

## Chapter Seven

# Sustainability

### 1. Introduction

“Imagine, if you will, three overlapping circles — one representing economic needs, one representing environmental needs, and one representing community or social needs. The area where the three circles overlap is the area of sustainability, the area of livability — the area where all the threads of quality of life come together.

“If we are to ‘have it all’ we must recognize that these three circles are not separate, unrelated entities. Rather they are the common desires and aspirations of all Oregonians and we must therefore strive to ensure that our efforts result in simultaneously meeting environmental, economic, and community needs throughout our state.”

—Governor John Kitzhaber, “Can We Have It All?” August 28, 2000

When recycling cans, bottles, and paper was new, it seemed terribly inconvenient. Today, recycling is so commonplace that it doesn’t warrant a second thought. But what about other impacts on the health of the environment and communities? From the food to transportation choices - from fertilizers and pesticides to home cleaners - from the goods and services purchased to participation in local government and community organizations - all Oregonians contribute to sustainability in the state.

The State of Oregon defines sustainability as: using, developing, and protecting resources at a rate and in a manner that enables people to meet their current needs and also provides that future generations can meet their own needs. Sustainability requires simultaneously meeting environmental, economic, and community needs.

Terms introduced in this chapter include:

Cathode Ray Tubes  
 Certified Wood  
 Compact Fluorescent  
 Embodied Energy  
 Extended Producer Responsibility  
 Green Building  
 Life Cycle  
 Polyvinyl Chloride  
 Product Stewardship  
 Sustainability  
 Stand By Watts  
 Voluntary Simplicity  
 Zero Waste

### Goals for Sustainability

- Increase the economic viability of all Oregon communities and citizens.
- Increase the efficiency with which energy, water, material resources, and land are used.
- Reduce releases of land, air, and water pollutants that are harmful to human health
- Reduce adverse impacts on natural habitats and species.

### 2. What’s Being Done

#### A. The Natural Step

Karl-Henrik Robèrt, one of Sweden’s leading cancer researchers, has created a concept and organization called The Natural Step, the purpose of which is to develop a framework of easily understood, scientifically based principles that serve as a guide to a sustainable future.

While working as a research scientist at a cancer institute in Sweden, Dr. Robèrt felt that progress in response to environmental problems was being stopped by disagreements over details, preventing society from addressing the issues. To

remedy this, he asked 50 scientists to help him draft a paper that would outline principles that would define a sustainable society. After 21 drafts, four rules by which human society must play if it is serious about its own sustainability were developed.

**Natural Step's Four System Conditions:**

- **In nature, concentrations of substances from the Earth's crust are not increased.** Fossil fuels, metals and other materials must not be extracted at a faster pace than their slow redeposit into the Earth's crust.

Practical application: Use less material or close the loop.

- **In nature, concentrations of substances produced by society are not increased.**

Substances must not be produced at a faster pace than they can be broken down and integrated into the cycles of nature.

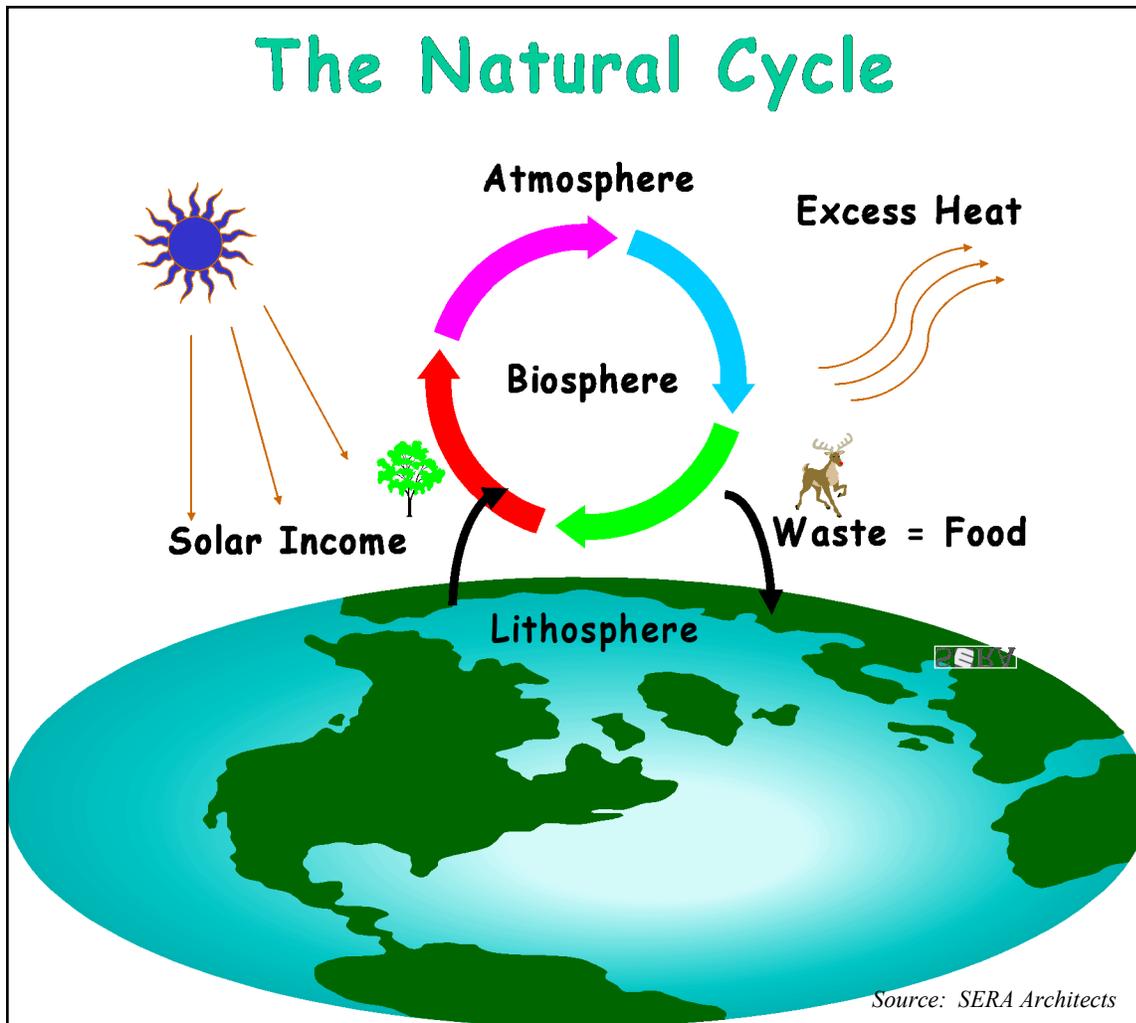
Practical application: Reduce dependence on synthetic materials and close the industrial loop.

- **In nature, degradation by physical means is not increased.**

The ecosystem must not be harvested or manipulated in such a way that productive capacity and diversity systematically diminish.

Human health and prosperity depend upon the capacity of nature to re-concentrate and restructure wastes into resources.

Practical Application: Preserve biodiversity and review production techniques.





- **In society, there are no structural obstacles to people’s health, influence, competence, impartiality and meaning.**

Basic human needs must be met with resource-efficient methods, including a just resource distribution.

Practical application: Do more with less and include everyone.

The principles of The Natural Step are about thinking and acting in harmony with the cyclical processes of the Earth. This provided people at “all levels - households, corporations, local authorities, nations” with a framework for living. It is like a compass. It is not prescriptive. It frees people to create solutions that produce sustainability and also save money and create new opportunities. This transforms the way individuals, communities, and businesses think about sustain-

ability.

Today, the Earth’s human population has passed seven billion people. Due to the collective actions of the current population, life-supporting systems such as croplands, wetlands, the ozone layer, forests, fisheries, and groundwater are in decline. An increasing amount of waste is being generated which includes visible garbage like landfill rubbish, as well as invisible forms of molecular garbage, like greenhouse gases and CFCs, which are accumulating in the atmosphere.

