### Facing the Challenges of Helping Societies to Progress Toward Sustainability: What visions, concepts, tools and approaches are needed?

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Senior Scientist in Sustainable Development

Institute for a Secure and Sustainable Environment

**University of TN** 

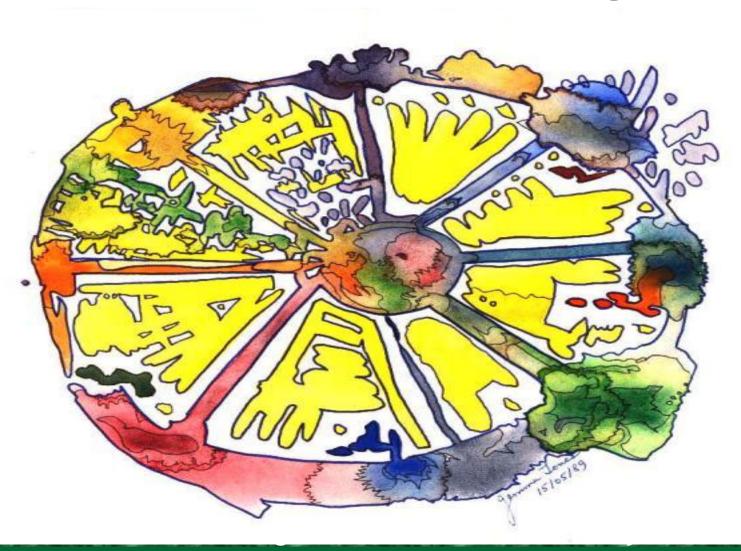
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### Overview of this presentation

- Context and urgency of the challenges to make changes;
- Changing awareness, changing values, changing approaches
- Managing and Monitoring progress;
- What if we succeed? What if we don't?



# Where Are We and Where Are We Going?



# What is Ahead on the Road to the Future?



Don Huisingh, Ph.D. IIIEE - Lund University

### Overview of this presentation

• Context and urgency of the challenges to make changes;

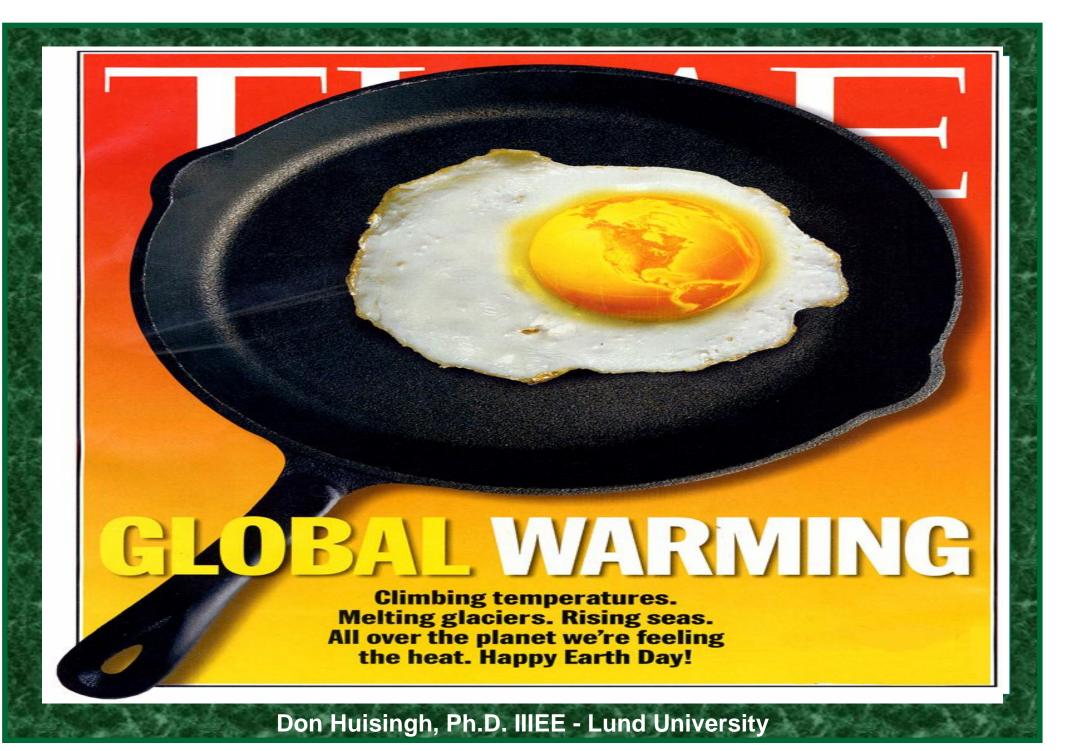
## What Issues Are Increasingly Threatening Our Societies with Un-Sustainability?

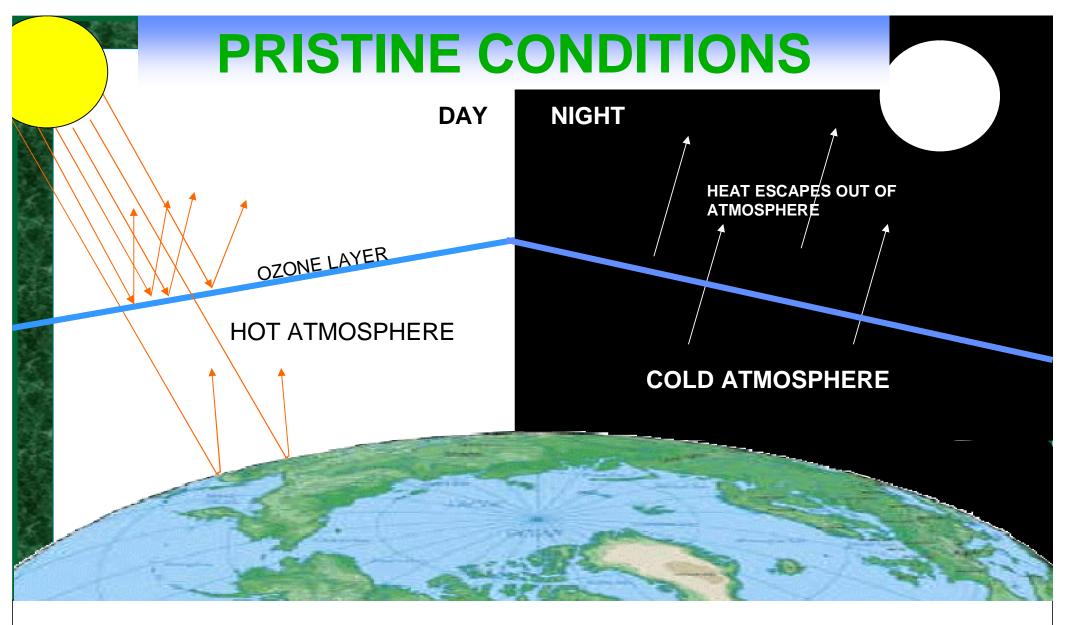
- Global warming;
- Ozone layer destruction;
- Sea level & desertification;
- Human population explosion;
- Toxics dispersion;
- Habitat destruction;
- Species diversity losses;
- Food and water insecurity;
- Poverty & terrorism.



