*original scientific article*

# A plastics index for the food services industry

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## Abstract

*Sustainability* is an increasingly powerful slogan for environmental consciousness in business and commerce. For all its benefits in enabling our current living standards, the use of plastic has proven to cause significant health and environmental damage. For the tourism industry, food services are of obvious aesthetic importance and are largely marred by the use of plastic items. This article explores the growing interface between all these factors as an increasing segment of tourists bring their health and environmental awareness with them to the dinner table. A co-creative approach to addressing the mounting plastic refuse problem is proposed, with potential benefits to participants. The proposal here is simple: (1) note the plastic items at a place setting, and (2) seek a sustainable alternative.

Key words: food services, health, plastic, pollution, sustainability

*"We are the children of the Age of Plastic."*

—Werner Boote, *Plastic Planet*

# 1 Introduction: plastics, civilisation and food services

At a recent academic conference, attendees were treated to food served on plastic plates, to be consumed by using plastic forks, and drinks served in plastic cups. Being among the crowd, I can confirm that the taste and quality of the food was excellent, but the experience felt awkward. After a couple of days, at an exquisite five-star meal with only one piece of plastic on the table, the reasons for the odd feeling were discussed and the idea of a "plastics index" was born. This article details the reasons for the uncomfortable feeling, and proposes an antidote that could, just possibly, do more than simply ease the conscience.

## 1.1 What is plastic?

Our current civilisation and lifestyles are unthinkable without plastic. In fact, depending on one's definition of the term *plastic,* its use in human civilisation can be traced back as far as ancient Mesoamerica, when natural rubber was processed to make "balls, figurines and bands" in approximately 1600 BC (Andrady & Neal, 2009). Modern thermoplastics arose in the early 19th century, with the development of vulcanised rubber (used for rubber tyres), polystyrene (billiard balls), polyvinyl chloride (PVC, plastic tubing), and viscose (rayon, for clothing) (Andrady & Neal, 2009).

The really explosive development of plastics is, however, a legacy of the 20th century, with "at least 15 new classes of polymer" being developed in the first half of the century (Andrady & Neal, 2009). Currently, there are "some 20 different groups of plastics, each with numerous grades and varieties" (Thompson et al., 2009, citing the Association of Plastics Manufacturers, 2006). And the development of new applications in fields as diverse as medicine, aerospace, construction and packaging is increasing.

Driven by the versatility and cost-effectiveness of plastics, PlasticsEurope estimates global plastics production at 245 million tonnes per year, with a growth rate estimated to be between 5 per cent and 9 per cent per year (2008, as cited in Andrady & Neal, 2009, and Thompson, Swan, Moore & Saal, 2009). Plastics production accounts for approximately 8 per cent of global oil production, and over one-third of that production is used "for disposable items of packaging, most of which are discarded within a year or so of manufacture" (Thompson et al., 2009), with food and beverage packaging accounting for about one-third of this amount. This means that the food and beverage industry accounts for close to 1 per cent of oil production worldwide, and there are no significant signs of a reversal in this trend of expanding usage.

To the contrary; current development and use could be considered "exponential", both in kind of plastics under development and in the increasing diversity of uses where these are deployed (Thompson et al., 2009). Many new plastics technologies are expected to be beneficial, as part of medical advances, reduction of fuel consumption in the transport of goods, in playing a role in renewable energy initiatives, and smart plastics used in packaging may be able to monitor food quality and spoilage (Thompson et al., 2009). Projection of current trends would indicate that we will have more, not less plastic in our future.

Being such a useful, inexpensive and malleable material, plastic is used for just about everything. It is so cheap that we make and use huge quantities of disposables, replacing quality in favor of convenience in an all too routine and unthinking manner.

## 1.2 Is anything wrong?

At first glance, there seems to be no doubt that plastics have been used to increase consumer health and safety, and have enabled the invention and mass distribution of products that have brought a quality of life to many that was undreamed of in earlier centuries. Yet the irony is that the wide use of these new materials has led to new health problems, problems that have never been seen before. The existence of these new maladies

is only slowly coming to light, and policy makers in government are very slow to react to regulate materials that have proven so beneficial to the economy. The invention and development of plastics for use in manufacturing and retail has preceded our knowledge of the effects of these compounds on human health and the environment. Many, if not most, of these new products were brought to market prior to sufficient testing to assess their effects on human health, animal health and the environment.

Viewed more broadly, it can be said that plastics are harmful to human health and the environment throughout the processes of extraction, manufacturing and usage, as well as the disposal life cycle. When thinking about oil extraction, we cannot be unaware of ecological and human disasters such as those in the Niger River Delta and the Gulf of Mexico. Refining oil and processing it into end products such as the ubiquitous rubber ducky or baby bottle involves the emission of chemicals no one wants to have in their "back yard". An increasing number of medical studies raise concerns about using plastics in the ways we currently consider ordinary or "normal". And it is increasingly difficult to find a beach where copious amounts of plastic refuse are not washed ashore on a daily basis.

