Energy & Environment

Environmental law

Petra Gsodam, Institute of Electricity Economics and Energy Innovation

12.10.2015, HS i1

Content

Environmental law

Directives

- End-of life vehicles
- Registration, Evaluation, Authorization and Restriction of Chemicals
- Restriction of the use of certain hazardous substances in electrical and electronic equipment
- Waste electrical and electronic equipment
- Eco-design requirements for energy using products (EuP)
- Energy Efficiency Directive

Environmental Impact Assessment

Product related environmental aspects, product design

Labels

Environmental law

Environmental and natural resources law addressing the effects of human activity on the natural environment

- Treaties, statutes, regulations, and common and customary laws
- Regulatory subjects:

Impact assessment	Air quality
Waste management	Contaminant clean-up
Chemical safety	Water resources
Mineral resources	Forest resources
Wildlife and plants	Fish and game

- Starting point: protection (against damage)

Regulatory approaches

Minimize impacts on the protected good

- Damage or negative impacts on the protected good are limited or minimized
- Basis for various environmental laws

Limiting harmful effects of known environmental hazards

- Harmful effects of known sources of environmental hazards or degradation are limited
- Source-related or environmental-related

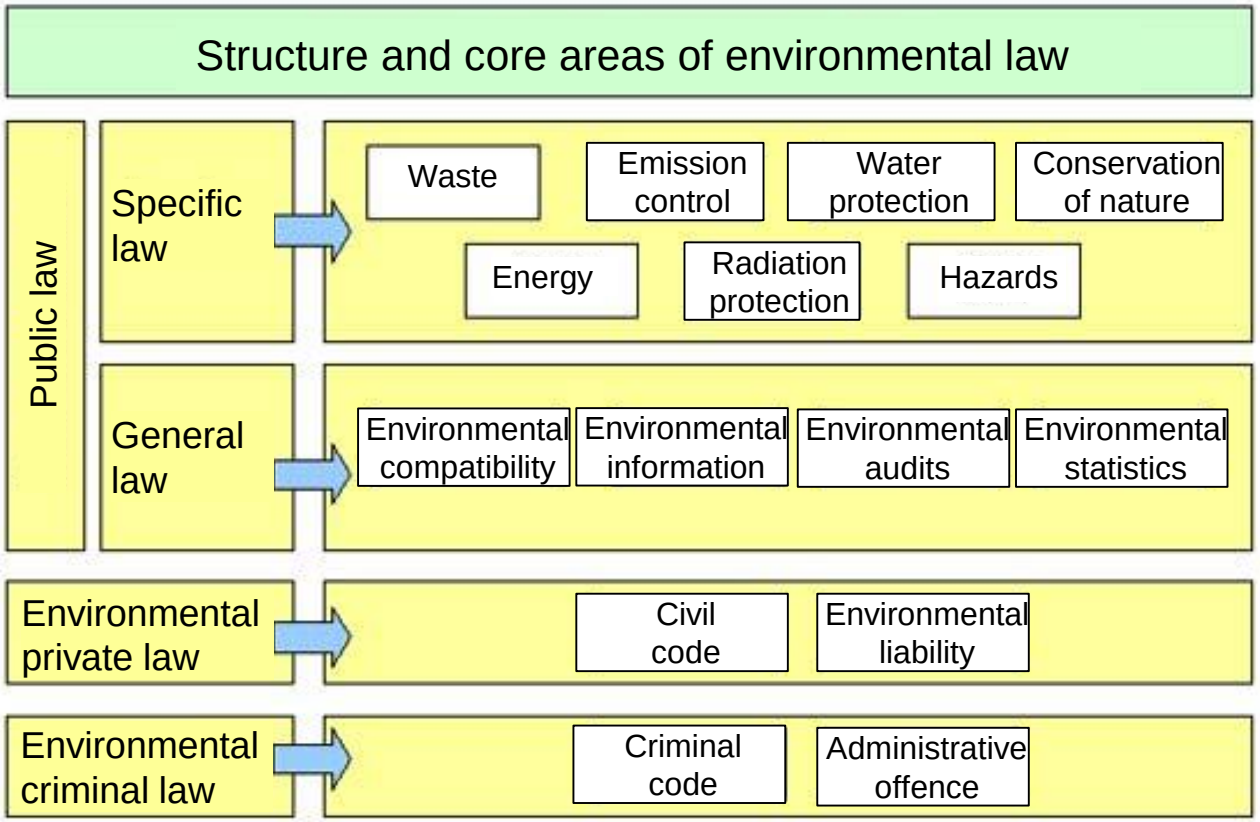
Regulations for substances endangering environment

- In order to minimize the risks posed by such substances/objects, they are subjected to a control regime

Areas of environmental law

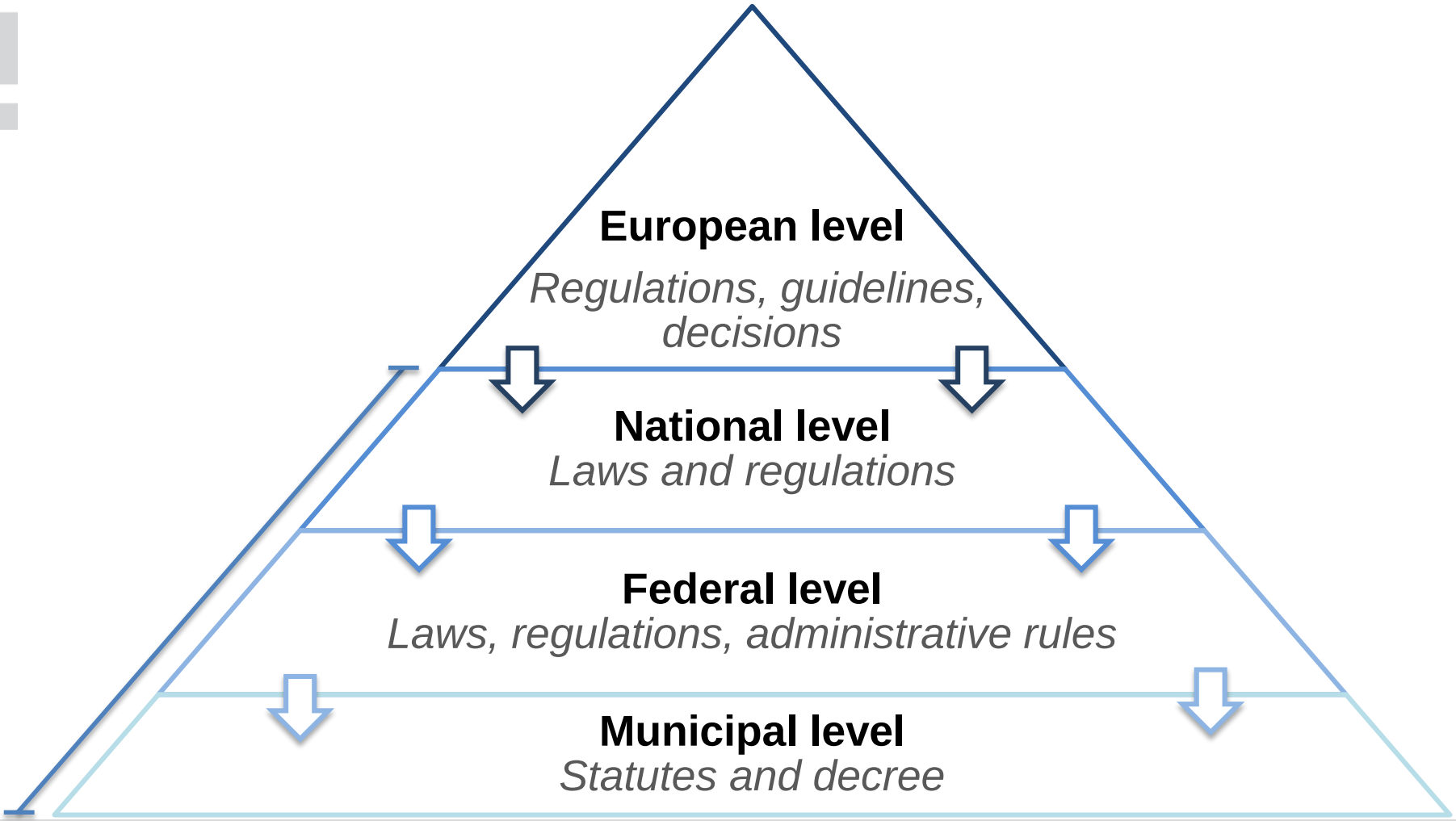
- Environmental control and information
- Chemicals
- Atomic and radiation protection
  - Natural sources of radiation
  - Radiation Protection Ordinance
- Climate protection and air pollution control
  - Motor vehicles, heating systems
  - Emission Control Act – Air (IG-L)
- Water and water bodies
- Waste
- …

Multi-level law



Source: http://www.bubw.de/?lvl=1112

Environmental law



Directive 2000/53/EC of the EP (ELV)

End-of-life vehicles

- **Prevention of waste from vehicles**
- **Reuse, recycling** and other forms of recovery of end-of life vehicles and their components to reduce the disposal of waste
- Measures which aim at **improving the environmental performance** of all economic operators involved in the life cycle of vehicles and especially the operators directly involved in the treatment of end-of life vehicles.

Person concerned

- Manufacturers or importers of vehicles into member states

EP… European Parliament
ELV… End-of-life vehicles
Source: http://eur-lex.europa.eu

End-of-life vehicles

Regulation

- Limit the use of hazardous substances in vehicles and reduce them as far as possible from the conception of the vehicle onwards.
- Vehicle manufactures shall increase the quantity of recycled material in vehicles and other products.
- Construction- and raw material identification to increase re-use and recovery.
- Materials and components of vehicles put on the market after 1 July 2003 are not allowed to contain lead, mercury, cadmium or hexavalent chromium; exclusions defined in directive 2011/37/EU Annex II.

