Sustainable Innovation

http://meaganmccall.theworldrace.org/blogphotos/theworldrace/meaganmccall/_tpw0709.jpg

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January 7, 2010

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Delft University of Technology

Managing technology for a transition to a Sustainable Society

- The need for a transition
- trends in technological innovation
  - Complexity
  - Globalisation
  - Emancipation
- Attempts to initiate transitions

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The need for a Transition

I = P * A * T

I Environmental **I**mpact

P **P**opulation

A **A**ffluence
Consumption of services and products per capita

T **T**echnology
Environmental burden per product or service unit

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Economic growth

	2002	2003	2004	
USA	2,4	2,5	3,5	
JAPAN	0,2	2	1,25	
EU	1,1	0,75	2	
INDUSTRIAL	1,6	1,75	2,5	
Other	4,5	4,5	5,25	
World	3	3	3,75	

http://www.cpb.nl/nl/cpbreport/2003_3/cpbr033.pdf

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The Challenge

future generations

	growth
population :	1.5
Affluence :	4 – 8
Environmental burden :	1/2
improvement factor	12 - 24

Leaps in efficiency of consumption/production are required

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Sustainability

The answer of technology

- ‘Triple D’
- ‘Management’
- ‘End of pipe’
- Process integrated
- Sustainable

Sustainability

Traditional Triple D technologies

Dumping

(waste in pits etc.)

Displacement

(moving pollution by e.g. sewerage or smoke stacks)

Dilution

(of gaseous and fluid waste)

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Sustainability

Good housekeeping or triple M

Monitoring,

Management,

Maintenance

International Chamber of Commerce

The world business organization

Principles

1. Corporate priority

   To recognise environmental management as among the highest corporate priorities and as a key determinant to sustainable development; to establish policies, programmes and practices for conducting operations in an environmentally sound manner.

2. Integrated management

   To integrate these policies, programmes and practices fully into each business as an essential element of management in all its functions.

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International Chamber of Commerce

The world business organization

Principles, ctd.

3. Process of improvement

   To continue to improve corporate policies, programmes and environmental performance, taking into account technical developments, scientific understanding consumer needs and community expectations, with legal regulations as a starting point; and to apply the same environmental criteria internationally.

4. Employee education

   To educate, train and motivate employees to conduct their activities in an environmentally responsible manner.

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End of Pipe Technologies

Incineration

Pyrolysis

Separation

Fermentation

Chemical transformation

Catalytic reduction

Shielding (radiation, noise)