This article is not a neo-Luddite effort to stop technological development, but rather a call to a specific effort to encourage intelligent decision-making about the use of plastics in the food services industry. In the broad sweep of activity in the food stream, the food services industry provides the penultimate step, at the consumer end of the production-to-consumption chain. With an increasing number of empirical studies raising significant concern, of which the general public is slowly becoming more aware, and with the effects of mass plastic use becoming visible, outstripping nascent attempts to develop bio-neutral plastics, this article suggests that it is time for the food services industry to do its part in addressing the situation, and offers a simple first step in this direction. By showing their commitment to health, environment and food quality, food services companies can benefit from an enhanced reputation while enhancing their customers' dining experience.

## 2 Spheres of concern and response

The use of plastics in food services is of concern in at least three areas: aesthetics, environment and health; and as consumers become increasingly conscious of the latter two, aesthetic sensibilities at the dinner table are further impacted.

### 2.1 Aesthetics

As noted above, the presence of plastics on the table cheapens the dining experience, and can extend into colouring the destination experience. Not only are aesthetics a factor in the way plastics impact the dining experience visually, but also consumers are increasingly aware of environmental and health impacts related to plastics. Beyond the purely symbolic elements of the dining experience, the growing awareness of the negative health effects of plastics introduces an incipient fear factor that may even lead to doubts about the food services provider's overall understanding of health issues. And the nearly unavoidable awareness of environmental factors introduces an ethical question into the customer's mind, which could impart a negative hue to an otherwise positive aesthetic presentation.

### 2.2 Health

> *They hold your water, line your canned goods, and even help save sick babies. But are the potential risks of certain plastics so great they outweigh the benefits?*
>
> —Larry Hand, 2010

The health effects of chemicals associated with plastics begin with their entry into our bodies, food being one major route. The pervasive nature of our exposure from sources in our environment becomes palpable when we consider the list of typical consumer products ubiquitous in most households, not just in industrialised countries, that emit varying levels of endocrine-disrupting compounds (EDCs) at various points along their life cycle. Just look around your home and your workplace – count the number of plastic items that sur-

round you: kitchen utensils, shower curtains, children's toys, clothing, shoes, cosmetics, electronic appliances, furniture and that "new car smell" (Mosko, 2006b).

It is often said that the use of lead in water pipes and cooking vessels contributed to the decline and fall of ancient Rome; could plastic play a similar role in the 21st century? To alter the basic characteristics of plastic to make useful products, chemicals are added to make plastic harder, softer, more or less elastic, more durable and so on. Many of these chemicals, unfortunately, are harmful to human health (Cho et al., 2010; Hand, 2010; Koch & Calafat, 2009; Mosko, 2005, 2006a, 2006b; Matsushima et al., 2010; Meeker, Sathyanarayana & Swan, 2009; Saal & Hughes, 2005; Talsness et al., 2009)

Of chief concern are two classes of plastics chemicals: phthalates; and bisphenol A (BPA). Phthalate chemicals, as described by Koch and Calafat (2009), come in a wide variety, and are used as general-purpose plasticisers, with worldwide production at over one million tonnes per year. The ubiquitous polyvinyl chloride (PVC) can have up to 40 per cent phthalate content. The most frequently used phthalate in PVC, di-2-ethylhexyl phthalate (DEHP), is used in a multitude of consumer products, ranging from floor coverings to medical devices and materials, to "food contact applications" (Meeker et al., 2009). Two other frequently used phthalates, diethyl phthalate (DEP) and dibutyl phthalate (DBP), are used as solvents in cosmetics, lacquers, varnishes and even for time-release coatings on pharmaceuticals. Given their widespread use, these chemicals can enter the human body directly through "ingestion, inhalation and dermal contact", with infants being particularly vulnerable (Meeker, 2009).

BPA is a single chemical compound with wide usage in polycarbonate plastic, epoxy resins, polyethylene terephthalate (PET) and PVCs, with production also at over one million tonnes per year (Koch, 2009). In the food industry, the most evident and pervasive usages are for the coatings inside metal food cans, water bottles and baby bottles (Koch & Calafat, 2009; Talsness et al., 2009). These are perhaps the most direct entry points for EDCs into our bodies – as they leach into the foods and beverages we eat and drink, and continuing to leach when these products are thrown into landfills and find their way into the oceans.

### 2.2.1 Health effects

The health effects manifest themselves first in the vulnerable area of our sex lives. BPA, in particular, disturbs human hormonal balance by mimicking estrogen (Heap, 2009; Meeker, Sathyanarayana & Swan, 2009), and "the male reproductive tract seems to be particularly sensitive to phthalate exposure" (Talsness et al., 2009). Matsushima et al. (2001) cite research using animal tests (with mice) showing that BPA can affect reproductive organs, fertility and the central nervous system, even at low levels. Teuten et al. (2009) note that the chemical additives used to increase the functionality of plastics may be carcinogenic and may disrupt proper endocrine function. And research by prominent professor Fredrick S. vom Saal shows that BPA is also considered an "obesogen", a substance that makes us fat (Wartman, 2012).

And then plastics start to affect our children. Various EDCs from plastic can, according to Guillette (1995, as cited in Talsness et al., 2009), cause permanent changes in developing organisms. An Italian study of newborns (n = 84) showed a correlation between phthalate levels in umbilical cord blood and shortened gestation periods (Latini et al., 2003, as cited in Meeker et al., 2009).

