Report:

Low Emission Solutions Conference

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COP22 Low-Emissions Solutions CONFERENCE

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Introduction

This was the first year that the LESC Conference was officially part of the COP, a symbol of the importance of action-oriented solutions in moving us closer to the climate action objectives set forth in Paris last year. Jeffrey Sachs, one of the organizers of the conference, laid out the purpose with clarity: to provide the best solutions to get us to zero net carbon.

According to Dr. Sachs, the Paris Agreement will be much more difficult to implement than most governments are willing to acknowledge. The markets alone will not get us there either. The LESC takes on a level of central importance by presenting, discussing, and analyzing options and plans to move forward. One of the main themes of this three-day event was that there is no “one size fits all” solution. In fact, there is not only one solution at all. By presenting policymakers with options, we can help them make better decisions on what policies to enact given their particular national, regional, and local contexts.

It’s for this reason that the LESC included speakers from across the private sector, governments of all levels, and the world of science. Engineers and innovators are already working on t he technologies that can enable us to move towards zero carbon. Businesses play a critical role in the implementation of these technologies and in partnering with civil society to create new business opportunities around these solutions. Meanwhile, federal governments must create detailed long-term plans, as well as policies that support and encourage further innovation. Regional and municipal governments have to deal with the realities of implementing these plans given local circumstances.

It is within this context that the LESC was held, a forum and platform for moving forward with a clear focus on action and solutions.

Mid-Century Strategies for Deep Decarbonization at Continental, National, and Subnational Scales

Government Mid-Century Strategies in Response to the Paris Agreement

This panel was introduced by Mr. Guido Schmidt-Traub, Executive Director of the UN Sustainable Development Solutions Network (SDSN). Panelists and the main conclusions presented included the following:

- Jonathan Pershing (US), Special Envoy on Climate Change
  - Mr. Pershing gave an overview of where the U.S. and the global community currently stand in terms of meeting the obligations laid out in Paris last year. **He emphasized that rather than prescribing solutions to countries, the objective should be to develop a series of options that can be used to frame how the answer to climate change can be derived.**
  - There are three domains that will play a part in this process:
    - National Governments
      - Tend to **invest in R&D and focus on the long term**
      - Should **analyze the issue of stranded assets to avoid wasteful government spending**
    - Private Sector
      - Look for **signals at medium-term level before taking initiative**
    - Local Level
      - Climate change is difficult to envision at the local level
      - There is a need to show that changes needed for climate action won't be so drastic that they will hamper the abilities of local governments to deliver services to citizens

- Stephen Lucas (Canada), Senior Associate Deputy Minister of Environment and Climate Change
  - Mr. Lucas outlined several areas of focus for national governments going forward, which included:
    - **Non-emitting electricity sources**
    - **Low-carbon fuels for transport**

        - **Energy conservation and efficiency** (he estimated that a 46% reduction is needed in this area to get a 2 degree reduction in global temperatures)
    - Echoing the message of Mr. Pershing, Mr. Lucas emphasized the need for national governments to think of long-term goals and to **address the issue of stranded assets. He pointed out that long-term low-carbon growth should dictate decision-making on infrastructure and in other areas.**

- Dr. Rodolfo Lacy Tamayo (Mexico), Undersecretary for Environmental Policy and Planning
    - Dr. Tamayo pointed out that it is not feasible to reduce total emissions to manageable levels unless drastic action is taken. This will take **coordination among actors across sectors.**
    - Financial and economic signals that create positive incentives are crucial for continuing to move this process forward.

Deep Decarbonization Pathways Project (DDPP)

The Deep Decarbonization Pathways Project (DDPP) is a coalition of countries, first formed in 2013, that have come together to research methods for limiting global temperature rises due to climate change to 2°C. This project was introduced by Mr. Jim Williams, DDPP Director at SDSN, and followed by a panel discussion with Dr. George Safonov (Russia), Dr. Liu Qiang (China), Dr. Daniel Buira (Mexico), and Dr. Chris Bataille (Canada).

DDPP Focus and Methodology

The main focus of the DDPP project is on **sustainable energy systems. The 16 countries that make up this global consortium produce 74% of worldwide energy-related emissions,** and include the following: Australia, Brazil, Canada, China, France, Germany, India, Indonesia, Italy, Japan, Mexico, Russia, South Africa, South Korea, the UK, and the US.

The objective of the initiative is **to set deep or complete decarbonization as the long-term goal of participant countries.** Within this framework, several options were developed independently by the member-countries, in the form of short-term policy options. This means that **there are several deep decarbonization pathways that are feasible for each country, and leaves it up to key stakeholders to debate and decide which pathway provides the best solution given country-level conditions.**

The pathways are meant to be solution-oriented. It is thus important to note that, although the goals of the pathways have to do with how many tons of CO2 are emitted into the atmosphere, **the plans to reach those goals have more to do with counting infrastructure stocks.** Solutions are presented sector-by-sector and year-by-year to demonstrate how such infrastructure can be transformed to low-emissions stocks.

The key assumptions of the DDPP project include:

- No major changes in lifestyles of people in developed countries
- Non-inclusion of future technology impact
- Population growth of 1% per year
- Economic growth of 3% per year

Key Findings of DDPP

- **Deep decarbonization is achievable given current technology.**
    - **Plan allows us to reduce emissions by a factor of 10 while maintaining economic growth objectives**
- Three technical requirements are needed to reach this objective and hold true across countries
    - **Energy efficiency must be drastically improved**
    - **We need an almost complete decarbonization of electricity generation (an average of 93% across countries studied)**
    - Significant reductions in end-uses must also be achieved
- The deep decarbonization objectives are also **within our reach economically.**
    - The net cost will be small because we will spend less on fossil fuels and more on technology
        - **Estimated cost is 1% of GDP (not counting the economic benefit of reducing the impact of climate change)**
        - Knowledge sharing through the creation of international networks will bring down these costs further

Panel Discussion

- Dr. George Safonov (Russia), Director of the Center of Environmental Economics
    - Dr. Safonov emphasized the turnaround Russia has made from a decade ago, when they were moving “in the absolute wrong direction”. **Modelling showed the Russian government that emissions could be reduced by 87% at that time.**
    - **For further progress, certain processes need to go hand in hand with decarbonization, including divestment from fossil fuels and carbon pricing.**

- Dr. Liu Qiang (China), National Center for Climate Change Strategy
    - Dr. Liu spoke about the progress China has made so far in terms of meeting its objectives. One fact she highlighted in terms of energy mix is that **low-carbon energies are poised to become the dominant sources of energy in China by 2050.**

- Dr. Daniel Buira (Mexico), CEO and President of Tempus Analitica
    - Dr. Buira said that international collaboration through projects such as DDPP was essential for Mexico to progress in its energy transition. By asking the same questions of the same data but with different perspectives in mind, **Mexico was able to envision a new energy path.**

- Dr. Chris Bataille (Canada), Institute for Sustainable Development and International Relations
    - Dr. Bataille emphasized that there is no single pathway for any country. Instead, certain general criteria need to be followed to create a successful path:
        - The pathway must cover all emissions
        - There should be clear long-term signals in place in each and every sector
        - Federal states should be given equity in certain systems (i.e. subnational actors are very important in Canada)
    - **International cooperation is key in creating soft and hard support linkages to drive policy along. As each nation produces more green technology, the costs will continue to decrease.**

Under 2 MOU

The Under 2 MOU is driven by state- and municipal-level governments (subnational). **There are currently 165 jurisdictions that form this group (which represent 1 billion people and ⅓ of the global economy). The group has pledged to reduce emissions by 80-90%, which is a limit of two tons of emissions per capita.** Each of the three speakers gave examples from their own regions/states on progress being made at the subnational level on sustainability issues.

