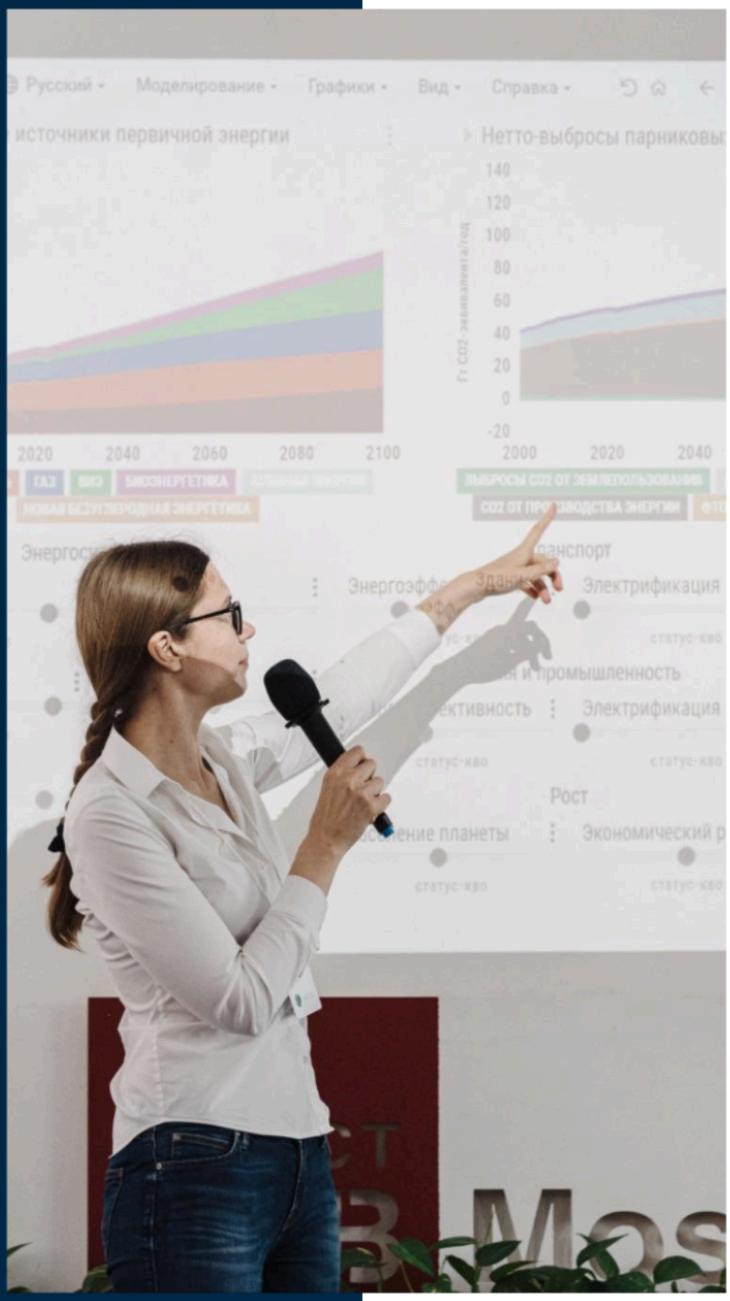
EN-ROADS

Climate Solutions Workshop

Facilitator Guide



CLIMATE INTERACTIVE

MIT MANAGEMENT SLOAN SCHOOL

Welcome

This guide is designed to support your facilitation of the **Climate Solutions Workshop**, an interactive group learning experience that promotes greater understanding of the causes of climate change and the solutions essential to mitigating it. The workshop is framed by the En-ROADS computer simulation model, which allows participants to explore and rapidly assess the impacts of different solutions to climate change—like energy supply subsidies, energy efficiency, or land use changes.

While this guide provides step-by-step instructions for leading the workshop, it is not intended to be your only preparation. A successful session also depends on your ability to explain the dynamics of the En-ROADS simulator with advanced facilitation skills—which you'll build through the Mastering En-ROADS training, available at learn.climateinteractive.org.

Climate Interactive also offers similar group activities:

- **Climate Action Simulation** - A group roleplaying game that also uses En-ROADS to explore climate solutions. The simulation game is set up as a fictitious summit of global stakeholders gathered to address climate change, where participants play government, business, and civil society leaders. This alternate format is fun and good for groups who may have less familiarity with climate solutions.

- **World Climate Simulation** - Another group roleplaying game that uses the C-ROADS simulation model to explore the role of national pledges to reduce emissions. Participants take part in a fictitious UN climate negotiation as representatives of major countries and world regions. Unlike En-ROADS which focuses on energy, land, and other sectors impacting greenhouse gas emissions, C-ROADS focuses on when and how much nations must reduce their CO_2 emissions.

Materials for all of Climate Interactive's group activities are available for free at climateinteractive.org.

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Workshop Overview

The Climate Solutions Workshop is an interactive group exercise guided by a trained facilitator where people work together to test solutions for addressing climate change. Participants use the En-ROADS simulation model, which is built with the best available science, to test their ideas for which policies and solutions should be enacted. The goal of the workshop is to create a scenario that limits global warming to well below 2°C and aims for 1.5°C above pre-industrial levels, the international goals formally recognized in the Paris climate agreement. The resulting experience of this workshop is solutions-oriented, science-based, hopeful, and eye-opening.

In the first part of the workshop, participants discuss their own climate actions at any level—individual, business, community, country, or region—and use the En-ROADS simulation model to learn about the global impact if their actions were to spread worldwide. Then, the group determines what else is needed to meet the climate goals.

During the second part of the workshop, participants engage in a rich debriefing discussion to explore their feelings, insights, and individual actions.

The workshop is designed to ground participants in the best available science on climate change and delve into difficult questions with the help of a facilitator and group. Participants can emerge empowered and activated for climate leadership.

The workshop can be run online or in-person and can accommodate groups of any size. People from all different backgrounds and levels of familiarity with climate change can learn from this experience.

The workshop was developed through a collaboration of several partners led by Climate Interactive and MIT Sloan School of Management.