Author, environmentalist, and board member of The Natural Step/US, Paul Hawken notes, “We are far better at making waste than at making products. For every 100 pounds of product we manufacture in the United States, we create at least 3,200 pounds of waste. In a decade, we

transform 500 trillion pounds of molecules into nonproductive solids, liquids, and gases.”

This “nonproductive garbage,” produced by a linear way of living and working, never finds its way back into the cycles of society or nature to be reused or absorbed. “As we busy ourselves with tearing down more than we rebuild,” Dr. Robèrt notes, “we are racing toward world-wide poverty in a monstrous, poisonous garbage dump. The only thing that can save us from the consequences is the restoration of cyclical processes, where wastes become new resources for society or nature.”

With a continual increase in the Earth’s human population over the coming decades, there will be greater demand for food, water, and other resources. There will also be increased pressure on the capacity of the ecosphere to absorb waste. In the face of such growing demands, and in a world of limited resources, fundamental societal changes are necessary.

The Natural Step has impacted the way corporations do business. Interface, Inc., a multinational carpet and flooring company, found that carpeting lasted for about 12 years. It ended up at the landfill where it would sit for another 20,000 years before it totally decomposed. As a commitment to the Natural Step, Interface now leases its carpet service, replaces carpet tiles as they become worn and recycles old tiles into new ones.

Applying the Natural Step principles has enabled the Collins Pine Foundation to reduce energy consumption, reduce and prevent waste, and increase the yield in their operations. The Collins Pine Foundation has over 200,000 acres of prime timberland that are sustainably managed. In California, they have a 95,000 acre timber tract that has a higher inventory of wood now than in 1943, when they began logging it. In Pennsylvania they own 125,000 acres that was originally logged in the 1850s by their ancestors.

The Natural Step has shifted the conversation from saving the environment to “investing for the future.” According to Dr. Robèrt, companies that do not follow the four system conditions will “hit the wall” and go bankrupt. Companies that see the wall coming will invest in progress.

Several businesses and other organizations in Corvallis have adopted the Natural Step framework as a basis for decision making.

## **B. Green Building**

Over the past few years there has been a significant increase in the demand for green building (also referred to as “sustainable” or “high performance” building). According to the U.S. Department of Energy, the design, construction, and maintenance of buildings has a tremendous impact on the environment and natural resources.

There are more than 76 million residential buildings and nearly 5 million commercial buildings in the U.S. today. These buildings together use one-third of all the energy and two-thirds of all electricity consumed in the U.S. By the year 2010, there may be another 38 million buildings. The challenge is to build them smartly so that they use minimal nonrenewable energy, produce minimal pollution (solid waste, air pollution, etc.), and cost a minimum of energy dollars, while increasing the comfort, health, and safety of the people who live and work in them.

Buildings are a major source of the pollution that causes urban air quality problems and climate change. They account for 49 percent of sulfur dioxide emissions, 25 percent of nitrous oxide emissions, and 10 percent of particulate emissions, all of which damage urban air quality. Buildings produce 35 percent of carbon dioxide emissions, the chief pollutant blamed for climate change. A PBS program in 2005 asserted that buildings for home and business produce more greenhouse gasses than all of the world’s vehicles put together. The rotation of the Earth establishes the flow of air in the hemispheres in such a way that the pollutants from Korea and Japan are choking residents of San Francisco, Portland, and Seattle. The pollutants of Portland and Seattle are contaminating air and water in Chicago, the emissions from Chicago are drifting into New York, the pollution from New York lands in London and other northern European areas, the contaminants from London and Paris are landing in St. Petersburg and Moscow, as around the globe they go. Scientists who have measured these drifts and their destinations call this the “tailpipe” phenomenon. Everyone is in the tailpipe of an upwind polluter.

Traditional building practices often overlook the interrelationships between a building, its components, its surroundings, and its occupants. “Typical” buildings consume more resources than necessary, negatively impact the environment, and generate a large amount of waste. Currently, 20 to 30 percent of North American landfill space is taken up by construction and demolition debris, at least half of which could have been recycled.

Green building practices offer an opportunity to create environmentally sound and resource-efficient buildings by using an integrated approach to design. Green buildings promote resource conservation, including energy efficiency, renewable energy, and water conservation features; consider environmental impacts and waste minimization; create a healthy and comfortable environment; reduce operation and maintenance costs; and address issues such as historical preservation, access to public transportation, and other community infrastructure systems. The entire lifecycle of the building and its components is considered, as well as the economic and environmental impact and performance.

Peter Buchanan, the Curator of the Ten Shades of Green exhibit, The Architectural League of New York, stated “architecture alone cannot create a sustainable culture. It can, however, make a major contribution to the pressing quest to devise ways of life that are less taxing on Earth resources and capacities for regeneration.” Green building merges social, cultural, psychological, and economic dimensions. Each is as important as the technical and ecological. The Ten Shades of Green include the following:

### **Low Energy/High Performance**

The single most effective way to reduce greenhouse gas emissions is to ensure that buildings consume only a fraction of the fossil fuel-derived energy they presently use. Three strategies must be applied to achieve the drastic energy savings required: the whole form and organization of buildings must be shaped to be far less dependent on fossil-fuels; mechanical plants must be more efficient; and each building and its environmental systems must harvest and be fueled by constantly replenished ambient energies.

### **Renewable (Replenishable) Resources**

Much of the destruction wrought on the planet by industrial civilization comes from the use of nonrenewable sources for energy and building materials. To live more gently on the earth, humanity must use the renewable energies of the sun, wind, waves, and gravity. Also important is use of constantly replenished materials such as woods from sustainably managed forests, or nearly inexhaustible materials such as mud, clay (for bricks), and sand (for glass). Buildings may generate their own energy with photovoltaic (PV) panels, or derive energy from wind farms, hydroelectric, geothermal, biomass (vegetal waste) burning plants, and wave or tide-driven turbine generators. Until very recently, tide-driven turbine generators were mounted in poured concrete dams that blocked entire massive estuaries and harmed the inter-tidal areas, marine ecosystems, and large mammalian species. The newest turbines look like wind generators and are freestanding on the ocean floor, swiveling to maximize the directional flow of the tides to turn the blades that turn the turbines to produce electricity. They appear to allow migration of fish and other marine mammals that feed on the fish.

When buildings are built to harness the solar and wind energy that strike planet Earth every day, less of the power that is produced by other sources and transported inefficiently is needed. There are building materials that are so thermally efficient that structures made from them need almost no heating or cooling systems. As buildings begin to produce the power they use and export excess power to buildings nearby, demand for external energy sources will be reduced. In the recent past, finding building materials made from recycled or renewable sources was difficult.

Compendia like *GREEN BUILDING OPTIONS*, *The Green America Green Guide*, and the book *Green Building Products—The GreenSpec Guide to Residential Building Materials* edited by Alex Wilson and Mark Piepkorn, augment the resources assembled in guides published in many major cities in the United States. Many recycled, reclaimed, and thermally efficient building materials are also reusable or recyclable.

## Recycling: Eliminating Waste and Pollution

In nature there is no waste. In the organic cycle, the waste from one creature or process nourishes for the next. Today, humans not only consume or destroy nature's resources faster than they can be regenerated, but they give nothing back to nature. Instead nature is further burdened with waste and toxic pollution. This must be stopped or ways must be found to convert waste and pollution into useful resources. Obsolete buildings, their materials, and components tend to be treated as waste, although many of the materials could be recycled. New buildings and the components they are made from could be designed to be robust and adaptable enough for a long life. These buildings would also be designed so that, if they were to be demolished, their materials and components could be readily recycled.