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Sustainability

Emission reduction by process and organisational change

Primary energy

Raw materials

By- product prevention

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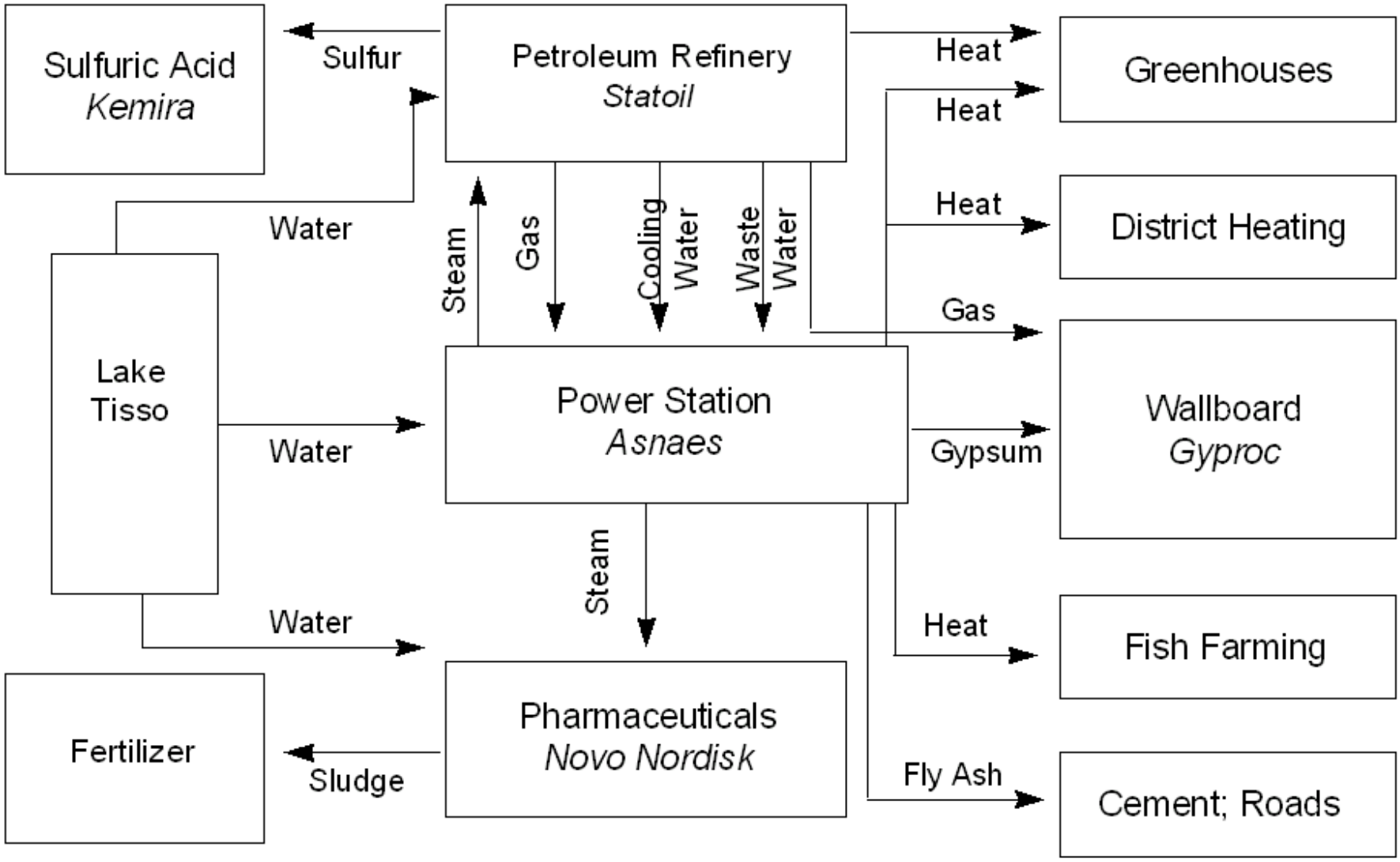
Sulfuric Acid
Kemira
Sulfur
Petroleum Refinery
Statoil
Heat
Heat
Greenhouses
Water
Steam
Gas
Cooling Water
Waste Water
Heat
District Heating
Gas
Lake Tisso
Water
Power Station
Asnaes
Gypsum
Wallboard
Gyproc
Steam
Water
Heat
Fish Farming
Fertilizer
Sludge
Pharmaceuticals
Novo Nordisk
Fly Ash
Cement; Roads

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Sustainability

Sustainable technologies are those technologies that fulfill the needs of mankind without the use of non-renewable resources, and without creating large scale, and/or irreversible damage.

Sustainability

Example: problems with plastics

Raw materials, 3-4 % of oil production

SO2, hydrocarbon emission

Emissions monomers: acrilonitril, VCM

Catalysts, initiators etc

Accidents chlorine, etc

Additives

Utilisation ?

Waste: CO2, litter

http://www.yachtingmonthly.com/img/newsdesk/ym/ymnews/RubbishleftonSaltburn_02.jpg

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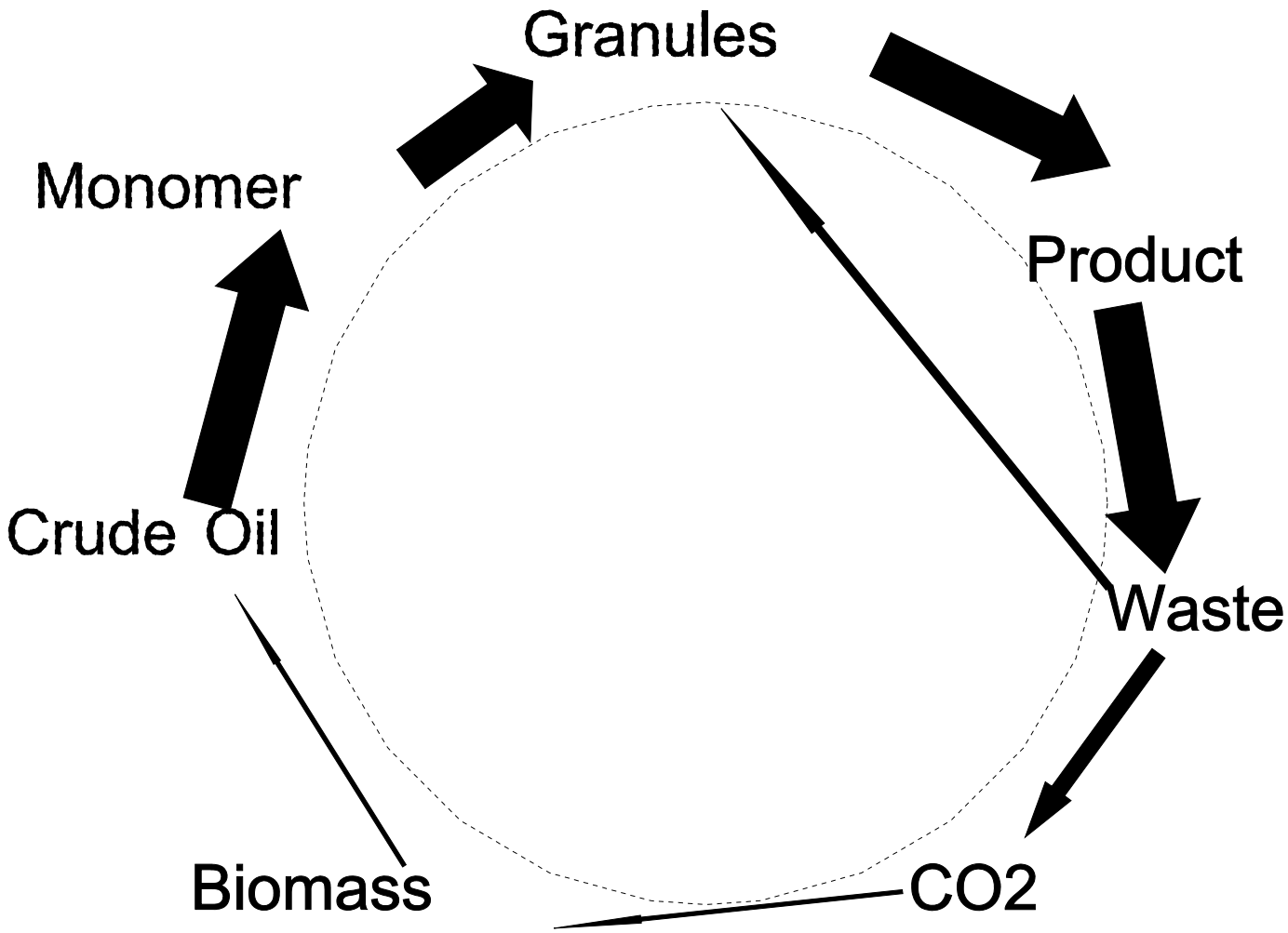

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Sustainability

STD Approach

Factor 20,

Start with a need, then function

Backcasting

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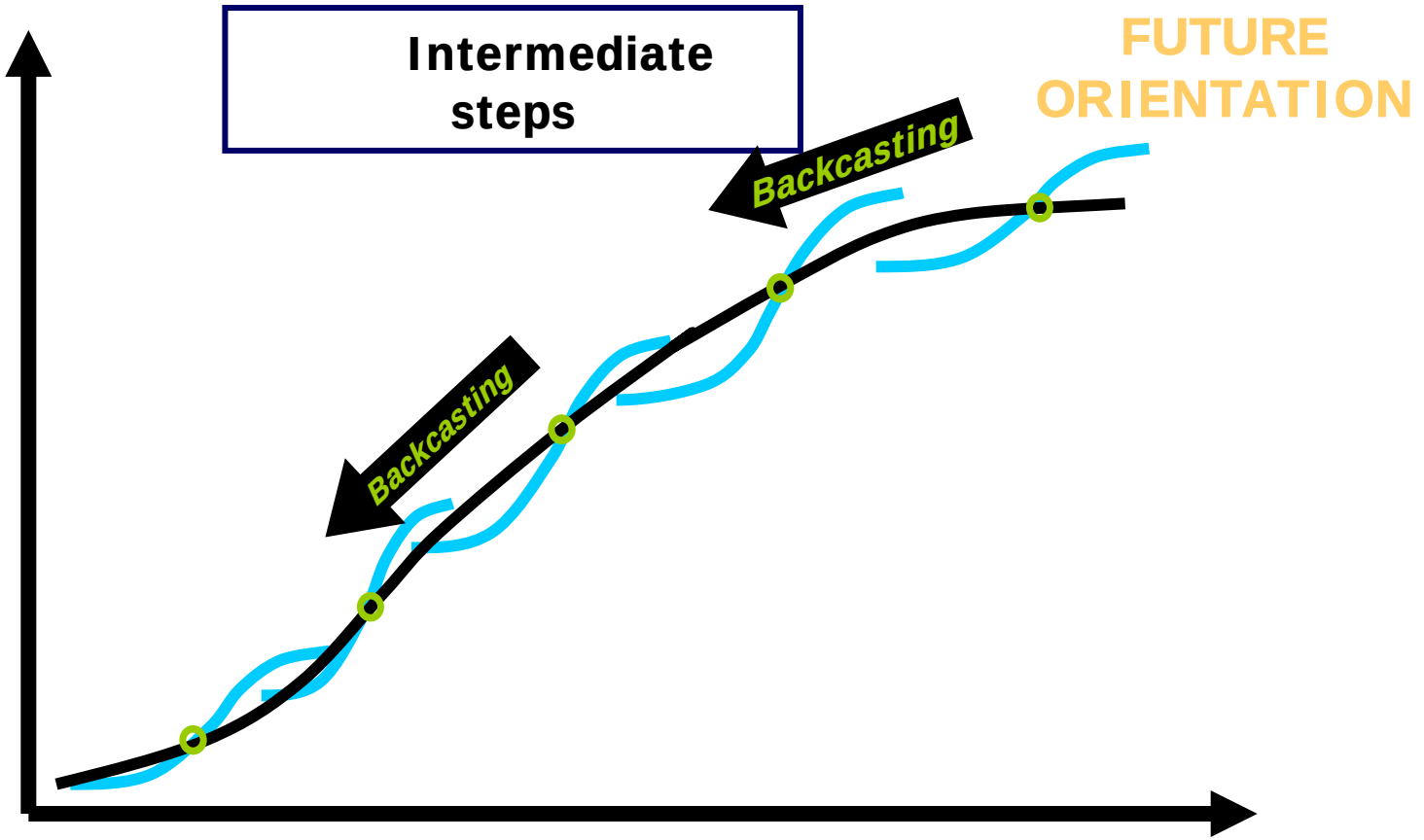
Sustainability

Technology in Sustainable Development



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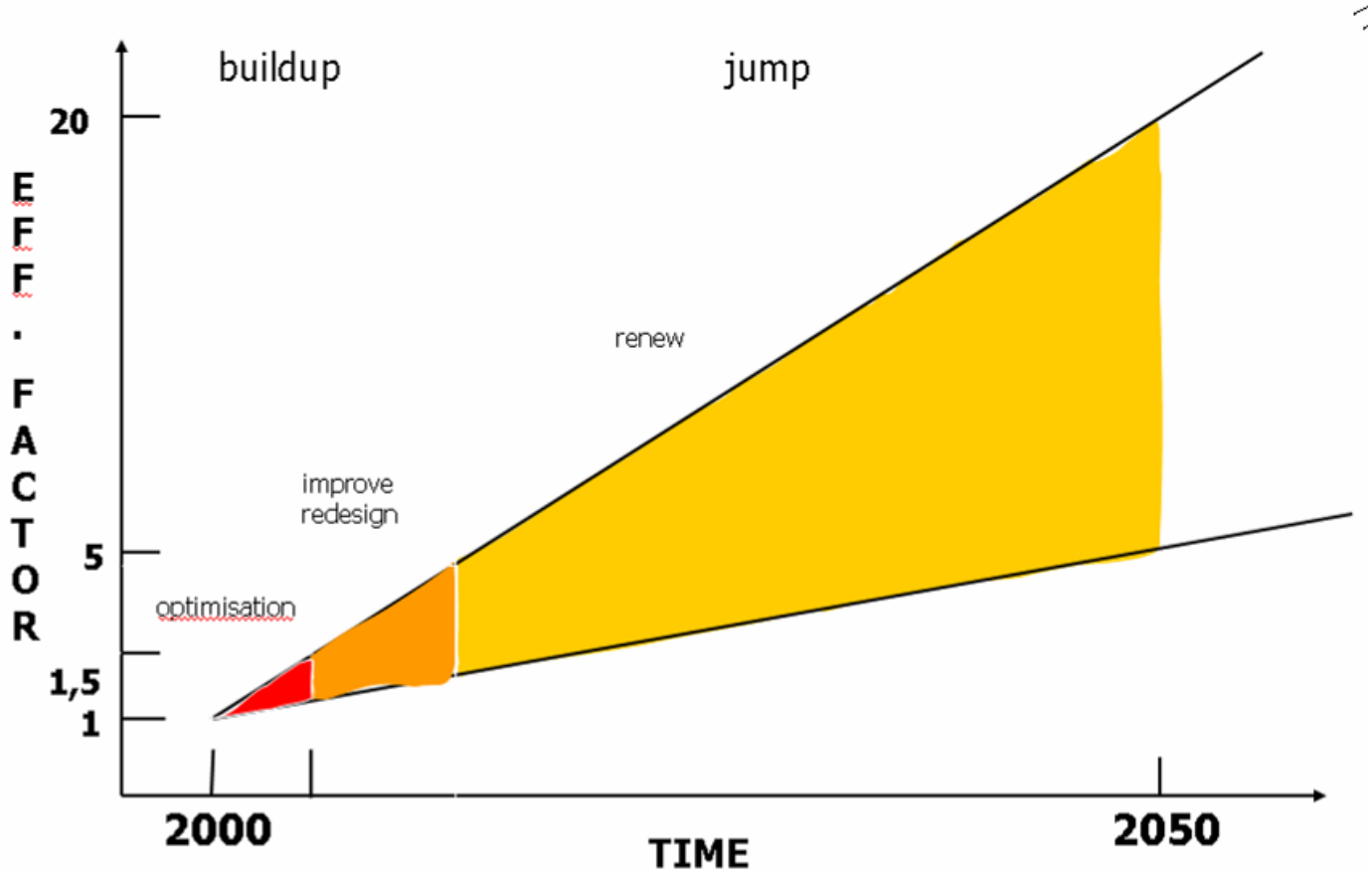
Technology in Sustainable Development



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Sustainability

Rebound

smart®
reduce to the max.

Eco® Lumen

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