State of Oregon
Department of
Environmental
Quality

Literature Review:
Alternatives for Advancing Sustainable Production and Consumption through Government Programs and Policies

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Introduction

In developing a 2050 Vision for Materials Management in Oregon, DEQ is taking a full life cycle approach to materials management. Some members of the external workgroup providing input to the project are keenly interested in addressing "upstream" stages of the life cycle such as resource extraction, product design and manufacturing as well as the topic of consumption.

This document summarizes results of a broad but limited literature review specific to program and policy alternatives that support sustainable production and consumption in Oregon. Much of the literature addresses both of these elements under the broad umbrella of "sustainable consumption and production," and in keeping with the literature, this paper covers both of these elements. Certain alternatives are limited to consumption, while others are limited to production, but many have the potential to involve and/or affect both production and consumption.

Some of the literature reviewed is specific to materials or individual life cycle stages of materials. Other literature is much broader, addressing the full universe of production and consumption (fuels, electricity, materials and services). Where possible, DEQ attempted to focus literature summaries on production and consumption of non-fuel materials. However, sometimes a broader viewpoint is relevant.

Information presented in this document summarizes program and policy alternatives identified in literature reviewed by DEQ staff, with assistance from the U.S. Environmental Protection Agency. Inclusion of specific alternatives in this list does not imply endorsement or acceptance by DEQ. Exclusion of specific alternatives only reflects that DEQ did not encounter them in its literature review. DEQ's purpose in conducting the literature review and summarizing the results is to educate itself and its stakeholders about the universe of possible options and to help aid 2050 Vision project discussions.

DEQ also attempted to focus the literature review on programs and policies specific to government. However, a key theme of much of the literature is the holistic nature of the topic and the need for better coordination and cooperation between players. In some cases, government's role might best be to support others (businesses, nongovernmental organizations, individuals) in their actions. The literature summarized here reflects the potential for inter-connected roles and responsibilities, while focusing primarily on the potential roles (both mandated and voluntary actions) of government. The literature reviewed by DEQ generally doesn't distinguish between federal, state and local government roles. In some cases, powers are reserved for the federal government or policies and programs are most effectively implemented at the federal level.

As DEQ reviewed literature, staff discovered that the field of sustainable production and consumption is exceptionally large and has been extensively documented. Despite this, much remains unknown or unclear. Given resource constraints, DEQ's review of the literature only scratched the surface.

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Organization of program and policy alternatives

To simplify consideration, this report groups program and policy alternatives into 21 broad approaches, as follows:

Addressing both production and consumption

- Public purchasing
- Collecting and disseminating product impact information
- Eco-labels and information disclosure
- Marketing standards
- Choice editing/product standards
- Building standards and incentives
- Supporting access to sustainable products and services
- Supporting businesses and non-governmental organizations
- Paradigm-challenging/changing research
- Goals, comprehensive indicators and targets

Primarily addressing sustainable production

- Product stewardship
- Chemical policy reform
- Abolishing virgin material subsidies
- Taxing pollution, unsustainable resource use
- Voluntary agreements with industries

Primarily addressing sustainable consumption

- Public outreach: broad (sustainable consumption, values)
- Public outreach: narrow (targeted behaviors)
- Direct financial incentives for consumers
- Media standards, literacy
- Shifting consumption to investments in natural capital
- Changing how we work, share and cooperate

This organization of program and policy alternatives is not perfect, and there remains overlap between some alternatives. Regardless, summaries of each approach follows. Some approaches are better documented than others; this reflects the limited (and incomplete) nature of DEQ's literature review.

To inform DEQ's January 2012 stakeholder meeting, where members of DEQ's stakeholder group will divide into two subgroups – one addressing production, the other addressing consumption – the summaries below use icons to identify whether they primarily operate in the realm of sustainable production, sustainable consumption, or both.

 indicates relevance to production and  indicates relevance to consumption.

Public procurement

While no standard definition exists for sustainable public procurement, it can generally be understood as a process by which a public organization purchases goods and services in a way that benefits society and economy, and also minimizes lifecycle environmental impacts (DEFRA 2006).[1]

Public procurement can be used to increase demand for more sustainable products. This reduces the negative impacts resulting from government purchases but also supports businesses producing these more sustainable products. In some markets, government is an important customer. Sustainable procurement can also generate information that can be used by other purchasers. In some cases, sustainable products also save money for government – they may be less costly to use, maintain and dispose of, despite potentially higher upfront costs (United Nations 2008). Purchase of sustainable products by government also is important to government credibility, as government's actions need to be consistent with its statements (Jackson 2005).

Some sustainable public purchasing programs are strictly voluntary while others rely on policy, legislative mandate or executive order as the basis for their implementation. Both approaches may be effective, although mandatory programs are often limited to only a few products. Some of the most comprehensive programs are voluntary, and often benefit from the support of a high-level advocate (EPA 2000).

Several other factors can increase the likelihood of success for a sustainable public purchasing program:

- setting sustainability priorities can help structure expenditure decisions;
- public expenditure frameworks need to allow for longer planning horizons for some purchases to be competitive;
- joint procurement by public administration authorities can drive down costs;
- use of practical tools such as procurement contracts, product databases, and guidelines is critical for enabling good purchasing choices;
- early and continuing engagement with suppliers helps ensure new, sometimes stricter standards can be met – this is especially true for small- and medium-size enterprises and local suppliers;
- use of pilot projects can drive innovation while taking on limited risk (United Nations 2008).

Once a program is in place, assessment is key to its long-term viability; exchanging best practices can help spread effective sustainable public procurement (United Nations 2011).

Collecting and disseminating product impact information

Government can support environmental improvements in products by collecting and disseminating information (Scholl, Rubik, Kalimo, Biedenkopf and Soebech 2010). This information may be used by both producers and consumers.

Life cycle analysis (or more broadly, taking a holistic life cycle perspective) is identified in some literature as an important approach (Munasinghe, 2010; BSR 2010; Scholl, Rubik, Kalimo, Biedenkopf

[1] A distinction is often drawn between sustainable and green public procurement, with the latter focusing just on environmental impacts (United Nations 2008).

and Soebech 2010).[2] A challenge for government is staying current with the rapid pace of change in product development (Scholl, Rubik, Kalimo, Biedenkopf and Soebech 2010).

One narrow example – limited to energy-consuming devices – is the United Kingdom's "Red/Green Calculator." In the UK, a "Red/Green Calculator" for electronic products provides consumers and retailers with information on the relative energy impacts of competing products; retailers are expected to reduce their offerings of "red" (higher impact) options (Scholl, Rubik, Kalimo, Biedenkopf and Soebech 2010).

One recent development in this area is the creation in the U.S. of the Sustainability Consortium. The Consortium is a relatively new membership-based organization that conducts and shares information (primarily life cycle analyses) of products in numerous product categories. Most members are large businesses, although government agencies and non-governmental organizations can also participate (The Sustainability Consortium 2011).

Eco-labels and information disclosure

Eco-labeling involves the use of information on product labels to convey information about the product's environmental impact. While eco-labels are commonly viewed as a way to help consumers make better-informed purchasing decisions, eco-labels can also drive changes by producers.

Eco-labels are placed on products indicating their conformity to, or performance on, specific environmental criteria. These criteria can focus on singular environmental attributes (such as "biodegradable" or "dolphin friendly"), single impacts such as carbon footprint or holistic, multi-attribute environmental impacts by using life cycle assessments (Schenck 2010). A variation on eco-labels is disclosure requirements, whereby product labels state whether they include certain materials.[3] Since the first eco-label program was established in 1977, many nations, industry associations and third-party certifiers have developed and implemented various labeling schemes (Thorgerson 2000).