## Embodied Energy

Buildings use energy, but it also takes energy to make them. This is *embodied* energy, which is all the energy required to extract, manufacture, transport, assemble, and finish a building. As buildings become more energy efficient, the energy required to create them becomes propor-

tionately more significant in relation to that required to run them. This is particularly true because some modern materials, such as aluminum, consume vast amounts of energy to manufacture.

The greenest building material is wood from sustainably managed forests. Wood has the least embodied energy, about 640 kilowatt-hours per ton. Brick is the material with the next lowest amount of embodied energy, 4 times (4X) that of wood (X), then concrete (5X), plastic (6X), glass (14X), steel (24X) and aluminum (126X). A building with a high proportion of aluminum components can hardly be green when considered from the perspective of total life cycle costing, no matter how energy-efficient it might be.

One exception may be the use of interlocking recycled aluminum roofing shingles for those who are installing PV panels on their roofs. Because this roofing never breaks down under weather or from UV damage, it never needs to be replaced. Most roofing decomposes within seven to 15 years and needs to be replaced. Unless an indestructible rustproof waterproof roofing material goes under PV panels, the panels will need to be professionally removed when roofing



Source: SERA Architects

materials need to be replaced.

Every building, no matter what its condition, has a large amount of energy locked into it. This is yet another factor in favor of conserving and restoring old buildings, and for designing long life, loose fit buildings that easily accommodate change. Also, because the energy used in transporting its materials becomes part of a building's embodied energy, this is an incentive to use local materials, thus helping the building to be embedded in place.

### **Long Life, Loose Fit**

Along with conserving nature and energy, green design focuses on conserving old buildings and creating new buildings that lend themselves to being conserved. Many historic buildings are proving more adaptable to reuse than buildings from the recent past. This is because newer buildings are designed to be tailored to a certain function or to accommodate specific mechanical equipment that is in use today. On the other hand, older buildings were not built to such space standards and are thus more versatile. In other words, old buildings are long life, loose fit. They were also built with materials that lasted and, with age, improved visually and in tactility. Green buildings should be long life, loose fit: generously accommodating and generic in organization so as to be adaptable, hospitable and socially convivial, pleasant in character and relatively timeless. They should also be made with robust materials that mellow with age and weathering, as generally do those with low embodied energy.

### **Total Life Cycle Costing**

Green thinking takes the long-term view and looks at the larger impacts of any action on the environment and society. Total life cycle costing is an essential part of such holistic thinking. Even when applied in a narrowly economic manner, life cycle costing demonstrates that green design is a sound investment. It proves that a building's initial capital cost amounts to only a small fraction of the total cost of running and maintaining it. Over the years, the monetary savings from energy efficiency can equal or exceed what the building originally cost. Also, buildings that require less maintenance, and are easier to clean, can recoup several times over any extra

investment necessary to achieve this. If the wages, contentment and performance of the building's occupants are considered, the cost-benefits of green design can prove enormous. During the life of an office building, factory or hospital, the salaries of those who work there amount to several times the building's original cost. The diminished absenteeism and staff turnover, along with the increased productivity typically reported are compelling economic (as well as social and political) reasons for investing in green buildings. Increasingly, total life cycle costing is considered in terms that are broader than economic, and longer term than merely that of the building's life. It is concerned with assessing the total costs—including those to society, local community and individuals, ecology and larger environment, the psyche and sense of the aesthetic—of every aspect of the building, from the extraction, manufacture and transport of its materials, through its erection and useful life to the ultimate recycling of its materials or their degradation back to earth.

### **Embedded in Place**

A green building cannot be designed in the abstract and imposed on a place. Rather than being conceived to produce a self-contained object, the design process must focus on creating a dense web of complex symbiotic relationships with all aspects of the building's setting. This does not imply a single, ideal design approach, but a spectrum of approaches. It proceeds by extensively studying the microclimate, ecology, geology, and hydrology of the site and surrounding area followed by an assessment of how to minimize any negative impacts.

### **Access and Urban Context**

After buildings, transport, particularly automobile use, is the second biggest consumer of energy. Even the most energy-efficient work place, if sited miles beyond access by public transport, does nothing to ameliorate pollution and global warming. Such a building would be even less useful from a green perspective if it were removed from local shops, restaurants, and opportunities to socialize, and housed none of these itself. A building's location, in terms of its accessibility and proximity to a range of other functions, is critical in determining how green that building can be.

## Health and Happiness

Too many contemporary buildings, particularly workplaces where people spend a significant part of their lives, are not only bad for the environment around them, they are bad for the people inside them. Their occupants are deprived of fresh air and natural light, and do not have personal control over the artificial substitutes for them. Nor do they even have a view to the outside. Designed only for efficiency, as defined in the narrowest terms, such buildings do nothing to foster any sort of community life. Many modern building materials and components pollute when manufactured and when installed, poisoning the environment and their occupants, creating 'sick building syndrome.' Green buildings do not use materials that are polluting to the air, earth, water, people, plants, or other creatures. Such buildings and the materials out of which they are made, would be designed for cleaning with non-polluting compounds. Green buildings are pleasant, healthy places for people. Companies moving into them typically report a drop in absenteeism and reduced staff turnover, both of which improve productivity and save money on training. At the most basic level, people are healthier because they are in an environment free of toxins and fumes.

## Community and Connection

The mindset that tolerated destruction of the natural world and the historical legacies left to humanity depended on the suppression of a sense of connection with one another, nature, and the cosmos, as well as to past and future generations. If green architecture is to help bring about a sustainable culture, it must regenerate a sense of community and connection to the natural world.

## Kelley Engineering Center - an Example of Green Building

The Kelley Engineering Center, centrally located on the Oregon State University campus in Corvallis, is the physical centerpiece for the College of Engineering's drive to become one of the nation's top-25 engineering programs.

The new building's design is centered on communication, innovation and responsible environmental design. It houses wireless classrooms, flexible laboratories, office clusters, and com-

mon areas that encourage communication including "plug-and-learn" alcoves built into spaces often underutilized in traditional building designs and an E-café where faculty, staff, students, and industry partners can gather to share ideas.

When it opened in summer 2005, the Kelley Engineering Center became home to the rapidly growing School of Electrical Engineering and Computer Science, providing labs, classrooms, and offices for over 360 professors and graduate students. It was the "greenest" academic engineering building anywhere in United States.

The four-story, 153,000-sq.ft., \$45 million building features extensive sustainable "green" design elements, used to educate students and others about sustainability and renewable energy issues, before, during, and long after construction.

The building achieved a U.S. Green Building Council LEED (Leadership in Energy and Environmental Design) Gold (2.0) rating. The Kelley Engineering Center's numerous "green" building elements include many features typical in LEED-rated buildings:

**Natural ventilation** provides interior spaces with fresh air. An extensive heat recovery system recovers more waste heat from ventilation than standard requirements, and was planned to pay itself off in 3.8 years.

**Daylighting** from a central atrium and windowed walls supplies classrooms, labs, and offices with natural light, cutting lighting energy costs up to 40 percent.

**Total energy use was designed to be reduced** by at least 55% over Oregon Energy Code, based on energy modeling.

**Earth-friendly concrete** reduces CO<sub>2</sub> emissions associated with cement production.

**Bio-planters** around much of the building perimeter use runoff for irrigation and provide outdoor seating.

**Bicycle parking, showers and close access to Corvallis busses** encourage alternative transportation usage.

**Local construction materials** make up at least 20% of building materials, reducing transportation costs and environmental impacts.

**Recycled building materials** were used extensively throughout the project.

**Low-toxicity finishes, fiberboard, and flooring** minimize VOC off-gassing and improve indoor air quality for the life of the building.

**The white roof** is Energy Star compliant with high emissivity and high reflectivity, reducing heat absorption by the roof.

The Kelley Engineering Center also incorporates some innovative and unique features not typical in today's buildings. Such systems and components include:

**Two rooftop solar systems** for electrical generation and hot water production. Water heated by a solar collector will flow to sinks and showers in the building. Additionally, a grid tied 2400-watt photovoltaic system offsets some of the building's electrical use with clean, renewable resources.