- Ken Alex (California, US), Director of Governor's Office of Research and Planning
    - Mr. Alex pointed out that since California represents the 5th or 6th largest economy in the world, its efforts resemble work done at the national level.
    - Emphasis was put on the need to adapt solutions pathways to local conditions. Specific directions are less important than a framework for how to think about options.
        - Ex: **The California government believed for a long time that they could use biofuels to achieve a large portion of their reductions. At some point, however, they realized that there were not enough biofuels to accomplish their desired goals.**
    - **There are four key areas of transition that California has been working in: energy efficiency, fuel switching, renewables, and decarbonization of fuels.**

- Aristoteles Sandoval (Jalisco, Mexico), Governor of Jalisco
    - Mr. Sandoval spoke about various initiatives in Jalisco, i.e. a **plan to use 100% renewable energy in public services.**
    - The governor also spoke about the challenge of convincing municipal authorities to go along with sustainability plans. He stressed that it is important to show these local officials what is possible.

- Stuart Hocking (South Australia, Australia), Deputy Chief Executive of Department of Treasury and Finance
    - Mr. Hocking discussed the example Australia has set in terms of continuing to move towards more ambitious climate action targets. The key, according to Mr. Hocking, is that Australia views the transition to renewables as an economic opportunity, not a threat to growth.

Mission Innovation

Mission Innovation is a global initiative that was launched in Paris during the COP21, **gathering 22 countries (Australia, Brazil, Canada, Chile, China, Denmark, Finland, France, Germany, India, Indonesia, Italy, Japan, Mexico, The Netherlands, Norway, Republic of Korea, Saudi Arabia, Sweden, United Arab Emirates, United Kingdom and The United States) and the European Union.** The initiative emphasizes the importance of accelerating innovation in the field of green and clean energy.

At the LESC, it was presented by Ernest Moniz, Secretary of Energy of the United States, who stated that **"*We won't get where we want to without technology and innovation across all sectors*". Countries that participate in Mission Innovation have committed to increase their government's R&D investments in clean energy and foster private sector investments in clean energy technologies as well.** The European Union, as mentioned by its Commissioner for Climate and Energy, is also planning to dedicate an important amount to climate-related activities (35% of its total budget although the exact timeline was not stated).

During the session, officials of member governments of the initiative **insisted on three key aspects they think are essential in the context of Mission Innovation.** These can be achieved together or individually by countries, depending on each country's needs and possibilities.

1. **Capitalizing on each country's characteristics and resources to develop innovations**

All panelists emphasized the fact that countries have to focus on alternative energy sources and off-grid solutions in line with their specific circumstances. By capitalizing on their own resources, countries are thus able to create new markets and develop sustainable and local ecosystems, which are beneficial for their development.

- Sharon Dijksma, Minister for the Environment in the Netherlands, explained that her country joined the Mission Innovation Initiative to intensify clean energy research as part of the National Energy Agreement. The Netherlands made the choice to take advantage of its geographical position and focus on offshore wind turbines to ensure clean energy access in the country.

- Josh Frydenberg, Minister for the Environment and Energy in Australia, explained how the geographical factors in Australia led to the development of off-grid solutions that "*are proving very beneficial, cost saving, providing environmental*

benefits and logistical advantages because less storage is needed". He gave the example of an indigenous community in Australia, isolated 6 months of the year due to the rainy season, that is benefiting from a combination of solar and diesel.

- Brazil also capitalizes on innovation in most effectively utilizing its resources to meet increasing energy demand, as mentioned by Luis Barroso, CEO of the Energy Research Company. **This means using biofuels to decarbonize the Brazilian economy and consolidate the country's position as world leader in the production of biofuels.**

All country representatives insisted on the fact that governments and businesses have to work together to speed up and scale up innovative solutions regarding clean energy.

2. **The importance of increasing innovation efforts in energy efficiency**

Panelists from countries with extreme climate conditions insisted on the importance of focusing on innovation to improve energy efficiency. Heating and cooling systems, which represent a major part of energy consumption, are at the heart of this strategy.

For example, Anne Vasara from Finland said that her country actually needs more energy efficient buildings with smart heating and cooling systems. Finland is already deeply committed to climate change and has allocated an important part of its GDP to research in clean energy.

Officials from Saudi Arabia and United Arab Emirates emphasized the commitments of their countries towards research and university programs to find solutions for innovation and technology. **The Gulf countries already dedicate a lot of resources to encourage industry leaders to commit to energy research. Given the importance of the construction industry in these countries, they also want to focus on energy efficiency and low-carbon, affordable heating and cooling systems. As the country representatives mentioned, they need to be able to deal with the peak demand for air-conditioning that they experience during the summer.**

3. **Putting a price on carbon as an efficient way to encourage private sector innovation**

Mission Innovation plays a role in sharing experiences and practices among governments about the best ways to encourage private sector commitments on clean energy innovation, as well as public-private partnerships and cooperation.

As Catherine McKenna, Minister of the Environment and Climate Change of Canada, mentioned, putting a price on carbon is an excellent way to foster innovation in the private sector. It creates powerful incentives by forcing companies to innovate and find clean energy solutions in order to pay less taxes. **Canada has taken the lead on this strategy by deciding that "*by 2018, all Canadian provinces will be required to have a price on carbon*".**

Finally, the Q&A sessions raised the issue of legal obstacles to innovation, especially in the biofuels sector, and on the role of nuclear in a low-carbon future as a sector with innovation potential. The panelists agreed that nuclear has an important role to play in the overall energy mix, but cannot be the sole solution. **Addressing the question on biofuels, they stated that a lot of work remains to be done policy-wise, but it's important to keep in mind that policies should focus on aggregate gains, and cannot choose one industry over another.**

The Clean Energy Ministerial (CEM)

The Clean Energy Ministerial is a global forum started in 2009 in Copenhagen that brings together ministries from 24 countries (Australia, Brazil, Canada, China, Denmark, European Commission, Finland, France, Germany, India, Indonesia, Italy, Japan, Korea, Mexico, Norway, Russia, Saudi Arabia, South Africa, Spain, Sweden, United Arab Emirates, United Kingdom, United States) **that represent 90% of global clean energy investment and 75% of greenhouse gas emissions. The purpose of the initiative is to promote policies and share technology and practices to accelerate clean energy deployment and fulfill country commitments in terms of Nationally Determined Contributions (NDCs).**

In the first part of the session, various initiatives launched by CEM were highlighted by the panelists :