Purposes

The Climate Solutions Workshop was developed to address three important purposes:

1. **Offer insights and understanding about climate change –** Enable participants to gain insights into the factors that affect climate change and what the solutions and possible paths are for equitably and effectively addressing climate change and achieving the international climate goals.
2. **Provide interactive learning –** Create a participant-centered, interactive learning experience to explore the best available science on climate impacts and solutions. Participants drive their own learning, so they are more engaged and gain more than they would through a lecture format. They also learn from each other as they work together to create a climate scenario for our global future.
3. **Engage people in effective action and diffusion –** Participants gain a meaningful climate leadership perspective and lasting impression that can translate into change in the real world. They learn which types of climate policies and solutions make a difference in reducing greenhouse gas emissions and explore the ways that challenges beyond climate change might be addressed by the same steps. This sets participants

up to think about their own role in addressing climate change, perhaps by advocating for the most effective climate actions or becoming a facilitator of En-ROADS events themselves.

Group Size

The workshop process described in this guide works best for groups of 6 people or more. For smaller groups or one-on-one you will likely only loosely follow the format of the workshop, but many techniques described in this guide will still be used. With groups that are very large, facilitators will have to build in ways to keep the interactive feel of the workshop present. In online settings, group chat features can enable relatively high levels of interaction even with large groups.

Time Required

The workshop described in this guide works best for sessions of 1- 2 hours, however 90 minutes seems to work best. Note that you can also dramatically cut down the features in the workshop and run it, interactively, in as little as ten minutes (see the En-ROADS videos playlist for examples). It can also be expanded to multiple hours when one includes significant hands-on experimentation in the simulator by participants and/or digging deeper into the possibilities for specific policies.

Preparation and Setup

Facilitation Team

Most workshops are facilitated by one person, but it is best if you can lead it with a second person—that way one person can be more focused on running the simulator and explaining its dynamics and the second person can be more focused on group dynamics and learning. It can be helpful to co-facilitate with someone who has knowledge and skills that complement your own. For example, a scientist or science educator may want to co-facilitate with someone who is more familiar with policy, economics, or business. Enlisting co-facilitators also gives them an opportunity to learn how to facilitate.

Event Partners

Sometimes it can be helpful to work with a partner to host your workshop. This partner may have an audience that is looking for content on climate change; for example, educators or conference organizers. In other cases, partners can help connect you to audiences you may not be able to reach otherwise. In many cases, you may have the audience already and seeking an additional partner isn't necessary.

If you are looking for a partner to work with on an event, start by brainstorming a list or get recommendations from others. Then reach out to introduce them to the En-ROADS workshop

and why you are interested in partnering to host an event. You can also explore our list of En-ROADS Climate Ambassadors, who are volunteers dedicated to sharing En-ROADS events and insights worldwide.

Note: Sometimes experienced facilitators may charge a fee for the event, especially for larger events or corporate partners. We defer to your judgment to coordinate an appropriate fee, if any, with your partner.

Marketing Your Event

Depending on the event and your audience you may need to do outreach to draw in an audience. Consider using email, social media, and word of mouth to share your event details. If you are advertising to a wide audience, consider setting up a registration page to collect responses, so that way you can follow-up with people to remind them about the event details just before it begins. Create a flyer for your event. You can download our sample flyer and Communications Kit. (See Appendix for list of resources).

Event Registration: Please Register Your Event!

An enormous amount of work has gone into developing En-ROADS and the materials for this workshop. We ask that you register every event with us, regardless of whether it is very small, online, or didn't take much time. Your registrations enable us to evaluate how these tools are being used so we can improve them, and help us to continue to receive funding.

Register your En-ROADS use at: https://www.climateinteractive.org/register/.

Thank you!

Running the Workshop In-person: Setup

- Projector and computer that has internet access to En-ROADS. The projected image should be large enough and positioned so that all participants can see it clearly.
    - If there is no internet access at the venue and you have a laptop, load En-ROADS in your laptop's browser before arriving and it will still operate without internet as long as the page isn't reloaded.
- Any PowerPoint slides (we recommend the En-ROADS Workshop slides) you plan to use to accompany the workshop.
- Helpful handouts and materials for participants:
    - o En-ROADS Control Panel Guide (See Figure 1)
    - o (optional) Climate Change Fact Sheet (See Figure 2)
    - o (optional) A white board or flip chart.
- Consider dividing the participants into groups, so that they can exchange views with each other during the workshop.

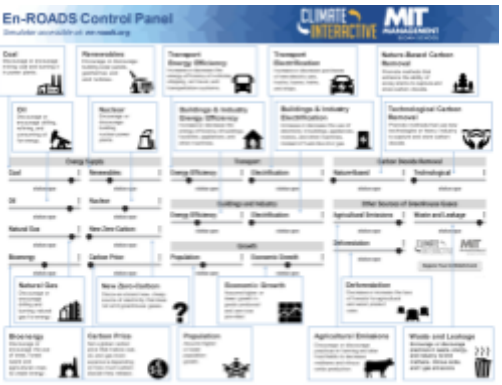

Figure 1: Control Panel Guide

Running the Workshop Virtually: Setup

- Web conferencing software that has screen sharing functionality for facilitators. Make sure to practice navigating between En-ROADS and the conferencing software in advance.
    - o Consider the videoconferencing features which would enhance your workshop experience (e.g., chat/questions box, breakout rooms, video for participants, etc.)
    - o For large events consider using a platform that allows you to moderate the chat and questions that come in, and mute participants.
- Any PowerPoint slides (we recommend the En-ROADS Workshop slides) you plan to use to accompany the workshop.
- Helpful handouts for each participant *(these can be shown on the screen as a PowerPoint slide or sent to participants in the chat or in advance by email.)*
    - o En-ROADS Control Panel Guide (See Figure 1)
    - o (optional) Climate Change Fact Sheet (See Figure 2)

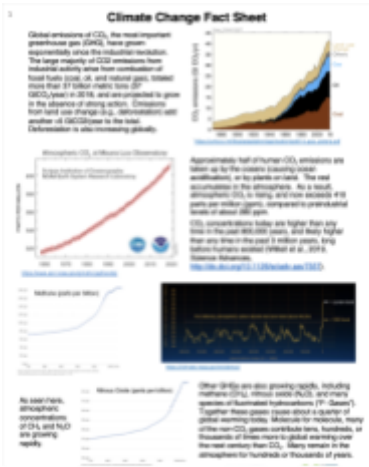

Figure 2: Climate Change Fact Sheet

Agenda and Schedule

Here is the estimated schedule of events for a standard workshop of 1-2 hours:

