Think Beyond Plastic™

Addressing marine plastics by harnessing innovation and entrepreneurship and the powers of the markets to do good
Plastic Pollution Opportunity

Untapped innovation and investment potential
Plastic pollution: economic impact

Reducing marine plastics through innovation and entrepreneurship

![Graph 1: Total Natural Capital Cost and Intensity of Selected Sectors](image1)

- **$75B**

![Graph 2: Total Natural Capital Cost of Plastic in the Ocean ($) and Percentage Contribution to Total Natural Capital Cost Per Sector](image2)

- **$13B**

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**Figure 1:** Total Natural Capital Cost and Intensity of Selected Sectors

**Figure 2:** Total Natural Capital Cost of Plastic in the Ocean ($) and Percentage Contribution to Total Natural Capital Cost Per Sector

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*Corresponds approximately to over 80 million tonnes of plastic. Trucost calculations derived from, but not limited to, World Bank [7], PlasticEurope [8], Eurostat [9], and the US EPA [10] databases (full set of references available in the main "Valuing Plastics" report to be published end of June 2014 www.trucost.com/publications).*

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Plastic pollution: environmental impact

Plastics have a high global warming impact

Plastics are the greatest danger to public health
Plastic production trends: continued growth

**Consumption = waste**

- Unbroken trend of growth to triple by 2050
- Trends stronger in fast-growing economies – India, China, Brazil and Indonesia
- Consumption correlates to GDP and waste: 23% growth in waste betw. 2008-2015 = 24% raise in packaging sector
- 9B population growth impacts:
  - 2B middle class
  - will drive consumption
  - most in coastal areas
- 9% of world oil resources used for plastic production

Plastic waste: market failure, resulting from growth

Plastics generation and recovery, 1960 - 2010

Bans: narrow focus
- Mostly plastic bags and some EPS food containers
- Bag are less than 10% of total film consumption
- Work only where easy alternatives

Material innovation failures
- Bioplastic: no standard, no collection mechanism, no agreement, adverse impact on recycling
- Composting: small, needs logistics and incentives

Recycling: insufficient and not efficient
- Low collection rates
- Substantial leakage
- Low cost of material, no incentives
- Costly plastic-related stoppages and repairs
- Substantial market volatility

Inherent material design flaws
- Indestructible, yet used for single-use packaging
- Leaches toxic chemicals, yet used for food and beverage packaging
- “recyclable” does not mean recycled
- Low cost, yet a fossil fuel product
Visible, urgent and large market failures
Heightened risk to business

Source: UNEP, Valuing plastics 2013
Most at risk
Projected Disruptions

Innovation opportunities
Projected disruptions – areas of innovation

Recycling
- Waste to value innovations
- Materials handling and processing – bioplastics, compostables etc

Material innovation
- Nanomaterials that improve properties of paper or bagasse pulp;
- Eliminate toxicity and toxic leaching from plastic products;
- Real biodegradability that does not impact negatively recycling;
- Real compostability under normal conditions, not current industrial;
- Increased moisture barrier appropriate for food storage and presentation;
- Alternatives to plastic film;
- Light-weight, shatterproof glass;
- Innovative uses of bagasse;

Manufacturing innovation – scalable production
- Injection molding and extrusion for paper pulp and bagasse
- Scalable, low-cost production of molded fiber;
- Manufacturing alternatives to plastic film; etc

Design innovation
- Reduce or eliminate plastic usage;
- Reduce exposure to food and drink in plastic packaging
- Integrate alternative materials; etc
Innovation Selection Criteria

- Price
- Performance
- Sustainable sourcing and manufacturing
- Scalability

Ex. Food packaging material innovation - all above plus:
  - Moisture Resistant
  - Gas Impermeable
  - Non-toxic
  - Heat Resistant
  - Transparent
  - Sturdy and pliable
Material innovation: Nanocrystalline cellulose

- The world’s most abundant natural polymer
- 10 X the tensile strength of steel
- Films can be produced that are 80–90% transparent
- Extremely high barrier properties, comparable and superior to conventional plastics
- Highly biodegradable, compostable, recyclable, derived from a renewable source
Material innovation: Methane conversion to Poly-hydroxybutyrate (PHB)

Similar to Polypropylene

Diagram showing the process from Waste facility to Methane (biogas) to Microbial process to Biopolymer to Products.
Material innovation: new Pyrolisys

