



## **Outcomes from the Low-Emissions Solutions Conference alongside the Global Climate Action Summit: *The Land-Energy Nexus in Climate Change Mitigation***

September 11, 2018

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How do interactions between land use and the deep decarbonization of energy affect our strategies for addressing climate change? Over 45 experts including scientists, politicians, environmental NGOs, farmers, foresters, modelers, and private sector leaders came together to consider this question, present practical solutions, and discuss implementation challenges at the fourth edition of the Low-Emissions Solutions Conference (LESC). The event took place alongside the Global Climate Action Summit (GCAS) in San Francisco, California on September 11, and was hosted by the University of San Francisco and Lawrence Berkeley National Laboratory with both local and global partners, including core LESG sponsor Enel.

Participants discussed how the land and energy sectors impact each other's emissions, both positively and negatively, yet there is little coordinated planning to address this. To achieve the goals of the Paris Agreement, keep global warming well below 2°C, and achieve global net-zero emissions by mid-century globally, these interactions must be better understood rapidly.

For example, many models for decarbonizing the energy system rely heavily on bioenergy for transportation fuel and dispatchable power. At the same time, food production must increase to feed the world's growing and increasingly affluent population, and could compete with bioenergy for land, water, and nutrients. Natural climate solutions like restoring forests can help sequester carbon while preserving biodiversity, but may also compete with other important land uses. Solar and wind energy are an essential part of the low-carbon energy mix, but a large-scale buildout requires well thought-out siting to protect ecosystems. How do we achieve these daunting and essential goals simultaneously?

## Key Takeaways

- Integrated assessment models (IAMs) need to more clearly reflect land use constraints in their modeling assumptions.
- Land use and carbon cycle experts need to do a better job of providing energy modelers with well-vetted modeling inputs and constraints that are consistent with sound land use practice.
- Investors and businesses want and require visible long-term policy signals in order to make sound investments in the technologies that will lead us to a low-carbon future.
- Policy support for low-carbon fuels is crucial to help the products make their way through the systems.
- Customer education and public acceptance are extremely important for most of the solutions discussed, and particularly so if we are ever to put a “price” on carbon.
- The technical feasibility to decarbonize energy systems has been proven, as demonstrated by the IPCC, the [Deep Decarbonization Pathways Project](#), and other modeling exercises around the world. The challenge facing us is to educate the public and mobilize political commitment to scale up the technical solutions already at hand.
- More research is needed to better understand how solutions best work together, in what specific locations, and at what scale, to support the Paris Agreement.

Below are summaries and takeaways from the morning plenary and afternoon breakout sessions. Stay informed about further LESC opportunities at [lowemissions.solutions](https://lowemissionsolutions.org).

## Panel and Session Takeaways

The morning plenary was organized to showcase three different perspectives on the land-energy nexus: political, analytical, and practical implementation. The plenary raised many questions in exploring the gaps between energy and land use mitigation approaches. The high-level discussions in the plenary then provided the context for the afternoon breakout sessions, which went into detail on practical solutions for the array of challenges presented.

### Plenary Panel 1: Climate Solutions in Action: Policy Perspectives on the Land and Energy Nexus

During the first session, we heard from political leaders from four jurisdictions on the forefront of climate change policymaking:

- **Hawaii** has enacted legislation requiring the state to achieve zero net emissions by 2045, one of the most ambitious climate policies in the world.
- **California** is the fifth largest economy in the world; just passed legislation to reach 100 percent clean electricity by 2045, accompanied by an executive order to achieve full carbon neutrality by 2045; is a major agricultural producer; and has large forest areas impacted by climate change.
- **Brazil** is the sixth largest economy in the world, a leading producer of biofuels, and a critical country for protecting forest carbon and biodiversity.
- The state of **Sonora, Mexico** stands at the crossroads of South America and North America and its borders abut Arizona and California, making it an important collaborator in reducing the regional emissions of this area. There is a large local impetus to improve air quality and reduce emissions.

The panelists offered their perspectives on parallel activities on climate change mitigation and adaptation in their jurisdictions, including both energy and land use components. All agreed on the importance of subnational governments in making bold commitments in support of the Paris Agreement and helping and encouraging national governments to meet their pledges.

### Plenary Panel 2: Where Energy and Land Use Meet: New Findings for Decarbonization Pathways

The second session of the morning detailed the current state of analysis on emissions reduction efforts and the impacts of emissions from land and natural climate solutions on the global carbon footprint. This panel featured experts in energy systems, climate change mitigation, and global ecology to discuss current thinking in analyzing carbon sinks.