The main purpose of an eco-label is to provide consumers with information they can use to make purchasing decisions (Thorgerson 2000; Koos 2010). By doing so, eco-labels attempt to drive environmental benefits by 1) forcing producers to quantify and understand the sources of their products' environmental impacts and 2) allowing consumers to shift their consumption towards products with lower environmental impacts (Schenck 2009). Additionally, eco-labels can affect product manufacturing. When producers attempt to have their product certified for an eco-label, they are forced to measure and evaluate the environmental impact or attributes of their products. By doing so, they often identify opportunities to reduce their products' environmental impacts and achieve cost savings (The Carbon Trust 2008).

There are three major drawbacks to eco-labeling programs. First, creating and running a government eco-labeling program has high administrative costs (Schenck 2009). Second, the large number of eco-labels available in the market is often confusing to consumers (Fliegelman 2010; Thorgerson 2000). Third, in some cases, eco-labels are based on relatively loose standards with little to no environmental credibility (Fliegelman 2010). The abundant and non-transparent nature of eco-labels has led many

[2] DEQ has limited experience with this type of approach, specific to commissioning life cycle analyses of e-commerce delivery options, drinking water delivery options, and residential construction. However, this research has focused on "generic" products, not specific brands.

[3] These can be specific chemicals of concern (e.g., mercury) or classes of chemicals (e.g., known or suspected human carcinogens).

consumers to be skeptical of their claims and has led to concerns about "greenwashing" (Fliegelman 2010; Thorgerson 2000).[4]

Schenck (2009 and 2010) recommends that for an eco-labeling program to be effective it should be:[5]

- transparent;
- supported by inexpensive background data;
- able to conform to international standards for life cycle analysis derived labels;
- quickly implementable;
- inexpensive;
- supported by legislation.[6]

Some evidence shows eco-labels do increase the purchasing of environmentally-preferable products. Vanclay et al. (2010) studied the impact of carbon footprint labels on multiple grocery store products. They found that after labeling, consumers increased their purchasing of lower carbon products by four percent. Deutsch (2010) reports on a field experiment involving customers of washing machines. Those who were provided with life cycle cost information (purchasing + operating costs) made purchasing decisions that reduced life cycle energy use by 0.8 percent when compared to consumers in a control group who weren't provided with that additional information. [7]

Marketing standards (specific to environmental claims)

Not all environmental marketing claims fall within the realm of "eco-labels". Producers commonly make claims without using certifications or standards, or engage in what is commonly referred to as "greenwashing".[8] Government can provide guidance, assistance, review, and/or regulation of such claims, with the goal to provide more accurate information to consumers.

According to Gray-Lee (1994), local, state and federal agencies have brought legal action against some of the more deceptive environmental claims. The Federal Trade Commission, through its "Green

[4] "Greenwashing" is defined by TerraChoice as "the act of misleading consumers regarding the environmental practices of a company or the environmental benefits of a product or service" (TerraChoice 2011).

[5] Additionally, for eco-labels to be effective at changing consumer behaviors, consumers must: value protecting the environment; perceive that their purchase of environmentally friendly products is an effective means to protect the environment; and easily recognize, understand and trust the eco-label (Thorgerson 2000; Koos 2010).

[6] Researchers have identified that government-backed eco-labels can increase the credibility and accountability of labeling programs (Salzman 1997; Fliegelman 2010; Koos 2010). Consumers also are more willing to trust government-backed programs than private sector programs (Thorgerson 2000; Koos 2010; Salzman 1997).

[7] Separately, in the area of nutrition, U.S.-based Hannaford Supermarkets in 2006 began implementing its "guiding star" program in 270 stores, in which products identified as especially healthy or nutritious get one to three stars. After several years, 28 percent of their food items had stars. Sales of starred products have increased by 7 percent while zero star product purchases have decreased by 5 percent. Suppliers began to make changes to get their products on the star list. The campaign included signs, shelf tags, an advertising campaigns, training materials, community outreach and changes in product placement (Maniates 2010).

[8] TerraChoice, a subsidiary of Underwriters Laboratories (UL), has published a series of reports on "greenwashing." Its most recent involved a review of 5,296 consumer products sold in the U.S. and Canada. These products made more than 12,600 "green" claims. Only 4.4 percent of products making green claims avoided all of TerraChoice's "seven sins of greenwashing." Put differently, the vast majority of products making environmental claims are engaging in some form of greenwashing, as defined by TerraChoice. The most common "sins" include the "sin of no proof" (making claims that aren't substantiated), vague claims, hidden trade-offs (implying greenness by calling out environmental attributes that may be positive but largely irrelevant, while not mentioning other negative environmental impacts), and the use of false/bogus certifications (TerraChoice, 2010).

Guides", provides guidance for the use of some environmental marketing claims. In some cases, the Federal Trade Commission negotiates consent orders where marketers agree to cease making deceptive environmental claims. However, case-by-case enforcement is limited in scope, fails to provide precise notice of what will and will not be considered deceptive, and can only be enforced retroactively; by the time a claim is judged to be deceptive, it is likely that consumers will already be confused.

States also pass legislation restricting use of certain marketing claims (such as "ozone friendly" or "degradable") or define these terms so as to limit their use. Some states carry marketing standards in statute that are stricter than FTC guidelines, while other states simply codify in statute that marketers must comply with FTC guidelines (Gray-Lee 1994).

Another potential role for government is to publish and disseminate information about valid and/or bogus environmental marketing claims, thus providing an information resource for consumers and an incentive for producers engaging in greenwashing to improve their practices (Prakash 2002).

Choice editing and product standards

Choice editing and product standards direct consumers to environmentally-preferable alternatives. The World Business Council on Sustainable Development (2008) defines choice editing as "the decisions that directly control the impacts of consumption." Choice editing and product standards provide consumers with better options to choose from, removing the least desirable options from the marketplace.

The World Business Council observes that "businesses edit choice by controlling elements of their supply chain or by eliminating product components that pose a risk to the environment or human health. Policy-makers may choice-edit by developing legislation that would ban a product or substance. Retailers may choice-edit by deciding to eliminate products from their shelves or by demanding certain standards of their supply chains." (WBSCD 2008)

Tim Lang of City University London asks "Why should the consumer be the one left in the supermarket aisle to agonize over complex issues such as animal welfare, carbon footprints, workers' rights and excessive packaging, often without any meaningful data on the label to inform their decision-making?" (quoted in Maniates 2010). Maniates (2010) posits that one answer is that labeling is less controversial than choice editing.[9] Not only is reading labels a burden on the average consumer, but studies indicate that labeling is sometimes not an effective driver for sustainable consumption (see "eco-labels" section above).