- Minister McKenna from Canada spoke about the Clean Energy Education & Empowerment women's initiative
- Minister Al-Falih from Saudi Arabia mentioned various solar and wind initiatives
- Ernest Moniz mentioned the CEM Global Lighting Challenge
- Josh Frydenberg also talked about the **Clean Energy Solutions Center, which plays a role in "*providing technical expertise, policy advice and capacity building to help countries to embrace innovation and reduce their emissions*". He gave the example of Indonesia, which sought advice on how to engage banks in clean energy financing, as well as the Pacific Island Countries, which asked for guidance on training custom officers on environmental standards.**

High-level remarks from ministers included a focus on CEM missions such as scale deployment of technologies, and **work on closer collaboration with industry and businesses to share solutions, foster public-private partnerships, and provide technical expertise and financial assistance for some countries.**

The second part of the session focused on the concrete results of CEM initiatives and campaigns in various countries. Ajay Mathur, Director General of The Energy and Resources Institute, highlighted how **CEM helped India to adopt LED standards** (which resulted in a subsequent dramatic price decrease) and promote energy efficient air conditioning. Mahama Kappiah, Executive Director of the ECOWAS Centre for Renewable Energy and Energy Efficiency, mentioned that the **CEM Solutions Center has been extremely helpful in guiding ECOWAS industries on how to implement the NDCs.** Both agreed that CEM's help has been very useful. Beyond the political level, the CEM's work has had practical results in terms of finding solutions to reduce emissions and meet the NDCs. **Peter Bakker, CEO of the World Business Council for Sustainable Development, strongly insisted on the role of the private sector to support CEM initiatives. As in most initiatives on low-carbon solutions and clean energy, real progress is impossible without strong support and commitment of the private sector.**

To summarize, **the discussion about CEM pointed out that businesses have to get involved in an increasing way to really accelerate a global transformation of national economies.** Collaboration seemed to be the keyword of the various initiatives presented during the day. This means collaboration between governments and businesses, but also a possible collaboration between the various initiatives presented. Dominique Ristori from the European Commission highlighted the fact that Mission Innovation and CEM can be complementary in the practical aspect of implementation.

ICT in Climate Action

***Main contributions of ICT to climate action**:*

The main take-away messages of this session have been:

- ***Breakthrough technologies offer the opportunity for emerging countries to leapfrog others in terms of their economic growth path***
- ***ICT can contribute to the reduction in CO2 emissions and at the same time economic growth. It could help other sectors to reduce their emissions by up to 15% by 2030.***
- ***Advanced ICT (dark data, explosion of global connectivity, and artificial intelligence) must be leveraged to open up new sustainable business models.***

The Global e-Sustainability Initiative, created in 2001, gathers around 40 of the world's leading service providers and vendors from the Information and Communication Technology (ICT) sector to provide information, resources, and best practices for achieving integrated social and environmental sustainability through ICT. The LESC was an opportunity for industry leaders to present their latest report: SMARTer 2030

The acceleration of digital technologies is increasing the scale and pace of sustainability benefits, especially through **greater user centricity, increased digital density, and innovative new business models. ICT offers additional environmental benefits beyond carbon mitigation, such as delivering better agricultural yields and helping to reduce the consumption of scarce resources like water, fuel, and paper. This is especially true in the mobility sector, i.e. the connected car. ICT could enable $11 Trillion in savings and connect 2.5 billion people to energy resources.**

Joan Krajewski, General Manager of Compliance & Sustainability of Microsoft, started the discussion by declaring "***we have noticed many differences compared to the previous SMARTer2020 report (2012) and this is due to the fact that our expectations of ICT device improvements are greater than we had calculated***".

Microsoft (a GeSI member) **has emphasised the increasing importance of the users, because they are at the center of the ICT processes through their co-creation of services according to their specific needs.** As new business models are created increasingly in connecting different users (i.e. Uber or Airbnb) the number of connected devices has changed beyond the expectations of the ICT companies. This "connectivity

boom" is creating new opportunities that could be linked to sustainable development in all sectors, including energy, healthcare, education.

Therefore, ICT-enabled solutions create benefits in income, health outcomes, and time savings. **This could take the form of a "doctor in your pocket" since ICT connects 1.6 billion people through healthcare applications. ICT could also increase access to "e-learning" platforms; 0.5 billion people are already using e-learning methods today. ICT-enabled solutions are moreover expected to have a great impact across smart manufacturing, agriculture, buildings and e-mobility, which will help save 25 billion barrels of oil and 332 trillion liters of water.**

Another issue that was raised in the discussions was the importance of energy efficiency and how ICT could contribute to improving this.

"***We cannot solve the 2 degrees of Global Warming with just 1.5% of energy efficiency improvements***", declared the CEO of Philips Lighting, Eric Rondolat.

He also highlighted that lighting represents about 15% of worldwide energy consumption and is one of the sectors that can save up to 80% of its consumption through new technological improvements.
Philips Lighting has developed three main technological solutions:

- **The use of smart meters that indicate to street lights that they should dim at certain times of day. This process could be improved by 40% through the use of motion sensors.**
- **In offices, smart meters help give employees more control over lighting. This could also be powered with one cable (Ethernet) that fulfills multiple functions.**
- **In homes, deploying motion-sensor lights with different lighting levels for day and night can drastically improve energy efficiency.**

Additionally, Caspar Herzberg, Head of Africa and Middle East in Schneider Electric, emphasized the need to be digitally smart and decarbonized. He argued that even **if ICT today has the potential to increase energy efficiency in buildings by 82%, this potential remains untapped.** Schneider Electric has reduced the energy consumption of its headquarters by 75% by collecting data that allows them to make more efficient decisions on energy use.

In emerging economies, Caspar Herzberg affirmed that **Africa and the Middle East can leapfrog within their economic growth paths through ICT solutions.** The use of smart solutions is key to making access to energy easier and cheaper through combining different daily solutions in a smarter way, such as using a phone charger that serves as a lamp at the same time.

Dr. Vijay Modi provided a different perspective in this panel, focusing on micro-level lessons from the bottom of the energy access pillar. This addressed a key question that was posed to the representatives of the multinational corporations included in this panel: how to address energy poverty and the need for sustainable energy at one time. Dr. Modi has worked on various projects in emerging countries attempting to answer this question. His experiences have allowed him to provide a few key conclusions:

- **You need to start with the customer first.** Dr. Modi declared that although the assumption is that the customers in such areas are not credit-worthy, this is not true. The key impediment for getting such customers to buy into energy schemes is capital cost. Utility companies were charging $300 to connect to the grid, a price that most consumers in underdeveloped areas balked at. By moving the price point to $20-30, Dr. Modi and his associates were able to attract a sufficient volume of customers.

- **Payment methods should be adapted to customers.** Consumers in underdeveloped areas don't hold enough capital to make large one-time or monthly payments. Instead, they have to be offered the option to "pay-as-you-go". This also enables utility companies to schedule electricity throughout the day instead of storing it.
- **Payment systems are available for only a few pennies per day.** Expensive technological systems such as Google Pay require prohibitively high transaction costs, and thus are not well adapted to this context. Even the simplest mobile phones on the market can be used to create much more cost-effective solutions.

