1831-2772

EEA SIGNALS 2014

Well-being and the environment

Building a resource-efficient and circular economy in Europe

European Environment Agency

Cover design: INTRASOFT International S.A
Layout: INTRASOFT International S.A/EEA

Luxembourg: Publications Office of the European Union, 2014
ISBN 978-92-9213-431-0
doi:10.2800/13662

Environmental production
This publication is printed according to high environmental standards.

Printed by Rosendahls-Schultz Grafisk
- Environmental Management Certificate: DS/EN ISO 14001: 2004
- Quality Certificate: DS/EN ISO 9001: 2008
- EMAS Registration. Licence no. DK — 000235
- Ecolabelling with the Nordic Swan, licence no. 541-457
- FSC Certificate — licence code FSC C0688122

Paper
Cocoon Offset — 100 gsm.
Cocoon Offset — 250 gsm.

Printed in Denmark

You can reach us

- by email: signals@eea.europa.eu
- on the EEA website: www.eea.europa.eu/signals
- on Facebook: www.facebook.com/European.Environment.Agency
- on Twitter: @EUenvironment

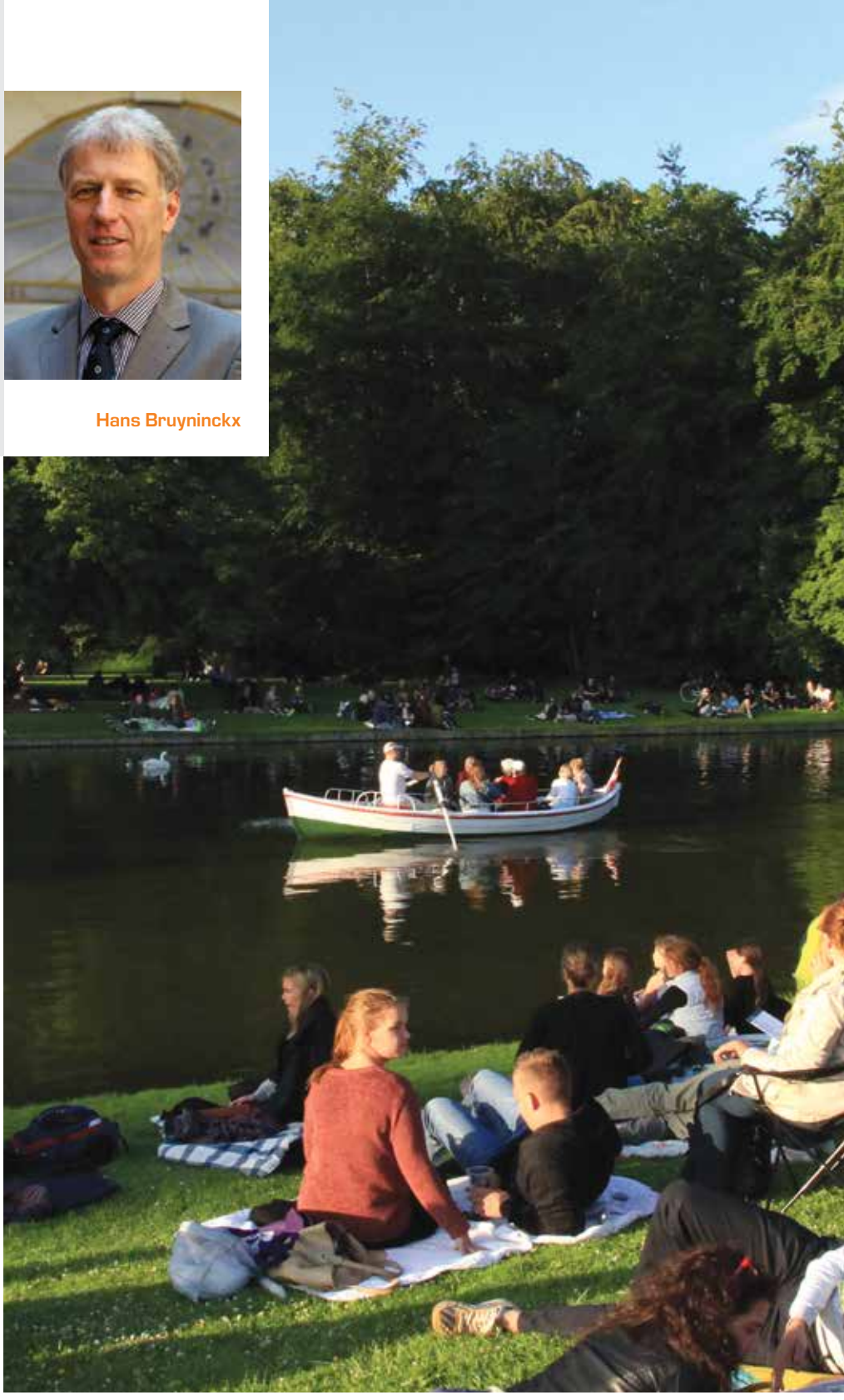
Order your free copy at the EU Bookshop: www.bookshop.europa.eu

Sign up to receive our publications: http://eea-subscriptions.eu/subscribe

Contents

Editorial

Hans Bruyninckx



Transition towards a green economy

Our quality of life, health and jobs all depend on the environment. However, the way and the rate we are using up natural resources today risk undermining our well-being along with nature's ability to provide for us. We need to fundamentally transform the way we produce, consume and live. We need to green our economy and the transition needs to start today.

Our planet has limited resources and today, we are extracting and using more resources than the planet can sustainably deliver. Natural resources fuel our production and consumption, and create wealth and jobs, contributing to our quality of life and well-being.

Everything around us comes from nature. In one form or another, our homes, cars, bicycles, food, clothes and energy were and are part of the environment. We extract raw materials, process them and build our communities. This connection with and dependence on the environment have always been essential to our existence.

But there is a downside to our level of resource consumption. We are actually exerting so much pressure on the environment that we risk weakening its capacity to provide for us in the future.

Our activities are releasing pollutants into our atmosphere and plastics into our oceans. Our ecosystems are changing faster than before, at unnatural rates. Increased trade introduces new species that can invade entire ecosystems. Climate change is altering precipitation patterns. Yields become less reliable, causing hikes in food prices. We can clearly see that some regions and countries are more vulnerable. However, some environmental impacts, like air pollution, affect everyone, albeit at varying degrees.

Future pressures urge us to take action today

Our current consumption and production are already unsustainable with more than 7 billion of us across the planet, and the population is projected to increase to around 9 billion by mid-century, with billions still in poverty, aspiring a higher standard of living.

Our resource use degrades and decreases the natural capital that will be available to sustain the well-being of future generations. At the very least, this will mean less land and less freshwater per person will be available to produce the food we will need.

To ensure our quality of life and long-term well-being, we need to green our economy and the transition needs to start today. But how can we achieve this? How do we transform our economy into one that preserves the environment while ensuring our quality of life?

Boosting Europe's resource efficiency

To start with, our economy has to become more resource efficient. We will effectively need to get more out of less. We need to decrease the amount of resources we extract and use.

While it is important to reduce the flow of new materials into the production process and make production processes more efficient, this is only one part of the story. We also need to reduce the material loss and waste generated throughout production and consumption.

And it is possible to transform our economy, but this requires action and commitment over several decades. Europe has achieved significant gains in increasing its resource efficiency, but much more needs to be done.

Various EU strategies and legislation, such as Europe 2020, the Flagship initiative for a Resource-Efficient Europe, the Waste Framework Directive or the 7th Environment Action Programme, are already in place and try to instil sustainability in key economic activities in a long-term transition perspective.

Full implementation of such policies would offer multiple benefits. Fewer resources would be used per output, and this would help protect and preserve the environment. At the same time, the economy would benefit from fundamental innovation and higher competitiveness for European companies.

Reducing waste

Let's take the example of food waste. Between 30 % and 50 % of the food worldwide is estimated to end up as waste. In the EU alone, we waste almost 90 million tonnes of food annually, corresponding to almost 180 kg per person.

Food is wasted at all the stages of the production and consumption chain. For every food item not consumed, we are wasting the energy, the water, the labour, and the land used in its production. Greenhouse gases and fertilisers released into nature contribute to environmental degradation.

Could we change the food system to prevent food waste in a way that consumers, supermarkets and food producers all worked towards producing, selling and buying only what will be eaten?

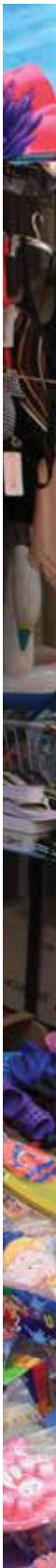
Could we actually use end-of-life products — 'leftovers' of one production process — as inputs into another production process? Could we create a 'circular economy' that generated as little loss as possible? Better management of our municipal waste shows that the potential gains, both in economic and environmental terms, are immense.

Greening an entire economy — European and ultimately global — is an immense task. It involves integrating sustainable resource use into every aspect of our lives.

Eco-innovation projects, renewables, and research in general all play a crucial role in designing better products and processes and reducing waste. The business community in collaboration with public authorities and civil society could implement sustainable solutions until they become the 'mainstream'. For example, can we create a system where we 'rent' or 'borrow' products, such as tools and cars, instead of owning them, where we would need fewer of those products to meet our needs.

We, the consumers...

We need to make our economy more resource efficient and reduce the amount of waste — or loss — it generates. The field of economics offers us some tools for estimating costs and damages and some suggestions as to how we can include environmental concerns in our economic decisions. But we also need more innovation, more research and certainly a long-term perspective.



As consumers, we all have a role to play in supporting the transition towards green economy. Our consumer behaviour is heavily influenced by our peers and social context, our impulses and the choices made available to us. Throughout history, consumption patterns have constantly evolved. We can use this flexibility to our advantage, and can steer the course towards sustainability.

Regardless of our income levels and where we live in the world, our health and well-being depend on the environment. We all have a stake in its well-being.

The 2014 edition of Signals takes a closer look at these issues.

Hans Bruyninckx
Executive Director

The economy: resource efficient, green and circular

Our well-being depends on using natural resources. We extract resources, and transform them into food, buildings, furniture, electronic devices, clothes, etc. Yet, our exploitation of resources outpaces the environment's ability to regenerate them and provide for us. How can we ensure the long-term well-being of our society? Greening our economy can certainly help.

Well-being is not easy to define or to measure. Many of us would mention good health, family and friends, personal security, living in a pleasant and healthy environment, job satisfaction, an income that ensures a good living standard as factors contributing to our well-being.

Although it may vary from person to person, economic concerns — being employed, earning a decent income, enjoying good working conditions — play an important part in our well-being. Considerations like job security or unemployment become particularly important in periods of economic crisis and can affect the morale and well-being of the society overall.

It is evident that we need a well-functioning economy that provides us not only the goods and services we need, but also jobs and income ensuring a certain living standard.

The economy depends on the environment

A well-functioning economy depends, among others, on an uninterrupted flow of natural resources and materials, such as timber, water, crops, fish, energy and minerals. Disruption in the supply of key materials can actually bring dependent sectors to a halt, and can force companies to lay people off or stop providing goods and services.

Having an uninterrupted flow implies that we can extract as much as we want. But can we really do that? Or, if we do, how does this impact the environment? How much can we actually extract without harming the environment?

The short answer is that we are extracting too much already, more than what our planet can produce or replenish in a given period. Some studies indicate that in the last hundred years the global per capita consumption of materials doubled, while that of primary energy tripled. In other words, every one of us is consuming on roughly three times as much energy and twice as many materials as our ancestors were consuming in 1900. And what's more, there are now over 7.2 billion of us doing so, compared with 1.6 billion back in 1900.