Environmental product standards are restrictions set by government to reduce a product's environmental impact. Setting product standards is one way that government negotiates "the institutional context in which business and consumers operate through the setting of legislation." (Jackson 2005) Examples of product standards include setting exhaust emission standards for automobiles, restricting preservatives used in foodstuffs, or specifying use of recycled plastics in product design (EU 2010; UK WRAP 2011b). Oftentimes, product standards require business to share information on their product's design, ingredients, and components beyond advertising and labeling purposes (Fedrigo and Tukker 2009). Setting standards has the potential to increase product durability and resource efficiency and result in more recyclable products (Jackson 2005). Requiring extended warranties on products encourages longer

[9] While choice editing may be viewed as more controversial, it is cited as an important strategy in some literature generated from business organizations. See for example World Business Council on Sustainable Development (2008).

product lifespan, reducing the need to replace products as frequently (Cox, Giorgi, Sharp, Strange, Wilson and Blakey 2010). Additionally, in some cases use of product standards has produced cost savings.[10]

The United Kingdom's Sustainable Consumption Roundtable analyzed 19 promising 'transformations' in consumer cultures. Its findings, summarized in a 2006 report, suggest that choice editing for quality and sustainability by government and business, as opposed to information campaigns, labeling or other mechanisms to drive voluntary consumer change, has been the critical driver in the majority of environmental innovation cases. Manufacturers, retailers and regulators have made decisions to edit out less sustainable products on behalf of consumers, raising the standard for all. The report finds that legislation is the most effective way to raise product standards if the more sustainable choice costs more.[11] Voluntary industry agreements are useful but generally do not act as a sole driver of product shifts (Sustainable Consumption Roundtable 2006).[12]

The report describes choice editing as being "about shifting the field of choice for mainstream consumers: cutting out unnecessarily damaging products and getting real sustainable choices on the shelves" (Sustainable Consumption Roundtable 2006). Maniates (2010) notes that choice editing is neither new nor novel as government has a long history of setting standards and sending economic signals that influence everything from the food we eat to the cars we drive.[13]

Japan's "top runner" program is an example of a successful government product standard used to steer the public in a more sustainable direction. Since 1998 products in this program have had their energy efficiency compared using a 1 to 5 ranking. Tiers one and two are for the best performing products. They set the standard that the entire industry must meet within five years to keep its product on the shelf (Maniates 2010).

Another form of choice editing involves changing defaults. Economist Richard Thaler and legal scholar Cass Sunstein, in their 2008 book *Nudge,* suggest the use of defaults to move consumers in certain directions. Someone may opt out of a default, but the burden rests on the individual to choose the wrong behavior over the right one. Examples include automatic carbon offsets with purchase of plane tickets, default savings plans and pricier renewable energy automatically included in energy bill unless opt out is chosen (putting people in the position of saying, "I want to use dirty, polluting coal to save a small amount of money.") (Maniates 2010)

[10] For example, UK WRAP (2011) points to how specifying use of recycled plastics in product design has reduced producer's costs by more than 10 percent while also reducing carbon emissions.

[11] The report also states that early announcement of proposed legislation can result in rapid innovation and further choice editing by retailers and manufacturers.

[12] Other key findings based on the review of 19 case studies include: 1) Providing information to consumers is generally not very effective. But when labeling is combined with setting minimum industry standards followed by voluntary industry agreements and more affordable products, efforts are more successful; 2) Product policy should work to integrate higher sustainability standards at the product design stage; 3) Green products must perform as well as the alternatives. This is more important than price, except in the area of food, where consumption practices can change based on strong appeal to emotions (e.g., dolphin-friendly); 4) The role of business as innovators and retailers to ensure availability was seen as critical; and 5) legislative leadership is also important.

[13] Maniates also suggests that for several decades now, such editing has been constrained and influenced by an assumption that mass consumption and consumer access to unlimited choices is the foundation of human happiness, egalitarianism and democracy.

Building standards and incentives[14]

Construction, remodeling, and demolition debris comprises 20-30% of all waste generated in Oregon annually. Data also suggests that approximately 50% of the waste is from the residential building sector. As large as those numbers may seem, the environmental impacts of waste are often many times smaller than the impacts associated with producing the materials that end up as waste (Quantis, Earth Advantage and Oregon Home Builders Association 2010).

Government can set standards and create incentives for more sustainable buildings. Policies and incentives specific to materials used in construction and remodeling can lead to buildings that are healthier and have fewer impacts on the environment. Some existing green building programs tend to be more comprehensive in their treatment of energy and water, and less so regarding impacts of materials. However, because material selection can influence energy use, decisions about material choice need to be made as part of a larger, integrated whole. (Quantis, Earth Advantage and Oregon Home Builders Association 2010)

Buildings can be thought of as a type of a "product," albeit one that is expensive and may be highly customized. Still, much of the discussion above about choice editing/product standards also applies to buildings.

The Oregon Global Warming Commission's Interim Roadmap to 2020 (2010) identifies the following policy recommendations specific to materials and buildings:[15]

- Establish higher standards for new buildings, combining net zero operational energy with a carbon offset program to account for the life cycle greenhouse impacts of the materials used in the building.
- Expand the Energy Performance Score (EPS) concept from a pilot to a statewide program, and extend the concept to include materials for home construction and maintenance (replacement of roofs, windows, carpet, etc.).
- Provide some form of incentive (or incentives) that reduce(s) the life cycle GHG impacts of construction materials.
- Support and implement policy changes to increase density in urban areas, decrease the rate of new construction, increase density in existing structures, increase use of small accessory dwelling units, and provide incentives to reduce the size of housing units.
- Require a more stringent building code for energy impacts of large homes (both operational energy and materials related).[16]
- Extend the mandatory State Energy Efficiency Design (SEED) program for new state buildings so that the life cycle energy impacts (or GHG impacts) of the whole building (energy + materials) represent a 20 percent improvement when compared to code.
- Expand reuse and salvage infrastructure, and provide incentives for reuse and salvage.

Other policy approaches mentioned in the literature include:[17]

[14] For more details specific to DEQ's research and existing work specific to residential construction, please refer to this briefing paper.

[15] While the Global Warming Commission's recommendations are defined narrowly to address climate impact, some of the same policy approaches could be applied to other environmental objectives, such as reduced product toxicity.

[16] For example, three tiers of homes could be created; any home below 1,950 square feet only would need to meet the standard building code. Homes 1,950 to 2,850 square feet would be required to be built 20 percent more energy and materially efficient than a smaller code home. Homes over 2,850 square feet would be required to be 40 percent more energy and materially efficient than a smaller code home.

- Adopt or support leading green building standards, such as the Living Building Challenge.
- Ensure appropriate guidance is available for materials, particularly for those in widespread or prescriptive use.
- Update building and energy codes and valuation systems in relation to natural building materials. Provide regulatory guidance on natural building materials, low-energy, and passive systems.
- Employ developer incentives like fast-tracked permitting and reduced fees.
- Provide financial incentives to recognize and encourage . . . measures with significant societal benefits, including improving public health (and) reduced consumption of natural resources.
- Develop appraisal and portfolio valuation financial incentives and systems that . . . facilitate links between green building measures . . . and appraised value; provide incentives for building evaluations to include life cycle analysis; and include . . . green features in real estate listings categories.
- Develop accessible, reliable, up-to-date, and appropriately evaluated information hubs to effectively share best practice solutions to regulatory issues.
- Support research, testing and development of passive optimization strategies including . . . those that eliminate the need for materials, products and systems by design.
- Provide support for testing protocols and systems to help address gaps in the availability of viable alternative building materials.
- Adopt legal and regulatory systems that recognize and account for cumulative environmental impacts and the limits of ecological systems.
- Develop a system for recognizing enhanced value of projects voluntarily internalizing as many of these risks and impacts as possible.
- Require adherence to green building standards for low-income housing (and other buildings) that receive state financial incentives (Sigmon 2011).
- Advance improved mandatory minimums through the use of building codes (Sigmon 2011).
- Provide training and education of building trades professionals (Sustainable Consumption Roundtable 2006).[18]

Supporting access to sustainable products and services

Government can support or provide infrastructure so that consumers have access to more sustainable options.

Jackson (2005) describes the need to address ‘”facilitation conditions” and “situational factors” (access). Adequacy of facilities and services, equality of access and consistency in standards of operation are all vital ingredients in encouraging pro-environment choice. Some institutional roadblocks are addressed in the ‘Choice editing’ section above. Other roadblocks are related to basic technical, infrastructure and financial support. Following are examples of the latter.

Government can provide financial support for waste prevention efforts in the reuse and repair industry as DEQ has done historically through its solid waste grants program.[19] The impacts have, in some cases, been significant.[20]

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[17] Unless otherwise noted, all approaches in this list are from Eisenberg and Persram (2009), who also provide a much more detailed list of recommendations in their report; only select recommendations specific to materials are listed in this report.