1. Introduction	5 - 20 min
2. Scenarios of Climate Success: Their Actions	10 - 15 min
3. Scenarios of Climate Success: What Will It Take?	15 - 20 min
4. Debriefing: Silence and Reflections	5 - 10 min
5. Debriefing: Discussion	15 - 20 min
6. Debriefing: Call to Action	5 - 15 min
Total	**60 - 120 min**

Lead the group through these steps:

1. **Introduction** – The facilitator welcomes the group and introduces them to the En-ROADS simulation model and background information on climate change.
2. **Scenarios of Climate Success: Their Actions** – Participants reflect on the actions to fight climate change that they have worked on or witnessed in the past five years. They use En-ROADS to assess how global temperature would develop until 2100 if the entire world implemented their policies or behavior changes.
3. **Scenarios of Climate Success: What Will It Take?** – Participants explore "What else needs to be done to get under 2 degrees?" and "What actions are high vs. low leverage?"
4. **Silence and Reflections** – After the group has succeeded in lowering the temperature increase to 2°C or below, they share a moment of silence, acknowledge how they feel, and think about the implications for themselves and the world. Sometimes more space needs to be held to allow participants to grapple with their strong feelings.
5. **Debriefing Discussion** – This is an important step in which the group works together to integrate their new insights, apply the global issue to their local setting, and cultivate hope for the possibility of achieving this future.
6. **Call to Action** – Participants discuss effective action, addressing the question "What can you do?"

Workshop Facilitation

1. Introduction

Welcome the participants and briefly introduce the background and motivation for the event, the urgency of addressing climate change, the use of the En-ROADS simulator, and the event agenda. There are presentation slides available on the Climate Interactive website to support this introduction, however select what suits your audience and needs.

Try to keep this segment brief. You want participants interacting with the model and each other as soon as possible to keep engagement levels high.

Topics that might be covered in the Introduction:

- Introduce yourself, as needed
- [For online events] Familiarize your participants with any virtual meeting platform controls they need to participate in the session
- Agenda and purpose of the event
- Introduction to climate change science and any local climate impacts for context
- Introduction to En-ROADS simulator
- An overview of the importance of identifying equity considerations and co-benefits with actions (multisolving)

En-ROADS Overview

Show En-ROADS on the screen and give people an overview of the simulation model. When you display En-ROADS, click the button on the top toolbar to use it in full screen mode to hide any distracting buttons on your browser or computer. Tell them:

> *"En-ROADS is a simulation model from Climate Interactive and MIT Sloan Sustainability Initiative which is grounded in the best available science on climate impacts and solutions. It is a global model that can help us determine what actions can address climate change."*

To help establish credibility, you can share these 5 points about the model:

- *Climate Interactive and the MIT Sloan Sustainability Initiative built En-ROADS using the best available science,*
- *using data sources such as the International Energy Agency (IEA), and the Intergovernmental Panel on Climate Change (IPCC).*
- *All of the references, equations, and parameters are available transparently in the extensive online Technical Reference on the website.*

- *The model was tested against the suite of large Integrated Assessment Models (IAMs) from research laboratories around the world.*

- *If anyone disagrees with any parameters or assumptions of the model, they can change many of them in the "Assumptions" pane in En-ROADS.*

First, orient participants to the En-ROADS Main Graphs View and the Baseline future:

"On the left is a graph of the global sources of energy from the year 2000 to 2100. At the bottom in brown is coal, then oil in red, natural gas in blue. On our current path, you can see that coal, oil, and gas continue to grow throughout the remainder of the century. Renewables, such as wind and solar (in green), are growing very quickly, especially approaching 2100, but still they must compete with fossil fuel energy sources. Bioenergy is in pink and nuclear is in light blue, at the top." <Point to the different colors as you say them.> (See Figure 3).

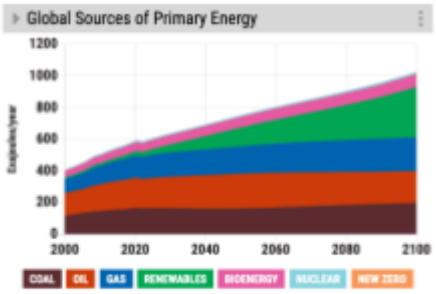

Figure 3: Global Sources of Primary Energy graph

"If we take minimal additional action, we expect that greenhouse gas emissions will continue rising throughout the century <point at right graph>. *This will then lead to global temperature increasing dramatically by the year 2100.* <Point at temperature number.> *We have already heated up the planet by over 1℃ from pre-industrial times, and are headed for even more dangerous warming by the end of the century. Our goal is to limit warming well below 2 °C, and aim for 1.5 °C."* (See Figure 4).

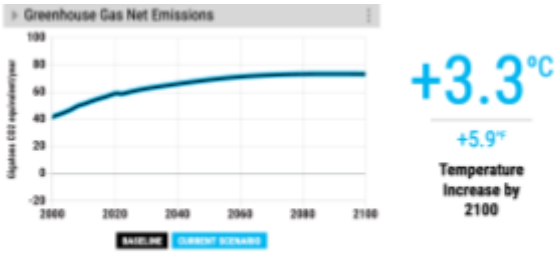

Figure 4: Greenhouse Gas Net Emissions graph

Note: In the United States some facilitators prefer to use the Fahrenheit temperature scale. You can switch the units in En-ROADS under the View menu, and change the goals in your presentation accordingly.

Second, you can opt to show 1-3 graphs or maps from the Impacts graph category to make the consequences more tangible. For example:

"So, what does this kind of temperature increase actually mean for us?"

<Show the Sea Level Rise—Flood Risk Map for a location near your audience.>

"Take a look at these coastal areas. In our Baseline Scenario, many of them are at significant risk of flooding from sea level rise by the end of the century."