#### What Are the Challenges Ahead of us?

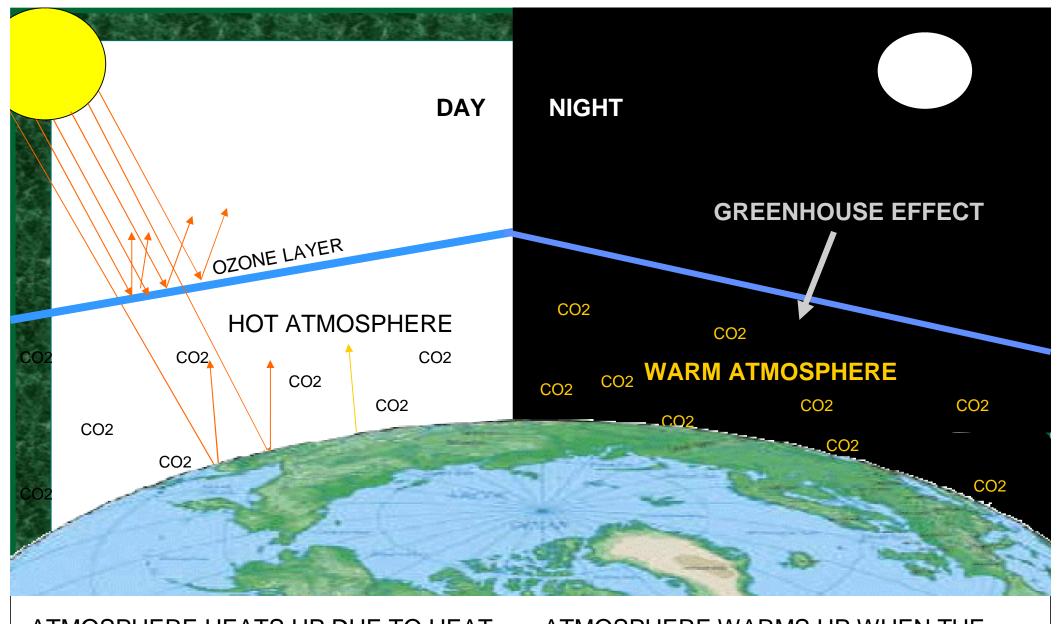
Global warming;





FROM THE SUN

ATMOSPHERE HEATS UP DUE TO HEAT ATMOSPHERE COLDS DOWN WHEN THE HEAT EXCAPES DURING THE NIGHT



ATMOSPHERE HEATS UP DUE TO HEAT FROM THE SUN. CARBON DIOXIDE CAPTURES THE HEAT

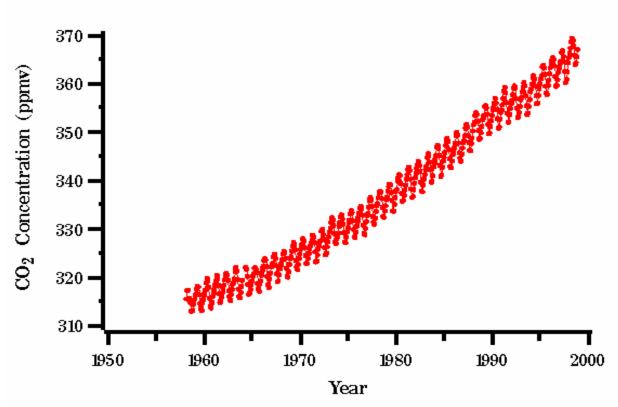
ATMOSPHERE WARMS UP WHEN THE HEAT IS RETAINED BY THE CARBON DIOXIDE AND CANNOT ESCAPE DURING THE NIGHT