[18] Although investments in the infrastructure of homes seems to be an area where large outlays require rational decision-making by consumers, a UK study found members of the public were relatively passive consumers of large and complex infrastructure purchases. The ultimate decision often lies with builders, installers, fitters and retailers. The training and education of these professionals is key to mainstreaming more sustainable products.

The City of Portland, through its Be Resourceful campaign provides small grants to fill neighborhood tool sheds and other materials sharing libraries and provides residents with links and information on other sharing, leasing, repair and reuse opportunities in Portland (e.g., swap shops, food exchanges, book libraries, thrift stores, used building materials, bike repair classes, sewing classes, shoe repair, sustainable purchasing options (City of Portland 2011).

European research concludes that re-use and repair opportunities can provide easily accessed social benefits, while at the same time acknowledging that these opportunities may not address the quest for novelty that spurs other consumption, and are ultimately a delay in the disposal stage. Standards for refurbished products and, specific to the European Union, integration of reusability criteria in the EU Ecodesign Directive is recommended (EU 2010).

Access to infrastructure can include services that help consumers prevent waste. For example, the City of Seattle requires publishers of telephone directories to participate in an "opt-out" program whereby residents can easily choose not to have phone books delivered to their homes (Product Stewardship Institute 2011). More broadly, options that would make it easier for consumers to decrease the amount of unwanted mail include voluntary agreements with industry, legislative requirements facilitating opt-out options, and requirements that all direct mail to contain opt-out information (Cox, Giorgi, Sharp, Strange, Wilson and Blakey 2010).

Supporting business and non-governmental organizations in their efforts to engage consumers in sustainable consumption

Government can support businesses and non-governmental organizations that are either working to make production more sustainable, and/or engaging consumers in making consumption more sustainable. Support can include technical assistance, recognition, assistance with funding specific projects and/or regulatory relief.

Technical assistance to businesses is at the heart of the UK's Waste and Resource Action Programme (WRAP). For example, in its 2011-2015 action plan, WRAP commits to continue work with manufacturers, retailers, supply chains and residents to:

- reduce food waste;
- work with the packaging sector to optimize design of food packaging;
- work with major do-it-yourself retailers, supply chains, facilities management and the events sector to increase resource efficiency;
- work with retailers and brands to reduce the impact of electronics and textiles at the design stage;

[19] DEQ grants have supported edible food collection efforts (e.g., staff, cold storage) in Lane, Deschutes and Tillamook counties; construction, remodeling and demolition materials reuse (e.g., deconstruction, collection and storage equipment, promotion and marketing) in Deschutes, Lane, Hood River and Tillamook counties, and Portland; funds for business resource efficiency staff in Gresham; food waste prevention in Hillsboro; and electronics reuse and recycling (prior to the Oregon E-Cycles program) in Marion County and Eugene.

[20] For example, the ReBuilding Center in Portland, which has received several grants from DEQ over the years, currently diverts an average of eight tons of reusable building materials each day (almost six million pounds annually). The amount of "embodied" energy in the products reused through The ReBuilding Center in one year, and thus saved by not having to create new products, is roughly equal to 150,000 gallons of gas. The Center has also created 45 "green collar" jobs and uses organizational profits to support a community building staff of three people who help neighbors to work together to improve their neighborhoods. The Center makes about 80 to 100 donations of materials per year to nonprofits and community groups, with an estimated value of around $20,000 (Hangen 2009).

- develop and pilot business models based on leasing, producing more durable goods, repair and reuse;
- support the design of resource-efficient construction products with focus on less use of primary resources, durability, recyclability and recycled content; and
- develop standards to build confidence in reused textiles, electrical goods and furniture (WRAP 2011b).

While acknowledging that long-term change will not be secured by individual consumer change, Makower and Fleischer (2003) emphasize the importance of early adopters in inspiring and motivating others, and the need for highly organized groups of motivated individuals to push for household and systemic change. The authors suggest involving faith-based and other nongovernmental organizations in efforts to engage consumers in sustainable consumption.

Paradigm-challenging/changing research

Government can provide inspiring, practical examples of significant changes, and set aside resources for "paradigm challenging" research. The purpose of this is to provide information that not only educates but also allows for discussions around what is important and feasible. This type of research can challenge mindsets and embedded beliefs that prevent positive change from occurring (Fedrigo and Tukker 2009).

Fedrigo and Tukker (2009) suggest this type of research is particularly important for addressing needed changes that are not currently feasible, due to unknowns in the transition path or controversy over the direction of change. Research efforts can be used to help organize a process of deliberation, learning and analysis. Topics that might be addressed through this research vary and could include several of the other approaches described elsewhere in this paper. Existing examples cited by Fedrigo and Tukker where research has had a clear effect on discussion are the New Economic Foundation's "Happy Planet Index" and "National Accounts of Well-Being."[21] The Ecological Footprint concept, developed by William Rees and Mathis Wackernagel, is another example.

Goals, comprehensive indicators and targets

Government can set goals, indicators and targets, and then track progress toward them. Doing so can more clearly signal desired outcomes and focus efforts (both by government and others) toward achieving those outcomes.

Clear, bold goals, indicators and targets can be set for both sustainable materials management and, more broadly, sustainability. Fedrigo and Tukker (2009) argue that society needs to more clearly articulate what sustainability really means. Too often, sustainability is mis-understood as "being less bad" with "lower environmental impact" (less bad than before) rather than the intended sustainable level of "low/no environmental impact" (Fedrigo and Tucker 2009). McDonough and Braungart (2002) make a similar argument, describing traditional pollution/impact reduction efforts as fundamentally unsatisfying and, not to mention, unsustainable. In nature, according to McDonough and Braungart, "waste equals food. To be sustainable, materials must be either 'technical nutrients' that are designed for perpetual recycling via manufacturing, or 'biological nutrients' that can be 'recycled' by natural systems. If

[21] According to Fedrigo and Tukker, these have shown that prosperity does not depend entirely on income, and that prosperity in Western nations in the past 40 years did not grow despite massive economic growth.

humans are truly going to prosper, we will have to learn to imitate nature's highly effective cradle-to-cradle system of nutrient flow and metabolism, *in which the very concept of waste does not exist*."[22]

Goals should also be inspiring and positive. Crompton (2010) calls out the importance of inspiring new visions. Writing about "downshifting," Peattie and Peattie (2007) note "the consumption reduction agenda must offer a vision of an enhanced quality of life that doesn't rely on continued and increased levels of consumption."

Support for this concept extends beyond academia. The business groups BSR and World Business Council for Sustainable Development both make extensive use of the "ecological footprint" and/or "one shared planet" concept in their literature (BSR 2010; WBCSD 2010). The World Business Council for Sustainable Development recently released its "Vision to 2050": "In 2050, around 9 billion people live well, and within the limits of the planet." The report states that the Vision may seem utopian but that since the world will be radically different in 40 years, the Vision provides a star to steer by today, based on the observations, projections and expectations of the companies and experts. It is intended to help leaders across government, businesses and civil society avoid making the mistakes of the past – specifically, making decisions in isolation that result in unintended consequences for people, the environment and planet Earth (WBCSD 2010).

Randall Krantz (2010), of the World Economic Forum, writes that "Although the vision of sustainable consumption may be daunting and unclear at times, leaders are more commonly discussing ideas around a long-term vision of a closed-loop, low-carbon economy with zero wastes."