<Show the Loss in Ocean Life from Warming graph.>

> *"If we stay on our current path, we could lose nearly 30% of marine species found only in specific regions—species that may not survive the changes in temperature."*

Third, orient participants to the En-ROADS Control Panel:

> *"Using the En-ROADS climate simulator model, you have 19 types of actions that can be proposed to affect future warming.* <Point at sliders on screen and in the guide.>
>
> *Your Guide to the Control Panel* <wave guide or send out the link in the chat> *is a handy reference to the solutions you can propose during the workshop."*

For a brief and simple setup, you could conclude your introduction here. For a longer and more advanced introduction, continue below:

Fourth, describe the drivers of carbon dioxide from energy consumption by switching to the Kaya Graphs view in En-ROADS [from dropdown menu on top go to View> Kaya Graphs]:

> *"These five graphs show the drivers of carbon dioxide (CO_2) emissions through our global energy consumption, which reflects about two thirds of all greenhouse gas emissions. The other third of emissions are from land use changes and other gases such as methane (CH_4) and nitrous oxide (N_2O)."*

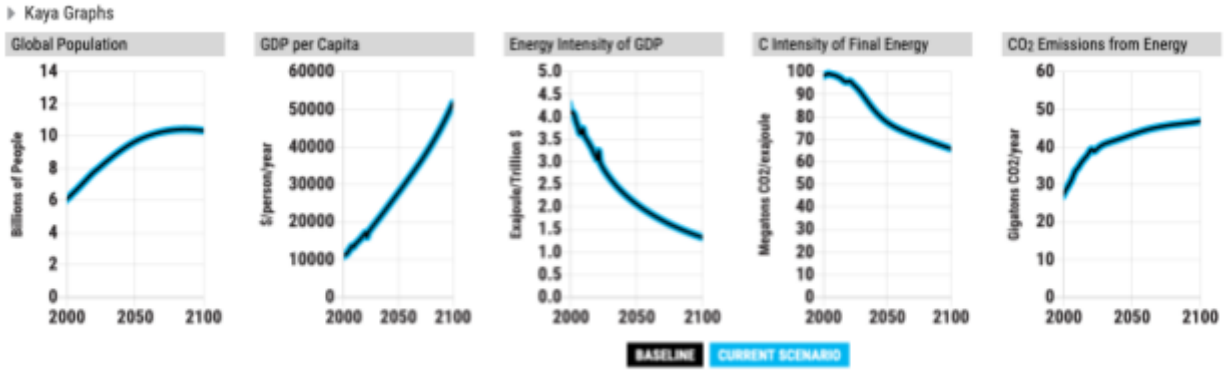

Figure 5: Kaya graphs

1. ***"Global Population** is growing — We anticipate growth to roughly 11 billion people by the end of the century, according to UN projections. The rate of population growth is slowing over time as people have smaller families."*

2. ***"GDP per Capita** is growing steadily per year, mostly as people in rapidly developing countries such as China, India, South Africa, Mexico, Brazil, and Indonesia attain higher standards of living."*

3. *"Simultaneously, the world economy is becoming more energy efficient, or using less energy per unit of economic output – as shown by the **Energy Intensity of GDP** decreasing over time. Technologies are improving—more efficient cars, buildings,*

machines and so on—and economies are shifting from manufacturing to service."

- *"The product of the first three — Global Population, GDP per Capita, and the Energy Intensity of GDP — is equal to the total amount of energy used by the global economy."*

4. ***"Carbon Intensity of Final Energy** – the amount of carbon dioxide emitted by energy use is dependent on our energy mix. In the Baseline Scenario, carbon intensity would trend down if we shifted away from fossil fuels and towards low-carbon energy sources."*

5. *"Multiply all four factors together, and you can see that overall **Carbon Dioxide Emissions from Energy** is growing each year, leading to the increase in temperature."*
   - *"These factors explain, in simple terms, why emissions keep going up in the Baseline Scenario: the improvements in energy efficiency and decarbonization are not keeping up with the strong growth in population and energy consumption."*

One way to use these graphs: if someone asks what can be done to reduce carbon dioxide emissions from energy, there are four choices where interventions can occur: slower population growth, less consumption, more energy efficiency, and less energy from fossil fuels.

Finally, pause for questions before moving into the next section:

"So, this is the En-ROADS simulator and baseline future at a glance. Any questions about the basic mechanics before we move into creating climate scenarios together?"

2. Scenarios of Climate Success: Their Actions

Transition from the Introduction to the interactive scenario building portion of the workshop. Scenario building inside the En-ROADS simulator is the core experience of this workshop. Say:

"We are meeting here today to discuss solutions and create scenarios for a better climate future, instead of the 'baseline' future we just reviewed."

Ask participants:

"What have you (or your business/organization) been doing over the past five years to lower carbon emissions and help prevent future climate change?"

If needed, expand the scope to name trends they have seen in their city, state, or country as opposed to just their actions.

If you want, use the En-ROADS Guide to the Control Panel handout (see Figure 1) and say:

"Circle the items that your actions seem to fit within – for example, Renewables or Coal or Transport Energy Efficiency. If they don't fit, jot them on the side."

Gather Responses

Ask participants to share their results with someone nearby or in small groups. Allow some time for these discussions. When discussions slow down (maybe after 3-5 minutes), ask participants to share some of their responses to the whole group. You may want to write them down on a whiteboard or document to share with the group. 3-5 responses provide a good list of options for further testing in En-ROADS.

If you are running the workshop virtually, breakout room features can be used for participant discussions. Alternatively, you can collect participant actions through chat features or a polling software such as Zoom polls or PollEverywhere. As you go, read a few participant responses aloud—this helps people feel acknowledged and draws them more into the conversation. If you plan to use a polling software, make sure to practice with it ahead of time.

Test Actions in En-ROADS

From the list you generated with the group, test their actions in En-ROADS one by one, implementing them in a single scenario. For the first one, choose an answer that you know significantly helps, so people can start off seeing the impact of the action. Some good options to begin with include:

- Supporting renewable energy
- Taxing coal
- Encouraging energy efficiency in buildings and industry
- Promoting energy efficiency in transport

Note: Some participant responses won't fit well and can't be tested in En-ROADS or you will need to guide them to where that impact would be seen. For example, participants might bring up an action like "talking to their friends about climate change" and you could note that this is an important way to raise awareness about all the various actions, and then move on.