A single 10-ton per day system

With waste plastic as feedstock:
• Processes 20,000 lbs. of plastic
• Produces 2,400 gallons of oil – converted to customers’ product of choice – e.g. blend stock, diesel, gasoline, heating oil
• Produces 3,000 lbs. of compressed gas, used to power the system

With tires as feedstock:
• Processes 800 used tires
• Produces 1,100 gallons of oil – converted to customers’ product of choice – e.g. blend stock, diesel, gasoline, heating oil
• Produces 5,500 lbs. of high quality carbon black
• Produces 2,000 lbs. of steel
• Produces 1,900 lbs. of compressed gas, used to power the system
Emerging opportunities: disposable medical devices

The medical disposable market is expected to grow 6.6% annually to reach $245 billion by 2018

- Aging population in the US and Europe combined with growing basic healthcare services in developing countries
- Heightened focus on infection prevention
- Increasing number of people who need long-term chronic therapy and drug delivery products

Growing incineration costs
Public pressure to shut down incinerators – currently only way of disposing of used plastic
Smaller volume engineering plastics will outpace commodity plastics

Key competitors [Dow, Dupont, Johnson & Johnson, Covidien plc, Becton, Dickinson and Company, 3M Company, Kimberly-Clark Corporation]

Skin Stapler made from sustainable material – TBP Accelerator company
Emerging opportunities: packaging

Global demand will grow at 4% - 5%, and will approach $1 Trillion in value by 2020
- Rigid plastics are the fastest growing segment (5.7%) followed by flexible film, foil, and paper (4.4%).
- Emerging markets will be the fastest growth segments

Developing world caught in dilemma
- Fastest growth - packaging plays an important role in food safety, logistics, and health
- Will exacerbate already severe problems of inadequate waste management, clean water access, and exposure to chemicals

Highly fragmented industry structure with low market share concentration
- More than 135,000 enterprises within the global plastic product and packaging industry
Emerging opportunities: food service disposables, non-toxic

Worldwide foodservice disposable demand expected to rise 5.4% in 2015 to $53.3B

Greatest growth will be in service ware (cups, dinnerware, utensils)

Cups and lids are the most favorable sector

Important role of beverages in restaurants and stores as revenue generators
Expanding carryout food and beverage sales
Increasing percentage of drinking cups utilizing lids
Increasing specialization of lids
Growing pattern of snacking and widening definition of snack foods advantageous for single serving packaging
The Think Beyond Plastic™
Innovation Eco-system

The innovation eco-system

identify

- **Innovation Forum**
  - Formulates & incubates hundreds of ideas

qualify

- University labs and research
- Focused innovation challenges
- Latin America/glass
- Middle East/plastic bottles
- Ocean/microplastics

accelerate

- **Accelerator**
  - Accelerates businesses
  - Focus on plastic pollution
- Investors
- Target Markets
  - Packaging
  - Food and beverage
  - Retail
  - Apparel
  - Construction
  - Agriculture
  - etc

Innovations

**Recycling**: infrastructure, incentives, handling

**Material**: nanomaterials, glass, bioplastic, compostable, non-toxic

**Manufacturing**: extrusion, film, injection-molding, reduced costs

**Design**: alternate materials, reduced toxicity

Competition contestants and winners
100+ ideas each year

Incubate and hatch ideas

Accelerate businesses

Mature businesses

Early stage businesses

Investors
Mentor network (in formation)

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<tr>
<th>Name</th>
<th>Role/Company</th>
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<tbody>
<tr>
<td>Julie Corbett</td>
<td>Ecologic</td>
</tr>
<tr>
<td>Mike Biddle</td>
<td>MBA Polymers</td>
</tr>
<tr>
<td>Shelley Goldberg</td>
<td>Global resources and commodities Strategist</td>
</tr>
<tr>
<td>Josh Fryday</td>
<td>COO NextGen Climate Action</td>
</tr>
<tr>
<td>Candace Chandra</td>
<td>Managing Partner Thula Capital</td>
</tr>
<tr>
<td>Dave Rappaport</td>
<td>Vice President, Earth and Community Care Aveda</td>
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<tr>
<td>Peter Lobin</td>
<td>Managing Director Zero Waste Global, LLC</td>
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<tr>
<td>Eben Bayer</td>
<td>Ecovative</td>
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<tr>
<td>Ramani Narayan, Ph.D.</td>
<td>Distinguished Professor Michigan State University</td>
</tr>
<tr>
<td>Murat Aktihanoglu</td>
<td>Founder, Managing Director Entrepreneurs Roundtable Accelerator</td>
</tr>
<tr>
<td>Lisa Kaas Boyle, esq</td>
<td>Attorney</td>
</tr>
<tr>
<td>Bridget Croke</td>
<td>Closed Loop Fund</td>
</tr>
<tr>
<td>Pam Marcus, P.T.</td>
<td>Sr. Director, Consumer Products</td>
</tr>
<tr>
<td>Zack Porter</td>
<td>Partner Proteus Environmental Technologies</td>
</tr>
<tr>
<td>Leslie Minz Tamminen</td>
<td>Consultant Seventh Generation Advisors</td>
</tr>
<tr>
<td>Charles Baxter</td>
<td>(ret) Lecturer, Marine biology Stanford University</td>
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Thought Leadership