This extraction rate and the way we are using resources are actually reducing our planet's capacity to sustain us. Take the example of fish stocks. Overfishing, pollution and climate change have severely affected global fish stocks. Many coastal communities previously dependent on fisheries had to invest in other sectors, such as tourism. Those that have not managed to diversify their economy are struggling.

In fact, our economic activities are causing a wide range of environmental and social impacts. Air pollution, acidification of ecosystems, biodiversity loss and climate change are all environmental problems seriously affecting our well-being.

Going green and resource efficient

To preserve the environment and keep reaping the benefits it provides us, we need to reduce the amount of materials we are extracting. This requires changing the way we produce goods and services and consume material resources. In short, we need to green our economy.

Although the term has several definitions, 'green economy' generally refers to an economy where all production and consumption choices are made with the well-being of society and the overall health of the environment in mind. In more technical terms, it is an economy where society uses resources efficiently, enhancing human well-being in an inclusive society, while maintaining the natural systems that sustain us.

The EU has already adopted strategic goals as well as concrete action programmes to make its economy more sustainable. The Europe 2020 strategy aims to deliver growth that is smart, sustainable and socially inclusive. It focuses on employment, education and research but also on achieving a low-carbon economy with climate and energy targets.

The strategy identifies flagship initiatives to achieve these targets. The flagship initiative 'A resource-efficient Europe' plays a central role in the EU's policy in this area. A series of legislative packages are also adopted to implement its objectives.

But what do we need to do to make the EU economy **resource efficient**? In short, we need to produce and consume in a way that optimises the use of all resources involved. Doing this entails creating production systems that generate decreasing amounts of waste or that produce more with less input.

Considering entire systems, not sectors

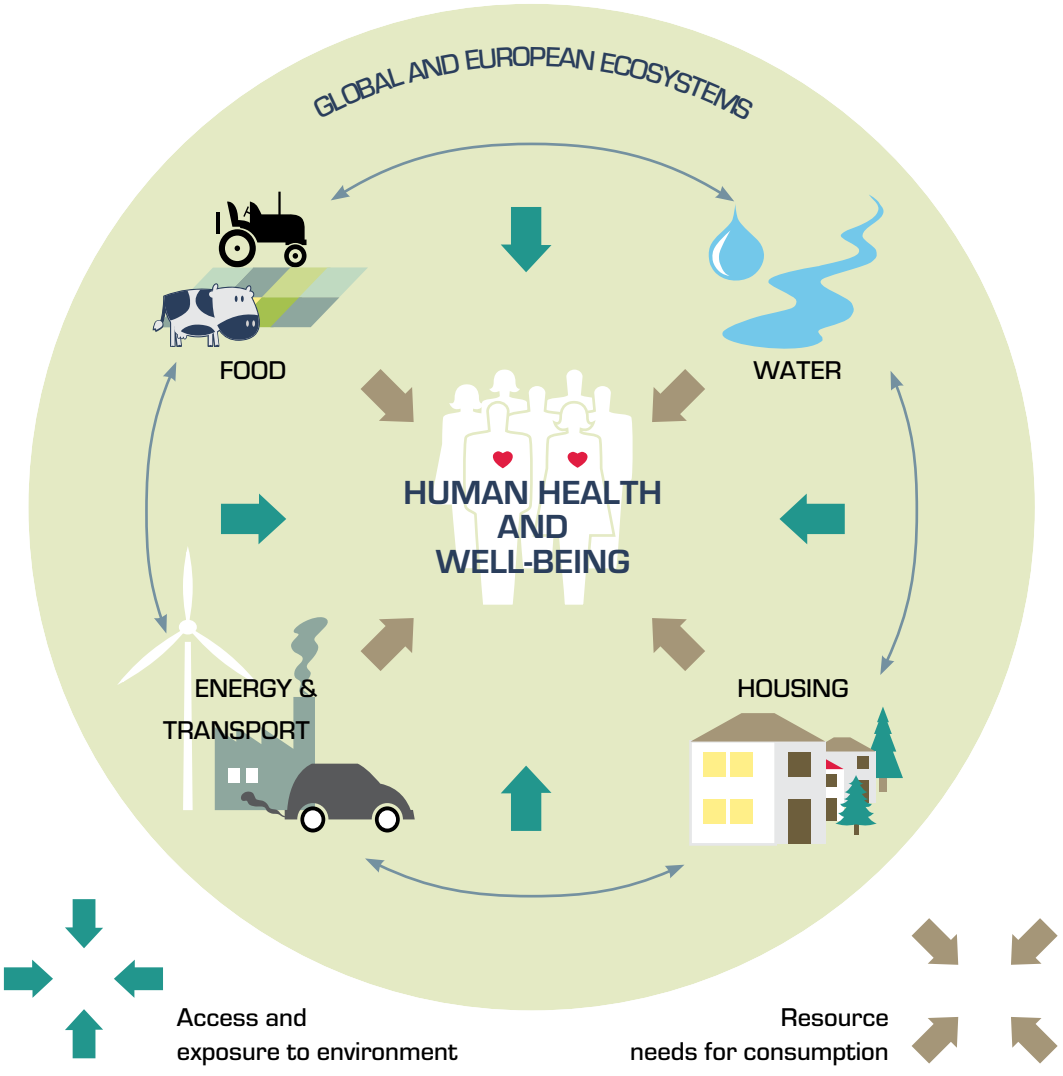
We also need to consider entire systems, rather than sectors. A system comprises all the processes and infrastructures that exist in connection with a resource or an activity, which are essential for human activities. For example, the energy system includes the types of energy we use (coal, wind, solar, oil, natural gas, etc.), how we extract or create this energy (wind turbines, oil wells, shale gas, etc.), where we use it (industry, transport, heating homes, etc.) and how we distribute it. It would also address other issues such as the land and water resources affected by energy use and energy production.

Materials in; products and residues out

To produce a good or a service, we need **input**. For example, to produce crops, in addition to their labour, farmers need land, grain, water, sun (energy), tools, and in modern agriculture, fertilisers and pesticide and more sophisticated tools. The same is more or less true of modern manufacturing. To produce electronic devices, we still need labour, as well as energy, water, land, minerals, metals, glass, plastics, rare earths, research, etc.

How are the environment and our well-being and health connected?

Natural resources fuel our production and consumption, and create wealth and jobs, contributing to our quality of life and well-being. But our level of resource consumption is undermining our ecosystems' capacity to provide for us in the future.



Between 2009 and 2011, up to

96 %

of EU city dwellers were exposed to fine particulate matter ($PM_{2.5}$) concentrations above WHO guidelines.

In Europe, at least

110 million

people are adversely affected by noise from road traffic alone.

In southern Europe, up to

80 %

of the extracted freshwater goes to agriculture, reducing the amount available to other uses.

Source: EEA

Most of the materials used in production in the European Union are also extracted in the EU. In 2011, 15.6 tonnes per capita of materials were used as input in the EU, of which 12.4 tonnes of consisted of materials extracted in the EU, while the remaining 3.2 tonnes were imported.

A small share of these material inputs was exported. The rest — 14.6 tonnes per capita — was used for consumption in the EU. Material consumption varies considerably between countries. For example, the Finns consumed more than 30 tonnes per capita, while the Maltese consumed 5 tonnes per capita in 2011.

In the last decade, the EU economy created more 'value added' in terms of Gross Domestic Product for each unit of material (minerals, metals, etc.) consumed. For example, using the same quantity of metal, the economy produced mobile phones or laptops, which were more 'valuable' (in simple terms, 'worth more') than their predecessors. This is known as resource productivity. In the EU, resource productivity rose by about 20 %: from EUR 1.34 to EUR 1.60 per kg of material between 2000 and 2011. The economy grew by 16.5 % in this period.

Some European countries have a relatively high resource productivity. In 2011, Switzerland, the U.K. and Luxembourg created more than EUR 3 in value added per kilogramme of materials, while Bulgaria, Romania and Latvia created less than EUR 0.5 of value per kilogramme. Resource productivity is closely linked to the economic structure of the country in question. Strong service and knowledge-technology sectors as well as high recycling rates tend to boost resource productivity.

Circular economy

Current production and consumption processes do not only produce goods and services. They also produce residues. These can take the form of pollutants released into the environment, unused pieces of materials (wood or metal), or food that is not consumed for one reason or another.

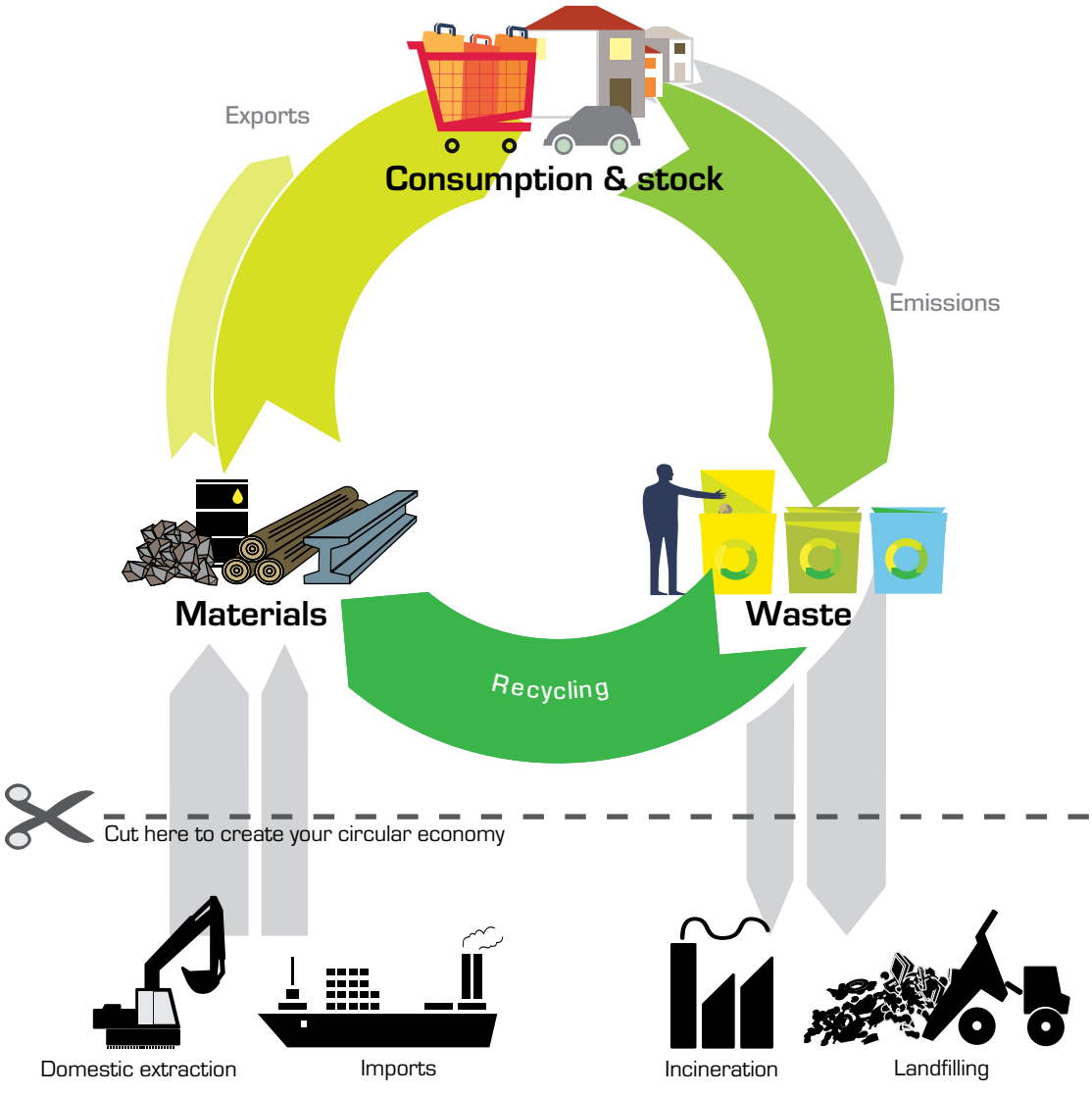
The same holds true for products at the end of their utility period. Some might be partly recycled or re-used, but some end up in dumps, landfills or incineration. Given that resources were used for these goods and services, any part that is not utilised actually represents a potential economic loss as well as an environmental problem.