Source: http://eur-lex.europa.eu

End-of-life vehicles

Regulation

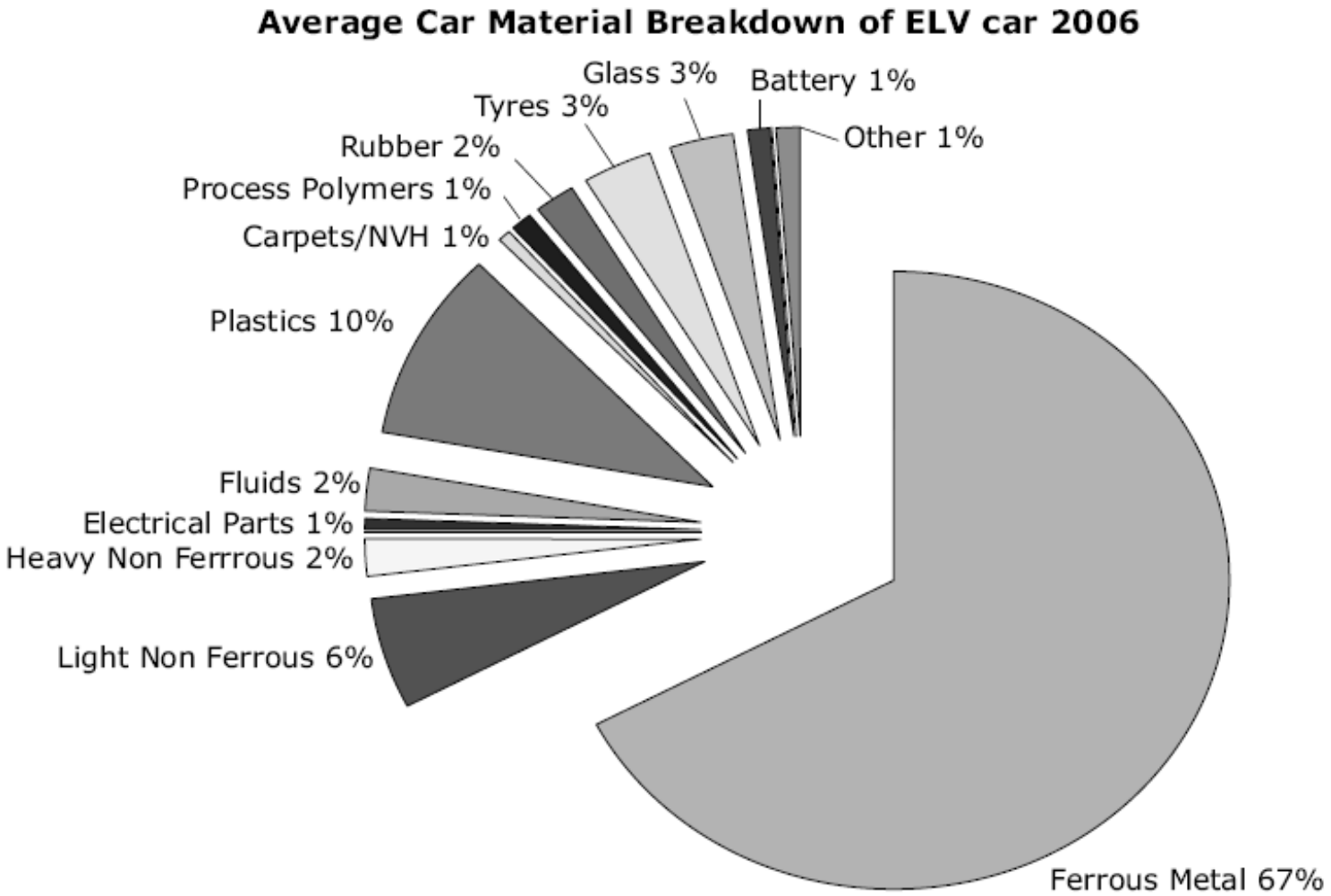
- Vehicle manufacturers/importers have to make information about recycling rates and the substances of their vehicles accessible to the public, customers and utilizers.
- Increase the rate of re-use and recovery to 95% by 2015, and increase the rate of re-use and recycling over the same period to at least 85% by average weight per vehicle and year
- Vehicles authorized after 1st of January 2002 have to be taken back free of charge.

Implementation in Austria

- Directive of the End-of life vehicles (Altfahrzeugverordnung) entered into force from 6th of November, 2002.

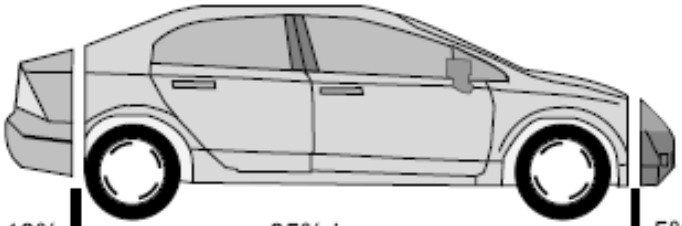
Source: http://eur-lex.europa.eu

End-of-life vehicles



Source: http://www.publications.parliament.uk/pa/ld200708/ldselect/ldsctech/163/163we07.htm

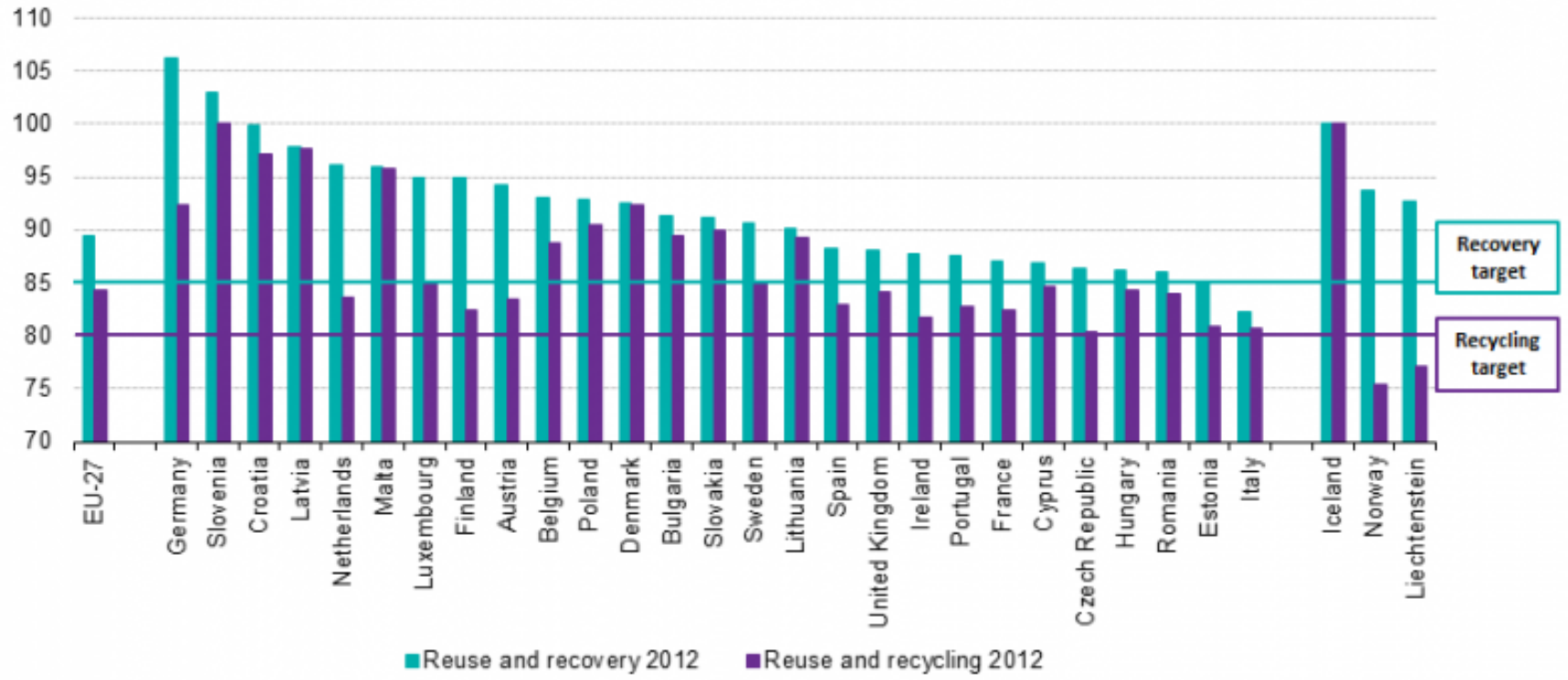
End-of-life vehicles



10% production	85% in-use	5% recycling
Production and Distribution • Production • Logistics • Energy for sales and support functions	**Use Phases:** • CO2 from distance driven • CO2 from servicing and other market functions	**Disposals** • CO2 from End of Life (ELV) operations *(Please note: if scrap is used in remanufacturing this item can become negative as scrap often saves energy over the use of virgin materials)

Source: http://www.publications.parliament.uk/pa/ld200708/ldselect/ldsctech/163/163we07.htm

End-of-life vehicles



Note: Old targets are illustrated! New targets are 85% for recycling and 95% for recovery

Source: http://ec.europa.eu/eurostat/statistics-explained/index.php/File:Recovery_and_recycling_rate_for_end-of-life_vehicles,_EU-27,_2012.png

Regulation 1907/2006/EC of the EP (REACH)

Registration, Evaluation, Authorisation and Restriction of Chemicals

- REACH is based on the principle of giving greater responsibility to industry and applies generally to all chemical substances, regardless of whether or not they have hazardous properties
- All chemical substances within the scope of this regulation can only be introduced after registration. The registration is necessary when a company produces more than 1t/a.

