ENERGY EQUITY and the Climate Crisis

Summit Report

February 2022

ELK COAST INSTITUTE
FOR MINDFUL SUSTAINABLE INNOVATION

ENERGY EQUITY
and the Climate Crisis

The goal of the Elk Coast Institute[1] (ECi), located in Elk, California, is to support and further innovations developed in a mindful, holistic manner. In 2021 the ECi focused on the intersection of energy equity and climate stability, an area that contains society's most significant challenges. Throughout 2021, ECi staff interviewed experts in relevant sectors and organized working groups to focus on the most pressing issues, then supported participants in drawing and refining conclusions at the ECi's 2021 Energy Equity Summit in October 2021.

This document describes the topics of discussion and the conclusions derived from the Summit, including information regarding the emerging technologies available to effect energy equity and the actions needed in government, finance, technology, and social policy. The materials developed by the working groups and presented at the Summit are described in more detail in the book titled, "Energy Equity 2021.[2]

We separated the Energy Equity Summit participants[3] into five Working Groups: Technology chaired by Deepak Divan; Government chaired by James Arbib; Finance headed by Nick Gogerty; Framework with Vijay Modi, Ron Baiman and Peter Eisenberger and Outreach led by Carly Fischer. Throughout several months, the Working Groups prepared working papers, which were distributed to all participants prior to the Summit. The papers then were presented and reviewed by participants at the Summit. All participants reviewed the recommendations developed by each Working Group. A consensus was developed regarding each Working Group's significant findings and recommendations[4]. Following the Summit, each Working Group prepared a report on its area of focus.

Before the Summit, volunteers having expertise in the crucial aspects of energy carried out multiple structured discussions, research efforts, and inquiries in order to prepare detailed working papers in the five categories listed above. We sincerely thank the volunteer contributors for the hard work, good humor, and precious insights they brought to this endeavor within a compressed timeframe.

The Elk Coast Institute (Prof. Peter Eisenberger and Nadia Kock) compiled this summary report of the Summit's findings and recommendations, with assistance from Valence Strategic (Colin McCormick), Moya Melody, and Matthew Chester. The Working Group chairs reviewed this report to confirm that it was consistent with their findings and recommendations. Still, the organizers of the Summit are responsible for the report itself. Disclaimer: Note that Peter Eisenberger and Nadia Kock are associated with the direct air capture company Global Thermostat. They have an interest in seeing direct air capture and Global Thermostat achieve broad distribution. They also believe that some form of direct carbon capture is necessary regardless of which companies provide it.

We gratefully acknowledge the generous support provided by the Global Mana Foundation and Patrick Furlotti, founder of Projects for Good[5] and NuCarbon[6].

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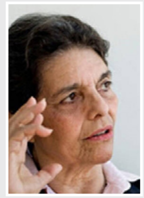

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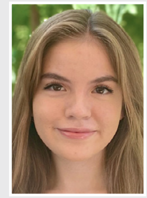

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Table Of Contents

Executive Summary

As we enter the third decade of the 21st Century, the world's people are confronting two profound crises that threaten human well-being worldwide. The first crisis is the large disparity in access to energy supplies. While advanced nations power their growing economies with ample supplies of reliable, cheap energy, nearly 800 million people[11] lack the most rudimentary access to electricity. As a result, their economic and social development is severely limited. At the same time, energy production and other modern industrial practices have driven atmospheric greenhouse gases to dangerously high levels, trapping increasing amounts of heat and threatening to destabilize the global climate catastrophically. Both crises endanger the security and stability of life on our planet, and both need to be addressed urgently.

Energy use per person, 2019

Energy use not only includes electricity, but also other areas of consumption including transport, heating and cooking.

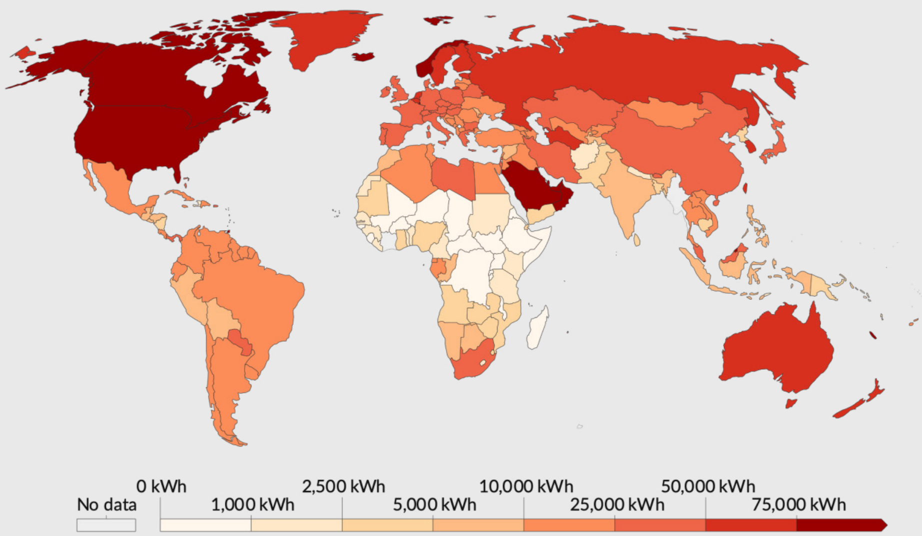

Figure 1: Eneregy refers to primary energy - the energy input before the transformation to forms of energy for end-use (such as electricity or petrol for transport)

Source: Our World in Data based on BP & Shift Data Portal

Participants in the Energy Equity 2021 Workshops and Summit are knowledgeable about those twin crises and for many years have worked to identify ways to ameliorate them. Most importantly, the expert participants recognize that energy inequity—both between and within countries—is a global crisis, as is the climate crisis. The global community must collaborate in addressing both crises together to develop solutions at the scale and speed needed. Through a series of presentations and in-depth discussions, Summit participants concluded that both crises have their roots in a system of values and social organization that prevents populations from applying the level of effort needed to address both crises rapidly and effectively.