Perhaps the most alarming evidence of the effects of plastics chemicals on human health comes from a study of 667 elementary schoolchildren in Korea, where Soo-Churl Cho and colleagues (2010) found "an inverse relationship between phthalate metabolites and IQ scores", meaning that as the levels of chemicals derived from plastics in children's bloodstream rose, their IQ scores decreased! Few issues are more frightening than hindering the mental development of the next generation.

## 2.3 Environmental effects: still snaring, starving and leaching after all these years

The continuing accumulation of plastics in landfills and oceans around the globe means that we currently

see only the very beginning of problems that will increase in magnitude in coming decades. The profuse amounts of plastic waste already at hand mean that "even if (the accumulation were) stopped immediately", the problems would "persist for centuries" (Barnes et al., 2009).

Though most plastic waste is deposited in landfills, less research is "available on the amounts, rates, fate or impacts" of plastics in landfills than in marine environments (Barnes et al., 2009). Allowing for variation between countries, on a global level plastics account for "approximately 10 per cent of solid waste", but "[u]p to 80 per cent … of the waste that accumulates on land, shorelines, the ocean surface or seabed is plastic" (Barnes et al., 2009). Another analyst estimates that only 20 per cent of trash in the ocean is attributable to cargo spills and deliberate dumping into the sea, with the remaining 80 per cent being washed into rivers that drain into our oceans, or blown there by winds, and that nearly 90 per cent of that trash is plastic (Mosko, 2005a). Barnes et al. (2009) lists three categories of plastic as being most prevalent: bags, fishing equipment and F&B (food and beverage) packaging.

Scientific monitoring (Ryan et al., 2009; Gregory, 2009) confirms and quantifies what nearly every visit to the ocean now makes plain: that plastic refuse invades even the most pristine environments. Monitoring also reveals affected areas that remain hidden to us, such as suspension at various depths in midocean and litter on even the deepest ocean floors. Plastics become encrusted, in a process called "fouling", with "bacteria, algae, animals and accumulated sediment", which weighs them down so that they slowly sink to the "seabed of all seas and oceans across the planet", far away from ultraviolet radiation that would "speed" their disintegration (Barnes et al., 2009).

The first victims of plastic debris in the oceans are marine animals, through entanglement or snaring, and ingestion. Lost and discarded fishing nets continue to ensnare fish, and items such as plastic holders for beverage can "six-packs" sometimes dangerously surround the necks of growing animals, as famously portrayed in the Disney film *Happy Feet*.

Plastic bags can look like jellyfish to turtles, and in the end, "[p]ractically any debris can be mistaken for food" by some animal (Mosko, 2005a). A relatively large amount of scientific literature documents the problems associated with the ingestion of plastics by animals on sea and land. As described by Gregory (2009), the problems include:

> *wounds (internal and external), suppurating skin lesions and ulcerating sores; blockage of digestive tract followed by satiation, starvation and general debilitation often leading to death; reduction in quality of life and reproductive capacity; drowning and limited predator avoidance; impairment of feeding capacity; and the possibility that plastic resin pellets may absorb and concentrate potentially damaging toxic compounds from sea water.*

A further problem is that plastics in seawater absorb chemicals from other sources, adding to their toxic effect when ingested by fish and other sea animals (Barnes et al., 2009). Research in the North Atlantic found that the stomachs of 35 per cent of all fish contained plastic; and Swiss research has shown that ingested plastic produces toxic effects in sea animals (Schmid, 2012).

### 2.3.1 Breaking up is hard to do

Petroleum-based plastics do not bio-degrade; they only leach chemicals into the earth and water, and break up into smaller and smaller pieces until they become "microplastics", with a longevity estimated at "hundreds to thousands of years", depending on the environment where they lodge (Barnes et al., 2009). Further, this research has shown that in significant areas of the ocean surface, plastic particles can outnumber plankton. Fish consume the particles along with plankton, and then of course plastic ends up where we started: at our dinner table.

### 2.3.2 Leaching

According to Talsness et al. (2009), leaching of phthalates happens easily because this class of chemicals does not bond to the plastic matrix. While this is a significant problem for oceans and waterways in general, Oehlmann and colleagues (2009, 2048) found that

"[c]oncentrations of BPA in sediments are generally several orders of magnitude higher than those in the water".

Though the research-based evidence is not yet at hand, it may well be that we are already eating the plastic we threw away. That bio-accumulation rates are higher in invertebrates than vertebrates (Oehlmann et al., 2009) is of little solace, as humans are at the top of the food chain and accumulation rates of these chemicals are increasing.

These thoughts invade our dinner tables at the sight of each piece of plastic. With each plastic item, customers are placed in a position of being participants in environmental damage, and possibly in damage to their own health. And if there is plastic on the table, what about in the kitchen and therefore in the food? The pervasive use of plastics in food services means that there is little choice. We feel bad about participating in plastic usage, and the more aware consumers feel slightly fearful, yet we need to eat. Can food services establishments offer an alternative?