Target:

- High level of protection of human health and the environment.
- Promote the development of alternative methods for the assessment of hazards of substances.

Source: http://eur-lex.europa.eu

REACH

Phases of REACH

- Registration
  - Registration of the substance at ECHA (European Chemicals Agency).
    - Submission of a registration dossier (technical dossier + safety report).
  - “One substance, one registration” – all manufacturers and importers of substances have to do the registration together.
  - Possibility of pre-registration for phase-in substances
    - Deadlines: 30 November 2010 (>1.000 t/a)
      31 May 2013 (100-1.000 t/a)
      31 May 2018 (1-100 t/a)
  - In all other cases, no authorization will be given to manufacturers or importers until the registration process is finished.

Source: http://eur-lex.europa.euc

REACH

- Evaluation
  - Evaluation of the transferred information by the Member States and the ECHA.
  - Validation if the substance pose a risk to human health or the environment.

  - Three points of the evaluation:
    - Check the submitted proposals
    - Check the submitted dossiers
    - Evaluation of the substance

Source: http://eur-lex.europa.eu

REACH

- Authorisation
  - Manufacturers, importers or users of Substances of Very High Concern (SVHC) need a special authorisation.
  - List of SVHC in annex 14 of the REACH-regulation:
    - Other substances can be included in the SVHC list at request of Member States or ECHA
    - Process of including according to annex 15 of the REACH-regulation.,

Person concerned

- Manufacturer or the importer of chemical substances.

Source: http://eur-lex.europa.eu

Directive 2011/65/EU of the EP (RoHS)

Restriction of the use of certain hazardous substances in electrical and electronic equipment

Target:

- Harmonisation of substances used in electrical and electronic equipment to regulate competition and to protect human health.
- Environmentally sound recovery and disposal of waste from electrical and electronic equipment in order to avoid hazardous substances.

Person concerned

- Manufacturers, importers or the operator of electrical and electronic equipment
  - Electrical and electronic equipment that was outside the scope of directive 2002/95/EC (predecessor of directive 2011/65/EU), but which wouldn't complain with the current directive, are allowed to be available on the market until 22 July 2019

RoHS… restriction of hazardous substances
Source: http://eur-lex.europa.eu

RoHS

Regulation

- Production of EEE without heavy metals, PBDE (polybrominated diphenyl ethers) and PBB (polybrominated biphenyl).
- Concentration values tolerated by weight in homogeneous materials of EEE: Lead (0,1%), Mercury (0,1%), Cadmium (0,1%), hexavalent chromium (0,1%), PBDE (0,1%) and PBB (0,1%).
- Stepwise increase of the scope: include cable and replacements until 22 July 2017
- Only electrical and electronic equipment which corresponds this directive are allowed to bear the CE marking

Implementation in Austria

- WEEE amendment 2012

(W)EEE… (waste) electrical and electronic equipment
Source: http://eur-lex.europa.eu

Directive 2012/19/EU of the EP (WEEE)

Waste electrical and electronic equipment

- Until 31 December 2015, at least 4 kg of WEEE per inhabitant per year should be reached, afterwards the amount of WEEE collected increases until 2019

Target:

- Prevent or reduce harmful effects during the generation and treatment of WEEE
- Improve the efficiency of resource use
- Reduce the overall environmental impact of products and contribute to a sustainable development

Person concerned

- Manufacturers and importers

Source: http://eur-lex.europa.eu

WEEE

Regulation

- The product design of WEEE should increase re-use, dismantling and recovery
- WEEE from private households
  - Systems are set up that allow end customers and distributors to return WEEE free of charge;
  - When supplying a new product, distributors are responsible that waste can be returned free of charge on a one-to-one basis as long as the equipment is of equivalent type;
  - The collection of very small WEEE is free of charge for end-users at distributors and with no obligation to buy EEE of an equivalent type;
  - Producers should set up and operate individual and/or collective take-back systems.

Source: http://eur-lex.europa.eu

WEEE

Regulation

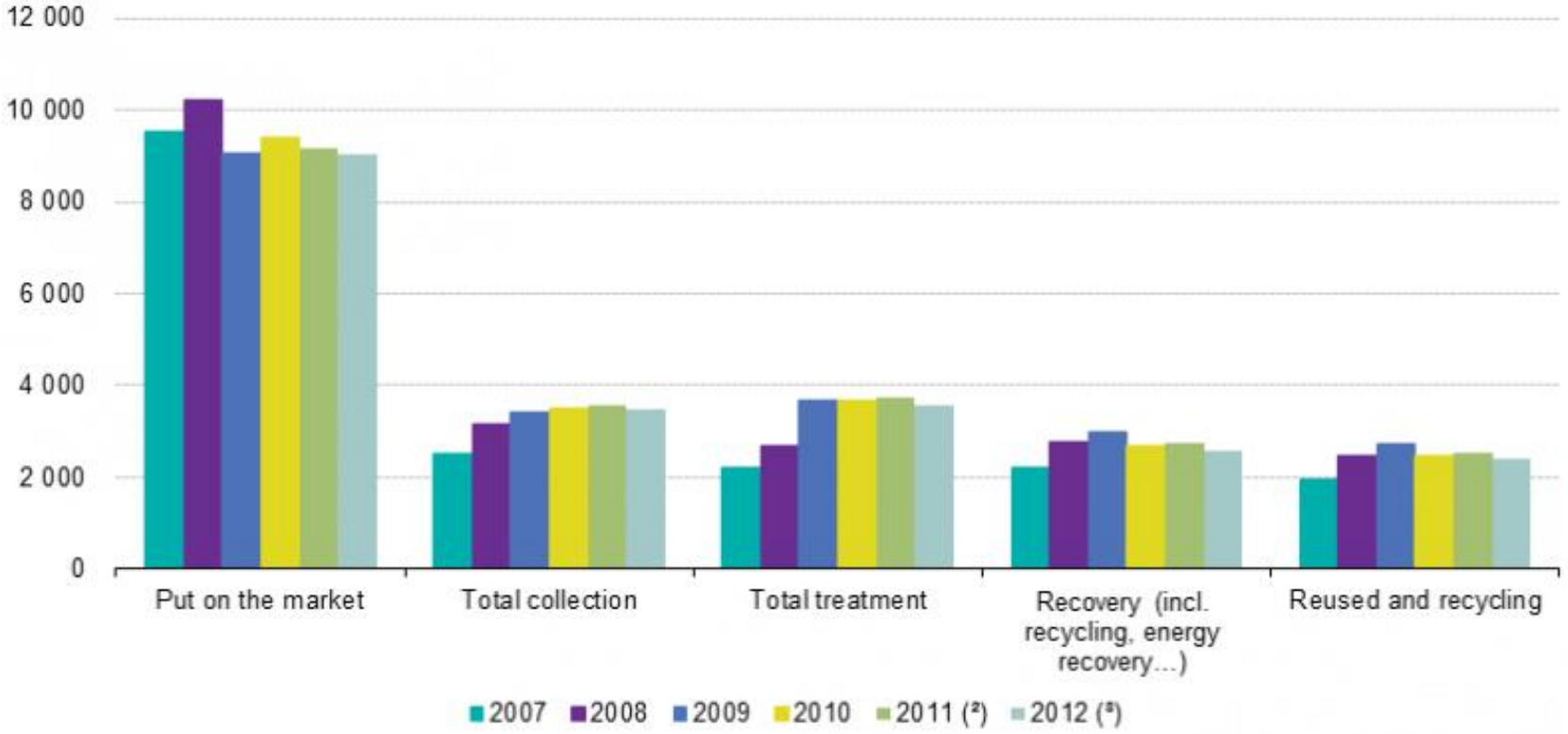
- 2016: minimum collection rate to be achieved per year of 45%
- 2019: 65%, calculated on the basis of the total weight of WEEE
- Specifications for separately collected WEEE: proper treatment and technical requirements for operators.
- Information requirements by the manufacturer for costumers and operators.