Timmer et al. (2009) call for development of long-term sustainability visions and targets that address the scale and urgency of the issue (for example, genuine progress indicators and indexes of well being, carbon neutrality, and absolute reductions in household ecological footprints). The authors also highlight the need for sustainable household indicators to monitor at the household and systems levels, and make progress transparent.

The literature also critiques shortcoming and common misuse of gross national product as a measure of social well-being. Knight and Rosa (2011) demonstrate that beyond a fairly low threshold, rising per-capita GNP does not correlate with increasing well-being. Fedrigo and Tukker (2009) argue for going "beyond GNP" and replacing quantity with quality as a measure of success. BSR (2010) observes:

> "In 2009, French President Nicolas Sarkozy suggested that a population's well-being should be measured along with its financial output to create a complete picture of the country's economic performance... Sarkozy's suggestion echoes a rising chorus of researchers and economists who point out that while GDP measures all final goods and services produced in a country in a given period, it includes many items that do not help... well-being... (and) it does not account for the real value of human and natural capital and a broad range of its services. More countries are publishing or developing national well-being accounts as a way to capture noneconomic dimensions such as health, education, and clean environment and safe streets."

[22] Please refer to this DEQ briefing paper (specifically, discussion of "Cradle to Cradle") for additional details on this approach.

Product stewardship

Product stewardship is an environmental management strategy where all parties involved in the design, production, sale and use of a product take responsibility for minimizing environmental impact throughout the stages of the product's life. Product stewardship can help reduce the impacts across the life cycle of products (Oregon DEQ 2010).

Product stewardship addresses the full life cycle of products, and many different types of actions fall under the broader umbrella of product stewardship. Several of these actions are mentioned here but explored more fully elsewhere in this literature review.

Product stewardship is commonly associated with producer responsibility for end-of-life management, but includes a wide range of other tools and mechanisms including (Stitzhal 2010; Five Winds International 2009):

- Developing clear policy or statement of intent to promote design changes that will improve environmental outcomes across the life cycle (e.g., in a solid waste plan, legislative preamble, agency white paper).
- Leveraging purchasing power (e.g., Electronic Product Environmental Assessment Tool, Top Runner) – combining regulatory targets and market-driven incentives (preferential purchasing, third-party certification) to stimulate continuous improvement (in extraction, production, use and disposal phases).
- Restricting materials (e.g. Restriction on Hazardous Substance, non-compostable food service packaging).
- Undertaking research that can inform future product stewardship policies (e.g., life cycle analysis for targeted products and materials).
- Providing information that allows consumers to choose products or packaging with better environmental performance over the life cycle.
- Operating and supporting programs that include baseline data, clear targets for collection, performance goals, reporting standards and clear goals for design improvements and other life-cycle improvements.
- Developing statewide priorities for product categories and articulating a clear step-by-step process for program development that includes design and life-cycle elements.
- Identifying and adopting existing standards (e.g., purchasing, energy).
- Providing feedback to manufacturers:
  - Prioritizing policy instruments that foster direct feedback to manufacturers (individual producer responsibility) rather than third-party organizations that pool responsibility.
  - Government purchasing preferences.
- Information disclosure such as product declarations, mandated reporting and "light of day" policy requirements.

Chemical policy reform

Chemical policy reform involves legislated changes to how chemicals are allowed into the marketplace. It is intended to reduce use of toxic chemicals in production and products.

"With global chemical production projected to double over the next 24 years, federal policies that shape the priorities of the U.S. chemical enterprise will be a cornerstone of sustainability. To date, these

policies have largely failed to adequately protect public health or the environment or motivate investment in or scientific exploration of cleaner chemical technologies, known collectively as green chemistry. On this trajectory, the United States will face growing health, environmental, and economic problems related to chemical exposures and pollution." (Wilson and Schwarzman 2009)

Wilson and Schwarzman (2009) state that "new chemicals policies must confront multiple challenges: a backlog of unexamined chemicals; ineffective means of phasing out chemicals of concern; and the need for methods to apply emerging science on chemical hazards, such as endocrine disrupting chemicals, to inform precautionary decision-making. New approaches should enable action in the face of scientific uncertainty and should account for interrelated factors affecting human health and ecosystems."

Better information is also needed. Denison (2009) identifies 10 elements that can facilitate a shift toward knowledge-driven policies that motivate the development of information sufficient to provide a reasonable assurance of chemical safety.[23]

Allen and Dinno (2011) identify opportunities specifically for Oregon to take leadership in sustainable chemicals policy:

1. Strengthen coordination and development of shared goals among agencies.
2. Prioritize the most hazardous chemicals, the most vulnerable people and the most sensitive and most toxic environments. The authors identified the following priorities:
    a. Target biomonitoring programs on areas with known health disparities.
    b. Enhance monitoring programs focusing on water bodies that do not currently meet standards for particular uses or where endangered or threatened species may be at risk.
    c. Require more complete information on consumer products.
    d. Build on and expand access to searchable databases with industry-specific information about safer alternatives.
3. Provide incentives for identifying and developing safer alternatives to the most highly toxic chemicals. Align priorities and resources of the state's university-based research centers with the needs of leading industry sectors.
4. Promote education and workforce development to lay the foundation for long-term innovation.

[23] Denison's 10 elements are:

1. Establish a policy and develop and apply criteria to identify and act to control all chemicals of concern.
2. Separate scientific decisions as to whether a chemical is of significant concern from policy decisions as to how best to address such concerns.
3. Eliminate the all-or-nothing approach to regulation under federal chemical regulation (Toxic Substances Control Act).
4. Shift the burden of proof from government (to demonstrate harm) to industry (to demonstrate safety).
5. Require comprehensive hazard information as a condition for existing chemicals to remain on, and for new chemicals to enter, the market.
6. Require robust data on chemical uses and exposures.
7. Improve integrity and credibility of industry-generated data.
8. Broaden public access to chemical data.
9. Tighten conditions under which industry can claim its submissions as confidential business information.
10. Federal policy reform should allow state governments to undertake more protective actions.

Abolishing virgin material subsidies

A variety of tax and other policies currently subsidize the use of virgin materials. Subsidies can take many forms:

- tax advantages
- direct transfer payments
- below-market loans and insurance
- loan guarantees
- below-market leasing policies
- subsidized energy and water use.

Subsidies for virgin materials industries tend to lower the cost of extraction, production and/or disposal. These subsidies can make reducing, reusing and recycling materials seem less economically attractive than they really are, especially compared to extracting, fabricating and discarding virgin materials (National Recycling Coalition 1999).

For the market economy to function efficiently, prices of goods and services should reflect the full or true costs imposed on society by their extraction, production and disposal. If some goods or services are artificially underpriced, either because they are subsidized or their environmental costs are not internalized, consumers cannot make educated decisions and may make choices detrimental to society's well being. Efforts to eliminate these subsidies aim to level the playing field between virgin and recycled materials.

The National Recycling Coalition (1999) recommended these subsidies be targeted for immediate action subject to feasibility:

- Require bonding levels to be raised for mine closure and reclamation
- Levy user fees on virgin materials to cover the cost of past site remediation
- Replace percentage depletion allowances for extraction of oil, gas, aggregates and metals with standard depletion treatment
- Upgrade Subtitle D standards to ensure long term landfill liabilities are not being shifted to the public
- Eliminate cross subsidies to large industrial electricity users with focus on federally-owned power facilities whose major customers are virgin industries.

Taxing pollution and unsustainable resource use

Governments can shift from taxing labor income (and savings) to taxing pollution and/or unsustainable resource use, and such shifts are already underway in some nations (Fedrigo and Tukker 2009; OECD 2008; Maniates 2010; Salzman 1997). Pollution taxes affect both production and consumption patterns by incentivizing product design change and reductions in the consumption of high polluting products. When designed properly, pollution taxes can achieve pollution control goals at the least cost to the economy while creating revenue for governments (Dower and Repetto 1994; Sumner, Bird and Smith 2009).