### SOURCES OF CARBON DIOXIDE



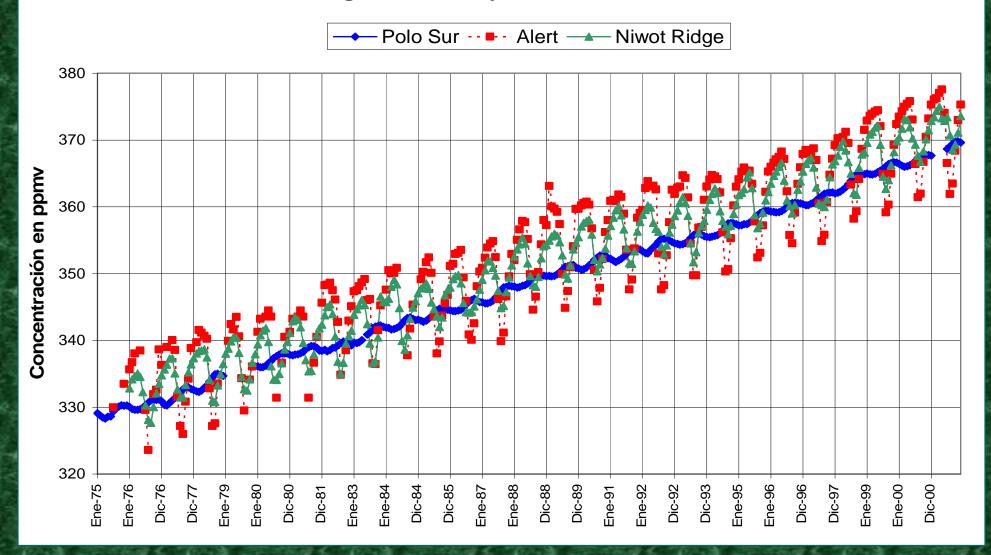
### CO<sub>2</sub>-levels 1957-1999

Mauna Loa, Hawaii

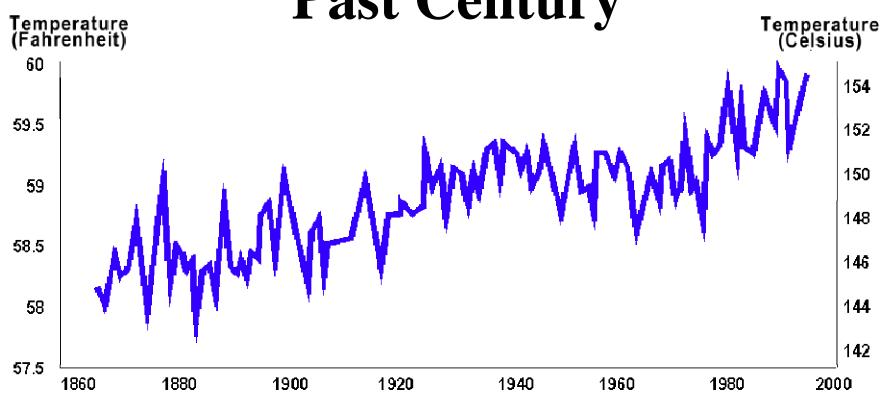


Source: Dave Keeling and Tim Whorf (Scripps Institution of Oceanography)

### Concentración de CO<sub>2</sub> mensual en las estaciones del Polo Sur, Niwot Ridge, Colorado y en Alert, Canadá



# Surface Temperatures Have Warmed Over the Past Century



# Theoretical Impacts of Global Warming

- Increasing temps;
- Acceleration of melting of glacial/polar ice;
- Rising sea levels;
- Increasing desertification;
- Increasing frequency and severity of storms.

# **Symptoms and Impacts of Global Warming?**

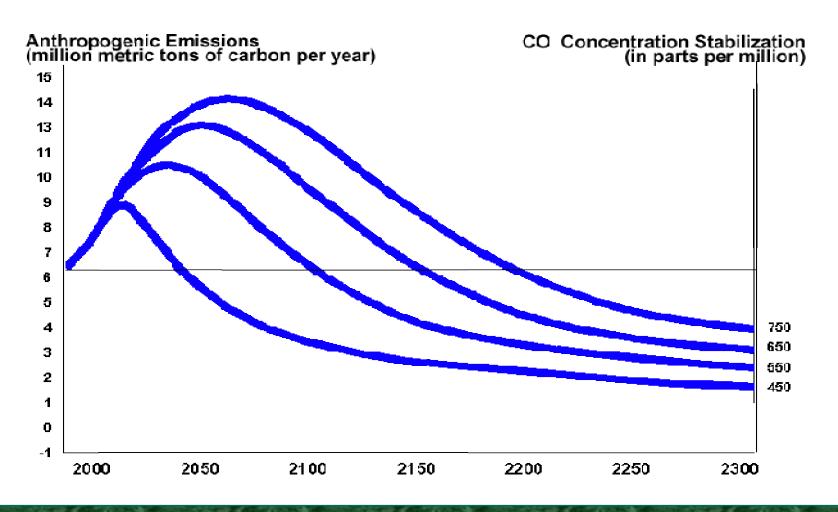
- Summer of 2003, high temperatures are blamed for 27,000 excess deaths in Europe.
- 2005 Atlantic Hurricane Season
  - 27 named storms (previous record 21)
- 2005 four <u>major</u> hurricanes hit the U.S./previous record three in 2004



# Atmospheric CO<sub>2</sub> concentrations are increasing, increasingly rapidly!

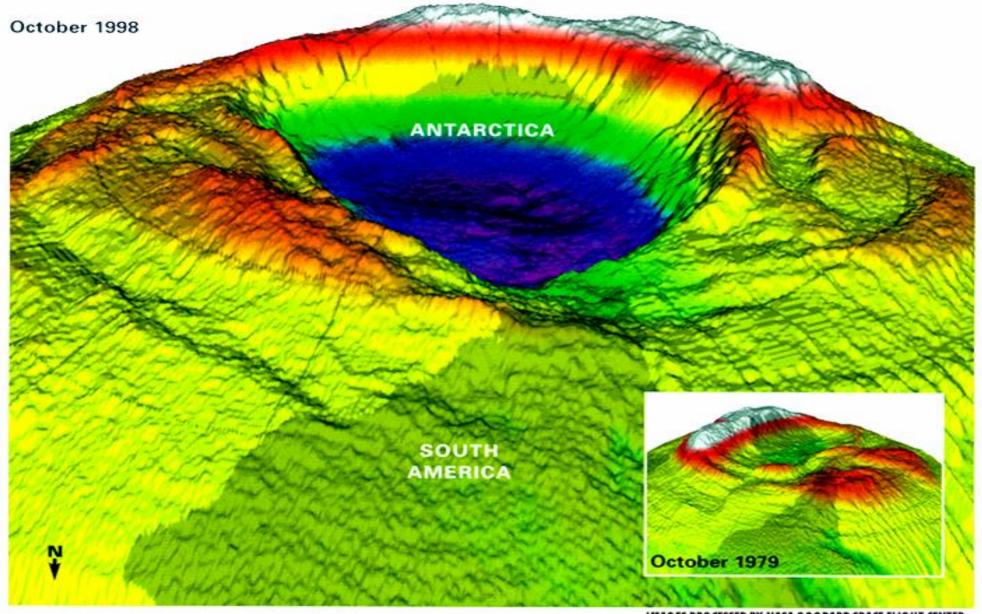
- Recent research showed that atmospheric CO<sub>2</sub> concentration increased 4Xs more rapidly between 2000 and 2005 than between 1990 and 2001;
- These findings were discussed in mid-Nov. 2006 at meetings in Nairobi to explore ways to move forward with the Kyoto protocol and other instruments on climate change.
  - Financial Times Nov. 11, 2006, p 4.