For each action, use En-ROADS to demonstrate what would happen if the action were implemented globally.

We will illustrate the steps for an example where someone mentions that their community has a program that insulates housing for low-income residents. You can skip or breeze through these steps as the workshop advances, but do a comprehensive overview of the first action.

1. **Restate what the participant said –**

   "There's an effort in your town that insulates housing – putting caulk around windows, adding attic insulation, fixing leaks, and so on. Let's imagine the whole world implements this solution."

2. **Before moving the slider, ask participants to mentally simulate the impact –**

   "How much of a difference do you think this will make? Would temperature drop to 3°C? 2? Think of a number in your head."

Encourage participants to call out their predictions. This is the time when you are helping people surface their assumptions about how the system works. For online events, you could also make people vote on a polling software.

Input the action into En-ROADS and explain where it fits –

"This type of action moves the 'Energy Efficiency – Buildings and Industry' slider which you can see here. <Point. (See Figure 6).> *Let's assume the whole world takes this action starting next year and continuing through the century. This would also include improving the efficiency of commercial and industrial buildings and motors."*

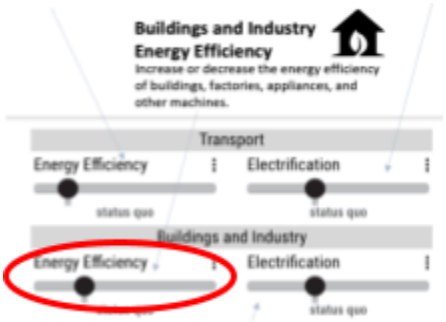

Figure 6: Energy efficiency B&I lever

<Possibly open the "Advanced" pane of the slider to show what is being changed more specifically.>

"Efficiency was improving at 1.2% per year. Now we increase it from Status Quo to Increased, which is about 3% per year. That means all new capital for buildings & industry entering the economy will improve their energy efficiency by 3% every year into the future." (See Figure 7).

Figure 7: Advanced detail

***Note*:** Each action can include either a single leap or a drop in the slider descriptor e.g., from "status quo" to "increased" OR "status quo" to "discouraged." This moderates the amount of change for each proposed action.

Find detailed explanations of slider and model dynamics in the complete En-ROADS User Guide.

3. **Show the graph that shows the most direct impact in question and replay the action** –

In the case of energy efficiency, pull up the "Energy Intensity of GDP" graph in the "Population & GDP" section of the graphs. Restate the base assumption.

"See the blue line showing our current scenario? We've assumed that energy efficiency is going to keep improving on its own. (See Figure 8). *Watch the blue line as I replay the action, turning on and off the proposed action in the model. The blue line departs from the black line (the Baseline) as the overall energy intensity of the economy improves even faster."*

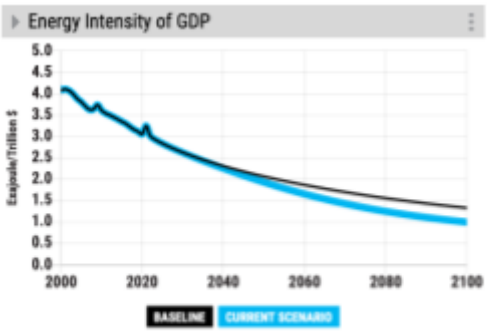

Figure 8: Energy Intensity of GDP graph

Move it back and forth 2-3 times to highlight the effect, using the "replay last change" button on the top toolbar of En-ROADS.

4. **Direct participants' eyes to the graphs that show more distant impacts –**

   In this case, you would go back to the default graphs using the "reset graphs" button that is a house icon on the top toolbar of En-ROADS, and show the lines for coal and natural gas shifting down (left graph) and then the Greenhouse Gas Emissions (right graph). (See Figure 9 below). Again, replay the action several times.

   "The world is more and more efficient, so energy demand goes down relative to what it would have been otherwise, so we burn less fossil fuels and emissions go down, so temperatures go down."

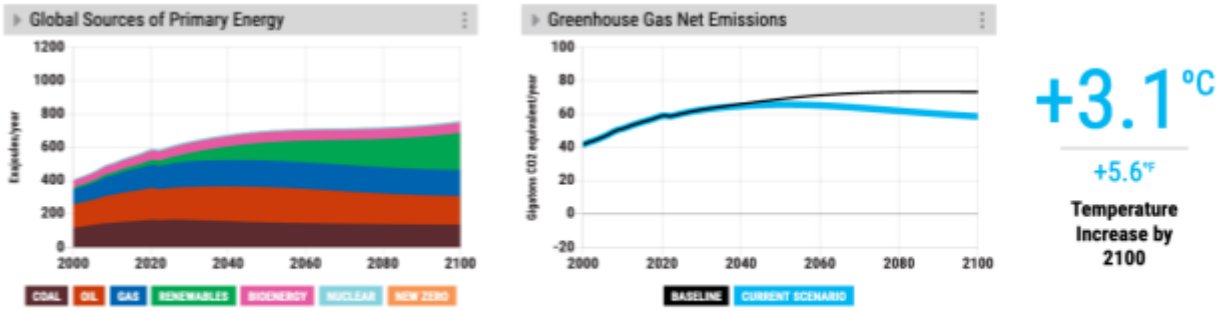

Figure 9: Default Graphs

5. **Explain model behavior** –

   Explain briefly why the action has the result it does in the model. When possible, cite reasons involving the structure of the system; for example, the long delays in energy transition, the "rebound effect" via energy price and demand, the reinforcing "learning" feedback loop and so on, as described in the En-ROADS User Guide.

6. **Summarize** –

   "If the whole buildings and industry sector improved its energy efficiency every year, then we'd burn less coal and gas, reducing emissions and temperature." Then ask, "Did it solve the whole problem?" (No!) "Did it help?" (Yes!) "This action is not one magic solution. It could be part of a suite of actions that, together, could help meet climate goals."