Europeans generated on average around 4.5 tonnes of waste per capita in 2010. Approximately half of this amount feeds back into the production process.

The term '**circular economy'** foresees a production and consumption system that generates as little loss as possible. In an ideal world, almost everything would get re-used, recycled or recovered to produce other outputs. Redesigning products and production processes could help minimise wastage and turn the unused portion into a resource.

How can we make our economy circular and resource efficient?

Currently, we are using more resources than our planet can produce in a given time. We need to reduce the amount of waste we generate and the amount of materials we extract.



12.4

tonnes of materials per capita were **extracted** in the EU.

3.2

tonnes of materials per capita were **imported** to the EU.

1.3

tonnes of material per capita were **exported** from the EU.

Read more: eea.europa.eu/themes/households and eea.europa.eu/themes/waste

People and business ideas

The consumer and the producer are equally important players in greening our economy. The production process is geared to deliver what consumers want. But do we want to own more consumer products, or do we just want the services that the products provide?

More and more companies are adopting business approaches known as **'collaborative consumption'**. This enables consumers to meet their needs leasing, product-service systems and sharing arrangements, rather than purchases. This might require a new way thinking about marketing and product design — with less focus on sales and more focus on making durable and reparable products.

The Internet and social media make such collaborative consumption products and services easier to find and use. And they do not need to be limited to borrowing tools from neighbours, booking a car from a car-sharing scheme or leasing electronic devices. Clothes libraries, where users can borrow clothes, also exist in some EU countries.

Any measure to reduce the rate of new extraction and the amount of waste, including boosting resource productivity, recycling and reusing, relieves the pressures on the environment and boosts our ecosystems' capacity to provide for us. The healthier our environment is, the better off and healthier we will be in turn.

Interview

Lucia Reisch

Lucia Reisch is a professor of consumer behaviour and consumer policy at Copenhagen Business School, Denmark. As a consumer researcher, she contributes to several EU-funded research projects.

What makes us buy what we buy?

Europeans of all ages are consumers. What we choose to consume and buy plays a role in determining what is produced. But how do we choose what to buy? Is it a rational or an impulsive decision? We asked Lucia Reisch, from Copenhagen Business School, about consumer behaviour in Europe.

What determines consumer behaviour?

There are external and internal factors determining our behaviour as consumers. External factors involve accessibility, availability and affordability — what products are available, and whether we can afford them... In some cases, for example, you might have the means to afford more expensive organic products, but they might be unavailable where you live.

Internal factors relate to motivations, one's own set of preferences and needs, which are in turn determined by many influences. Commercial communication is one of these influences, but not the only one. Most of our consumption is determined by what others around us do. Recent neurological studies show that we are much less rational, less disciplined when it comes to buying.

According to some studies, up to 90 % to 95 % of the choices we make in a store are determined by impulse, emotions and habit. We mainly buy what we know. Only a small percentage of our purchases are made based on a cognitive decision.

Certainly, the findings might vary depending on the group. Youth seems to be more influenced by commercial communication.

Has our consumption behaviour changed over time?

In some ways, the basics have remained the same. We are influenced by what others around us do. In other ways, it has changed considerably. It has become much more sophisticated. More products and more choice are available on the shelves.

Online shopping has taken this to another level. We can now order more or less whatever is available on the global market, and expect it to be delivered to us. These developments have naturally changed consumer behaviour. There is less self-regulation.

The structure of household expenditure has also changed to some degree. In Europe, we are spending more on communications, information and technology, travel and housing. Technological developments have influenced our consumption choices. A few decades ago, not every household owned a television set. Now, in the EU and other developed regions, many households have more than one set.

Another difference concerns our savings. In Europe, people tend to save a smaller share of their incomes. They are actually more likely to take on consumer credit for travel and gadgets. Some of these trends are picked up on by Eurobarometer surveys.

Is it all about more and impulsive consumption?

Not at all! We can also see a strong development around sustainable and collaborative consumption — affecting not only individuals, but also the companies producing the consumer products and services.

In some business sectors, such as textiles, construction and the financial sector, we can see more and more resource-efficient products and services. In the construction sector, for example, energy efficiency and better use of materials input has become part of the mainstream. One of the projects I am involved in looks at how the fashion industry can become more sustainable, not only from an environmental, but also from a social point of view.

In many ways, these new trends are closely linked to, and resulting from, consumers' demands and expectations. In Europe, there is a segment of society that is questioning their overall well-being and happiness. It might include families with kids, or individuals with a certain level of education, income or awareness. For these groups, it is becoming increasingly important to live in a healthy environment or to know who produces the products they are buying, and how. And they are often willing to take action. In wealthier nations, they are becoming a market force.

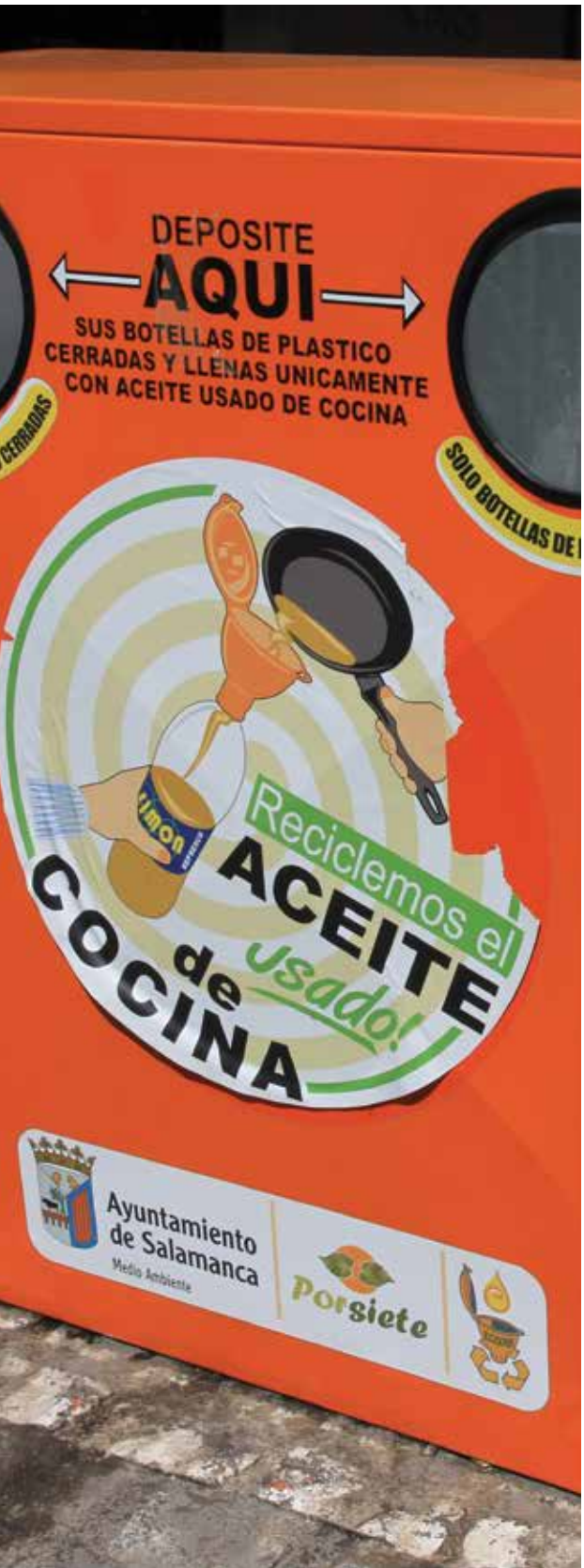
Unsurprisingly, the support for such sustainability movements is much more limited in lower income groups in Europe, and similarly in developing countries. The affordability element in the 'accessibility, availability and affordability' triangle weighs in.

Policy interventions: can policies influence behaviour?

Policies can certainly influence consumer behaviour. We have to bear in mind that in democratic societies, policies need the backing of voters. Imposing taxes on unsustainable options would increase the price, and price is an important factor for many when buying goods and services.

Public authorities are also buyers — a market force for some products. For example, a decision to buy only organic food or fair trade coffee for all public institutions, or to favour sustainable vehicles for public services, can boost the market share of sustainable products and services.

Public policy also plays a role in transforming the infrastructure, to offer more sustainable options. This goes back to the question of accessibility and availability. If there are no bicycle paths, one cannot expect extensive use of bicycles as a transport mode. The key to public policy's success is to offer healthy and sustainable defaults along with the freedom to opt out.



When is behaviour more likely to change?

Information campaigns can help raise awareness. But for any kind of behaviour change to happen at a large scale, the offer has to be accessible, reliable and easy to use. Some car-sharing schemes are extremely successful. Well-designed and organised schemes, like the 'Car-to-Go' scheme in Stuttgart, Germany are very successful, even in a car-producing city like Stuttgart.

There are some biases that are hardwired. For example, we are interested in our own relative status compared to our peers. We are also social imitators. When designing an initiative or a policy, we should not try to change the hardwiring. On the contrary, the best results are achieved when we take these elements into account and work with them. If the offer is attractive, and your peers are doing it, you are more likely to get on board.

I am involved in an EU-funded research project looking at how to develop user-integrated innovation as well as collaborative consumption. What are the user needs? How can sustainable choices be promoted? How can initiatives where communities share resources be applied more extensively? How can nudging be used to promote healthier food among the youth?

There are many good ideas out there for sharing resources, be it borrowing clothes from fashion libraries or borrowing tools from neighbours. Upscaling such niche-ideas might require facilitation or support by public bodies.

From production to waste: the food system

We are using more and more natural resources because of population growth, lifestyle changes and increasing personal consumption. To tackle our unsustainable consumption, we need to address the entire resource system, including production methods, demand patterns and supply chains. Here, we take a closer look at food.

The food system, in general terms, includes all the materials, processes and infrastructures relating to agriculture, trade, retail, transport and consumption of food products. Like water and energy, food is a basic human need. In addition to being available, food needs to be of high quality, diverse, accessible, safe for consumption and affordable. There is also a strong link between our health and well-being and food. Both malnutrition and obesity are health problems directly linked to the way we produce, market and consume our food.

Europeans' food consumption has changed considerably over time. For example, compared to 50 years ago, we eat more than twice as much meat per person. But also, since 1995, beef consumption per person has declined by 10 %. At the same time, Europeans are eating more poultry, fish and seafood, fruits and vegetables.

The EU is one of the biggest food producers in the world. It employs modern agricultural production systems and has land suitable for agriculture. Productivity per hectare has gone up considerably, particularly in the second half of the 20th century. Given its diversity of agricultural land and climates, Europe produces a wide range of products. But it also relies on imports to meet its demand for food.

