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MEETING REPORT ON THE SUSTAINABLE CONSUMPTION AND PRODUCTION STREAM

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Alan Dove

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SUMMARY

Finding sustainable ways to produce and consume our goods is both a prerequisite and a critical pathway for achieving the United Nations' Sustainable Development Goals (SDGs). The discussion group on sustainable consumption and production began by defining the scope of this vast undertaking as "minimizing the use of natural resources as well as the emissions of waste ... so as not to jeopardize the needs of future generations." Within that definition, the group focused on the need to close current production and consumption lifecycles to points that are both environmentally and socially sustainable.

Production and consumption are two parts of the same activity. Producers will only make what consumers will buy, and consumers, in turn, can only make choices from among products that they can access and afford. The group envisioned production as the central activity to try to change, but acknowledged that this must happen in concert with changes in consumption patterns.

Meeting that need will require scientists across multiple sectors to close major gaps in our current knowledge. In production, those gaps include the need for better data on production methods, analysis of the scalability of different technologies, the internalization of costs that are currently being deferred to future generations, and improved traceability of resources through production chains. Consumption is the major driver of production, so researchers - especially in the social sciences - need to improve our understanding of consumers' motivations. The key gaps in that area include understanding what drives people to adopt and retire technologies, how to scale sustainable solutions across a market, and how to provide transparent, understandable data to the public to shift mindsets toward new consumption patterns.

With the major gaps identified, the group developed a preliminary road map to address them. They identified several activities that can push production toward greater sustainability, including explorations of different scaling strategies, interdisciplinary collaboration, better data collection and analysis, promotion of systems-based thinking across sectors, and establishing specific sustainability targets for each industry. To change consumer behavior, the group recommended clear frameworks for product labels explaining how sustainable each product's manufacture is, advocacy to nudge consumers away from unnecessary materialism, improved education, and better, more transparent data for product life cycle analysis. All of these activities need to be coordinated not only across industries, but across academic, nongovernmental, and international government boundaries.

To measure the success of these efforts, the discussion group recommended setting specific sector-wide or system-wide targets, for example reducing the material use in a particular sector by a specific percentage within the next five years. These targets must be aimed at achieving both social and environmental sustainability.

Having made considerable progress establishing a plan for action, the group agreed to widen and extend the discussion, re-convening either in person or through teleconferences and bringing in more participants to encompass all of the relevant viewpoints.

OVERVIEW

This working group was comprised of 25 people, including representatives with a wide range of backgrounds from non-governmental organizations, academic institutions, and major corporations around the world.

Stream leads were as follows:

- Chris Cioffe, PepsiCo
- Cheryl Martin, World Economic Forum
- Johan Rockström, Stockholm Resilience Center
- Margo Mosher (facilitator), SustainAbility

SCOPE AND OPPORTUNITIES

Highlights

- Production and consumption are intertwined activities that must change together.
- Sustainable production entails closing product lifecycles as much as possible.
- Moving production and consumption toward sustainability will require extensive new science.
- Developed countries need to set better examples for consumption and production in the developing world.
- The research needs for production are easier to define than those for consumption.

The meeting's first breakout session focused on "Scope and Opportunity," which the moderators of the Sustainable Consumption and Production session took to mean defining the boundary conditions and goals of the discussion.

Though the discussion ranged across a vast territory of policies, behaviors, and activities, attendees kept returning to a few common themes. The moderators nudged the group toward identifying underlying patterns of consumption and production, and general strategies that could be used to make these intertwined activities more sustainable.

The production of goods and services is a concrete activity; there is no theoretical production. However, the concept of sustainable production remains amorphous, despite being called out specifically in the UN's Sustainable Development Goals (SDGs). In general, experts in the field define sustainable production as a set of closed-loop systems. The ideal sustainable manufacturing plant, for example, would recycle all of the matter and energy used to make its products. That ideal is thermodynamically impossible, as all transformations of matter require a net input of energy and cause a net increase in entropy. Instead, the practical goal of sustainable production is to close production loops as far as possible in all sectors, reducing the negative impacts of economic activity.

