# 2015 Green Growth and Sustainable Development

# Enabling the next industrial revolution: Systems innovation for green growth

## Initial Summary of Discussion Points

### *Day 1 – Monday, 14 December 2015*

**Opening Session: Innovation and Green Growth**

Moderator: **Kumi Kitamori**
Head of Division, Green Growth and Global Relations, OECD

Opening Remarks**: Angel Gurría**
Secretary General, OECD

Key Note Speaker: **Eric Beinhocker** (United Kingdom)
Executive Director, Institute for New Economic Thinking (INET), Oxford Martin School, University of Oxford

Scene-setting Presentation: **Jong-Won Yoon**
Korean Ambassador to the OECD

**Initial Summary of Discussion Points**

**Best Practices:**

- "Tegway" – wearable battery (Korea)
- Carbon-free islands (Jeju, Korea)
- Eco-Friendly Energy Towns (Hongcheon, Korea)

**Knowledge Gaps & Future Work Priorities:**

- Shifting R&D and subsidies to clean energy technology
- Full disclosure of stranded asset risks in the financial system
- Global implementation of air quality and public health regulations
- (Beinhocker) G20 Commitment "Wish List"
  - o commitment to "net-zero" / end fossil fuel subsidies / no new fossil fuel investment / increase clean energy R&D
- Incentives / regulatory predictability / policy misalignments
- Fostering international cooperation

## Session 1: Capturing Innovation Complementarities for Green Growth

***Joint Session with the Working Party on Innovation and Technology Policy (TIP)***

Moderator: **Jerry Sheehan** (United States)
Assistant Director for Policy Development, National Library of Medicine and Chair of the Working Party on Innovation and Technology Policy (TIP) under the Committee on Scientific and Technological Policy (CSTP)

Maximising the benefits associated with the need to make the transition to a much more resource efficient and low carbon economy requires a co-ordinated strategy between policies for green growth and policies for innovation. This is particularly true in the context of urban development, where network externalities, sunk costs, and sectoral complementarity are rife. A significant issue here is how to ensure that innovations progress in a complementary manner, allowing for the exploitation of synergies. Technological, process or institutional innovations in any domain can be mutually reinforcing and support the economic transformation needed. Examples can be found in sectors such as agriculture (e.g. food-fibre production), water and energy (e.g. water, energy, food nexus) as well as more targeted areas such as SMART cities, urban transport systems, or energy for buildings. But innovation in one area, for example, gas extraction, can arguably delay innovation in other areas (e.g. cleaner energy). How can a more systematic approach be developed that breaks down path dependencies and effectively combines the objectives of green growth and innovation policies?

Keynote Presentation: **Jan Rotmans** (Netherlands)
Professor, Dutch Research Institute for Transitions, Erasmus University

Speakers:

- **Zhaoyuan Xu** on behalf of Zhao Changwen (China)
  Director-General, Department of Industrial Economy, Development Research Center of the State Council (DRC)
- **Philippe Sajhau** (France)
  Vice President of Smarter Cities, IBM France

Discussant:

- **Frank Geels** (United Kingdom)
  Professor of System Innovation and Sustainability, Manchester Business School

### Initial Summary of Discussion Points

**Best Practices**

- "Green Chemistry Campus" (SABIC, Netherlands)
- Waste Management in Nice – traffic and routing data
- Water Management in Africa – citizens reporting leaks

**Knowledge Gaps & Future Work Priorities**

- Better identify and address barriers and misalignments
- Upscaling and implementation of best practices
- Green transitions within companies and organisations – incumbents as solution
- Use of real time and predictive data
- Role of citizens as sensors
- Understanding firms as multi-dimensional
- Analysing multiple innovations (as opposed to single technologies)

## *Day 2 – Tuesday, 15 December 2015*

### Session 2: Emerging Technologies & Firm Dynamics: Implications for Green Growth

Moderator: **Erik Fahlbeck** (Sweden)
Chief Analyst, Swedish Ministry of Enterprise and Innovation and Chair of the OECD Committee on Industry, Innovation and Entrepreneurship (CIIE)

Responding to global challenges such as those associated with addressing climate change, preserving biodiversity, and increasing water scarcity will require continuous incremental improvements in existing technologies. However, this also needs to be supported by more radical innovation, particularly for pressing and potentially irreversible environmental outcomes. Unfortunately, relatively little is known about the policy conditions which lead to breakthrough innovations that in turn lead to a significant change in the trajectory of economies toward green growth. The balance in the use of supply-side measures which support research efforts and demand-side measures such as procurement, advance commitments, and prizes as well as the right policy mix to induce both incremental (i.e. short-run) and radical breakthrough innovations (i.e. long-run) need to be considered.

In addition, new firms are the vehicles through which many disruptive technological innovations and innovative business practices enter the market. Since the transition to a "greener" growth trajectory is likely to require such disruption, the role that policy conditions play in affecting firm entry and post-entry growth is particularly important in this domain. Similarly, some policy settings – including environmental policy settings – can unwittingly discourage the exit of less productive and more polluting incumbents.