Agricultural productivity, in terms of crop yield, has increased owing to growing monoculture (i.e. producing the same crop in larger areas) and irrigation, better machines, and more chemical inputs such as pesticides and fertilisers. This intensification has allowed Europe to use less land to produce more food.

However, these modes of production have not been without their environmental costs. Intensification in this manner exerts higher pressures on the environment, resulting in higher nitrogen pollution and CO_2 emissions, greater biodiversity loss in farmlands and contamination of soil, rivers and lakes. Furthermore, increasing the use of external inputs in order to obtain higher yields in food production often decreases its overall energy efficiency. That is, when we invest even more energy to produce food, we actually get less and less energy (calories) out in terms of actual food energy provided to society.

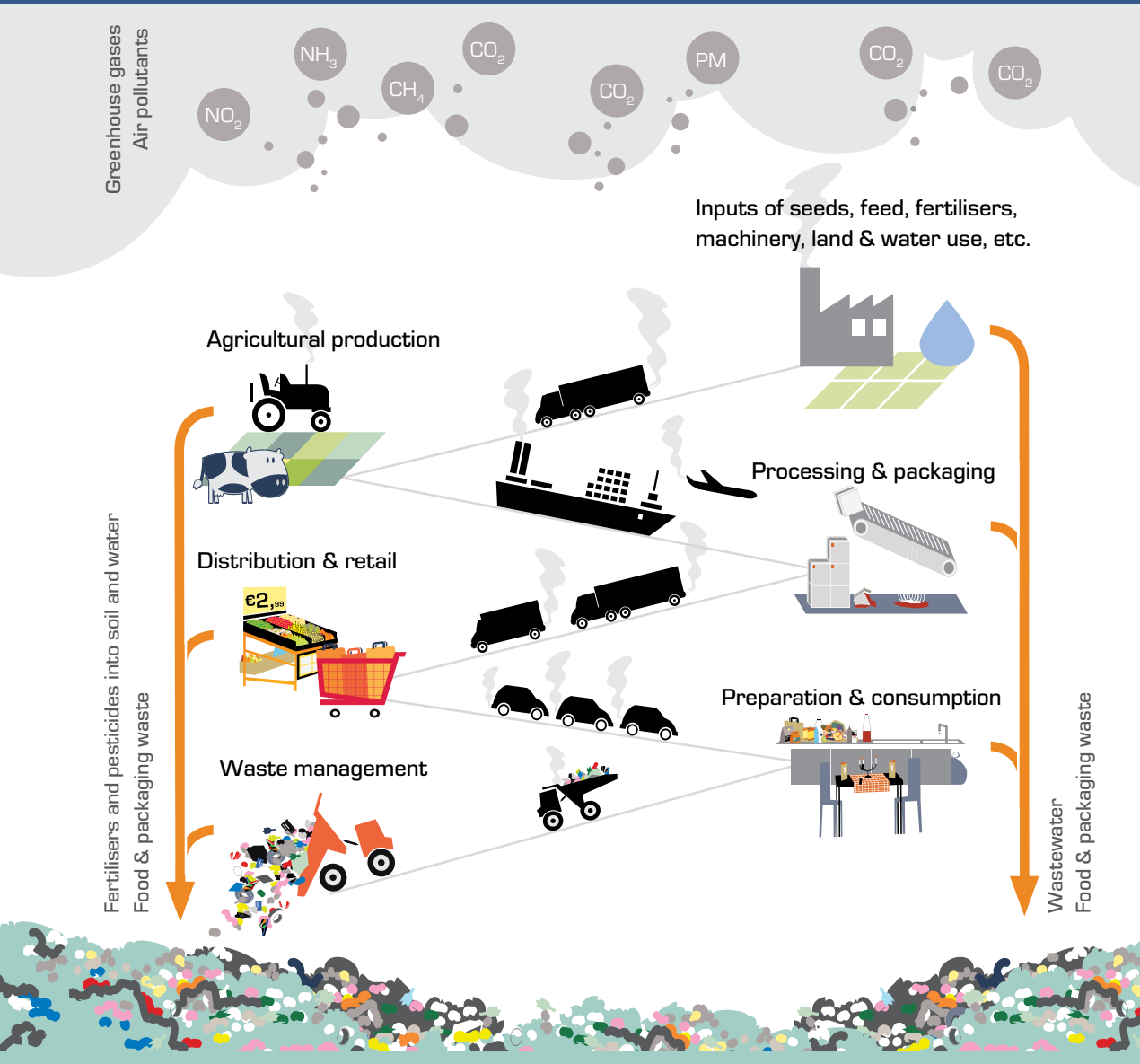
Sustainable and productive

It is clear that Europe needs to reduce the environmental impacts of agricultural production. And at the same time, Europe needs to continue producing similar amounts of food to meet the demand both in the EU and globally.

The EU is one of the largest food producers and exporters in the world. Any significant reduction in its output would affect global production and consequently food prices. How can Europe continue producing high quality food in sufficient quantities and at affordable prices, while reducing the environmental impacts of agriculture?

How does the food we buy, eat and don't eat impact the environment?

Before reaching our plates, food needs to be produced, processed, packaged, transported and distributed. Every step uses up resources and generates more waste and pollution.



In Europe, agricultural production of food, fibre and fuel accounts for:

90 %

of ammonia (NH_3) emissions, impacting air quality

50–80 %

of nitrogen load in freshwater bodies, affecting water quality and aquatic ecosystems

10 %

of greenhouse gas emissions (incl. 80 % of methane emissions) contributing to climate change

Source: EEA

Adopting more sustainable farming practices can help. For example, agro-ecological methods offer a means of intensifying agriculture without synthetic chemical inputs (i.e. fertilisers and pesticides) by utilising natural products and leveraging ecological processes in its production. Precision farming techniques offer the means to reduce the use of chemical and hence some of the environmental impacts.

Regardless of the method, food production needs to remain sufficiently intensive so that productivity keeps up with food demands. In this way, land use and biodiversity will not become further compromised.

Moreover, in many regions, agriculture is the main source of income for local communities, not to mention being part of the social fabric and the local culture. Any measures aiming to improve the food system would have to take such social aspects into account.

Measures only targeting the production side would fall short of 'greening' the entire food system. Nevertheless, additional efficiency gains are needed at other stages, such as transport, retail and consumption. A dietary shift from less meat towards more vegetables would ease the pressure on land use.

Food waste

In Europe, it is estimated that about one third of the food produced in Europe is not consumed and waste occurs at all stages of the chain. The European Commission estimates that in the EU alone 90 million tonnes of food (or 180 kg per person) are wasted, much of which is still suitable for human consumption. Food waste is identified as one of the areas to tackle in the EU's Roadmap to a Resource Efficient Europe.

Many of us try to reduce the amount of food we throw away at home. One way is to try to prepare just the right amount of food for dinner — not too much; not too little. Another way is to be creative with the leftovers from the day before. Yet, no matter how hard we try, some food is inevitably thrown away: fruits rot and milk sours. Food waste from households represents only a fraction of the total amount of food we waste. Large amounts of food have already been wasted before ever reaching our refrigerators.

With regards to how much food is wasted at various stages, there are no EU-wide estimates. Reliable and comparable data does not exist, especially for food waste generated in agricultural production and fisheries. However, some country-specific analyses are available.

Food waste analysis in Sweden

According to a study by the Swedish Environment Protection Agency, in 2012 Swedes wasted 127 kg of food per person. This estimate does not include the food wasted in the production phase (agriculture and fishing) and the inevitable food waste from the food processing industry.

Of this amount, 81 kg per person was generated in households. Restaurants generated 15 kg per person, supermarkets 7 kg per person and catering facilities 6 kg per person. The Swedish study also estimated how much of this food waste was 'unnecessary'. The findings point to areas of potential gains: 91 % of the food waste generated in supermarkets, 62 % in restaurants, 52 % in catering facilities and 35 % in households were qualified as unnecessary.

What are the sources of food waste in Europe?

Around one third of the food produced globally is lost or wasted. Food waste represents a substantial loss of other resources such as land, water, energy and labour.

Manufacturing

By-products, such as carcasses & bones from meat production

Misshapen products

Damaged products

Overproduction

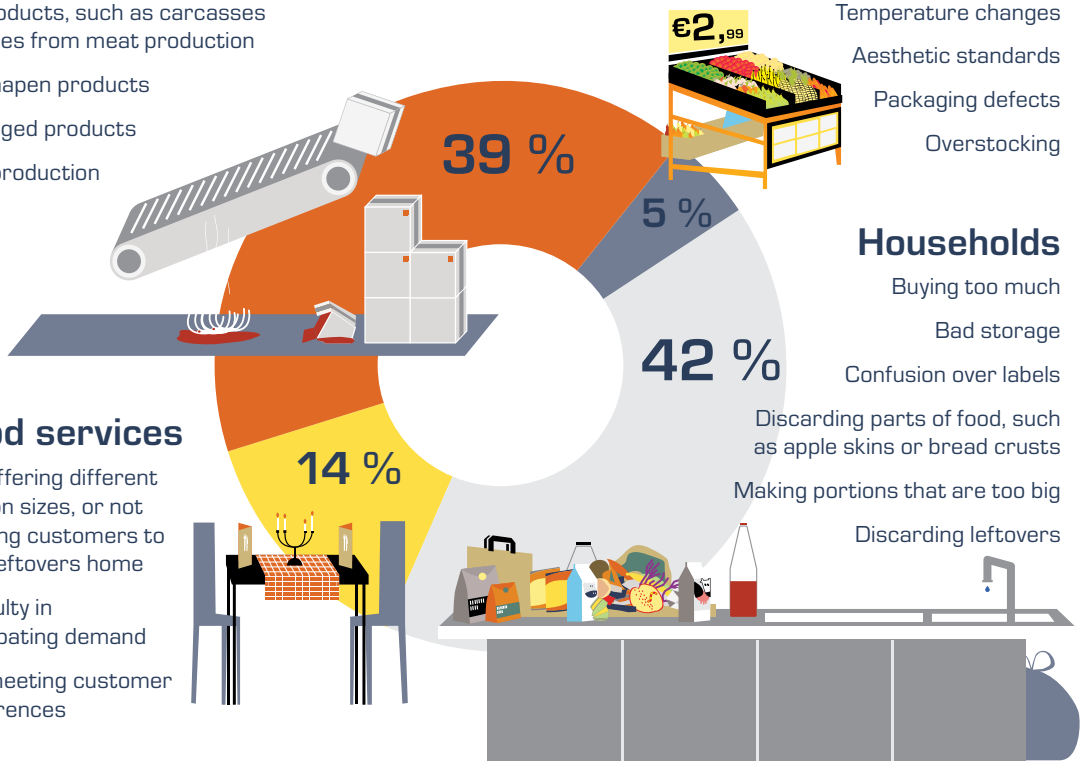
Wholesale and retail

Temperature changes

Aesthetic standards

Packaging defects

Overstocking



Households

Buying too much

Bad storage

Confusion over labels

Discarding parts of food, such as apple skins or bread crusts

Making portions that are too big

Discarding leftovers

Food services

Not offering different portion sizes, or not allowing customers to take leftovers home

Difficulty in anticipating demand

Not meeting customer preferences

Average households discard about 25 % of the food they purchase (by weight).

In the EU, around 180 kg of food waste per capita is generated each year.

1/3 of the food produced globally is lost or wasted.