### Stabilizing CO<sub>2</sub> Means Steep Emission Cuts



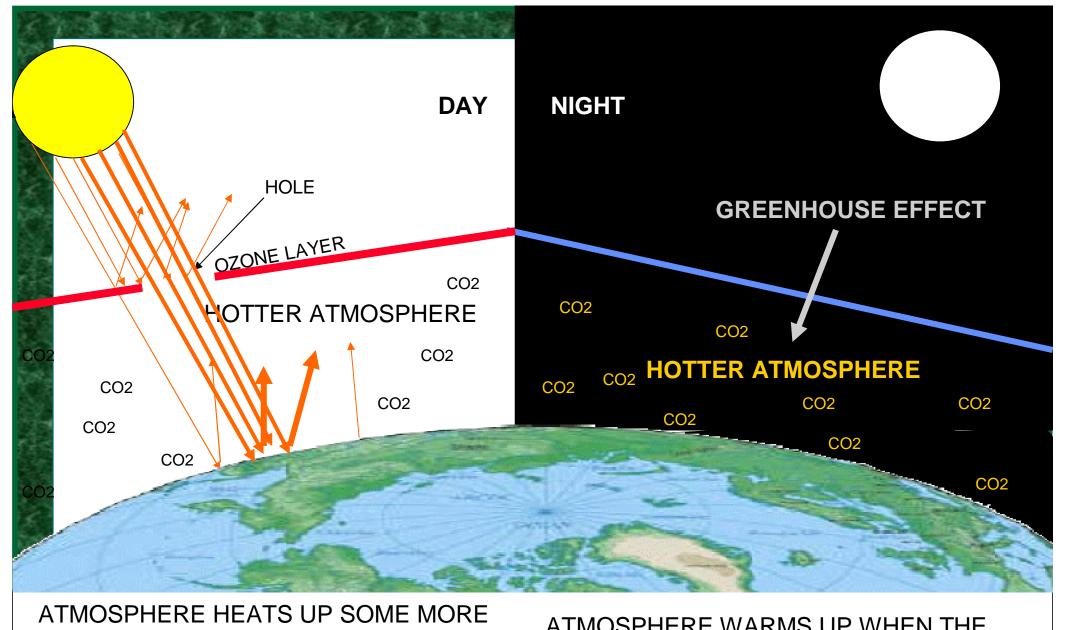
#### What Are the Challenges Ahead of us?

Ozone layer destruction;



# The Rate of Ozone Layer Thinning Continues to Accelerate!

• Recent research found that the 'Ozone Hole,' over the Antarctica is larger this year than in any previous year!



ATMOSPHERE HEATS UP SOME MORE AFTER DEPLETION OF THE OZONE LAYER. GLOBAL TEMPERATURE INCREASING AT A RATE OF ABOUT

ATMOSPHERE WARMS UP WHEN THE HEAT IS RETAINED BY THE CARBON DIOXIDE AND CANNOT ESCAPE DURING THE NIGHT

# In this context what are some of the related challenges ahead of us?

- Human population explosion;
- Toxics dispersion;
- Habitat destruction;
- Species diversity losses;
- Food and water insecurity;
- Poverty & terrorism.

### The Earth is Shrinking!!!

- Human Population increasing:
  - at the current rate of 70,000,000 per year million

 The Earth is Shrinking: Advancing deserts and Rising Seas Squeezing Civilization by Lester Brown

http://www.earthpolicy.org/updates/2006/update61.ht m

### The Earth is Shrinking!!!

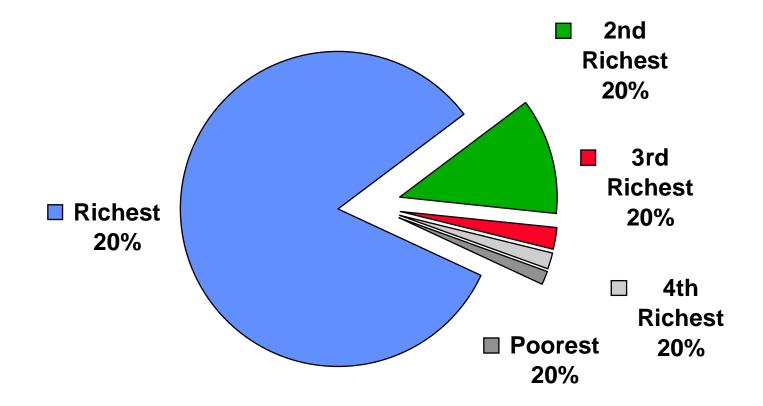
- Desserts are spreading;
  - China is losing productive land to deserts at an accelerating rate
    - 1950 1975 they lost 1,560 sq km/yr.
    - By 2000 they lost 2,480 sq km/yr
  - In recent years Afghanistan lost 100 villages and Iran lost 124 villages due to advancing desserts;
  - Nigeria with a 4x increase in population from 33 million to 134 million between 1950 and 2006 had an 11x increase in domestic animal population and lost 3,400 sq km to desserts;
  - Latin America is also experiencing similar loss rates;

### The Earth is Shrinking!!!

- Sea Level Rising
  - Due to thermal expansion and to ice glacial ice melt;
    - During 1900s, the sea level increased 15 cm
    - It is projected to increase 9 80 cm during the current century;
    - But if the Greenland icecap melts at the rate it has melted and all of it melts, there will be a 7,000 cm sea level rise!

