Decarbonization Pathways Studies Approach[1]
Frequently Asked Questions with Answers from Experts

SUSTAINABLE DEVELOPMENT SOLUTIONS NETWORK
A GLOBAL INITIATIVE FOR THE UNITED NATIONS

I. Research Approach

Q: What is "decarbonization?"
A: Decarbonization is the process of steeply reducing carbon emissions across all sectors of the economy. Decarbonization is a systems-wide process because energy, the primary source of carbon emissions, is depended upon by all industries and is linked to all aspects of society. While global emissions have increased across all major sectors since 2010, most global anthropogenic (or human-caused) emissions currently come from the energy supply sector (34%), industry (24%), agriculture, forestry, and other land use (22%), transport (15%), and buildings (5%) (Intergovernmental Panel on Climate Change, 2022). There are four main pillars of decarbonization: electricity decarbonization, energy efficiency, electrification, and carbon capture (Zero Carbon Action Plan, 2020).

Q: Why do we need decarbonization?
A: Human activities have warmed the atmosphere, ocean, and land through rapid accumulations of greenhouse gases, including carbon dioxide, in the atmosphere and the ocean, causing unprecedented and alarming climatic changes across the globe. As more carbon dioxide and other greenhouse gases build up, they trap more heat, which is amplifying the global warming process and causing climate change. In order to reduce the worst impacts of climate change, including sea level rise, extreme temperatures, and increasingly frequent and intense storms, wildfires, and flooding events worldwide, the international community has agreed that societies must limit the rise in mean global temperature to well below 2°C (ideally 1.5ºC), as specified by the Paris Climate Agreement (United Nations Framework Convention on Climate Change, 2015). Meeting this goal requires that global net emissions of greenhouse gases reach zero by the year 2050. In other words, the amount of greenhouse gases emitted into the

[1] The information relayed in this document specifically pertains to the decarbonization pathways studies co-developed by SDSN and its partners. Other institutions may employ alternative approaches and methodologies.

atmosphere and the amount removed from the atmosphere must be balanced by mid-century. Decarbonization also has various co-benefits, such as environmental and health improvements, investments, and employment opportunities created in the carbon-free economy.

Q: What is a decarbonization pathway?

A: The term "pathway" refers to a blueprint for how an energy system reaches future greenhouse gas emissions reduction targets. Pathways are not forecasts of what will happen and instead are potential trajectories based on a predefined end goal (e.g., net zero). Decarbonization pathways are used to analyze technical components (like energy, infrastructure, and geospatial factors), while also integrating economic and policy considerations. Decarbonization pathways provide clear, science-based, and comprehensive outlines of the technologies, investments, and policies needed to reach net-zero carbon emissions by 2050.

Q: Why do we need decarbonization pathways studies?

A: In the face of the urgent need to rapidly decrease greenhouse gas emissions to reach net zero by 2050 or sooner, we are currently seeing a growing number of net-zero emissions goals being adopted by companies, investors, organizations, regions, countries, and cities. Despite the rising amount of commitments being made worldwide, such goals have primarily focused on the problem of "what to do," leaving the question of "how to do it" largely unanswered. While scientists agree we now have most of the technologies we need to enable the transition to net zero (Energy Transitions Commission, 2020), the exact configuration of those technologies, accompanied by supporting policy frameworks and financing, will need to be calibrated for specific jurisdictions around the world, regionally, nationally, and locally. Decarbonization pathways studies provide practical, science-based information that jurisdictions need to take action on their climate commitments, in ways that integrate all key sectors and align with their local needs.

It should be noted that while the energy system physics and emissions accounting that underpin the models used are well-established, projecting technological progress (particularly cost) and energy service demand has a mixed track record, even over time spans much shorter than 30 years. Thus, selecting a single pathway as the basis for public policy is faulty, as it does not account for the changes in quickly advancing technologies and economies which may change the pathways over time. Decarbonization pathways studies therefore highlight trade-offs and synergies across multiple pathways forward, and emphasize the need for ongoing planning and research as new information becomes available (San Diego Regional Decarbonization Framework 2022).

Q: Why are decarbonization pathways valuable?