Among pollution taxes, the example with the most literature reviewed for this report is the carbon tax, although the principles may be relevant to other pollution taxes. A carbon tax places a fee on the carbon dioxide emissions from burning fossil fuels (Carbon Tax Center 2010). Compared to cap-and-trade

policies, carbon taxes are expected to generate more net benefits, continuously encourage emissions reductions, be easily administered, create revenue, and decrease volatility in the market. The design of carbon taxes varies based on the tax base, tax rate and revenue distribution method (Sumner, Bird and Smith 2009).[24]

However, carbon taxes have three main potential disadvantages (Bruvoll and Larsen 2002). First, the tax's net benefits are unequally distributed, establishing winners and losers. Unless careful mitigation is attempted, these taxes are often regressive and disproportionately burden low income brackets. Second, negative public attitudes towards taxation reduce the political feasibility of establishing a carbon tax (Sumner, Bird and Smith 2009). Lastly, only a few carbon taxes have been implemented, making it difficult to measure their effectiveness and success.

Studies have attempted to quantify the impact of carbon taxes on reducing CO2 emissions. Some evidence shows countries that instituted taxes in the early 1990s have achieved CO2 emission reductions, as high as 15 percent (Sumner, Bird and Smith 2009). In a study of Norway's carbon tax, Bruvoll and Larsen (2002) found a 2.3 percent reduction in total national CO2 emissions as a result of the implementation of a carbon tax between 1991 and 1999.[25]

Voluntary agreements with industry

Government can convene meetings with businesses in selected industries and enter into voluntary agreements that lead to more sustainable production practices and/or product offerings for consumers.

There are several examples of voluntary initiatives on the part of producers and retailers, some driven by government and private sector agreements. One example involves the Courtauld Commitment. In 2005, the Waste and Resources Action Programme of the United Kingdom convened a meeting of grocery retailers and the British Retail Consortium, as well as the UK environment minister, to set goals, share best practices, monitor progress and develop further initiatives to address packaging and food waste growth. Retailers worked with WRAP
to develop new packaging strategies, consider alternative packaging materials, support household food waste reduction initiatives, set company targets and share best practices. The first objective of halting packaging growth was achieved in 2007 despite growth in the grocery sector. Progress is being made on other fronts like reduced household food waste to landfills. Making progress on reducing the impacts of the supply chain has been more challenging, resulting in only small improvements (WRAP 2011a).

Voluntary initiatives and codes can be more flexible than legislation. A problem remains, however, in the lack of enforceability. A 1999 report by the Organisation for Economic Cooperation and

[24] Carbon taxes are most commonly placed on gasoline, coal and natural gas, with tax rates varying from as high as $105 per metric ton of CO2 in Sweden to $0.045 per metric ton of CO2 in California's Bay Area Air Quality Management District (Sumner, Bird and Smith 2009). Tax revenues can be 1) directed to carbon mitigation programs, 2) directed to individuals through measures such as reductions in income taxes, or 3) used to supplement government budgets. The United Kingdom and British Columbia use "revenue-neutral" mechanisms which are designed to change consumer behavior while reducing other taxes (Sumner, Bird and Smith 2009). These revenue-neutral policies are beneficial because they can be used to lower income taxes and spur new employment opportunities. Additionally, to mitigate the regressive nature of the carbon tax, some policies include income tax reductions and credits to low-income households (e.g. British Columbia's carbon tax). Lastly, researchers indicate the importance of designing the tax policy so that rates automatically increase if emissions reduction goals are not met (Sumner, Bird and Smith 2009).

[25] Bruvoll and Larsen concluded that Norway's tax, as currently designed, has limited potential for reducing CO2 emissions because of the high number of fossil fuel-intensive industries that are exempt from the carbon tax.

Development reported that it was impossible to confirm whether or not negotiated approaches were effective tools of environmental policy (cited in Sustainable Consumption Roundtable 2006). The UK report states that, "It is critical to avoid 'lowest common denominator' industry standards on sustainability and rather than building consensus agreements, targets should be set by Government in conjunction with the 'best in class' rather than the laggards or conservative industry associations" (Sustainable Consumption Roundtable 2006).

Public outreach: broad (sustainable consumption, values)

Government can engage the public with information and outreach on sustainability and sustainable materials management. This engagement is divided here into two types: broad engagement that addresses larger issues of sustainability and values; and narrower, focused engagement that aims to change specific behaviors. The goal of both is to facilitate more sustainable consumer behavior.

There is considerable agreement in the sustainable consumption literature that:

- above a threshold where basic needs are met, more consumption does not necessarily translate into more happiness
- the ability to change individual behavior through broad-based education and social-marketing techniques is limited
- consumption behavior is heavily influenced by institutional (society, government and political institutions) and structural (e.g., access to mass transit and sustainable products) constraints
- even if individual behavior change is successful, if piecemeal and not connected to a broader civic engagement, it will not be enough to address the daunting environmental problems we face.

Please refer to separate DEQ briefing papers on sustainable consumption and challenges to sustainable consumption for additional details on these (and other relevant) findings.

In this context, public outreach can focus in several different ways. The approach here involves high-level, broad outreach regarding sustainability, consumption and values. More narrowly-focused outreach specific to individual targeted behaviors, is discussed in the next section.

Jackson (2005) contends that government needs to get its message straight on sustainable consumption. He notes that policymakers are often uncomfortable with the idea that they have a role in influencing people's values and aspirations. However, government already intervenes in a myriad of ways, including: the importance accorded to economic indicators, the structuring of education, procurement policies, planning guidelines for public spaces, wage policy and product standards.

Various researchers (cited below) emphasize the need to articulate the meaning and importance of sustainable consumption to the general public, local government, business, non-governmental organizations, and other institutions. Researchers describe the need as existing within the contextual environment that frames how we think about consumption and the big structural and institutional arenas that may determine the consumption choices that are ultimately promoted, accessible and deemed culturally desirable.

Researchers suggest that government (and others) reframe the topic of sustainable consumption with the following actions:

1. Articulate the environmental case for sustainable consumption based on science and environmental realities. For example, Szasz (2009) believes that for the material impact of "earth friendly"

consumption to be significant, there must be a high degree of citizen agreement that climate change is real.

2. Address the need for systemic change as it relates to institutions and structures (e.g., access to healthcare and childcare, access to public transit, regulations, market structures) and the potential for sustainable consumption. (Schor 2010b; Crompton 2008; Jackson 2005).
3. Address the values, as well as cultural and societal biases, upon which norms are based. Crompton (2008) makes a case for bringing to the forefront "values that may not predominate in public discourse but are critical to moving the change that needs to occur."[26]
4. Develop a better understanding of frames and how they influence values and decision-making, and support opportunities to engage stakeholders in discussions about frames (Crompton 2010).[27]
5. Develop alternative measures of well-being (Timmer, Prinet and Timmer 2009; Schor 2010b). The widespread assumption that increasing levels of consumption will always lead to increasing well-being and happiness has been convincingly disputed. Government needs to articulate this; otherwise, the argument will be made that the environment needs to be sacrificed in order to satisfy the well being of humans (via increased consumption) (Knight and Rosa 2011).
6. Address negative perceptions of sustainable consumption including those related to cultural and societal norms and ideas that reducing consumption will hurt the economy and result in personal deprivations.[28] At the same time, recognize that "…not everything is about reduction . . . sustainability requires an *increase* in community, personal autonomy, satisfaction from honest work well done, intergenerational solidarity, cooperation, leisure time, happiness, ingenuity, artistry and beauty of the built environment." (Fedrigo and Tukker 2009)
7. Offer a vision of an enhanced quality of life that doesn't rely on continued and increased levels of consumption (Peattie and Peattie 2007). Strategies must focus on achieving comprehensive behavioral change by creating supportive social environments, fostering a sense of community, and imparting shared values. And this should be coupled with alternative behavioral opportunities (Tukker, Cohen, Hubacek and Mont 2010), including reduced workweeks and job sharing (Schor 2010b; Sanne 2000; de Graaf quoted in Maniates 2010).