7. **Discuss implications through a Multisolving[1] lens –**

   The two multisolving perspectives are:

   - **Co-Benefits**: Consider near-term co-benefits which help make investments in

[1] Multisolving is about addressing multiple challenges through one action. Although practiced in many ways worldwide and called other things, the idea of multisolving was developed and carried out as the Multisolving Program at Climate Interactive and now is spearheaded by the Multisolving Institute (https://multisolving.org).

climate actions more attractive because they produce other benefits that often have a shorter payback time period.

- **Equity:** Climate change affects certain communities more than others: the poor communities living in places facing more severe climate impacts, people with jobs that are impacted. Considering the equity lens means ensuring that climate actions will not disproportionately harm or leave out the most vulnerable people.

Encourage participants to reflect upon the implications of adopting this action.

> *"If you think about the existing inequities in your community or country – this could be in regards to race, income, gender, or other factors – how might this policy help or hurt those most vulnerable?"*

This question prompts people to reflect on the co-benefits and equity considerations that need to be considered around making the action. Highlighting these factors is important to design better solutions for climate change that are easier to gain support for and are more just.

In the Advanced View for each slider, you can access the En-ROADS User Guide which includes examples of potential co-benefits and equity considerations. Visit the Climate Interactive Multisolving webpages to learn more.

Repeat the process above, adding 2-5 more actions to the scenario you're building, and then move on to part 3. Note that guidance is available in the En-ROADS User Guide and the Mastering En-ROADS training to help you lead the group through the testing of different slider choices and model insights.

3. Scenarios of Climate Success: What Will It Take?

Even after testing all the solutions given by participants in the previous section, it will probably not be enough to meet our climate goals. Next, ask the group to think about or discuss in small groups **what else it would take to limit warming to less than 2 °C or even 1.5 °C.** If you are using the En-ROADS Guide to the Control Panel handout, the audience can look back at that.

Gather Responses

Give participants some time, then ask them to share their answers. Collect 5-10 responses. Test their solutions in En-ROADS one by one as you did before, building upon your group's scenario from earlier.

Keep adding actions to your En-ROADS scenario until you reach your goal of limiting warming to under 2 °C or run out of time.

En-ROADS Model Insights & Dynamics:

As you continue through the rounds of play, remind everyone of the top insights:

- **There is no magic solution to addressing climate change.** There is not one single action that fixes climate change.
- **"It takes many seeds to plant a garden."** Many actions in many sectors are required. Some actions may be much lower leverage than people think, while others like carbon pricing and energy efficiency might be higher leverage than people expect.
- **We can do it.** The good news is that it is still *physically* possible to meet our climate goals and avoid the worst-case future, even if some people may argue that it is not politically or socially feasible.

Note: If participants express frustration that the simulation goal is hard to achieve, remind them that En-ROADS is grounded in the best available science, so this is representative of how enormous the challenge is that we really face. You can delve into these feelings more in the debrief. The Hope section is helpful for addressing feelings of overwhelm or pessimism.

High vs. Low Leverage Actions

Along the way, you will notice that some interventions are more helpful or higher leverage than expected, while others are less. Common examples of interventions that are lower leverage than expected include:

- **New zero-carbon energy** – Limited impact due to long delays for commercially implementing the new zero-carbon technology (even at the fastest rate of R&D and commercialization) before it starts to effectively displace much coal and gas, and a rebound effect in which lower energy prices boost energy demand.
- **Deforestation** – While protecting forests is very important for biodiversity and other reasons, moving this lever avoids little future warming because greenhouse gas emissions from energy sources are growing so rapidly in contrast.
- **Bioenergy** – Burning or processing trees and other plants for energy can still produce a large amount of CO_2.
- **Electrification in transport** – While the overall lifecycle efficiency of an electrified transportation system is higher, the benefits can be countered if the sources of electricity are still primarily from carbon-intensive coal and gas.
- **Subsidizing natural gas** – Much advertising has claimed that promoting natural gas is a climate solution, since it emits less CO_2 than coal. While it is true that natural gas emits less CO_2 than coal, it still emits a significant amount of CO_2 when scaled and it also releases another kind of greenhouse gas called methane. Methane is emitted through leakage across the lifecycle of natural gas energy generation. When natural gas is scaled up, it competes with the other energy sources available which can mean that it displaces some renewable energy.

Other System Dynamics Insights

You will likely draw on other insights about the dynamics of the

energy-land-agricultural-economic-climate system in order to answer questions about why the model is behaving as it does. It is important that you have reviewed our Mastering En-ROADS Training course and the En-ROADS User Guide in order to understand the En-ROADS model dynamics before running a workshop. Many more specific questions are explored at support.climateinteractive.org.

As the event advances, the dynamics of the multiple levers interacting in the model may become more difficult to predict or explain. You may run into unexpected twists and combinations of policies that you aren't familiar with. Since En-ROADS is a nonlinear model that incorporates the interactions between many levers, policies will have less impact if other policies impacting the same part of the system have already been put in place. It is okay if you can't predict what the result of an action will be, and you should not expect to have an explanation for everything. In fact, it is better to be honest and say that you don't know an answer and will look into it, than to answer incorrectly. The En-ROADS User Guide and our support website (support.climateinteractive.org) will be your best resources for finding answers about model dynamics.

Finishing the Scenario

Eventually the group will either create a scenario in En-ROADS that could limit warming to 2°C or 1.5°C, or the group will run out of time. When the participants are successful, congratulate and lead them in a huge applause for their accomplishment, acknowledging the possibility of this future. If they are not successful, state the progress they made and that "we still have crucial work to do." Recap the major inputs and outputs of the group's scenario. For example:

> *"Our proposals today successfully limit warming to 1.7°C. We will get there by investing in energy efficiency, reducing deforestation, etc.* <Summarize the elements of the plan.>
>
> *According to the En-ROADS simulator, this future is technically possible. Now we must figure out how to make it a reality. We have taken a huge step forward today by creating a vision for a future that avoids the worst of climate change. Yes, the journey will be tough, but it will be worth it. We can and we must do it!"*

If you showed impact graphs or maps earlier using the Baseline Scenario, now is the time to show the same impacts again to highlight how much better this new scenario is. If you didn't, you can still select 1–3 impact graphs to compare this scenario with one that has little climate action. Consider using the impact maps in En-ROADS (under *Graphs* > *Impacts*) to show how global action can mitigate local impacts—especially focusing in regions where your participants live.