Sources: European Commission preparatory study on food waste (2010), FAO

Read more: www.eea.europa.eu/waste

Some food waste occurs as part of the attempt to ensure compliance with existing legislation protecting public health and consumers. Contaminated meat taken off the shelves is a waste of resources, but it is also a preventive measure necessary to safeguard human health.

Other measures are less straightforward. For example, the 'best before' dates on food products do not necessarily mean that the product goes bad from one day to the next but that its quality decreases from that point forward. That is, some products are still safe to be consumed after the date displayed, but retailers cannot sell them, consumers do not buy them. Meeting consumer expectations (for example regarding ample choice and full shelves, or aesthetics) can also drive food waste at the retail phase.

The fate of unsold food depends on waste management practices. It might be used as fodder, composted or recovered as energy, or end up in landfills.

One system's gain is also another's gain

Every time we waste food, we are also wasting the land, the water, the energy and all the other inputs used to create the food we are not consuming. Therefore, any decrease in food waste actually means potential gains for the environment. If we reduce the amount of food we waste throughout the food system, we will need less water, less fertiliser, less land, less transport, less energy, less waste collection, less recycling and so on.

To put this in the broader context of green economy, increasing resource efficiency in one system helps reduce resource use in other systems. It is almost always a win-win scenario.

Waste: a problem or a resource?

Waste is not only an environmental problem, but also an economic loss. On average Europeans produce 481 kilogrammes of municipal waste per year. An increasing share of this is recycled or composted, and less is sent to landfill. How can we change the way we produce and consume so as to produce less and less waste, while using all waste as a resource?

Europe generates large amounts of waste: food and garden waste, construction and demolition waste, mining waste, industrial waste, sludge, old televisions, old cars, batteries, plastic bags, paper, sanitary waste, old clothes and old furniture... the list goes on.

The amount of waste we generate is closely linked to our consumption and production patterns. The sheer number of products entering the market poses yet another challenge. Demographic changes, like an increase in the number of one-person households, also affect the amount of waste we generate (e.g. packaging goods in smaller units).

The large spectrum of waste types and complex waste-treatment paths (including illegal ones) makes it difficult to get a complete overview of the waste generated and its whereabouts. There are data, albeit of varying quality, for all types of waste.

How much waste do we generate?

The EU Data Centre on Waste compiles waste data at European level. According to data for 2010 for 29 European countries (i.e. EU-28 and Norway), around 60 % of the waste generated consisted of mineral waste and soil, largely from construction and demolition activities and mining. For metal, paper and cardboard, wood, chemical and medical waste and animal and vegetal wastes, each waste type ranged from 2 % to 4 % of the total.

Around 10 % of the total waste generated in Europe consists of what is known as 'municipal waste' — waste generated mainly by households, and to a lesser extent by small businesses, and by public buildings such as schools and hospitals.

In 2012, 481 kg of municipal solid waste was generated per person in the 33 member countries of the European Environment Agency (EEA). There is a slight downward trend from 2007 onwards, which can be explained partly by the economic crisis affecting Europe since 2008.

On the right track: recycling more; landfilling less

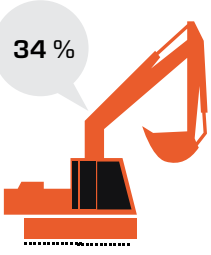
The slight dip observed in municipal waste generated in the EU might have helped reduce the environmental impacts of waste, to some extent. However, while waste quantities are important, waste management also plays a key role.

Overall in the EU, an increasing amount of waste is recycled and a decreasing amount is sent to landfills. For municipal waste, the share of recycled or composted waste in the EU-27 increased from 31 % in 2004 to 41 % in 2012.

Europe's waste streams

In total, about 2500 million tonnes of waste was generated in the EU-28 and Norway in 2010. Here is an overview of where the waste came from and what it was composed of.

Waste streams by source



34 % Construction

27 % Mining and quarrying

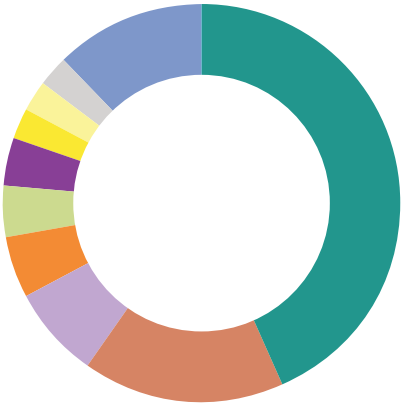
11 % Manufacturing

9 % Households

3 % Energy supply

16 % Other sources

Waste streams by type of waste

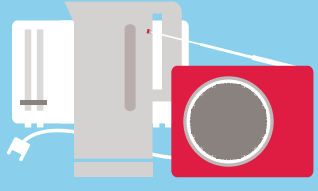


43.5 %	Mineral waste
16.4 %	Soils
7.4 %	Household and similar waste
5.0 %	Combustion waste
4.4 %	Animal and vegetal waste
3.9 %	Metal waste
2.5 %	Chemical and medical waste
2.5 %	Wood waste
2.3 %	Paper and cardboard waste
12.2 %	Other waste

Source: Eurostat 2010 data on EU-28 and Norway

On average, we generate 157 kg of packaging waste per capita in the EU.

Every year, the generation of some 74 million tonnes of hazardous waste is reported in the EU.



Electrical and electronic equipment is the fastest growing waste stream in the EU, estimated to reach 12 million tonnes a year by 2020.

Sources: EEA, Eurostat, European Commission
Read more: www.eea.europa.eu/waste

Despite these achievements, large discrepancies still exist between countries. For example, Germany, Sweden and Switzerland each send less than 2 % of their municipal waste to landfills, while Croatia, Latvia and Malta each landfill more than 90 %. Most of the countries with low landfilling rates have high recycling and incineration rates, both above 30 % of their total municipal waste.

EU legislation sets ambitious targets

The shift in waste management is closely linked to EU waste legislation. The key piece of legislation in this area is the Waste Framework Directive (WFD). It outlines a waste management hierarchy: starting with prevention, followed by preparing for re-use, recycling, recovery and ending with disposal. It aims to prevent waste generation as much as possible, to use waste that is generated as a resource and to minimise the amount of waste sent to landfill.

The WFD along with other EU waste directives (on landfilling, end-of-life vehicles, e-waste, batteries, packaging waste, etc.) includes specific targets. For instance, by 2020, each EU country has to recycle half of its municipal waste; by 2016, 45 % of batteries need to be collected; by 2020, 70 % of non-hazardous construction and demolition waste (by weight) has to be recycled or recovered.

EU countries can adopt different approaches in order to reach their waste targets. Some approaches seem to work better than others. For example, if designed well, landfill taxes appear to be an effective way of reducing landfilled waste. Extended producer responsibility, where the producer has to take back the product at the end of its life, also seems effective.

Air pollution, climate change, soil and water contamination...

Poor waste management contributes to climate change and air pollution, and directly affects many ecosystems and species.

Landfills, considered the last resort in the waste hierarchy, release methane, a very powerful greenhouse gas linked to climate change. Methane is formed by microorganisms present in landfills from biodegradable waste, such as food, paper and garden waste. Depending on the way they are built, landfills might also contaminate soil and water.

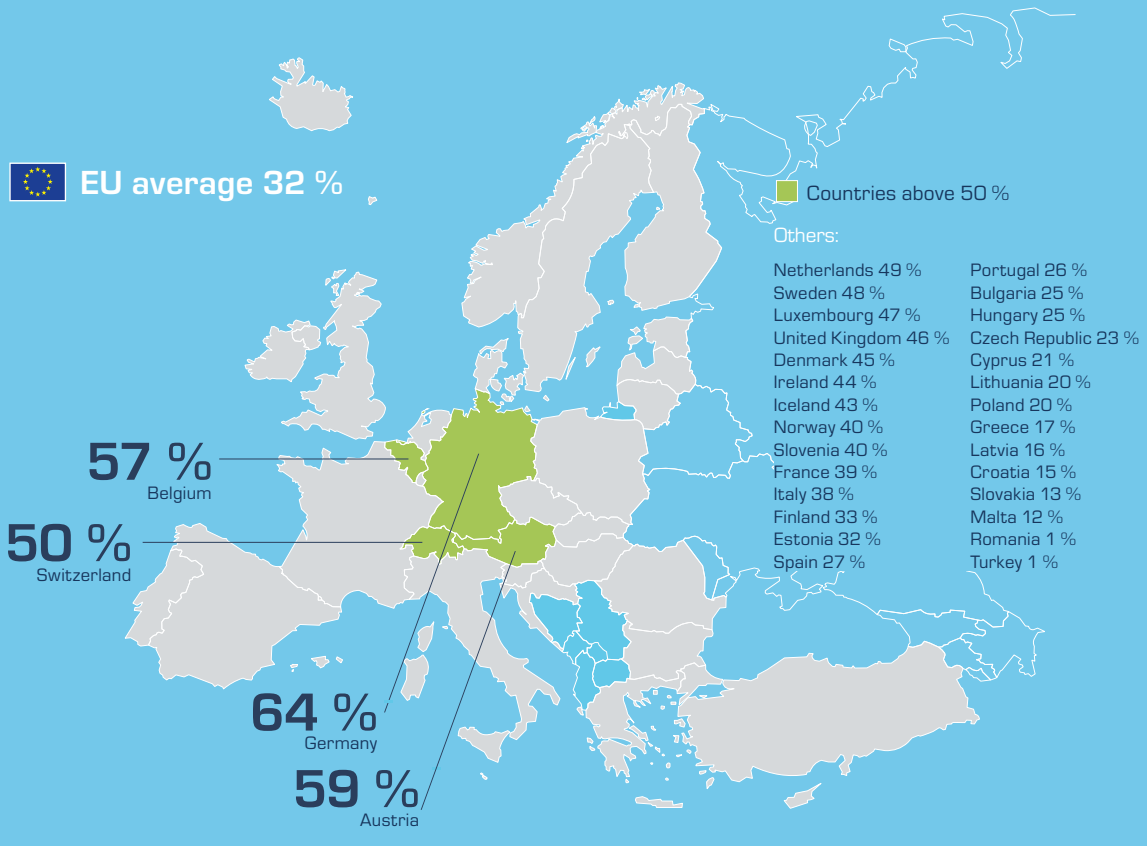
After waste is collected, it is transported and treated. The transport process releases carbon dioxide — the most prevalent greenhouse gas — and air pollutants, including particulate matter, into the atmosphere.

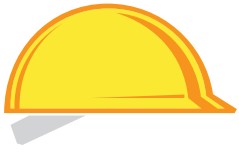
Part of the waste might be incinerated or recycled. Energy from waste can be used to produce heat or electricity, which might then replace the energy produced using coal or other fuels. Energy recovery of waste can thus help reduce greenhouse gas emissions.

Recycling can help even more to lower greenhouse gas emissions and other emissions. When recycled materials replace new materials, fewer new materials need to be extracted or produced in the first place.

How much of our municipal waste do we recycle?

Much of the waste we throw away can be recycled. Recycling benefits the environment by diverting waste away from landfills and by providing raw materials for new products. Recycling can also encourage innovation and create jobs.





In Europe, employment related to recycling increased by 45 % between 2000 and 2007.

50 %

EU countries should recycle at least 50 % of their municipal waste by 2020.

45 %

EU countries should recycle at least 45 % of used batteries by 2020.