More specifically, responding to the climate crisis requires a global effort to transform our energy production and use while simultaneously delivering sufficient energy to enable every person to enjoy an abundant, sustainable future and participate in climate-compatible human development.

Energy equity has improved significantly over time, but remains inadequate. Meanwhile, the climate crisis has not been rectified at the pace and scale needed to avoid potentially catastrophic effects, including failed states and mass migration. (Climate change appears to have played a role in the onset of the Syrian civil war[12], an early example of those consequences.) In this context, advanced economies must intensify their collaboration with each other and developing countries to ensure access to reliable and clean energy. Reliable and clean energy is needed to curtail greenhouse gas emissions and remove accumulated CO^2 from the atmosphere. Rather than being an overlooked afterthought, achieving true energy equity must inform every step toward lessening the climate crisis.

This report describes the path the Working Groups and Summit participants recommended to transform our energy ecology into an equitable and sustainable system. We divide the path into three components.

1. Deliver sufficient energy to address global energy inequity during the transition to clean Energy sources.

2. Address the climate crisis through a global effort to transform energy production.

3. Create a new energy ecology that provides abundant energy, is climate compatible, and supports universal human development.

There is a broad consensus about the importance of scaling up renewable energy sources as fast as possible. However, the established efforts are insufficient if we don't find new ways to address the dual challenges we face. In the short term we need to focus technologies on the transition to renewables and in the long term on an improved energy ecology, or a Renewable Energy and Materials Economy (REME)[13]. **The detailed recommendations for action are provided on pages 15-18 of this report.**

Why Energy Equity Matters

For the past four centuries, advancements in accessing energy supplies and developing infrastructure to deliver those supplies have underpinned extraordinary economic growth and improved billions of people's average quality of life. Those advancements, however, have created two seemingly intractable problems.

Energy Inequity Energy supplies and delivery for providing necessary services are not distributed evenly. Many geographic areas remain unconnected to reliable, affordable energy sources, leaving them unable to reap the economic and social benefits energy access brings. Such areas are in danger of succumbing to social and political instability. Reversing this situation and achieving energy equity would mean providing every person with the Energy necessary to meet basic needs and, further, to develop their full human potential.

Climate Change Greenhouse gases (GHGs) from the unabated burning of fossil fuels continue to accumulate in the atmosphere and are surpassing planetary limits. The ongoing production of GHGs risks crossing thresholds that will trigger catastrophic, irreversible changes to global climate systems, leading to massive environmental, social, and political instability and damage.

Providing every human with the Energy necessary to meet basic needs and develop to full human potential.

*Definition of energy equity

Globally, almost 1 billion people live off the grid, and an additional 3 billion are in extreme energy poverty, defined as having limited or unreliable access to electricity and fuel. Evidence supported (and in 2008 finally proved[14]) that lack of or limited access to modern energy services hamper economic and human development. The connection between access to Energy and advancing human well-being are illustrated by the United Nations' Human Development Index (HDI).

Components of the Human Development Index

The HDI - three dimensions and four indicators

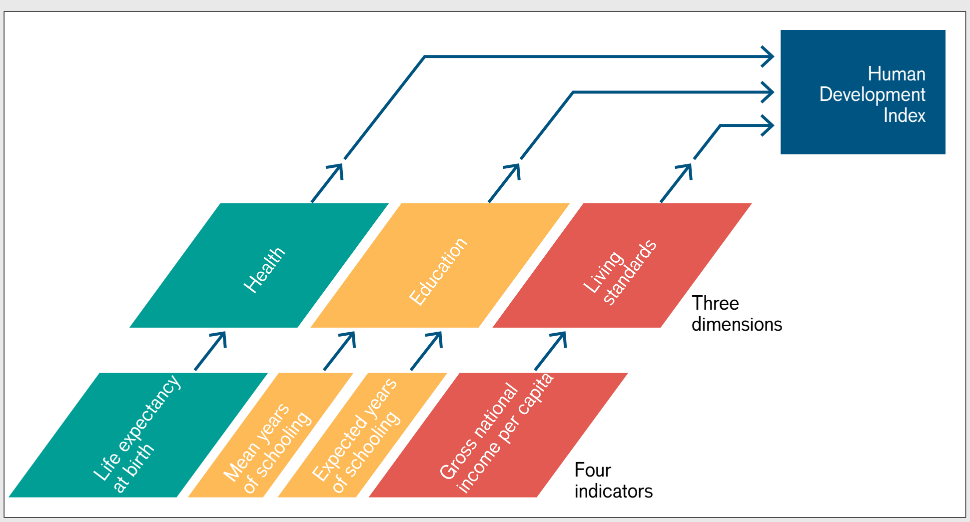

Figure 2: The indicators presented in this figure follow the new methodology

Unequal access to energy and its effects on human development have long raised troubling moral questions. In an era when pervasive energy access enables some societies to enjoy smartphones, air travel, and other modern luxuries, some people consider it grossly immoral that millions have no access to essential energy services.