**A 16,500-gallon rainwater collection system** provides water to flush toilets and urinals. The combination of water-efficient fixtures and rainwater collection system allow a reduction in water usage of 65%.

**Permeable surfaces** are used on surrounding grounds rather than paved hard surfaces, to mimic natural drainage and minimize need for runoff water control. Individual pavers eliminate expansive concrete surfaces.

**Operable windows** and an underfloor air distribution system allow for more individual control of occupied space to promote the productivity, comfort and well-being of building occupants. Windows and interior transoms are tied to climate controls so the systems respond according to user inputs (open window = heat shutdown).

**A goal was to divert 90% of construction project waste** from landfills. The project exceeded the goal and diverted 99% of construction and demolition waste from landfills.

**OSU encourages process responsibility:** the contractor, Skanska, implemented an environmental management system that is ISO 14001 certified. Skanska implements this

standard at all jobsites, not only LEED jobs.

**The building is used as a learning tool** to allow students, faculty and visitors to experience successful 'green' processes, features and systems. Signage, tours, and curriculum make the Kelley Engineering Center a unique point of interest.

Information about project LEED and Earth Advantage criteria are available online.

"Sustainability Fact Sheet for Kelley Engineering Center Oregon State University" <http://fa.oregonstate.edu/files/sustainability/docs/kelleygreenfeat.pdf>

### C. Extended Producer Responsibility

Due to the costs of recycling and the increase in items that cannot be recycled, communities want manufacturers to take responsibility for materials at the end of a product's life. These concerns have spurred the emergence of extended product responsibility (EPR) or extended producer responsibility legislation. EPR links product design with waste generation. At this level of responsibility, producers are forced to evaluate their design decisions concerning materials, chemical selection, production processes, as well as packaging and marketing strategies.

In designing for sustainability, producer responsibility helps shift the emphasis to materials management "upstream" when the product is being designed, manufactured, and packaged for consumption. EPR policies aim to reduce the amount of waste generated, thereby reducing the amount of waste requiring disposal. EPR policies are also designed to reduce the amount of raw material and natural resources, such as water and energy, that are consumed in the product manufacture and delivery process.

EPR changes the balance of responsibility for the end-of-life management of materials and products. The manufacturers bear some of the responsibility, instead of everything resting on the consumer. This influences the design and production of products to be less toxic, more durable

and more resource efficient overall.

Priorities of waste avoidance:

- Low-waste product design
- Closed loop waste management system where materials resulting from the life cycle of one product are reused in the life cycle of another product
- Teach customers to purchase low waste and low pollution products
- Give priority to material recovery
- Encourage the use of renewable resources

The Oregon Bottle Bill is an early example of producer responsibility legislation. It places the cost of collecting aluminum pop cans and glass bottles on the stores that sell the beverages. Retailers charge a small deposit which is refunded when the customer returns the container. Rather than each consumer bearing responsibility for the container once it is empty, the responsibility is shared with the retailer who sells it. The bottle

### Air Quality

- ◆ Most people spend 90 percent of their day indoors
- ◆ Thirty percent of new and renovated buildings in the U.S. have poor indoor air quality. (IAQ)
- ◆ Since the 1960s, buildings, in order to conserve energy, are being sealed more tightly.
- ◆ Many common building materials emit toxic gasses: plywood, paints, carpets, and carpet adhesives.
- ◆ Four million new chemicals have been added to the planet since 1980; few are fully tested for toxicity.

container law or “bottle bill” has proven effective in controlling litter on roads, parkways, and beaches throughout Oregon. Redemption and recycling of beverage containers conserves energy and resources. In Oregon, recycling activists attempted unsuccessfully to update and expand the Bottle Bill. In June 2007 they succeeded in placing a deposit on water bottles and flavored water bottles. In 2017, the deposit increased from 5 to 10 cents per container. Other changes which were not accepted were routing unclaimed de-

posits away from manufacturers and using the money for waste reduction education and grants.

Unlike the Bottle Bill, new producer responsibility laws single out the manufacturer as the key player responsible for influencing the choices of materials and designs which can be reused and recycled.

Fifteen European countries mandate producer take-back by law. Products that are made for the world market such as cars, appliances, and electronics must meet international take-back and design standards.

European-style producer responsibility mandates have not yet been adopted in the U.S. Many states and local communities are interested in producer responsibility mandates to jump start recycling and waste prevention programs. Enactment of legislation appears to be the only recourse for cities and states whose recycling programs have been impacted by companies not taking responsibility for their products. The following list summarizes the EPR programs being contemplated by some states. Contemplating such programs are Minnesota and California. Minnesota is targeting electronics, carpet, and paint. California wants to control the growth of beverage containers and plastics packaging.

- California - Beverage containers and plastics packaging
- Midwest - Carpeting and electronics
- Massachusetts - Electronics, cathode ray tubes (CRT), and paint
- New Hampshire - Banned mercury goods like thermometers
- British Columbia and Quebec - Paint recycling programs with expanded deposits

Flaws in the European mandates include:

- Tendency to set recovery targets that exceeded the market’s absorption capabilities; duplication of existing waste recovery infrastructures resulting in extra costs
- High costs for businesses in reporting and record keeping
- Reduced competition in the waste management and recycling field

- Potential growth of trade barriers

When considering EPR programs, communities should develop programs that work best for waste diversion in the U.S. Producers should design for recycling and incorporate recycled material into their products.

#### **D. Product Stewardship Principles**

Product stewardship is a component of sustainable development which creates relationships with the environment and with people. The first step is to get groups of government officials, manufacturers, and recyclers to identify their roles and responsibilities. This creates shared responsibility for reducing the environmental impacts of products and packaging. It looks at the life cycle of a product. Everyone who comes in contact with the product after it is in the market place is involved including designers, suppliers, manufacturers, distributors, retailers, consumers, advocates, and governments. The philosophy is that creating partnerships with manufacturers will determine effective collection and management methods, identify market opportunities, and increase the value of collected materials. These partnerships deflect responsibility for the product's disposal because of the number of players involved in the product's useful life.

Many materials that can be recycled are currently being discarded, resulting in lost economic and environmental protection opportunities. Product stewardship programs can lead to packaging redesign for less waste, more opportunities for reuse, reductions of toxics in products, and expansion of safe and effective post-consumer collection and recycling/reuse efforts.

Pollution prevention is an important part of product stewardship. Several toxics, including mercury, lead, paint, and PVC are being targeted for removal before they enter the waste streams.

#### **1) Toxics Being Targeted**

##### **Mercury**

Mercury is a toxic pollutant that can cause neurological damage in humans and animals. Chronic breathing of mercury vapors can cause a range of physical symptoms, including inability to coordinate body movement and impairment of

hearing, speech and vision. Exposure to mercury in other forms can lead to skin rashes and kidney damage. It is also a persistent pollutant - it does not break down in the environment into less toxic forms. Moreover, small amounts of mercury have significant environmental impacts. Mercury in the water "bioaccumulates" in the tissues of fish. It builds up over time and becomes more concentrated.

While mercury enters the environment from a wide variety of sources (including old industrial operations, landfills, etc.), most of the mercury found in the environment today is believed to be deposited on land and in water bodies from air pollution. Products containing mercury also enter the waste stream when they are thrown in the trash or poured down the drain.

Mercury is widely used in a vast array of products and processes because of its diverse properties. Specifically, mercury is used in the following products:

- Lighting - fluorescent, mercury vapor, metal halide, neon, and high-pressure sodium lamps
- Switches and relays, car-trunk and hood switches, tilt switches in freezers, washers, and sump pumps
- Measuring devices - thermostats, thermometers, barometers, manometers, blood pressure, and vacuum gauges
- Antibacterial applications - ingredient in soaps, ointments, contact lens solution, pigments
- Reagents, fixatives, and laboratory stains

Voluntary stewardship programs for waste products containing mercury consist of: replacement purchase of non-mercury thermometers and other products, promotion of product substitution, reformed purchasing policies, and appropriate hazardous waste disposal/recovery.

