MIT Sustainability Summit & the Circular Economy
Reframing the conversation

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The MIT Sustainability Summit is a student-run conference that has been held at MIT since 2009. The objective of the annual event is to bring together a wide range of thinkers and doers—reflecting MIT’s motto mens et manus (mind and hand)—to share, discuss, and expand new ideas and insights about incorporating values and practices of sustainability in real-world organizations. Unlike other university conferences that prioritize academic research and other environment-related summits that focus on technical or scientific breakthroughs, the Sustainability Summit seeks to drive real organizational change by giving visionaries a stage on which to present their demonstrated successes.

At the Summit, student organizers leverage MIT’s numerous assets in this arena, including its reputation, to create a convening space for a vital conversation about the future, putting in the same room students, professors, business-people, inventors, policy-makers, and interested community members. It would seem as if this would be a winning formula, and yet over the years the conversation has gotten tired and direct evidence of success is scarce. Year after year, new students recruit new speakers from the MIT faculty, local government, and leading businesses to speak to a largely new audience, and somehow the same tropes about the perils of resource depletion and climate change are met with familiar promises of sustainable business, green building, renewable energy, etc. Specifics would change, but you could probably swap any speaker, panel, or workshop from any of the first six events with no one the wiser.

I have been involved with the Summit throughout my entire tenure as a PhD student at MIT, first as a content organizer and then as content co-director. At the beginning of the summer before my fourth year, I was asked to serve in a newly-created executive position called “content architect,” which made me primarily responsible for the overarching theme and message of the 2015 event. After returning from the Schmidt-MacArthur Fellowship summer school during the summer of 2014, I realized that the circular economy offered a perfect opportunity to revitalize the Summit. The circular economy and its constituent set of tools and concepts could offer new insights to problems and solutions we all care deeply about. In this article, I am pleased to share perspectives on understanding, communicating, and realizing a circular economy that I gained as content architect of the 2015 MIT Sustainability Summit.

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I Introduction

On April 24–25, 2015, a group of approximately 300 individuals gathered at MIT, as similar groups had around Earth Day each year for seven years, to talk about the present we have, the future want, and how we can get from one to the other. This year, the group, which included

- students and professors
- government officials and activists
- engineers, designers, marketers, financiers, chefs, and managers
- entrepreneurs, employees, and homemakers
- thinkers and doers, all

was introduced to a new way of thinking about that trajectory: the Circular Economy. The 2015 MIT Sustainability Summit\(^2\) focused on agriculture systems and the circular economy. In this way, it offered a real-world, deep dive into the "left-hand loops" (biological nutrient cycles) of the Ellen MacArthur Foundation butterfly diagram. As the Summit content architect, I had a first-hand view of the Summit from initial conception through post-event reflection. In the context of this circular economy innovation project, I had three goals for the Summit:

1. To organize and execute a student-run conference on the circular economy
2. To develop strategies for introducing circular economy-framed ideas to established sustainability communities
3. To explore unique challenges associated with circular economy in food/agriculture systems

In my opinion, each of these three objectives was only partially achieved. However, in the course of planning, executing, and reflecting on the event, I gained insights that I believe can be valuable for others interested in holding similar events in the future.

This report opens with an overview of relevant background information, including a history of sustainability thought and activity at MIT. This is followed by a narrative of the organizing process and resulting content of the 2015 Summit.\(^3\) The article closes with a discussion of key outcomes and lessons learned.

2 Background\(^4\)

The Massachusetts Institute of Technology was established in Boston, Massachusetts in 1861. Its founder, William Barton Rogers, sought to create an institute of higher education suited to the rapidly industrializing and newly technological world, with which he saw classical

\(^2\) [http://sustainabilitysummit.mit.edu/]
\(^3\) This report, and lessons learned, does not include summaries or references to specific content delivered by the speakers, because such a use of their intellectual material was not cleared with them before hand.
\(^4\) This background section should not be taken for an authoritative history of the relevant topics at MIT; rather, they are the aspects about MIT, its history and its activities that were instrumental in giving me the perspective that I have. For more in-depth histories of MIT, see the detailed bibliography compiled by the MIT Libraries here: [https://libraries.mit.edu/mithistory/bibliography/]
universities incapable of keeping pace. The new model he advocated elevated laboratory instruction and focused on the dissemination of scientific knowledge into the world. Although its opening was immediately disrupted by the US Civil War (1861-1865), by the end of the 19th century, MIT had become a leading university, competitive with the top schools in the country (so competitive, in fact, that Harvard made two unsuccessful attempts to merge with the upstart Institute of Technology).