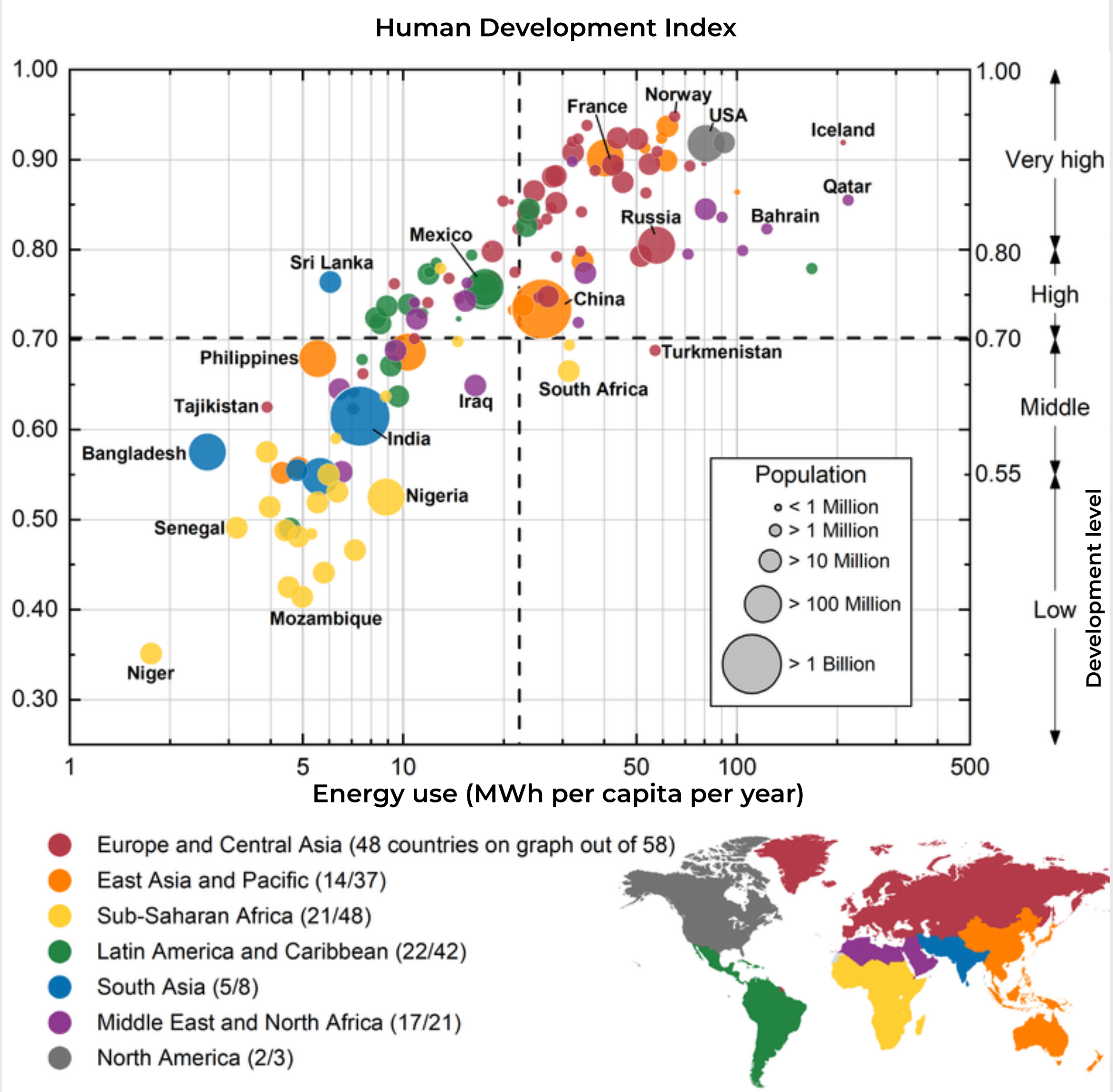

Figure 3: Human development index versus energy use for 2014 in 129 countries. Countries are sorted by geographical regions as defined by the World Bank. Dashed lines show the world average HDI (0.702) and energy use per capita (22.3 MWh per year) in 2014. Source: World Bank Open Data.

This moral debate on the topic will continue to inform the thinking of many people. However, it is important to note that energy inequality has also created a political division between the Global North and Global South as well as haves and have-nots, preventing the international community from reaching an accord on climate change. This effect should come as no surprise. A population that lacks adequate access to energy must focus on meeting survival needs; even communities having basic but barely adequate energy access must prioritize ways to maintain livelihoods within the constraints of an insufficient energy system. People in those situations cannot fully contribute to producing the economic, social, industrial, and scientific gains required to meet humanity's challenges.

In addition, limited energy access can have consequences such as social and political instability manifesting as popularism, unrest, and mass migration to nations offering more opportunities. Achieving energy equity is a top priority for enabling a global response to the climate crisis. Setting moral questions aside, equitable access to Energy is necessary for all societies to protect themselves from climate catastrophe.

Increasing developing countries' access to energy will enable them to improve their economies and more fully partake in solving humanity's most pressing problem of climate change. The participants at the 2021 Summit sought to address this urgent need by developing a new framework for creating a sustainable and fair future based on accelerating the most effective energy equity and climate action plans.

Energy Equity and the Climate crisis

Many of the world's issues are interconnected, from climate change to widespread poverty, pandemics, and immigration. But among the array of pressing global challenges, three are the most significant, far-reaching, and impactful for the 21st century: the needs to transition to a low-carbon/net-zero energy future, preserve our environment, and minimize poverty and wealth disparity around the world.[15] Efforts to address these challenges independently are doomed to fail because of the extensive connections that underlie them.

Most current climate and clean energy development efforts focus on improving existing energy and industrial systems, ignoring energy equity, or factoring it in after the fact. Yet, we need to reconfigure energy systems to enable everyone to access the energy required to progress. The global community will be able to manage a successful transition to net-zero energy emissions by treating energy inequity and overall energy needs simultaneously and universally.

Global distribution of carbon emissions and carbon footprints

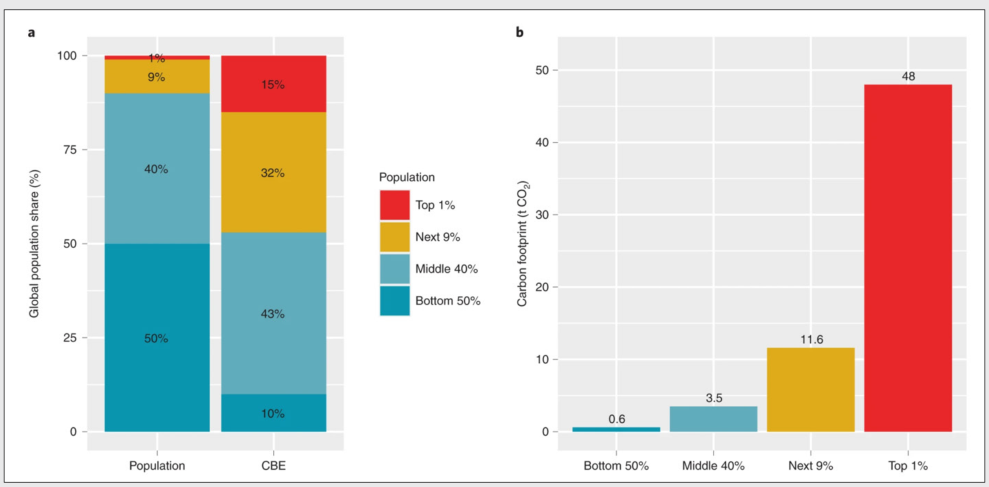

Figure 4: A. Percents of global population (left) and corresponding percents of global carbon emissions (CBE, right). B. Average carbon footprints of the populations in the top 1%, top 10%, middle 40%, and bottom 50% of global wealth[18]

Recent research highlights the fact that, given the enormous global inequalities in GHG emissions, eliminating extreme poverty should not imperil efforts to mitigate climate change. Calculations show that if the UN Sustainable Development Goal of lifting 1.2 billion people out of extreme poverty[16] was reached in 2030, global emissions would increase by just 1%[17].