In response to consumer demands, most domestic battery manufacturers have dramatically reduced the amount of mercury in alkaline batteries. Check alkaline batteries (toy, flashlight, radio, etc.) for a green tree or green leaf symbol. Batteries bearing these symbols are mercury-free or contain minute amounts of mercury and present little or no threat to the environment. Effec-

tive January 1, 1996, all batteries sold in Oregon were required by state law to be mercury-free.

Alkaline AAA-D & 9-volt, NiCD, NiMH, lithium ion, and button cell batteries can be recycled at household hazardous waste events and in Corvallis at Robnets, BiMart, 1st Alternative Co-op, and Republic Services recycle depot. OSU students and staff may recycle batteries at the OSU Valley Library.

Residents can also recycle fluorescent tubes at household hazardous waste collection events offered at Republic Services. Compact fluorescent bulbs can be recycled at Republic Services recycle depots and at Home Depot in Albany and Corvallis. The recycling process removes the mercury-containing phosphor powder for later reuse and recycles the remaining glass, aluminum, and other lamp components.

## Lead

Lead damages the brain, nervous system, blood cells, kidneys, and reproductive organs. The first step to reduce lead pollution was to create lead-free gasoline in the 1970's. Now the biggest source of lead comes from lead paint. Lead was restricted in residential paint in 1978 but persists in houses built before then, and especially in those built before 1950. The EPA has set strict rules and guidelines for working around lead paints.

Lead is also found in cathode ray tubes (CRT). A CRT is the picture tube made of glass, lead, and other materials found inside televisions, computer monitors and some video game units. Due to new and ever-changing technology, such as the introduction of high definition television, disposal of televisions and computers has increased dramatically. The growing number of older and obsolete CRTs will become a product stewardship issue.

One strategy for managing discarded computer monitors and televisions was implemented by Massachusetts. On April 1, 2000, they instituted a waste ban on CRTs to divert them from landfills and incinerators and toward increased reuse and recycling. Massachusetts became the first state in the country to promote full-scale residen-

tial CRT recycling. This product stewardship philosophy promoted a market-based approach to electronic product reuse and recycling by working with industry, municipalities, environmentalists, and the public. A phased-in plan provided convenient, affordable access to residents and businesses while protecting the environment from a growing solid waste problem.

In 2011 the Oregon E-Cycle law banning CRTs in landfills was passed. The law requires collection sites and services to accept computers, monitors and TVs at no charge from anyone bringing in seven or fewer devices. The program is financed by electronics manufacturers and jointly implemented with the Oregon Department of Environmental Quality.

Linn and Benton County residents can recycle computer monitors, which contain CRTs, at their local Republic Services offices. Also accepted are CPU's, laptops and televisions.

## Paint

Paint disposal is another concern in solid waste management because of ground water and other toxics issues. Old paints contain lead and other chemicals that are hazardous to human health. A 1987 EPA study found that 27 to 43 percent of all household hazardous waste disposed of in landfills was paint products.



Oregon has become the first state in the nation to enact a law requiring paint manufacturers to safely manage leftover latex and oil-based paint from consumer and contractor painting jobs. This historic product stewardship legislation responds to the problem of managing leftover paint -- the largest component of local household hazardous

waste collection programs. An estimated 10 percent of the more than 750 million gallons of architectural paint sold each year in the United States is unused. This difficult-to-manage waste can be captured for reuse, recycling, energy recovery, or safe disposal, but doing so requires public awareness and a convenient and effective local infrastructure, currently beyond most local budgets and capacity.

The new paint stewardship law, signed July 23, 2009, was expected to result in the proper management of an estimated 800,000 gallons of leftover paint each year and to provide Oregon governments with service valued at over \$6 million. Between July 1, 2011 and June 30, 2012 609,471 gallons of paint were collected.

Paint recycling is now more convenient throughout the state, particularly in areas where local governments did not offer paint recycling opportunities. Governments that had collected leftover paint realized a direct financial savings. Communities that were traditionally underserved are now included. Under the law, the paint industry has set up a program to reduce paint waste, increase reuse and recycling, and safely dispose of remaining unusable paint. Costs for safely managing leftover paint are incorporated in the purchase price of new paint.

### **Polyvinyl Chloride (PVC)**

PVC is the most environmentally damaging of all plastics and poses serious threats to human health and the environment. PVC is pervasive in packaging, home furnishings, children's toys, automobile parts, building materials, hospital supplies, and hundreds of other products. PVC contaminates humans and the environment throughout its life cycle - during its production, use, and disposal.

PVC production is the largest and fastest growing use of chlorine, accounting for nearly 40 percent of all chlorine used in the United States. Chlorine is the basic building block of the most infamous toxic problems. Hundreds of chlorine-based toxins are building up in the air, water, and food chain. Many of these chemicals, called organochlorines, are resistant to breakdown and will remain in the environment for decades to come. Scientific studies reveal that these chemi-

cals are linked to many health problems including infertility, immune system damage, impaired childhood development, hormone disruption, and cancer.

Dioxin, an extremely toxic chemical, is created when chlorine-based chemicals are produced, used, or burned. Large amounts of dioxin are produced during the various stages of PVC production. If improperly incinerated, PVC items in medical waste and garbage can be a significant contributor to dioxin production. Thousands of accidental fires in buildings containing PVC result in the release of dioxin in ash and soot.

In many cases, PVC can be replaced with safer materials. Numerous companies and governments have enacted PVC restrictions and material substitution policies. Large companies such as Proctor and Gamble, Mattel, and the Body Shop have phased out PVC packaging. BMW, Herlitz - IKEA Opel, Sony-Europe, and Volkswagen have all announced policies to eliminate PVC use. Big construction projects such as the Euro-tunnel between England and continental Europe were completed without the use of PVC.

Hundreds of European communities have instituted restrictions on the use of PVC in public buildings. The Swedish Parliament voted in 1995 to phase out soft and rigid PVC which contain additives that are already identified as harmful. The 2000 Summer Olympics in Sydney was designed without PVC.

When product stewardship plans are developed for "problem" products such as paint, electronics, carpet, or those that contain mercury or pesticides, markets and alternative products will develop. As a result, the environmental impacts of these products should lessen.

## **2) What Companies are Doing**

Many companies are adopting and experimenting with product stewardship policies.

### **Daimler-Chrysler**

The Daimler-Chrysler CARE (Concepts for Advanced Recycling and Environment) Car program goals are to increase the recyclability and recovery of automobiles and the use of recycled

materials in vehicles. Daimler-Chrysler Corporation is testing plastics recycling technology to help make their vehicles 95 percent recoverable within the next few years and to manufacture new automotive parts from recycled plastics to save money in the production of new vehicles.

### **Nike Reuse A Shoe**

The Nike Reuse-A-Shoe program is an example of an extended producer responsibility program. Nike takes athletic/sport shoes from any manufacturer, as long as the shoes don't contain metal. These shoes are taken apart and made into a variety of materials including artificial turf, carpet padding, and sports surfaces such as basketball courts, equestrian arenas, playground cushioning, and tracks. From 1993 to August 2007, Nike has recycled 20 million pairs of shoes.

### **TREX Plastic Lumber**

TREX has developed a recycling process that mixes plastic film with pulverized wood to create easy care, splinter free decking material. The plastics used (plastic bags, grocery sacks, and shrink wrap) have historically had a very low recovery rate. The plastic film comes from grocers and other retailers while the reclaimed wood comes from cabinet and furniture manufacturers and pallet recyclers. It has the best qualities of wood and the best qualities of plastic. TREX has increased the value of recycling polyethylene film. Many grocers are now able to recycle the stretch wrap from their packaging. Agri-Plas, a company in Brooks, Oregon, collects plastic film then processes and ships it to Nevada where it is made into TREX lumber. Unfortunately, at this time, TREX itself can not be recycled.