A: Decarbonization demands the implementation of integrated, systems-wide solutions that account for social, economic, and environmental well-being. Such solutions are analyzed by decarbonization pathways. Decarbonization pathways are valuable for four key reasons: (1)

identifying and lowering the risk of dead-end strategies, (2) identifying key decision points, (3) identifying commonalities in pathways under sensitivity analyses, and (4) situating near-term policy targets with respect to long-term goals (San Diego Regional Decarbonization Framework 2022). Further, as roadmaps of options and enabling conditions, decarbonization pathways are also valuable for: increasing the ambition of climate commitments, providing long-term benchmarks for measuring short-term progress, avoiding dead-ends, designing resilient and adaptive policies in a context of long horizons with large uncertainties, private-sector decision-making, guiding today's policies and investments in low-emission technologies, achieving other sustainable development priorities including justice, and coordinating policy and investment across jurisdictions, sectors, and levels of government based on scientific analyses (Deep Decarbonization Pathways Project, 2015).

Q: How long have decarbonization pathways studies been developed?

A: Decarbonization pathways studies build on many years of research stemming from original modeling work about technology pathways to deep decarbonization in California, originally published in *Science* in 2012. The methodology, data, and modeling tools used in recent US decarbonization pathways studies were presented in Williams et al. (2021) and were also used in SDSN's Zero Carbon Action Plan, the Princeton Net-Zero America study, and the Decarb America Initiative. Other resources and studies can be found in Section IV of this document.

Q: Who develops these decarbonization pathways studies?

A: Decarbonization pathways studies are carried out by researchers and modelers all over the world. The studies co-developed by SDSN have been conducted in partnership with various institutions and organizations, including those described below:

Sustainable Development Solutions Network (SDSN): a global network of universities, research centers, and other knowledge institutions that mobilize global scientific and technological expertise to promote practical problem solving for sustainable development. SDSN has operated under the auspices of the UN Secretary-General and leadership of Professor Jeffrey Sachs since 2012. SDSN is committed to supporting the implementation of the SDGs at local, national, and global scales. Experts from across SDSN's 55 national and regional networks collaborate and contribute to the decarbonization pathways studies worldwide.

Evolved Energy Research (EER): a consulting company that advises on strategies for deep decarbonization of the energy economy. Experts from EER (engineers, economists, and software developers) are responsible for the development of proprietary analytical tools and novel pathways reports at the forefront of modeling energy system transformation. EER clients include consulting companies, government and regulating bodies, large technology and manufacturing companies, utilities, and NGOs.

Institute for Sustainable Development and International Relations (IDDRI): an independent policy research institute and a multi-stakeholder dialogue platform that identifies the conditions and proposes tools to put sustainable development at the heart of international relations and public and private policies.

ClimateWorks Australia: an independent non-profit working within the Monash Sustainable Development Institute that bridges research and action to achieve the system-level transitions required to reach net zero emissions across Australia, Southeast Asia and the Pacific. Climateworks acts as trusted advisers, creating evidence-based solutions and influencing decision-makers to reduce emissions at scale.

Jeffrey Sachs Center on Sustainable Development at Sunway University: a regional center of excellence that advances the achievement of the 17 SDGs in Malaysia and Southeast Asia, tackling the sustainability agenda through education, training, research and policy advisory. The Center has a focus on research and policy practice, delivering world-class programs to train students, practitioners and policy leaders on sustainable initiatives while working in collaboration with industry, government bodies, NGOs and universities worldwide, to develop solutions related to the SDGs.

Q: How does a decarbonization pathways study compare to a 100% renewable electricity study? Why is looking at electricity supply in isolation from other energy sectors counterproductive to stopping climate change?

A: 100% renewable electricity studies focus only on reducing emissions in the electric sector. This is important, but too limited when trying to understand how to reduce an entire economy's emissions to net zero. The electric sector requires significant sectoral integration (production of electric fuels, direct electrification of transportation) both to meet its own targets and support the transition to zero-emissions economies for all sectors. Narrowly focusing on an electric sector without considering its interaction with other sectors or its role in supporting the emissions reductions from other sectors (e.g. transportation) is likely to lead to poor decision-making.

Q: At what scale are decarbonization pathways studies developed?