The production of low-carbon bioenergy and the sequestration of carbon in forests and soils can make a large contribution to protecting the climate, and can reduce the long-term costs of energy decarbonization. Moreover, if done well, land-sector mitigation promises co-benefits for ecosystems, employment, and technological leadership. However, overreliance on the land sector—like

that implicit in many integrated assessment modeling scenarios—can undermine not only sustainable development and essential ecosystem services, but also our success in climate change mitigation itself.

The panelists called for integrated assessment models to more accurately reflect the impact of land use practices on emissions and as constraints on model inputs. At the same time, they acknowledged that bioenergy with carbon capture and sequestration (BECCS) is likely necessary to meet the 1.5°C target, a goal that most climate scientists agree is not reachable without some form negative emissions. However, Rob Jackson (Stanford University, Woods Institute) cautioned that bioenergy is one of the most water intensive forms of energy, and therefore we cannot manage our lands for purely carbon emissions without impacting water. Jim Williams (University of San Francisco) concluded that [California’s new SB 100 law](#) and Gov. Brown’s [executive order for carbon neutrality](#) are a “polestar” to guide other subnationals in this arena, as these make combined efforts in energy and land use a central feature of the state’s mitigation strategy.

### **Plenary Panel 3: New Thinking on Navigating the Land-Energy Intersection**

Current land use and food systems are unsustainable and businesses lack clarity on where and how to invest to operate more sustainably—especially critical in areas of high biodiversity. The final plenary panel looked at the current frameworks and tools (or rather lack thereof) available to measure and assess the tradeoffs from different land use and energy decisions. Climate protection requires a sweeping low-carbon transformation of both energy systems and land use. Yet this transformation could also bring potential conflicts.

The panelists discussed how bioenergy production, siting of energy facilities like wind farms, and carbon sequestration in forests and soils be conducted so as to avoid impacts on food, water, and biodiversity. This panel also looked at different frameworks and implementation mechanisms to avoid these conflicts, enhance the co-benefits of carbon-smart land use, and align stakeholder interests with the most sustainable pathways. One of the premier projects that was mentioned was the [Food, Agriculture, Biodiversity, Land use and Energy \(FABLE\)](#) project, which is currently working with national modeling teams to design an integrated land use model to illustrate and understand the tradeoffs discussed in the previous sessions. The project is newly launched and will have initial results to share in 2019.

## Afternoon Breakout Sessions

In the afternoon, conference participants were invited to delve into the case studies, mechanisms, and policies currently in place or proposed for meeting the crucial challenges raised in the morning. Panelists presented and brainstormed on what is working and what can be improved to more sustainably manage our land and transition to low-carbon energy.

The **Energy track** was framed around three sessions: transmission grid integration, going beyond decarbonization, and transforming transport.

### From Microgrids to Global Interconnection: The Electricity System of the Future

Decarbonizing an economy requires large amounts of low-carbon electricity to displace fossil fuels. The scale at which that electricity is supplied—ranging from rooftop systems to large, offshore wind farms and desert solar installations—has vastly different implications for how the electrical grid is interconnected and operated. It also raises critical concerns about the cost of electricity, reliability of the power supply, energy security, and land use. Speakers concluded that decarbonization requires both modernization and new investments in large bulk power grids in many regions, and that integration at larger scales is often the least cost way to expand the ability of a bulk power system to absorb high levels of intermittent renewable generation. At the same time, they acknowledged that small-scale solutions such as distributed energy resources and microgrids can provide crucial flexibility for electricity systems, and should be seen as complementary to, rather than in competition with, large-scale grid integration. Both are needed in a decarbonized electricity system. Laura Brand of The Nature Conservancy made the point that large buildouts of wind and solar energy, and transmission lines to carry them, can and must be done in a way that minimizes impacts on the land.

### The Step Beyond Next in Deep Decarbonization

It is well known that the key, near-term steps toward protecting the climate include low-carbon electricity, zero-emission vehicles, and energy efficient buildings. Many states, cities, and countries are committed to making major strides in these areas by 2030. But what are the steps beyond these, through mid-century and beyond?