Goal: transformative public policies with focus on marine plastics that encourage innovation, create long-term economic incentives for adopting innovation, and support entrepreneurship.
Ms. Daniella Russo  
Think Beyond Plastic  
1014 Pine Street  
Menlo Park, CA 94025

Dear Daniella Russo,

Marine plastic is a great concern to ocean health. To a great extent, it is the direct result of challenges in technological challenges in relation to waste collection, manufacturing materials, and product design.

I was thrilled with the event that Think Beyond Plastic held on Capitol Hill last month. The information offered was exceptional and I believe attendees came away with a new appreciation for the need – and the very real capability – to make positive changes in our ocean environment. For this, I thank Beyond Plastic’s focus on innovation and entrepreneurship as the engine for transformative changes, with focus on reducing marine debris and plastic pollution.

What the public doesn’t know and what Think Beyond Plastic can help inform is the nexus between improving ocean health and economic opportunity. Those are not exclusive enterprises and in fact complement each other tremendously. I can see many chances for businesses to grow this blue economy while simultaneously improving ocean health. The strategies for entrepreneurs to consider should be transformative – they should empower new businesses and stimulate job creation by opening up new markets and new opportunities.

Innovation and entrepreneurship create job opportunities and represent potential for real, measurable progress for improving ocean health. I am pleased to have worked with Think Beyond Plastic on the March event where these principles were what the attendees took away with them. I look forward to other chances to partner with you on this very important subject. Thank you for your commitment to the health of our oceans!
Ms. Daniella Russo
Founder and Chief Executive Officer
Think Beyond Plastic
1014 Pine Street
Menlo Park, CA 94025

Dear Ms. Russo,

Marine debris was named as an emerging issue by the United Nations Environmental Programme in 2014. Marine plastic has major environmental and public health impacts. It is also an economic issue – the ocean economy created over 2.7 million jobs and $258 billion in GDP in 2010, and marine plastic threatens that economy.

To a great extent, this problem is the direct result of deficiencies in waste collection, manufacturing materials, and product design. This complex problem will require a multifaceted solution that includes innovation in products and packaging, as well as updating our waste management practices and infrastructure.

That is why I am excited about Think Beyond Plastic’s focus on innovation and entrepreneurship as the engine for transformative changes, with a focus on reducing marine debris and plastic pollution. Innovation and entrepreneurship create job opportunities. They represent potential for real, measurable progress for improving ocean health.

I was honored to take part in Think Beyond Plastic’s Innovation Showcase on Capitol Hill, which featured recycling, material, manufacturing, and design innovations that can positively impact our oceans by measurably reducing the impact of plastic, all in a business-friendly manner.
Innovation showcase on US Capitol Hill, March 16 2015

32 innovators from the US, Kyrgyzstan, Morocco, Turkey, Hong-Kong, Denmark and Canada
Innovations for the ocean
Strategic Partners (partial list)

**Schmidt Marine Technology Partners**  
**Eastman Business Park**  
- Startups R&D  
- Startup manufacturing

**Innovation Accelerator**  
Accelerator services to materials, manufacturing, biotech and technology companies.

**Entrepreneur Roundtable Accelerator**  
Basic Accelerator services to early stage companies.

**New Ventures Mexico**  
Accelerator services to early stage companies with social mission.

**Impact Hub Mexico**  
Social entrepreneurs from Mexico

**StartX - Stanford University Accelerator**

**X-Prize Ocean Health Project**
Investor contact

New York office
Shelley Goldberg, Chief Investments Officer
sgoldberg@thinkbeyondplastic.com
(917) 885-8799

Silicon Valley office
Daniella Russo, Chief Executive Officer
drusso@thinkbeyondplastic.com
(415) 608-6423

Greg T. Baxter, Ph.D. Chief Technology Officer
gbaxter@thinkbeyondplastic.com
(650) 350-0220