It is essential to understand that fighting poverty will not jeopardize climate goals. Instead, removing inequity through a REME will accelerate our ability to address climate change.[19]

The biggest reason we have not reached a global accord regarding climate stabilization measures is the Global North's failure to recognize the Global South's need to increase energy supply to enable human development. The following pages describe the technologies that can solve both the climate and energy challenges simultaneously. The good news is that the measures exist, so we need only the policies and financial mechanisms to scale them up in the time required to avoid catastrophic climate change.

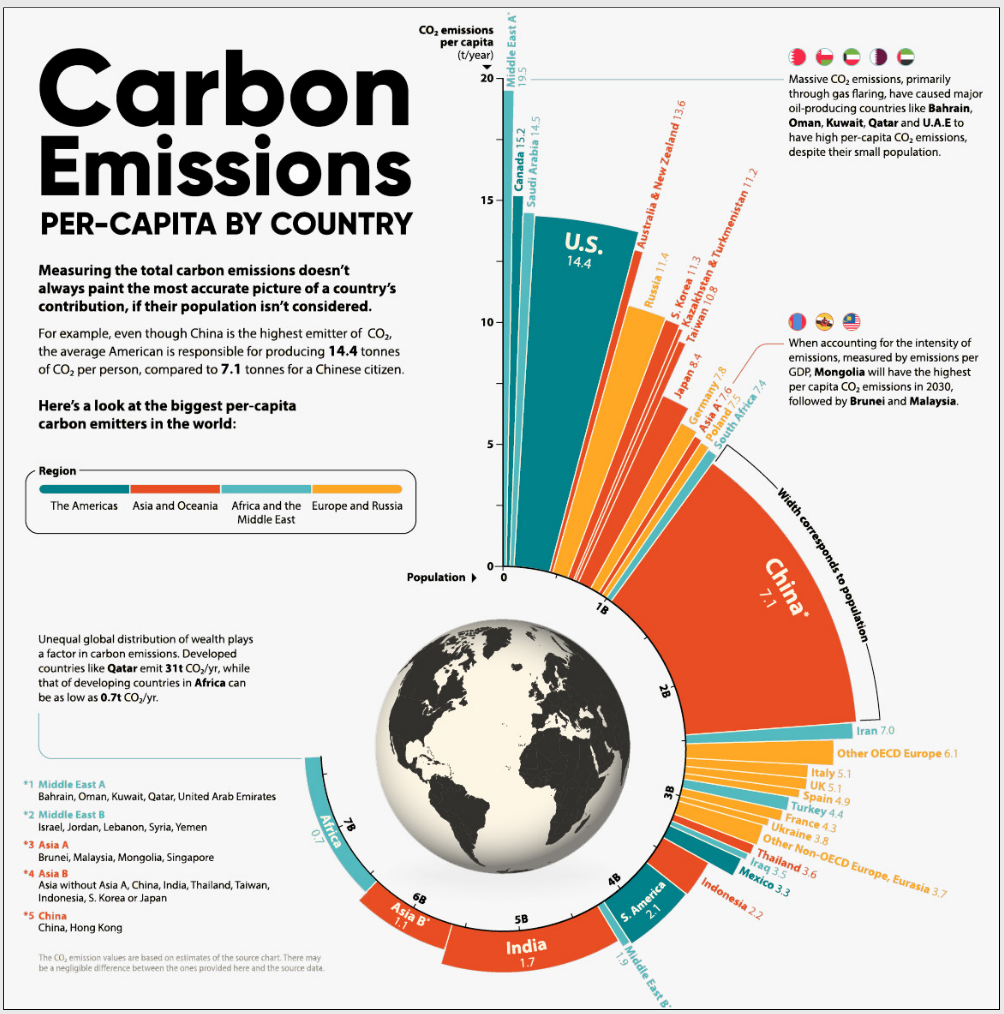

Figure 5: Per Capita and Country Carbon Emisions, Source: Aqual Group, IEA 2021, VisualCapitalist.com

Noteworthy Energy Technologies

Many people living in advanced economies view energy inequity as a problem afflicting only developing nations. Energy inequity exists even in developed economies, however, because it affects not only the amount of energy available but also its cleanliness and distribution. The energy systems of even advanced economies are coming under increasing strain from extreme weather events caused or amplified by climate change. In terms of aggregate data, a 2021 report by Swiss Re, one of the world's largest re-insurance companies, estimates that given its current trajectory, global temperature is likely to rise to 2.6°C above pre-industrial levels by 2050. The increase of 2.6°C is estimated to reduce world GDP by 18% by 2050, with emerging countries suffering the most. Even under a scenario of 2°C warming by 2050, rising temperatures and more extreme weather events will set economies back through physical effects such as property damage, disruption to trade, and lost productivity. The Swiss Re report estimates that the world stands to lose about 11% of GDP even under the ambitious 2°C scenario,[20] because many economies suffer from poor energy resiliency and a lack of energy access.

