

## **Innovation for energy and climate security: Smart green growth** *Dr Peter Johnston<sup>1</sup>*

In the light of the need for sustained economic growth in Europe, a new direction must be given to European leadership on energy and climate security. The risks of energy or climate disruptions are as great, if not greater than ever. Smart, green growth is the way forward, but to achieve this, European policies must shift to an innovation-centred approach in partnership with consumers and the progressive business community.

The Copenhagen agreement recognised the need to stabilise concentrations of greenhouse gases in the atmosphere at levels that will avoid an average surface temperature rise of more than 2 degrees C. However, the latest scientific assessments in 2009-10 indicate that concentrations are already near this level. Therefore the whole carbon cycle of emissions to and removals from the atmosphere will need to be re-balanced with action to enhance natural removals and sequestrations as well as reductions in emissions.

Management of green-house gas concentrations is inextricably linked to energy security through much more efficient use of energy everywhere and a new diversity of indigenous energy supplies in all regions. It is also inextricably linked to sustaining bio-diversity in forests and wetlands, the natural stores of bio-sequestered carbon, and reserves of fresh water.

The European and international debate must be about opportunities and strategies for a better life in all countries. Innovation to drive “green growth” must be at the heart of this strategy. Europe can lead in innovation and investments which offer solutions which are effective, sustainable, multi-purpose and carry the support of key businesses and communities in the world. We therefore need a new approach for a partnership between business leaders, legislators, civil society and Governments, each contributing to transformation in their own way.

Information and communications innovations are crucial to the changes we need – to Smart systems, and greater awareness by everyone of the impacts of their activities. Investment in ICT innovations is still the greatest driver of change, and the leading ICT companies are leaders in energy-efficiency and reductions in carbon emissions. **However, energy and climate security must be now put at the heart of public policies for ICT innovation.**

### **Revisiting targets for climate and energy-security**

To meet temperature change and GHG concentration targets, a strategy for rapid reduction in “net emissions<sup>2</sup>” will be needed. The European 2020 emission targets will have to be reviewed as scientific evidence and the international framework evolves. However, the

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<sup>2</sup> Total anthropogenic emissions, less sequestrations additional to those from natural systems associated with deliberate forestry and wetland management or specific agricultural practices.

effectiveness of the Emissions Trading System must also be critically re-assessed: It has not generated a sufficiently stable “carbon price” to affect investment and cut emissions. It affects only about 40% of production-based emissions and is unlikely to be replicated globally. It will not be sufficient to simply trade emission permits between larger emitters in industrialised countries: 75% of emissions are related to discretionary consumption, and all consumers will need to be enabled and encouraged to change consumption patterns.

The effectiveness of emission targets will depend on the strength of a portfolio of policies to accelerate transformational change: Support for RTD and innovation, transformation of public administrations and government services, and pulling-through innovations by billions of personal, informed choices in our daily lives. Regulation and financial incentives must be complemented by other measures such as the labelling of products and services with their energy-efficiency and “net carbon footprint” at the point of sale; and net-carbon emission reporting by companies to let investors take carbon-related risks into account.

Whatever the approach, an economic cost must be associated with carbon emissions<sup>3</sup>. **To stabilise GHG concentrations, the real price of emitting a tonne of carbon dioxide will eventually need to be the cost of removing it again.** Carbon emissions must eventually be matched by removals. We know that the natural stability of green-house gases has been assured by a balance between geological emissions and bio- and geo-sequestration. Such a balance must be restored. We know that bio-sequestrations in forests; wetlands and soils have the potential to match natural and enhanced emissions. We know that they can be enhanced by appropriate forestry and agricultural practices, and can be scalable to the billions of tonnes, at affordable costs (20-100 Euros/tonne), if we engage most farmers and forest and wetland managers in the world.

**The market of emissions and removals must eventually be global, and must assure a stable and predictable “carbon emission price”, related to the real cost of removals.** However, markets must be first created at local and regional level, and must be open to a very large number of participants – most or all emitters and sequesters of carbon dioxide. Wider markets can be built progressively from local, national and sector initiatives, with clearing mechanisms at regional and global levels. Only when such regional markets are mature and stable can they effectively be interlinked through global clearing systems. Europe cannot simply extend its own market to other regions.

There is now abundant experience on which to build: The European Emissions Trading Scheme; the Clean Development Mechanism (CDM), and various “Carbon off-set” frameworks, both public and private. However, to build on these, it will be necessary to bring carbon-capture, storage and sequestration within a wider framework of certification. For millions of companies and individuals to participate directly in markets, Governments will need to assure **certification for both carbon emissions and sequestration**, and standards for reporting and labelling, in collaboration with business and NGO alliances<sup>4</sup>.

A market in which carbon emissions are traded and balanced with removals could provide stability and predictability, essential for investment and innovation; stimulate innovation and investment in both energy efficiency; low-carbon energies and bio-sequestration; protect bio-

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<sup>3</sup> Only carbon dioxide. A separate and parallel framework may be needed for methane because of its radically different residence-time in the atmosphere and different emission and absorption mechanisms. HFC would be better dealt with in the Montreal Protocol.