- **The most important conclusion from his experiments was that the poor are willing to pay for reliable services that match their needs.** An extension of this is to realize that the consumer is credit-worthy if the conditions are right, and it is often utility companies that are not (due to large losses incurred as upfront costs). This turns conventional wisdom on its head.

Mr. Youssef Zafri, Regional Business Manager of Ericsson, followed Dr. Modi and spoke of the potential role of his company in driving down emissions. **The company can have an outsized impact given that it handles 40% of global telecommunications networks (in 180 countries).** In addition, recent general consumer trends have been to move to smaller communications devices, which decreases electricity consumption. Ericsson itself is committed to be a zero emissions company by 2030. The company has also led the way in terms of innovative pilot projects:

- Zero Site - This utilizes the first device that uses solar energy to power street lighting. There are currently 5 different sites in Marrakech.

- Connected Water - This is a small sensor with a battery that lasts up to 10 years that gives real-time data on water quality.
- Connected Mangroves - These are devices that provide better information on land quality and growth levels of mangrove trees, allowing the focus to shift to the overall ecosystem.

ICT is also crucial for raising climate commitments by deploying new and innovative approaches.

The ICT sector can reach more people than any other sector in promoting climate action. With this in mind, a global initiative was launched to recognize and promote the ICT sector's role in climate mitigation and adaptation. **ICT enables other companies to drastically reduce their emissions by developing innovative ways to report through collecting data.** It also helps to change customers patterns and to produce more efficient regulations.

However, as explained by Frances Way, Chief Operating Officer of CDP, companies have been more focused on how much they are going to reduce their emissions rather than thinking about how they can implement transition plans. This is why **an initiative called Renewable 100 was created to gather companies that are committed to get to 100% renewables and to make manufacturing processes more efficient.** This will allow these corporations to reduce embedded emissions in the production process.

Thierry Valette, CTO of Huawei Access Network, also highlighted the importance of greening the manufacturing processes from hardware to software, along with changing customer usages. Huawei has put a lot of efforts into improving power consumption in DSL connections.

Furthermore, Bill Wehl, Vice President of Sustainability at Facebook, affirmed that since Facebook consumes a lot of energy due to its software, it is committed to design more energy-efficient systems. Knowing that 4.6 billion people already have mobile phones, with nearly 50% of them owning a smartphone, ICT companies are important actors in engaging consumers in climate action.

David Hochschild (US), Commissioner of the California Energy Commission, spoke about California's leadership in the area of clean energy. He emphasized that even if federal support decreases during the coming Trump administration, the state will continue to push ahead. By 2030, for example, California will require 50% of renewable energy usage. Mr. Hochschild also **outlined three myths about renewable energies that should be dispelled to move the energy transition forward:**

- Renewables will crash the economy. This has been disproven by several states and countries, most notably the fact that California has grown faster than the

national average at the same time that it has drastically increased its renewable energy usage.

- The transition to renewables will increase unemployment. Unemployment has actually been cut in half in California in the last five years, and the state has strived to increase employment opportunities through its energy transition.
- Moving to renewables will increase the risk of rolling blackouts. In fact, there have been no statewide rolling blackouts in California since 2001. This is a drastic improvement in the state's record.

To conclude, **two types of incentives** were identified as being crucial for ICT companies:

- **By anticipating new business models they can lower long-term costs (economic)**
- **Adopting sustainable strategies is crucial to meet social responsibility (reputational)**

SECOND DAY

Local Climate Action

The second day of the LESC started by presenting different aspects of climate action at the local level, and analyzing how this can contribute to reducing emissions and deploying low-carbon solutions. The first panel discussed successful strategies for local governments to implement climate-friendly solutions:

- **Standardization and reporting are crucial for creating sustainable pathways**

Local climate action requires reporting processes, transparency, and disclosure policies in order to ensure monitoring and follow-up, reinforce what is working, and address failures and bottlenecks. This is also an excellent way to **engage citizens in the process.**

- Mrs Maryke van Staden from ICLEI (Local Governments for Sustainability) explained how her organization offers tools to report and measure progress. One example is the "Carbon Climate Registry", a platform dedicated to voluntary reporting by local and subnational governments in order to enhance transparency and accountability when it comes to local climate action.
- Don Iveson, **Mayor of Edmonton (Canada), also insisted in the second panel on the importance of transparency and publicly available data to drive efficiency in local climate action.**

- **Energy efficiency and low-carbon transport as the two main focuses of local climate action**

Members of local governments present in the session specifically examined two areas that are critical for local climate action.

- Leszek Drogosz, Director of Infrastructure Department of Warsaw Municipality (Poland) detailed how the city government there is investing in **low-carbon transport** to make the city more comfortable for pedestrians and develop a **bike-sharing system, which has become one of the ten best in the world (8 million**

rentals a year, 500km of biking lanes today and an objective of 1000 km by 2020).

- The other main area of focus was **energy efficiency in buildings**, especially when heating represents the great majority of energy consumption in the city of Warsaw

- Antoine Faye, Chief Resilience Officer in the city of Dakar (Senegal) also insisted on energy efficiency as a key element to overcome the challenge of population growth. He stated that "*Dakar can become an energy efficient city if we tap into the vast potential of energy saving technologies*", but also spoke about the importance of efficient consumer practices and behaviors.

- **Cities have to drive climate action, in cooperation with the commitment of the private sector**

Cities have a crucial role to play in order to reach national low-carbon targets, but need to deepen cooperation with the private sector and establish partnerships to accelerate climate action. All stakeholders must be involved and understand how their activity can be affected as well as it how it should evolve in the future.

- **China understood early on that cities are critical to achieving its climate ambitions. Gao Xiang, Deputy Director of Energy Research Institute of NRDC mentioned the launching of APPC (Alliance of Peaking Pioneer Cities) in September 2015 at the U.S.-China Climate Leaders Summit. The organization gathered 23 Chinese cities with the purpose of supporting policies to achieve China's national peaking of CO2 emissions around 2030. Cities aim at reaching that goal themselves in order to help reaching the national goal, but need support and partnerships.**

- Antoine Faye insisted on the fact that cities need to focus on their local assets when it comes to climate action, because the majority of international treaties and negotiations on climate action mostly deal with national-level planning.

- William Sisson, Director of Sustainability in United Technologies, raised the key issue of how to get the private sector committed. He stated that market barriers can be overcome at the local level if climate action is understood as a business opportunity that will create jobs in the city, improve economic growth, and create value in local territories. He gave the example of the **EEB Amplify project (Energy Efficiency in Buildings) launched by WBCSD: a private sector-led action that aims to include 50 cities by 2020 and enables local B2B and B2C networks.**

- **Deploying Smart and Sustainable Cities can take many shapes and forms**

The second panel of the day focused on examples of solutions deployed to foster smart and sustainable cities, with panelists offering feedback from their own experiences.

- Michèle Pappalardo, Coordinator of Vivapolis, focused on **digital solutions** to facilitate the energy transition and create low-carbon solutions. Digital actors have to work with architects and urbanists to make cities "smarter". She mentioned smart public lighting to illustrate the importance of solutions that mix sustainable development and digital. Haron Idris, Chief Minister of Melaka in Malaysia, gave a concrete example from his own city on the use of Smart LED Street Lighting.