The following section describes the need for energy resiliency and some of the technologies available for achieving it. The technologies are discussed in greater detail in the Technology Working Group paper.[21]

Energy Resiliency

A switch is flipped, and the light comes on. For much of the population in advanced economies, energy supply is an unacknowledged matter of course. The year 2021, however, revealed how unreliable our energy systems are, particularly as the effects of global climate change accelerate. Energy infrastructures worldwide were tested, from the state of Texas suffering a major power outage caused by severe winter storms, to Europe experiencing soaring energy prices because of worldwide shortages, to the multilayered geopolitical conflicts arising in response to Russia's Nord Stream 2 partnership with Germany.

In the decades to come, unreliable energy systems will threaten many livelihoods (and democracies). Many experts forecast that renewables alone will not offer adequate resiliency. Additionally, renewables cannot replace fossil fuels entirely within the timeframe necessary, and they are not dispatchable. We must plan future energy production and distribution to be as multidimensional and thus as resilient as possible. The most valuable technologies for energy resiliency and climate stability are modular, able to provide a more resilient, more pervasive, and less costly energy infrastructure.

The costs of renewable Energy currently are market viable and, in some regions, even lower than costs for electricity generated from fossil fuels. And the costs of renewables will continue to decline, approaching global market viability. Technological innovations such as battery energy storage can increase the availability of renewables, although those technologies have yet to reach the price point necessary for global implementation.

Green and Synthetic Clean Fuels

Economically developed countries will transition relatively easily to renewable energy. Developed countries usually can bring electricity to non-electrified areas by creating access to nearby renewable energy sources rather than making the significant investment required to extend the broader grid. Because the sun and wind, the leading renewable technologies, are inherently intermittent energy sources, however, economies cannot rely on them entirely to provide reliable baseload generation.

Understandably, some developing economies have concluded that the need for reliable electricity and fuel outweighs the drawbacks of carbon output. For example, farm equipment generally runs on petroleum products. Although electricity and battery storage can power many vehicles, it is difficult to electrify farm machinery and other heavy equipment. Such vehicles need high-density sources of energy, which liquid fuels can provide more easily than battery-stored electricity. The dependable availability of as little as 50 gallons of clean gasoline could be a gamechanger[22] for farmers in developing countries. Lacking access to electric machinery, rural agricultural communities will produce synthetic hydrocarbon-clean fuels if the process becomes available and economically viable. The greatest value of renewable energy in such communities is for direct use and for producing synthetic liquid fuels that can power machinery at a low cost. In this future scenario, the requirements for a carbon-neutral synthetic fuel are:

1. renewable Energy from the sun, wind, etcetera;
2. clean hydrogen (also known as green hydrogen) extracted from water through electrolysis;
3. atmospheric carbon, harvested through direct air capture (DAC).

Even in cases where electrification of some vehicle classes may be technically feasible, the capital cost of retiring all liquid-fuel (combustion) vehicles early and replacing them with electrified versions is higher than developing economies can afford. Another drawback is that the energy and materials needed for such an ambitious program would increase the carbon footprint. For these reasons, carbon-neutral synthetic fuels can be vital for enabling developing countries to be part of the green energy transformation.

Synthetic fuels will also create resilient energy sources, thereby minimizing dependency on fuel imports. Clean synthetic fuels also provide the most efficient energy-per-volume density of all storable energy forms. Synthetic fuels are easy to store and transport because infrastructure for transporting liquid fuel already exists. In addition to creating carbon-neutral liquid fuels, green hydrogen, and atmospheric CO_2 (from DAC) can be processed to produce a variety of chemicals, pharmaceuticals, polymers, and other carbon-based materials (e.g., carbon fiber). Widely distributed production of net-zero liquid fuel will facilitate energy equity while reducing geopolitical conflicts over fossil fuels and offering many less-developed nations a practical path to climate-compatible development.

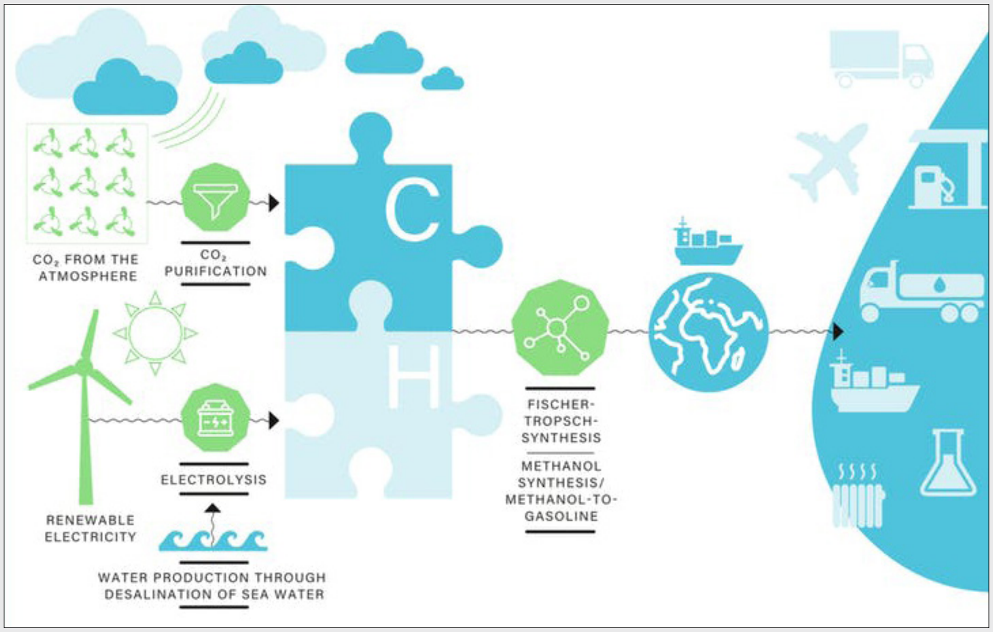

Figure 6: Synthetic Fuel (Electrofuel) Production. Source: eFuels Alliance

DAC is one of the most promising emerging technologies because it separates and removes CO_2 from the atmosphere. DAC uses large fans to move air through filtration units that extract CO_2. Like a sponge that soaks up spilled water, the filtration materials fill up with CO_2 and then are emptied by heating or other mechanisms. One advantage to DAC is that it can be installed anywhere since there is excess CO_2 everywhere there is air. Renewable Energy can power DAC, and the removed CO_2 can either be recycled for uses such as producing liquid fuel or safely stored deep underground. Unlike fossil fuels, which can be extracted and distributed from only a few locations, DAC can be used to produce green and synthetic fuels on any scale and in many places. As shown in the figure below, the distribution of renewable energy sources greatly favor the Global South. The south's abundance of solar energy can provide Energy Equity and even allow for exporting synthetic fuel to the north[23].