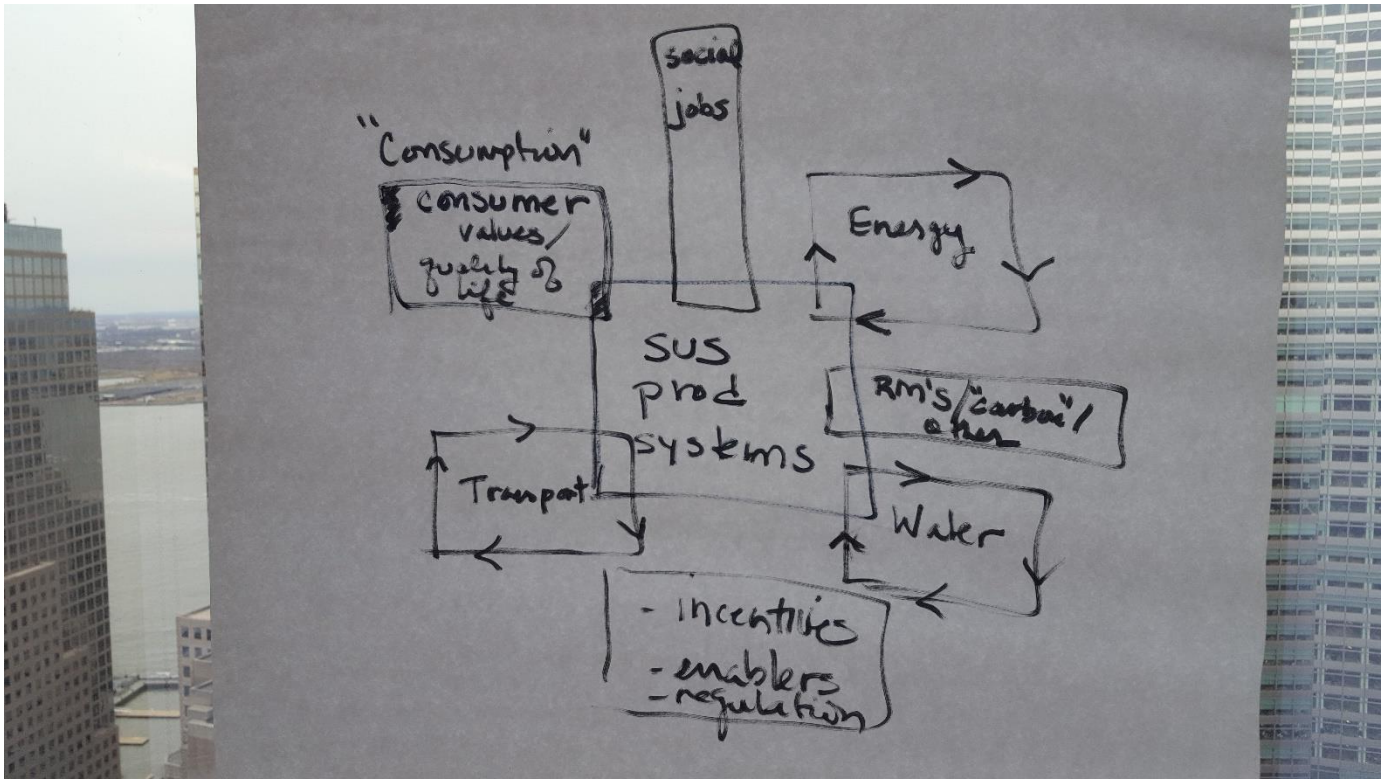

Figure 1. Schematic devised by the task group to illustrate a closed-loop production model.

