



Middlebury Institute of International Studies at Monterey

Graduate School of International Policy & Management

COURSE SYLLABUS – Spring 2016

IEPG 8521: Marine Plastic: Market-based Solutions

2 credits

**March 30 – May 20, 2016
Monday and Thursday, 6:00 – 7:50 pm**

Room: Morse B106

Prof. Daniella Russo, CEO Think Beyond Plastic
drusso@thinkbeyondplastic.com
(415) 608-6423
Office Hours (by appointment)

COURSE DESCRIPTION

In the last 20 years alone, the world has consumed more plastic than the entire 20th century. With exponential growth from 1.5M T in 1957 to 256M T in 2010, global plastic production has exploded, especially in the sectors for packaging, construction and agriculture. Most of the growth is in disposable consumer packaging, intended specifically to be discarded. In most countries, but especially in the developing countries, waste management infrastructure is incapable to handle this exponential growth, resulting in visible accumulations of plastic trash, economic damages and public health impact. Plastic trash builds up and damages ecosystems, drainage systems, pastures and fields, and entire communities.

Plastic pollution is a massive, urgent, and complex phenomenon. Its impacts on the ocean (marine plastics) are only partially understood; but the accelerated rate of consumption, combined with the projected growth of coastal population by year 2050 and the growing body of evidence of impact of toxicity on human health and marine ecosystems present an urgent challenge that must be addressed without delay.

Plastic pollution is changing the planet in a way that jeopardizes human security and well-being. The plastic pollution trend we are contributing to differs alarmingly from any other pollution trends. It is largely driven by the unintended uses of a material that is very useful yet long-lasting, toxic and deceptively cheap. The effects and costs of plastic pollution are now being felt across the globe – in our oceans, our rivers, our air, the food chain, and even our bodies (1).

The combination of explosive industry growth and inadequate action have raised marine plastic pollution into a crisis in global governance, a market failure, a technological challenge, and a social justice issue. Plastic pollution is emerging as a “global threat” comparable to global climate change or water security.

Plastic pollution can no longer be treated as a future problem that can be mitigated by end-of-life actions, such as recycling and incineration. Plastic pollution must be tackled with aggressive actions to reduce consumption of

¹ Halden, R.U. 2010. Plastics and Health Risks. Annual Review of Public Health Vol. 31: 179-194. DOI: 10.1146/annurev.publhealth.012809.103714

*Syllabi are subject to change by the instructor with advance notice to students

conventional plastic, to introduce new, sustainable materials that offer comparable price and performance alternatives coupled with systems-based approaches to building resilience to plastic pollution impacts today.

A challenge of this magnitude can only be addressed with a major disruption, by transforming the problem into an opportunity, by focusing on a long-term solution that involves the creation of new materials, new manufacturing and recycling infrastructures, new product design and the generation of thousands of new jobs with skilled labor; jobs for the blue economy, which has broad relevance as the Oceans, including humankind's common heritage of the High Seas, represent in many respects the final frontier for humanity and its quest for sustainable development (2.)

This class will examine innovative models for addressing marine plastics by engaging innovation, entrepreneurship, impact investment, transformative public policy and civil society. Marine plastic pollution is viewed as an innovation opportunity with untapped investment potential.

The course is in two parts. Part I explores the socio-economic and business foundation of plastic pollution and specifically marine plastics and the strategies endorsed and embraced by business, civil society and policy-makers. We will examine cases studies of NGOs strategies, businesses approaches and strategies, and current policies – their success and lack thereof. Part 2 explores emerging solutions, such as market-based approaches, innovation and entrepreneurship, and regional pilots currently in place. We will examine the unique aspects of developing and growing the innovation eco-system comprised of sourcing innovation, accelerating entrepreneurship and impact investment. We will examine the connections between the innovation eco-system and the work of civil society, businesses, policy-makers in regional and local context.

You will develop a holistic lens for assessing marine plastic as an innovation opportunity. You will develop case studies, examine best practices and learn how to evaluate innovation and market-based solutions for their transformative potential. You will participate in development of an innovation eco-system analysis; a pollution “hot-spot” analysis” and a plastic waste potential analysis. You will work in teams to research, write and develop case studies of deployment of market-based solutions to current hot spots of marine plastic pollution in communities around the globe. You will have the opportunity to contribute directly to active projects currently developed with leading environmental organizations such as UNEP.