Implementation in Austria

- Replaces directive 2002/96/EG, 2003/108/EG and 2008/34/EG
- Implementation by amending WEEE-Regulation

Source: http://eur-lex.europa.eu

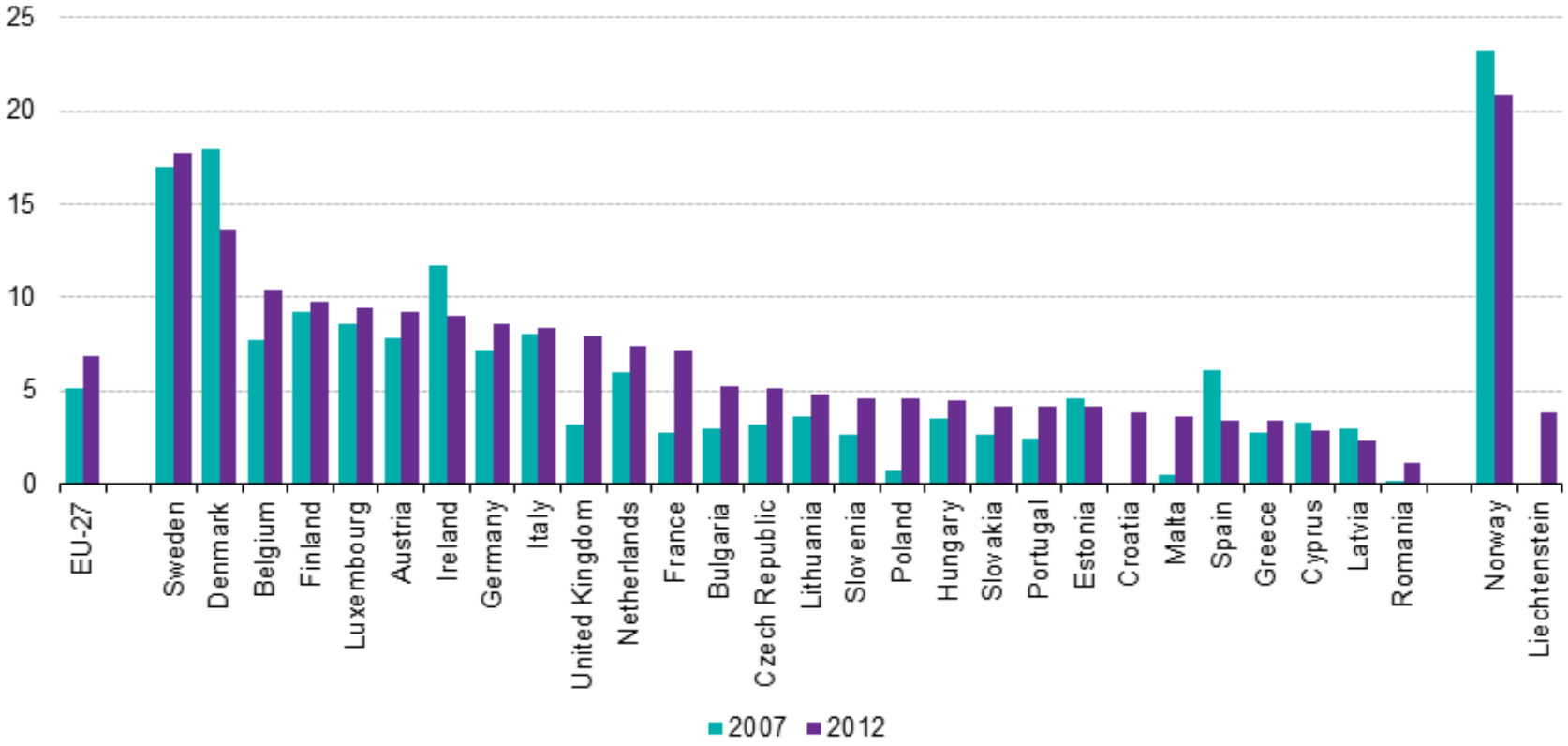
WEEE



(¹) Includes Eurostat estimates due to missing data for several EU Member States.
(²) Does not include data for Croatia on reuse and recovery.
(³) Includes data for EU-28.

Source: http://ec.europa.eu/eurostat/statistics-explained/index.php/Waste_statistics_-_electrical_and_electronic_equipment

WEEE



Source: http://ec.europa.eu/eurostat/statistics-explained/index.php/Waste_statistics_-_electrical_and_electronic_equipment

Directive 2009/125/EC of the EP (ErP)

Eco-design requirements for energy related products

- Reduce and avoid negative environmental impacts with eco-design requirements for energy-related products.

Target:

- Establishment of a framework for the application of eco-design requirements for energy-using products.
- Establishment of requirements that must be met before commissioning the products.
- Increase energy efficiency, the level of environmental protection and at the same time increase security of the energy supply.

Person concerned

- Manufacturers and importer

ErP… energy-related products
Source: http://eur-lex.europa.eu

ErP

Regulation

- Regulations for placing products on the market and/or the commissioning of products, including rules for CE marking and declaration of conformity.
- Defining implementing measures, including a methodology for assessing eco-design-parameters for energy-using products (assessment/declaration of the environmental aspects along defined life cycle phases).
- Method to define specific eco-design requirements.
- Industry self-regulation (instead of by-law) proves to be more efficient, and a list of criteria for assessing the legitimacy of such self-regulatory measures.

Source: http://eur-lex.europa.eu

ErP

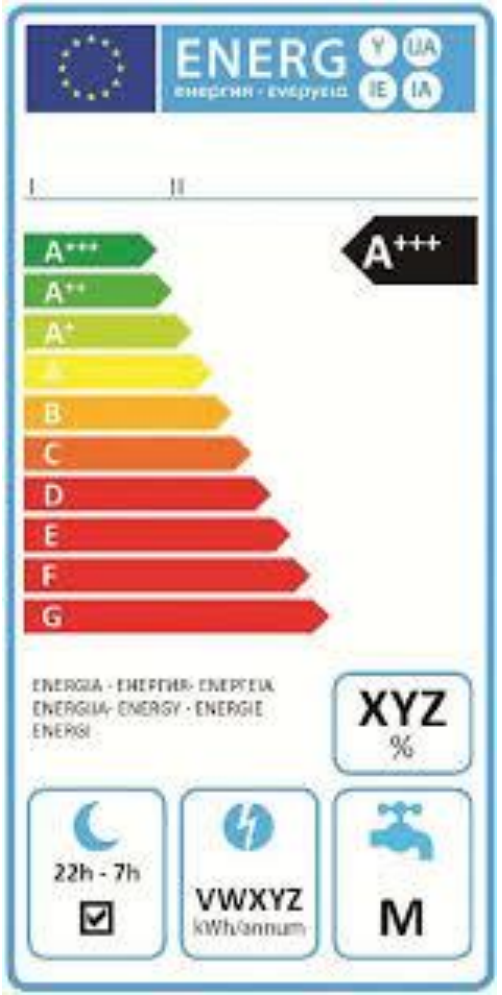
Regulation

- Educate and inform consumers about energy-saving products.
- Definition of a procedure for the conformity assessment of an ErP.

Implementation in Austria

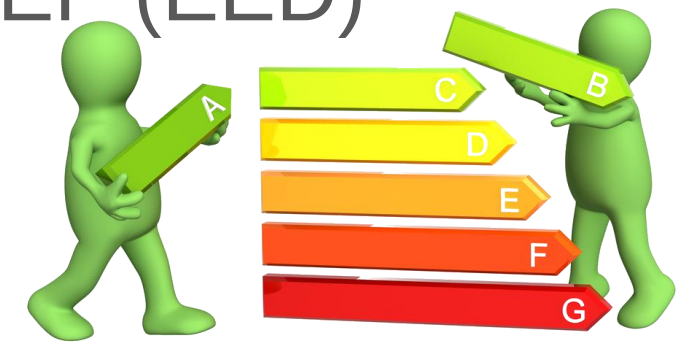
- Implementation by amending eco-design regulation 2007

ErP efficiency labels



Source: http://eur-lex.europa.eu

Directive 2012/27/EU of the EP (EED)



Energy Efficiency Directive

Target:

- Increase energy efficiency in the EU to achieve the target of saving 20% of primary energy consumption by 2020 compared to 2007
- All EU countries are required to use energy more efficiently at all stages of the energy chain from its production to its final consumption
- All EU countries have set their own indicative targets in NEEAP
- Targets can be based on primary or final energy consumption, primary or final energy savings, or energy intensity

EED… energy efficiency directive
NEEAP… National Energy Efficiency Action Plan
Source: http://eur-lex.europa.eu

EED

Regulation

- Energy distributors or retail energy sales companies have to achieve 1,5% energy savings per year by implementing energy efficiency measures.
- EU countries can try to achieve the savings through other measures such as improving the efficiency of heating systems, installing double glazed windows or insulating roofs.
- The public sector: energy efficient buildings, products and services.
- 3% of heated and/or cooled buildings owned and used by central governments have to be renovated each year to meet the minimum energy performance requirements.

SME… small and medium-sized enterprise
Source: http://eur-lex.europa.eu

EED

Regulation

- Educate and inform energy consumers
- Easy and free access to data on energy consumption (electricity, natural gas, district heating/cooling, domestic hot water) through individual metering
- Develop energy audit applications suitable for SMEs
- Mandatory and periodic energy audits for large enterprises – high potential for energy savings

Implementation

- EU countries had to implement the directive into national law by 5 June 2014

SME… small and medium-sized enterprise
Source: http://eur-lex.europa.eu

EED

New climate and energy targets until 2030

- Increase energy efficiency to achieve the target of saving 27% of the EU's primary energy consumption by 2030 compared to 2007 (currently without obligation).
- A 40% reduction of CO_2 emission compared to 1990 levels and an increase in renewable energies to 27% of total energy consumption.

Person concerned

- Member states, public sector, large enterprises, energy service companies, energy supply and the end-use sector

Source: http://eur-lex.europa.eu

EED – Criticism on the national EnEff law

- Companies, which produce electricity, steam or waste heat during industry processes and deliver this energy partially to end users (households) are energy distributors with energy reduction responsibilities.
- Due to the energy reduction responsibilities, energy distributors should force end users to save energy; in spite of a liberal electricity market.
- The law should enter into force retroactive with 1 January 2014; retroactive arrangements are not allowed for energy distributors (status: mid-2014).
- The 3% renovating quote for public buildings is for buildings owned and used by central governments – many exceptions.
- Monitoring options are insufficiently explained in the law.

