Addressing Technology Transfers in the Global Climate and Energy Agendas 2015-2030

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French High Council of Economy, Industry, Energy and Technology

PICMET’2015 Conference : « Management of the Technology Age »
Portland (OR) 2-5 August 2015

Summary of the Presentation

- **Introduction to « Technology Transfer » Stakes from a Climate and Energy Global Agendas Perspective**
  - Part. I  **Until Now**: Setting the « Technology Transfer » Scene under the Climate Change Negotiations (UNFCCC). Towards COP21 Paris Dec. 2015
  - PART II  **Beyond 2015**: The UN 17 Sustainable Development Goals (SDGs) and the STI/Technology Transfer contribution to the Global Agendas. New-York (Sept. 2015)
- **Conclusion**: Strengthening International Cooperation in Technology for SDGs Global Positive Impact
Technology Transfer Mechanisms, Technology Needs and Needs Assessment: UNFCCC* Definitions

- **Mechanisms for Technology Transfer** are made to facilitating the support of financial, institutional and methodological activities:
  
  - (a) to enhance the coordination of the full range of stakeholders in different countries and regions;
  
  - (b) to engage them in cooperative efforts to accelerate the development and diffusion through technology cooperation and partnerships (public/public, private/public and private/private);
  
  - and (c) to facilitate the development of projects and programs to support such ends.”

- **Technology Needs and Needs Assessments** are “a set of country-driven activities that identify and determine the priorities.

  - They involve different stakeholders in a consultative process to identify the barriers to technology transfer and measures to address these barriers through sectoral analyses.

  - These activities may address soft and hard technologies, such as mitigation and adaptation technologies, identify regulatory options and develop fiscal and financial incentives and capacity-building.”

* UNFCCC stands for United Nations Framework Convention on Climate Change.

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Perception of RISKS 2015 / World Economic Forum

**Climate Change:**
Addressing a Matter of High Concern in case of Failure to adapt.
Why addressing Technology Transfers in International Agendas now?

A matter of Behavioral - significant - Change

Because of the tremendous potential contribution and impact of STI / Technology and Management of the Technology Age, to Stakeholders’:

- **AWARENESS**: Building an international consensus
- **READINESS**: Aligning Stakeholders and policies agendas:
- **RESPONSE**: Action, Compliance, Feedback and Improvement.

- **and EVALUATION**: *On going* Feedback with relevant Information Systems, Predictive Models and relevant use of Big Data for multi-level Governance Continuum.

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**Setting the Scene (I):**

Gt CO₂ Emissions 1970-2012

![Graph of Gt CO₂ Emissions 1970-2012](F.Roure__PICMET_Portland_2015-08-03)
Setting the Scene (2): Making efforts?
Impact Order of Magnitude of Emissions Reduction 2025 - 2050

<table>
<thead>
<tr>
<th>Year</th>
<th>Median (Gt CO₂)</th>
<th>Relative to 1990 emissions</th>
<th>Relative to 2010 emissions</th>
<th>Range (Gt CO₂)</th>
<th>Relative to 1990 emissions</th>
<th>Relative to 2010 emissions</th>
</tr>
</thead>
<tbody>
<tr>
<td>2025</td>
<td>47</td>
<td>+27%</td>
<td>-4%</td>
<td>40 to 48</td>
<td>+8 to +30%</td>
<td>-2 to -18%</td>
</tr>
<tr>
<td>2030</td>
<td>42</td>
<td>+14%</td>
<td>-14%</td>
<td>30 to 44</td>
<td>-19 to +19%</td>
<td>-10 to -39%</td>
</tr>
<tr>
<td>2050</td>
<td>22</td>
<td>-40%</td>
<td>-55%</td>
<td>18 to 25</td>
<td>-32 to -51%</td>
<td>-49 to -63%</td>
</tr>
</tbody>
</table>

Notes: Since current emissions are 54 Gt CO₂ and rising (see Section 4 of the Summary), substantial emission reductions will be needed to reach these levels.