4. Debriefing: Silence and Reflections

You have now finished the En-ROADS scenario building part of the workshop and are entering into the debriefing discussion.

A Minute of Silence

Start by inviting your participants to take one minute of silence to reflect on future possibilities. You could say:

> *"When we talk about future scenarios for our climate, we spend a lot of time focused on how bad the worst-case future looks or how difficult change will be. Instead, I'd like for us to spend just one minute **silently** considering the possibility that we could create this better future. As you do this, think of something you would love about being part of this sort of future."*

Start a timer, stop talking, and don't speak for a full 60 seconds.

This is an important moment of the workshop and initiates a period of increasing hope and possibility. Participants may be silently prepping themselves to find resolve, a vision of a better future, and commitment to do something about it. Treat the moment with respect.

Ask participants to turn to the person next to them and tell them to briefly share their answer, or ask if a few people want to share with the whole group.

Besides protecting the climate, ask what else will be different in this world where we've taken action to limit temperature increase to well below 2°? Participants might name things, like "there will be more good jobs" or "less air pollution and fewer kids with asthma." You may need to prompt some of these potential benefits. For example, point to the growth of renewable energy in the scenario the group has created, and ask "what would need to happen to have wind and solar growing this fast," which will usually prompt people to mention jobs in manufacturing and electrification. If you are facilitating the event virtually, ask people to write their responses in the chat or a polling software, or even encourage them to unmute themselves, if time allows.

Feelings

Ask the group for their **feelings**. If you have time, ask people again to think for a few minutes, talk to someone near them, and possibly share with the group.

*"How are you feeling? For example, mad, sad, glad, scared, or confused. Note that I'm **not** asking what you **think** about the model or the scenario. I'm asking for **feelings**."*

Hope

Help participants recognize that although the challenge is big, there is much that can be done, and we are in it together. Three approaches you could take to build hope:

Your Own Hopefulness – Explain why you are personally hopeful. Some approaches include:

- **Use a personal story** – Maybe you have a story about overcoming great odds that you or someone you know was a part of. Perhaps a time when you thought the path ahead

looked very hard and you were able to overcome great odds to succeed.

- **Humans have addressed "impossibility" before** – We can look to human history for evidence of success and adopt the approach for addressing climate change. (Read this New York Times Op-Ed by Climate Interactive's Co-Director Drew Jones for more on this).
- **Hope is a choice, not an assessment** – You could say:

  "Hope is a choice, not hinged upon an assessment of the likelihood of future success. Being hopeful is about choosing to prevent this huge problem every day because it is the right thing to do, not because you know that we are going to win."

Highlight good news trends – You can cite evidence or tell stories of significant recent progress. Examples include:

- Falling cost of wind and solar coupled with peaking emissions of CO_2 from coal.
- Increasing public awareness of climate change and support for climate action from polling.
- More companies, cities, and states are pledging to go 100% renewable or take other climate actions.
- The increasing number of young people demonstrating for more ambitious action against climate change.

Emphasize co-benefits to climate action (Multisolving) – Emphasize the many co-benefits beyond the direct impacts to the climate, which may make successful adoption of climate solutions all the more possible. Common examples include:

- Shutting down a coal power plant also improves local air quality which reduces health impacts like asthma that come from local air pollution.
- Improving energy efficiency in buildings can reduce energy use, save money, and improve people's health and quality of life.

More examples of co-benefits can be found throughout the En-ROADS User Guide.

The Multisolving FLOWER tool provides a visual way of introducing common types of co-benefits (see Figure 10).

Figure 10: Multisolving FLOWER

Their Hope – Often participants will have their own stories that inspire hope and possibility. Give people space to share their experience.

1. Give participants a couple minutes to think about why they are hopeful.
2. Have them reflect in pairs.
3. Ask them to share with the group.

5. Debriefing: Discussion

Reprise the main lessons

After a rapid experience of moving lots of sliders, participants will be beginning to formulate new understandings of what it will take to address climate change, but they will need help solidifying those understandings. It can help for the facilitator to offer some conclusions. Here are some of the ones that we tend to offer.

- Avoiding the most dangerous impacts of climate goals is still technically feasible - it's not too late.
  - Refer to the fact that you did create a scenario at or below 2° of temperature increase.
- There is no one magic solution.
  - Ask whether any one policy you tested together was enough to protect the climate fully.
- There are a collection of solutions.
  - Remind participants about the suite of solutions they put together.
- There is no path to avoiding the most dangerous climate change that does not involve keeping most of the remaining coal, oil, and gas in the ground.
  - Point to all the levers that somehow put downward pressure on coal, oil, and gas.
- We need to start now.
  - Remind participants that, even using very many levers, they had to start policies almost immediately.
- We need to ensure full participation, across countries, urban/rural, North/South.
  - Do the thought experiment, "what if we only pushed these levers halfway, to represent half of the countries, or half the world's people, could we have met the climate goals that we did in our scenario?"

Additional Discussion

Depending on the time available and your goals for the workshop, you could facilitate the debriefing discussion by asking some of these questions:

- What surprised you about the results you achieved and the difficulty (or ease/possibility) of achieving them?
- To what extent did your proposals taken together produce the result you expected, or hoped for? Why or why not?
- How was energy consumption, greenhouse gas emissions or other key parameters, affected by your proposals? Can you imagine humans living in that kind of world?
- (If <2˚C goal was not ultimately reached) What might you have proposed that could

have helped us to achieve our goal? You may use the model for a couple of rounds of speculation.

- If time allows, run sensitivity tests in En-ROADS, in which all levers are reset, and individual levers are adjusted one by one to see their individual impact. This exercise is helpful for learning about the leverage of different individual actions, which can be difficult to see amongst the many other levers that are changed during the workshop.
- To what extent is the result you achieved feasible? From an economic standpoint? A political standpoint? A social, technical, or cultural standpoint?

It's easy to move sliders to make a scenario, but what will it take in the "real world"?