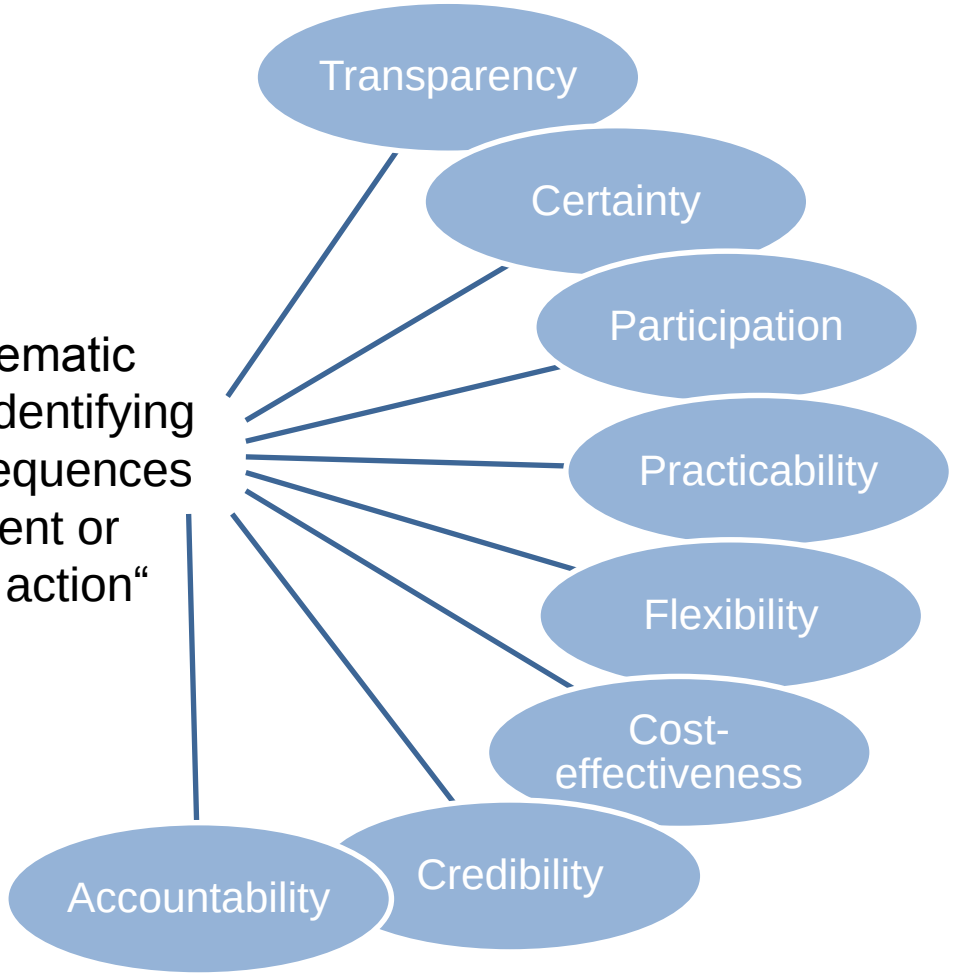
Source: http://eur-lex.europa.eu

Environmental Impact Assessment (EIA)

Environmental impact assessment

EIA

„…a systematic process of identifying future consequences of a current or proposed action“



Environmental Planning vs. EIA

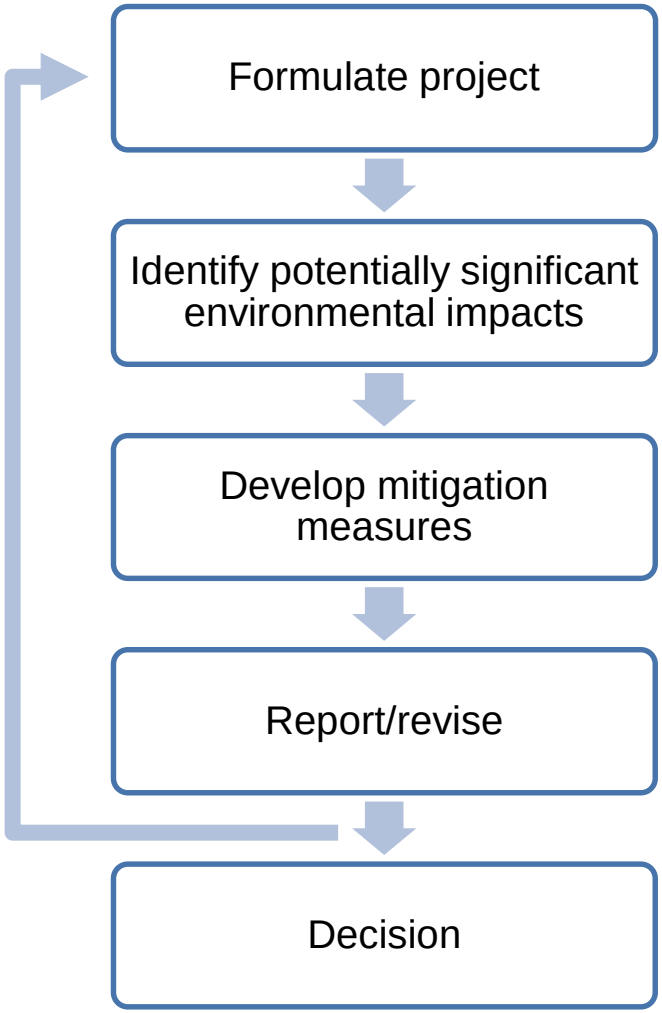
Environmental Planning

- Evaluation of the potential environmental impacts of a proposed action
- Provides recommendations to avoid or minimize potential adverse impacts

Environmental Impact Assessment

- Systematic process for identifying and evaluating the potential effects of proposed action on the physical, biological, cultural and socioeconomic components of the environment on a quite early stage of the planning process
- Applied to projects, programs, plans, policies

General steps in EIA process



Why EIA?

- Includes technical and economic considerations but also traditional aspects like impact on local people or biodiversity
- Prevent or minimize potentially adverse environmental impacts
- Enhance overall quality of a project

Benefits

- Lower project costs in the long-term
- Increased project acceptance, accountability and transparency
- Informed decision making and environmentally sensitive decisions
- Reduced environmental damage
- Improved integration of projects into their environmental and social settings
- Improved project design

Which types of projects undergo EIA?

- Often part of National planning process for large scale developments
- Developments that need an EIA differ from country to country

- Major new road networks
- Airport and port developments
- Building power stations
- Building dams and reservoirs

Maasvlate Port development, rotterdam, Netherlands - Extending the worlds second largest port needed an EIA

Which types of projects undergo EIA?

- Agriculture
- Construction (road network, malls, townships, dam, etc.)
- Industries
- Electrical projects (e.g. grid expansion)
- Waste disposal
- Any projects around protected areas or nature preserves
- Clean development mechanism projects
- Large scale housing projects

How does an EIA work?

- During the planning, design and authorisation stage of any development
- Comprehensive, addressing all potential impacts
- Need for consultation and public participation throughout the EIA process
- Findings are part of the final decision process

Stages of an EIA

Impact identification

Screening

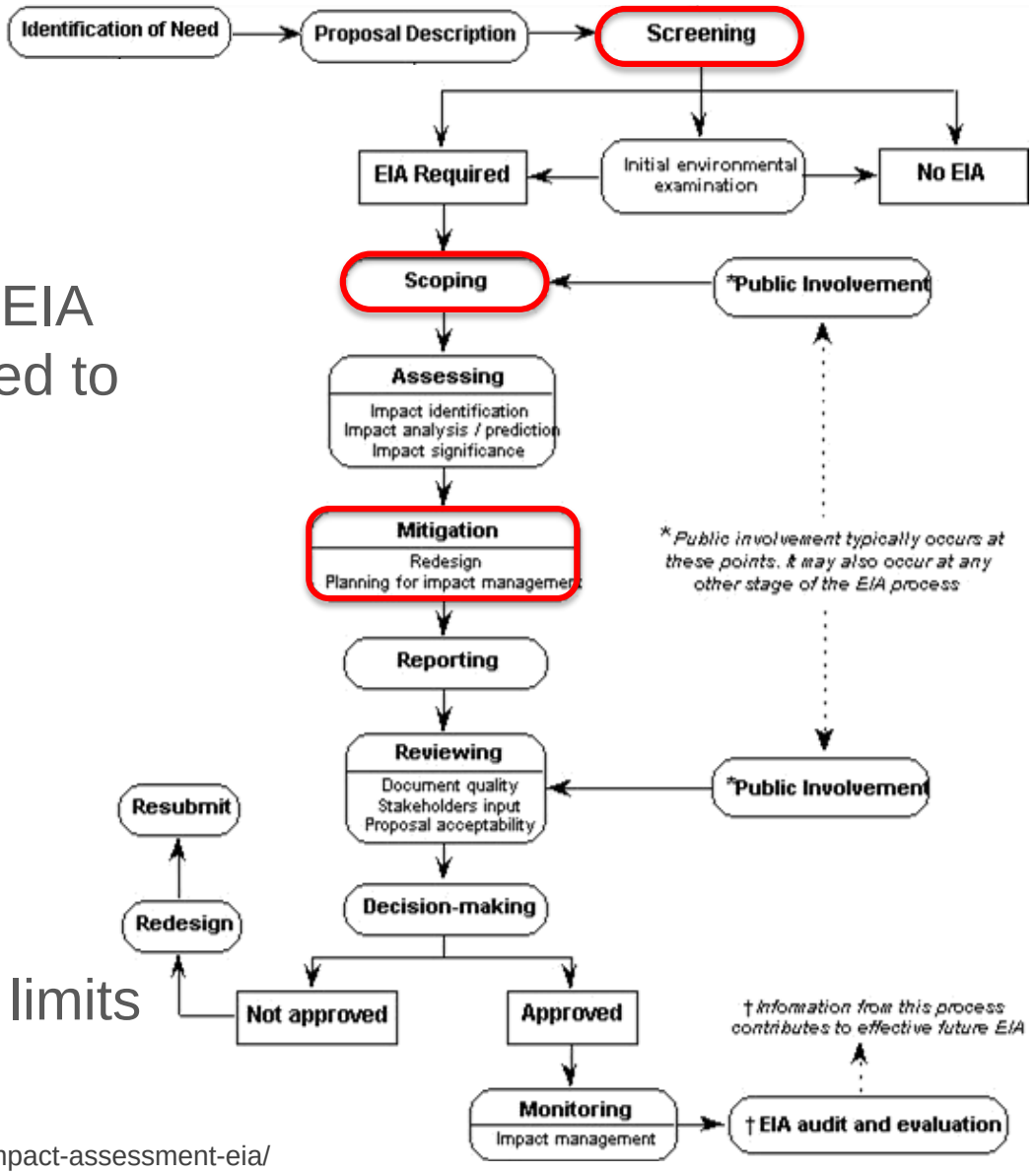
- Is there a need for an EIA and which impacts need to be considered?