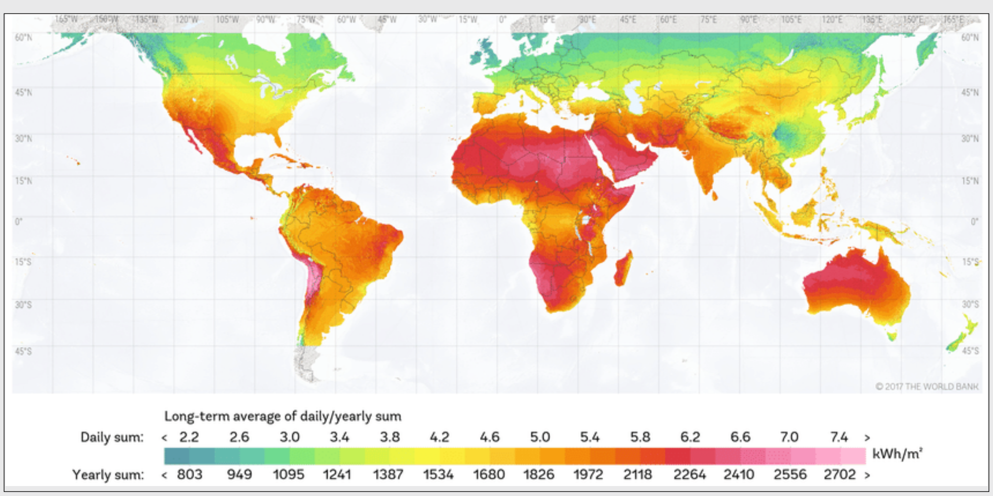

Figure 7: World map of horizontal solar irradiation at a spatial resolution of 1 km. Source: Global Solar Atlas

Carbon capture and natural gas

Natural gas, a fossil fuel that accounts for a significant percentage of power industry emissions, often hinders decarbonization efforts. Natural gas, however, can provide reliable baseload generation that compensates for the intermittent nature of solar and wind sources. It also avoids the need for costly battery storage (natural gas storage tanks are relatively cheap). If an energy-efficient DAC system is added to a power plant fueled by natural gas, not only can it capture the emissions created by producing electricity, but simultaneously remove substantial amounts of CO_2 from the atmosphere. Natural gas produces 19 gigajoules of energy per tonne of CO_2 released. Using DAC to remove CO_2 from the air uses an average of 5 to 6 gigajoules per tonne. Adding 50% of the CO_2 from the power plant flue to the DAC machine reduces that production to 4 to 5 gigajoules and using the heat from the flue further reduces production to 3 to 4 gigajoules per tonne. Such a system could produce 6 gigajoules or more of electricity plus two or more tonnes of CO_2 removed per tonne of CO_2 released in the combustion of natural gas. Because every kilowatt-hour of electricity produced this way represents a net reduction in atmospheric carbon, the power plant surpasses carbon-zero to become carbon-negative. DAC technology can be installed anywhere that lacks electrification; no CO_2 is added to the atmosphere and the captured carbon can provide economic benefits.

Sub-net-zero power generation is the type of outcome needed to complement commercial renewable energy sources and, if deployed globally, represents a major antidote to energy inequity. The significant advantage of this technology is that existing infrastructure can be used to achieve the combined goals of decarbonization and energy equity. Although embracing natural gas may feel counterintuitive to clean energy ideologies, we must push past preconceived notions in order to solve our systemic global problems. Ideals are vital for creating momentum and educating stakeholders, but ideological purity ultimately cannot help solve real-world problems. Of course, one requirement for using natural gas is to eliminate the methane emissions produced when extracting and processing it. [24]

Carbon capture and the renewable energy and materials economy

Most people understand the need to remove large quantities of CO_2 from the atmosphere; simply lowering emissions will no longer prevent climate disasters. Although much focus centers on renewable energy sources such as solar and wind for lowering GHGs, DAC can be equally valuable. The DAC process produces a stream of high-quality, high-purity CO_2 having potential uses beyond synthesizing the carbon-neutral liquid fuel vital to achieving energy equity. The harvested CO_2 can also have commercial applications, as has been demonstrated at small scales. Large-scale production of DAC-sourced CO_2 would enable long-term sequestration of carbon in the built environment, such as in carbon-fiber composites and concrete aggregate and additives. As the supply of captured CO_2 increases, other uses in energy and non-energy industries doubtless will be found. The ultimate goal is to create a REME.[25] In a REME, removed carbon is incorporated in long-lasting ways that provide significant economic value. Net-zero carbon, in displacing fossil-based carbon, can transform a problem into an opportunity, generating jobs and stimulating economic growth.