## 2.4 Alternatives: recycling and bio-plastics

Response to environmental concerns has included major public sector initiatives in recycling and nascent private sector product development in bio-plastics. According to Ryan et al. (2009), many of the products in the category "biodegradable plastics" actually contain standard plastics that remain present in microscopic form when the object degrades. This raises several issues, including those of definitions and labelling, which are not yet agreed in the public arena.

## 2.5 Conscience: public policy and consumer participation in systemic change

What we see bothers us enough, and slowly emerging in our consciousness through documentaries and news reports is the realisation that the problems are deeper and more pervasive than we allow ourselves to think (Heal the Bay, 2010). Aesthetic problems associated with plastic are evident in virtually every visit to a beach (Gregory, 2009).

Over time, cumulative toxicity can lead to significant, even frightening results that are increasingly evident to the public and therefore present at various levels of awareness among consumers. Documentary films, such as *The Disappearing Male* (2008), and an increasing number of news articles and health and environmental blogs are spreading awareness to the general public, so that changes in consumer behaviour are to be expected.

And expert groups are beginning to play a public policy role in this topic. Hand (2010) cites the Endocrine Society, a global medical association "representing 14,000 members from more than 100 countries", which recently called for government "regulation of exposure to endocrine disruptors".

Since the use of plastics is integrated into all areas of 21st-century civilisation, change will be needed in a multitude of areas to maximise benefits and minimise the health and environmental problems of plastics.

Governments have started to respond to the emerging medical data, with varying speed and consistency. In response to health concerns, Canada banned the use of BPA in baby bottles in 2008; in 2009, polycarbonate water cooler bottles were banned from city buildings in Copenhagen; also in 2009, BPA-containing baby products were banned by Suffolk County, New York; and the US Food and Drug Administration has made statements on both sides of the fence (Hand, 2010).

In examining policy options for the UK government, Shaxson (2009) discusses the cross currents of various departments and levels of government with responsibilities relevant to plastics issues. Shaxson argues for a multi-party approach that includes "academia, industry, [and] other stakeholders" (2009), focusing well and appropriately on the production end of industry. But her analysis overlooks the potential of service industries and consumer groups. The "Plastics Road Map" she proposes, tracing the entire product life cycle, would likely include these stakeholders, since the intent of the process would be to "open up a broad debate", yet her "road map" is focussed on forming government

policy in the UK, not on generating a universal list of actions for all actors to consider.

Independent initiatives can make a difference both in government policy and in changing consumer behaviour. For example, in Santa Monica, California, local law was changed to mandate an end to the use of plastic bags due to a citizens' initiative that included a widely circulated video "mockumentary" [*sic*] called *The Magic Plastic Bag,* featuring environmental concerns (Heal the Bay, 2010).

The power of consumer spending is sought after in the world of brand management, marketing and sales, and is increasingly being directed towards social change objectives. In what we could call the "conscience" or "ethics" approach, the growth of independent labels addressing fair trade, environmental impact, animal testing and organic food production shows that increasing numbers of consumers care about the meaning of their spending, not just the product or service they receive. Gabriel & Lang (2008) argue that this is a general phenomenon, since "decades of consumerism have not delivered unequivocal happiness", and that increasing numbers of people are seeking a way to feel good about their spending.

Conventional logic holds that to compete with current plastic packaging, alternatives will either need to be more cost-effective at a single bottom-line accounting, or to convince decision makers that a multiple bottom-line accounting system that includes measures for the health and environmental burdens of the full product life cycle demands their ethical attention and concomitant decisions. Needless to say, single-bottom-liners dominate, and join "ethical" bandwagons when consumer behaviours indicate their buying decisions are moving significantly in that direction. The idealists create the new forms of market behaviour, and the "bean counters" join in when it proves profitable.

The need is slowly growing in public awareness to find alternatives that address the multiple drags on our consciences from the environment, health and social justice. What customers –including food services customers – demand changes over time; by detecting the concerns of thought leaders it is sometimes possible to gain market share through anticipating shifts in these demands. Hand (2010) points out that some savvy producers have already begun to produce baby bottles and other products for infants in anticipation of consumer demands and regulations from lawmakers. Can the food industry show similar foresight?

### 2.5.1 Potential food industry responses

Perhaps not entirely consciously, a variety of perceptions invade our dinner tables at the sight of each piece of plastic. Even items made for long-term use, such as a plastic saltshaker, will eventually end up as refuse, leaching harmful chemicals into the groundwater or ocean. Food services customers are thereby placed in a position of being participants in environmental damage. The pervasive use of plastic in food production and consumption means that there is often little or no choice. We feel bad about plastic usage, for the harm it does to the environment and ourselves, yet we must eat to live.

The Plastics Index, proposed here, expands, in a limited yet visible way, our range of choice, thereby enabling a response that is appropriate to the situation and can motivate purchasing decisions which consumers can identify with and feel good about. It can be anticipated that use of the Plastics Index will address both the rational and irrational aspects of customer agency described by Korczynski and Tyler (2008).

With the effects of plastic on the environment becoming ever more visible, and medical research increasing our knowledge of the negative effects of plastics and their attendant chemicals on our health, there is a growing sense of unease among the more conscious customers when faced with potential hazards. This sense of unease at the sight of something as ubiquitous as a small plastic container of coffee creamer may still be unconscious for most, yet there can be no doubt about the direction of change. Consumer demands for less plastic at the dinner table seem bound to emerge more forcefully in the coming decade.