### **E. Zero Waste**

Zero waste is a philosophy that unifies business and recyclers. It is a movement that believes that waste can be eliminated from many aspects of modern life with good planning.

The first step in Zero Waste is to ask the questions, "How can we not create waste?" and "What activities do we need to do to eliminate waste?" Zero Waste wants people to see the possibilities in every object. The process starts with

each individual identifying activities in their life that create waste and modifying these activities to eliminate waste production. Then individuals will be followed by communities, cities, regions, states, nations, and finally the world. Zero Waste thinking can start people down the road towards a sustainable future.

Many businesses, including DuPont, Interface, Hewlett Packard, Herman Miller Inc., and Kimberly Clark, have adopted Zero Waste strategies. Epson Portland Inc. adopted a Zero Waste policy in March 2000. None of Epson's waste goes to a landfill; they recycle approximately thirty-five items, with the remaining 10% (1-2 tons) of waste going to the Covanta Waste to Energy Facility in Brooks to generate electricity. These companies have found innovative ways to reduce their waste through reuse, waste reduction, and recycling, thus saving money and resources.

### **F. Growth in Sustainable Farming**

Food production has a pervasive impact on the environment. Fertilizers, pesticides, animal wastes, and erosion can effect water quality, wildlife habitat, and air quality. Sustainable agriculture involves practices that preserve natural resources and biodiversity while being economically feasible. These practices include the use of beneficial insects, the planting of cover crops, and the application of compost and mulch. Farmers may still use pesticides and herbicides, but they try ecologically sound alternatives such as beneficial insects and pest monitoring.

#### **1) Advantages of Buying Locally**

In March 1999, *Consumer Reports* magazine analyzed pesticide levels in 27,000 fruit and vegetable samples and found that many were too high ("How Safe is our Produce?"). Buying organically grown, locally produced fresh produce is a more sustainable buying practice and may be healthier for you. In *Consumer Reports*, January 1998 report "Greener Greens?" 1000 pounds of produce from all over the U.S. were tested. Organic food had few or no toxic pesticide residues. Their analysis of U.S. government data on pesticide residues in food, "Do You Know What You're Eating?" is on [www.consunion.org](http://www.consunion.org).

Buying locally grown produce avoids food being transported over long distances. According to World Watch magazine, a typical mouthful of food in the U.S. travels 1300 miles from farm field to dinner plate. Buying locally grown produce:

- Saves energy
- Creates less pollution
- Supports local business

## 2) Concern Over Genetically Modified Foods.

In the U.S., approximately 30,000 foods (about 70 percent of the total) are estimated to have genetically altered ingredients. This is the new commercial practice of putting “foreign” genes into specific crops to bestow on them certain characteristics including greater food production through pest management. There is concern that genetically engineered BT (bacillus thuringiensis) crops are killing the Monarch butterfly as well as beneficial soil organisms, and affecting the entire soil food web.

The European Union has suspended approval for planting these plants due to the uncertainty of health and other environmental problems caused by these plants. Because this technology is so new, there are many unanswered questions about the health and allergenic effects of genetically altered food being in the food stream. People are concerned about the potential health risks caused by consuming genetically altered foods. Many people refuse to eat these foods and are demanding mandatory labeling through their governments. It is difficult for a consumer to know which foods are traditionally raised and which ones are genetically altered because there is no labeling. Continuing reports that unapproved bioengineered grains are seeping into the food supply worldwide are raising questions on whether governments can keep genetically modified and unmodified crops separate.

A *Consumer Reports* article analyzed many of the issues with the genetically engineered food industry (September 1999 - “Seeds of Change; in the U.S. and elsewhere, the food supply is being genetically altered. Here’s why you should care”). These issues included: insufficient safeguards, lack of mandatory federal human-safety review, incomplete reviews on the safety of releasing these organisms into the environment,

and the problem of inducing widespread insect resistance. *Consumer Reports* recommended a mandatory labeling program and a national standard for certified-organic food that excludes genetically engineered food from the definition.

## 3. What Consumers Can Do

Consumer decisions, buying habits, and actions impact the environment. Making some simple changes helps to meet the goal of sustainability.

### A. Reduce, Reuse, Revise, and Recycle

This manual has explored many ways to reduce, reuse, revise, and recycle to minimize garbage which also reduces pollution.

### B. Use Water Efficiently

Even though water is the most abundant substance on earth, only 1% is available for human consumption. Most of the water on earth is either saltwater or freshwater that is frozen in the polar ice caps. Population growth, agriculture, and manufacturing all demand increasing amounts of freshwater.

Clean drinking water is precious because the amount of water on earth is constant and is recycled through time. This means some of the water one drinks is more than 20 million years old! Protecting and conserving water is vital to survival now and for future generations. Besides, it is easy and it can save money!

#### Some practical suggestions...

- Turn off the water while brushing teeth. This can save 100 gallons of water every month.
- Install a low flow shower head and faucet aerators: Showerheads using 2.5 gallons per minute (gpm) and faucets using 1.5 gpm use half the water of traditional fixtures. It only takes minutes to install, costs less than \$20, and can save 100 gallons a week per person.
- Take a 5 minute shower or take one every other day: This saves 3 ways: the water, the sewer, and the gas or electricity it takes to heat the water.
- Save water every flush: The best option is to

use a 1.6 gallons per flush toilet (\$100). Another option is to fill a plastic milk jug with water and place it in the toilet tank. Toilet displacement bags are also available. These can save 90 gallons or more per month.

- Make sure the dishwasher is full before running it. Average dishwashers use approximately 12 gallons of water. If washing by hand, fill the sink with soapy water and use a small trickle to rinse.
- Chill drinking water in the refrigerator instead of running the tap for cold water. Up to 4 gallons of water is wasted every time the water runs until it is cold.
- Make sure there are no leaks or drips: A dripping faucet can waste 20 gallons a day or more, and leaking toilets can waste up to 500 gallons a day!
- Check a toilet tank for leaks by putting a few drops of food coloring in the tank. Wait 10 minutes and see if the colored water appears in the bowl. If it does, you have a leak. They are very easy to fix.
- Run the clothes washer on the proper setting: For just a few items, set the washer for a small load. A typical clothes washer uses about 20-50 gallons of water per load and the permanent press cycle uses an additional 15 gallons of water.
- Water plants only as much as necessary: Use no more than one inch of water each week for the lawn. That is all it needs to stay healthy and green. Use a water gauge to monitor watering. Water in the morning or evening to reduce evaporation. Do not waste water on paved areas. Water according to the soil and plant needs. Consider gardening with native plants which require less water.
- When washing the car use a bucket: Only run water when rinsing the car. Most commercial car washes recycle their water and are more efficient than washing at home. The water goes to the waste water treatment plant and is cleaned. When a car is washed near a storm drain, the water containing soap, dirt, and other pollutants goes into the creek. Washing the car on the lawn is better for the fish and biodegradable soap will fertilize the turf.
- Know how much water is being used: A good

### Five Strategies for Meeting the Sustainability Challenge

1. **Set Outrageous Goals**  
What would we do differently if we had to reduce an environmental impact by 100% and still meet the needs of our customers?
2. **Think Like a System**  
What changes to our product's system would add value and increase efficiency?
3. **Dematerialize**  
What is the simplest form in which we can deliver our product and still meet our customers' needs? What function does our product perform? Can we meet this need better by selling a service rather than, or in addition to, a product?
4. **Make it Fit**  
How can we make sure our products best fit the needs of our customers?
5. **Restore Rather than Take**  
What would it take for our product to benefit the environment or society?