- **Waste Management** is another area to focus on in order to develop sustainable cities and circular economies. Don Iveson, Mayor of Edmonton, explained how he tries to engage people of his city in waste management. Edmonton has been recycling for 30 years and composting for 20 years. **Canada also developed its technologies to create biofuels and alternative energy from garbage recycling, in order to foster a circular and sustainable economy. This is also a project that can be worked on by companies,** as mentioned by Sylvia Parienté of Exochems. This French-Moroccan company works on composting organic waste and developing waste management strategies within the enterprise.

- When talking about smart and sustainable cities, **infrastructure** has to be a main area of focus. Akiko Miura, Director of Cap and Trade of the Tokyo Metropolitan Government, detailed how smart infrastructures are a major concern for Japanese cities in the context of the Olympics in 2020: "*Tokyo is working hard to make those infrastructures as smart as the rest of the city, through innovation and technology*". Sylvia Parienté, CEO of Exochems Environment also mentioned the issue of infrastructure as a priority for the Global South, and underlined the importance of providing smarter and better infrastructure.

The consensus view of the panel was that smart and sustainable cities start with the people first and the participation of inhabitants. For this reason, **education and programs that involve citizens in the sustainable development of their cities are crucial.** In other words, people are a big part of the solution.

Sustainable Construction

In the construction sector, there are several existing innovations that could drastically reduce emissions, which is crucial since **reaching the 2°C goal requires a 50% reduction in emissions from the built environment.** The innovations highlighted at the LESC included:

- **The use of durable wood for the construction of large urban buildings**
- **Brick technology for rural housing that eliminates the need for burning biomass during production**
- **Low-emissions cement technology**
- **Wood-plastic composites that can be used to construct weather-resilient and off-grid houses**

However, several roadblocks remain that prevent these innovations from realizing their full potential. Regulations often stand in the way of their expanded use. Policymakers generally don't have good information on these technologies or their impact; thus, the current regulatory scheme discourages innovators from taking risks. **Building codes specifically often disincentivize innovation in this area.**

The introduction of the topic was followed by a panel. One of the first focuses was introducing new innovations in building materials that could drastically reduce emissions.

- Mr. Peter Moonen, National Sustainability Manager of the Canadian Wood Council, emphasized the **importance of wood in construction in Canada, home to 40% of the world's certified forests.** In doing so, he spoke about the 4 S's in relation to sustainable utilization of wood in construction: sustainable forestry, sink, sequester in buildings, and substitute.

- Mr. Nev Hyman, founder of Nev House, is an entrepreneur that has come up with an innovative solution that solves two issues: sustainable construction material and a means to remove plastic waste from the environment. The material he has developed is a plastic-wood composite that is Category 5-rated, and can be used to create durable, off-grid building structures. The resulting structure can be built in 3-5 days, which makes it a potential option in cases of disaster relief, refugee encampments, etc.

On the other hand, two of the other panelists expressed more skepticism about substitutes for concrete. Instead, they analyzed the potential for reducing emissions from concrete itself.

- Ms. Karen Scrivener, Professor and Researcher, Ecole Polytechnique Federale de Lausanne, started by emphatically stating that cement cannot realistically be replaced by substitutes. She argued that actually it is a relatively low-carbon material, an existing technologies can be used to further decrease its carbon impact.
    - **Previous studies have focused on efficiency and carbon capture and storage (CCS), but this will be difficult to develop and will also increase the price of cement by a factor of 2-3. Since 90% of cement is used in the developing world, this will have a devastating impact on infrastructure construction.**
    - **Instead, 30% "filler" technology allows disposed cement by-products to be used to replace "poured" cement in use today. This also has enormous market potential, which differentiates it from many other solutions being proposed today.**

- Mr. Marcel Cobuz, CEO of LafargeHolcim, Morocco, spoke about concrete as well, but from the perspective of a company working in an emerging economy. He stated upfront that in the context of rapid urbanization, meeting infrastructure needs would require incremental changes.
    - Mr. Cobuz's company, LafargeHolcim, produces cement that results in 573kg of CO2 emissions per tonne. By 2030, the goal is to reduce that footprint by 40%.

Mr. Cobuz used a case study to illustrate his point and the challenges ahead. The government in Malawi is facing massive deforestation due to building from clay bricks - one house is equivalent to the cutting down of 14 trees. In fact, there are a billion houses worldwide that were built this way (which translates to 14 billion trees being cut down). In response, **LafargeHolcim launched the "durabrick" in 2015, which is produced with common soil, sand, water, and cement, and has a 90% smaller carbon footprint. Current production is 3 million, and the company is partnering with CDC group to scale up operations.**

One of the issues that several speakers **discussed was the presence of regulatory networks that disincentivize innovation in building materials. Mr. Moonen noted that most regulations and building codes today don't reflect true performance capabilities, one thing that he believes is hampering the widespread use of wood. Life-cycle analysis, which looks at all stages of use and includes water use, energy**

use, and carbon footprint, can help us better understand our choices and align regulations to incentivize sustainability. Two examples were offered:

- In Canada, provinces set building codes, which leads to a patchwork of inconsistent policies around the country.
- The building code cycle is currently 7 years, which means a long waiting period before a new product is approved and brought to market - this discourages innovation.

It was appropriate that the last speaker on the panel, Mr. John Thwaites, Chair of ClimateWorks in Australia, took on the issue of policies directly, stating that while we need technology and innovation, we also need smart policies to make sure these are effective. ClimateWorks Australia has developed a policy roadmap for zero-carbon buildings by mid-century. This plan includes:

- National Plan for 2050 - strong governance and coordination
- Mandatory minimum standards
- Targeted tax breaks and funding for innovation
- Reform of energy market regulations
- Utilization of information and data to guide decisions

Current barriers to action include cost, capabilities, motivation, and bad policies. For this policy roadmap to be successful, it will be necessary to connect land use planning to building and transport planning. An example of current operationalization of the plan is the NABERS' Building Rating Tool, which relies on disclosure (via a 6-star rating system) to drive market changes.

Innovation in the Transport sector

Another key challenge of climate implementation is to make mobility more sustainable and to foster innovation in the transport sector.

In this perspective, the Paris Agreement has been a turning point that has pushed the transportation sector to make great strides to reduce their emissions and to make their business models more sustainable and climate-friendly. However, further transformation is needed to rethink the transportation system, as we should not merely replace one technology with another but capitalize, instead, on the actual sources and technologies to retransform the business models.

Patrick Oliva, Senior Vice President of Sustainable Mobility and Energy Transition of Michelin Group, discussed the Actionable Vision of Transport Decarbonization which is a discussion paper that was prepared by the Paris Process on Mobility and Climate (PPMC) on behalf of the Global Climate Action Agenda Transport Team. **He also emphasized that the transportation sector accounts for approximately 25% of CO2 emissions from fossil fuels and 15% of global GHG emissions.**

Thus, **there is an urgent need for the transportation sector to plan for mid/long-term disruptions towards a systemic transformation of the transport sector (2020-2050+)** in order to implement the Paris Agreement. Moreover, even if the Current Transport initiatives offer a good base for key components of the Global Macro-Roadmap, key gaps exist such as energy supply issues, a lack of macroeconomic transition toward a low-carbon economy, and the need to enlarge the scale of the initiatives.