#### **Global Income and Economic Disparities**

#### In Distribution of World Income



Source: Agenda for Change, Center for our Common Future. 1989 figures from UNDP

### As Chad Holiday, CEO of DuPont Inc, recently stated in an address to the United Nations:

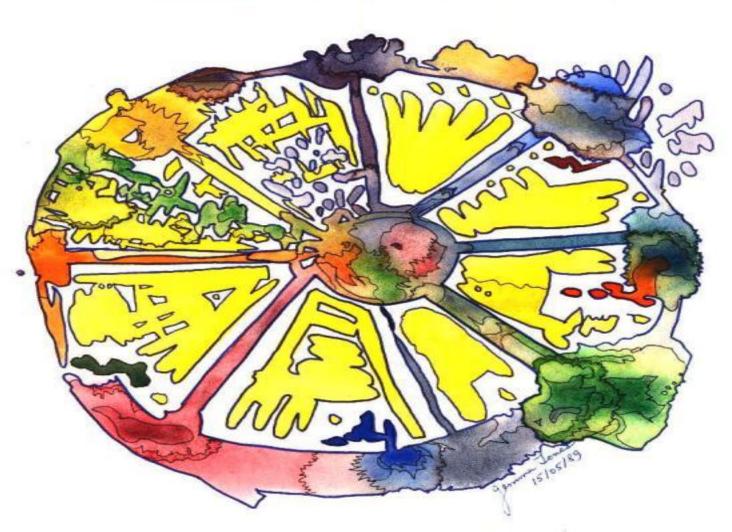
"Given existing technology and products, for all six billion people on the planet to live like the average American, we would require the equivalent of three planet Earths to provide the material, create the energy and dispose of the waste."



### Overview of this presentation

• Changing awareness, changing values, changing approaches

# Where Are We and Where Are We Going?



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# What Are Some Related Challenges?

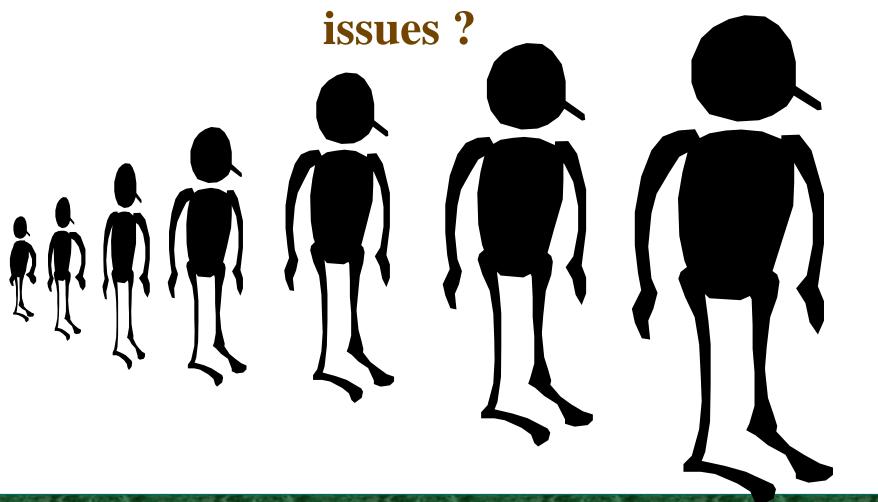
- What are the root causes of the ecological and economic challenges facing us?
- How are they leading to spreading:
  - -Poverty;
  - Frustration;
  - Despair;
  - Terrorism?

# How can we reverse this negative spiral?

- How can we change to positive hopeful, positive visions and effective actions toward SD?
- What needs to be done to make these changes?

- How can we develop, test and implement changes in <u>vision</u>, <u>will</u>, <u>policy</u> and <u>approaches</u> to help to ensure that we make progress toward SD?
- How can we "Think and Plan Globally," while acting "Locally?"

Who should be empowered to make decisions on local, regional, national and global welfare



#### Interconnectedness of Population, Affluence & Technology



Number of units of resources used per person (A)

Environmental degradation and pollution per unit of resource used (T)

Environmental impact of Population (I)

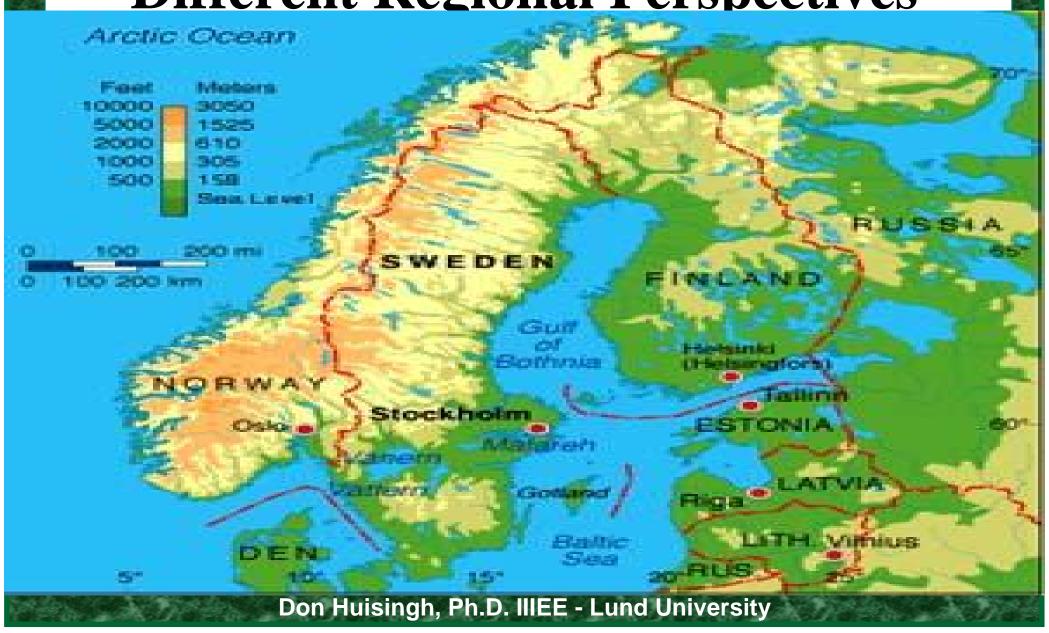
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#### **Human-ecosystem Relationships**

All things are bound together. All things connect. What happens to the earth happens to the children of the earth. Man has not woven the web of life. He is but one thread. Whatever he does to the web, he does to himself.

• Chief Seattle.

#### Different Regional Perspectives



#### Different Regional Perspectives



#### Different Time Perspectives



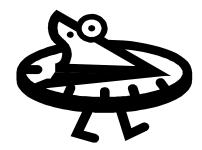
#### Time...!