The group discussed two different ways of approaching that. They could focus on improving science and business models to close loops in specific sectors and squeeze more efficiencies out of existing systems. Alternatively, they could take a larger view, proposing entirely new approaches to production and consumption as a vehicle for accomplishing many of the other SDGs. Attendees seemed to favor the latter idea, with broad agreement that improving the efficiency of existing systems was ultimately inadequate; many current production and consumption patterns inherently conflict with broad sustainability.

Closing production loops poses a tremendous scientific challenge. Much of the current literature focuses on "decarbonization," or reducing the carbon footprint and resulting climate impact of industries. While that's clearly important, true sustainability will require a much broader "dematerialization," reducing inputs and outputs of virtually every element in the periodic table. For example, agriculture currently consumes vast amounts of phosphorous, an essential nutrient for all life. By failing to recycle that element, the sector is rapidly running out of it. Even if farms can be made entirely carbon-neutral, the system will fail catastrophically if it doesn't also become phosphorous-neutral. Similar problems plague many other sectors.

Under the SDGs, a "sustainable" process must be more than just environmentally or economically capable of continuing into the future. It must also be politically and socially sustainable, achieving - or at least not undermining - goals such as peace, justice, and economic equity for all people globally. For example, the production of goods must benefit the people who make them, with workers receiving appropriate compensation and working in safe conditions.

Sustainability discussions often focus on production, but without consumption nobody would produce anything. Returning to the agricultural example, a rising middle class around the world increasingly demands meat-rich diets that are inherently unsustainable. That demand creates immense economic and

political incentives favoring unsustainable production. Conversely, consumers shifting to favor less damaging products can drive profound changes in production practices. Supply and demand are two sides of the same problem. Even the notion of dichotomizing consumption and production may be misleading, as producers are inevitably also consumers; a factory consumes raw materials to make products.

Science and technology undergird both production and consumption, requiring a systems approach to evaluate influences on entire industries and sectors. In his keynote presentation at the meeting's start, economist Jeffrey Sachs described the process of "RDD&D," or the research, development, deployment and diffusion of new technologies. While producers can research and develop a new product, it's up to consumers to deploy and diffuse it, highlighting the interconnectedness of the entire economic process.

Consumption and production of any given product form a feedback loop, but they also interact with the entire global ecosystem, often in poorly understood ways. This has led many sectors to externalize environmental and social costs. A gallon of gasoline may only cost two dollars at a typical American service station, but the real cost of that fuel to the world is several times higher. The difference is effectively billed to future generations through climate change, species loss, and pollution, paid for by neither the oil company nor the driver. Internalizing those costs, so that the current price of a product reflects its actual present and future cost to society, would force many industries toward greater sustainability. If gasoline cost ten dollars a gallon people would use far less of it. Other than a few efforts to establish carbon trading markets, however, this idea remains largely unimplemented.

Consumption patterns are also a huge concern for developing countries. Researchers, often based in developed countries, have engaged in much hand-wringing about the rising consumption of meat, cars, consumer gadgets and other unsustainable products as poor countries enter the global middle class. Commenters from developing countries agreed that this is a real concern, but find its presentation somewhat paternalistic and hypocritical, as rich countries have shown little interest in cutting their own consumption of these products. To accomplish real change, developed countries will need to take the lead and set better examples for sustainable consumption.

Because the group's mandate was to address science and technology needs, they agreed that an emphasis on production seemed most relevant. Consumption is often a function of politics and class, whereas production entails clear research and development needs. This view reflects the traditional notion of "science and technology" as encompassing hard sciences such as physics, chemistry, and biology, and their engineering counterparts. However, the group noted, many branches of social and behavioral sciences have progressed to the level of making useful predictions about consumer choices and strategies for changing them. Participants felt that social scientists could clearly contribute to sustainability by identifying ways to change consumer behavior.

This idea led to a view of sustainable production as a closed loop, with consumption as an intersecting influence. Both systems are amenable to scientific and technological interventions. For example, medical science clearly supports the idea that current food consumption patterns in developed countries are unhealthy as well as unsustainable. Social scientists are studying ways to use that information to influence eating choices. If enough consumers change their eating behavior, food producers will be forced to change as well, potentially improving both health and environmental sustainability measures under the SDGs.