<sup>4</sup> Such as the Forestry and marine stewardship councils.

diversity by valuing eco-systems services, and rebalance investments between developed and developing countries and between urban and rural areas, to the benefit of equitable human development.

## **Re-directing innovation and investment**

It is essential to encourage and enable the business and investment communities to accelerate investments in innovations for three areas of transformational change:

**Smart green growth is firstly about energy efficiency.** Most of the reductions in European emissions by 2020 will come from improvements in efficiencies. Technologies for radical improvements exist, but are not widely enough used. Their potential goes beyond incremental improvements in the efficiencies of existing products and services. IT and electronic communications offer radical changes in the way services are provided; in new business models and services that substitute for traditional ways of doing things, and in making more intelligent use of energy in homes, offices and cities<sup>5</sup>. **The ICT sector is the motor of innovation capacities and has over 2 billion customers worldwide. It is also spinning-off more efficient lighting systems, solar energy and smart-grid technologies that can help meet our needs more efficiently.** Enormous new investments are needed to exploit new opportunities in all societies, but can now be a key role in accelerating recovery from the current economic and financial crisis.

The opportunities for ICT-based green growth have been addressed by an EPC Task Force, from which the report is now published<sup>6</sup>. The Task Force urges new action to put three critical infrastructures in place:

- A carbon accounting infrastructure to make energy use and carbon emissions visible to all;
- A smart electrical power grid system to accommodate new demands for renewable energy, energy efficiency and consumer empowerment, and
- high speed broadband access to the Internet to support a new range of efficient on-line services.

This will require sustained investment, and Governments must create the regulatory frameworks and partnerships within which such investments are secure. In addition, the Task Force suggests mobilising ICT-based innovations in transport and logistics: smart buildings and smart green cities, and also stresses that the numerous dispersed initiatives for smart, green growth must be brought together in a coherent and synergetic framework.

**In the longer-term (2020-50), low-carbon and renewable energy sources have the potential to progressively substitute for fossil fuels.** Solar (thermal and voltaic), wind and bio-fuel technologies open up radically new ways of meeting energy-demand in all communities worldwide, even in the poorest: Bio-fuels could meet a substantial share of demand in Latin America: Wind energy generators could meeting a significant and growing part of demand in Europe and the US; and beyond 2020, solar thermal generators could meet a large share of demand in North Africa and other deserts<sup>7</sup>. In some regions, it may be possible and economic to continue to use oil, gas and coal, but with direct geological storage

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<sup>5</sup> [www.smart2020.org](http://www.smart2020.org) and <http://www.aeanet.org/publications/publicationsstart.asp>

<sup>6</sup> EPC Working Document 33, Economic recovery to a greener economy: Mobilising ICT innovations; February 2010

<sup>7</sup> [en.wikipedia.org/wiki/Trans-Mediterranean\\_Renewable\\_Energy\\_Cooperation](http://en.wikipedia.org/wiki/Trans-Mediterranean_Renewable_Energy_Cooperation)

of the effluent carbon-dioxide stream. Technologies for a diverse mix of de-centralized low-carbon energy supply are therefore becoming available, but huge sustained investment is needed to make them affordable in all countries

**Technologies for removal and sequestration of carbon from the atmosphere exist.** Agricultural practices and forest management practices have been demonstrated at a sufficient scale and can remove and fix carbon at an affordable price. The most promising mimic biological processes<sup>8</sup>. The business and investment capacity for large-scale carbon removal and sequestration exists: The business of agriculture can become the production of food and fuels, and the removal of greenhouse gases from the atmosphere. The business of forest management can become the production of food, clean water, fuel, wood, and the fixing of greenhouse gases. The business of wet-land management can become water management, bio-diversity and flood protection, and the fixing of greenhouse gases. However, none of these opportunities will be realised without a “carbon market” that values the eco-service of carbon sequestration.

## **Building confidence in the future and re-stimulating investment and economic growth**

Recovery from the 2008-9 financial and economic crisis will require co-ordinated efforts to re-build confidence in the stability of the world economy, and in our ability to meet the challenges of energy and climate security: We need confidence in our ability to innovate and manage markets; and confidence to invest in new infrastructures and technologies; with the investments amortised against the future revenues that will be generated for a stable, more prosperous and more equitable world economy.

The investments required will be large: Some tens of trillions of Euros over the next 2-3 decades. However, these investments are both realisable and economically viable if shared widely by millions of businesses and billions of individuals – as has been the case for the collective investments in Internet and mobile telephony infrastructures and equipment in the last 15 years. Governments must provide an environment conducive to these investments: Clear and stable targets; sound markets, a stable financial system and effective research and innovation frameworks.

We now know that there are limits to current development patterns. However, a new opportunity for smart growth is within reach: it will require a partnership between business leaders, legislators, civil society and Governments, each contributing in their own way.

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<sup>8</sup> [www.biomimicryinstitute.org/institute-bio.htm](http://www.biomimicryinstitute.org/institute-bio.htm) and [www.amazon.com/Upsizing-Gunter-Pauli/dp/](http://www.amazon.com/Upsizing-Gunter-Pauli/dp/)