**Governmental Time...?** 



**Species Time...?** 



**Corporate Time...?** 





**Eco-system Time...?** 



#### Different attitudinal perspectives

• If mankind is to survive, we shall require a substantially new manner of thinking.

• Albert Einstein

#### Different life styles

- We must begin to see the possibility of evolving a new lifestyle, with new methods of production and new patterns of consumption;
- a life-style designed for permanence.

E.F. Schumacher

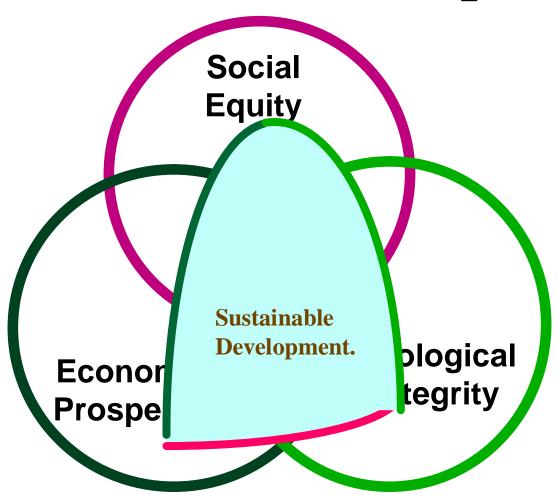
# How can/should we work to make (short and long-term progress toward SD?

How does the system work and how can we use this information to help make progress in sustainable development?

What went wrong with the system and how can we fix it?

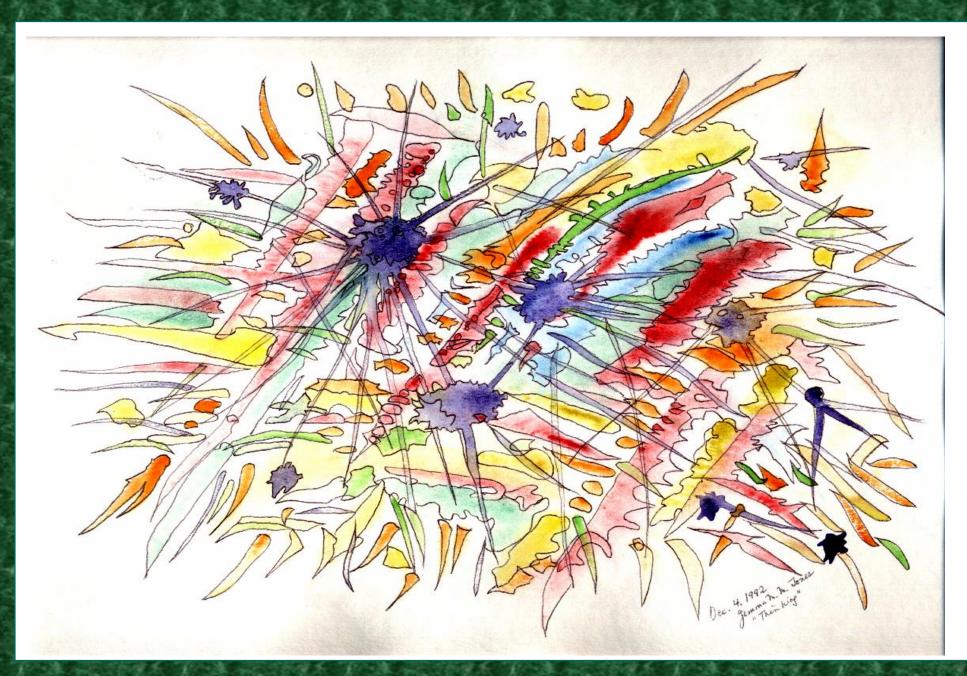


#### Sustainable Development

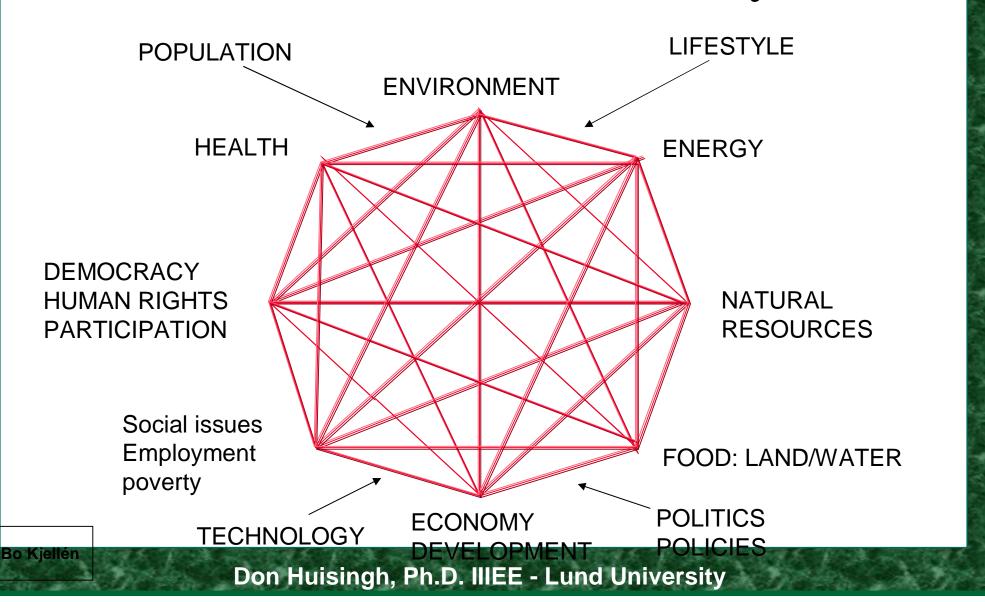


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#### Diamond of Sustainability



# What changes are needed to help make progress toward SD of sustainable regions?

Foul & flee

- Foul & flee
- Dilute & disperse

- Foul & flee
- Dilute & disperse
- Concentrate & contain

- Foul & flee
- Dilute & disperse
- Concentrate & contain
- End-of-pipe treatment

- Foul & flee
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- Cleaner production, cleaner products, cleaner consumption

- Foul & Flee
- Dilute & Disperse
- Concentrate & Contain
- End-of-pipe Treatment
- Cleaner Production, Cleaner Products, Cleaner Consumption
- Eco-Efficient, Sustainable Regions

- New thinking;



- New thinking;
- New paradigms;



- New thinking;
- New paradigms;
- New policies;



- New thinking;
- New paradigms;
- New policies;
- New technologies;



- New thinking;
- New paradigms;
- New policies;
- New technologies;
- New management;



- New thinking;
- New paradigms;
- New policies;
- New technologies;
- New management;
- New cooperation;



- New thinking;
- New paradigms;
- New policies;
- New technologies;
- New management;
- New cooperation;
- -New values.