In 1916, MIT relocated to the north shore of the Charles River to its current location in Cambridge, which allowed the school to grow in size, scope, and stature. Through the 20th century, MIT became the world-class institution that it is today through effective leadership, breakthrough discoveries, educational innovations, and good timing. At the center of all of MIT’s success has remained Rogers’s original vision of a school of science and technology oriented to the public interest. The definition of this interest has evolved—as has the world—over the Institute’s 150-year history. At its founding, MIT was chartered to “[aid] generally, by suitable means, the advancement, development and practical application of science in connection with arts, agriculture, manufactures and commerce.”5 Today, the school’s mission is “to advance knowledge and educate students in science, technology, and other areas of scholarship that will best serve the nation and the world in the 21st century.”6 On the one hand, the scope of the public interest has broadened considerably from specific concerns of building a national technological base to all areas that “best serve the ... world.” On the other hand, the reframing has enabled MIT to explicitly focus on the “betterment of humankind.” This is the context in which MIT has tackled the sustainability challenge.

Environmental concern was not part of Rogers’s original vision for MIT, but came later as a natural progression of the “application of science.” In particular, MIT’s first female graduate, Ellen H. Swallow Richards, is credited with pioneering so-called sanitary engineering, a predecessor to today’s field of environmental engineering, during her tenure as an instructor in sanitary chemistry at MIT from 1884 to her death in 1911.7 The study of sanitary chemistry was concerned largely with the effect of environmental contamination on human health, focusing on air and water pollution. Sanitary engineering, along with Richards herself, contributed significantly to the development of early public health programs during the reform years before the turn of the century. From that point until now, there have been a number of active relevant narratives—although at times more implicit than explicit—operating within the MIT community.

The Rogers vision was one of basic research directly applied to issues of immediate public concern. Certainly this had been accomplished in the decades preceding Richards, with output of all of MIT’s academic and research programs affecting the new industries in the United States through metallurgy, engines, chemistry, etc. But from Richards on, the bar was

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6 http://web.mit.edu/facts/mission.html
http://libraries.mit.edu/archives/exhibits/esr/esr-biography.html
set higher, and demonstrated the ability of scientific thought to directly improve the lives of people. This remains the *raison d'être* for many applied scientists and engineers at MIT.

Richards’s research also demonstrated the power and utility of considering the environment as integrated with society. It is certain that her work would not resemble today’s human-environment systems research, but nevertheless did view the environment as connected with human activity; open dumping and pollution did not simply go away, and conscientious environmental management would yield dividends for human and household health. Approaching the environment as something to be managed is one of the characteristics that connected sanitary engineering with the later field of environmental engineering, which applies scientific principles to understanding the physical interface between society and the environment.

Finally, MIT serves as an important mediator for scientific and technological deployment, between the laboratory and the market and also between the public and private spheres. The environment is, quite literally, the *commons*, and as such is poorly accommodated by market forces. Similarly, as both the understanding of human-environmental systems and the capacity of humans to influence the environment expanded throughout the 20th century, old models governing environmental behavior became obsolete. MIT and many other peer institutions developed new scientifically-grounded frameworks that reflected the new reality. These frameworks encouraged new technological development and deployment, but more importantly also offered novel policy prescriptions and business model innovations.

A notable example of this innovative approach to reframing the conversation about society and the environment came with the early-1970s work with system dynamics. In the mid-1950s, Jay Forrester, an electrical engineer who pioneered many proto-computing inventions during the 1940s and 50s (including what we know today as RAM), developed a method of representing the dynamics of real-world systems as an integrated network of stocks and flows. After applying the method to industrial and urban systems, he created a model of the world as five interconnected sub-systems: population, agriculture, industry, resources, and pollution. Members of his research team, lead by Donella H. Meadows, applied this model to explore the long-term implications of exponential growth in a finite world, which were documented in *The Limits to Growth*.9

*The Limits to Growth* represented the start of a paradigm shift among scholars interested in the impacts of human activity on the planet. The notion of the earth as a complex system opened up new considerations of chaotic behaviors, such as emergence, feedbacks, and delays, which were found to more accurately represent the real world than did their Newtonian antecedents. This new understanding was enabled by computer modeling, which could explicitly test various hypotheses about the potential complex effects of various scenarios, including technological and policy interventions as well as business-as-usual.