A: Decarbonization pathways studies can be developed at the scale of any jurisdiction (i.e., city, municipality, state, region, country, global) but the range of assumptions, specificity, attribution and granularity might differ. Studies of different scales should ensure that they are aligned with other decarbonization pathways work at both smaller and larger scales, in order to ensure continuity and compatibility and to build on already existing data collection efforts (Guide to Regional Decarbonization, 2022). This can be accomplished by upscaling or downscaling the results of other studies as needed, a process which is exemplified via the development of the 2022 San Diego Regional Decarbonization Framework, which downscaled and localized the results of previous national US studies. Evolved Energy Research's Annual Decarbonization Perspective, for example, is an annual report that provides the most up-to-date results for investigating options for long-term deep decarbonization pathways for the US and can be downscaled to create more localized pathways across the country. It should be noted that this work is highly specialized and takes a considerable amount of time and knowledge to be done comprehensively.

Q: What is a Regional Decarbonization Framework (RDF)?

A: An RDF is a zero-carbon sustainability plan that is intended to inform policy-making at a regional scale (e.g., across sub-regional governments) toward reducing greenhouse gas emissions. An RDF presents a science-based approach to help all the governments in a region plan for policies and investments to reduce emissions based on decarbonization pathways. An RDF provides a technical roadmap, gap analysis, and recommended policy actions toward decarbonization across all jurisdictions in a region.

Q: How is an RDF different from a Climate Action Plan?

A: An RDF provides a roadmap to decarbonize a region through suggested actions that can be taken by different agencies. A Climate Action Plan can support an RDF by implementing some of these actions in a specific jurisdiction. In other words, the RDF serves as a visionary document that provides regional data, information, and pathways to reduce emissions, which individual governments can use to begin implementing actions in various sectors, including via Climate Action Plans, to decarbonize in alignment with modeling results.

Q: Who is the target audience of decarbonization pathway studies?

A: The primary target audience of decarbonization pathways studies consists of governing bodies, research groups/universities, and sustainability practitioners. However, the findings of these studies are designed to be used across all sectors (academia, government, non-governmental organizations, private sector) and relevant disciplines (power, buildings, transport, industry, materials, geospatial analysis, land use, employment, justice, and policy). They can thus be used by an international community of researchers, sustainability practitioners, policymakers, and civil society members with decarbonization planning and implementation interests, both in the area of study and beyond.

II. Technology, Modeling, and Methodology

Q: What kind of modeling tools are used to develop decarbonization pathways?

A: The experts at Energy Evolved Research, LLC primarily use the EnergyPATHWAYS and Regional Investment and Operations (RIO) modeling platforms (which they developed) in their decarbonization pathways research. These models are widely recognized as best in class. While EnergyPATHWAYS is used to develop demand-side cases, the RIO Platform is used to provide cost-optimal energy supply. For more information on both modeling platforms and how they are used together in decarbonization pathways analysis, please see their respective links.

Q: What are the modeling scenarios used in decarbonization pathways studies?
A: Decarbonization pathway studies conduct their modeling analysis using a set of different scenarios that allow them to present multiple pathways forward under various circumstances. First, a reference, or "baseline," scenario that does not enforce emissions constraints is created for the other scenarios to be compared against. From there, the other scenarios are developed based on different potential behaviors, social preferences, and technological developments. The scenario options and assumptions are chosen to reflect the broad debates happening around climate policy and human behavior and to reflect a wide range of plausible futures (San Diego Regional Decarbonization Framework 2022). Assumptions made in an analysis are specific to that decarbonization pathways study; all assumptions must be made relative to the local context of a project.

Q: What are the key analyses carried out in decarbonization pathways studies?
A: The most comprehensive decarbonization pathways studies link energy system modeling, geospatial modeling, employment impact modeling, and policy analyses to cover all major facets of decarbonization. Such studies examine the potential for natural climate solutions, the impact of jobs during the decarbonization transition, and employ energy systems modeling to analyze how changes across all key sectors (e.g., electricity, transportation, buildings, land use, materials, and industry) could make up technical pathways for arriving at net-zero emissions. Example analyses include:

- *Geospatial analysis* to identify low-impact, high-quality areas for renewable energy development through the examination of several site-selection scenarios that prioritize different factors;
- *Transportation analysis* to identify opportunities to accelerate zero emission and electric vehicle adoption and to reduce vehicle miles traveled;
- *Buildings analysis* to examine ways to reduce emissions from space heating and water heating in new and old buildings, with a focus on communities of concern;
- *Natural climate solutions analysis* to examine nature-based solutions based on the ecology of the jurisdiction of study, such as carbon farming, wetland protection, urban forestry, and leaving natural lands intact;
- *Employment impacts analysis* to examine job creation and contraction estimates across various scenarios, with recommendations to ensure a just transition for fossil-fuel based industries; and
- *Policy analysis* to examine local policy opportunities to reduce emissions, analyze local Climate Action Plans, and identify low-regret policies.