COURSE OBJECTIVES

Upon completion of this course, you will be able to:

- Develop a lens for assessing “hot-spots” of marine plastic pollution by product, geography, demographic and behavior patterns, in the context of a community or a region;
- Learn to identify and assess the synergistic effect of the elements of marine plastic “hot-spots”
- Develop the skills necessary to build out the innovation eco-system framework: engaging civil society, policy-makers, business, impact investment;
- Understand the elements and interconnectedness of the innovation ecosystem for marine plastics; Apply the innovation eco-system framework to address marine plastic pollution and measure impact;
- Understand the concept of innovation eco-system and best practices in deployment in the context of marine plastics;
- Develop metrics for impact investment in the context of impact investment with focus on marine plastics;
- Participate in the development of current pilot installations in island communities;
- Work in a team to conduct original research;
- Design and undertake a case study for deploying the social enterprise in a regional or local context;

² A developing world initiative pioneered by SIDS but relevant to all coastal states and countries with an interest in waters beyond national jurisdiction. <https://sustainabledevelopment.un.org/content/documents/2978BEconcept.pdf>

Required texts: None

Recommended texts (on reserve in MIIS library)

Jambeck, J. R., R. Geyer, C. Wilcox, T. R. Siegler, M. Perryman, A. Andrady, R. Narayan, and K. L. Law. "Plastic Waste Inputs from Land into the Ocean." *Science* (2015): 347, 768-71

Rochman, Chelsea M. et al. 'Ingested Plastic Transfers Hazardous Chemicals To Fish And Induces Hepatic Stress'. *Scientific Reports* 3 (2013): 3263.

Hall, N. M., et al. 2015. 'Microplastic Ingestion By Scleractinian Corals'. *Mar Biol* 162 (3): 725-732.
doi:10.1007/s00227-015-2619-7

Hämer, Julia, et al. 2014. 'Fate Of Microplastics In The Marine Isopod *Idotea emarginata*'. *Environmental Science and Technology* 48 (22) 13451-13458

Woodall, L. C., et al. 2014. 'The Deep Sea Is A Major Sink For Microplastic Debris'. *Royal Society Open Science* 1 (4): 140317-140317. doi:10.1098/rsos.140317.

Besseling E, Foekema EM, Van Franeker JA, Leopold MF, Kühn S, Bravo Rebolledo EL, Heße E, Mielke L, IJzer J, Kamminga P, Koelmans AA. Microplastic in a macro filter feeder: Humpback whale *Megaptera novaeangliae*. *Mar Pollut Bull.* 2015 Apr 24. pii: S0025 326X(15)00195-2

Browne, Mark A., Awantha Dissanayake, Tamara S. Galloway, David M. Lowe, and Richard C. Thompson. "Ingested Microscopic Plastic Translocates to the Circulatory System of the Mussel, *Mytilus Edulis* (L.)." *Environ. Sci. Technol.* 42 (2008): 5026-031.

World Economic Forum, Ellen MacArthur Foundation and McKinsey & Company, *The New Plastics Economy – Rethinking the future of plastics* (2016, <http://www.ellenmacarthurfoundation.org/publications>).

Recommended Websites:

Plastic Production and Consumption

Plastics Europe research and statistics of plastic consumption since 1950

<http://www.plasticseurope.org/Document/plastics-the-facts-2013.aspx?FolID=2>

US EPA Statistics of consumption and recovery of plastics

http://www.epa.gov/solidwaste/nonhaz/municipal/pubs/2012_msw_dat_tbls.pdf

UN Environmental Program Plastic in the Ocean Summary

http://www.unep.org/yearbook/2011/pdfs/plastic_debris_in_the_ocean.pdf

UN Environmental Program Microplastics

http://www.unep.org/yearbook/2013/pdf/Microplastic_english.pdf.

Regional issues with plastic pollution (case study in the course)

Mesoamerican Reef tourism, fishing and environmental well-being

<http://www.healthyreefs.org/cms/wp-content/uploads/2012/12/2012-Report-Card.pdf>

Corals and impacts of tourism

http://www.nytimes.com/2007/06/26/travel/26iht-trreefs.6341022.html?pagewanted=all&_r=0

Summit Foundation and project at the Mesoamerican Reef

<http://www.summitfdn.org/>

Public health issues

Health Impacts of Chemicals Associated with Plastic

https://www.niehs.nih.gov/health/materials/endocrine_disruptors_508.pdf

Breast Cancer Fund

<http://www.breastcancerfund.org>

Innovation and entrepreneurship

Innovation Commercialization due-dilligence for innovation asesment

http://media.wix.com/ugd/a0a447_6d03ba8c121c4700bb8e7fe90b7ff481.pdf

New Ventures, Mexico – innovators and entrepreneurs, and impact investment fund for Latin America