*Source: Jacquelyn A. Ottman, J. Ottman Consulting, Inc.*

way to help reduce use of water is to know how much is being consumed. The water bill will identify what has been used in cubic feet (cf's) or 100's of cubic feet (ccf's). To convert cf's to gallons multiply the number of cf's by 7.5. To convert ccf's to gallons multiply by 748.

- Going on vacation? Let the water heater have a vacation too. It takes only an hour to reheat when you return home.

### C. Use Energy Efficiently

Energy is needed for every task. Using energy efficiently can be as simple as turning out the lights when leaving a room and as important as saving the salmon habitat.

The United States is dependent on a few sources of non-renewable energy (oil, natural gas, and coal). To sustain its standard of living and quality of life, conservation of energy is needed whenever possible. It's easy and it will save money.

### Here's what an individual can do...

- *Control the thermostat:* Place a thermometer next to the thermostat to ensure it is set accurately. Set the thermostat for 68 degrees during the day and 55 degrees at night for maximum efficiency. In the summer, limit use of air conditioning and keep the thermostat as high as is minimally comfortable---cooling costs substantially more than heating and places an immense demand on scarce resources at the least opportune time.

#### Did you know...

Oregonians generated 1,264 pounds of waste per person in 2011. That's 2,437,767 tons.

4 cents of every dollar Americans spend on goods goes to packaging; \$225 per person per year or \$75 a month for a family of four.

- *Keep furnace filters clean:* Clean or replace furnace filters every month in the winter and vacuum the fins of electric baseboards. This will not only cut costs, it will improve the air quality in your home.
- *Cut down on drafts:* Low-cost improvements to windows will keep spaces warmer. Cover windows at night. Push "rope" caulk in the cracks of windows that open, and install plastic film storm windows in the rooms most lived in.
- *Plug up leaks:* Cold drafts don't just come from windows. Close the fireplace damper when it is not in use. Patch holes in walls, ceilings, windows, etc. Weather strip the at-

#### Did you know...

The bathroom accounts for about 65% of the water used in a home.

Some showerheads use 5-7 gallons per minute (gpm). That adds up to 50-70 gallons for a shower lasting 10 minutes!

tic access door or hatch. Use v-weatherstripping for the top and sides of exterior doors. Install foam gaskets behind electrical

outlets.

- *Keep the water heater at 120 degrees:* Why waste \$20-\$60 a year keeping water hotter than is needed? It's easy to lower the setting of a water heater. Turn off the electricity, remove top and bottom cover plates on the side of electric water heaters, then adjust both thermostats to 120 degrees and replace covers. For a gas water heater, set the dial near the bottom. EXCEPTION: If the water heater is fed from a well and there is natural soil bacteria in the water, keep the tank at 140 degrees F. The hotter water will help to kill the bacteria. If well water stinks, creates gray to black accumulations in your toilet tanks, or makes your laundry look dingy, your hot water tank may already have accumulated warm water bacterial sludge. Flush the tank and intake pipes, and chlorinate the well once each year with the help of a local well expert. Be sure to test the water for manganese which will make white clothes look gray.
- *Insulate the water heater:* Insulating blankets are available for water heaters, which will pay for themselves in the money saved.
- *Install water saving showerheads:* They cut water use by 40% and save energy used for hot water. They are easy to install, cost less than \$20, and do not affect water pressure.
- *Change clothes washing routine:* Washers and dryers can account for as much as 25% of the energy use at home. Wash clothes in warm or cold water. Energy for hot water to wash clothes can cost 40 cents per load. Warm or cold water is usually enough to get clothes clean. Chemists say that water does 97% of the washing anyway. Dry clothes efficiently by sorting into fast and slow drying loads, or better yet, hang clothes to dry and save 25 cents a load! Be sure to clean lint traps and avoid over-filling your dryer.
- *Save energy with the refrigerator:* Set the temperature of your refrigerator using a thermometer to 38-40 degrees. Vacuum the coils on the back of the refrigerator and avoid letting the ice build-up more than 1-1.5" in the freezer.
- *Turn off the lights:* Keep lights off in empty rooms. Consider replacing burned out bulbs with energy efficient compact fluorescents

and save \$15 per bulb.

- *Choose lighting that uses less energy:* Replace incandescent light bulbs with more efficient compact fluorescent or LED lights. CFLs work by running a high voltage through gas rather than burning a filament, as incandescent lights do. Compact fluorescents are 3 to 4 times more efficient than incandescent bulbs and last 6 to 10 times longer. LEDs emit light when electrons move around within its semiconductor structure. LEDs are 85 percent more efficient than incandescent bulbs, and about 5 percent more efficient than CFLs.
- *Appliances on “Standby” Waste Watts:* Many small household appliances, such as clocks or cordless phones, are on “standby” 24 hours a day and this use of electricity adds up to a substantial total. *Consumer Reports* (March 1998) noted that standby power usage in the average household adds up to about 50 watts, or about 450 kilowatt hours a year. One way to hold down the silent energy leak is to use power cords. Most computer users use surge protectors which have a power switch which simply needs to be put in a convenient place. Simply turning off the switch when not using a device saves energy.
- *Buy an energy efficient appliance:* Energy Star ([www.energystar.gov](http://www.energystar.gov)) appliances are certified by the EPA as the most energy efficient. Energy Guide labels give detailed information on estimated yearly energy costs - the higher the efficiency the lower the operating costs.
- *Take Advantage of Oregon’s Residential Energy Tax Credit Program:* Currently, Oregon has an energy tax credit to encourage households and businesses to invest in energy conservation, renewable energy resources, and less-polluting fuels. To find out about specific programs contact the Oregon Department of Energy. They can be reached at 503-378-4040 or visit their web site at <http://www.oregon.gov/energy/Pages/index.aspx>

Typical household energy breaks down this way:

- Home heating (50%)
- Water heating (25%): shower/baths (15%); laundry and dishwashing (10%)

- Refrigerator/freezer (8%)

After these, cooking, drying clothes, and lighting are all about the same.

To find out more about specific home energy usage call the local utility - electric, gas, or oil - for a free energy audit.

## D. Use Materials Efficiently

Much of what humans use daily comes from natural resources. These resources, like iron ore, aluminum, oil, gas, and water, are critical to current ways of life and survival. Using them wisely is in humanity’s best interest.

Using materials efficiently means making good purchases, reusing when possible, and recycling conscientiously. While Oregonians are good at recycling, there is still more waste being generated every year. By making simple changes in purchases and the way everyday tasks are done, waste can be prevented by not generating it in the first place.

### Some practical suggestions...

- Think before buying: How many times a day does a possible purchase come to mind? On a daily basis there is encouragement to buy unneeded products. This can be expensive and clutter living and working space.
- Buy in bulk or “value-pack” sizes: This reduces packaging. Some products are not available in bulk but might come in a large container or in a concentrate. Purchasing bulk rather than heavily packaged products can save as much as 52%.
- Purchase products that are durable and won’t break easily: Look for warranties, ask if the

### Did you know...

- ◆ You can save \$10 to \$20 every month by lowering the thermostat in the winter by 3 degrees or more!
- ◆ Hot water accounts for 20-50% of an annual energy bill.
- ◆ Each incandescent light bulb replaced with a compact fluorescent can keep half a ton of carbon dioxide gases out of the atmosphere over the lifetime of the bulb.

product can be repaired, and find out which product is rated highest in *Consumer Reports*.