### What Is Needed to Make These Transitions?

What Are Some Principles and Tools That May Help Us to Make Them?

#### Approaches that may help us

- Utilize the 'Natural Step' principles;
- Implement prevention-oriented cleaner production of cleaner products;
- Make dramatic increases in ecoefficiency (Factor 4 – 10 - X);
- Avoid the rebound effects;

#### Approaches that may help us

• Implement sustainable production and consumption systems in local-global systems that operate within the ecosystem's short and long-term carrying capacities.

#### Principles and Tools That May Help Us

Natural Step Principles;

# The Four Natural Step System Conditions(1)

Extracted Substances from the Earth's crust must not be systematically increased in the biosphere.

# The Four Natural Step System Conditions (2)

The productivity and biodiversity of the Earth itself must not be systematically deteriorated.

# The Four Natural Step System Conditions(3)

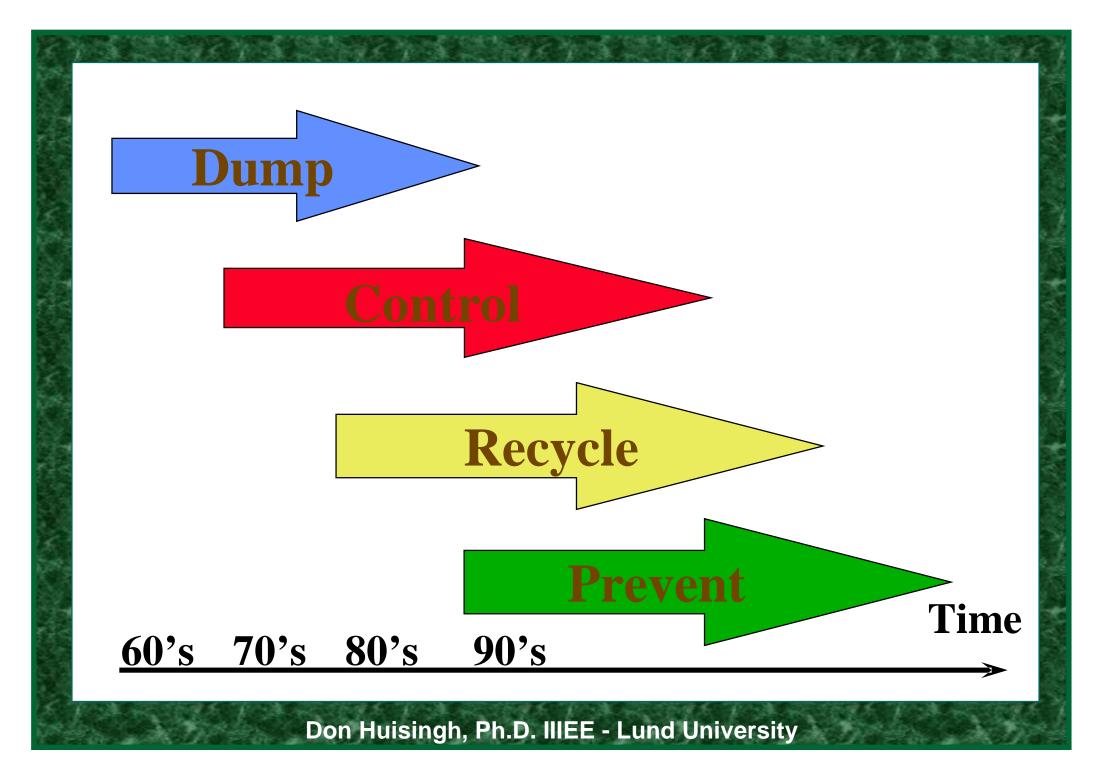
Substances produced by human society must not be systematically increased in the biosphere.

# The Four Natural Step System Conditions (4)

Human needs must be met with a fair and efficient use of energy and other natural resources.

# The Principle of Prevention Is Central to Cleaner Production of Cleaner Products

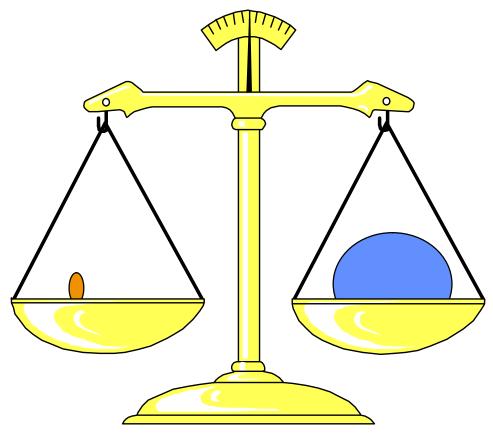
- What is the principle of prevention?
- It means that it is better to prevent than to clean up after a problem has been produced.



**An Ounce of Prevention** 

is worth

A Pound of Cure.



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#### Cleaner Production - Definition

Cleaner production is the continuous application of an integrative, preventative, environmental protection strategy for products, processes, and services, which can result in improved organizational and societal efficiency and reduced risks to humans and to the environment.

#### .....CP is accomplished by.....

- Product modifications and changes;
- **∨** <u>Input</u> substitutions;
- Process modifications and changes;
- V Modifications and changes in <u>operational</u> <u>practices</u>;
- Reuse of materials;
- On site <u>recycling</u>;

# In this context, what is meant by Eco-Efficiency?

• "...the delivery of competitively priced goods and services that satisfy human needs and bring quality of life while progressively reducing ecological impacts and resource intensity, through the life cycle, to a level at least in line with the Earth's carrying capacity."