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By the late 1980s, global environmental concerns had reached the highest levels of global concern, with issues of hazardous waste, acid rain, and the ozone hole each receiving considerable intergovernmental attention. The UN Brundtland Report\textsuperscript{10} of 1987 codified the principles of \textit{sustainable development} as balancing environmental, social, and economic concerns across and within generations. In 1992, the famous Earth Summit translated those principles into global policy objectives.\textsuperscript{11}

At MIT, a similar transition had occurred. In 1992, the Department of Civil Engineering was renamed Civil and Environmental Engineering, reflecting the growing importance of environmental concerns.\textsuperscript{12} Throughout the 1990s, numerous environment- and sustainability-related research programs were launched, including the Laboratory for Energy and the Environment\textsuperscript{13} and the Alliance for Global Sustainability,\textsuperscript{14} both of which provided support for interdisciplinary and transdisciplinary sustainability research. In her 2005 inaugural address, new MIT President Susan Hockfield challenged the Institute to tackle problems of energy and the environment, and announced the creation of the MIT Energy Initiative to do just that.\textsuperscript{15}

The systems thinking heritage that followed from the \textit{Limits to Growth} research also found traction during the 1990s. A new academic program, the Engineering Systems Division, was launched to tackle the types of large-scale, complex, socio-technical problems that no individual department was suited to research.\textsuperscript{16} In particular, ESD brought together faculty members from the engineering and management schools, a recipe ideal for the promulgation of real-world solutions. As a part of this research effort, the Materials Systems Lab was established to study the economic and environmental implications of “materials and materials processing choices,” including large-scale recycling.\textsuperscript{17}

Today, MIT continues to tackle sustainability topics from many directions. Following a successful decade of research supported by the Energy Initiative,\textsuperscript{18} in 2015 the Environmental Solutions Initiative was set up in a similar model, and has begun funding interdisciplinary research into food, water, pollution, and other “issues of environmental significance.”\textsuperscript{19} Looking inwards, MIT has also established an Office of Sustainability, charged with tackling sustainability challenges at MIT by using the campus as a “living laboratory.”\textsuperscript{20} Additionally, the Sustainability Initiative at MIT Sloan has created the first sustainability-related curriculum at the university and shepherded numerous classes of MBA students through a certificate

\textsuperscript{10} http://www.un-documents.net/wced-ocf.htm
\textsuperscript{11} http://www.un.org/geninfo/bp/enviro.html
\textsuperscript{12} https://cee.mit.edu/timeline
\textsuperscript{13} http://web.mit.edu/annualreports/pres05/03.10.pdf
\textsuperscript{14} http://theags.org/
\textsuperscript{15} http://hockfield.mit.edu/inaugural-address-16th-president-massachusetts-institute-technology
\textsuperscript{16} https://esd.mit.edu/Headline/esd-founded.htm
\textsuperscript{17} http://msl.mit.edu/
\textsuperscript{18} http://mitei.mit.edu/
\textsuperscript{19} http://environmentalsolutions.mit.edu/
\textsuperscript{20} https://sustainability.mit.edu/
program that enriches their leadership skills with specific tools and knowledge necessary for leading what they define as "sustainable business."\textsuperscript{21}

Despite its high profile at the present, there does not seem to be a unifying framework for or understanding of sustainability at MIT, and research branded as such is not much of a departure from the strongly disciplinary research that has gone on for decades. Engineers apply methods and analytical frameworks from their home disciplines—environmental, mechanical, chemical, etc.—to the design and analysis of renewable energy, innovative water systems, products designed for environmentally-benign manufacturing and recycling; economists use study the effects of new taxing models on emissions behaviors; and management scholars study new ways for "sustainability" to be integrated into a firm’s activities. The research that has resulted is often policy-relevant and impactful, but is subject to the whims of a disciplinary mindset, where what is important are the methods used to solve problems, rather than the problems themselves. This approach constrains the types of solutions that are available to those that can be identified with existing epistemological frameworks, specifically, reductionist scientific thinking. It also leaves problems of sustainability to the whims of those departments; there is already evidence of a refocusing away from “faddish” sustainability research in the only explicitly systems-oriented department at MIT.

In contrast, a source of unconstrained and uncompromising focus on a better future has been the student community. Student innovation has been an important part of MIT’s culture throughout its history, and since at least the turn of the 21st century, central to MIT’s institutional focus on sustainability and the environment. Activities ranging from conservation campaigns to on-campus research activities helped to orient the attention of the university community on these issues. In 2009, a newly-unified student club, Sustainability@MIT,\textsuperscript{22} held the first of what would be annual summits, bringing together interested parties from across the campus and beyond. The first Sustainability Summit was subtitled “Discovering New Dimensions for Growth,” immediately evoking the business and real-world applications orientation of the event.\textsuperscript{23}

The first Summit was organized by students from three of MIT’s five schools: management (Sloan), engineering, and architecture and planning, and as such reflected a multi- (or even non-) disciplinary approach to sustainability. Over subsequent years, this event has become the keystone activity for a constantly changing MIT student sustainability community. As new students enter and interests ebb and flow from year to year, the Summit can be more and less representative of the community, but it is by far the highest profile and most outward-facing of any of that community’s activities. But although students may be interested in tackling issues of sustainability from a place of creativity and holism, the model

\textsuperscript{21} http://mitsloan.mit.edu/sustainability/
\textsuperscript{22} Sustainability@MIT resulted from the merger of related clubs, including Share a Vital Earth, Students for Global Sustainability, Closing the Loop, and S*. In 2014, it was renamed the MIT Sustainability Club.
for the Summit requires they build on the knowledge base at MIT, which, as described above, has a rather narrow take on the problem and potential solutions.