Keynote Presentation: **Gregory Nemet** (United States)
Associate Professor, LaFollette School of Public Affairs
University of Wisconsin-Madison

Speakers:

- **Marjolein Helder** (Netherlands)
  CEO, Plant-e
- **Dermott Crombie** on behalf of Paul Camuti (United States)
  Senior Vice President, Innovation and Chief Technology Officer, Ingersoll Rand
- **Florian Egli** (Switzerland)
  Mercator Fellow on International Affairs

#### Initial Summary of Discussion Points

**Best Practices**

- Japanese government plans/support for electronics and semiconductors

**Knowledge Gaps & Future Work Priorities**

- Role of government procurement in supporting green innovation
- Government approach to failures – perverse incentives in bureacracies
- Characterization of the social returns to innovation
- Credibility of policy signals – trust in government (i.e. expectations)
- Engaging industry in establishing policy targets / regulation
  - Ambition vs. credibility
  - Ensuring new entrants are considered / supported / engaged
- Determining how actors establish perceptions and expectations
- How and when to "sunset" government support
- Evaluate technology potential and analyse policies effect on firm age/size

## Session 3: The Role of New Data Sources in Greening Growth

Moderator: **Vincent Champain** (France)
President, Long Terme Observatory

The growing number of unconventional data sources ("big data", satellite images etc.) has opened up new possibilities to green our growth trajectories, both for market participants and for public authorities. Optimizing resource use and reducing environmental externalities can increasingly be pursued by using these new sources of data. However, there are technical, regulatory and policy implications that need to be considered in addition to the collection and confidentiality of the data.

Energy and transport sectors have seen growing "green" applications of such data and information technology in recent years (e.g. smart metering) and emerging lessons will be discussed. The session will also consider a case study on big data and the use of drones in greening agriculture. This case study will consider how a green agricultural revolution could be created based on more precise access and use of information that can be used to optimise the use of resources for food production. Consideration will be given to the technical and regulatory implications (e.g. regulation of drones), how data can affect how farming is done (e.g. impacts on farm size, growing role of data consultancy and software firms), as well as the role these innovations can play in policy design (e.g. monitoring farm practices, crop insurance – assessment of claims to estimate losses and thus indemnities).

Speakers:

- **Lammert Kooistra** (Netherlands)
  Assistant Professor, Laboratory for Geo-information Science and Remote Sensing, Wageningen University
- **Sachiko Hayashida** (Japan)
  Professor, Faculty of Science, Nara Women's University
- **Ick Hoon Choi** (Korea)
  Director of Korea Environmental Cooperation (KECO)
- **Luis Munuera**
  Smart Grids Technology Lead, International Energy Agency (IEA)

### Initial Summary of Discussion Points

**Best Practices**

- Use of drones for sustainable agriculture (e.g. efficient use of pesticides)
- Satelite measurement and remote sensing of GHG emissions (Japan)
- Using data to improve water supply management (Korea)
- Smart Grids for decentralized electricity generation and storage – realtime PV project approval (Germany) and reduced infrastructure investment (Hawaii)

**Knowledge Gaps & Future Work Priorities**

- Use of drones to collect information on environmental outcomes (e.g. nitrogen monitoring) as opposed to inputs (e.g. fertilizers, pesticides)
- Consumer responses to new technology (privacy, security, responsibilities)
- Integration across technologies & disciplines (including data & terminology)
- Integrating environmental data with social data (health, opinions etc.)
- Managing unstructured data (80% of world's data)
- Understanding market structure changes caused by new technologies

## Parallel Session A:

### *Emerging technologies – risk, trust and public engagement:*

Emerging technologies hold great promise for enabling more sustainable energy, transport, water and agricultural systems but they also present risks and unknowns for health, environmental safety, and livelihoods. Furthermore, different technological choices imply divergent visions of a greener society. Risks, unknowns, and value trade-offs have made the introduction of new technology controversial, and have presented governments difficult regulatory questions around, e.g., nuclear power, GM, and nanotechnology. This session will examine how governments and other actors might best manage the ethical, regulatory, and social questions surrounding emerging technologies. What have we learned about the challenges and pathways of assessing and managing technological risks? How should regulatory systems incorporate both robust evidence and social concerns as they seek to ensure health, safety, and public trust? How are new forms of governance being explored to guide governments, industry actors, and publics towards a better system of technological adoption?