Sources: Eurostat (2012), EEA, European Commission

Read more: www.eea.europa.eu/waste

Waste affects ecosystems and our health

Some ecosystems, like the marine and coastal ones, can be severely affected by poor management of waste, or by littering. Marine litter is a growing concern, and not only for aesthetic reasons: entanglement and ingestion constitute severe threats to many marine species.

Waste impacts the environment indirectly as well. Whatever is not recycled or recovered from waste represents a loss of raw material and other inputs used in the chain, i.e. in the production, transport and consumption phases of the product. Environmental impacts in the life-cycle chain are significantly larger than those in the waste management phases alone.

Directly or indirectly, waste affects our health and well-being in many ways: methane gases contribute to climate change, air pollutants are released into the atmosphere, freshwater sources are contaminated, crops are grown in contaminated soil and fish ingest toxic chemicals, subsequently ending up on our dinner plates...

Illegal activities such as illegal dumping, burning or exports also play a part, but it is difficult to estimate the full extent of such activities, or of their impacts.

Economic loss and management costs

Waste also represents an economic loss and burden to our society. Labour and the other inputs (land, energy, etc.) used in its extraction, production, dissemination and consumption phases are also lost when the 'leftovers' are discarded.

Moreover, waste management costs money. Creating an infrastructure for collecting, sorting and recycling is costly, but once in place, recycling can generate revenues and create jobs.

There is also a global dimension to waste, linked to our exports and imports. What we consume and produce in Europe could generate waste elsewhere. And in some instances, it actually becomes a good traded across borders, both legally and illegally.

Waste as a resource

What if we could use waste as a resource and thereby scale down the demand for extraction of new resources? Extracting fewer materials and using existing resources would help avert some of the impacts created along the chain. In this context, unused waste also represents a potential loss.

Turning waste into a resource by 2020 is one of the key objectives of the EU's Roadmap to a Resource Efficient Europe. The roadmap also highlights the need to ensure high-quality recycling, eliminate landfilling, limit energy recovery to non-recyclable materials, and stop illegal shipments of waste.

And it is possible to achieve these things. In many countries, kitchen and gardening waste constitutes the biggest fraction of municipal solid waste. This type of waste, when collected separately, can be turned into an energy source or fertiliser. Anaerobic digestion is a waste treatment method that involves submitting bio-waste to a biological decomposition process similar to the one in landfills, but under controlled conditions. Anaerobic digestion produces biogas and residual material, which in turn can be used as fertiliser, like compost.

An EEA study from 2011 looked at the potential gains from better management of municipal waste. Its findings are striking. Improved management of municipal waste between 1995 and 2008 resulted in significantly lower greenhouse gas emissions, mainly attributable to lower methane emissions from landfill and emissions avoided through recycling. If, by 2020, all countries fully meet the Landfill Directive's landfill diversion targets, they could cut an additional 62 million tonnes of CO_2 equivalent of greenhouse gas emissions from the life cycle — which would be a significant contribution to the EU's climate change mitigation efforts.

Tackling waste starts with prevention

The potential gains are immense, and they can facilitate the EU's move towards a circular economy, where nothing is wasted. Moving up the waste hierarchy offers environmental gains, even for countries with high recycling and recovery rates.

Unfortunately, our current production and consumption systems do not offer many incentives for preventing and reducing waste. From product design and packaging to choice of materials, the entire value chain needs to be redesigned first with waste prevention in mind, and then the 'leftovers' of one process can be made into an input for another.

Moving up the waste hierarchy requires a joint effort by all the parties concerned: consumers, producers, policymakers, local authorities, waste treatment facilities, etc. Consumers willing to sort their household waste can only recycle if the infrastructure for collecting their sorted waste is in place. The opposite also holds true; municipalities can recycle an increasing share only if households sort their waste.

Ultimately, whether waste will constitute a problem or a resource all depends on how we manage it.

How can we reduce and make better use of waste?

The best way to reduce the environmental impacts of waste is to prevent it in the first place. Many items that we throw away could also be re-used, and others can be recycled for raw materials.

1

Think how to prevent waste already when shopping

2

Repair and re-use products. Buy second-hand and sell or give away things you don't need

3

Sort, recycle and compost

4

Some waste can be turned into energy

5

As little as possible should end up in landfills

481 kg

of municipal waste is generated per person per year in the EU.

42%

of treated municipal waste in the EU is recycled or composted.

Recycling an aluminium can saves around 95 % of the energy needed to make a new one from raw material.

Sources: Eurostat (2012)

Read more: www.eea.europa.eu/waste

Close up

Litter in our seas

Around 70 % of our planet is covered by oceans and marine litter can be found almost everywhere. Marine litter, plastics in particular, pose a threat not only to the health of our seas and coasts, but also to our economy and our communities. Most marine litter is generated by land-based activities. How can we stop the flow of litter into our seas? The best place to start tackling this global marine problem is on land.

In 2007, a rather unusual group of castaways washed ashore in northern France. They were rubber ducks that had completed a 15-year-long epic journey, started in January 1992 when a ship travelling from Hong Kong to the United States lost some of its cargo during a storm. One of the containers washed overboard held 28 800 toys, some of which had landed on the Australian and the east coast of the United States years earlier. Others had crossed the Bering Strait and the Arctic Ocean, to come ashore in Greenland, the United Kingdom and Nova Scotia.

Never-ending journey of plastics

Rubber ducks are not the only form of man-made litter drifting in our seas. Marine litter consists of manufactured or processed solid materials (e.g. plastic, glass, metal and wood), which end up in the marine environment in one way or another.

Approximately 10 million tonnes of litter end up in the world's seas and oceans every year. Plastics, more particularly plastic packaging waste such as beverage bottles and single-use bags, are by far the main type of debris found in the marine environment. The list goes on: damaged fishing nets, ropes, sanitary towels, tampons, cotton buds sticks, condoms, cigarette butts, disposable lighters, etc.

Mass production of plastics started in the 1950s and increased exponentially from 1.5 million tonnes per year to its current level of 280 million tonnes per year. Approximately one-third of current production consists of disposable packaging that is discarded within a year or so.

Unlike organic materials, plastic never 'disappears' in nature and accumulates in the environment, in the oceans in particular. Sunlight, salt water and waves split plastics into ever-smaller pieces. A disposable diaper or a plastic bottle can take around 500 years to split into such microscopic pieces. But not all microplastics are the result of the splitting process. Some of our consumer products, such as toothpaste, cosmetics and personal care products, already contain microplastics.

Ocean currents coupled with winds and the earth´s rotation gather these pieces, some of which measure mere microns (one millionth of a metre), and create large patches in areas called gyres. Depending on the size of the pieces, they might appear as a transparent type of 'plastic soup'. These gyres are fluid and change in size and shape. The largest and most studied gyre, the North Pacific Gyre is estimated to have pulled 3.5 million tons of trash, affecting an area estimated to be twice the size of the United States. There are five other major whirlpools in our oceans where waste is also accumulating, including in the Atlantic.

Some pieces wash ashore to mix up with sand even in the most remote parts of the world. Others pieces become part of the food chain.

Where marine litter comes from

According to some estimates, about 80 % of the debris found in the marine environment comes from land-based activities. The source of marine litter is not necessarily limited to human activities along the coastline. Even when disposed of on land, rivers, floods and wind transport litter to the sea. Fishing activities, shipping, off-shore installations such as oil rigs and the sewage system contribute the rest.

There are some regional variations in the origin of marine litter. In the Mediterranean, Baltic and Black Seas, land-based activities generate most of the marine litter; in the North Sea, however, maritime activities are an equally significant contributor.

More plastics than plankton

The full extent of the impacts of marine litter is difficult to estimate. Marine litter has two key adverse effects on marine wild life: ingestion and entanglement.

Research conducted by Algalita, an independent marine research institute based in California, found in 2004 that marine water samples contained six times more plastic than plankton.

Given its size and prevalence, marine animals and sea birds mistake marine litter for food. More than 40 % of existing species of whales, dolphins and porpoises, all species of marine turtles, and around 36 % of sea birds species are reported to have ingested marine litter. Ingestion is not limited to one or two individuals. It affects schools of fish, as well as flocks of sea birds. For example, over 90 % of Fulmar sea birds that washed ashore dead in the North Sea had plastic in their stomach.

A stomach filled with indigestible plastic can prevent the animal from feeding, ultimately starving it to death. The chemicals in plastics can also act as poison, and depending on the dose, they can permanently weaken or kill the animal.

Larger pieces of plastic also pose a threat to marine life. Many species, including seals, dolphins and sea turtles, can get entangled in plastic debris, and fishing nets and lines lost at sea. Most of the entangled animals do not survive, as they cannot get up to the water's surface to breathe, escape from predators or feed themselves.

Tip of the iceberg

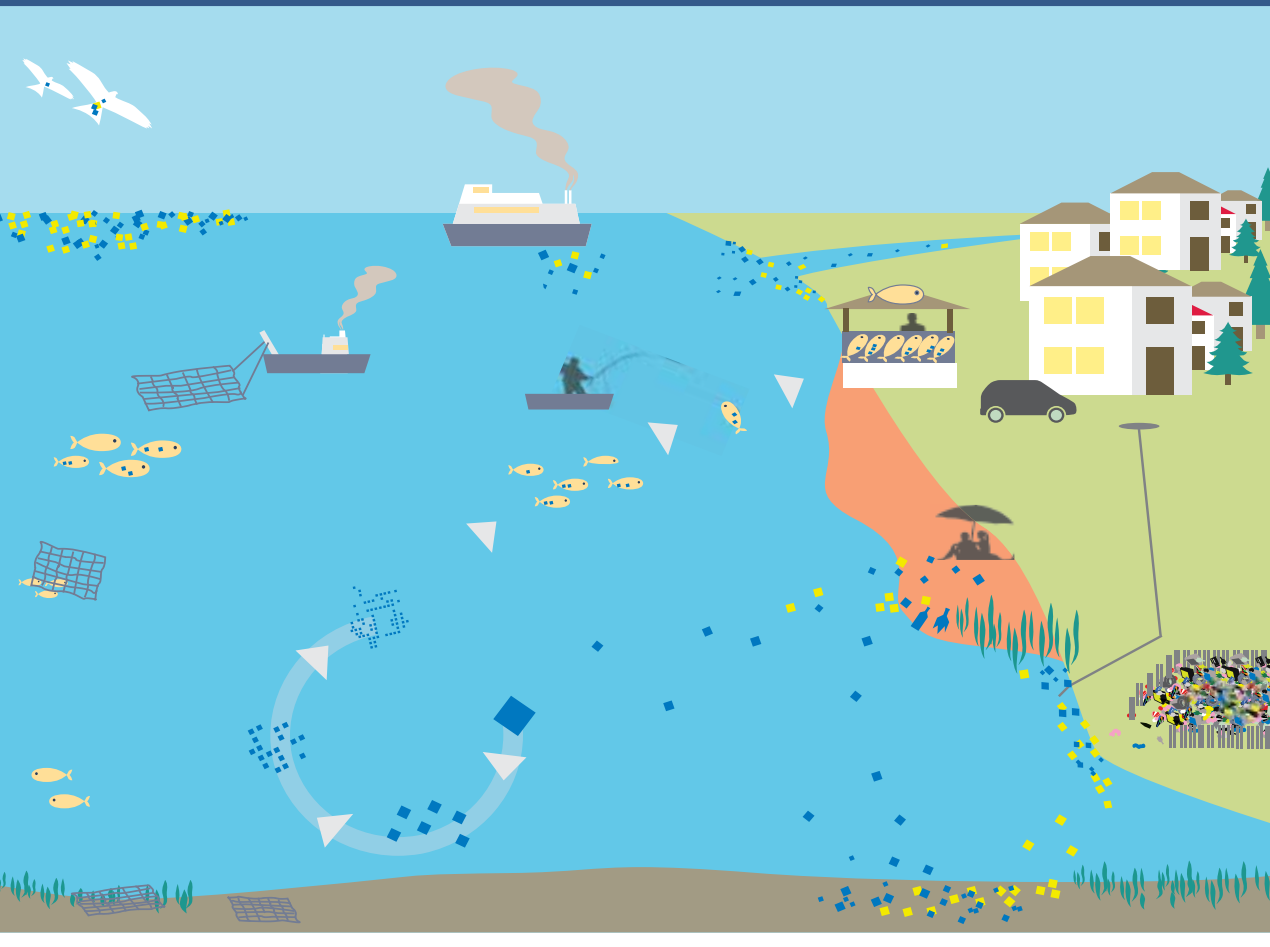
Marine litter is a global problem, and reliable data are hard to collect. Currents and winds move visible pieces around, which might result in the same debris being counted more than once. Moreover, only a small portion of marine litter is believed to be floating or to wash ashore. According to United Nations Environment Programme (UNEP), only 15 % of marine debris floats on the sea surface; another 15 % remains in the water column, and 70 % rests on the seabed.