Furthermore, each subsequent Summit is organized by a new team of students. Ideally, some team members from each year are elevated to leadership roles the following year, but are no effective mechanisms put in place for accumulation or direction of topical content. This was perhaps by design, as campus conferences are valuable learning experiences for students and offer opportunities to connect with potential future employers. But with a topic as simultaneously urgent and diffuse as sustainability, it has resulted in a series of stand-alone events that each start from zero and attempt to address a large number of topics (e.g. water, energy, climate change, international development, food, finance, etc.) linked together under a tenuous Summit theme.

In recent years, attempts have been made to tighten the thematic link of the Summit; this is highlighted by the 2014 Summit which focused on cities and climate change. But there are powerful forces pushing towards a “big tent” conference, even in the case of a strong theme like cities. One is the nature of the organizing team. Relying on an all-student, all-volunteer staff has led many directors over the years to be rather accommodating to the interests of the team; disparate interests lead to poorly coordinated content. Second is the institutional landscape on which the Summit operates, namely, MIT. The Summit has become a recognized brand at MIT, and many companies, universities and governments look to it to gauge MIT’s take on sustainability issues. Similarly, some of the sustainability-related programs at MIT mentioned above use the Summit as a showcase for their work and a conduit through which to meet potential future research partners. These trends have over time increased the importance and legitimacy of the Summit, but has also subjected the planning process to sometimes conflicting demands. It is against this background that I began planning the 2015 Sustainability Summit, the process of which is described in the next section.

3 Organizing the 2015 Sustainability Summit

As content architect, my primary responsibility for the 2015 Summit was to develop and execute the overarching message of the conference. I was not expected to implement all content for the two-day, 250-person event myself; I had a team of three directors and 15 organizers who were responsible for individual panels and workshops. My job, therefore, became one of spiritual leader, so to speak, ensuring (or attempting to ensure) all of the elements were meeting the standards of the theme. The process for organizing the Summit followed a spiral path, with each loop involving more and more people (and therefore falling more and more out of my control). Planning started with initial theme selection, which I did essentially alone (but with considerable stakeholder input). Summit structure, including major content tracks, was developed with the leadership team. Each panel and/or workshop was defined and executed by the organizing team. Finally, the content was delivered by invited speakers. This section presents my narrative of this process.
My involvement in MIT’s student sustainability community began during my time as an undergraduate in the MIT materials science department, when I was first exposed to industrial ecology and a materials-based understanding of human-environmental impact. Appropriately, I was inspired by *Cradle to Cradle* as a handbook of systems and design thinking for sustainability with materials at its core. When I later returned to MIT to pursue my PhD, having continued to develop my own thinking on sustainable materials systems, the general discourse around sustainability in the student community was earnest but lacking a coherent theoretical base. In addition, I found the Summit in the state described above, in short, ambitious but aimless.

After demonstrating my domain knowledge and content development skills in the 2012 and 2013 Summits, and making a strong statement in favor of thematic coherence by convincing the 2014 Summit organizing team to focus on cities, I was named Summit content architect and was finally in a position to actualize my vision of an event based on a conceptually coherent and theoretically robust theme: the circular economy. Initial sketches of the event were built on MIT’s disciplinary expertise in materials science and engineering, environmentally benign design and manufacturing, chemical and biological engineering, environmental policy, and sustainable business and innovation studies. The Summit content would follow major materials through their life-cycles—raw material extraction, processing, manufacturing, distribution, use, and disposal—and highlight key technological, business model, and policy innovations that were leading to a more *Cradle to Cradle* materials economy. This vision would enable us to engage with superficially uninteresting but economically essential and environmentally impactful materials like steel and concrete, and look at advancements in biomaterials and nanomaterials through a consistent lens, rather than through a hodgepodge of panel discussions on sustainability topics *du jour*.