How to get ahead of the curve? A lesson can be taken from the response to the BSE ("mad cow") disease crisis of a decade ago. To allay customer fears about eating

meat, restaurant menus began listing the country of origin for their meats. And customers responded positively. This interface, directly at the restaurant and catering service dinner table, can again be used to address the plastics problem.

Unlike BSE, an acute problem, the health and environmental problems with plastics are chronic, growing slowly yet steadily. Like the proverbial frog placed in a cooking pot, awareness of the problem grows slowly as the water gets warmer, and threshold events that awaken public awareness are not likely. Nonetheless, given the pervasiveness and visibility of the problems, a tide of concern may develop in the coming years, affecting consumer perceptions and behaviours. Food services companies wishing to position themselves (Ries and Trout, 2001) in a market of increasingly uncomfortable frogs should consider the Plastics Index as an opportunity.

# 3 Plastics indexing

## 3.1 How to kick a habit

A useful technique used by some smokers to help them kick the habit is to simply write down the rationalisations they have for continuing to smoke whenever these arise. By becoming more conscious of each justification, and because it is slightly annoying to follow one's own commitment to keep the record, smokers slowly defeat their addiction one decision at a time (American Cancer Society, 2012).

The Plastics Index proposed here follows a similar logic: become more aware of the amount of plastic being used in specific food services settings, thereby motivating a search for more sustainable, healthy and aesthetically pleasing alternatives at the next purchase decision.

## 3.2 A Plastics index for the service provider – customer interface

Customers are increasingly seeking opportunities to "co-create" their experiences in tourism and hospitality. This note proposes the development of a "Plastics Index" for rating food services acts. The index would be simply an account of the number of plastic items used at an average place setting. For example:

| | |
|---|---|
| Plastic plate | 1 |
| Spoon, knife, fork | 1 |
| Plastic cup | 1 |
| Butter containers | 1 |
| Plastic wrapping | 1 |
| Plastic chair & table | 2 |
| **Total** | 7 |

In counting the number of kinds of items, it is not the amount of waste per se that is the focus. Rather, it is the search for alternatives and emphasis on decision-making. In other words, even if three plastic butter containers are used, or none at all, the index registers one item, representing one purchase decision by the food services provider. Similarly, since cutlery usually comes in sets, replacing plastic spoon, knife and fork is one decision.

This focus on the notion of replacing the item as such spotlights the responsibility of the business, and not the amount of waste generated in that context by the customer. The latter could lead to restricted consumption and a diminished dining experience for the consumer ("I would like more butter, but that would add more plastic waste …"). Similarly, though a typical single-serving butter container consists of a plastic base and a "plasticised" aluminum top, this counts as one item. Lowering the index in this case would require the food services organisation to find a different, more sustainable way to deliver butter to an end user. Restaurants that serve outside may choose plastic tables and chairs on financial grounds; the index may nudge some towards wood or metal when replacing their outdoor furniture.

This also gives caterers an argument that may help mitigate an increased price scale. Marketing and sales statements could look something like this:

*Being concerned with the environment, your health and dining experience, we have reduced our use of plastic to the greatest extent possible. We favor the use of reusable utensils, such as metal cutlery and ceramic plates. Where this is not practical, such as in catering outdoor events, we now use disposable utensils that are made of renewable, biodegradable materials.*

The message becomes attractive, drawing on widespread and growing concern about material waste. If a consumer raises issue with a plastic fork, the response can now be educational, providing an opportunity for the food services firm to show its ecological conscience in a way that is likely to increase customer loyalty.

By engaging the service provider – customer interface, the Plastics Index enables a moment of co-creation where the customer can identify with and share a higher ideal in a way that is similar to the various fair trade and eco-friendly initiatives current in today's marketplace. This impulse could even have a ripple effect on consumer behaviour in other arenas; one could imagine comments such as "do these bananas really have to be sold in a plastic bag?"

## 3.3 A plastics index for kitchens and beyond?

The Plastics Index at the customer interface can also act as a mind opener (Kegan and Lahey, 2001), leading to questions in adjacent areas of activity. The first and most logical next step is in the kitchen; and this is where the larger market-adjusting impact may be most clearly felt. If persons responsible for procurement "get religion" (become convicted) on this issue, their decisions and concomitant messages can be sent up the production chain.

There are two areas of concern in kitchens: (1) the packaging for food products and (2) utensils and cooking implements. While aesthetics play less of a role in production facilities, employee choice of workplace and owner concerns may become a factor. Therefore, the focus is on health and environmental effects: the amount of contact foodstuffs have with plastic, and the environmental effects of disposing.

To produce a Plastics Index for kitchens is nearly as simple as for the dining table: account for each food product as either having plastic in the packaging or not. This simple yes/no will yield a percentage at the end. Utensils and cooking implements that come into contact with food can be similarly counted. The "pushback" from end users to wholesalers and on to manufacturers will certainly take time, and the size of the problem is significant. We are speaking about perhaps 1 per cent of global oil production that is used for packaging in the food industry.