Source: UNEP The Emissions Gap Report 2014

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World Bank Group (WBG) Warning:
The later Decarbonization of Development, The faster the rate of GHS Cuts needed (2°+ scenarios)
Energy Agendas.
« King Coal » : Production and International Trade

Source: International Energy Agency /IEA

Energy Agendas: Oil production in the USA 1983-2014

**Technology Transfers as a solution: Which Ones?**

Lucile Clerc, L’Obs 2015-07-9

**Clean Technologies for Energy: Conditions for Transfer?**

*Source: REN21 Renewables 2015 Global Status Report*
Are We Resilient to Climate Change?
What would we need to improving Global Resilience?

OECD Working Definition of RESILIENCE: Capacity of an economy to reduce vulnerabilities, to resist to shock and to recover quickly.

Source: OECD 2015. «Resilience, a framework analysis»

Reminder: Major Oil Supply Disruptions

Source: www.iea.org
Measures of Ex-ante and Ex-post Resilience and the Potential Role of Technology

**Ex-ante resilience**
- Lower vulnerability to shocks
  - Vulnerability indicators:
    - Financial sector imbalances
    - Non-financial sector imbalances
    - Asset market imbalances
    - Public sector imbalances
    - External imbalances
    - International spillovers, contagion and global risks

**Ex-post resilience**
- Higher resistance to shocks
  - Recession amplitude
  - Recession duration
  - Maximum negative output gap
- Quicker recovery following a shock
  - Returning to previous peak
  - Returning to pre-crisis trend
  - Closing the output gap
  - Returning to counter-factual estimate of potential “had the crisis not happened”
- Lower overall costs of crises
  - Cumulative output loss relative to previous peak
  - Cumulative negative output gaps
  - Cumulative negative output gaps relative to counterfactual estimate of potential “had the crisis not happened”
  - Indicators to gauge the impacts of shocks beyond GDP (e.g., unemployment, long-term unemployment, poverty, etc.)

Source: Id. OECD 2015

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Beyond 2030: Increases in Energy demand for SPACE COOLING after accounting for CLIMATE CHANGE

Strengthen energy sector resilience to climate change

Past energy demand patterns cannot serve to plan future energy systems.

<table>
<thead>
<tr>
<th>Region</th>
<th>Additional 2035 to 2050</th>
<th>2035</th>
</tr>
</thead>
<tbody>
<tr>
<td>China</td>
<td>20%</td>
<td>5%</td>
</tr>
<tr>
<td>United States</td>
<td>15%</td>
<td>10%</td>
</tr>
<tr>
<td>Middle East</td>
<td>10%</td>
<td>7%</td>
</tr>
<tr>
<td>India</td>
<td>5%</td>
<td>-</td>
</tr>
</tbody>
</table>

The Middelgrunden, offshore wind farm outside Copenhagen, Denmark.

A diagram showing the CO2 Emissions Abatement Potential and Index of Climate Technology Transfer (based on Patents, Trade and FDI).

Source: Authors’ calculations based on McKinsey (2013), FASTSTAT, COMTRADE and CRISIS data. The straight line is estimated with the OLS method (R² = 0.1968). The index of technology transfer is the average of the share of imports to the region through patents, trade, and FDI.

Mathieu Glachant. « Promoting the International transfer of Low Carbon Technology. CAS Report 2013. »
The Role of Market and Investment Conditions in Clean Energy Licensing Agreements: Other issues than just « IPR ».