At the same time, however, I had been advocating a stronger relationship between the Summit—and the student sustainability community as a whole—and relevant programs at MIT. As president of Sustainability@MIT, I cultivated connections with the MIT Office of Sustainability, the Sustainability Initiative at MIT Sloan, and the Environmental Solutions Initiative (ESI). Each of these programs was steadily gaining momentum, and it seemed, at the very least, to be a shame to miss an opportunity for synergy. More substantially, each of these programs offered the potential for the unifying theme that had been elusive in past Summits: the Office of Sustainability was asking questions about using the campus as a “living laboratory” for organizational transformation; the Sustainability Initiative was conducting a variety of research projects focused on corporate sustainability enabled by organizational and technological innovation; and ESI had just been launched with a major donation to support research into issues of global food and water security. Clearly, satisfying all of these competing interests, while technically feasible, would be counterproductive, as it would end up yielding the sort of big-tent Summit that we were determined to avoid.

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A solution was thankfully forthcoming. After a series of conversations with relevant stakeholders from the aforementioned Institute programs and other student sustainability leaders, including those who had expressed interest in helping to run the 2015 Summit, we decided to focus on agriculture systems and the circular economy. What initially seemed to me to be a compromise of my original vision to accommodate other stakeholders in fact became a much clearer and potentially high impact theme. By focusing on just the biological nutrient cycles, we would be able to incorporate cutting edge research on food and water security occurring at MIT and be able to engage with an explicit conversation about organizational and technological innovation—already a key element to the circular economy framework. Any refocusing would inevitably leave out certain stakeholders; in this case we were unable to find a role for the Office of Sustainability in the Summit theme, although efforts were made later in the planning process to include them as participants.

The theme was further developed once I returned from the 2014 Schmidt-MacArthur summer school. In a vision document that was used to recruit a leadership team, I wrote:

The global agriculture system is facing escalating stresses as the years of the 21st century march on. Not only do the changing dietary demands of a larger and increasingly affluent population tax food production capacity, but a changing climate threatens crop and livestock yields already suffering from more than a century of extractive growing practices. On top of this dilemma, agriculture systems are being looked to as a source of fuel and raw materials in efforts to transition away from a fossil-based economy. Against the backdrop of a seemingly inevitable catastrophe, the Circular Economy offers hope and, critically, real strategies for creating a restorative, productive, and sustainable agriculture system that can satisfy nutrition, energy, and material needs of tomorrow.

At the 2015 MIT Sustainability Summit, we will explore the complex, multi-scale dynamics that govern local and global agricultural systems; learn about the way biological nutrients are currently used in the economy and how improving nutrient cycling offers a path towards improved system performance; and debate how competing demands of diet, energy, and materials yield synergies and tradeoffs in different circumstances. In addition, Summit participants will get hands-on exposure to new technologies, projects, and companies actively ushering in a more circular agricultural system.

This original vision focused on four key elements: systems thinking, stocks and flows of biological nutrients, synergies and tradeoffs among competing demands, and real-world examples. These elements were drawn from MIT’s specific history and strength in environmental thinking, current trends in MIT work, and what I saw as essential elements of the circular economy framework. In addition, these elements combined with an explicit focus on circular economy examples, yielded a number of possible topics that would be used to kick-start the brainstorming session by the content organizing team. Topics included: food waste, food vs. fuel vs. materials, compostable products, food packaging, bio-technology, sewage nutrient recovery, local agro-economies, high-tech agriculture, and non-traditional farm additives.

An organizing team was recruited from relevant degree programs across MIT, including the Sloan school, Civil and Environmental Engineering, Environmental Policy and Planning,
Technology and Policy, Systems Design and Management, and others. The main criteria used
to evaluate candidates were level of interest in sustainability and willingness to put in the
requisite effort, rather than any existing knowledge about the specific topics, including the
circular economy. Few enough students who expressed interest in joining the team had read
Cradle to Cradle that finding even a single student with sufficient pre-existing circular economy
knowledge would have been a surprise. It was therefore up to me to educate the team about key
concepts. This was done via a brief primer that I prepared (which was shared with the broader
Summit planning team, not just my content team), a series of lectures and discussion sessions,
and extra reading suggestions. I was pleased with the degree to which the team accepted the
vision of the conference that I presented, although I did not fully trust the level of
internalization of key circular economy concepts. While much of the language started
appearing more and more frequently in meetings and emails, it often seemed as if “circular
economy” was simply replacing other vague sustainability-related terms.

The process for developing content for the Summit is an iterative one. The initial steps,
summarized above, are overarching theme definition and identification of key concepts to
guide brainstorming. It is untenable for a single person to develop the content fully, and even
if it was possible it would go against the spirit of the Summit, which is based on the idea that
collaboration and group discussion yields wisdom unreachable by the individual. Furthermore,
it is important for the student volunteers who run the event to have legitimate buy-in, so as to
increase the probability that they will prioritize Summit work when MIT responsibilities
inevitably conflict.

