# ENVIRONOMICS JUNE 2009

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## Director's Note

Minister Garrett recently announced the allocation of an additional $264,000 to the EERH. The funds are to be used in the development of additional research projects, in line with priorities specified by the DEWHA as "emerging issues". New projects will include an initiative to be based at Macquarie University under the leadership of Professor David Throsby that will focus on heritage economics. Other projects are being developed in association with fellow CERH Hubs.

The value of biological collections will be investigated in partnership with TRIN based at CSIRO (Black Mountain) and the non-use values of temperate marine biodiversity will be estimated collaboratively with the Marine Biodiversity Hub in Hobart. These and other new projects mark an exciting new directions for the EERH. Future editions of Environomics will contain more details of the new projects.

Another exciting initiative being developed by the Hub is a major symposium to be held on 10-11 September. The topic to be addressed is "Invasive Species and Biodiversity" and the

## Hub researchers part of Adaption Research Network for Marine Biodiversity and Resources – Mission of Markets Theme

Hub Theme Leaders, Professor Quentin Grafton and Professor Tom Kompas have taken on another Theme Leader role as leaders in the Mission of Markets Theme within the Adaptation Research Network for Marine Bidiversity and Reources. The purpose of Mission of Markets, is to facilitate the development of economic tools to assess the adaptive capacity and potential impacts of climate change risks and their roles in the overall vulnerability of marine resource harvesting so that appropriate management strategies can be developed to ensure economically resilient and sustainable fishing practices.

The Markets Theme role within NARN-MBR is two fold:
1.     To facilitate the development of economic tools and methods to (i) predict and estimate the likelihood and effect of adaptation as part of climate change impact assessment and (ii) to evaluate planned adaptation options as part of the policy development process in the marine sector so that appropriate management strategies can be developed to ensure economically resilient and sustainable fishing practices for traditional, commercial and recreational sectors.
2.     To facilitate the development of market-based instruments that can be used to address climate-induced conservation and resource impacts as part of planned adaptation strategies in the marine sector.

Members of the Markets Theme will work closely with other themes within NARN-MBR and with other Networks in order to facilitate the development of integrated, interdisciplinary economic assessment tools and cost-effective market-based adaptation options for the marine sector.

Over the next four years, the Adaptation Research Network in Marine Biodiversity and Resources will work closely with the National Climate Change Adaptation Research Facility (NCCARF) to advance knowledge about climate change adaptation, and adaptation options for stakeholders, of Australia's marine biodiversity and resources. Fostering an inclusive collaborative and interdisciplinary research environment will generate outputs relevant for policy-makers and managers to develop appropriate climate change adaptation responses. Autonomous adaptation by marine species to climate change impacts (e.g., fish swimming from a warming ocean to cooler higher latitudes) is one adaptation response. However, societal attitudes, economic policy, management and governance arrangements can enhance the adaptive capacity of marine biodiversity and

EERH will collaborate with the Australian Agricultural and Resource Economics Society to hold this major event at the ANU.

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resources (e.g., society limiting non-climate stressors such as coastal nutrient waste; ecosystem conscious fisheries management; flexible adaptive management). Marine stakeholder organisations can also be adaptive to climate change risks and impacts.

The Adaptation Research Network in Marine Biodiversity and Resources consists of five inter-connecting themes:
• Integration
• Biodiversity & Resources
• Communities
• Markets
• Policy
These inter-connecting themes will improve our understanding of, and enhance, adaptive capacity of all sectors within the marine space. An integrative model of collaboration, engagement and cooperation that cross-cuts between biodiversity resources, communities, markets and policy (including management and governance) will be developed.