The 'invisible' part of the debris continues to affect the overall health of the marine environment. Around 640 000 tonnes of fishing gear is estimated to be lost, abandoned or discarded globally. These 'ghost nets' continue catching fish and other marine animals for years and decades.

Moreover, some of the fish species ingesting plastics are regulars on our plates. By consuming seafood exposed to plastics and their oil-based chemicals, human health is also put at risk. The human health impacts are not fully clear.

What are the sources and impacts of marine litter?

Increasing amounts of litter are ending up in the world's oceans and harming the health of ecosystems, killing animals and putting human health at risk. The solution lies in waste prevention and better waste management on land.

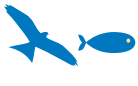


Litter ends up in the sea via rivers and sewage pipes or with wind. Litter from ships and boats often also accumulates in the ocean.

Vast patches of litter and small plastic particles are funnelled together by ocean currents. Litter also accumulates on the sea bed and on beaches.

About 10 % of marine litter is discarded fishing gear, which often kills or injures marine animals and seabirds.

Many plastics break into ever smaller pieces, which can then enter the food chain.



Around 36 % of the world's seabird species and many species of fish have been reported to ingest marine litter.

Read more: eea.europa.eu/themes/coast_sea/marine-litterwatch
unep.org/regionalseas/marinelitter

Coastal communities most affected

More than 40 % of the EU population lives in coastal regions. In addition to its environmental costs, marine litter has also socio-economic costs, affecting mostly coastal communities. A clean coastline is vital for beach tourism. On average, 712 items of litter are found on a 100-m stretch of beach on the Atlantic Coast. And without action, marine litter accumulates on the beach. In order to boost the appeal of their bathing sites to tourists, many communities and businesses must clean up the beaches before the start of the summer season.

There are no comprehensive estimates of the total cost of marine litter on society. Likewise, it is difficult to estimate the loss to the local economy due to potential visitors choosing other sites. But there are examples of concrete costs for clean-up activities, quantified in monetary terms. In the United Kingdom, municipalities spend approximately EUR 18 million per year for beach clean-ups.

Clean-up activities might help collect larger pieces and improve the aesthetics of the area, but what about small pieces? According to Kommunenes Internasjonale Miljøorganisasjon (KIMO), an international organisation bringing together local authorities around marine pollution issues, around 10 % (by weight) of the strandline material consists of plastics. Because of their small size, it is often impossible to differentiate these from sand.

Tackling marine litter: start with prevention

Although marine litter is only one of the pressures on the health of the marine environment, it is a growing concern. The accumulation and long endurance of plastics in nature complicates the issue further.

Marine litter is a cross-border problem; once it enters the sea, it has no owner. This makes its management difficult and highly dependent on good regional and international collaboration.

Some EU legislation targets marine issues directly. For example, the EU's Marine Strategy Framework Directive adopted in 2008 identifies marine litter as one of the areas to tackle in order to achieve good environmental status for all marine waters by 2020. Following up on these EU directives and the global commitment expressed at the Rio+20 UN Sustainable Development Conference in 2012, the EU's 7th Environment Action Programme (2014–2020) foresees establishing a baseline and setting a reduction target.

Similar to overall waste management, the starting point for tackling marine litter is prevention. How can we prevent litter? Do we need plastic bags every time we go shopping? Can some of our products and production processes be designed so that they do not contain or create microplastics? Indeed, they can.

Action starts on land

The next step is to take action on land, before litter reaches our seas. To this end, the EU has policies and legislation aimed at improving waste management, reducing packaging waste and increasing recycling rates (of plastics in particular), improving wastewater treatment, and using resources more efficiently in general. There are also directives drawn up to help curb pollution from ships and ports. Improving the implementation of waste prevention and reduction policies can potentially reap enormous benefits.

But what about the litter already affecting our seas and oceans? Marine litter has been accumulating in our seas for years. Some pieces have sunk to the bottom, while others are moving around with ocean currents. It is nearly impossible to imagine how we can clean it all up.

Several 'fishing for litter' initiatives are in place, where vessels collect marine litter — similar to municipal waste collection on land. However, the methods being used fail to collect litter below a certain size. So the problem of microplastics remains unsolved. Moreover, given the scope of the problem and the size of our oceans, such initiatives are too limited to result in real improvements.

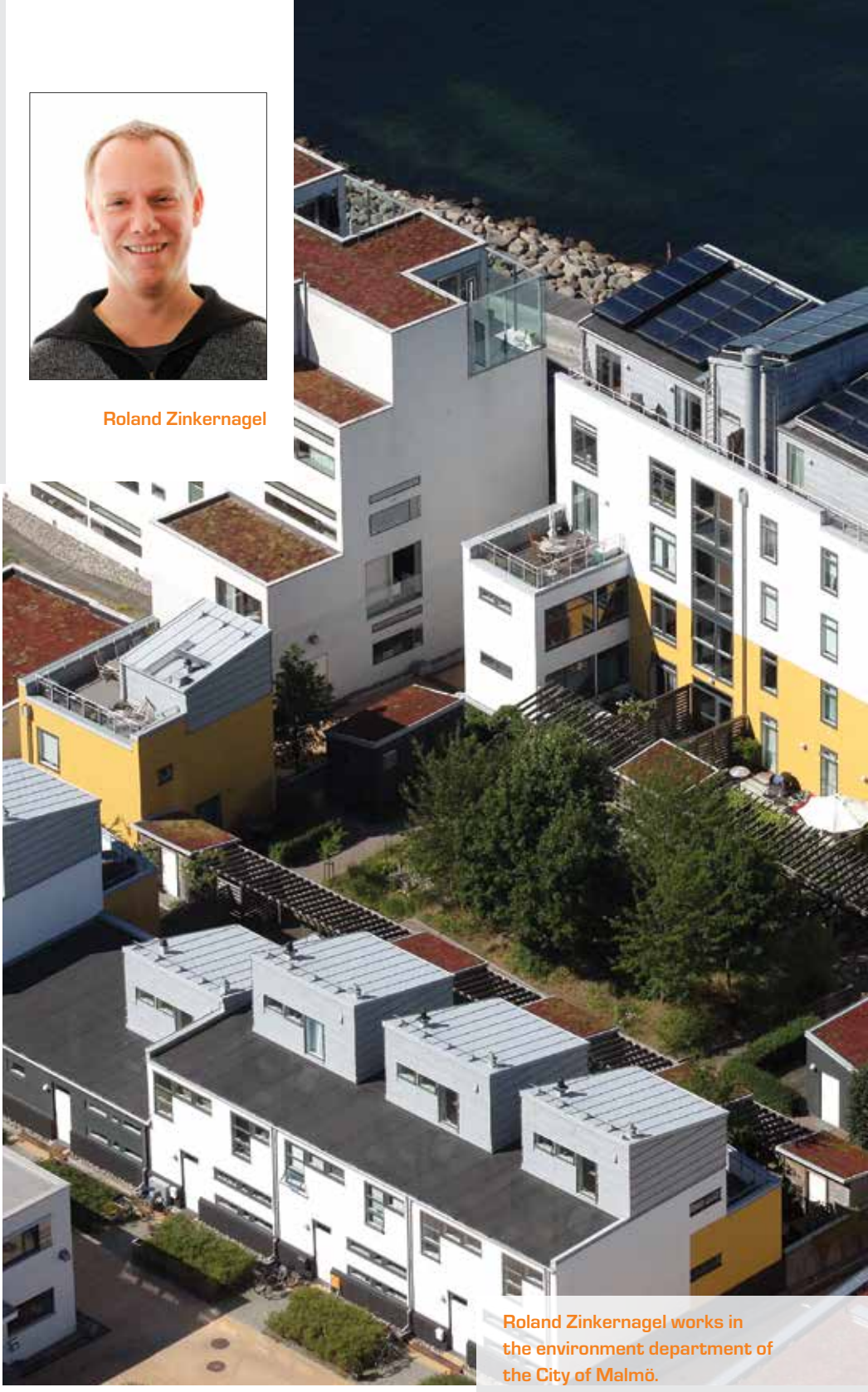
The same might be said about clean-up activities on beaches and coasts. Nevertheless, such initiatives are a good way to raise awareness of the issue and engage citizens in the tackling of the problem of marine litter. At the end, it may simply be a question of numbers. As the number of volunteers joining such activities increases, the better we might be at prevention.

Marine LitterWatch

The EEA has developed 'Marine LitterWatch', which includes an app to monitor marine litter on Europe's beaches. The app, available for free, allows beach clean-up communities to collect data in a way that can help improve our knowledge about marine litter.
It also allows interested parties to find clean-up initiatives nearby or to create their own community.

Interview

Roland Zinkernagel



Roland Zinkernagel works in the environment department of the City of Malmö.

How to make cities 'green'

More than three quarters of Europeans live in urban areas. What urban residents produce, buy, eat, and throw away, the way they move around and where they live all have an impact on the environment. At the same time, the way a city is built also affects the way its residents live. We asked Roland Zinkernagel from the City of Malmö in Sweden about concrete actions to make their city sustainable.

What makes a city sustainable?

Cities are centres of economic and social activity. They can grow; they can decline. There is not a one-size-fits-all solution to make a city sustainable. Different aspects of urban life need to be addressed. It is not just about building green spaces, attracting innovative and green businesses and building strong public transport. It is about looking at a city as whole, including the well-being of its residents.

Malmö is an industrial city of roughly 300 000 people with diverse backgrounds. The city has high-rise buildings constructed in the 1960s as well as single-family houses with gardens. It also has new neighbourhoods, where we tried to build the city of the future: carbon neutral, compact, green.

After the closure of its large shipyard in the beginning of 1980s, its population started shrinking, mainly due high unemployment rates. It took time to replace this negative image of the city with a positive one — a pleasant living environment, a front-runner in environmental policies and awareness, a fair-trade city that is green and clean, and so on.

How can a city be made sustainable?

The City of Malmö has outlined its general environmental objectives in a long-term programme agreed across the political spectrum. The environmental programme stipulates that the city administration of Malmö will be climate-neutral by 2020, and the whole municipality will run on 100 % renewable energy by 2030. There are also targets to reduce energy consumption per capita, as well as greenhouse gas emissions.