### Importance of decision factors for licensing agreements with recipients in developing countries

(Percentage of survey respondents)

<table>
<thead>
<tr>
<th></th>
<th>Protection of intellectual property rights</th>
<th>Scientific capacities and infrastructure</th>
<th>Favourable market conditions</th>
<th>Favourable investment climate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not a factor</td>
<td>18</td>
<td>13</td>
<td>16</td>
<td>15</td>
</tr>
<tr>
<td>A basic precondition for doing business, but not a driving factor</td>
<td>28</td>
<td>57</td>
<td>26</td>
<td>27</td>
</tr>
<tr>
<td>Significantly attractive condition; would encourage negotiation</td>
<td>29</td>
<td>37</td>
<td>44</td>
<td>42</td>
</tr>
<tr>
<td>Compelling reason towards an agreement</td>
<td>25</td>
<td>13</td>
<td>14</td>
<td>25</td>
</tr>
</tbody>
</table>


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- **Introduction to « Technology Transfer » Stakes from a Climate and Energy Global Agendas Perspective**
- **Part. I Until Now: Setting the « Technology Transfer » Scene under the Climate Change Negotiations (UNFCCC), Towards COP21 Paris Dec. 2015**
- **PART II Beyond 2015: The UN 17 Sustainable Development Goals (SDGs) and the STI/Technology Transfer contribution to the Global Agendas, New-York (Sept. 2015)**
- **Conclusion: Strengthening International Cooperation in Technology for SDGs Global Positive Impact**
Technology transfers are relevant in almost all the 17 Sustainable Development Goals (UN SDGs)

Goal 1: End poverty in all its forms everywhere
Goal 2: End hunger, achieve food security and improved nutrition, and promote sustainable agriculture
Goal 3: Ensure healthy lives and promote well-being for all at all ages
Goal 4: Ensure inclusive and equitable quality education and promote life-long learning opportunities for all
Goal 5: Achieve gender equality and empower all women and girls
Goal 6: Ensure availability and sustainable management of water and sanitation for all
Goal 7: Ensure access to affordable, reliable, sustainable, and modern energy for all
Goal 8: Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all
Goal 9: Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation
Goal 10: Reduce inequality within and among countries
Goal 11: Make cities and human settlements inclusive, safe, resilient and sustainable
Goal 12: Ensure sustainable consumption and production patterns
Goal 13: Take urgent action to combat climate change and its impacts
Goal 14: Conserve and sustainably use the oceans, seas and marine resources for sustainable development
Goal 15: Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss
Goal 16: Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels
Goal 17: Strengthen the means of implementation and revitalize the global partnership for sustainable development

United-Nations 2015-2030 Agenda: « Road to Dignity »:
the Role of Energy and Climate Global Agendas

The final goal of this Agenda is to fully eradicating poverty in all its forms

17 Sustainable Development Goals (SDGs)
169 Sub-SDGs

- SDG 1 : Eradicate Poverty
- SDG 7 : Energy for All
- SDG 13 : Climate change (under UNFCCC Leadership)

Beware: « Not a business as usual aiming at reducing poverty or promoting Environmental management »:

- Cherry picking one goal among the 17 SDGS is not an option: Aligning Policies for a positive impact is required, overcoming the easy, traditional « silo -approach »
- Universality of the Agenda: All countries, private stakeholders involved and committed as well.
- Transparency, monitoring accountability and review (Big Data may help).
Energy and Climate Policies to reduce GHG Emissions: the contribution of Technology and Standards Policies