Neither hard nor social science is a strictly neutral activity, though. Entrenched corporate and political interests control formidable scientific research facilities and staff. As a result, research has yielded new

ways to extract fossil fuels, new devices that are nearly impossible to recycle, and new, highly effective marketing strategies that have fed unsustainable consumption patterns. Changing these patterns will require strong incentives and clear pathways.

One way to address that could be to change the way producers think about their businesses, so that they begin evaluating problems in terms of functions rather than products. For example, a dye manufacturer is in the business of providing a color, not an aniline dye compound; a food processor should think of producing nutrition, not a can of beef. The dye and the beef might be the right products for their respective markets, but using a functional approach means at least evaluating other possibilities as well.

Developing countries have had some notable successes in changing production and consumption patterns. Vernacular architecture, or traditional building design handed down in a culture, often provides efficient heating and cooling with minimal energy use. Adopting the same principles in new construction, rather than simply copying designs used in the developed world, has helped reduce the impact of some buildings.

In this way, identifying a few important sectors such as buildings, energy, and transportation, and closing material loops within those sectors, emerged as a feasible way to move toward more sustainable systems.

To define sectors, the group decided to focus on broad categories of needs, such as food, clothing, housing, and energy, then looked at what science is needed to reorient those sectors toward more sustainable pathways. Such change will require identifying the critical factors that could enable change and determining what's blocking them.

As one means for accomplishing this, commenters agreed to try backcasting, defining what an ideal production system would look like in a particular sector, then working backward to determine how to get there.

The current UN definition of sustainability focuses on minimizing the impacts of production and consumption. The discussion group's working definition, which emphasizes closing production loops and evaluating entire sectors systematically, includes and extends that concept.

RESEARCH AND DATA

Highlights

- Sustainable production requires addressing gaps in both knowledge and implementation.
- Tracing resources through production loops remains extremely hard.
- Industries lack systematic models for designing closed production loops.
- Consumers need better information to make sustainable choices.
- Most of the scientific gaps in sustainable consumption and production require interdisciplinary research.
- Private sector funding and participation are essential for sustainability research.

After a brief break, the Sustainable Consumption and Production group re-convened with about 20 participants. This session's moderators began by focusing the group's attention on identifying scientific gaps that could be addressed in the next five to ten years. The first session had already established the boundaries of the discussion: closing the loops in sustainable production systems to advance the SDGs in multiple areas, including water, raw material use, energy, social equity, and urban development.

The moderators decided to split the hour-long session in half, with the first half focused primarily on production and the second half on consumption. Attendees were to identify specific scientific and technological needs in each area.

Production

Though production encompasses a huge range of activities, examples from well-characterized sectors such as food, transportation, and construction served to guide the group. In all of those areas, attendees agreed that there were two types of gaps: knowledge and implementation. Knowledge gaps stem from missing information, while implementation gaps involve measures that have been proven effective but remain difficult to scale across an industry or sector.

Both problems affect the transition to non-carbon-based energy sources, especially in transportation. Some technologies such as wind and solar power are already effective in some areas, but have had difficulty achieving more widespread use. Meanwhile, scientific gaps limit the utility of electric vehicle batteries.

Externalities pose another knowledge gap, as research on the true environmental and social costs of current products and resources is in its infancy. Water, for example, is often underpriced and therefore overused, hindering the development of technological solutions that could help conserve it.

Closing production loops requires understanding what currently goes into and out of those loops, but tracing resources through different transformations is extremely hard. This data gap is huge. One attendee characterized it as the "environmental genome" of an industry, and pointed out that it remains virtually unexplored in most businesses. Some researchers have attempted to model the inputs and outputs of specific production chains, based on available data about raw materials and final products, but companies generally haven't engaged in such efforts.