The environmental programme also foresees more sustainable use of resources, including water, land and biodiversity in the city, as well as in the wider surrounding area. We also aim to create a more pleasant living environment for everyone, in other words, to help build the city of the future.

How are these objectives translated into concrete projects?

On the basis of the environmental programme, the City of Malmö adopts action plans with more specific targets. For example, one of the concrete targets in our action plan states that by 2015, 40 % of organic waste should go to biogas production. A concrete target like this requires action at different levels and stages. Households need to sort an increasing share of their waste. Waste management authorities need to prepare for collection of increased amounts of organic waste. And finally, to convert the increasing amount of organic waste into biogas, we need new plants, or additional capacity for existing plants.

Some targets, like higher sorting rates in households, can be achieved through information campaigns. Others might require investing in infrastructure, including in waste collection fleets and energy plants.

As with this example, one concrete target requires the involvement of many different actors. To bring these projects to life, we are and need to be in constant dialogue with civil society, public institutions and the private sector. Many of our projects receive funds from the EU.

How do the residents get involved or contribute?

A key component of our environmental programme is what we call 'making it easy to do the right thing'. We need to offer them the possibility to opt for the more sustainable alternatives, including facilitating the use of public transport and improved waste management.

When it comes to behaviour change, knowledge is vital. Our approach rests on enabling our residents to make informed decisions. What does their decision to take their car mean for the city's air quality and traffic, compared to using public transport?

One of our objectives is to make the city socially sustainable, with more interaction between people living in different parts of the city. This involves creating spaces and opportunities for Malmö's residents to come together, like green spaces or festivals. This also contributes to fostering a positive image of the city, as well as improving the living environment.

How long does it take to transform a city like Malmö into a fully sustainable city?

Each city starts from a different point. It depends on the existing infrastructure, political priorities and objectives. Malmö has an advantage compared to most European cities. This forward-looking vision has been in action since the 1990s. As a result, we have parts of the city already built and developed with this vision in mind.

We are talking about very concrete projects and concrete problems, and we have a better understanding of the tasks at hand. So in this sense, we are among the front-runners in Europe.

In the neighbourhoods where we have been active for 15 years, we can see that the programme has gained its own momentum. Some projects, such as waste sorting and recycling, might take 5 to 10 years to implement, but public perception might take up to a generation to change. Other cases, including transforming the existing buildings, might take even longer.

The transition certainly happens in small steps. Public authorities play a certain role in facilitating this transition, not only by providing a framework but also by leading by example.

What are the main challenges?

In my opinion, the biggest challenge is to plan for the long-term; in other words, to move away from short- to medium-term planning. Politicians are elected for four- or five-year terms and their policy priorities can change after elections or during their term in office. The same is true for businesses. An investment decision depends on how much they can earn in return, and when. When it comes to building sustainable cities, we are actually looking at many different elements, as I mentioned earlier.

We need to plan and prepare for a horizon well beyond our 5- to 10-year action plans. For example, the buildings we are constructing now might actually still be in use in 2100. Are we factoring in future energy needs or the use of buildings when we design them? We need to be visionary and flexible at the same time. There might not be clear answers to these questions yet, but they are certainly worth considering.


Buy 1 Get 1 F
CLOSING DOW
SALE
verything Must G

Basics of economics and the environment

In March 2014, Paris, France, was affected by a particulate matter episode. Private car use was highly restricted for days. On other side of the planet, a Chinese company was launching a new product: smog insurance for domestic travellers whose stay was ruined by poor air quality. So how much is clean air worth? Can economics help us reduce pollution? We take a closer look at basic economic concepts.

The word 'economy' comes from the ancient Greek word 'oikonomia', meaning household management. The activities it covers go back even further. Early communities consisted mainly of extended families working together to ensure that the group survived and their basic needs were met. Different members of the community were responsible for diverse activities: providing food, finding or building shelter, etc.

As our societies and the technology available got more sophisticated, members started to specialise in various tasks needed by the community. Specialisation came with an increasing exchange of goods and services, both within the community and with other communities.

Market prices

The use of a common currency facilitated commerce. Whether in the form of beads, silver coins or euros, 'money' reflects an implicit agreement that anyone in possession of it can exchange it for goods and services. The actual price — how many units of the common currency to be exchanged for a product — is also an agreement between the buyer and the seller.

There are different models used for explaining how markets determine the selling/buying price. One of the basic assumptions is that the buyer or the consumer is attributing some value to the product and is willing to pay for it. For most products, the higher the price is, the fewer the consumers willing to buy.

Another assumption is that the supplier would not produce the product if the product cannot be sold at a price higher than what it cost to produce a unit of that product. In the real world, to force competitors out of the market or reduce redundant stocks, suppliers might sell their products below production costs, a practice called 'dumping'.

The key word here is 'cost'. How do we calculate the cost? Do the prices we pay for goods and services include the cost of using natural resources — in more technical terms 'natural capital' — or the cost of the pollution generated during production and consumption?

The short answer is no. Hardly any of the prices on the market reflect the true cost of a product — i.e. one covering both production costs and environmental costs (including health costs linked to environmental degradation). Our current economic system is built on thousands of years' of practice based on an understanding that the services nature provides to us are free. In most cases, what we pay for materials (oil, iron ore, water, timber, etc.) covers extraction, transportation and business costs. This is one of the main weaknesses of the current economic system and it is not easy to remedy, for two main reasons.

Difficulty in estimating costs

First, it is very difficult to come up with a cost estimate for all the services and benefits that nature provides to us, or for all the damages that our activities inflict. How much individuals or societies are willing to pay for clean air can vary substantially. To a population exposed to extremely high levels of particulate matter pollution, it might be worth a fortune; to those enjoying it on a daily basis, however, it might be something they barely notice.

Environmental economists are developing accounting concepts that try to calculate a 'price' for such benefits we get from the environment as well as for damages to the environment caused by our activities.

A part of the environmental accounting work focuses on damage costs, in order to calculate a monetary value for the services. In the case of air quality, for example, they calculate medical costs due to poor air quality, loss of life, loss in life expectancy, loss of working days, etc. Likewise, how much is living in a quiet area worth? The difference in housing prices for houses of similar standing might be used to get an estimate of the market value for a silent environment.

However, all these calculations remain indicative. It is not always clear to what extent poor air quality contributes to specific respiratory problems or noise to lower house prices.

For some resources, environmental accounting also estimates how much of that resource is available in a given area, for example, fresh water in a river basin. It adds up precipitation rates, river flows, surface water and ground water, etc.

Paying for environmental services

Secondly, even if we could come up with a clear price tag, reflecting this 'extra cost' in current prices in the short term would have severe social consequences. The drastic increase in food prices in 2008, where the price of some staple foods doubled in six months, affected everyone, but the poorest were affected the most. A quick switch from a system where natural services are free of charge to one with all costs included would be quite socially controversial.

However, there are already some environmental costs included in the prices we pay for some goods and services. Taxes and subsidies are the most common tools governments use to 'adjust' market prices. Environmental taxes add an extra cost to product prices, making the selling price higher. This tool could be used to curb consumption of certain unsustainable products. For example, congestion charges applicable in some European cities allow only those private car users who have paid an extra charge to drive in the city centre.

Similarly, subsidies can encourage consumers to choose more environment-friendly products by lowering their buying price. These tools can also be used to address social equity issues by providing assistance to disadvantaged and affected groups.

Environmental economists are also developing the concepts around 'environmental fiscal reform' to explore how taxes can be shifted to favour environment-friendly alternatives and how environmentally harmful subsidies can be reformed.

In some cases, a market actor (supplier or buyer) can be big enough to influence the market. For some green technologies and products, public authorities' decision to switch to these technologies has enabled them to penetrate the market and compete against established players.

Although the economics field helps us understand some concepts driving our consumption and production patterns, prices and incentives, in our globalised world, many other factors, such as technology and politics, can come into play.

More information

EEA sources

EEA environmental indicator report 2013:
http://www.eea.europa.eu/publications/environmental-indicator-report-2013

Managing municipal solid waste — a review of achievements in 32 European countries (EEA Report No 2/2013): http://www.eea.europa.eu/publications/managing-municipal-solid-waste

Movements of waste across the EU's internal and external borders (EEA Report No 7/2012):
http://www.eea.europa.eu/publications/movements-of-waste-EU-2012

Greening the EU's Common Agricultural Policy:
http://www.eea.europa.eu/themes/agriculture/greening-agricultural-policy

Marine messages: Our seas, our future — moving towards a new understanding (EEA Brochure No 1/2014): http://www.eea.europa.eu/publications/marine-messages

European Union sources

Europe 2020 Strategy: http://ec.europa.eu/europe2020/index_en.htm

European Commission's Online Resource Efficiency Platform (OREP):
http://ec.europa.eu/environment/resource_efficiency/index_en.htm

7th Environment Action Programme:
http://ec.europa.eu/environment/newprg/index.htm

Eurostat publication: Sustainable development in the European Union — 2013 monitoring report of the EU sustainable development strategy

European Commission on the marine environment:
http://ec.europa.eu/environment/marine/index_en.htm

For clean-up activities across Europe: European Week for Waste Reduction

International sources

UNEP Green Economy Initiative: http://www.unep.org/greeneconomy

UNEP Resource Efficiency: http://www.unep.org/resourceefficiency

OECD on green economy: http://www.oecd.org/greengrowth

OECD How's life: http://www.oecdbetterlifeindex.org

Waste•smART — creative competition

The European Environment Agency (EEA) invited the European public to share their views about waste in Europe in a new creative competition, Waste•smART. The competition called for submissions through a photo, video or cartoon. Some of the Waste•smART finalists are presented throughout Signals 2014.

More information on Waste•smART is available online at: www.eea.europa.eu/wastesmart

To see all the Waste•smART finalists, please visit our Flick'r account at: http://www.flickr.com/photos/europeanenvironmentagency

Photo credits

Cover pages, pages 4, 7, 19, 20, 25, 44 and 47: Gülçin Karadeniz

Pages 2–3, 8 and 34: Rastislav Staník

Page 15: Stipe Surac/EEA Waste•smART

Page 16: Emma Lövgren/EEA Waste•smART

Page 26: Andrzej Bochenski/EEA Waste•smART

Page 39: Ani Becheva/EEA Waste•smART

Page 40: Jacob Härnqvist (Roland Zinkernagel); Asa Hellstrom

Page 43: Daniel Skog

Page 49: Stephen Mynhardt/EEA Waste•smART

Pages 50–51: Janika Fabrikant/EEA Waste•smART


Heineken
zero
CALANDA

Signals 2014

The European Environment Agency (EEA) publishes Signals annually, providing a snapshot of issues of interest to the environmental debate and the wider public. Signals 2014 focuses on green economy, resource efficiency and circular economy.

We are extracting and using more resources than our planet can produce in a given time. Current consumption and production levels are not sustainable and risk weakening our planet's ability to provide for us. We need to reshape our production and consumption systems to enable us to produce the same amount of output with less resource, to re-use, recover and recycle more, and to reduce the amount of waste we generate.

Please see the online version to:

- test your knowledge on resource efficiency and waste in Europe;
- check out our questions for further discussion;
- tell us what you think of this publication and helps us improve it.

www.eea.europa.eu/signals

European Environment Agency
Kongens Nytorv 6
1050 Copenhagen K
Denmark

Tel: +45 33 36 71 00
Fax: +45 33 36 71 99

Publications Office

European Environment Agency

TH-AP-14-001-EN-C
doi:10.2800/13662