Once I had developed the vision document and did my best to educate the team about
the objectives of the content, we entered an iterative brainstorming process. First, the
leadership team (three students in addition to myself) built on the vision I had prepared to
identify a structure for the Summit, including potential content tracks that we felt we had the
collective capacity to manage. The refined statement of purpose follows:

At the 2015 MIT Sustainability Summit, we will focus on understanding the complex problems
facing local and global systems of agriculture and explore a range of innovative solutions to meet the
multifaceted demands of the 21st century. This year’s Summit engages with a systems-thinking approach to
sustainability called the “Circular Economy,” which argues that a flourishing, sustainable world follows
efforts to create an economy that cycles resources from production to consumption and back -- specifically,
from farm to table to farm.

Already, it is clear from the language that the process of integrating circular economy
concepts into a large and dynamic sustainability community diluted the conceptual framing.
Nevertheless, the four thematic tracks that we identified are strongly influenced by the circular
economy framework:

• **Consumption cascades**: Agricultural resources like food, biomaterials, and biofuels do not
  always need to be returned to nature for recycling immediately after just one use. This track
  presents novel business models and waste management technologies that can enable much greater
  value to be extracted from the same biological resources that we consume today.
• **Restoring resilience in production:** Year after year, modern agriculture moves closer to emulating an industrial factory, with (often excessive) inputs of costly fertilizers and pesticides replacing the functions that healthy and resilient agricultural ecosystems can provide. Here we learn how ideas from the current sustainable farming movement translates into the circular economy framework and also how systems thinking creates new opportunities for environmental, social, and economic vitality in farming.

• **The biological-technical interface:** Although the biological products of agricultural systems can and should be returned to the earth for recycling, many materials require industrial solutions to enable their circularity. Here we explore the interactions between these two types of materials (biological and technical), and learn how better design of both products and systems can result in a more sustainable economy.

• **Engineering new cycles:** Biological engineering and gene modification technologies have created a new reality for agriculture, with opportunities to cautiously develop resource cycles transcending the conventional farm context.

Roughly, these four tracks address issues of consumption, production, overlap between the two types of nutrient cycles, and the role of technological innovation. There are inevitably topics that fall into more than one of these tracks; this is the nature of systems thinking. But these tracks were not intended to be the final word on conference organization. Rather, from these four initial categories, we opened the floor to the 10-person content team. Over a number of sessions, they pitched ideas for panels, workshops, and demonstrations that either fit within the tracks or were otherwise inspired by the theme. Throughout this process, the leadership team continually evaluated other clustering options. By the end of the planning process, the content had collapsed into three main tracks: consumption cascades, agricultural resilience, and enabling conditions. This third category, drawn in a large part from Ellen MacArthur Foundation literature, included discussions of the various systems characteristics that must be put into place to enable the circular economy transition, including public policy, business and technological innovations, and finance.  

Recruitment of speakers and presenters was the responsibility of the content organizing team. Each team member had essentially free rein to look up and contact anyone who they felt would advance the objectives of the Summit. The leadership team, myself included, assisted by suggesting avenues for finding speakers, and in some cases specific people. MIT faculty members and speakers affiliated with key partner organizations were given first look. Keynote speakers, on the other hand, were recruited by the leadership team directly. Each keynote was designed to cover a different element of the overall Summit theme. The resulting program is presented in the next section.

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25 This final category unfortunately served as a bit of a “catch-all,” as can be seen in the conference run-down.
4 Summit Content Summary

The 2015 MIT Sustainability Summit spanned two days. Content was delivered in the form of keynote addresses to the entire conference and parallel panel sessions, which included TED-style talks, moderated discussions, and extended Q&A. As described above, content fit roughly into three main categories: consumption cascades, agricultural resilience, and enabling conditions. A run-down of the Summit content, along with keynote speakers and organizations represented on panels, follows. Detailed descriptions of each panel and speaker are attached in an appendix.