Scoping

- Identifying impacts
- Predicting the scale of potential impacts

Mitigation

- Limiting the effect of impacts to acceptable limits



Source: https://watergis.wordpress.com/2012/03/20/environmental-impact-assessment-eia/

Stages of an EIA

Screening: Process of determining whether an EIA is required

Scoping: Identifying the impacts that are likely to be important.

Examination of alternatives: Process of determining the environmentally most desired policy option.

Impact analysis: Process of identifying and predicting the effects of the proposal.

Mitigation: Process to establish measures to minimise negative effects.

Evaluation of significance: Evaluation if the impacts that cannot be mitigated are acceptable as compared to the benefits

Environmental impact statement (EIS) report.

Review of the EIS: Process of assessing the quality of the report.

Decision making: Approving or rejecting the proposal (although arguably not occurring within the EIA process).

Follow up: Process of monitoring impacts and effectiveness of mitigation measures as well as reflecting.

Data requirements

Project

- Type
- Size
- Location

Area of potential impact

- Physical resources
- Biological resources
- Economic development resources
- Quality of life
- Other existing and planned projects

Techniques

- Systematic and comprehensive but also flexible enough to respond to changing conditions
- Be able to arrange large amounts of data often from different sources in a meaningful way
- Based on quantitative evaluation that is both accurate and objective

Techniques: Checklists of impacts

- General set of criteria
- Often designed for certain types of projects

	Project-related effects		Wider effects	
Resource	Impacts on the project	Considerations for sustainability	Impacts on the environment	Considerations for sustainability
Water	Water shortages Floods Sedimentation Pollution	Protected water source Water management Flood protection Sediment control	Downstream hydrological and morphological changes	Surface and groundwater resources Sediment management
Land/ Mineral	Salinisation Sedimentation Waterlogging	Soil fertility Catchment management Drainage	Land degradation Hinterland effects	Drainage water and groundwater Fuelwood and grazing provision
Biological	Weeds and pests	Crop ecology	Loss of species Loss of habitat	Genetic diversity Aquatic and terrestrial ecology
Human	Lack of skills Mismanagement Lack of credit Lack of markets	Financial and institutional factors	Health Resettlement Social conflicts	Disease ecology Social, economic and political factors
Other (energy, etc.)	Fuel shortages	Energy provision	Global warming	Gas emissions

Techniques: Impact matrices

Combine a checklist of environmental conditions and a list of activities that may have an effect

Cause and effect between the environmental feature and the activity can be individually identified

Significance of Impacts				STAGES OF THE PROJECT				
				Equipment Production	Transport	Installation	Operation	Decommission
ENVIRONMENTAL CONDITIONS	PHYSICAL	SOIL	Soil Quality					
			Erosion					
			Landscape					
		WATER	Rivers					
			Costal Zone					
			Subsurface Water					
		AIR	Air Quality					
			Odor					
			Visual					
			Noise					
	BIOLOGICAL	FLORA						
		FAUNA						
		ECOSYSTEM	Quality					
			Destruction					

Techniques: Cost and benefit analysis

- Outlines the value both positive and negative of each impact
- Very difficult to add a „cost“ value to ecosystems

Source: http://www.eoearth.org/view/article/149762/

Evaluation techniques

- Compare various possible scenarios and analyse the consequences

Magnitude

- What scale will the impact have?

Extent

- What area does the impact affect: site only, local or regional?

Duration

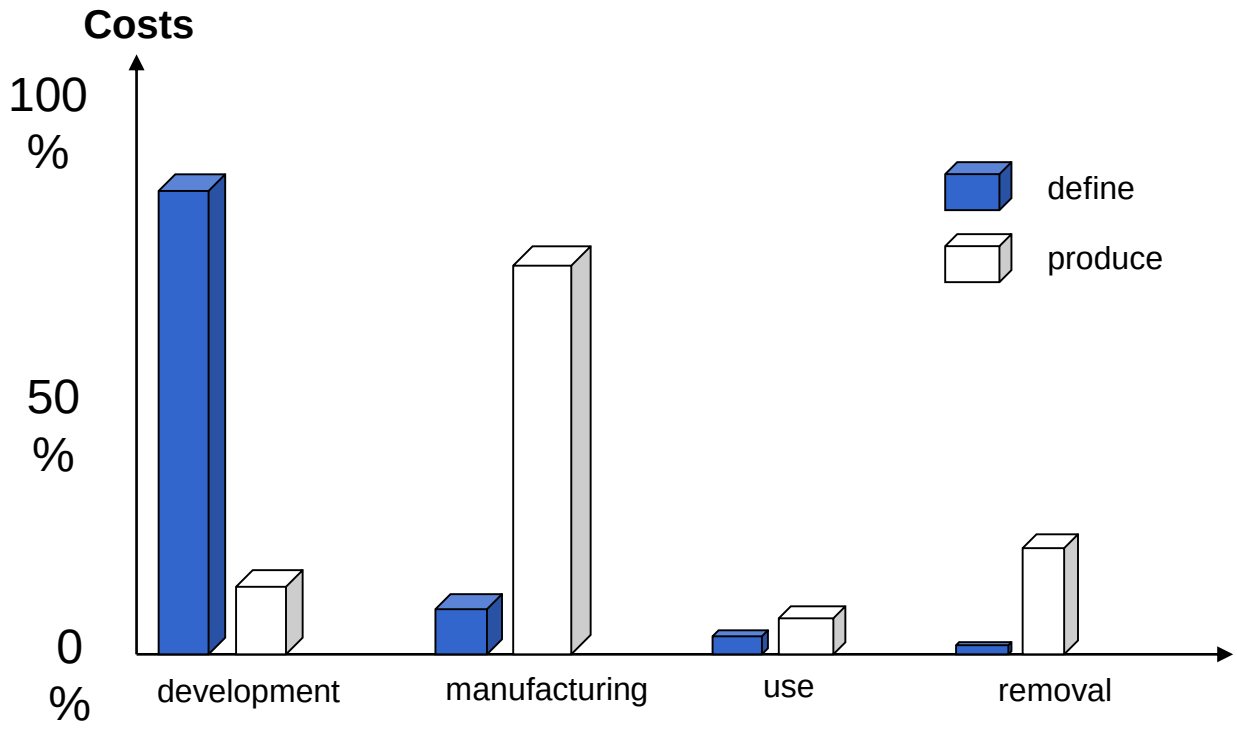
- How long will the impact last: short, medium or long term?

Criticism on EIA

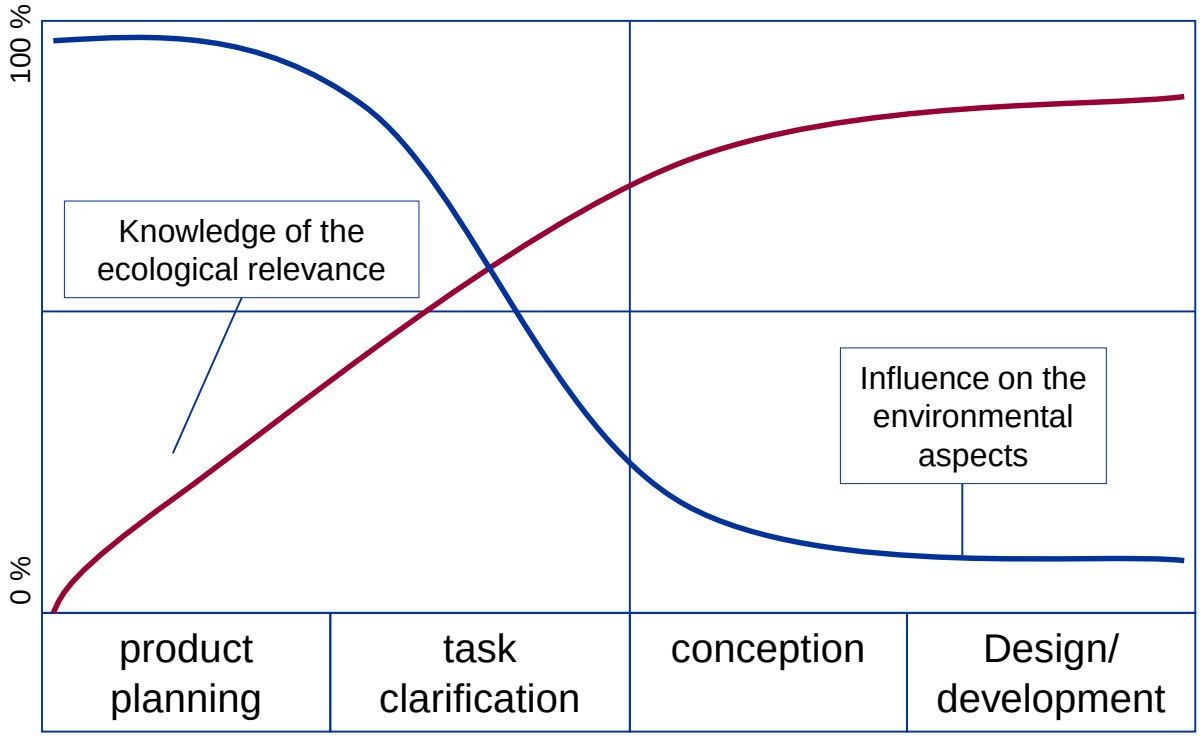
- Environmental issues are dealt with in a reactive and project focused, rather than a pro-active way.
- The main focus is often on mitigation.
- Non-direct effects are often neglected.
- Decisions above the project level – at which EIA is usually applied – are made without an awareness of their consequences.
- Long-term visions of sustainable development and associated aims and objectives are not consistently followed through.
- Short term political interest and benefits prevail.