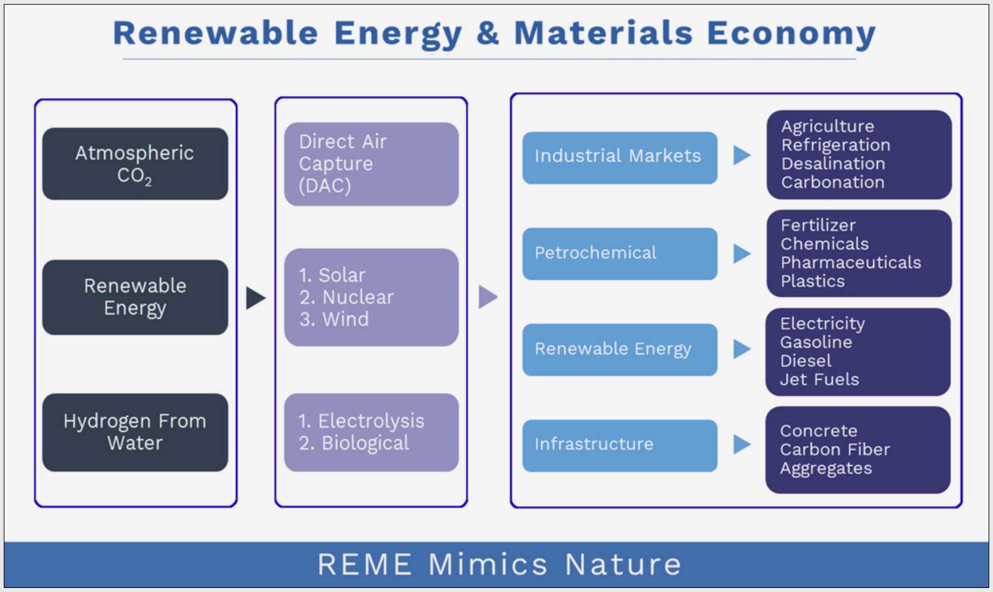

Figure 8: Flow chart of a Renewable Energy and Materials Economy

For DAC to process 2,500 tonnes of air for every tonne of CO_2 captured requires significant energy. In addition, energy-intensive processes are required to convert the harvested CO_2 to other forms of carbon. Luckily, renewable Energy (primarily solar and wind, geothermal, hydro, and biomass power) is on the cusp of providing vast amounts of low-cost clean electricity and heat to upgrade the removed CO_2. Using renewable Energy to power DAC will produce synergies between increasing use of renewables and transforming atmospheric carbon for valuable purposes. As technologies decrease in price and become more prevalent, economies of scale can create the pivot point needed for massive decarbonization of the atmosphere and simultaneous production of low emissions energy and materials. Present-day solar thermal plants can provide the high temperatures required for producing steel and aluminum.[26] The waste 100'C heat from such plants could be used for capturing carbon, thereby reducing the need for other energy sources to power the DAC technology. A further emerging alternative is to replace steel and aluminum with carbon fiber developed from captured atmospheric carbon.

In sum, the combination of DAC-sourced CO_2, cheap renewable power, and green hydrogen presents an enormous opportunity for the global economy to both decarbonize and prosper. The path to grasping this opportunity is demanding, however. The critical component to transitioning to a renewables-based economy is utilizing not top-down directives from leaders but a bottom-up and democratized approach. Like solar and wind facilities, REME technologies are modular and scalable. They can be sited anywhere, being particularly useful in locations of unequal energy access. Even better, developing regions can utilize existing fossil fuel infrastructure to transport the new carbon-neutral fuels, gaining immediate access and benefits.

Summary of actions needed

Although the challenges we face are formidable, we have reason for optimism. Many technologies for achieving energy equity and climate stability are ready to be implemented and/or scaled up. Expanded governmental leadership, appropriate financial mechanisms, and strategies for implementing the technologies are crucial to achieving success on the scale necessary within the timeframe required. A distributed approach must be applied regionally and locally, enabling bottom-up progress. Only bottom-up progress will create the impact needed for our climate and energy crises. Because our species has not dealt with this scale and complexity of threat before, we must seek out innovations in top leadership, policies, and financial mechanisms. A bottom-up, full-impact movement calls for administrative actions to create and enforce the rules required to provide a stable climate and abundant clean energy. To transition to a diverse and resilient energy infrastructure, the following activities are critical.

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1. Governments must amplify support for global, cross-sector, and public-private collaboration to advance technology development and scaling at the speed identified in the DAC Mobilization Summit[27].
2. Starting with energy systems, including CO^2 harvesting and conversion, a significant percentage of investment funds must be conveyed locally so that the benefits flow to local communities rather than corporations. Governments must ensure affordable funding for underprivileged communities.
3. Conflicts between the developed and developing nations must transform into mutual collaboration.

Unlike previous industrial revolutions, the speed of the transition to a sustainable Renewable Energy and Materials Economy needs to be driven by the immediacy of the climate threat rather than economic opportunities. Governments must recognize their leadership responsibilities. The current U.S. administration, for instance, realized that solving the climate crisis requires more than the open market and private sector, therefore allocating $3.5 billion to advancing Direct Air Capture technologies. Scientists are convinced that solutions require even larger investments.[28]

The 2021 Energy Equity Summit's government group report[29] highlighted the most important policy and financial measures for ameliorating our twin crises.

1. Form government-industry partnerships globally to quickly scale up solutions.

2. Transfer technologies and training to local workforces, furthering access to education and empowering local entrepreneurs.

3. Further the capability for locally producing carbon-neutral synthetic fuels.

4. Broaden access to financing mechanisms to deliver low-cost capital anywhere.

5. Subsidize net-zero and net-negative carbon technologies as they become ready to scale.

6. Establish a Climate/Equity Power Corps, similar to the Peace Corps, to transfer knowledge, technology, and funds.

7. Create international regulations that ensure that clean power supplies are universally usable (plug and play).

8. Give individuals and distributed organizations the right to produce and sell energy.

9. Make corruption impractical by heightening commitments to transparency.

10. Remove fossil fuel subsidies (unless required to "keep the lights on").

The above measures demonstrate that there is no silver bullet or single solution that can solve our complex problems. Readying even a single technology for deployment requires multiple types and rounds of innovation and intergovernmental and cross-sector partnerships. Technologies generally undergo a long development period before commercialization to reduce risk once they enter the market.

Recently, technologists and investors have demonstrated increased worry about the risk of failure. Failure, however, has always been a part of achieving technological breakthroughs, which ultimately provide benefits that massively outweigh the costs of early failures. In addition, effective deployment at scale requires resource efficiency and the financial mechanisms to enable that efficiency.[30] That means innovative policies at all scales, globally and among governments and industries. The challenges currently facing nascent technologies are a lack of scale, an overemphasis on immediate success rather than measurable outcomes, and investment risk, factors that have torpedoed voluntary decarbonization. The financial world has developed practices that could be applied to global credit markets, such as:

1. evaluating projects based not on financial success but on effectiveness;

2. developing tools for assessing risk;

3. providing for independent raters and reviewers;

4. funding insurance for private-sector risk-taking;

5. subsidizing regulators for ratings and insurance products; and

6. developing institutional-scale assets and portfolios for global resource allocations.