Public outreach: narrow (targeted behaviors)

Various researchers conclude that education can be a useful role for government and others ***if*** it is part of a more comprehensive program or campaign that uses multiple tools.

The Organisation for Economic Cooperation and Development's 2008 report "Promoting Sustainable Practices in OECD Countries" states, "Education can be a powerful tool for providing individuals with appropriate skills and competencies to become sustainable consumers." However, the report also warns that OECD countries have commonly used public communications campaigns to provide information and raise awareness and that generally these efforts have not been very successful in promoting sustainable consumption patterns or lifestyles.

[26] In critiquing social marketing, Crompton (2008) states that social marketers are right to emphasize the importance of social context, but that says nothing about the values on which those norms are based. He also emphasizes the importance of personal motivations when a systemic shift in public acceptance and engagement will be needed to create the demand for significant change.

[27] Cognitive scientist George Lakoff defines frames as "the mental structures that allow human beings to understand reality – and sometimes to create what we take to be reality." Facts play only a partial role in shaping people's judgment and emotion is far more important. Lakoff argues that if the facts don't fit a person's values, "the facts bounce off." (quoted by Crompton 2010)

[28] Fedrigo and Tukker add that this will be necessary to move us toward consumption reduction rather than consumption shifting. Further, those engaged in outreach should distinguish between efficiency and sufficiency, and address the public as citizens, not consumers.

The OECD report (2008) describes more recent campaigns, some with documented success, that have focused on single issues, as well as broader efforts that aim to change both consumption and social norms. Some have used one primary tool (e.g., a print campaign) while others have used multiple tools.[29,30,31]

These examples as well as various research papers emphasize the following for effective education:

- Information alone will not drive sustainable consumer behavior and green innovation, so education must be coupled with other approaches such as choice editing (Sustainable Consumption Roundtable 2006).
- Ensure education efforts reflect values consistent with sustainability (Lakoff quoted in Maniates 2010; Crompton 2008; Timmer, Prinet and Timmer 2009).
- Focus on actions that have a large impact, not small-impact actions. There is little evidence that encouraging individuals to adopt simple and easy behavioral changes will motivate them to engage in more significant changes (Crompton 2008). In fact, there is some evidence that incremental actions may undermine deeper change (Timmer, Prinet and Timmer 2009).
- Provide specific tools for changes at the household level such as access to user-friendly databases with detailed and current information on life-cycle environmental, social, economic impacts of products and socio-economic characteristics of current consumption patterns (Scholl, Rubik, Kalimo, Biedenkopf and Soebech 2010).
- Support campaigns that engage people collectively in assessing impacts, making personal changes at the household level and, in some cases, even becoming change agents. Jackson (2005) observes that "Behavioral change must occur at the collective, social level … Research suggest(s) that learning by trial and error, observing how others behave, and modeling our behavior on what we see around us provide more effective . . . avenues for changing behaviors than information and awareness campaigns."

Direct financial incentives for consumers

Government can provide - or require that producers provide - direct financial incentives to consumers, with the intent of changing consumer behavior. Subsidies and incentives have worked well at

[29] For example, New Zealand mounted a print campaign entitled *The Big Clean-Up* to focus on, among other things, transport-related pollution. Monitoring showed that campaign awareness among consumers was 50 percent and 12 percent of those polled had changed their behavior (OECD 2008).

[30] Some campaigns have focused on developing change agents and moving specific populations towards deeper and more sustained sustainability efforts, including those that support co-benefits such as socially-conscious consumption. The National Youth Affairs Research Scheme sponsored *Sustainable Consumption: Young Australians as Agents of Change*, which listed techniques to empower students to change their consumption patterns and act as catalysts for more sustainable lifestyles in the wider community. Italy, which chairs the Marrakech Task Force on Education for Sustainable Consumption, has set up a network of "Schole Futuro" or schools of the future which teach and practice environmental and social sustainability (OECD 2008).

[31] A November 2011 report from the United Kingdom's Waste & Resources Action Programme found that WRAP's Love Food, Hate Waste program resulted in a 13 percent reduction in household food wasting (prevention of food wasted prior to composting or disposal) from 2006-07 to 2010. This equals an estimated annual reduction in CO2e emissions by 3.6 million tons, water usage by 1 billion liters, and 1 million tons less food waste to landfills. The program involved major retailers and brands, the media, households and more than 300 local authorities in messaging and activities that promoted more sustainable purchasing, storage, preparation and use of foods. Local authorities participated in road shows, cooking demonstrations and other community activities. Institutional changes included in-store promotion of sustainable practices and changes by brands to make packaging easier for longer-term storage and use of food, offering smaller loaf sizes, and simplifying date labels (e.g., use by…) and storage guidelines.

significantly increasing purchases of low-emission, hybrid or alternative fuel vehicles in some countries. There has been widespread use of subsidies and incentives to spur energy efficiency measures in homes (insulation, water and space heaters, solar heating).

A broader incentive approach to encouraging sustainable consumption is the *Nu Spaarpas* scheme launched in Rotterdam, the Netherlands, in 2002. Consumers earn green points when they separate waste for recycling, use public transport or purchase locally produced, fair trade, or environmentally preferable products. The points can be redeemed for public transport tickets or discounts on sustainable goods. In this way, incentives are provided to change consumption behavior when both earning and spending the points. By the pilot's end in late 2003, 10,000 households had earned the card, more than 100 retail outlets were participating, and 1.5 million points had been issued (Sambeek and Kampers 2004).

Media standards, literacy

In contemporary society, the communications media – including but not limited to marketing – plays a powerful role in encouraging levels of consumption that are not sustainable. Standards on media can influence not only individual consumption choices, but also deeper, more fundamental values and frames by which individuals choose how and what to consume.

Jackson (2005) emphasizes the importance of media in social construction of identity. He observes that control of important symbolic resources lies mainly in the realm of the marketing strategies of corporate actors, who have a vested interest in controlling them, and a long and sophisticated experience in effecting this control. Jackson goes on to note: "The commercial nature of this relationship is particularly problematic where children are concerned. From about the age of five onwards, social and developmental psychology suggests that (influence) shifts gradually away from parental influence and towards the peer group... at least until the early teens, this peer group lacks the critical faculties needed to resist, select or accommodate the complexities of these (marketing) messages. It is precisely for this reason that some Nordic countries have banned advertising for those under 12, and why the UK National Family and Parenting Institute has called for similar measures."[32]

Linn (2010) states that "marketing is linked to a host of public health and social problems facing children today." She observes that in the U.S., marketers spent some $17 billion targeting children in 2010, compared to a mere $100 million in 1983. She notes that "the underlying message of nearly all marketing... is that the things people buy will make them happy... immersing children in a message that material goods are essential to self-fulfillment promotes the acquisition of materialistic values (and)... children with more materialistic values are …less likely to engage in environmentally sustainable behaviors."

Andersen and Miller (2010) discuss the importance of media literacy, both for younger people and adults, calling media literacy a "cornerstone in the transition to sustainable cultural practices" and "no longer an option for... citizenship but a necessity for social development and civic engagement." A main goal of media literacy education is to find ways to encourage media users to actively engage through critical awareness and creative media skills. The authors note a variety of programs such as school curriculum (voluntary and mandated), provision of teaching tools, and public outreach.