Product design

Why is product design important? (I)



Why is product design important? (II)



Source: Züst (2004) - Einstieg ins Systems Engineering, S. 46

Eco-design

"…describes a design philosophy that values the natural environment as an integral factor in creating new products or modifying old ones."

- Aims to design technology and organization in a way that with an intelligent use of all available resources the highest possible benefit for all stakeholders and consumers is achieved, while the environmental impact is minimized.
- Sustainable design principles include the ability to:
  - optimize site potential;
  - minimize non-renewable energy consumption;
  - use environmentally preferable products;
  - protect and conserve water;
  - enhance indoor environmental quality;
  - optimize operational and maintenance practices.

Source: Wimmer et al. (2004): Ecodesign Implementation

Eco Design: Alstom

Source: https://www.youtube.com/watch?v=7gTdyh8ejQw

Starting point for eco-design

Which environmental requirements are there?

- Existing or new requirements/directives

How can the company improve the environmental performance of a product?

Environmental analysis: Specific energy demand

Ratio between energy demand during production and use

	Production		Use
Car	1	:	7
Washing machine	1	:	45
Energy-saving bulb	1	:	60
Light bulb	1	:	300

Source: Siemens (1996)

Action fields for eco-design

Production optimization

- Change in production technology
- Replacement of raw and auxiliary materials

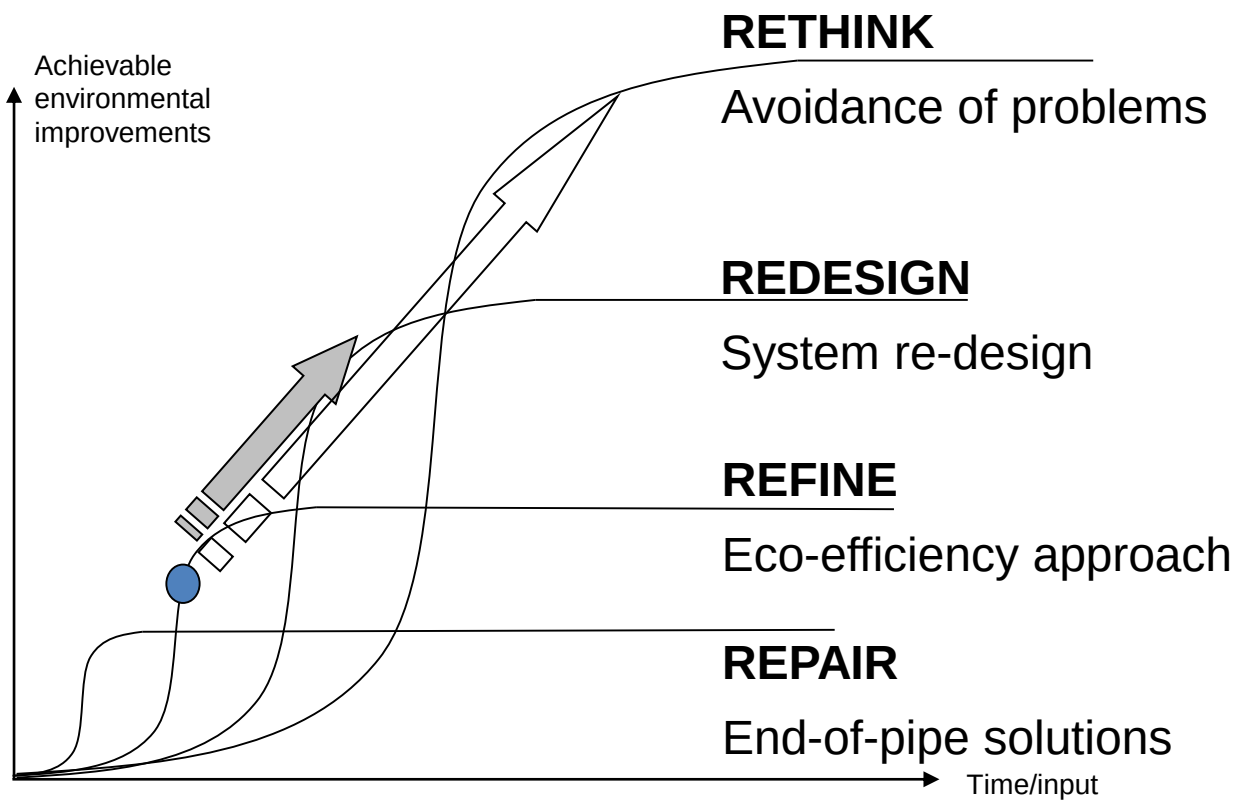
Product optimization

- Change in building structure, compounds, materials

Service optimization

- Service concepts
- Re-marketing systems

The s-curve of innovation



Source: Tischer U., Charter M. (2001) - Sustainable Product Design, in Sustainable Solutions, Sheffield: Greenleaf

Product life cycle

possible eco-design aspects

Environmental factors / Life stage	Energy savings	Chemical substances	Effective use of resources
Materials	——	Green procurement	Reduced use of scarce resources
Manufacturing	Reduction of energy consumption during manufacturing	Elimination of harmful chemical substances	Reduction of resources used
Distribution	Reduction of energy consumption during distribution	——	Reduction of packaging resources
Use	Energy-saving products	Disclosure of information on chemical substances in products	Long-life designs
Disposal	Easy-disassembly designs	Chemical substance labeling	Recycling and reuse

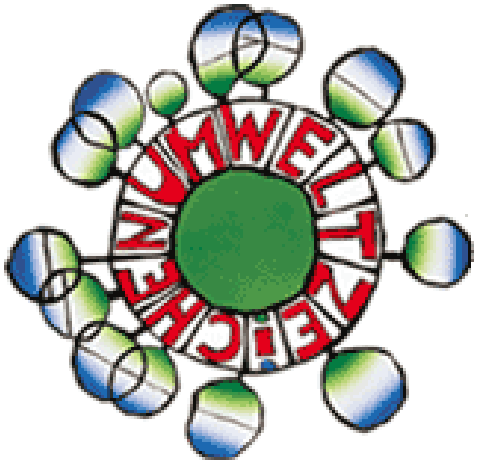
Source: http://product.tdk.com/en/environment/ecolove/eco01000.html

Labels

Sustainable procurement

- Eco-labelling, quality labels
- Competitive advantage for producers
- Useful sales tool
- Useful purchasing tool for consumers
  - Quality
  - Information about the environmental impact of the product through its production, use and disposal
  - Shows consumers environmentally friendly alternatives
- Motivation to produce and offer environmentally friendly products and services
- Promote environmentally friendly products and technologies

The Austrian ecolabel



More information: www.umweltzeichen.at

The German ecolabel

Source: Handbook Umweltcontrolling (2001), S. 287

The European ecolabel

Source: Handbuch Umweltcontrolling (2001), S. 290

Certification of wood products

www.fsc-deutschland.de

www.pefc.org

Sustainability on the point?

www.gruener-punkt.de

Overview: Environmental and social standards

Source: Müller, Moutchnik, Freier (2008): Standards und Zertifikate im Umweltmanagement und im Sozialbereich, in: Baumast, Pape (Hrsg.): Betriebliches Umweltmanagement, S. 47-63

Standard	Description	Target markets	Participants
Fairtrade Labelling Organization (FLO)	Promotion of fair trade, association of twenty national initiatives, ISEAL member	Alternatives to markets in industrialised countries	~ 1000, mostly in developing countries
UTZ certified	World's largest program for sustainable farming of coffee and cocoa; based on the UTZ Certified Code of Conduct; ISEAL member	Alternatives to markets in industrialised countries	10,000 different product packages in over 116 countries
Forest stewardship council	Sustainable forestry, ten principles and criteria to protect and improve the economic, ecologic and social function of the forestry, system for chain of custody	Markets worldwide	~ 500 members worldwide
Marine Stewardship Council (MSC)	Sustainable fishing, based on the Code of Conduct of the Food and Agricultural organisation of the UN, ISEAL member	Markets in industrialised countries	~ 40 companies
Rainforest Alliance	Protect biodiversity and promote sustainable forms of economy, NGO in the USA, ISEAL member	Markets in industrialised countries	~ 650 organisations, mostly in Latin America