The National Climate Change Adaptation Research Network in Marine Biodiversity and Resources (NARN-MBR) is an interdisciplinary network that is building adaptive capacity and adaptive response strategies for the effective management of marine biodiversity and natural marine resources under climate change. The central aim of the network is to lead Australia's efforts in understanding and adapting to today's emerging climate change needs, while also providing the training ground for the development of tomorrow's interdisciplinary climate change researchers. The network is designed to foster collaborative and creative interdisciplinary research, data-sharing, communication and education, and to help advance and document climate change adaptation knowledge so that policy and decision-makers can develop appropriate climate change adaptation

# Experiences with Tradable – Green-Certificate Schemes in Poland and Romania
## Christoph Heinzel, UNSW

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In a majority of OECD countries, including Australia, the European Union and the U.S. policies are in force to promote the deployment of renewable-energy technologies. Major forms comprise feed-in tariffs, renewable tariff supplements to energy prices, and quota obligation schemes based on tradable green certificates (TGC). Feed-in tariffs specify fixed, often technology-specific tariffs per unit of power from renewable energy sources (RES) provided to the grid. TGC schemes require consumers, or energy suppliers on their behalf, to prove a certain proportion (quota) of their electricity used, or sold, is generated from RES. A regulatory authority issues and distributes green certificates to generators according to their output of RES electricity. RE generators may sell certificates either on a TGC market or via long-term contracts to consumers or retailers, who prove quota fulfillment by submitting certificates to the regulatory authority.

TGC-based quota obligation schemes were conceived in the restructuring debates of the U.S. electricity industry in the 1990s. The Australian Mandatory Renewable Energy Target (MRET) introduced in 2001 was the first national scheme worldwide. Under the currently discussed Expanded National RET, RES power generation shall rise to 20% by 2020. In the European Union, RES support policies have been established in all Member States following EU Directive 2001/77/EC. A 20% RES share target of energy consumption is (besides emissions reductions and increases in energy efficiency) part of its 20-20-20-by-2020 objective. Related to their EU accession Poland and Romania introduced TGC schemes in 2006 and 2005, respectively. Generating 95% of its electricity from coal, 2% from gas, 3% from RES, Poland was in 2007 EU's forth largest emitter with 210 Mt $CO_2$. Romania, with 40% of its power from coal, 17% gas, 13% nuclear, 2% oil, 28% big hydropower plants, was EU no. 10 with

70 Mt $CO_2$. (Poland with 38m inhabitants (EU no. 6) had in 2007 a GDP of EUR 308bn (EU no. 7), Romania with 21.5m inhabitants (EU no. 7) a GDP of EUR 121bn (EU no. 17).) With their schemes Poland aims at an RES share of 10.4% in 2014, Romania at a share of additional RES power of 8.3% by 2012.

In an upcoming study we show that both the Polish and the Romanian RES support systems provide clear incentives for investors to expand, especially, wind-power generation capacity. With their ambitious expansion targets, the schemes already led to considerable expansions of RES deployment. In both cases it seems unlikely, if not impossible, that the RES quotas as currently specified for the next years can be fulfilled. The TGC spot market price should hence remain near its effective upper bound. Further additional deployment of RES installations can be expected in the next years.

Despite the success of the RES-support policies in both Poland and Romania with respect to the expanded RES use, a surprising neglect in both the European discussion and the scientific literature on TGC concerns the question of what the implementation of policies for the promotion of the deployment of RE technologies actually justifies. From a welfare-economics perspective, every policy intervention needs to directly target at the correction of a market failure at its source. However, the two major candidates mentioned in support of these policies in the literature – the emissions externality and social learning effects from technology production – fail to apply in a context where an emissions trading scheme (ETS) is available. The social costs of carbon pollution can, and should, be directly internalised via the emissions trading scheme. If social learning effects in technology production can be proven, a supportive policy (e.g., a subsidy) should rather target directly the technology-producing companies. Also disadvantages arising for RES after market liberalisation can hardly be referred to, because the very idea of liberalised markets, if well regulated, is just to create fair market conditions for any kind of technology. The situation was different as long as measures directly targeting sources, such as emissions trading, were not available. In their absence the support of specific low-pollution technologies can be justified in a so-called second-best sense.