Keynotes

- **Opening Remarks and Introduction: MIT’s Food and Agriculture Focus**
  - John Lienhard, Abdul Latif Jameel World Water and Food Security Lab at MIT
- **What is the Circular Economy?**
  - Malaika Thorne, Terracentric Press
- **Circularity and the Restaurant Industry**
  - Fedele Bauccio, Bon Appetit Management Company
- **Is the circular economy inevitable?**
  - Ken Webster, Ellen MacArthur Foundation
- **Feeding 10 Billion: Leveraging Private Sector Capital**
  - Paul Matteucci, US Venture Capital Partners
- **Transition to more Sustainable and Equitable Agriculture and Food Systems**
  - L. Ann Thrupp, UC Berkeley Food Institute
- **Rerframing the Conversation about Waste**
  - Jon Duschinsky, The Conversation Farm
- **Taking Action Post-Summit**
  - Ray Offenheiser, Oxfam America

Consumption Cascades

- **The Role of Retail in the Circular Economy**
  - Whole Foods Market, Pure Strategies, Environmental Defense Fund, Stonyfield
- **Creating Consumption Cascades**
  - Ego Sum Terra, Pure Strategies, Novozymes, Ecovative
- **Closing the Big Loop: Energy and Nutrient Recovery from Waste**
  - The Conversation Farm, Harvest Power, Agreen Energy LLC, Innovation Center for U.S. Dairy, Rich Earth Institute

Production Resilience

- **Scaling Resilience Across Production Systems**
  - University of Vermont, Maine Farmland Trust, Inter-American Development Bank
- **Technology, Agriculture andCircularity**
  - Michigan State University, PrecisionHawk, MIT Sloan Initiative for Sustainable Business and Society, Anheuser-Busch InBev, United Suppliers Inc.
In addition to the formal program, the Summit was coordinated with other student activities, most notably the MIT Waste Research and Innovation Night, which was held the evening of the Saturday of the Summit. This event featured posters of cutting-edge research and start-ups around waste-sector innovations from MIT students, alums, and the surrounding community. Additional related programs occurred during the week leading up to the Summit as part of MIT Earth Days celebrations.

5 Lessons Learned
The Summit yielded numerous insights in planning and executing an effective CE-focused conference as well as in CE-related content.

1. People respond to big visions
The most well-received keynote address at the Summit was Ken Webster’s. This was partially because Ken is such an entertaining and engaging speaker, and he was a change of pace at the end of a long (and cold) first day. But for the same reasons that Cradle to Cradle was so influential when it was first released, and Ellen MacArthur’s message is so popular today, Ken shared a message of complete systems reinvention that is extremely compelling. While most talks throughout the day—even the other keynotes—proposed incremental changes, Ken suggested that we toss out the whole lot and start again with a different, and more appealing, set of ground rules. A big vision, with a combination of novelty and ambition, can energize a crowd, and make them excited to learn more. This is a trick that some politicians—at least the aspirational one—know well. But of course once the vision has been shared, it must be
implemented, which is where many of those politicians fall short, and is where the circular economy movement finds itself today.

2. The biological cycle is underdeveloped

Most real world examples of the circular economy—even those promoted by the Ellen MacArthur Foundation—are part of technical nutrient cycles. Redesigned consumer electronics, new servicization schemes, and municipal recycling efforts all focus on non-biological materials, and as such fit into the “right hand loops” of the butterfly diagram. Compelling, large-scale examples of applying the CE principles to biological nutrients are less available. One excellent example, Ecovative’s mushroom-based packaging materials, which we featured at the Summit, seems to have had limited effect on its market so far. At the same time, the facility with which nature cycles biological nutrients means that there are plenty of real-world biological nutrient cycles that already exist in our current economy without circular economy intervention. Do current composting programs and on-farm biogas production and all the other examples of nutrient recovery and reapplication on farms count? On the other hand, the incredible degree of cross-contamination between biological and technical nutrients throughout the economy and the use of biological materials as if they were technical materials (e.g. paper) suggests a great need for focused innovation on the biological cycle.

3. There is a need for a science of “circular economics.”

Concepts of sustainability emerged in part from a scientific approach to the earth-human system. How have human and societal activities impacted the environment? What are the future prospects of this relationship, and what can we do to ensure future generations can flourish? Unfortunately, the implementation of sustainability principles rarely addresses central incompatibilities between economic growth imperatives and planetary limits, although plenty of research and punditry does acknowledge this conflict. The circular economy offers an internally consistent set of principles to reconfigure our societies and economics to exist in balance with natural systems, but that does not mean that every activity that seems to comply with those principles genuinely advances the ultimate objectives of sustainability. Tremendous amounts of scholarship has evaluated the potential effectiveness of solutions that emerged from the “sustainability” narrative; a similar body of information is at present lacking in the discussion about circular economy. When speakers at the Summit seek to discuss the strengths and weaknesses of various proposals, they must fall back on the research that is available. Being an MIT event, research is held to a high standard of openness, transparency, and replicability. The impressive economic analyses performed by McKinsey and others for the Ellen MacArthur Foundation have not as yet met these criteria, and therefore are given a somewhat skeptical eye by our scientists.