The point is to increase awareness, then change purchasing behaviour, and ultimately impact production processes. Similar indexes could be developed for food processing plants and also reach back into production processes.

## 3.4 Limits for the index?

In developing the idea for an index, several considerations should be discussed. First, why not use a "Disposables Index" or a more complex "Sustainable Consumption Index" instead?

A Disposables Index could track the use of paper napkins and so on, in addition to plastics. This would miss the reusable plastics, and since paper products such as napkins are recyclable and from renewable resources, the discussion would become more complex. This begs the question of whether what should be developed is a Sustainability Index for meals. While this could be more comprehensive, the process of developing the index could become highly complex and politically divisive. For example, how would one rate the various energy usages for cooking and washing? And how about the energy used and ecological considerations attached to the method of agriculture used for each food item? While all these considerations are valid concerns for the ecological management of the planet, they would lead the discussion into controversy beyond their utility. The list of concerns could become virtually infinite, and ultimately the exercise would likely end in futility.

In favor of a Plastics Index are ease of use and recognition. It also has an aesthetic component – plastic does not ennoble at the dinner table, it cheapens. The hospitality industry could address presentation quality, dining experience and sustainability in one simple number. While some plastic items are reusable, their end disposal remains difficult in spite of some new developments in recycling technology.

Recycling is, of course, a positive behaviour. Yet the recycling process itself consumes energy, and because the original manufacturing process is a heavy polluter, it is best to consider the issue of recycling separately and not seek to factor this aspect into the index.

In accounting that uses a multiple bottom line, to account for resources used and broader impact beyond a simple one-factor bottom line (financial profit), the Plastics Index should be seen as a welcome addition to the change process.

# 4 Conclusions

*Since WWII we have made a complete about-face from a "fix it and make it do" to a "use it once and toss it" society, with plastics playing a starring role.*

*—Sarah S. Mosko, Ph.D., 2006c*

*The belief among scientists is that the window of opportunity to take action is narrow. There is little time left in which we can still act to prevent irreversible, catastrophic changes to marine eco systems as we see them today.*

*– International Programme on the State of the Ocean, 2008*

## 4.1 What do we hope to gain?

The Plastics Index is aimed at a general reduction of the overall use of plastic in the food stream. Taken as a whole, the general awareness and subsequent behavioural impact generated may influence purchasing patterns that favor less packaging or different packaging, thereby encouraging holistic and sustainable forms of production and processing, and encourage a trend towards direct purchases from local farms. Use of the terms "slow food" and "real food" may become more widespread as a result, helping to break the "fraternity of ideas" and assumptions that provide the conceptual foundations of the food industry (Salatin, 2010).

This is not a call to a puritanical or Luddite reaction; it is a call to common sense. This article proposes increased consumer action aimed at moving our civilisation, from where we are currently, towards a better use of resources and healthier lifestyles. Some will move faster than others in making conscious choices that align more closely with environmental and human health.

## 4.2 Call for research and action

With less plastic, the food services industry could be ennobled, not only through an improved presentation at the table, but also through exhibiting concern for customer health and demonstrating a "corporate social responsibility" commitment to environmental sustainability. Support could be offered to researchers working on ecological packaging, and for the implementation of emergent technologies. For example:

- Plastics manufacturing currently being developed to monitor food spoilage should be merged with biodegradable materials for optimisation of resources usage.

- Supplier practices to optimise resources usage such as local food production and sales, such as the "from the region—for the region" programme.

This article proposes the creation of structured opportunities for some ecologically smart pushback to come from consumers to food services companies regarding the use of plastics. And it argues that these companies should see their best interest, as business enterprises and as human beings, in co-creating these events of social communication and change. We could also hope that these cooperative scenarios at restaurant tables would have ripple effects in purchasing decisions by food services businesses, through self-initiated kitchen audits of plastic usage, more conscious efforts

in recycling and visible signs of pride in promoting ecological consciousness. Such image and identity change in the direction of social responsibility is seen as attractive by many consumers, and one could hope that pushback from customers to restaurants could eventually reach a level where the pressure would have a positive effect on manufacturers. With the increasing fragility of our environment ever more evident, can we face the thought of our children and grandchildren regarding us as poor stewards of God's creation because we refused to do something as simple as count the plastic?

# Indeks plastike v gostinstvu

## Povzetek

*Trajnostni razvoj* postaja čedalje pogostejši in močnejši slogan za okoljsko zavest v podjetništvu in trgovini. Kljub številnim koristnim uporabam plastike, ki omogočajo vzdrževanje sodobnega življenjskega standarda, je uporaba plastičnih izdelkov dokazano škodljiva zdravju in okolju. Za turistično gospodarstvo so nekateri vidiki gostinske storitve predvsem estetskega pomena, a žal v veliki meri zaznamovani z uporabo plastičnih izdelkov. Članek preučuje vse močnejšo povezavo med temi dejavniki v času, ko ima vse večji segment turistov nove zahteve, povezane z naraščajočo zdravstveno in okoljsko osveščenostjo. Prispevek predlaga pristop k reševanju naraščajočega problema odstranjevanja plastičnih odpadkov, ki temelji na sodelovanju in bi lahko prinašal koristi vsem udeležencem. Predlog je preprost: (1) popisati uporabo plastičnih izdelkov na posamezni lokaciji in (2) poiskati trajnostne alternative.