If policies supporting the deployment of RE technologies remain in place under an emissions trading scheme, no additional emissions reductions can be achieved below the cap set by the ETS. Rather additional costs will arise due to the use of more expensive generation technologies ultimately borne by the final consumer. For example, with respect to the (structurally equivalent) case of the German feed-in tariff system, Frondel et al. (2008, Energy Policy) calculate that the abatement of 1 tonne $CO_2$ via photovoltaics (PV) costs about EUR 760 (the EU-ETS price historically peaked at EUR 30). The cumulated subsidies only for PV in Germany since the introduction of the scheme in 2000 until 2007 amounted to about EUR 26.5bn, to which by 2010 another EUR 27bn will add. Also for Poland and Romania massive cont'd Page 4


*David Stern presented at the AARES Conference in Cairns in February*

# Introducing David Stern

David started working in March on a new subproject within the Hub project on "Improving Australia's energy efficiency through faster development and adoption of technologies" in the climate change analysis theme. His subproject looks at international trends in energy productivity and the factors that explain differences in energy efficiency among countries as well as the implications for carbon emissions.

David recently moved back to Australia from the United States where he was an associate professor in the Department of Economics at Rensselaer Polytechnic Institute in upstate New York. He was previously at A.N.U. between 1996 and 2002 as a research fellow in CRES, which is now part of the Fenner School of Environment and Society. He got his Ph.D. from Boston University in 1994. David's research has focused on the role of energy and resources in economic development, air pollution and climate change.

The Hub project is the latest stage in David's research on alternatives to the environmental Kuznets curve (EKC) – the hypothesis that emissions of pollutants and environmental degradation first rise and then fall as countries develop economically. He has published a number of papers on the topic, three of which are among the ten most cited papers on the subject according to Google Scholar. His research has criticized the EKC as an incomplete model with poor statistical properties and proposed alternative modelling frameworks.

While income per se does not seem to be a particularly strong force for reducing emissions of pollutants or other environmental impacts, research shows that technological change is a very important factor in reducing the environmental impact of economic activity. Critically, countries converge faster in technology than income. Many anecdotal examples are available such as China's adoption in 2004 of tougher fuel efficiency standards than the United States and its adoption in 2008 of the European Union's 2005 emissions standards.

David received funding from the U.S. Environmental Protection Agency and the Commission for Environmental Cooperation in North America to develop an alternative model using a production frontier approach estimated as a structural time series model. This allows us to estimate the state of environmental technology in each country while controlling for the country's economic structure. We can also distinguish between the global best practice technology and the distance each country is from that frontier. In a 2005 paper in the Journal of Environment and Development on sulfur emissions in developed economies, David carried out an exploratory analysis of some of the factors that might lead countries to adopt different levels of environmental technology. The results suggest that environmental policy is endogenous – countries where pollution and the number of people affected would be high in the absence of policy adopt more stringent policies.

In the absence of significant sequestration, carbon intensity (emissions per dollar of GDP) is determined by fuel mix and energy productivity. Therefore, the project will focus on modelling energy productivity. The first stage of the project will estimate a production frontier model using data from developed and major developing economies – especially China – from the 1970s to the mid 2000s that decomposes energy intensity into structural and technological change.

The second stage will use the estimated energy efficiency

technology trends to test leading theories about the choice of technology. This will allow us to both explain past trends in carbon emissions and energy efficiency and provide important inputs for the projection of future trends.

The results should be of interest both to researchers who want to understand the factors affecting trends in energy efficiency and practitioners who want to project future carbon emissions

*An overview of the project is available in EERH Research Report No. 20 'Modelling the Global Diffusion of Energy Efficiency and Low Carbon Technology'. For more information about David's other research and publications please visit his website at http://www.sterndavidi.com*

## Tradeable Green Certificates continued from Page 3

over-investments especially in wind power can be expected, along with excessive power prices, no additional abatement below the cap and a negatively biased carbon price taking abatement pressure from polluting technologies. Whether implemented emissions trading schemes drive investment in clean technologies sufficiently, which in view of a EUR-10 carbon price under the EU ETS seems doubtful, is a different question. It refers to the design of the ETS, not to additional measures.

Ongoing research at CEEM studies the Australian conditions in view of the planned Carbon Pollution Reduction Scheme, as well as the presence of further justifications for RES support policies, such as social learning effects in the Australian PV industry, and their policy implications.

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strategies to build adaptive capacity. The network comprises a holistic framework that cross-cuts climate change risk, marine biodiversity and resources, socioeconomics, policy and governance, and includes ecosystems and species from the tropics to Australian Antarctic waters.

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