<table>
<thead>
<tr>
<th>Policy Type</th>
<th>Policy options</th>
</tr>
</thead>
<tbody>
<tr>
<td>Price-based instruments</td>
<td>Taxes on CO2 directly</td>
</tr>
<tr>
<td></td>
<td>Taxes or charges on inputs or outputs of process (e.g. fuel and vehicle taxes)</td>
</tr>
<tr>
<td></td>
<td>Subsidies for emissions-reducing activities</td>
</tr>
<tr>
<td></td>
<td>Emissions trading systems (cap and trade or baseline and credit)</td>
</tr>
<tr>
<td>Command and control regulations</td>
<td>Technology standards (e.g. biofuel blend mandate, minimum energy performance standards)</td>
</tr>
<tr>
<td></td>
<td>Performance standards (e.g. fleet average CO2, vehicle efficiency)</td>
</tr>
<tr>
<td></td>
<td>Prohibition or mandating of certain products or practices</td>
</tr>
<tr>
<td></td>
<td>Reporting requirements</td>
</tr>
<tr>
<td></td>
<td>Requirements for operating certification (e.g. HFC handling certification)</td>
</tr>
<tr>
<td></td>
<td>Land use planning, zoning</td>
</tr>
<tr>
<td>Technology support policies</td>
<td>Public and private R&amp;D funding</td>
</tr>
<tr>
<td></td>
<td>Public procurement</td>
</tr>
<tr>
<td></td>
<td>Green certificates (renewable portfolio standard or clean energy standard)</td>
</tr>
<tr>
<td></td>
<td>Feed-in tariffs</td>
</tr>
<tr>
<td></td>
<td>Public investment in underpinning infrastructure for new technologies</td>
</tr>
<tr>
<td>Information and voluntary approaches</td>
<td>Policies to remove financial barriers to acquiring green technology (loans, revolving funds)</td>
</tr>
<tr>
<td></td>
<td>Rating and labelling programmes</td>
</tr>
<tr>
<td></td>
<td>Public information campaigns</td>
</tr>
<tr>
<td></td>
<td>Education and training</td>
</tr>
<tr>
<td></td>
<td>Product certification and labelling</td>
</tr>
<tr>
<td></td>
<td>Award schemes</td>
</tr>
</tbody>
</table>

Source: Hood (2011), based on de Serres, Murkin and Nicoletti (2010). Note: the bottom three categories are in the second and third pillars of climate mitigation instruments (market barrier removal and technology support).

Energy (for ICT) for All? When? Where?

United Nations Summit to adopt the post-2015 development agenda
New York
### UN- Post-2015 Agenda SDG 7

“Ensure access to affordable, reliable, sustainable and modern energy for all”

<table>
<thead>
<tr>
<th>Objective</th>
<th>By 2030</th>
</tr>
</thead>
<tbody>
<tr>
<td>7.1 Ensure universal access to affordable, reliable, and modern energy services;</td>
<td></td>
</tr>
<tr>
<td>7.2 Increase substantially the share of renewable energy in the global energy mix by 2030;</td>
<td></td>
</tr>
<tr>
<td>7.3 Double the global rate of improvement in energy efficiency by 2030;</td>
<td></td>
</tr>
<tr>
<td>7.4 Enhance international cooperation to facilitate access to clean energy research and technologies, including renewable energy, energy efficiency, and advanced and cleaner fossil fuel technologies, and promote investment in energy infrastructure and clean energy technologies;</td>
<td></td>
</tr>
<tr>
<td>7.5 By 2030 expand infrastructure and upgrade technology for supplying modern and sustainable energy services for all in developing countries, particularly LDCs and SIDS.</td>
<td></td>
</tr>
</tbody>
</table>

### Technology Transfers in the Climate Change Negotiations: Rationale

“Recognizing that there is a crucial need to accelerate innovation in the development, deployment, adoption, diffusion and transfer of environmentally sound technologies among all Parties, and particularly from developed countries to developing countries, for both mitigation and adaptation.

Further recognizing that current institutional arrangements, access to financing and suitable indicators for monitoring under the Convention for the implementation of Article 4, paragraph 5, are limited and should be enhanced to deliver immediate and urgent technology development, deployment, diffusion and transfer to developing countries,

Further recognizing that the immediate and urgent delivery of technology development, deployment, diffusion and transfer to developing countries requires suitable responses, including a continued emphasis by all Parties on the enhancement of enabling environments, facilitating access to technology information and capacity-building, identification of technology needs and innovative financing that mobilizes the vast resources of the private sector to supplement public finance sources where appropriate, »

Source: UNFCCC Decision 14-15 December 2007
1. The Conference of the Parties (COP), by decision 1/CP.16,1 established a Technology Mechanism, comprising a Technology Executive Committee (TEC) and a Climate Technology Centre and Network (CTCN), to facilitate the implementation of enhanced action on technology development and transfer. The objective of that enhanced action is to support action on mitigation and adaptation in order to achieve the full implementation of the Convention.

2. By the same decision, the COP decided that the TEC and the CTCN shall report to the COP, through the subsidiary bodies, on their respective activities and the performance of their respective functions.

**UNFCCC Technology Executive Committee (TEC): Mission**

- (a) Provide an overview of technological needs and analysis of policy and technical issues related to the development and transfer of technologies for climate change mitigation and adaptation;
- (b) Consider and recommend actions to promote technology development and transfer, in order to accelerate action on mitigation and adaptation;
- (c) Recommend guidance on policies and programme priorities related to technology development and transfer with special consideration given to the least developed country Parties;
- (d) Promote and facilitate collaboration on the development and transfer of technologies for mitigation and adaptation between governments, the private sector, non-profit organizations and academic and research communities;
- (e) Recommend actions to address the barriers to technology development and transfer in order to enable enhanced action on mitigation and adaptation;
- (f) Seek cooperation with relevant international technology initiatives, stakeholders and organizations, and promote coherence and cooperation across technology activities, including activities under and outside of the Convention;
- (g) Catalyse the development and use of technology road maps or action plans at the international, regional and national levels through cooperation between relevant stakeholders, particularly governments and relevant organizations or bodies, including the development of best practice guidelines as facilitative tools for action on mitigation and adaptation.
UNFCCC Technology Executive Committee (TEC): Implementing the Mandate and Missions

Technology Mechanism: Prioritized sectors for mitigation (1) and adaptation (2) (% of parties)

Source UNFCCC
Climate Technology Centre and Network (UNFCCC-CTCN)
Technical Assistance Requests and Responses  (Oct. 2014)

These requests cover both climate change adaptation and mitigation, with five being related to adaptation, nine to mitigation and nine to both mitigation and adaptation. They are well distributed geographically, with six requests received from Latin American and Caribbean States, eight from Asia-Pacific States, eight from African States and one from Eastern European States. Two of the requests are multi-country requests.

Selected Technologies for Energy and the Agriculture
(\% of parties, TEC/CTCN Mechanism)

Source: TTCLEAR DATABASE <unfccc.int/ttclear/TNA>
ttclean@unfccc.int
Climate change, Diseases and Transfer of Emerging, Disruptive, Technologies

"Modified mosquitoes begin blitz on Dengue in Brazilian City"

A recent trial in a suburb of another Brazilian city, Juazeiro, showed that within six months the GM mosquitoes had reduced the native population by 95 per cent – below the theoretical level needed to transmit the disease. "It showed that our method is more effective than any other at eradicating the mosquitoes that transmit disease," says Parry. "With insecticides, nothing clears more than 50 per cent of the mosquitoes, whereas we got above 90 per cent."

Example of a Synthetic Biology application for Public Health Purpose

Ex: The impact of Public R&D Investment in International Cooperation for Bio-Energy


Note: squares, cooperation frameworks; circles, participating countries; circle size, number of participations.

FP 7 European Union R&D Program

Source: Department of Economic and Social Affairs, Background paper, 2011.
No Sustainable and Affordable Clean Energy Solutions without *Raw materials and Rare Earth*

- Technologies for Exploration (Earth and Marine, Space in the Future?)
- Technologies for Cartography / Bathymetry of Oceans floors
- Techniques for Exploitation (open and underground mining)
- Technologies of transformation
- Technologies for Occupational Health and Safety and Training in related Industries (production, transformative, transport, packaging...)
- Technologies for Traceability (physical, accounts, political (« conflict » minerals »).

![Rare earth elements map](http://ec.europa.eu/enterprise/policies/raw-materials/critical/index_en.htm)

Technology Transfers for Peace? Rare Earth Recycling, from Dependance to Interdependance

![Rare earth elements](https://commons.wikimedia.org/wiki/File:Rare_Earth_Elements.jpg)

Rare earth elements like these are used in a wide variety of technologies, from magnetic resonance imaging to fluorescent lighting. Clockwise from top left: gadolinium, praseodymium, cerium, lanthanum, neodymium and samarium.

Wikimedia Commons
Accelerating in the UN SDGs
Post-2015 Agenda Implementation

➢ Three Great Decoupling
- of Growth and GHG emissions
- of Energy Production and GHS emissions
- of Energy Consumption and GHS emissions

➢ Three Great Facilities
- Local Loop of low emission Energy for All
- Local Loop of Water supply/treatment for All
- Local Loop ICTs for All. Using the “servicization” of economy to ease the infrastructures burden in the transition, in particular in emerging, highly emissive, economies.

➢ Three Great Accelerators: it is about complete transformation of the way we organize socially. Enhancing long lasting resilience. PROPOSALS
- 1. Make Finance for Development climate/energy aware. IPR and energy investment innovative financial mechanisms to unlock investment in energy systems alternative to fossil fuels + Carbon Capture Sequestration (CCS) in industrial process.
- 2. Set SDGs International “Civil Corps” in charge of their grass root implementation.
- 3. Adapt Consumers Behavior to challenges by Big Data (MOOC Massive Open online courses. SPOOC : Short Personalized Open Online course), recognizing that it is Consumption that makes GHS / Climate change happen...not only production.

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✓ Conclusion: Strengthening International Cooperation in Technology for SDGs Global Positive Impact
Mapping out Gaps (2015): Coverage of the 17 SDGs and the Technology Cycle

Multilateral Development Banks
Diverse Contributions and Tools

LEVERAGING

Official Development Assistance (ODA) and Other Official Flows (OOF)

Figure 1: Financial Flows to Developing Countries

Figure 2: Composition of Financial Flows to Developing Countries – in 2012

Note: ODA=Official Development Assistance, OOF=Other Official Flows, LIMCs=Lower Income Middle Income Countries, UMICs=Upper Middle Income Countries, LDCs=Least Developed Countries. Source: OECD

Main contributors to United Nations operational activities for development, 2012

$23.9 billion

Source: UN ECOSOC 2014

Implementation of General Assembly resolution 67/226 on the quadrennial comprehensive policy review of operational activities for development of the United Nations system

VII BRICS Summit, “Ufa Declaration”, Ufa, the Russian Federation, 9 July 2015:
“We stress the importance of transfer of technology and scientific knowledge to address climate change and its adverse effects and therefore agreed to conduct joint research on the priority issues of common interest”.

Note: Figures are before the creation of The New Development Bank/NDB BRICs in 2014 and implementation in 2015, and of the Asian International Infrastructure Bank (AIIB) in 2015.

Official Bilateral Development Finance (ODA + OOF) targeting the Energy Sector

Share of Bilateral Development Finance up to 16% of total ODA in 2011-2013
Trillion US$ Investments/Year in the Global Climate and Energy Agendas. Involving Private Stakeholders in Technology Transfer, Dissemination and Implementation.

World CO₂ budget for 2 °C ~2300 Gt

Average annual low-carbon investment, 2014-2040

Share of budget used in Central Scenario

Source: AIE – WEO (2014) * CCS stands for Carbon Capture and Sequestration

Technology-Powered Partnership: Global Compact Post-2015

POST-2015 BUSINESS ENGAGEMENT ARCHITECTURE

BUILDING THE POST-2015 BUSINESS ENGAGEMENT ARCHITECTURE

United Nations Global Compact
Still Financial Gaps to bridge in Financing the Energy and Climate Change Technologies and their Transfers

Source: IAWF Inter Agency Group on a Technology Facilitation Mechanism, Briefing 22 June 2015

«Chronos and Kairos»: The Right Time to Act In the Technology Age

Ideas are not set in Stone When exposed to thoughtful People, They morph and adapt Into their most potent Form.

Sir Ken Robinson, TED Conference
Addressing Technology Transfers in the Global Climate and Energy Agendas 2015-2030

Dr. Françoise D. Roure
Chair, « Risk, Safety and Security Committee »
French High Council of Economy, Industry, Energy and Technology
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THANK YOU FOR YOUR ATTENTION