The obscurity of inputs and outputs doesn't just affect manufacturing. Various government and international agencies have collected data on agriculture, but the information is scattered and incomplete. A new database will collate these data, covering everything from fertilizer and seed use to crop yields and food production, but huge quantities of information are still missing simply because nobody has collected it.

Equipment manufacturers may be able to help with some of these data gaps. Makers of farming and mining equipment, for example, are now installing software in their products to track and report detailed usage data for maintenance and product development purposes. If these companies can be persuaded to share those data with researchers, they could add considerable detail to models.

Besides analyzing inputs and outputs, closed-loop production will require clear guidelines. However, there's no established suite of systems-based methods for designing closed loop production systems. Engineers often talk of designing for manufacturing or use, but there is no systematic "design for a closed loop" concept. One pilot project in the textile industry, based on customers recycling their used clothing, has had difficulty finding a systems-based business model that can operate at full scale. Other sustainable production efforts are likely to encounter the same problem.

Given the information gaps, perhaps it's unsurprising that there may not be any current examples of effective closed loop production—even "sustainable" models of agriculture still depend heavily on oil and overuse fresh water. The U.S. National Science Foundation has recently established targeted funding to identify closed-loop systems for food, energy, and water, projects that could yield such an example.

Private companies are among the most important producers in all sectors, but they've long lacked any kind of multi-party discussions. Indeed, many industries frown on collaboration out of fear of exposing proprietary information. Fertilizer companies don't talk to each other or to food processors about their long-term plans, for example. Companies need to agree on models for sharing information, and for pursuing more sustainable production pathways.

Attendees also recommended increased interdisciplinary research, deeper collaboration between industry and academic researchers, and inclusion of unconventional sources of knowledge such as the traditions of indigenous peoples and the insights of low-level technicians and engineers in industries.

Consumption

Next, the group addressed knowledge gaps related to consumption. Given the unsustainability of many current practices, meeting the SDGs will clearly require consumers to adopt new products and technologies and retire old ones. Researchers will need to determine what drives these behaviors in multiple sectors. For capital-intensive industries such as manufacturing and agriculture, retiring old technologies can be especially hard.

To make intelligent choices about sustainability, consumers will need to know where products come from. That will require better traceability of inputs, and also better translation of the available information into terms consumers can understand. Unfortunately, efforts to improve communication about product sustainability remain spotty. One problem is that behavioral science funded by government agencies often runs afoul of politicians, who see such research as a type of marketing that conflicts with politically-entrenched industry interests. In some cases legislators have added language to appropriations bills that explicitly blocks agencies from pursuing such research.

One participant suggested breaking the problem of consumer behavior change into three parts: information, incentives, and alternatives. In order to change, consumers must understand the reasons for changing, have some kind of motivation to do so, and have reasonable alternatives to which they can switch. Social scientists need to do more research on which of these factors works best for changing consumption patterns of different products.

Ideally, consumers should understand the full environmental impact of a product, including any biodiversity loss its production causes. Researchers still haven't found good ways to measure such loss, however. Even in cases where a species loss has a clear cause, it's often difficult to quantify the impact of that loss.

Consumers are already demanding more information and traceability for some products, such as foods. In the U.S. and other developed countries, independent organizations have been setting up efforts to trace different categories of food and enforce sustainability standards. Whether these standards are set by government or private concerns, trustworthiness is a crucial factor. Political and social scientists should investigate what types of regulatory regimes garner the most trust among consumers. Those standards will need to be adjusted for specific markets and legal systems, which vary from one country to the next.

A related problem is presenting a change to consumers in a way that appeals to them. School-based educational efforts may help, by reaching consumers at a young age and indirectly influencing their parents' choices as well as their own. In cases where relatively low-technology solutions are most appropriate, it's also important to counter the prevailing view that links progress to increasing complexity. An effort in Ghana succeeded in doing this by collaborating with creative designers, packaging the idea of traditional energy-efficient architecture as a stylish new trend.