Investments in climate change technologies have a return expectancy longer than any private entity would accept. To achieve an upscaled impact in 10 to 30 years, we need to focus on technologies that have steep learning curves; are close to an economic breakeven point; require limited resources; can scale rapidly; and can achieve long-term, sustainable decarbonization. Investment decisions must focus on long-term practical outcomes. Further, financial mechanisms must minimize the deterrent nature of risk. For example, risk factors must be normalized (e.g., establishing a 20-year development with 95% certainty to standardize cost vs. results). An entire ecosystem of valuable portfolios and tools for normalizing capital deployment can be created. Once risk insurance is provided, the energy industry will move forward.

Because of the situation's urgency, the tools and solutions for dealing with energy inequity and the climate crisis should resemble war-time deployments, enabling quick scalability and giving adequate financial support.

Moving forward

Both resilient energy supplies and climate stability are global challenges, requiring use of the interconnected systems that govern the world's populations, economies, and energy supplies. Currently, efforts are dispersed and unconnected, inefficiently applying band-aid after band-aid when large-scale planning and cooperation are required. Having never addressed issues at this scale and complexity, we humans have been slow to understand that we can realize more by cooperating than by going it alone. [31]

Creating long-term social stability worldwide requires incorporating energy equity worldwide in policies, financial systems, and technologies. If energy equity is incorporated correctly, addressing the climate threat will not involve sacrifice or inhibit human development. Technological advances, governmental policies, and access to funds can align people's interests with societal interests.

Stakeholders need to be confident in emerging technologies and their development. In the past, society-transforming technologies have progressed from science to market by following steep learning curves driven primarily by advances in basic science, new materials, engineering, and manufacturing processes (not just economies of production scale). For instance, solar energy wasn't widely attractive at its first cost point, but progress along the learning curve has reduced costs by 1,000 times. A factor of only 10 reduction in cost is necessary for direct air carbon capture to unlock a decarbonized and energy-equitable future. As solution-oriented technologies become more easily and widely distributed, access to reliable, clean energy will drive economic growth, further increasing the adoption of carbon-neutral energy sources. As people's lives improve through REME technologies, individuals will contribute more effectively to the fight against climate change. Developing systems that incorporate and normalize non-financial outcomes based on clean energy and the equity it brings will enable us to design our own future.

ONE CANNOT SOLVE A PROBLEM WITH THE SAME SORT OF THINKING AS CREATED IT.

*One of Albert Einstein's famous sayings notes

Final words

By convening the 2021 Energy Equity Summit and disseminating this report, we hope to shepherd in a new way of thinking and acting, abandoning the status quo that has us collectively stuck. The Summit developed a framework for accomplishing energy equity and a healthy climate founded on three underpinnings: technology, government, and finance.

We hope the framework, described in detail in the ECi's Energy Equity 2021 Book[32] and summarized herein, will help mobilize the worldwide cooperative effort needed to achieve the future we all want, need, and deserve.

"THE FUTURE IS OURS – NOT SOMEONE ELSE'S"

*That's what we say

Inputs

1 Elk Coast Instituite
2 Energy Equity Summit Booklet, which presents all content collected during the Summit
3 Energy Equity Participant List
4 Energy Equity Working Group Report
5 Projects for Good
6 NuCarbon
7 Energy Equity Framework Group Working Paper, Oct. 21
8 Energy Equity Technology Group Working Paper, Oct. 21
9 Energy Equity Government Group Working Paper, Oct. 21
10 Energy Equity Finance Group Working Paper, Oct 21
11 The World Bank, Report: Universal Access to Sustainable Energy Will Remain Elusive Without Addressing Inequalities, June 2021.
12 Scientific American - Climate Change Hastened Syria's Civil War, March 2015
13 The Elk Coast Institute- Renewable Energy and Materials Economy – REME, May 2020
14 UNDP - Human Development Report 2007/2008: Fighting climate change: Human solidarity in a divided world
15 Economics Observatory: How does climate change shape inequality, poverty and economic opportunity?, October 2021
16 Ferreira, F. H. G., et al. A global count of the extreme poor in 2012: data issues, methodology and initial results. J. Econ. Inequal. 14, 141–172 (2016)
17 Bruckner, B., Hubacek, K., Shan, Y., et al. Impacts of poverty alleviation on national and global carbon emissions. Nat Sustain Feb 2022
18 Nature.com - Impacts of poverty alleviation on national and global carbon emissions
19 Chichilnisky & Eisenberger, Energy security, economic development and global warming: addressing short and long term challenges, Jan. 2009
20 Swiss Re Institute: Turbulence after lift-off: Global economic and insurance market outlook 2022/23, Nov 2021
21 The Energy Equity Summit Technology Working Group paper
22 The Wilson Center: The Battle for Earth's Climate Will Be Fought in Africa, March 2021
23 The World Bank: Solar Photovoltaic Power Potential by Country, July 2020
24 Environmental Defense Fund - Methane: A crucial opportunity in the climate fight
25 The Elk Coast Institute - Renewable Energy and Materials Economy – REME, May 2020
26 GreenBiz: How Innovator Bill Gross's solar breakthrough could decarbonize heavy industry
27 Mobilize for Climate – DAC/Climate Mobilization Report, Nov 2020
28 Negative CO_2 Emissions Technologies, Why will we need them and how quickly will we need to scale them, Matthew J. Realff, Peter Eisenberger
29 Energy Equity Summit - Government Group Working Report, Chair: James Arbib, Oct 21
30 Energy Equity Summit - Finance Group Working Report, Chair: Nick Gogerty, Oct 21
31 Chichilnisky & Eisenberger, Energy security, economic development and global warming: addressing short and long term challenges, Jan 2009
32 Energy Equity Summit Booklet, Nov 2021

Universal Access to Reliable Energy

is the driver of a sustainable, just and resilient future.
Inclusivity will mobilize the global population
to a net zero emission energy transition.

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FOR MINDFUL SUSTAINABLE INNOVATION