Moderator: **Jim Dratwa** (Belgium)
European Commission, Directorate-General for Research and Innovation

Speakers:

- **René von Schomberg** (Netherlands)
  Directorate-General for Research and Innovation, European Commission
- **Jeremy Ouedraogo** (Burkina Faso)
  Head of Plant Genetics and Biotec Laboratory, INERA/CNRST Ouagadougou
- **Andy Stirling** (United Kingdom)
  Professor of Science & Technology Policy, University of Sussex

**Initial Summary of Discussion Points**

**Best Practices**

- Orient R&D in terms of social goals rather than individual technologies
- Goals should be informed by participatory processes with multiple stakeholders
- Consultation with user communities – engaging at different stages
- Policies should foster experimentation & bottom-up efforts (social innovations)

**Knowledge Gaps & Future Work Priorities**

- Assessing engagement mechanisms
- Lack of data and frameworks for assessment of technological futures
- Lack of information on societal attitudes towards technology
- How can SDGs inform existing “green” indicators and measures?
- Historical assessment of systems transitions (socio-technological lessons)
- Build the capacity of regulatory agencies - public trust and barrier reduction
- Database/platform on regulatory capacity within Africa
- Assess bottom-up innovations
- Lack of impact analysis data

## Parallel Session B:

***International cooperation in research and technologies***:

Just as the costs of many environmental damages cross borders, the benefits of innovation which mitigate such impacts are shared. This session would look at mechanisms and incentives for international research, cost and knowledge-sharing (e.g. international data and study repositories). The role of "open science" in the internationalization of research efforts related to international/global challenges would be addressed.

Moderator: **Roland Sommer** (Austria)
Vice-Chair of BIAC Committee on Innovation and Technology
Director of Public-Private Affairs, AVL

Speakers:

- **Pranab Baruah** (India)
  Senior Knowledge Manager, Knowledge Solutions Division, Global Green Growth Institute
- **Marcos Alegre** (Peru)
  Executive Director, Grupo GEA/CER, President RECPnet
- **Asaf Tzachor** (Israel)
  Head of Strategy, Ministry of Environmental Protection

### Initial Summary of Discussion Points

**Best Practices**

- Green Growth Knowledge Platform (knowledge sharing)
- Green Growth Best Practice Initiative (knowledge sharing)
- European Technology Platforms

**Knowledge Gaps & Future Work Priorities**

- Assessment of R&D agreements (bilateral, plurilateral)
- Indicators (incl. grassroots and social)
- Accessibility and availability of data – allowing for decision-making
  - Behavioral economics for consumption data + evidence approach
  - Systemic inventive thinking
  - Design thinking
- R&D agreements often limited to technology (capacity building)
- Which education level should be targeted to change mindsets?
- Lack of cooperation with African countries on renewables (e.g. solar)

## Parallel Session C:

### *Innovation measurement and learning:*

Assessing the benefits associated with the development and adoption of existing technologies is far from straight forward. Looking forward, the measurement issues become even more difficult. Moreover, while governments are actively supporting a number of technologies with a view to supporting green innovation, the links between emerging technologies and environmental outcomes are uncertain. How can green innovation be effectively measured? How can a stable policy environment be provided against a backdrop of changing information? How to design policy "exit" when evaluations indicate support measures should be removed (in cases of failure and success)?

Moderator: **Teimuraz Murgulia** (Georgia)
First Deputy Minister, Ministry of Environment and Natural Resources Protection

Speakers:

- **Lucas Porsch** (Germany)
  Senior Fellow, Ecologic Institute, Project NETGREEN – Network for Green Economy Indicators
- **Jose Pineda** (Venezuela)
  Adjunct Professor, Sauder School of Business, University of British Columbia (Venezuela)
- **Antoine Dechezleprêtre** (France)
  Associate Professorial Research Fellow, Grantham Institute on Climate Change and the Environment, London School of Economics

**Initial Summary of Discussion Points**

**Best Practices**

- Patent data and R&D spending (environmental outcomes)
- Impact chain measurement
- Integrated measurement framework
- Monetizing pressure changes

**Knowledge Gaps & Future Work Priorities**

- Limited data available
- Limited use of indicators
- Defining innovation and “green” innovation
- Determining measurements of systems innovation
- Ensure data/indicators are useful in decision-making (compariblity, focus)
- Continue to consider new options and approaches for measurement
- Consider as a future Forum topic as opposed to a parallel session

## Reporting Back From Parallel Sessions and Closing Remarks

Moderator:

- **Simon Upton**, Director, Environment Directorate, OECD

Reporting Back From Parallel Sessions: Moderators from Parallel Sessions A, B and C:

- **Jim Dratwa,** European Commission, Directorate-General for Research and Innovation
- **Roland Sommer,** Vice-Chair of BIAC Committee on Innovation and Technology
- **Teimuraz Murgulia,** First Deputy Minister, Ministry of Environment and Natural Resources

OECD Response and Next Steps:

- **Andrew Wyckoff**, Director, Science, Technology and Innovation, OECD

Closing Remarks

- **Rintaro Tamaki**, Deputy Secretary-General, OECD

### Initial Summary of Discussion Points

**Knowledge Gaps & Future Work Priorities**

- Prizes and incentives – green growth solutions likely to come from outside the energy and environmental fields
- Intellectual Property Rights (IPRs) are now mainstreamed and are the future source of rents in a dematerialising world
- Incumbency beyond firms – regulations, scientists, institutions
- Technological and non-technical innovations
- Oceans economy – green and blue growth
- Differentiated innovation policies
- Mapping R&D on topic areas (CSTP Ministerial Declaration)