While social scientists may be able to find ways to change consumer behavior, their jobs will be much easier if researchers include them from the beginning of the product development process. Attendees agreed that interdisciplinary teams should pick a few examples of sustainable products, then work to develop them from the research phase through deployment. Besides working across disciplines, teams should incorporate input from multiple sectors, including non-governmental organizations, industry, academia, and creative designers. Such an effort proved highly effective in introducing dry sanitation toilets in Mexico City, where local businesses modified an international project's design and promoted it to wealthy businesses and homeowners. That set the trend, making the new toilets highly desirable among the general population.

Increasing the efficiency of a product, however, can also increase its consumption, an effect economists call Jevon's Paradox. Improved technology in the 19th century made coal burning more efficient, leading to a drastic increase in the consumption of coal during the Industrial Revolution. More recently, robotic manufacturing and miniaturization led to an explosion in the use of disposable cellular telephones.

The final - and perhaps most fundamental - scientific gap in sustainable production and consumption is funding. With prominent politicians in the U.S. and elsewhere either actively opposing or passively starving research, government-funded science seems unlikely to fill all of the needs. Private sector research will clearly be critical.

Highlights

- Distributed energy and manufacturing systems could provide more sustainable scaling for many technologies.
- Science funding agencies can promote interdisciplinary research by requiring it.
- Canonical models and pre-competitive boundaries would help companies collaborate on sustainability.
- Companies that mandate systems-based engineering can move quickly toward more sustainable solutions.
- Industries need clear, realistic targets and deadlines for achieving sustainability.
- The group will enlist more participants and meet again to develop its new agenda further.

The two morning sessions laid out the pieces of an agenda for science in sustainable consumption and production, identifying several major gaps in current knowledge that could be addressed by research. Both science and technology, and both hard and social sciences, need to be integrated across disciplines and across academic and non-academic boundaries.

Specifically, researchers need to find ways to improve the traceability of resources and close production loops, and also determine the best strategies for changing consumer behavior. The afternoon session focused on assembling all of those ideas into a coherent research road map, and deciding what the group should do next to follow it.

Partnerships

Scaling technology from research to a pilot plant to full-scale production remains one of the biggest hurdles for sustainable production systems. One common strategy is to abandon the pilot facility and build a new, much larger one for full production, usually in or near the same location. Conventional wisdom has long held that these larger facilities will achieve economies of scale, reducing costs. A less common but perhaps more sustainable approach is to simply build more pilot-scale facilities in different locations, scaling the system by multiplying it rather than rebuilding.

Distributed energy generation and water purification provide good examples of this type of modular scaling. Instead of building a few huge plants to generate electricity or purify drinking water, some countries have scattered numerous smaller facilities across their landscapes. Manufacturing industries are also amenable to modularization, with parts being manufactured in different locations, then transported to assembly plants. Process-based industries such as mining and bulk chemical production may be harder to scale this way, as those facilities often need to be located near similar plants, or close to the natural resources they're extracting.

For industries that can implement it, modular scaling could offer numerous advantages. Decentralized production usually takes requires less capital per plant, opening the field to smaller operations and feeding the equity goals of the SDGs. However, some components of the production system might still require large, capital-intensive production facilities. For example, the mushrooming field of 3-D printing now employs thousands of entrepreneurs around the world. Startup costs are so low that one or two people often finance the initial investment in a 3-D printer from personal savings. The resins and plastics these printers use, though, are made by large manufacturers who can achieve economies of scale.

Another example of a working modular scale-up is drip irrigation in India. A few companies lobbied the government for subsidies to speed the adoption of this irrigation system, which uses far less water than traditional irrigation. The result was a subsidy program that led to massive adoption of the technology in just ten years' time. The group agreed that a combination of a strong business interest and a government subsidy was a good strategy for scaling sustainable technologies.