The paper that Patrick Oliva presented also gave an overview of the eventual actions and recommendations that need to be taken into account for the transportation sector to efficiently implement the Paris agreement: defragmented and shortened supply chains, synergistic urban transformation; improved modal and system efficiencies, low-carbon energy supplies, tailored solutions for rural populations, and more investments in adaptation (and not just mitigation).

Peter Bakker, President and CEO of WBCSD, presented a slightly different approach, recalling the importance of the LESC as a place to discuss real solutions since the COP22 is the COP of action and innovation. Hence, he urged the necessity of the transport sector to reassess their resources and human capacities, as transforming the transport sector will impact the consumers as well as create new jobs and opportunities. He also affirmed

that, "***Businesses should look at what we can do with today's technologies tomorrow.***"

Ahmed Baroudi, Director General of the Société d'Investissements Energétiques (SIE), announced the establishment of the African Association for Sustainable Road Transport that disseminates and exchanges information to highlight the best models and examples of sustainable road transport. He also highlights the need of African countries to cooperate in order to leapfrog by upgrading the infrastructure for electric vehicles.

Electric and Hydrogen Mobility

This part of the LESC conference focused specifically on one increasingly important form of sustainable mobility: electric and hydrogen. **The technology for electric transport vehicles already exists. However, three essential points should be noted to make this sector progress further:**

- As production increases and technology advances, **the price point will continue to decrease to make these technologies more available.**
- **Governments must play critical roles in creating the incentives** that enable this progress.
- Solutions must be **adapted to local conditions, resources**, etc. to make sure that policies are effective.

The panel followed. According to Mr. Girardeau, Electric Vehicle Vice President of Schneider Electric, the question today is more than technology. The technology exists and financing is not lacking. It is projects and outdated business models that hold the industry back. Government incentives will be key in moving past this obstacle. Mr. Girardeau pointed specifically to two projects his company has been involved in:

- **UCLA - EV and grid integration**
  - **Collaboration between Schneider Electric and MOEV, Inc. that improves grid reliability and enables use of a larger amount of renewables in the grid.**
- **AASRT - sustainable transport initiative in Morocco**
  - **Forum for exchanging and sharing ideas and best practices to enable African countries to make most appropriate choices to meet mobility needs.**

Two of the other speakers also focused on electric vehicles. Mr. Sylvain Allano, Co-Founder of Ma3D Technologies, offered another private-sector perspective, but specifically in developing countries. He mentioned that electric vehicles already exist in developing countries, but that these countries will need sustainable infrastructure to make

them grow further. Mr. Allano's prediction is that a drop in the price point would really help the industry take off. The current price point is too high, so subsidies are required, but disruption will decrease prices as electric vehicles scale (similar to what we had with solar panels).

Mrs. Lan Marie Nguyen Berg, Vice Mayor for Environment and Transport for the City of Oslo in Norway, gave an example of how cities can support electric vehicles to promote their use. **Oslo has pioneered several economic incentives to increase sustainability in transport:**

- **No registration tax or VAT on EV purchases**
- **EVs can drive in the bus lane**
- **Free parking in public spaces for EVs**

The results from these efforts have been outstanding. A total of 61% of emissions in Oslo come from transport; private cars (39% of this) and construction work (30%) are the main drivers. Partly because of the efforts with electric vehicles, **Oslo has been a leader in fossil fuel reduction - the plan is a 50% reduction in emissions by 2020 and 95% by 2030. These targets are in line with the 1.5°C overall goal.**

Finally, the conversation shifted back to hydrogen-based solutions. Mr. Toshifumi Kokubun, Vice President Partner of Deloitte Tomatsu Consulting in Japan made the point that such technologies allow us to maximize the utilization of renewables and improve the efficiency of fossil fuels.

Low Carbon Fuels

This section focused specifically on biofuels and their utility in creating a more sustainable transport sector. Three of the speakers presented examples of the types of **technologies that are making a difference in producing low-carbon fuels.**

- Mr. William Brandt, Director of Strategic Integration at ASU Lightworks, emphasized that there are enormous business opportunities available in reaching our objective to reduce CO2 emissions. The example from his work is synthetic fuel production. Specifically, air catcher technologies provide new opportunities for entrepreneurs and innovators in creating such fuels.

- Mr. Sean Simpson, Co-Founder and CSO of LanzaTech, introduced a different innovation: a biological technique to use bacteria to create fuels from harmful elements. However, he mentioned that policy barriers remain because many gases are not considered feedstocks for biofuels.

- Ms. Nour Amrani, Manager of Novozymes, was an advocate for renewable ethanol; it can be extracted using enzymes to produce it from corn and wheat. The main challenge that she identified for renewable ethanol is cost.

Mr. David Burns, Manager of the National Wildlife Federation, spoke on behalf of the Roundtable on Sustainable Biomaterials (RSB) to answer questions about policy roadblocks. He explained how the organization rates biomaterials along a number of different categories to advise governments and companies on their use.

One important closing point, as Ms. Amrani pointed out, is that there is no one solution to decarbonization. Thus, renewable ethanol and biofuels in general can play a role as one of the many solutions used to reach this objective.

Low-Carbon Freight and Shipping

This was a very interesting panel focusing on an issue that is often ignored when discussing transport sector sustainability: freight and shipping. Mr. Tahri, President of the Moroccan Freight Forwarders Association (AFFM), presented the FIATA, which is the largest NGO in the field of transportation. The organization encourages freight forwarders to adopt efficient practices in terms of sustainable logistics, an example of how we can push for better standards in the future.

One of the proposed solutions was better data sharing and use of ICT. Two of the speakers in the panel introduced new innovations that aim to do just this.

- Mr. Martin Rapos, Energy and Mobility Director of Route Monkey, presented his company as an innovative startup dedicated to helping businesses optimize fleet and logistics planning and reduce emissions. It is, according to Mr. Rapos, the first true “freight sharing” platform. The company is an excellent example for how to utilize data and information systems to create a business opportunity (higher productivity and lower costs) and have a positive environmental impact at the same time, an answer to Mr. Tahri’s call.