Q: Why do you use the energy forecast provided by the US Energy Information Agency (EIA) as your baseline in US studies? Are the EIA's forecasts and data reliable or do they overproject energy demand?
A: We use the underlying energy services demand forecast (space heating, industrial production, vehicle miles traveled, etc.) to support the idea that we can decarbonize the economy, the same economy that is predicted to run primarily on fossil fuels by the US

government, without necessitating changes in lifestyle or a reduction in economic output. The EIA's forecasts suffer from the same limitations as all forecasting exercises and will inevitably deviate from actual future service demands, but they represent an apples to apples comparison.

Q: If we conserve more energy and consume less, can we meet our energy demand with 100% renewables by 2050?

A: Meeting all of our energy demand with 100% renewables (wind, water, solar, hydro, biomass + storage) by 2050, not just electricity demand, is possible even under the projections of steady energy demand provided by the US Energy Information Administration. Meeting all energy demand with renewables would just be more costly, under certain assumptions, than to continue to deploy small amounts of fossil fuels in some areas of the economy.

Q: Why is direct air capture an important component of deep decarbonization?

A: Direct air capture will be an important complementary technology depending on how other strategies that we intend to rely on (zero-carbon biomass, electrification, etc.) unfold in the future. When powered by zero-carbon electricity, direct air capture can remove CO_2 from the atmosphere and either sequester it (resulting in negative emissions) or utilize it with hydrogen to produce a carbon-neutral alternative to fossil fuels (gas, diesel, gasoline, etc.). Negative emission technologies, like direct air capture, can lower the cost of achieving net-zero emissions, and will have a key role beyond 2050 in stabilizing the climate.

Q: What are the risks or downsides of direct air capture technology?

A: Capturing CO_2 from the atmosphere is an energy intensive process. Therefore, these direct air capture plants are most cost-effective if they operate on excess low carbon electricity – solar or wind, for example, when they are producing more than is needed. This electricity that would otherwise be "curtailed" is inexpensive from a system perspective. If there is not excess electricity available, the operation of direct air capture facilities will require the construction of new renewables to support their energy needs. It is not possible to run these economically on the grid as it looks today because the emissions associated with fossil-fueled electricity would offset much of the benefit of the capture process. Direct air capture only "fits" on a very low-carbon grid. In the longer term, direct air capture may be a cost-effective approach for capturing CO_2 for utilization (e.g., production of synthetic liquid fuels) or geological sequestration or storage. Like other new infrastructure, there will be land use and siting challenges, though there is no imperative to locate them near human habitation.

Q: Why do some deep decarbonization pathways call for building more gas power generation capacity?

A: In the near-term, the priority is displacing electricity generation from the existing coal fleet. Robust pathways studies incorporate assumptions about real world limitations on the speed of renewable energy deployment in the near-term, which means while much of the displacement can be renewables, gas still plays a role in the rapid drawdown of coal generation. If planned well, in the long-term, these are not wasted investments, as gas-fired electricity generation, running very rarely to provide capacity, is the most cost-efficient way to maintain electric reliability, even as we transition to a system where most of the energy is being provided by renewable sources. With load growth from electrification, in the longer term, the need for capacity is growing, even with higher energy efficiency, flexible load, and the deployment of significant renewables.

Q: Will the transition to low carbon require construction of new natural gas transmission pipelines?

A: New pipelines that transport biogas, synthetic gas from renewables, hydrogen, or CO2 will be required. This is because the locations where these future sources of energy or carbon are sourced are not the same locations where we source natural gas today; and therefore, will require some new pipeline to connect them with loads or with carbon sequestration locations. As a general rule, new pipelines to transport natural gas are not needed in this transition, though exceptions may exist.

Q: Why do most scenarios call for Carbon Capture and Storage (CCS) and Carbon Capture and Utilization (CCU)? Why can't we transition off of fossil fuels quickly enough to avoid the need for carbon capture?