Ključne besede: prehrambene storitve, zdravje, plastika, onesnaževanje, trajnostni razvoj

## REFERENCES

American Cancer Society. (2012). *Guide to Quitting Smoking.* Retrieved September 16, 2012, from: http://www.cancer.org/Healthy/StayAwayfromTobacco/GuidetoQuittingSmoking/guide-to-quitting-smoking-how-to-quit

Andrady, A. L., & Neal, M. A. (2009). Applications and societal benefits of plastics. *Philosophical Transactions of the Royal Society B.: Biological Sciences, 364,* 1977–1984. Retrieved May 30, 2011, from http://rstb.royalsocietypublishing.org/content/364/1526/1977.full.html#ref-list.1

Barnes, D. K. A., Galgani, F., Thompson, R. C., & Barlaz, M. (2009). Accumulation and fragmentation of plastic debris in global environments. *Philosophical Transactions of the Royal Society B.: Biological Sciences, 364,* 1985–1998. Retrieved May 30, 2011, from http://rstb.royalsocietypublishing.org/content/364/1526/1985.full.html#ref-list.1

Boote, W. (2009). *Plastic Planet in English.* Neue Sentimental Film, Frankfurt am Main & Hamburg. Retrieved May 30, 2011, from http://www.plastic-planet.de/

Cho, S. C., Bhang, S. Y., Hong, Y. C, Shin, M. S., Kim, B. N., Kim, J. W., Yoo, H. J., Cho, H., & Kim, H. W. (2010). Relationship between environmental phthalate exposure and the intelligence of school-age children. *Environmental Health Perspectives*, *118*(7), 1027–1032.

Gabriel, Y., & Lang, T. (2008). New faces and new masks of today's consumer. *Journal of Consumer Culture*, *8*(3), 321–340.

Gregory, M. R. (2009). Environmental implications of plastic debris in marine settings – entanglement, ingestion, smothering, hangers-on, hitch-hiking and alien invasions. *Philosophical Transactions of the Royal Society B.: Biological Sciences, 364*, 2013. Retrieved May 30, 2011, from http://rstb.royalsocietypublishing.org/content/364/1526/2013.full.html#related-urls

Hand, L. (2010, Winter). Plastics: Danger where we least expect it. *Harvard Public Health Review.* Harvard School of Public Health. Retrieved April 21, 2011, from http://www.hsph.harvard.edu/news/hphr/winter-2010/winter10plastics.html

Heal The Bay (Producer). (2010). *The majestic plastic bag: A mockumentary* [Motion picture]. [Narrated by Jeremy Irons.] Posted to http://www.youtube.com/watch?v=GLgh9h2ePYw USA, http://www.healthebay.org

Heap, B. (2009). Preface. *Philosophical Transactions of the Royal Society B.: Biological Sciences, 364*. Retrieved April 21, 2011, from http://rstb.royalsocietypublishing.org/content/364/1526/1971.full.html#ref-list.1

International Programme on the State of the Ocean. (2008). *Implementing the Global State of the Oceans Report*. International Programme on the State of the Ocean. Retrieved June 13, 2012, from http://www.stateoftheocean.org/pdfs/ipso_report_051208web.pdf

Kegan, R., & Lahey, L. L. (2001). *How the Way We Talk Can Change the Way We Work: Seven Languages for Transformation*. San Francisco: Jossey-Bass, A Wiley Company.

Koch, H. M., & Calafat, A. M. (2009). Human body burdens of chemicals used in plastic manufacture. *Philosophical Transactions of the Royal Society B.: Biological Sciences, 364*, 2063–2078. Retrieved May 30, 2011, from http://rstb.royalsocietypublishing.org/content/364/1526/2063.full.html#ref-list.1

Korczynski, M., & Tyler, M. (2008). The contradictions of consumption at the point of service delivery. *Journal of Consumer Culture*, *8*(3), 307–320.

Levis, J. W., & Barlaz, M. A. (2011). Is biodegradability a desirable attribute for discarded solid waste? Perspectives from a national landfill greenhouse gas inventory model. *Environmental Science & Technology*, *45*, 5470–5476.

Matsushima, A., Liu, X., Okada, H., Shimohigashi, M., & Shimohigashi, Y. (2010). Bisphenol AF is a full agonist for the estrogen receptor ERα but a hightly specific antagonist for ERβ. *Environmental Health Perspectives*, *118*(9), 1267–1272.