Most likely some people in the room will be thinking to themselves, if it was so easy to institute these policies and investments, we'd already have solved the climate crisis. It can help to acknowledge this by saying something like:

> *"It's pretty easy to move a slider, isn't it, but not so easy to pass policies and change spending."*

You can ask the group what needs to change in the world to make it easier to move the sliders in real life. You'll likely hear things such as: education, better press coverage, pressure from the grassroots, and removing money from politics. These topics can make a good transition to a call to action, as most people can find somewhere in those areas a place where they feel they can act.

6. Debriefing: Call to Action

The purpose of this workshop is to motivate effective action in the real world, so now is the time to make it happen. You can help people see what they can do to channel their emotions (both positive and negative) into constructive ends. Share the slide which shows the different layers in which an individual can make an impact and ask, "What can you do?"

Give people time to reflect on this question and share with others. For example:

> *"Turn to the person next to you and tell them one thing that you feel called to do after this experience."*

Give people time to talk and process. Then, ask for a few people to share their plans with the group. You may encourage people to share the climate initiatives that they are already leading or a part of and recruit other participants to support them.

There is a broad range of possible actions, from changing one's personal impact on climate change, to participating in collective action, to learning more and talking with others. Sometimes this might just mean going home and talking about the event with those they live with.

If you notice any participants who seem particularly adept at understanding the simulator and appreciative of the workshop, suggest that they could lead this workshop for others someday and encourage them to join the En-ROADS training.

You might also share your own recommended list of call to actions and link to specific nonprofits, projects, or local resources in your list that participants can follow up with later.

From here you can wrap up the workshop and thank everyone for their participation and engagement—or include some of the additional activities below.

Group Photo

Gather everyone around the projector screen with the final scenario in En-ROADS to take a group photo to share. We also encourage you to take photos throughout the event.

If possible, quickly distribute the group photo (or photos) to participants for them to share on social media (LinkedIn, X, Facebook, Bluesky), tag us @climateinteract (use #EnROADS), or send us an email: multimedia@climateinteractive.org. You can use the Share Your Scenario button in En-ROADS to share the link to the scenario that you created as well.

Ask for feedback

At the end of the event, hand out index cards or a feedback survey for participants to provide feedback to you. This can help you continually improve your event facilitation for the future.

Please register your event on Climate Interactive's website and do not hesitate to reach out to us and share your experience and feedback:

https://support.climateinteractive.org/

Appendix:

Event Variations

The Climate Solutions Workshop can be delivered in a range of settings. Some key examples include:

Debrief after World Climate Simulation

Facilitators of the World Climate Simulation, a roleplaying game that mimics the UN climate change negotiations, could run a quick version of the Climate Solutions Workshop right after. In this case, after participants of World Climate step out of their roles as delegates at a UN climate summit, the facilitator does not (yet) proceed into the Debriefing Discussion but transitions into En-ROADS with the question:

> *"After you have learned that we all need to act together with urgency in order to achieve the Paris goals, let's assess together **how** we will accomplish this – which actions, policies, etc. are necessary to reach 2 °C, or better 1.5 °C? We will use the En-ROADS simulation model."*

Climate Solutions Workshops for Companies

When facilitating the Climate Solutions Workshop for a company, you might focus more towards company-specific actions. Since En-ROADS is a global model, it can be useful in helping people see the larger picture while introducing them to a variety of interventions necessary to address climate change. The challenge here is to transfer insights from the global model, provided by En-ROADS, to corporate action and personal involvement. Encourage discussion about the ways in which the company plays a role in contributing to climate change.

Dinner parties with En-ROADS

Gather some friends or family together and use En-ROADS as part of a social event to explore climate solutions with people you are close to. Many people who are curious about climate change find En-ROADS to be a fascinating tool. Each person can take turns proposing an action while you highlight the impact of that action as you test it in En-ROADS. Offer people food and drinks or ask them to bring some to share in a potluck event. Food can help us bond as we confront this big topic together.

Participants directly using En-ROADS simulator during the workshop

You could encourage participants to directly use En-ROADS in their groups to answer the question during "Part 3 – Scenarios of Climate Success - What it Will Take?" Participants can gather in groups of up to 6 people around one laptop with En-ROADS loaded. Allow the groups 10-15 minutes to create a scenario together. Each group has at least one scribe to write down their solutions on their En-ROADS Control Panel Guide. Then call everyone to attention and ask each group for their solutions as you write them down on your flip chat/ white board. Test and discuss the solutions in En-ROADS with the whole group. If people have email access, each

group could send their scenario link to the facilitator. The facilitator may choose to open the team's specific scenario, so the whole group can follow their scenario on the large screen.

Finding audiences to share the En-ROADS workshop or game

Many facilitators may have existing audiences through the community groups, workplaces, or schools they are a part of. Others may want to extend beyond their current networks to reach new audiences. Finding partners in your community is one good strategy. Don't try to reinvent the wheel. Partnering with the right community leaders or organizations can help you connect with audiences that may already be seeking event opportunities.

1. **Places to consider reaching out to:**
   - Local environmental organizations
   - Social justice organizations
   - Activist and community leaders
   - Professors and teachers
   - Places of worship
2. **Build connection:**

   Consider how the En-ROADS experience that you are offering will be of interest to the person or group you are reaching out to.

   You may want to consider customizing the experience to better suit the interests of the groups you are reaching out to. For example, you can:

   - Add slides about local climate impacts & add a slide with examples of Calls to Action that include local examples.
   - Take time to more deeply explore the equity considerations of each intervention made with En-ROADS.
   - Add this question to your debriefing discussion: How do the solutions for climate change apply to your local community?

Resources

Here is a list of resources that can be useful for running the Climate Solutions Workshop. Everything can be found on our En-ROADS workshop webpage: www.climateinteractive.org/tools/en-roads/the-en-roads-climate-workshop/

- The En-ROADS Simulator
- Support page
- En-ROADS Workshop Presentation Slides
- En-ROADS Additional Slides
- Event Registration Link
- 1-page Guide to En-ROADS Control Panel
- Marketing flyer
- Marketing Communications Kit
- Printable feedback form or Online feedback form
- En-ROADS User Guide
- En-ROADS Training Program
- En-ROADS Reference Guide
- All En-ROADS resources