- Mr. Sebastien Bougon, Founder of Flying Whales, presented an equally interesting proposal for a future technology. This company has **developed a new form of low-emissions transport: it is essentially a blimp with the ability to transport large freight containers over land and sea. The efforts are currently supported by the French, Chinese, and Moroccan governments, and serve as a good example for how to align diverse interests.** The French want to use it to extract wood from forests without building roads into them. China wants this for its economic program moving west. Morocco wants this for landlocked areas that lack

infrastructure. There are several advantages to this new technology, which has 2.5 years remaining until implementation:

- **Can carry large containers**
- **Very low cost**
- **Environmentally friendly (helium used as fuel)**
- **Point to point without need for infrastructure**

Finally, Dr. Tristan Smith, Researcher and Lecturer in Energy and Transport at the University College London Energy Institute, focused on shipping. According to Mr. Smith, the industry suffers from a lack of positive environmental regulations, since most decisions require consensus. There is a significant gap between regulators and tech innovators in the shipping industry. Current technological solutions that Dr. Smith presented included:

- Wind assistance (for slow-speed ships)
- Renewable fuels
- Batteries and storage (for short-distance routes)

Third Day

Clean Energy Transition

The first panel of the third day focused on low-carbon solutions to reach a clean energy transition adapted to each country's specificities. **The Clean Energy Transition is indeed an urgent environmental need but also an economic opportunity that can allow countries to capitalize on their resources and characteristics.**

Panelists provided information on the experiences and challenges faced by their respective countries regarding the clean energy transition, showing how every country's situation must be assessed individually to ensure the implementation of adequate solutions:

- Jordan Sturdy explained that the **Canadian province of British Columbia gets 98% of its energy from clean and renewable sources (hydroelectric principally but also solar and wind).** In the face of an important geographical challenge due to the size of its territory (4 times the United Kingdom with only 4 million people), **the province developed off-grid and renewable solutions to provide energy to remote areas.** The province is also at the forefront of the clean energy transition by being "*the only jurisdiction in North America that is carbon neutral*" and establishing a charter to help local governments to reach the same carbon neutrality as the province

- Mandy Rambharos, representative of the **South African** electric public utility Eskom, explained the situation in her country, with 88% of power generated by coal, facing the dual challenge of meeting its NDCs but also ensuring economic growth and poverty eradication. Coal is a cheap energy source in SA, and an industry that employs a great part of the population. Dropping coal in a context of low economic growth could create a major unemployment problem: "*How do we decarbonize the economy in a sustainable way without destroying jobs?*".

Jeffrey Sachs confronted Ms Rambharos by saying that coal must absolutely be eliminated, that South Africa needs to move faster and that job destruction is a false excuse used by big companies that actually exploit miners.

In a second discussion, panelists from giant energy companies discussed the clean energy transition from a "business" point of view :

- Carlos Sallé, Director of Energy Policy and Climate Change of Iberdrola, a Spanish company that works with renewables, explained how innovation, investment, but also compromises are the key factors that have been driving Iberdrola's commitment to renewables for the past 15 years. He also mentioned the importance of transparency and honoring disclosure obligations to avoid greenwashing.

- Juan Ramon Silva Ferrada, Chief Sustainability Officer of Acciona, insisted on the fact that **renewable energy has proven to be an economic opportunity, especially with the decreasing costs (off-shore wind costs have come down by 50% since 2009 and solar PV costs have decreased by 80% since 2008). He mentioned the "growing appetite for renewables" among big companies that are now taking direct action, i.e. Google, which bought a large quantity of solar panels in Chile**.

Nuclear Energy was the last topic discussed in this session. Eric Maucord, Deputy Vice President for Sustainable Development at EDF, the French state-owned utilities company, started by acknowledging today's challenge for electricity providers:

- **Provide low-carbon electricity at a large scale**
- **Improve energy efficiency**
- **Improve access to electricity in the world**
- **Develop new uses**

He emphasized that France's electricity already has a very low carbon footprint today, mostly because of the use of nuclear, which he describes as the "*only big-scale low-carbon solution viable*", and the "*best ally of renewables*". Moreover, nuclear had been mentioned earlier by Ms Rambharos as an option for South Africa. The latter country is looking for partnerships with others (such as France).

The session showed that even if the clean energy transition is an economic opportunity, it requires strong political support at the local and national level. Most of the time, political reasons are what drive some countries to stay or come back to fossil fuels even when they have a high capacity for renewables.

Smart Grids

This panel was highly technical and focused on the energy grid transformation that is currently underway. **All of the speakers emphasized the grid's fundamental role in our energy system:**

- Terry Boston, Former President and CEO, PJM Interconnection
    - Mr. Boston pointed out that nothing has improved our standard of living and productivity more than the creation of the power grid. As he put it, "Power engineering is not rocket science. It's much more important than that."

- Mr. Deepak Divan, Director of Intelligent Power Infrastructure Consortium (IPIC)
    - Mr. Divan also pointed to the grid's importance, calling it the "engine for global growth".

However, the speakers also pointed out the need for further reforms to the grid's infrastructure. As Mr. Divan pointed out, demand has changed today, and we want to do a lot more things with the same technology. In addition, the grid is moving towards a more distributed and decentralized model. Each speaker highlighted what he/she believes are the key factors to successful grid transformation:

- Ms. Maxime Ghavi, Head of Microgrids Initiative, ASEA Brown Boveri (ABB)
    - Ms. Ghavi pointed to two key elements of the "grid of the future":
        - Utilization of renewables
            - Challenges - intermittent, not able to provide inertial response, source far from point of consumption

        Microgrids
            - Definition - Multiple generation sources and loads that run under one control system (but must have ability to island itself from grid i.e. disconnect itself and run independently)

The two other speakers touched upon one of these points each. Mr. Boston expanded upon the technology needed to further integrate renewables. Meanwhile, Mr. Anjan Bose focused on microgrids in developing countries.

- Mr. Terry Boston
    - **Referred to storage as the "silver bullet" in helping push the use of renewables forward. He mentioned that pumped storage is the most effective method currently used.**

- **The main challenge is that current technologies don't meet needs in this area. We would need 30 gigawatts (100 gigawatt average grid for 8-10 hours) of storage to get to 50% renewables on the grid but we are still some distance from this.**

- Mr. Anjan Bose, Regents Professor, Washington State University
  - Spoke about the need to use ICT to control microgrids. Mr. Bose mentioned that this represents an opportunity for developing countries, which have high load growth and experience mostly greenfield investment for the growth of microgrids. Developed countries, on the other hand, mostly have to engage in retrofitting to make this possible, which comes at a high cost.

Mr. Divan provided some insight at the end, tying together the different ideas to focus on smart grids.

- Mr. Deepak Divan
  - The smart grid today is composed of smart meters plus distribution automation plus renewables. However, there are several challenges to make this possible and support its growth:
    - Price volatility
    - Dynamic ramp rate (especially problematic for solar)
    - Grid edge voltage volatility
  - Mr. Divan also cautioned against over-reliance on ICT, saying that real-time monitoring is necessary to make this effective.

Carbon Capture and Storage

There were two separate panels on CCUS. The first addressed roadmaps to achieve the 2°C objective. Dr. Julio Friedmann, Principal Deputy Assistant Secretary for Fossil Energy at the U.S. Department of Energy, moderated this discussion, asking the panelists to give their view on how to make the "climate math" work.

All of the speakers emphasized that CCUS can be one of the options used by industry to help us get to 2°C, although each one put slightly different emphasis. Eric Masanet, Director of the Energy Demand Technology Unit at the IEA, introduced the panel, focusing on the decoupling of of economic growth and the rise of greenhouse gases.

The first focus was about the cement industry. Ms. Manuela Ojan, Public Affairs, Global Environmental Sustainability at Heidelberg Cement, spoke about her company's efforts to reduce CO2 emissions. She focused on four main factors for this: energy efficiency, renewable fuels, clinker substitution, and CCUS.

Ms. Valerie Quiniou, VP Climate, Strategy, Innovation of Total, then detailed her own company's efforts on climate action. These include constantly measuring progress and merging the climate and strategy teams to better integrate climate action into planning.