Meeker, J. D., Sathyanarayana, S., & Swan, S. H. (2009). Phthalates and other additives in plastics: human exposure and associated health outcomes. *Philosophical Transactions of the Royal Society B.: Biological Sciences, 364*, 2097–2113. Retrieved May 30, 2011, from http://rstb.royalsocietypublishing.org/content/364/1526/2097.full.html#ref-list.1

Mosko, S. S. (2005). Plastics for Dinner. *Plastics Plague series, #2.* Retrieved May 31, 2011, from http://sarahmosko.wordpress.com/2005/07/01/plastics-for-dinner/

Mosko, S. S. (2006a). Unhealthy Plastic Habit? *Plastics Plague series, #6.* Retrieved May 31, 2011, from http://sarahmosko.wordpress.com/2006/01/01/unhealthy-plastic-habit/

Mosko, S. S. (2006b). That New Car Smell. *Plastics Plague series, #10.* Retrieved May 31, 2011, from http://sarahmosko.wordpress.com/2006/07/01/newcar/

Mosko, S. S. (2006c). The Plastic Plague: From a "fix it" to a "throw away" society. *Plastics Plague series, #1.* Retrieved May 31, 2011, from http://sarahmosko.wordpress.com/2006/12/01/plastic-plague/

Mosko, S. S., & Moody, S. (2007). "Is bottled water really safer? Billions of plastic bottles harm the environment." *Plastics Plague series, #4.* Retrieved May 31, 2011, from http://sarahmosko.wordpress.com/2007/05/01/bottledwater/

Oehlmann, J., Schulte-Oehlmann, U., Kloas, W., Jagnytsch, O., Lutz, I., Kusk, K. O., Wollenberger, L., Santos, E. M., Paull, G. C., Van Look, K. J. W., & Tyler, C. R. (2009). A critical analysis of the biological impacts of plasticizers on wildlife. *Philosophical Transactions of the Royal Society B.: Biological Sciences, 364*, 2047. Retrieved May 30, 2011, from http://rstb.royalsocietypublishing.org/content/364/1526/2047.full.html#ref-list-1

Ries, Al., & Trout, J. (2001). *Positioning: The Battle for Your Mind: How to be seen and heard in the overcrowded marketplace*. New York: McGraw-Hill Companies, Inc.

Ryan, P. G., Moore, C. J., van Franeker, J. A., & Moloney, C. L. (2009). Monitoring the abundance of plastic debris in the marine environment. *Philosophical Transactions of the Royal Society B.: Biological Sciences, 364*, 1999–2012. Retrieved May 30, 2011, from http://rstb.royalsocietypublishing.org

Saal, Vrederick S. vom, & Hughes, C. (2005). An Extensive New Literature Concerning Low-Dose Effects of Bisphenol A Shows the Need for a New Risk Assessment. *Environmental Health Perspectives, 113*(8), 926–933.

Salatin, J. (2010, Winter). The politics of food. *Wise Traditions in Food, Farming and the Healing Arts, The Quarterly Journal of the Weston A. Price Foundation*. Posted January 17, 2011. Retrieved July 23, 2011, from http://www.westonaprice.org/farm-a-ranch/2087-the-politics-of-food.

Schmid, S. (2012, 9 September). *Die Plastic-Suppe*. NZZ am Sonntag. Zürich, 57–58.

Soo-Churl, C., Soo-Young, B., Yun-Chul, H., Min-Sup, S., Boong-Nyun, K., Jae-Won, K., Hee-Jung, Y., In Hee, C., & Hyo-Won, K. (2010, July). Relationship between environmental phthalate exposure and the intelligence of school-age children. *Environmental Health Perspectives, 118*(7), 1027–1032.

Talsness, C. E., Andrade, A. J. M., Kuriyama, S. N., Taylor, J. A., & vom Saal, F. S. (2009). Components of plastic: Experimental studies in animals and relevance for human health. *Philosophical Transactions of the Royal Society B.: Biological Sciences, 364,* 1973–1976. Retrieved May 30, 2011, from http://rstb.royalsocietypublishing.org/content/364/1526/2079.full.html#ref-list.1

Teuten, E. L., Saquing, J. M., Knappe, D. R. U., Barlaz, M. A., Jonsson, S., Björn, A., Rowland, S. J., Thompson, R. C., Galloway, T. S., Yamashita, R., Ochi, D., Watanuki, Y., Moore, C., Viet, P. H., Tana, T. S., Prudente, M., Boonyatumanod, R., Zakaria, M. P., Akkhavong, K., Ogata, Y., Hirai, H., Iwasa, S., Mizukawa, K., Hagino, Y., Imamura, A., Saha, M., & Takada, H. (2009). Transport and release of chemicals from plastics to the environment and to wildlife. *Philosophical Transactions of the Royal Society B.: Biological Sciences, 364*, 2027. Retrieved May 30, 2011, from http://rstb.royalsocietypublishing.org/content/364/1526/2027.full.html#related-urls

The Disappearing Male. (2008). Canadian Broadcast Corporation, available at: http://www.cbc.ca/documentaries/doczone/2008/disappearingmale/

Thompson, R. C., Swan, S. H., Moore, C. J., & Vom Saal, F. S. (2009). Our plastic age. *Philosophical Transactions of the Royal Society B.: Biological Sciences, 364,* 1973–1976. Retrieved May 30, 2011, from http://rstb.royalsocietypublishing.org/content/364/1526/1973.full.html#ref-list.1.

Wartman, K. (2012, March 8). What's Really Making Us Fat? *The Atlantic*. Retrieved September 16, 2012, from http://www.theatlantic.com/health/archive/2012/03/whats-really-making-us-fat/254087/