A: Carbon capture does not mean we are always capturing emissions from fossil energy. Most of our carbon capture is done in conjunction with biofuels production or accomplished through direct air capture, which is not a function of fossil emissions. These both contribute negative emissions without requiring fossil consumption, so the use of carbon capture in these scenarios does not necessarily support continued use of fossil fuels. When fuels (aviation, for example) or the chemical components of fuels (cement, petrochemicals) are required for an application, the use of carbon capture is critical. This can be used either in the production of fuels (CCS on biomass production, power-to-x using direct air capture) and/or at the point of use (CCS on cement and petrochemicals). This can result in zero or negative emissions fuels pathways, which contribute to overall emissions reductions in the economy.

Q: Are CCS and CCU already being used in the US? How much more use would be needed?

A: CCS and CCU in the applications we describe are not currently common in the US. The only significant use for captured carbon, currently, is enhanced oil recovery, which is not an application we analyze in any great detail and is not the purpose of CCS and CCU in our scenarios. This would therefore be an almost entirely new industry, but one in which the technical implementation is already understood.

As of September 2022, there are 196 (including two suspended) projects in the CCS facilities pipeline worldwide. This is an impressive growth of 44% in the number of CCS facilities since the Global Status of CCS 2021 report. The Americas, particularly North America, continue leading the world in CCS deployment. CCS in the Asia-Pacific region, as part of broader climate mitigation, remains a continuing contrast between significant development and lagging deployment. Today, there are 73 CCS facilities in various stages of development across Europe and the UK. In the Middle East and North Africa region, three operational CCS facilities in the UAE, Saudi Arabia and Qatar already account for around 10% of global CO_2 captured each year (Global CCS Institute, 2022).

Q: Can existing fossil fuel infrastructure be used with synthetic fuels and gases?
A: Yes, these are what we refer to as "drop-in fuels" meaning all the components of the existing delivery (pipelines, storage facilities, etc.) and end-use consumption infrastructure (trucks, boilers, etc.) can use these fuels as if they were fossil-based.

Q: What would happen if the US decommissioned nuclear power plants that are currently operating?
A: Decommissioning nuclear without the time to replace them with renewable energy would result in higher operating levels for other online thermal plants (coal and gas). In the longer-term, they can be technically replaced with renewables, but in many cases, this would increase the cost of achieving emissions targets.

Q: Does the US need new nuclear power to meet the emissions reduction and carbon budget targets?
A: No, we do not. Achieving the target requires decarbonization of electricity, principally more renewables, but this can be accomplished without new nuclear generation. There are some contexts where new nuclear power could result in lower decarbonization costs, but recent studies (EER's Annual Decarbonization Perspective, Zero Carbon Action Plan, Princeton Net-Zero America study) indicate that new nuclear is not a requirement.

Q: What role does hydrogen play in meeting the emissions reduction and carbon budget targets?
A: Hydrogen production plays an important role in helping to balance a high-renewable grid, enabling decarbonization of some industrial processes (e.g., iron and steel) and supporting production of low-carbon fuels for end uses where electrification is not viable. Current projections indicate that hydrogen produced from electrolyzers running on clean electricity will be the most economical, and enables hydrogen production to help support the electricity system by utilizing energy that would otherwise be curtailed. Even pathways which include higher levels of demand for hydrogen (hydrogen competing for some transportation and industrial applications where other fuels could be used) do not start deploying hydrogen production at large scale until the late 2030s or early 2040s.

III. Implementation

Q: Has an energy transition of this speed and magnitude ever happened in the US or elsewhere?

A: Significant energy and economic transitions have happened in the US (rural electrification, nuclear deployment, WWII mobilization), sometimes at even greater rates of change, but there are no perfect analogs domestically or internationally for this transition.

Q: Are there technologies that are not yet developed that would be needed to implement one of the pathways modeled?

A: No technologies that are in the research phase are employed in these studies, though some are employed that have only been piloted or not deployed at commercial scale.

Q: What would need to happen for this transition to be done in a way that is just and equitable?

A: This transition offers two key inherent opportunities for making our energy system more equitable than it is today. With nearly complete reliance on fossil fuels, the current energy system disproportionately impacts lower income households who pay a larger share of their income for energy. Without alternatives to fossil fuels, when energy prices spike, those same low income households get squeezed financially. In this way, the current energy system is extremely regressive. In contrast, in a low-carbon energy system:

1. Electricity becomes the centerpiece of energy service delivery, and the regulation of electricity rates gives policymakers the ability to support equity with different rate structures (i.e. low-income rates) and cost allocation mechanisms. Fossil fuels like oil are obviously not subject to regulated rates, eliminating this opportunity to improve equity.
2. Air quality, which disproportionately impacts the poor, will be improved dramatically from reduced combustion in power plants, vehicles, and petroleum refineries.