The message was clear: there is a business opportunity available for the private sector. This was exactly the message emphasized by Mr. Julien Perez, Senior Manager of EY Climate Change and Sustainability Services. Mr. Perez spoke about the specific business opportunity that climate action represents, noting that investors are putting pressure on companies to engage in decarbonization.

The second panel looked at more specific and technical innovations in carbon capture and storage. This was a more solutions-oriented discussion.

Mr. Issam Dairanieh, of CO2 Sciences examined the potential of CCUS in helping reduce emissions, as well as noting the business opportunity it represents, but urged further cooperation to realize this potential. Ms. Wolff-Bye presented a specific Norwegian proposal for CCUS to ensure its positive climate impact.

Mr. Alan Knight, Corporate Responsibility - General Manager of **ArcelorMittal, looked specifically at the steel industry, which produces a lot of CO2. His company is currently cooperating with LanzaTech to convert CO2 into raw materials and fuels.** He also called for policies to support such innovations.

On the subject of policy action, Mr. K-C Tran, Co-Founder of Carbon Recycling International, emphatically agreed. He also pointed out that collaboration will help move this process forward. This was something that Mr. Michel Bande, VP of Sustainability at Solvay, also brought up in his talk. Mr. Bande said that his company is currently collaborating with others on research and development to mitigate its climate impact. He urged other companies to follow suit.

Innovation and climate smart Agriculture

Agriculture was an important issue that was debated several times at the LESC, but especially in a specific panel dedicated to the subject. It is one of the most important sectors for Africa and the one most impacted by global warming. Innovation is hence key to make it smarter, more efficient, and more resilient.

The debate was moderated by Sonja Vermeulen, a representative of the Consortium of International Agricultural Research Centers (CGIAR), who introduced the debate by highlighting that agriculture is responsible for around one quarter of global CO2 emissions.

Gabriela Burian, Global Lead of Sustainable Agriculture & Innovation of Monsanto, described how Monsanto has started to increase food production by 50% while reducing emissions by 50%. Monsanto is working with farmers on these goals and on improving efficiency and halting deforestation.

Another issue that Chris Brown, Vice President of Corporate Responsibility and Sustainability of Olam, addressed is that most of GHGs emissions of the agribusiness companies come from the supply chain. In order to make the supply chain more efficient, working with farmers is key to encourage innovation. **Olam is trying to improve its ecosystems through the following initiatives: farmer information system; transparent information; farmer management plans and institutional partnerships.** He added that, "***Agriculture is not just about smart business – it's about investing in people and community"***.

This brings to mind the importance of food security, which Diane Holdorf, Chief Sustainability Officer of The Kellogg Company addressed because it is core to her business. Climate change threatens the entire food system, and needs to be tackled through transformative policies. This is why Kellogg's has invested a lot in scaling up programs that focus on minimizing post-harvest loss.

Abbie Reynolds, Executive Director of the Sustainable Business Council in New Zealand, also highlighted the importance of transforming the way states deploy their agricultural policies. She suggested some innovations for mitigation, such as the removal of subsidies to drive innovation through addressing farm management and developing research projects.

Furthermore, Varun Vats, Senior Manager in Public Policy & Partnerships of Syngenta International, said that helping farmers stabilizing their crop yields using fewer resources is possible through resilient seed varieties and crop stimulant products to ensure sustainable yields. Regarding adaptation, which is more crucial for farmers, Vats insisted on the importance of developing practices to improve soil water-carrying capacity to ensure biodiversity and other benefits. He added that the most efficient incentives encourage the adoption of innovation in farms by using " ***the right technology at the right time on the right crops***".
However, according to Margaret Torn, Senior Scientist at the Lawrence Berkeley National Laboratory, deep decarbonization will increase the share of non-energy GHGs; hence, agricultural and working land will be at the forefront of this issue. Thus, it is crucial to enhance the global carbon sink and protect it from drought and land-use changes.

She also pointed to the innovations that the laboratory is working on, such as the use of microbes rather than other measures to ensure carbon storage.

Another innovation for rationalizing the use of land was presented by Michael Obersteiner, the program director of the International Institute for Applied System Analysis. He discussed algae uses, including for feedstock, which will free up land for other uses. Algae is, according to Michael Obersteiner, an "***amazing silver bullet,***" as it is cost effective.
Even if agriculture is an important sector and contributes to ensuring food security worldwide, it also has a negative impact by driving deforestation. Virgilio Viana, Superintendent-General at the Amazonas Sustainable Foundation, ended the discussion by highlighting the importance of improving incentives to make deforestation unattractive. He also affirmed that resilience should be built into the system, and urged combining REDD+ into other goals and targets.

Low-Carbon Policies

The last session of the day focused on the issue of carbon pricing, as a key element in the fight against climate change. Various tendencies and challenges were identified by the panelists.

Over the last few years, ***internal carbon price usage has been growing globally****, in different forms and for different reasons, both from governments and in the private sector.*

- Lance Pierce from CDP (Carbon Disclosure Project), detailed a **28% increase in companies disclosing carbon emissions between 2015 and 2016. In just three years, we have gone from below 100 to almost 1200 companies using carbon pricing internally or planning to implement it in the next two years. He insisted on the benefit for companies that implement a carbon pricing internally, especially for financing R&D and investments.**

- Thomas Kerr explained that his organization, CPLC (Carbon Pricing Leadership Coalition), launched at the COP21, works to advance carbon pricing and overcome political challenges in implementing it. One way they do this is by collecting and sharing evidence and best practices. **He stated that today over 60 jurisdictions (40 national) price carbon in some way, and this number has grown three times in the last decade and represents 13% of emissions. He added that when China will join the initiative in 2017, 25% of emissions will be covered.** Mr Kerr advocates for increasing the price that is currently at $10 or lower on average. He mentioned that even if carbon pricing is an effective solution, it remains politically very difficult.

Political will *has a crucial role to play to drive efficient and coherent policies in order to meet climate goals. Carbon pricing also depends on political decisions and the government's capacity to engage in a real transition.*

- **Fossil Fuel Subsidies** are a major issue preventing the acceleration of the reduction of emissions. Mark Sinclair, Climate Change Ambassador for New Zealand, mentioned that we still put a "negative" price on carbon via fossil fuel subsidies (13% of emissions receive some type of subsidy). **Most recent estimates of subsidies at a global level count $500bn in consumer subsidies, $100bn in producer subsidies (four times the level of renewables subsidies of $135bn and five times the $100bn of the Green Climate Fund). This contradiction has been mentioned several times during COP22 and must be reversed: we continue to give subsidies to fossil fuels and this holds back renewables, drives emissions, and wastes government resources.**

- The Argentinian Case demonstrates the **strong impact of politics on climate ambitions.** Carlos Gentile, Undersecretary of Climate Change explained that recent political changes in Argentina led the country to review its NDCs and make them much more ambitious but still within the realm of possibility. The review mechanism was inclusive since it included inputs from the private sector, academics, and CSOs from all provinces. "*The new Argentinian NDCs plan is transparent, achievable, and more ambitious*". It will focus on soil regeneration, energy system transition, and a sustainable transport system. Argentina hopes that its Neighbors will follow the movement.

ANNEXE: