Methods for sustainable development implementation (circular economy, EMS)

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Sustainable development

Human beings are at the centre of concerns for sustainable development

They are entitled to a healthy and productive life in a harmony with nature

(The first principle of Rio Declaration, 1992)

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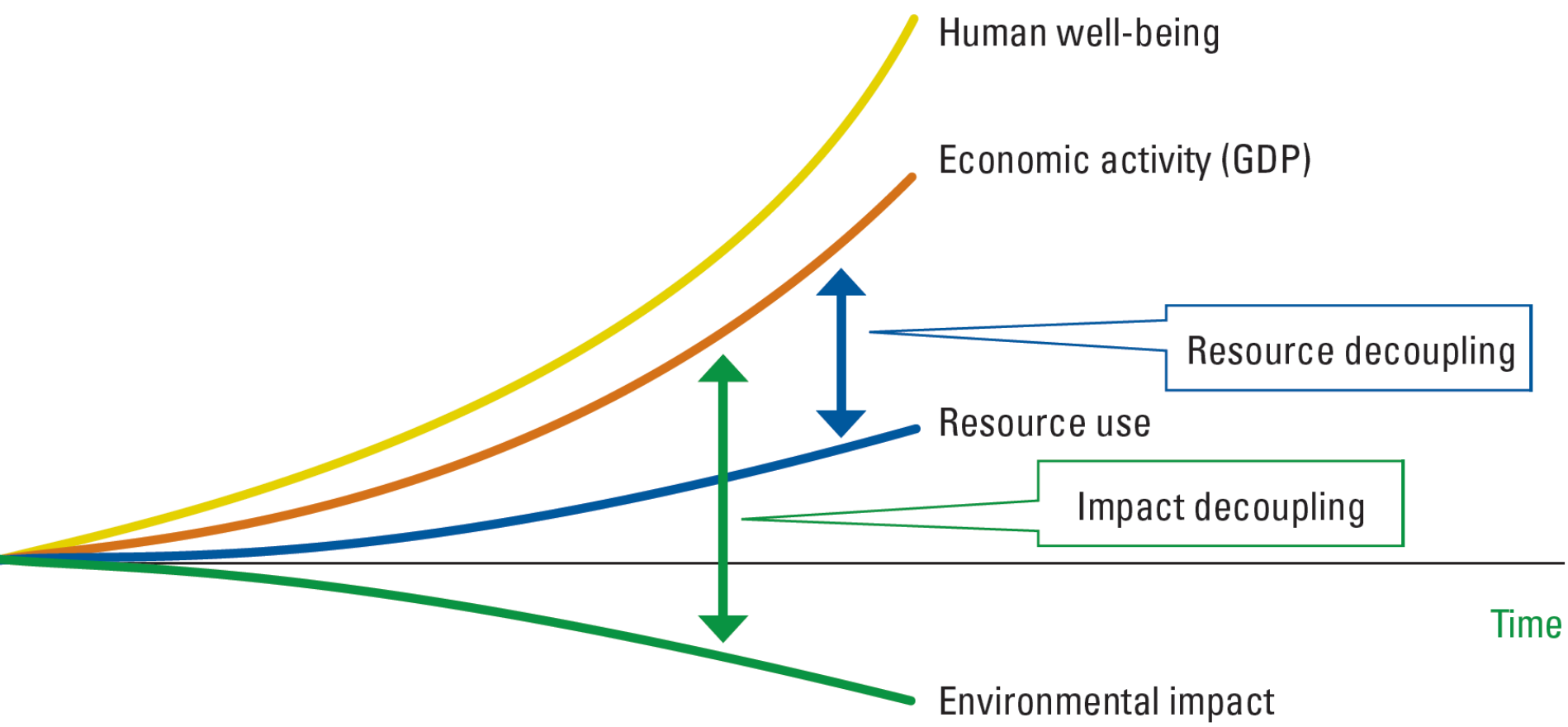
Scenarios for sustainable economical development



CP definition

Cleaner production means a continuous application of an integrated PREVENTIVE environmental strategy to processes, products and services to increase overall efficiency. This leads to improved environmental performance, cost savings, and the reduction of risks to humans and the environment.

- ***For production processes***, CP includes conserving raw materials and energy, eliminating toxic raw materials, and reducing the quantity and toxicity of all emissions and waste before they leave the process.
- ***For products***, CP focuses on reducing impact along the entire life cycle of the product, fro raw material extraction to the ultimate dispos of the product.
- ***For services***, using a preventive approach involves design issues, housekeeping improvement, and a better selection of material inputs (in the form of products).

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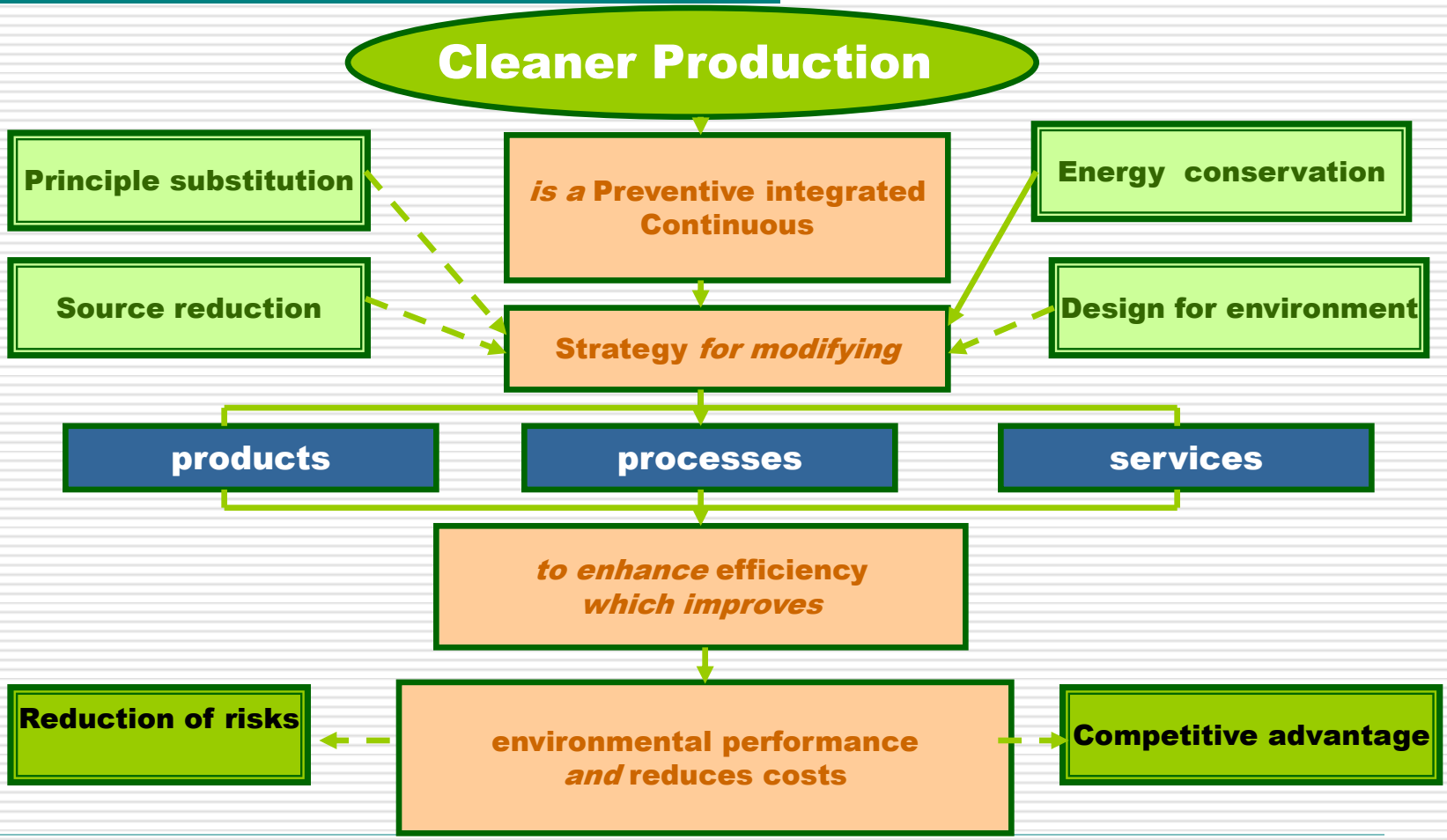
Cleaner Production Definition



RECP definition

Resource Efficient and Cleaner Production continuously applies integrated and preventive strategies to processes, products and services. This increases efficiency and reduces risks to humans and the environment. RECP specifically works to advance

- **Production Efficiency** – through optimization of productive use of natural resources (materials, energy, water) at all stages of the production cycle;
- **Environmental Management** - through minimization of the adverse impacts of industrial production systems on nature and the environment;
- **Human development** – through minimization of risks to people and communities, and support to their development.

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RECP PROJECT DEVELOPMENT

RECP PROJECT IMPLEMENTATION

COMPANY

- Preparation of Loan Application
- Assistance in calculation of cost savings
- Assistance in communication

- Assistance in projects monitoring and supervision,
- Preparation of project progress and completion reports

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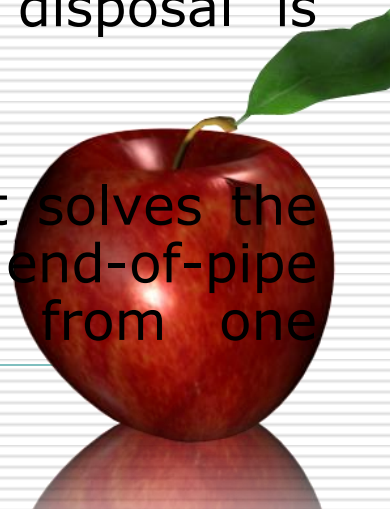
Some Key Learning Points

- effluent treatment, incineration, and even waste recycling outside the production process are not regarded as cleaner production, although they remain necessary activities to achieve a low environmental impact;

- the economic advantages of RECP are that it is more cost effective than pollution control. The systematic avoidance of waste and pollutants increases process efficiency and improves product quality. Through pollution prevention at the source, the cost of final treatment and disposal is minimised;

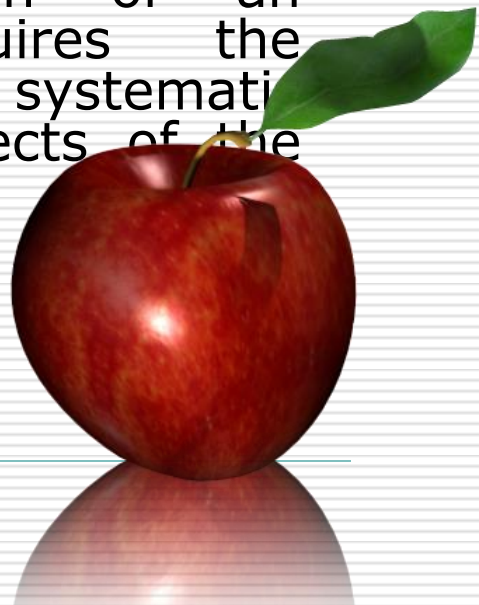
- the environmental advantage of RECP is that it solves the waste problem at its source. The conventional end-of-pipe treatment often only moves the pollutants from one environmental medium to another;



Some Key Learning Points

- companies recognized the importance of the environmental impacts of their products and began to incorporate significant environmental aspects into their product design and development processes. That require the identification of key environmental issues related to the product throughout its entire life- cycle;

- considering that CP addresses the problem at several levels at the same time, introduction of an industry/plant level programme requires the commitment of top management and a systemati approach to cleaner production in all aspects of the production process.



Circular economy

PRINCIPLE 1

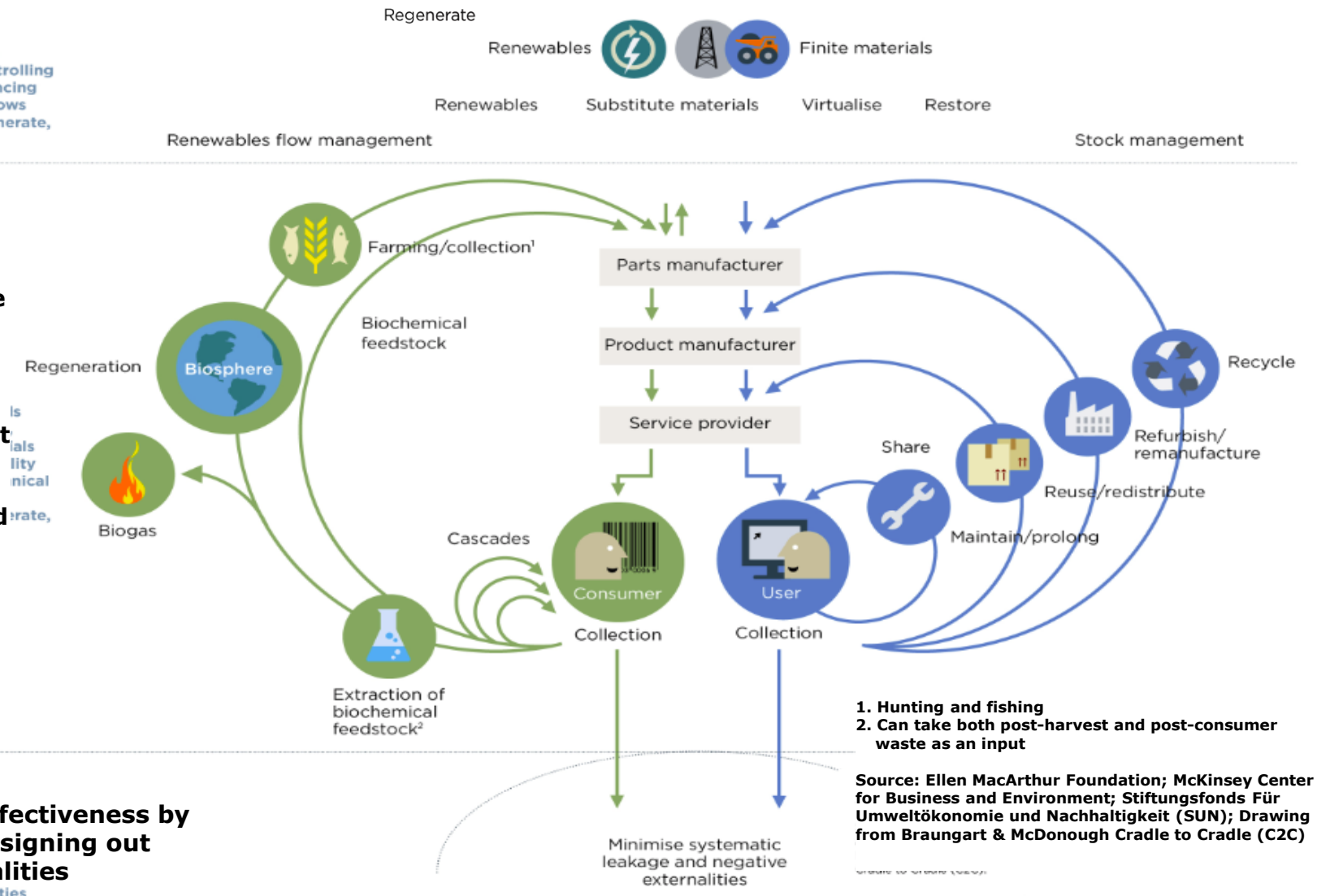
Preserve and enhance natural capital by controlling finite stocks and balancing renewable resource flows

PRINCIPLE 2

Optimise resource yields by circulating products, components and materials in use at the highest utility at all times in both technical and biological cycles

PRINCIPLE 3

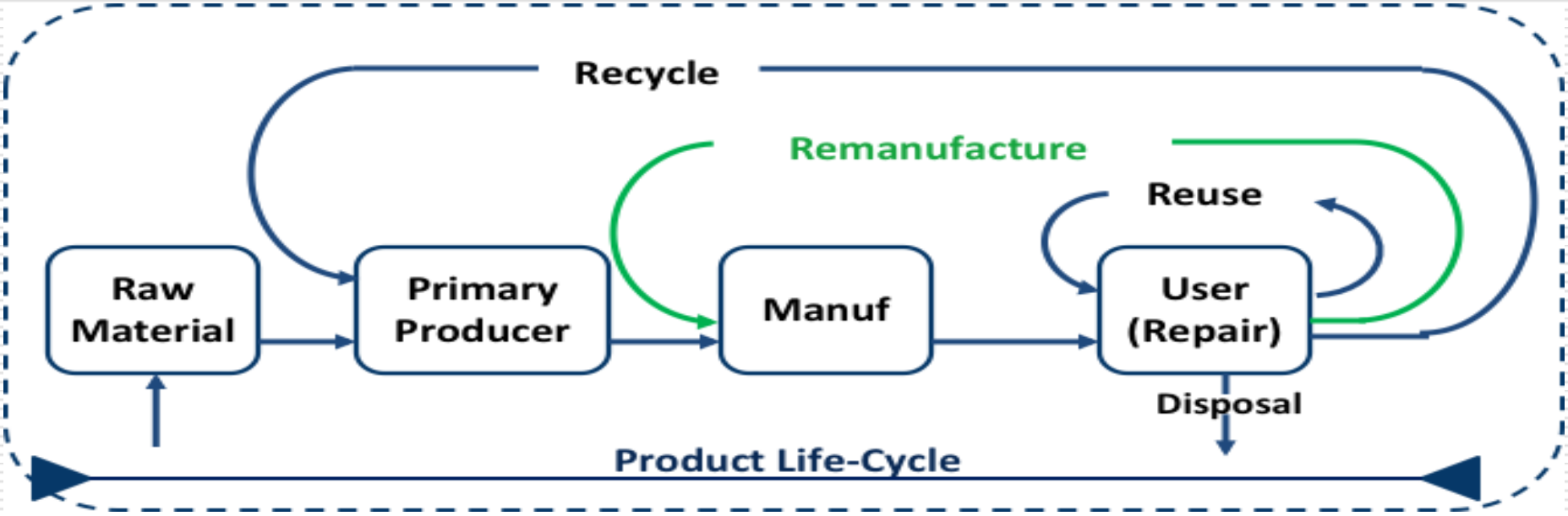
Foster system effectiveness by revealing and designing out negative externalities



1. Hunting and fishing
2. Can take both post-harvest and post-consumer waste as an input

Source: Ellen MacArthur Foundation; McKinsey Center for Business and Environment; Stiftungsfonds Für Umweltökonomie und Nachhaltigkeit (SUN); Drawing from Braungart & McDonough Cradle to Cradle (C2C)

Circular production



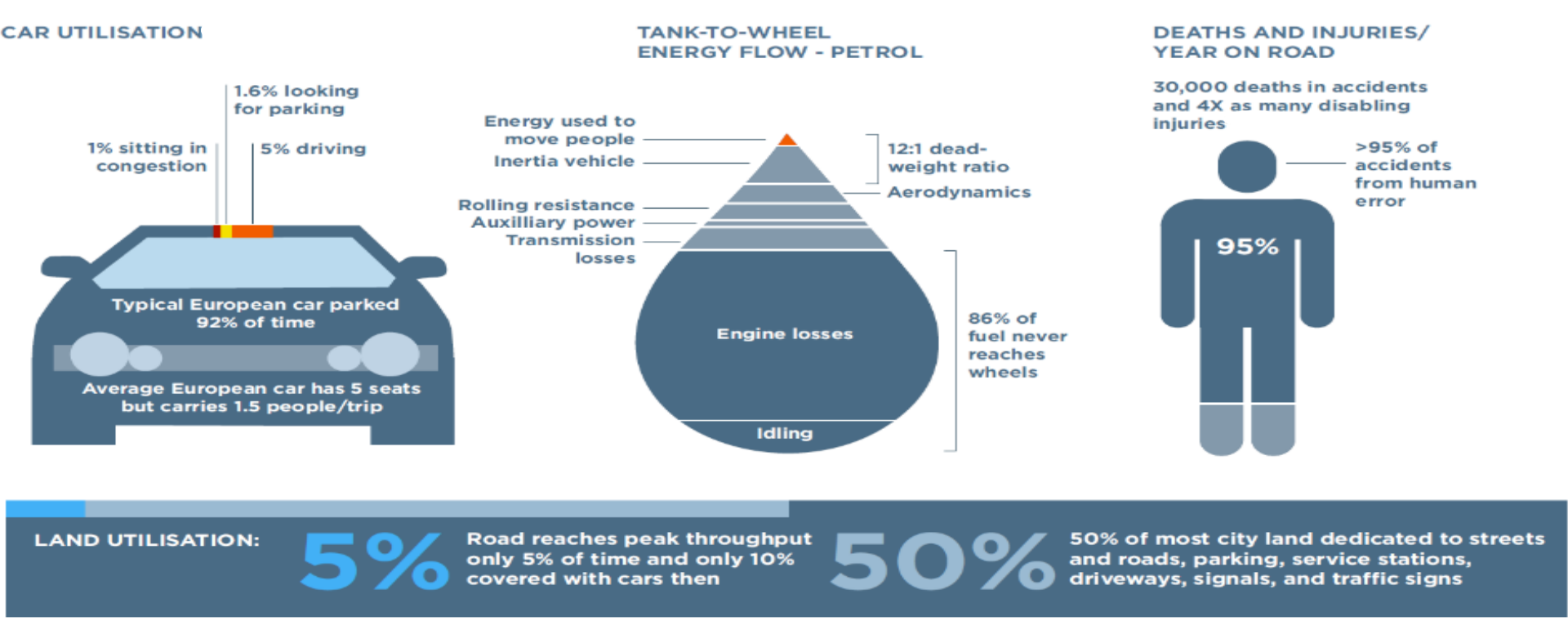
"Closing the loop" of product lifecycles through greater recycling and re-use, and **bring benefits for both the environment and the economy**

Facts, which we ignore

FOR 54 SCARCE AND ECONOMICALY IMPORTANT RAW MATERIALS, EUROPE IN ITS ENTIRETY DEPENDS 90% ON RAW MATERIALS IMPORTED FROM OUTSIDE EUROPE

(EUROPEAN COMMISSION, 2014)

Usage of car resources



OIKOS (HOME)

- PROTECTING ENVIRONMENT AND HUMAN HEALTH WILL NOT BE POSSIBLE WITHOUT FUNDAMENTALLY CHANGING OUR ECONOMIC BEHAVIOUR - WITHOUT GOING INTO THE ROOTS OF ECONOMIC THEORY
- ECONOMIC DEVELOPMENT WILL NOT BE POSSIBLE WITHOUT RESPECTING THE LIMITS OF THE PLANET

ECOLOGY
ECONOMY
OIKOS (HOME)

Problems

1.All production processes lead to downgrading materials and to create value we always need energy. Complete recycling is therefore a thermodynamic impossibility;
2. The assumption that natural nutrients can be fed into the ecosphere without any problems, regardless of their quantity, cannot be guaranteed;
3. Scientific information about more or less harmful effects of substance flows on the environment is growing continuously leading to necessitate treatment and disposal of unexpected waste
4. Optimizing production systems to completely close material loops requires a rigid coupling of diverse processes of material conversion, not only within one company, but also between processes in different companies and countries. This is difficult to establish and manage in market economy.

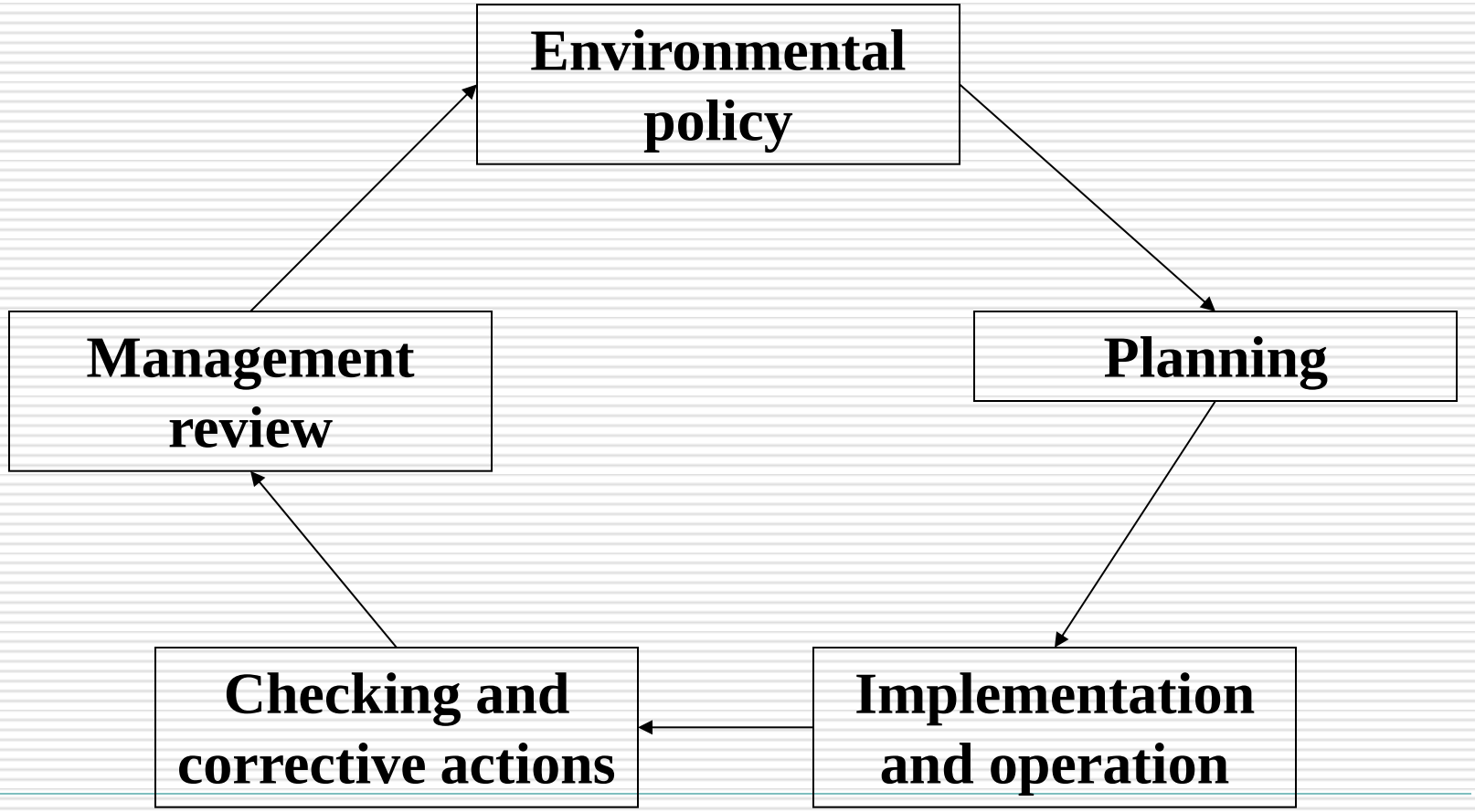
Environmental Management System: principles

- How can an organisation formulate an environmental policy and objectives, considering legislative requirements and information about significant environmental impacts?
- Continual environmental improvement of the organisation
- ISO 14001

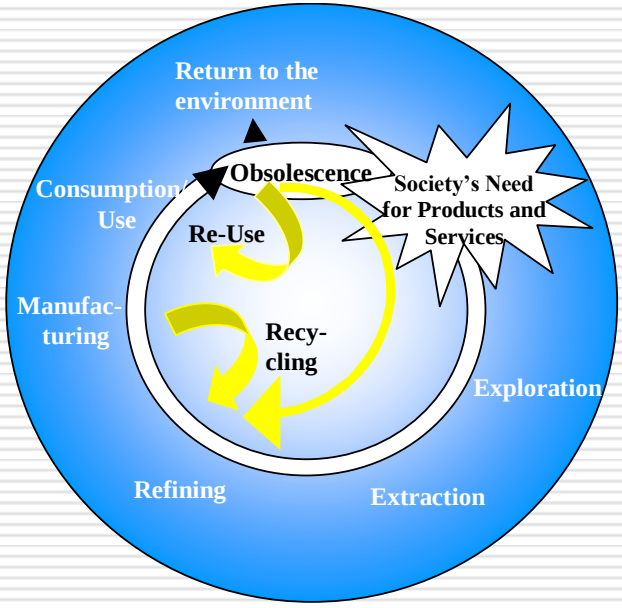
Environmental Management Systems

- An environmental management system (EMS) is a means of ensuring effective implementation of an EM plan or procedures in compliance with environmental policy objectives.
- A key feature on any effective EMS is the preparation of documented system procedures and to ensure effective communication and continuity of implementation.
- There are certification systems for EMS as the ISO 14001 and EC EMAS scheme.
- Ongoing development towards product-orientated management systems (POEMS).

Environmental Management System: steps



Life Cycle Management



Life cycle thinking provides a holistic framework taking the entire system of a product, process or service into account, enabling us to make realistic choices for the longer term taking multiple factors into account.

- Life cycle thinking needs tools to make it practical to regular activities and decisions.

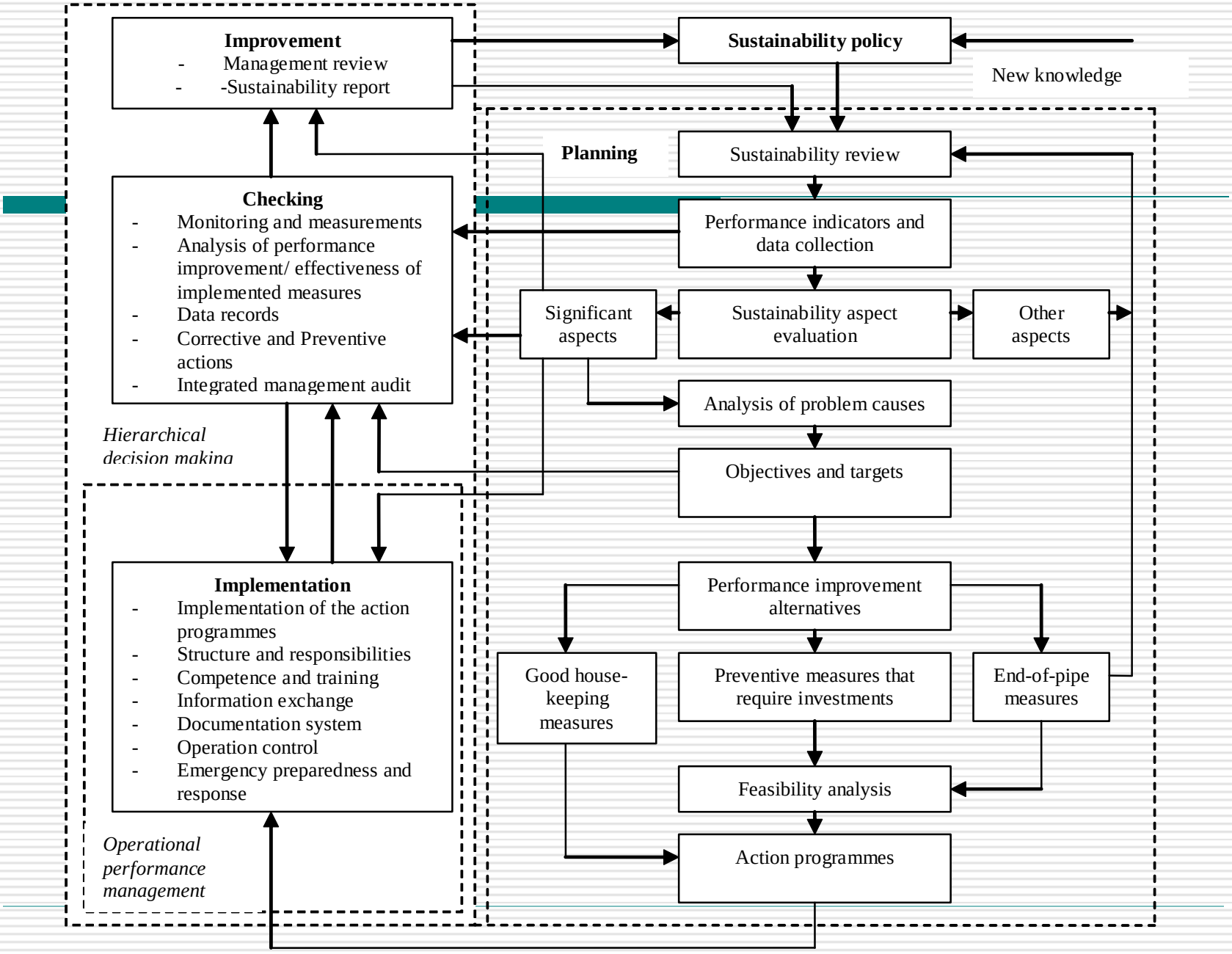
Concept of sustainability management

- To make it operational, sustainable industrial development may be considered as a process of continuous improvement of environmental, economic and social performance in industry.
- Such a process approach allows specialists to identify particular process performance parameters that could be controlled and managed.
- In this context, sustainability performance can be interpreted as a result of management of sustainability aspects in enterprises.

RECP management structural model

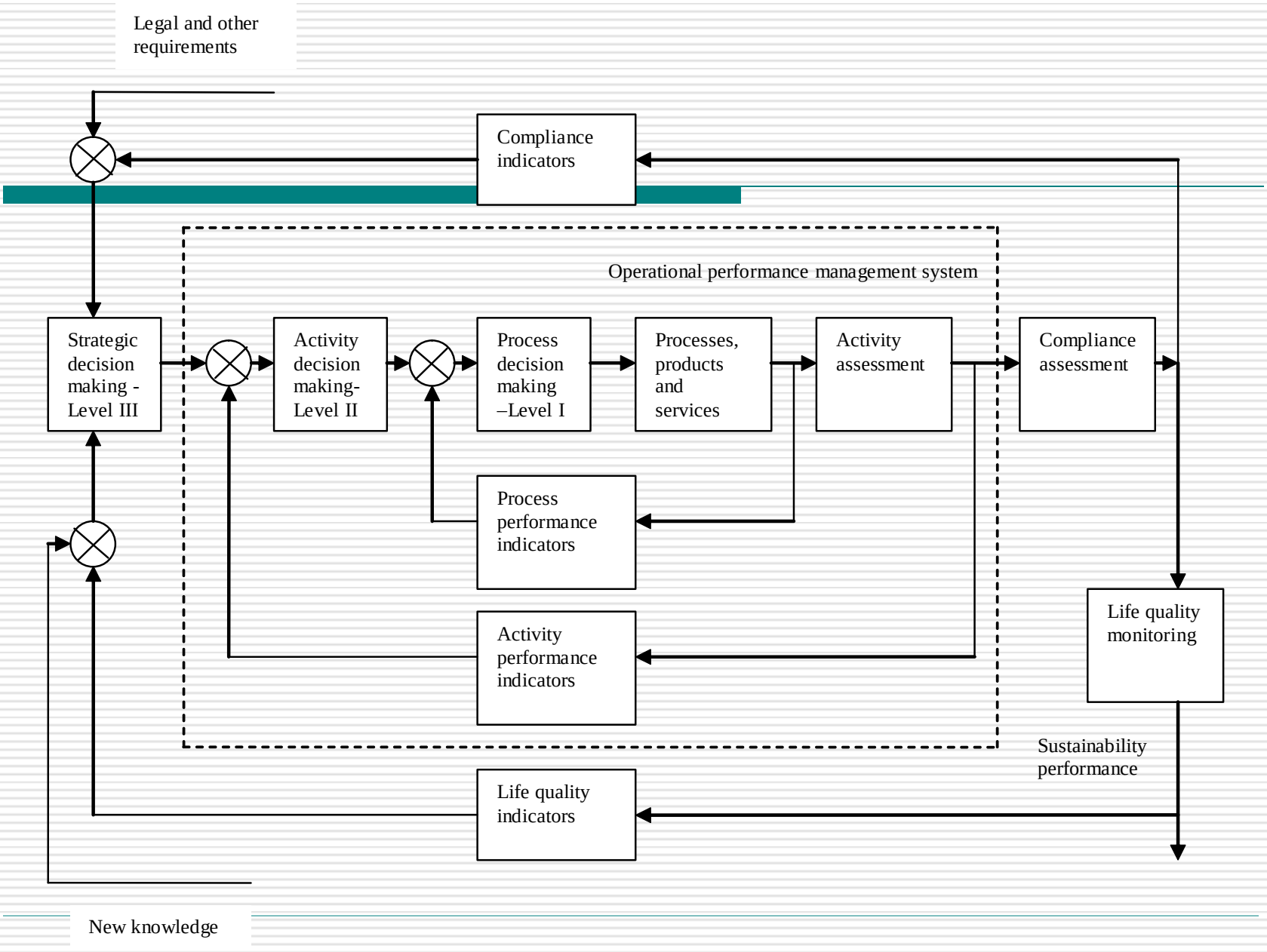
- The structural model presents the key elements of environmental management system and other sustainable industrial development tools in a sequence of integration.

- Distinctive features and novelty of the proposed model are integration of sustainability aspects and criteria at operational level, and shift of conventional management system to sustainable management system as well as introduction of hierarchical system for sustainability performance management based on sustainability indicators


Improvement
- Management review
- -Sustainability report
Sustainability policy
New knowledge
Planning
Sustainability review
Checking
- Monitoring and measurements
- Analysis of performance improvement/ effectiveness of implemented measures
- Data records
- Corrective and Preventive actions
- Integrated management audit
Performance indicators and data collection
Significant aspects
Sustainability aspect evaluation
Other aspects
Analysis of problem causes
Hierarchical decision making
Objectives and targets
Implementation
- Implementation of the action programmes
- Structure and responsibilities
- Competence and training
- Information exchange
- Documentation system
- Operation control
- Emergency preparedness and response
Performance improvement alternatives
Good house-keeping measures
Preventive measures that require investments
End-of-pipe measures
Feasibility analysis
Action programmes
Operational performance management

Proposed hierarchical system

- The proposed system of sustainability performance management is based on a hierarchical approach to decision making.
- The system covers process, activity and strategic decision making with legal and other requirements as well as a new scientific knowledge (stakeholder expectations and scientific knowledge) constituting the system input information.
- The control system also relies on feed back information from several process stages. Decision makers at different hierarchical levels are also provided with the feedback information based on sustainability performance indicators of the enterprise.
- Such approach enables to increase participation of employees in problem solving at different levels of enterprises.


Legal and other requirements
Compliance indicators
Operational performance management system
Strategic decision making - Level III
Activity decision making- Level II
Process decision making –Level I
Processes, products and services
Activity assessment
Compliance assessment
Process performance indicators
Activity performance indicators
Life quality monitoring
Sustainability performance
Life quality indicators
New knowledge

Three levels of performance indicators

- Process indicators (level I) provide information to the enterprise personnel on the process efficiency and help identify both the deviations from technological specifications and the measures for improving the process efficiency.
- Activity performance indicators (level II) are used at process, product, department and enterprise levels and present the “digested” information obtained from a detailed analysis of processes, products and services.
- Compliance and life quality indicators are used in the level III.

Use of performance indicators

Environmental/ social/ economic/ communication indicators	Process indicators	Activity indicators	Compliance indicators	Life quality indicators
Absolute indicators	*Process decision making*	*Operational and process decision making*	*Strategic and operational decision making*	*Strategic decision making*
Relative indicators	*Process decision making to a limited extent*	*Operational and process decision making*	*Strategic decision making*	*Strategic decision making*
Indexed and aggregated indicators	*Not applicable*	*Operational decision making*	*Strategic decision making*	*Strategic decision making*

Conclusions (1)

- A number of tools are available to industrial enterprises to be applied, but the best results are achieved by applying the key tools in an integrated way, because particular sustainable industrial development tools are mutually supportive.

- To ensure effective decision making aimed at improvement of sustainability performance, a sustainability performance management system based on three hierarchical levels (process, activity and strategic decision making) is recommended for use in enterprises.

Conclusions (2)

- To make sustainability performance evaluation meaningful in terms of the better enterprise management, enterprises have to develop their own sets of indicators that reflect their profile and needs. Standard performance evaluation systems could be used as a reference.

- To satisfy the needs of decision making in enterprises aimed at continuous improvement of sustainability performance, four categories of performance indicators should be used: (i) process performance indicators, (ii) operational performance indicators, (iii) compliance and life quality indicators.

Transformations towards sustainability

- Producing sustainability takes much more than simple problem-solving and incremental improvements in the present socio-economic system. Sustainability demands a discontinuous leap from the existing basis of cultural action, and that's why transformations are needed because they are very powerful concept and denote the process in which the reality in front of us changes its form.

Transformations/Revolution in values

"We live at a crucial moment in history, when choices must be made in order to attain higher levels of human consciousness and coherence. The situation demands a revolution in values…

- Business and entrepreneurship based on inner awareness of the self, and directed to the natural and human environments;
- On technology design and implementation that meets people's material and non-material needs rather than just the profit motive;
- On technological change that creates the conditions for human inner growth and development and
- On governance and business management instruments that benefit all people."

Alfredo Sfeir-Younis,
Chilean economist

Three types of action to solve the problem (I)

- *To resolve the problem*: to attempt to resolve the conflict/problem is to accept the conditions that create it and to seek a compromise, a distribution of gains and/or losses that is acceptable to the participants (most managers today are problems resolvers);
- *To solve the problem:* involves analysis and mathematical models. It tends to ignore parts of the problem system that cannot be fitted into the analytic framework, fails to change the underlying conditions that create the problems situation and to make the problem go away;

Three types of action to solve the problem (II)

- *To dissolve the problem*: the objective is to produce long-lasting satisfaction or at least get them back on track to attain their vision. Here the actors take a course that changes the context such that the problem disappears. It called ***design*** and it is the only one that can take on the challenge of producing sustainability.

Design is an activity that precedes learning. It provides new, alternative action-producing structures that change the mode of behavior from one that has been ineffective to a more effective regime.

Creating sustainability

- Even reducing unsustainability is not the same as creating sustainability, it is still makes great sense to remove the proximate causes of whatever is creating unsustainability but recognizing at the same time, that they are but quick fixes. In our culture attacking the symptoms is the underlying rationale for virtually all responses to the growing set of societal problems, yet even here it is important to design the solutions to avoid even more damage. (*John R. Ehrenfeld Sustainability by design,2008)*

Product Service Systems

Product Service Systems (PSS): strategy to develop a marketable mix of products and services that are jointly capable of fulfilling a client's need - with less environmental impact.

- a need rather than a product
- win-win solutions
- de-coupling economic growth and environmental degradation.

Product Service Systems: Definition

"A Product-Service System can be defined as the result of an innovation strategy, shifting the business focus from designing and selling physical products only, to selling a system of products and services which are jointly capable of fulfilling specific client demands."

UNEP (2002)

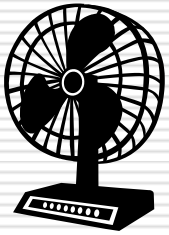
Life Cycle Assessment

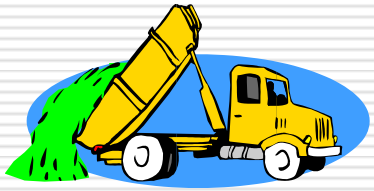
Life Cycle Assessment (LCA) is a tool for the systematic evaluation of the environmental aspects of a product or service system through all stages of its life cycle.

- provides an adequate instrument for environmental decision support.
- reliable LCA performance is crucial to achieve a life-cycle economy.
- The International Organisation for Standardisation (ISO), has standardised this framework within the series ISO 14040 on LCA.

Life Cycle assessment

From cradle to grave

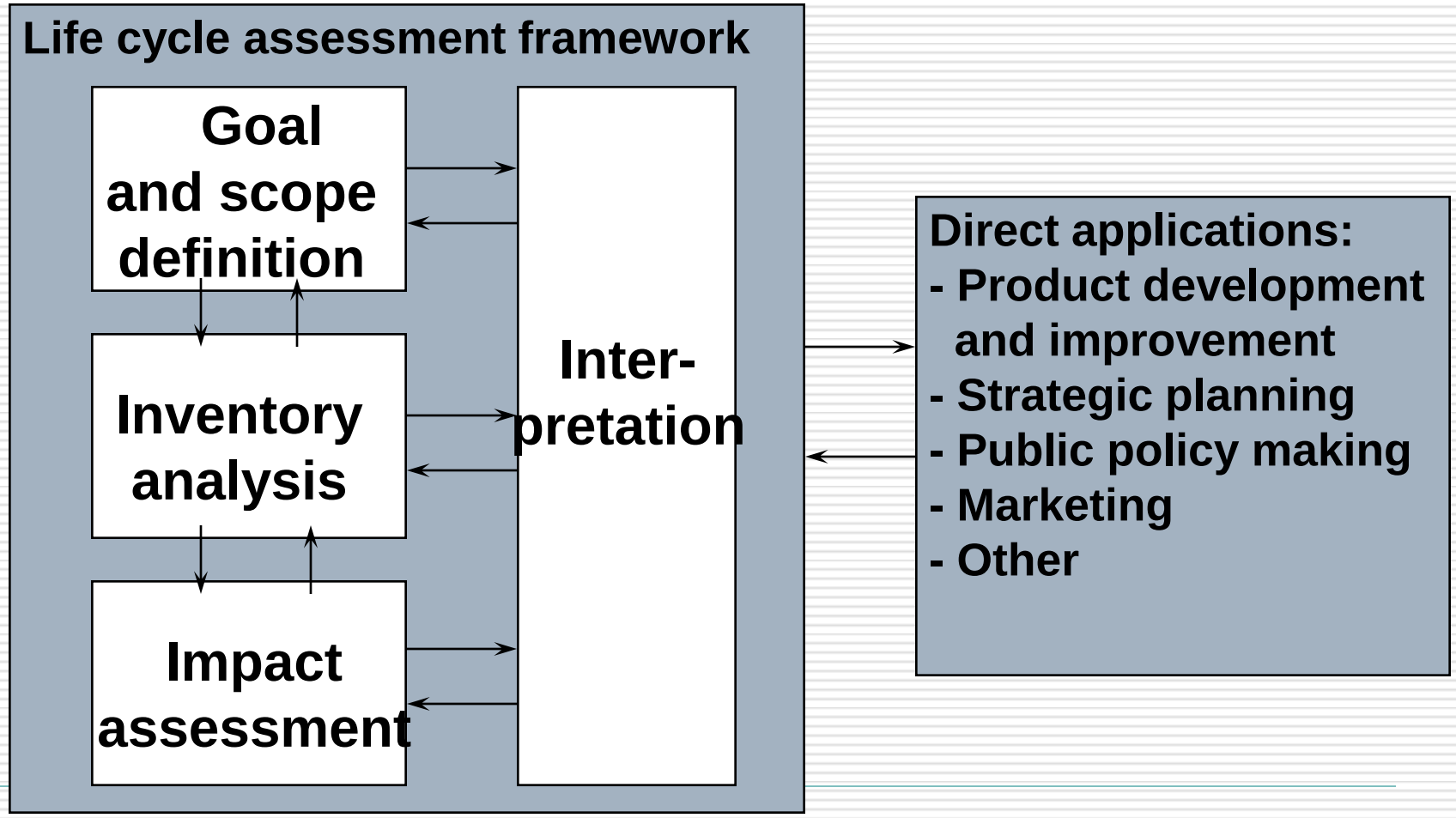




Impacts on

- **Human health**
- **Ecosystems**
- **Resources**

ISO 14040 Life Cycle Assessment, Principles and framework



Weaknesses of LCA

- Too complex
- Too data intensive
- Does not directly consider future changes in technology and demand
- Does not consider societal effects
- Only known and quantifyable environmental effects are considered
- Requires expert knowledge

Life Cycle Costing (LCC)

- Looks at the complete life-span of a product to calculate the entire life cycle costs, which include all internal costs plus **external costs (=externalities)** incurred through throughout the entire life cycle of a product, process or activity
- Puts a monetary value on the emissions and resource use (unfortumately, no valuation method has been generally agreed)

Ecological Rucksack and MIPS

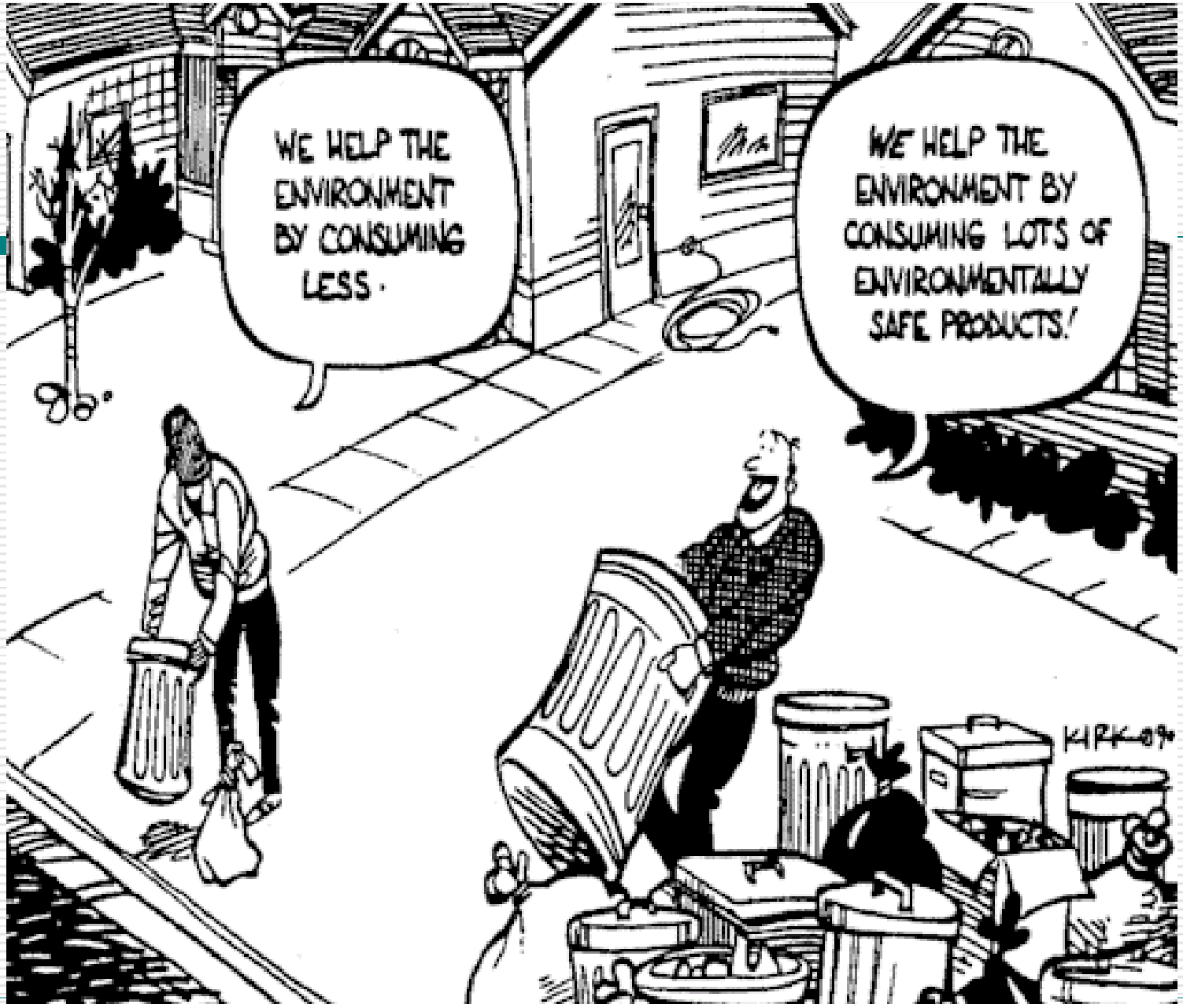
- Ecological Rucksack: “The total weight of material flow ‘carried by’ an item if consumption in the course of its life cycle.”
- MIPS (Materials Intensity per service unit): An indicator based on the material flow and the number of services provided.
- Reducing MIPS is equivalent to increasing resource productivity


"Ecological Rucksack"
Sep.98

Plastic or Cotton Bag?

- **The plastic bag (PE plastic, 18 g) has the following ecological rucksack: abiotic and biotic material 0.1 kg, water 1.17 kg, air 0.04 kg, earth 0 g.**
- **The cotton bag (54 g) has the following ecological rucksack: abiotic and biotic material 1.277 kg, water 214.704 kg, air 0.216 kg, earth 3.402 g. (Vähä-Jaakkola 1999, Wuppertal Institute)**

- **If you use the cotton bag for a year and buy a plastic bag once per day, which is the better buy?**
- **Use the Ecological Rucksack to determine the solution**

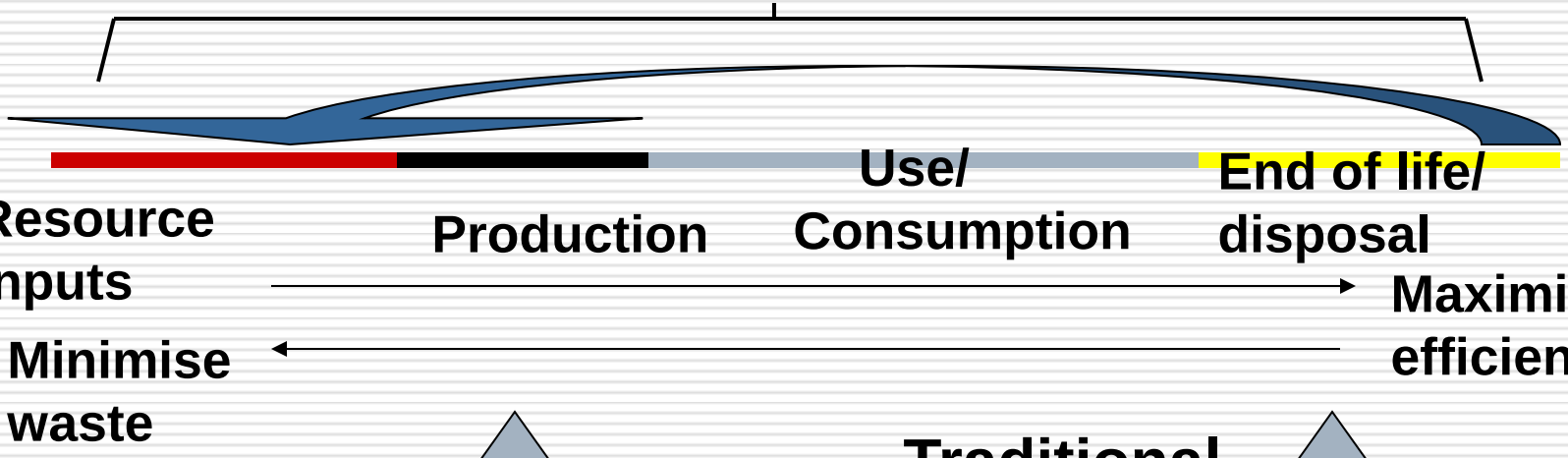

WE HELP THE ENVIRONMENT BY CONSUMING LESS.
WE HELP THE ENVIRONMENT BY CONSUMING LOTS OF ENVIRONMENTALLY SAFE PRODUCTS!

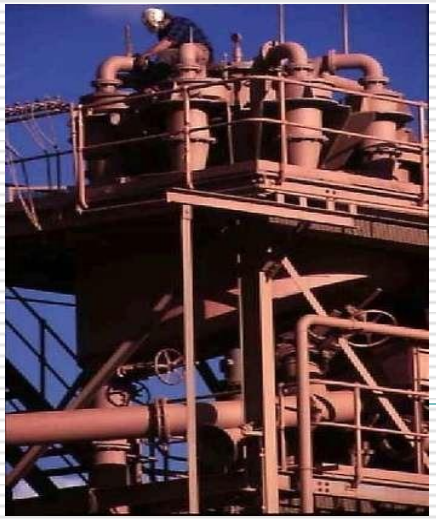
Eco-design

Looks at the relation between a product and the environment. Some common propositions about eco-design or Design for Environment (DfE) include:

- captures the environmental impacts of the whole production-consumption chain;
- 60% to 80% of life-cycle impacts from products are determined at the design stage;
- DfE is to develop generic, company and product independent standards (under ISO TC207)
- way to engage business interest and action because it focuses on the products' market vulnerability.

Traditional life cycle view of policy





Traditional focus of governments

Traditional focus of governments

Integrated Product Policy (IPP)

- **Life-Cycle Thinking** – cumulative environmental impacts - from the "cradle to the grave".
- **Working with the market** – setting incentives so that the market moves in a more sustainable direction by encouraging the supply and demand of greener products.
- **Stakeholder Involvement** – it aims to encourage all those who come into contact with the product
- **Continuous Improvement** – improvements can often be made to decrease a product's environmental impacts
- **A Variety of Policy Instruments** – the IPP approach requires a number of different instruments because there are such a variety of products and different stakeholders.

Thank you !