Future research should include a deeper, evidenced-based investigation of the current problems of the “sustainability” mindset. Right now, some circular economy rhetoric places it in opposition to a diverse and expansive set of ideas associated with sustainability. I understand this positioning to be partially political (i.e. to avoid green-washing), but there are also
legitimate concerns. Sustainable business has become about existing firms continuing to do what they have been doing, just slightly less badly. And less bad is very far from where we need to be, which is more good.

Part of the investigation into the distinction between circularity and sustainability must include critical drivers of the linear system that we seek to abandon. If those drivers are not reformed, other efforts to encourage circularity will be futile. My experience at the Sustainability Summit has demonstrated that large, publicly-held corporations can have sophisticated and genuinely effective sustainability programs, but it is the small, innovative companies that are driving circularity. Perhaps this is because circularity challenges the extractive model of capitalism that rewards bigness.

4. Sustainability is an ally

All this being said, my experience introducing circular economy to the crowded—and proud—sustainability community at MIT taught me the importance of approaching sustainability as an ally. At high levels, language and objectives of circularity have considerable differences from those of sustainability. But many of the prescriptions put forward by circular economy advocates—particularly those regarding biological cycles—are identical to those that come from sustainability frameworks. Therefore, it might not matter all that much what things are called, if genuine progress is being made towards a shared end goal.

CE suffers from the same condition as other systems-thinking frameworks: it is an all-or-nothing kind of thing. It makes little sense to call something “more circular” the way we would say (perhaps also incorrectly) “more environmentally friendly.” Until all of the parts of the circle are in place, few real benefits can be realized. Sustainability is the same way. It is an emergent phenomenon of the planet, not observable from the behavior of a single firm or even single country. But this perspective has been lost in practice. There has been a dilution of the meaning of the term to an extent that any activity that is perceived as reducing environmental impact is seen as sustainable. Frighteningly, similar trends are already occurring within the circular economy. Not everything that is designed for recycling actively contributes to a more circular system; not every product-service system does either. There is much that can be learned from earnest sustainability scholars and advocates who understand these parallels and who can help inform a process of maintaining conceptual integrity as more and more people take ownership of the terms. In retrospect, it might not have been the best idea to ask so many people to examine their companies’ activities through the lens of the circular economy without sufficient education, as it runs the risk of accelerating dilution of the terms.

5. Framing is essential

In planning the Summit, it finally made sense to me why Ken hammered home the issue of framing from the very beginning of the fellowship program. For those people who have not spent years thinking critically about human-environment interactions and different frameworks for sustainability (as I have), different approaches to solving the problem do not appear to be that different. Almost nobody involved with this conference seemed to fully appreciate either
the total integration of the circular economy vision (and the importance of a whole-systems perspective) or how pursuing eco-efficiency and other small-scale sustainability changes do not necessary add up to large-scale transformation. I was dismayed by my own team’s seeming lack of awareness about issues that are fundamental to my understanding of the sustainability challenge. I was more sympathetic to the invited speakers’ half-hearted attempts to fit their activities into the CE box, because few of them were adequately educated by the team member who invited them.

In Summit follow-up, I was pleased to find that, perhaps too late, my team did partially absorb some elements of the circular economy vision I was peddling. Ken’s presentation was essential to this, as he helped them tie together concepts I had shared with them over the previous months. Perhaps this was the most impactful outcome from the Summit.

6. The Summit needs follow-through

In the months leading up to the Summit, the leadership team discussed the importance of connecting Summits from year to year. Since it is unlikely that students participate for more than two years (and most for just one), traditional models of institutional knowledge transfer are off the table. One compelling option would be to cultivate multi-year sponsors, so external companies and organizations can help maintain continuity. In any event, increasing the impact of the Summit will necessitate follow-through, especially if we are intentional about spreading new frameworks like the circular economy. There is very little that people can learn from a single two-day event. I am impressed with the range of programs that the Ellen MacArthur Foundation has put together for its network; perhaps we should consider working with MIT programs to facilitate multiple mini-Summits or online seminars throughout the year to increase the impact of the Summit content.

In conclusion, the 2015 MIT Sustainability Summit left participants with a variety of outcomes. Audience members were exposed to a broad set of information about current agriculture activities, efforts to improve environmental and social impact of the food system from multiple points in the supply chain, and new policies, technologies, and business models transforming the industry. Speakers built new contacts and were exposed to the circular economy as a new framework within which to situate their activities. MIT faculty and researchers had the opportunity to suggest real-world implications of their work. But the most important outcome was the learning and networking opportunities afforded the student organizing team, myself included, who will take the experience and new insights into circular economy thinking out into the world as leaders and ambassadors of a reframed conversation about sustainability.