[32] In addition to Norway and Sweden (noted by Jackson), the province of Quebec prohibits television advertising to children under 13. In Greece, advertisements for toys cannot be broadcast before 10 p.m., and ads for war toys are prohibited entirely. France has banned programs on broadcast television aimed at children under the age of three (Linn 2010).

Shift consumption to investments in natural capital[33]

Increasing investments in natural capital (i.e. restoring the natural environment) results in less money available for consumptive activities. Sanne (2000) proposes this approach as one of several possible responses to a core dilemma: continuing gains in efficiency tend to enhance the volume of consumption and production, with associated environmental impacts that undo the benefits of efficiency (the rebound effect). What is needed, in Sanne's view, is to circumvent that process by reducing the amount of money flowing between consumers and producers in the first place. One way to do so is to redirect funds to restoring the natural environment.

Drawing heavily on the work of economist Herman Daly, Sanne (2000) suggests that surplus resulting from economic efficiencies could be redirected to preserve natural resources, also called "natural capital." Securing an anticipated future with growing populations requires not only that we preserve nature but also enhance its power to serve humans.

A distinction is made between renewable and non-renewable resources. Projects that exploit non-renewable resources should be required to implement a "twin" project, generating a stock of renewable assets which will eventually produce the same yield (income) sustainably as the non-renewable one that is being exploited. An example would be that extraction of petroleum should be conditioned on the planting of forests which can supply raw materials when the oilwells run dry. A shortcut to this approach is to demand that the price for a non-renewable asset should correspond to the nearest renewable substitute (Sanne 2000).

Voluntary donations (such as to land trusts) are one way to redirect money from consumption to natural capital. But to achieve sustainability, Sanne believes that purely economic signals are insufficient and measures for sustainability will have to be supported by legal means (Sanne 2000).

Changing how we work, share and cooperate

Through tax, labor, land-use and other laws, government already exerts considerable influence over how and how much people work, share and cooperate (or not). Changes to government policies can influence these fundamental realms of consumer behavior, with resulting impacts on materials management.

Jackson (2005) describes material goods and services as deeply embedded in the cultural fabric of our lives: a means to satisfy our needs and desires, communicate with each other and negotiate important social relationships. He suggests that behavior change initiatives will encounter considerable resistance unless they find substitutes for these important societal functions. Motivating sustainable consumption will require building supportive communities, promoting inclusive societies, providing meaningful work, and encouraging purposeful lives.

[33] The term "natural capital" refers to natural resources and ecological systems that provide vital life-supporting services such as food, fiber, nutrient regulation and climate control. For example, natural capital in the form of healthy ocean ecosystems provides humans with fish, an important food source for many. If we manage this natural capital wisely, we can maintain a flow of "dividends" (harvest) in perpetuity. However, if we deplete this natural capital (for example, through ocean pollution or overharvesting), then future services (fish available for catch) will be diminished.

John de Graaf cites the prevailing focus on "consumer shifting" rather than "consumption reducing" as an obstacle to choice editing. He suggests that one way to get the public to reduce consumption is to make it attractive for people to trade work for leisure (time) in ways that would lead to a voluntary reduction in income (with resulting reductions in consumption) (quoted in Maniates 2010).

Sanne (2000) makes a similar argument, observing that due to ongoing technological improvements that reduce the need for labor, "the cherished political goal of full employment seems increasingly impossible to attain... This suggests a revival of the long-standing proposals for a reduction of the working time of each employee. Technological progress would be directly transformed into leisure as an alternative form of welfare, in contrast to higher consumption... Notions of material saturation, which are held by many people, can be lined up with their concern with nature."

Schor (2010b) disputes the notion that the growth economy or business as usual will get us out of our economic fix or that strategies like dematerialization and decoupling environment impacts from products, without addressing the increasing desire to consume and the lack of social connection and meaning in our lives, will solve our environmental crisis.

In Schor's 2010 book, "Plentitude: The New Economics of True Wealth," she describes the principles of "plentitude" and calls for shifts in how we function in more sustainable communities. Her recommendations include the following:

- New allocation of time – Reverse the trend of working long hours.[34,35] Schor and de Graaf both describe how shorter workweeks, job sharing or more time off in vacation and sabbaticals can be achieved.[36,37,38]

[34] Annual work hours in U.S. exceed those of Germany, France, Italy and the Netherlands by an average of 270 hours or 6.5 weeks annually (based on a 40-hour work week). Polls show that U.S. residents want more time in their lives. Shorter work weeks will expand the number of jobs, reduce unemployment and provide opportunities to grow the green job sector.

[35] Schor also notes that if we earn less, we spend, emit and degrade less. A study by the Center for Economics and Policy Research estimates that if the U.S. were to shift to working patterns of Western Europe, energy consumption would decline by about 20 percent. Fewer work hours affect the mix of products purchased. Shorter work hours create more time wealth to use in slower, less resource-intensive activities like walking, biking, use of mass transit, hanging clothes on line, gardening and cooking. A French study, after controlling for income, found that households with longer working hours increased spending on housing (larger houses; more appliances), transport (reduced use of public transit), and hotels/restaurants. These have been identified as three of the most environmentally damaging categories of household expenditures on a number of metrics.

[36] A voluntary "downshifting" trend has helped to reduce some of the stress that characterized U.S. culture in the 1990s and is part of the reason that the escalation of annual hours slowed after its rapid increase in the 1980s and early 1990s. Beyond this shift, many are embracing voluntary simplicity as a way of living which requires smaller incomes and allows for less time put into earning money (Schor 2010a).

[37] Employers have attempted to avoid layoffs by instituting company-wide cutbacks in schedules, furloughs and other work reduction measures. This ethic of sharing work has not been widely seen in the United States since the 1930s. A Hewitt Associates study found that, out of 518 large companies surveyed, 20 percent had cut hours. A Towers Perrin study of companies found even more significant cuts: 40 percent had instituted a furlough and 32 percent, a shorter workweek. Schor believes that many workers—particularly those who get a three-day weekend—will adjust to the lower incomes and decide not to resume a five-day schedule (Schor 2010a).

[38] Government initiatives have also supported a reduction of work hours in some places, and new initiatives are underway. For example, Take Back Your Time, a U.S. non-governmental organization, has been exploring the possibilities for about a decade and cites the Hours Adjustment Act in the Netherlands and France's 35-hour week. The Netherlands has the highest percentage of part-time workers and the shortest working hours in the world, partly due to government policy initiatives. European Union law requires pay and benefit parity for part-time workers who do the same work as full-timers. The Netherland's Work and Care Act and the Hours Adjustment Act encourage parents to share 1.5 jobs, each working three quarters time, by requiring that employers allow workers to reduce their hours while keeping the same hourly rate of pay and prorating the benefits. This benefit applies to childless employees as well. In other European countries, innovative laws allow

- Move towards self-provisioning and small businesses – Create/build/produce at individual and community levels to meet needs (gardening, home repair, canning) and develop small community-based businesses.[39]
- Utilize secondary markets, where the incremental footprint is largely transportation. Due to overproduction, we have enormous inventory of products that are no longer of much value to original owners: eBay; Craigslist; specialized web resellers; used clothing.
- Shrink and repurpose homes and share resources (Zipcar; community tool sheds, collective bike programs).

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for such things as regular sabbaticals, phased-in retirement and guaranteed days of rest, while sharply restricting long hours and overtime work (de Graaf 2010).

[39] According to Schor, this scale of enterprise allows for skill acquisition, has low capital requirements and encourages small-scale production rather than a production scale that results in over-production. Sharing is another way to reduce consumption: childcare, transportation, harvesting, tool sheds.

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