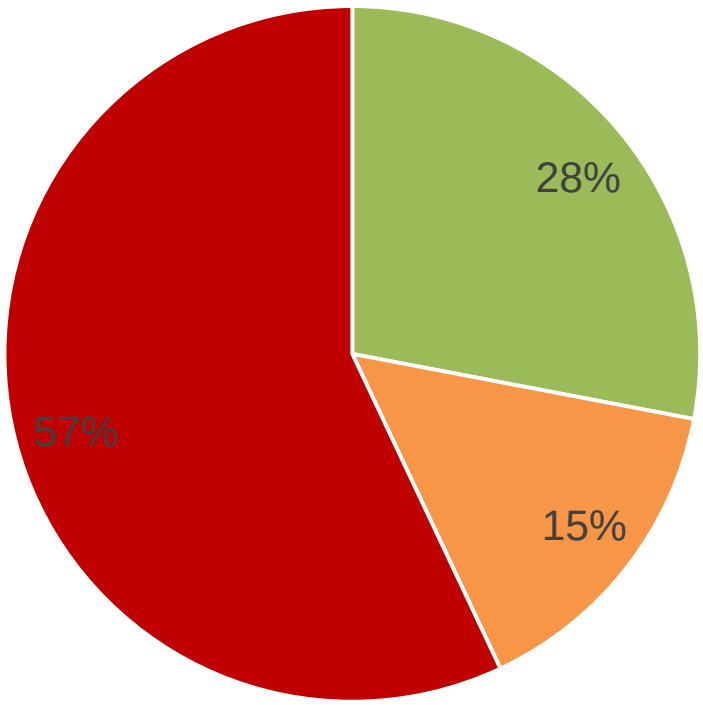
Energy Roadmap 2050

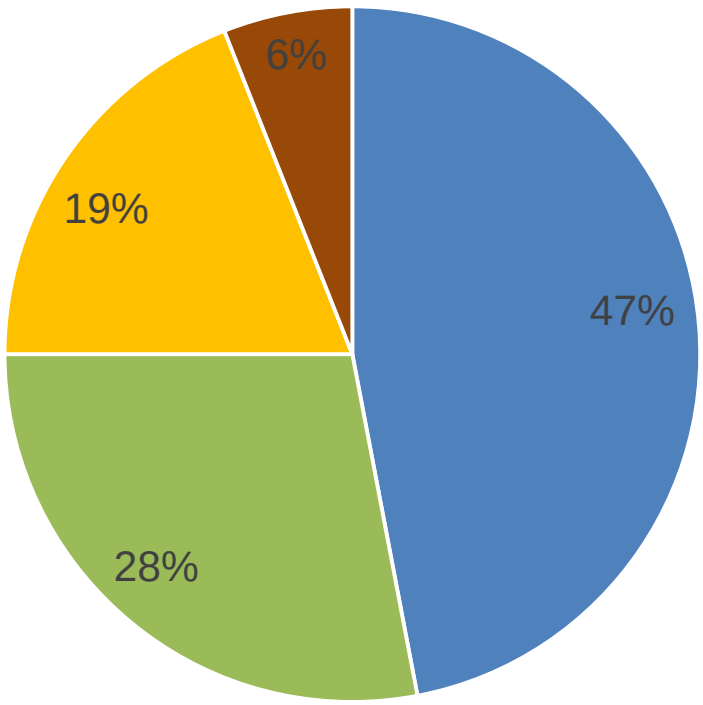
Introduction

- Decarbonisation
- Provide a practical independent and objective analysis of pathways to achieve a low-carbon economy in Europe
- In line with energy security, environmental and economic goals of the EU

- Reduction of GHG emissions to 80-95% below 1990 levels in 2050
- Explores transition in different possible ways
- Describes challenges due to decarbonisation
- Increase of competitiveness and security of supply

Energy mix in Europe 2010





Renewables
Nuclear energy
Fossil fuels

Hydro
Wind
Solar
Biomas

Source: ENTSO-E, 2014

Scenarios

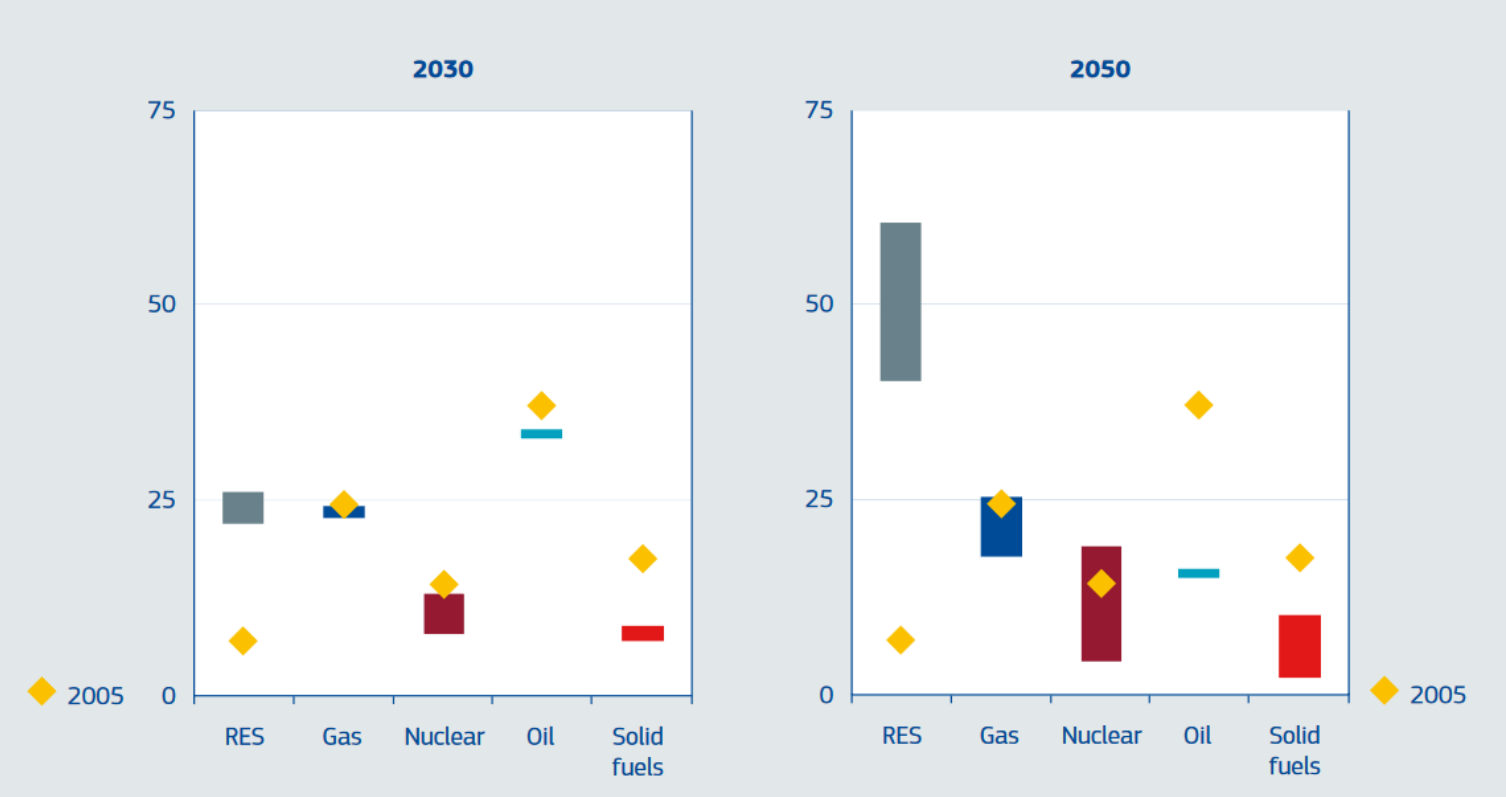
Current trend scenarios

- Reference Scenario
- Current policy initiatives

Decarbonisation scenarios

- High energy efficiency
- Diversified supply technologies
- High renewable energy sources
- Delayed CCS
- Low nuclear

Decarbonisation Scenarios



From roadmaps to reality

10 Structural Changes for Energy System Transformation

1. Decarbonisation is possible – and can be less costly than current policies in the long run
2. Higher capital expenditure and lower fuel costs
3. Electricity plays an increasing role
4. Electricity prices rise until 2030 and then decline
5. Household expenditure will increase

10 Structural Changes for Energy System Transformation

6. Energy savings throughout the system are crucial
7. Renewables rise substantially
8. Carbon capture and storage has to play a pivotal role in system transformation
9. Nuclear energy provides an important contribution
10. Decentralisation and centralised systems increasingly interact

Challenges and opportunities

1. Transforming the energy system

- Energy saving and managing demand: a responsibility for all
- Switching to renewable energy sources
- Gas plays a key role in the transition
- Transforming other fossil fuels
- Nuclear energy as an important contributor
- Smart technology, storage and alternative fuels

Challenges and opportunities

2. Rethinking energy markets

- New ways to manage electricity
- Integrating local resources and centralised systems

3. Mobilising investors – a unified and effective approach to energy sector incentives

4. Engaging the public is crucial

5. Driving change at the international level

The way forward

1. Implementing fully the EU Energy 2020 strategy
2. Higher energy efficiency of energy system and society
3. Development of renewable energy sources
4. Higher public and private investments in R&D and technological innovation
5. Integrated market → regulatory and structural shortcomings necessary

The way forward

1. Energy prices must better reflect costs
2. Sense of urgency and collective responsibility necessary for new energy infrastructure and storage
3. No compromise on safety and security
4. Better EU approach to international energy relations
5. Concrete milestones for member states and investors

More information

http://www.roadmap2050.eu/

https://ec.europa.eu/energy/sites/ener/files/documents/2012_energy_roadmap_2050_en_0.pdf

Thank you for your attention!

Petra Gsodam

Graz University of Technology

Institute of Electricity Economics and Energy Innovation
Inffeldgasse 18
8010 Graz

Tel.: +43 316 873 7902
Fax: +43 316 873 107902

Email: petra.gsodam@TUGraz.at
Web: www.IEE.TUGraz.at