The earlier sessions also featured extensive discussion about the need for systems-based analysis of production and consumption, and interdisciplinary research to make those systems more sustainable. In the U.S., both the National Institutes of Health and the Department of Defense have added interdisciplinarity as a requirement for some projects, prompting many researchers to collaborate across traditional academic lines. Clearly, government or institutional funders who control large sums of grant money can stimulate this type of research simply by mandating it.

The science of sustainability needs more data as well as better methods for analyzing it. Sensors in farm fields and manufacturing equipment can collect much of the necessary data, but researchers will need to be able to collate, access, and study that information to push the field forward. Both technical and political barriers stand in the way. The former may be easiest to address, as computing power and miniaturization are already letting companies and scientists deploy more and better sensors.

Politically, producers are often loathe to expose data that could reveal trade secrets. Military research programs address this problem with "canonical models," black-box abstractions that hide classified information while allowing researchers to understand what needs to go into and out of the process. Academic scientists can then study the problem openly without seeing the secret parts. A similar strategy could work in manufacturing. Materials and chemical production would be harder to handle this way, as product formulas are often the core of the trade secret.

The topic of protected information brought the discussion to the broader problem of intellectual property. In some industries, patents and other IP help innovative companies advance, moving the entire field toward greater sustainability. In other fields, however, IP keeps the industry locked in unsustainable production patterns.

Applying the pharmaceutical industry's solution, which clearly defines which parts of a process are competitive and which are pre-competitive, might help. Companies can share pre-competitive information freely with each other and with academic researchers, but still protect secrets that are critical for their profits. Defining competitive boundaries in other industries would drastically increase the ability of companies to collaborate.

The group also discussed the need for establishing trustworthiness in big data sets, ideally with independent validation and robust efforts to explain the data to consumers.

KEY ACTIONS

With the needs reasonably well defined, the group turned to developing a map for further action. Promoting interdisciplinary research and the related, but distinct activity of systems-based solution development is one of the top priorities. It may also be one of the easiest to implement, at least initially.

Attendees discussed having research funding agencies set clear requirements for interdisciplinarity on projects that could drive more sustainable production and consumption. While that clearly works for academic science, corporate research may need a different incentive. One commenter advocated teaching executives and researchers across entire industries about systems thinking. While dedicated systems analysts will remain crucial, even a short half-day workshop on systems-based approaches could make the strategy much easier to promote. One company found that mandating systems approaches for engineering decisions, and incorporating that requirement into decision support tools used throughout the company, was highly effective at producing broader solutions and breaking through organizational silos.

At the government level, both Norway and Sweden have permeabilized departmental boundaries by placing responsibility for the SDGs directly under their Prime Ministers. Some developing countries have taken a similar top-level approach. In the U.S., this could be accomplished by putting the Presidential Office of Science and Technology Policy in charge of the SDGs, assuming that office continues to exist.

Crossing the boundaries between academic, corporate, and government efforts will require even broader collaboration. To that end, the group advised assembling larger communities of participants to discuss each sub-topic on the road map to sustainable production and consumption.

To ensure the broadest possible collaboration, the group plans to issue open calls for stakeholders to come forward and join each discussion.

For each action the group identifies, they will determine what would motivate research in a particular direction, and who could drive that. This will most often amount to "show us the money."

Moving from current production and consumption patterns to more sustainable ones will also require funding. Who should pay the transition costs? The answer will likely vary from one sector to the next, but there needs to be an answer.

The group will also need to determine how to measure success. Accomplishing the SDGs will definitely require advanced technology, but it must be sustainable advanced technology. Sharing success stories about sustainable production systems that also boosted profits would go a long way toward motivating more companies to pursue the necessary advances. General Electric, for example, now makes a substantial profit on energy efficiency products, but many other companies have been less outspoken about their successes. The group called for a database showing production changes that boosted both sustainability and profit in different industries.