Ken Alex of the California Governor's office talked about the carbon neutrality order signed during GCAS, and its key role in signalling the need for R&D, investment, and clear land use rules in terms of maximizing the land use carbon

sink and how it interacts with energy sector, especially in the case of bio-CCS for net negative emissions. Ken also highlighted the the high uncertainty around California's long-term industrial structure. Leon Clarke (JGCRI), who played a leading role in the last IPCC's (AR5, 2014) chapter on transformative pathways, described in detail the scope of net-negative emissions required, up to 15 GT per year for 1.5 C (~2.3 times current US emissions). Ben Haley of Evolved Energy provided preliminary results of a US pathway that would, as part of similar global effort, eventually return the atmospheric concentrations of CO2 to 350 ppm, allowing a stabilization of the climate at +1C following a bump to 1.5-2C, thereby minimizing long term damages and the possibility of lower probability but very high damage events. Chris Bataille (IDDRI) described possible technological and policy pathways for decarbonizing the hard-to-abate sectors like heavy industry, legacy buildings and industry, and aviation.

### Transforming Transport for a Clean Future

To meet the goals of the Paris Agreement, we need to accelerate and scale adoption of clean transport systems. Businesses are in a strong position to lead this transformation and collaborate with government at the national, state, and city levels. Transport contributes to 18 percent of global greenhouse gas emissions and growing. Transport related energy use is set to increase 75 percent by 2050 unless we take serious steps to transform the current system. As climate change continues to gain importance, we urgently need a global and unified strategy to reduce emissions from transport and freight.

This panel discussed the next steps beyond incremental improvements to the transport system to explore what is really needed for a step change in emissions from transport. The speakers approached the system from their own companies' expertise and investments, covering: people and freight; long- and short-distance; and heavy- and light-duty transport. A theme that reappeared throughout the discussion was collaboration within companies, between companies, and with external stakeholders.

Erik van der Schans (Port of Rotterdam, the Netherlands) discussed how better planning in shipping can help reduce emissions by approximately 30 percent. But there is need to ensure that the emission reductions are shared between the ship and the port. To draw the session to a close, Rasmus Valanko (World Business Council on Sustainable Development, or WBCSD) presented the organization's newly-launched project, [Transforming Heavy Transport](#), as an example of the type of collaboration needed to make a step change in transport decarbonization.

The **Land track** was focused on natural climate solutions and climate smart agriculture.

### **Implementing Natural Climate Solutions**

This session was an effort to look at how governments and private sector are currently implementing natural climate solutions and how these solutions are being funded.

One of the biggest challenges is financing national climate solutions. How do we pay for it, and how do we bring these solutions to scale to make an impact on our global emissions?

### **Land for Mitigation, Biodiversity, Food, and Fiber: How Can We Do It All?**

Competition for land in an increasingly crowded world is causing over-extraction of resources, biodiversity loss, climate change, and reduced climate resiliency. Meeting multiple sustainable development goals requires anticipating and reconciling land use conflicts through cross-disciplinary research and innovative solutions. This session highlighted:

- Land use solutions in action—case studies that demonstrate how integrative land use solutions can simultaneously achieve biodiversity conservation, climate change mitigation, energy security, and sustainable livelihoods (food and fiber); and
- New analytical approaches that can support integrative land use practices and planning through ambitious yet reasonable goal-setting and scaling-up of solutions.

With a finite amount of land available—and only 14.7% of that land currently protected—where can we find “additional” land to meet the needs of a growing global population? Professor Virgilio Vianna (Amazonas Sustainable Foundation) detailed his organization’s core strategy, of helping farmers and local actors to more efficiently and sustainably manage their land. Some of the key challenges that his team has come across are informality and property rights. Additionally, the panel discussed the importance of data in the context of access, accuracy, and granularity.

### **Solutions for Implementing Climate Smart Agriculture**

Approximately 90 countries have included greenhouse gas mitigation and climate change adaptation in agriculture as part of their Paris Agreement commitments or Nationally Determined Contributions (NDCs), but there are no targets or pathways



that can guide policymakers, investors, or business on how this could be achieved. As a stopgap, many countries and states have adopted emissions trading schemes or offset development opportunities in the land use, forestry, and agricultural sectors with some degree of success and at large scale.

This session showcased how business, farmers, and investors have been working successfully in programmatic and project-based carbon projects and drew on their recommendations for NDCs across mitigation and adaptation in land use, forestry, and agriculture. Particular reference was made to how new developments in technology across mapping, precision agriculture, modelling, monitoring, verification, and reporting can assist in scaling up land-based solutions.

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The outcomes from this event will feed into two additional 2018 LESC events that will further this work. Visit the website to learn more or follow LESC on social media to stay informed on upcoming events [@low2no](#).