- Pack lunches in reusable containers: Why spend money buying plastic and paper bags, aluminum foil, or wax paper? The garbage bill goes down when containers are used over and over again.
- Purchase durable products: More and more consumer products are made to be used only once. That's not very efficient. Look for refillable pens, lighters, real cameras, and cloth napkins and towels.
- Repair broken or torn things: It is fun and satisfying to fix things when they break. It saves money, resources, and a trip to the store.
- Give gifts that are resource efficient: An energy efficient light bulb, a fancy lunchbox, or a wrapped box that can be used over and over again. Give an experience instead of "stuff," like a trip to the beach or a memorable event.
- Reduce the amount of unwanted mail: Ask to be removed from unwanted mailing lists. Call the company's 1-800 number if there is one, or if the mailing includes a reply envelope use it to mail a request to be removed from the mailing list.
- Share tools with friends and neighbors: Sharing is fun and can save a lot of money.
- Simplify life: The things most cherished in life aren't for sale. Spend time discovering "low-tech" recreation - taking a walk, gardening, visiting friends, and stopping to "smell the roses."

awareness, and personal growth - life can be different. In the process, the world also may be changed. By making adjustments in day-to-day living humans can control some of the complex dilemmas of this time in history. This program also leads to a new way of thinking about and living with money.

### **E. Reduce Consumption Habits - Voluntary Simplicity**

The Voluntary Simplicity Movement helps people to look at the effects of consumerism and asking whether this lifestyle is healthy for people and the planet.

The movement looks at the loss of quality of life, of real community in country and village settings, of security and self-reliance, and of living in harmony with the earth. Voluntary Simplicity does not embrace living in poverty, but living with balance. By embracing the tenets of voluntary simplicity - frugal consumption, ecological

**What if nature was used as the model for our next industrial revolution?**

**Nature has no waste**

**Nature** runs on sunlight  
**Nature** uses only the energy it needs  
**Nature** fits form to function  
**Nature** recycles everything  
**Nature** rewards cooperation  
**Nature** banks on diversity  
**Nature** demands local expertise  
**Nature** curbs excesses from within  
**Nature** taps the power of limits

**Nature as a model**

**Buildings** run on sunlight  
**Buildings** use only the energy they need  
**Buildings** fit form to function  
**Buildings** recycle everything  
**Buildings** reward cooperation  
**Buildings** bank on diversity  
**Buildings** demand local expertise  
**Buildings** curb excesses from within  
**Buildings** tap the power of limits

**Think about it...**

*Source: Biomimicry (Innovation Inspired by Nature) –Janine Benyus*

## 4. The Future

Sustainability, as framed by Oregon's Governor Kitzhaber, is really about quality of life - a combination of elements that together produce the richness of place and experience that we associate with Oregon. In order to achieve sustainability, actions need to occur at the community level in addition to the policy level.

### Objectives for Sustainable Communities

#### Economic objectives

- A resilient economy that provides a diversity of good economic opportunities for all citizens
- Workers, whose knowledge and skills are globally competitive, supported by life-long education

#### Community objectives

- Independent and productive citizens
- Youth who are fully supported by strong families and communities
- Downtowns and main streets that are active and vital

- Efficient and compact development that saves infrastructure investments and natural resources
- Affordable housing available for citizens in the community centers

#### Environmental objectives

- Healthy urban and rural watersheds and species abundance and diversity
- Clean and sufficient water for human and natural use
- Efficient use and reuse of resources and elimination of harmful toxins and emissions to the environment

An Oregon solution seeks to achieve economic, environmental, and community objectives simultaneously in order to create a sustainable future. In order to progress toward a truly sustainable future, solutions must use collaborative problem solving methods that integrate government, business, non-profit, and citizen resources.

## Did you know...

- ◆ In 1998, the U.S. generated 136 million tons of waste from construction and demolition. Only 20 to 30 percent (mostly concrete, asphalt, metals and some wood) was recycled or reused.  
Environmental Protection Agency, "A Characterization of Building-Related Construction and Demolition Debris in the United States," 1998
- ◆ In 1998, 48 percent of all building waste debris came from demolitions. Renovations generated 44 percent. New construction accounted for only 8 percent of the total.  
Environmental Protection Agency, "A Characterization of Building-Related Construction and Demolition Debris in the United States," 1998
- ◆ More than 1.5 million new homes were built in the U.S. in 1999 (more than 80 percent were single-family detached).  
National Association of Home Builders, 1999
- ◆ There are an estimated 5,000 natural building projects (adobe, straw bale, rammed earth, etc.) in the U.S. each year.  
David Eisenberg, Development Center for Appropriate Technology
- ◆ The average size of new single-family homes increased from 1,500 square feet in 1970 to more than 2,200 square feet in 2000, while the average household size declined from 3.1 people per household in 1970 to 2.6 in 2002.  
AmeriStat, (using US Census Bureau 2000 data), [www.ameristat.org](http://www.ameristat.org)
- ◆ Builders of new homes typically generate about 3,000 pounds of wood, 2,000 pounds of drywall and 600 pounds of cardboard as waste for the average 2,000-square-foot home.  
National Association of Home Builders Research Center, 2001, [www.nahbrc.org](http://www.nahbrc.org)
- ◆ Total waste from an average 2,000-square-foot home adds up to about 8,000 pounds, taking up 50 cubic yards of space.  
National Association of Home Builders Research Center, 2001, [www.nahbrc.org](http://www.nahbrc.org)
- ◆ Scrap from residential construction sites typically represents between 6 and 8 percent of the total weight of the building material delivered to the site (approximately 6.5 million tons annually across the U.S.).  
Characterization of Building-Related Construction and Demolition Debris in the US, report EPA 530-R-98-010, June 1998, [www.epa.gov/tribalmsw/thirds/recandd.htm](http://www.epa.gov/tribalmsw/thirds/recandd.htm)
- ◆ The U.S. produces about 15 million tons of new drywall per year. About 12 percent of the drywall used in new construction ends up as scrap.  
California Integrated Waste Management Board, 2002, [www.ciwmb.ca.gov](http://www.ciwmb.ca.gov)
- ◆ 245,000 housing units are demolished annually.  
Environmental Protection Agency, "A Characterization of Building-Related Construction and Demolition Debris in the United States," 1998
- ◆ 170,000 commercial buildings are constructed annually in the U.S. 44,000 commercial buildings are demolished annually in the U.S.  
Environmental Protection Agency, "A Characterization of Building-Related Construction and Demolition Debris in the United States," 1998
- ◆ Sixty percent of the ozone-depleting substances used annually in the U.S. are used for building construction and systems.  
U.S. EPA's Alternative Emissions and Reductions Branch, Global Programs Division, 2000

## Chapter VII Sustainability

### Balancing Present and Future

#### **PREFLECTION – Consider sustainability for society.**

What are the hopes you have for future generations?  
What changes are necessary for those hopes to be realized?

#### **ACTION – Determine guidelines for sustainable consumption.**

Read an issue of your local paper with an eye to articles and ads encouraging a sustainable/an unsustainable society.  
Attend a home show or visit a green home store to discover what products are available locally for green building **OR**  
Ask friends and neighbors about their experience with green products (lighting, carpets, paint, lumber, insulation) **OR**  
Attend a farmers' market and talk with vendors about their sustainable farming practices **OR**  
Visit with a clerk in a clothing store about clothing from sustainable companies using sustainably produced materials.  
Develop a personal sustainability index to use when making purchasing decisions.

#### **REFLECTION – Ask yourself these questions:**

Is there one product area (eg. home building, clothing, food) that is more important for a sustainable society than another?  
How do the needs of others impinge on my decisions about living a sustainable life?  
Should sustainability be legislated?  
How often does a concern about sustainability come into my everyday conversation with friends and relatives?

#### **RE-ACTION – Research product areas of particular concern.**

Search the web for makers of particular types of products and information about their sustainability practices.  
Write letters to corporate officers sharing your response to their sustainability practices.  
Alter your personal purchasing practices based on your evaluation of a product's ranking on your personal sustainability index.

#### **INVOLVE YOUR CHILDREN**

Have a conversation about some of the things you have in your home that are made from sustainable products (eg. organic cotton clothing, post-consumer recycled content paper, glass jars).