<http://nvgroup.org/>

Innovation Accelerator – furthering innovation and entrepreneurship

<http://www.innovationaccelerator.org/>

Entrepreneur Roundtable Accelerator, NYC

<http://www.eranyc.com>

Think Beyond Plastic

<http://www.thinkbeyondplastic.com>

MIIS Center for the Blue Economy

<http://www.miis.edu/academics/researchcenters/blue-economy>

Monitor Institute

<http://www.monitorinstitute.com/impactinvesting/>

Impact investing

Acumen Fund <http://www.acumenfund.org>

TONIIC <http://www.toniic.org>

Global Impact Investing Network <http://www.thegiin.org/cgi-bin/iowa/home/index.html>

METHODOLOGY AND POLICIES

The methodology consists of lectures by instructor, guest speakers, student-designed class presentations and exercises, student group discussion, and student oral presentations. It is expected that each student will have read the assigned material and or case and be prepared to engage with a discussion in class. Since a large part of the class will be geared toward the discussion of class material and cases, everyone is expected to have read the assigned materials and be ready to discuss them in class. Discussions and individual contributions are encouraged, expected, and count toward your final evaluation.

Attendance is valued highly, as the material that will be covered in class represents current and emerging evolving projects and pilot solutions about which no other source of information is currently available.

To effectively participate in a case assignment or classroom discussion, you should be able to accomplish one or more of the following: demonstrate your understanding of class materials or a case by showing how to analyze and evaluate case studies; present creative solutions or alternatives during class discussion; present additional material not contained in the case or class material; and contribute with unique case studies.

ACADEMIC CONDUCT

All students will be held to all policies and procedures listed in the most current Policies and Standards Manual (PSM). This includes but is not limited to our Student Honor Code and regulations on plagiarism. A complete copy of the Policies and Standards Manual (PSM) can be found here:

http://www.miis.edu/media/view/34514/original/miis_psm_10-9-13.pdf

REQUIREMENTS AND GRADING

- Your grade will be based on the following performance criteria:

Attendance	20%
Final Design project	15%
Written Assignments	20%
Case Presentation/Review	20%
Class Participation	<u>25%</u>
TOTAL	100%

For information on standard MIIS Grading Policies, please refer to the [Policy and Standards Manual](#).

POLICY FOR STUDENT DISABILITY ACCOMMODATIONS

Students with documented disabilities who believe that they may need accommodations in class are encouraged to contact Assistant Dean of Student Services, Ashley Arrocha, as early in the semester as possible to ensure that such accommodations are implemented in a timely manner. Assistance is available to eligible students through the Office of Student Services. Please contact aarrocha@miis.edu or 831-647-4654 for more information. All discussions will remain confidential.

SCHEDULE AND WEEKLY ASSIGNMENTS

Readings are subject to change with one week's notice. Unless otherwise specified, readings that are not on-line or moodle are available on MIIS e-reserve.

Course outline

March 31	The history of plastic: chemistry, history, economics Plastic production: global petroleum resources, design flaws of plastic products
April 5	Impacts of global plastic production: eco-systems, health, other Complexity of the global plastic production problem
April 7	Plastic pollution as a global threat The ocean as a "hot-spot" of plastic pollution: marine plastics
April 12	Marine Plastic: sources, accumulations, behaviors Synergistic effect of impacts of marine plastic: economic, health, environmental

- April 14 Marine plastic and coral eco-systems
Case study: Mesoamerican Reef: tourism, local economy and public policies
- April 19 Marine plastic and coastal eco-systems
Case study: Hawaii / Honduras / California
- April 21 Marine plastic and human food chain
Case study: penetration of the human food chain
- April 26 Current solutions to marine plastics and market failures
End of life management; Waste 2 Value; Policy; Material Innovation;
Case studies: International Policies: ERP, UNEP GEF, other.
- April 28 Market-based approaches to marine plastics. Market failures and challenges; viable solutions. The circular economy
Case studies, Business: ACC, Coca Cola, Nestle Waters, Covanta Energy - what is their agenda?
- May 3 Building the innovation eco-system: innovation, entrepreneurship, impact investment, civil society
Cultivating, growing and focusing innovation within the innovation eco-system [guest speaker]
- May 5 Pilot projects: reducing marine plastics on islands
Case study: Market-based approaches to reducing marine plastic pollution along the MAR
- May 10 Accelerating businesses within the innovation ecosystem [guest speaker, accelerator CEO]
Cultivating impact investment for the innovation ecosystem: family offices, DBL-TBL
- May 12 Engaging civil society: value of strategic partnerships and alignments
Transformative public policies: support and accelerate innovation and solutions [guest speaker]
- May 17 Emerging solutions: innovation and entrepreneurship, meet the CEOs [guest speaker]
Sourcing innovation, accelerating businesses, focus on the “hot spots”
- May 19 Case study: Reducing plastic pollution in the Caribbean by engaging the social enterprise
Case study: Reducing plastic pollution in Haiti by engaging the social enterprise [Thread, LLC]