In terms of managing the transition effectively, it will be necessary to focus on policy making for industries that may decline or change significantly. In our scenarios, for example, there are some very obvious transition paths: while petroleum refining declines, we have an entire new advanced biofuels, CCS, and power-to-fuels industry that requires much of the same skillset. Our employment impact analyses can also inform the development of just transition strategies that make sure fossil fuel-based communities and workers are not left behind.

Further, ongoing community engagement is required to enable inclusive planning and implementation processes that truly address the needs of the communities they impact. Local participation and public support throughout the entire process (from creating to implementing pathways) secure the long-term stability of decarbonization outcomes by guaranteeing local stakeholders' desire for, understanding of, and ownership of decarbonization efforts.

Q: What is the hardest part of achieving deep decarbonization?

A: Multiple challenges come to mind, the three we would highlight are: coordinating change across all sectors of the economy; siting large amounts of new infrastructure in short periods of time; and accelerating industrial production of key technologies (wind, solar, batteries) to support the timelines of the transition. A comprehensive plan, such as SDSN's 2020 Zero Carbon Action Plan, would greatly assist with the coordination of the decarbonization and help overcome these hurdles.

Q: What is the benefit of deep decarbonization?
A: The most significant benefit is reducing greenhouse gas emissions commensurate with what science says we need to achieve to avoid the worst impacts from climate change. Co-benefits include huge reductions in air pollution; potential domestication of 100% of energy production, enhancing energy security; the development of new industries and jobs; and reduced environmental degradation from fossil fuel extraction.

Q: Can market-based mechanisms achieve this deep decarbonization transition? How important is government policy and leadership?
A: Coordinated policy and leadership from the federal government is critical. A broad portfolio of policy changes are likely to be required in order to compel a transition of this scale this quickly. Transitioning toward decarbonization additionally requires local, state, and national governments to work together to align policies and investments across jurisdictions whose energy systems are all connected. Smart application of market-based mechanisms would help this transition, as well as targeted approaches that set standards and allow markets to develop to meet them.

Q: What role do local governments play in implementing decarbonization?
A: The multidimensional challenge of reaching net-zero emissions by mid-century or earlier requires that decarbonization frameworks have a clear vision of both near- and long-term policies at multiple levels. In particular, policy planning and implementation at the local level plays a crucial role in decarbonization, as local governments have often stepped up as leaders in climate and sustainability in the absence of meaningful action at the national level. While there are limitations to the agency with which local governments can control large-scale infrastructure, there are several mechanisms by which local governments have leverage over key issues, such as zoning, urban land use, transit, roads, and building codes, which play essential roles in achieving emissions reduction targets.

IV. Resources and Studies

Please see the Frequently Asked Questions for the San Diego Regional Decarbonization Framework and 350 PPM for the United States Report for more information.

Q: Where can examples of decarbonization pathways studies be found?
A: Please see the SDSN Climate & Energy page for more decarbonization pathways studies, such as the *Deep Decarbonization Pathways Project* (analyses of 16 different countries in 2015), *America's Zero Carbon Action Plan* (national analysis of the US in 2020), and the *San Diego Regional Decarbonization Framework* (subregional analysis of San Diego, California, in 2022). Other notable studies can also be found on the Evolved Energy Research and the University of Massachusetts Amherst's Political Economy Research Institute websites.

Q: Where can decarbonization pathways related resources be found?
A: Please see SDSN's Regional Guide to Decarbonization that serves as a step-by-step instruction manual for jurisdictions who wish to create science-based pathways to net zero across the US and beyond. The Guide is bolstered by an online database including an elaborate library of key resources and research papers to help build the knowledge base needed to support stakeholders across academia, think tanks, and governments who may be starting or advancing their own decarbonization efforts. Other examples of national, regional and local pathways can be found on the SDSN Climate & Energy page.

Q: Who can I contact if I am interested in developing/collaborating on a decarbonization pathways study?
A: Please contact SDSN at info@unsdsn.org for more information.