In casual conversation, the term "sustainability" is often taken to refer only to environmental concerns. Promoting the broader view of sustainable production will require constant reminders to include social,

political, and economic sustainability as well. A change that reduces an industry's carbon footprint but forces thousands out of work is not sustainable.

Though some aspects of sustainability may be difficult to measure, asking for specific quantitative targets still makes sense. For example, calling for a specific industry to be 30% less material-intensive by 2020 implies clear benchmarks that a company will have to reach by specific deadlines. Companies yearn for that level of clarity, as many executives find the current murkiness of sustainability goals frustrating. To be adopted, though, the targets need to be reasoned, outlining why those specific numbers are dates matter.

Promoting sustainable consumption will also require clearer guidelines. Individual companies and nonprofit organizations currently offer a plethora of different standards with diverse motivations, but efforts such as product labeling will only work if they're regulated. The group recommended developing a framework around consumer-friendly sustainability labels, initially for food products.

Life cycle analysis could help inform consumers about sustainability, but that field currently operates with multiple, obscure frameworks. The group recommended exploring this problem with industry participants to agree on a uniform, transparent framework.

Several participants agreed that the discussion had been extremely productive, and the group strongly favored re-convening to continue it either in person or through a series of conference calls.

NEXT STEPS

- Broaden the group to include more representatives from more sectors.
- Identify who would perform further research on particular consumption and production problems, and who would fund it.
- Develop a database of production changes that boosted both sustainability and profits in different industries.
- Established reasoned targets and deadlines for sustainability in individual sectors.
- Develop a framework for consumer-friendly sustainability labels, initially for food products.
- Work with industry to establish a uniform, transparent framework for life cycle analysis.
- Convene additional meetings of the group, either through conference calls or in person.

APPENDIX: WORKING GROUP PARTCIPANTS

Full Name	Title	Primary Affiliation
Dominic Vergine	Head of Sustainability and Corporate Responsibility	ARM
Johan Rockström	Executive Director	Stockholm Resilience Center
Dawda Jobarteh	First Officer	UN Office of the SG
Margo Mosher	Manager	SustainAbility
Lara Allen	Director	Centre for Global Equality
Cheryl Martin	Head, Centre for Global Industries	World Economic Forum
Geoff Jordan	Associate	SAP
Emily Shackles	Project Engineer, Mission Critical	SKANSKA
Christine Cioffe	SVP, Strategy and Portfolio Management, Global R&D	PepsiCo
Anne Roulin	Vice President, Nutrition, Health & Wellness & Sustainability	Nestlé S.A.
Jesse Mudrick	Strategy Analyst, Global Academic Relations	Elsevier
Tom Speechley	Chief Executive Officer	Abraaj North America
Al Bunshaft	Senior Vice President, Global Affairs	Dassault Systèmes
Elisaveta Petkova	Research Associate	National Center for Disaster Preparedness, Columbia University
Takao Kuramochi	Senior Deputy Director General	Center for Research & Development Strategy, Japan Science & Technology
David Constable	Director, Green Chemistry Institute	American Chemical Society
Erica Schoenberger	Professor	The Johns Hopkins University
Fumie Imabayashi	Deputy Manager, Center for Research and Development Strategy	Japan Science and Technology Agency
Alicia Harley	Research Fellow	Harvard Center for the Environment
Mark Gregory Robson	Professor	Rutgers
Thomas McKeag	Executive Director	Berkeley Center for Green Chemistry
Nandini Hampole	Manager - Climate Change & Sustainability Services	Ernst & Young
Alan Dove		
Takao Kuramochi	Senior Deputy Director General, Center for Research &	Japan Science and Technology Agency
Shigeru Kitaba	Manager, Washington D.C. Office and Center for Research and Devel	Japan Science and Technology Agency
Sarah Frazier		Accenture
Mathias Dub	Advisor	Delegation of the European Union to the United Nations
Philip Fox-Drummond Gough		Mission of Brazil
Anna Chapman		Rockefeller University