a tanda" (2n semestre)	16/02/09 (¿) 10/12/08	19/02/09 15/1/09	GA 26/09/09 (¿) 25/1/09	EP 26/09/09 25/1/09		
Altres matrícules de 2n curs		_____	GA 25/9/08	_____	Abans del 31/01/09	15/02/09