**World Business Council for Sustainable Development** 

#### **Eco-Efficiency Means**

- Eco-nomic improvements;
- Eco-logical improvements;
- Socio-logical improvements;
- Psycho-logical improvements;
- Governance improvements;
- Values improvments.

# How can one work to achieve improvements in Eco-Efficiency?

- Reduce material and energy requirements for provision of goods and services;
- Reduce toxics use and dispersion;
- Maximize sustainable use of renewable resources;
- Extend product durability;
- Increase service intensity of goods and services;
- Change life-style to reduce per-capita consumption!

## Does Improved Energy Efficiency Really Save Energy in the long term? What about the <u>Rebound Effect?</u>

- Some economists have argued that energy efficiency reduces the cost of energy services, thereby increasing disposable income, some of which may be spent on activities that lead to more energy consumption.
- Therefore, engineering/policy estimates that do not account for such potential <u>rebound effects</u> may overestimate energy savings.

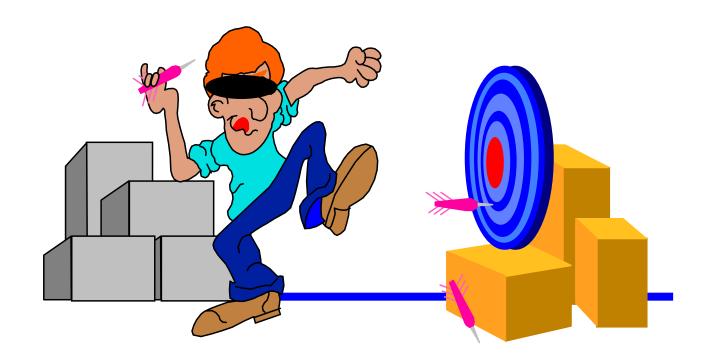
## What are some other tools that may be helpful?

- LCA and Life cycle thinking;
- EMA/TCA
- Toxics and risk reduction approaches;
- Backcasting/forecasting and realated tools;
- EPR;
- Precautionary Principle;

## Overview of this presentation

Managing and Monitoring progress;

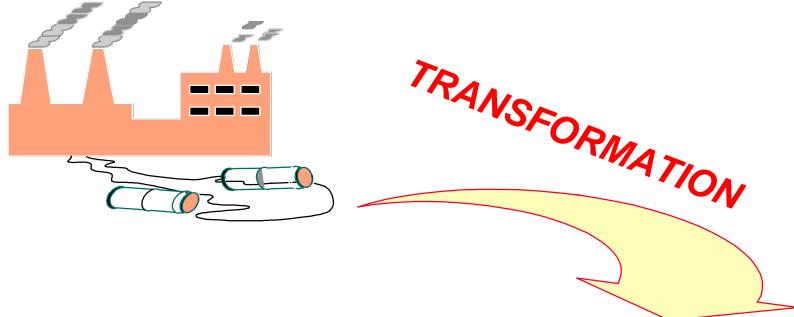
# You can't manage what you can't or aren't monitoring!



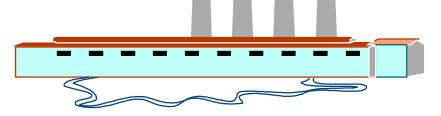
**Better Monitoring Is Better Management** 

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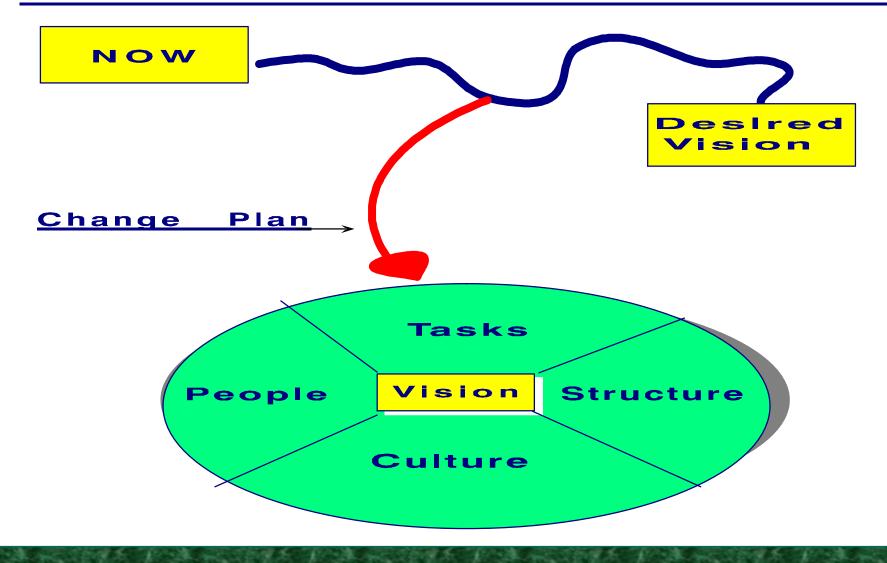
#### PRESENT CONDITION



**VISION** of the FUTURE



#### The Change Plan and the Organization



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#### What are barriers to change?

- 1. Conservationism and unwillingness to change;
- 2. Work over-load with "day-to-day" activities, thereby discouraging engagement in thinking about and working for change.

# 4. BePractical Mental Locks

#### Ten Blocks to Creativity

- Fear of making <u>mistakes</u>
- Fear of being seen as a <u>fool</u>
- Fear of being <u>criticized</u>
- Fear of being misused
- Fear of being <u>alone</u> (a person with an idea is automatically a minority of one.)

#### Ten Blocks to Creativity

- Fear of disturbing a <u>tradition</u> AND making changes
- Fear of being associated with <u>taboos</u>
- Fear of losing the security of habit
- Fear of losing the group's love
- Fear of being truly an <u>INDIVIDUAL</u>

## **Overcoming Barriers**

- Ensure that top-management commitment is clear and strongly supportive at corporate, community and at regional, national and global levels;
- Work with and empower stakeholders at all levels in co-envisioning the future and in working to implement that vision;
- Provide new information and teaching tools to accelerate awareness, commitment and engagement in working toward SD goals.

#### Management pyramid is strongly influenced by framework conditions

FRAMEWORK

- People

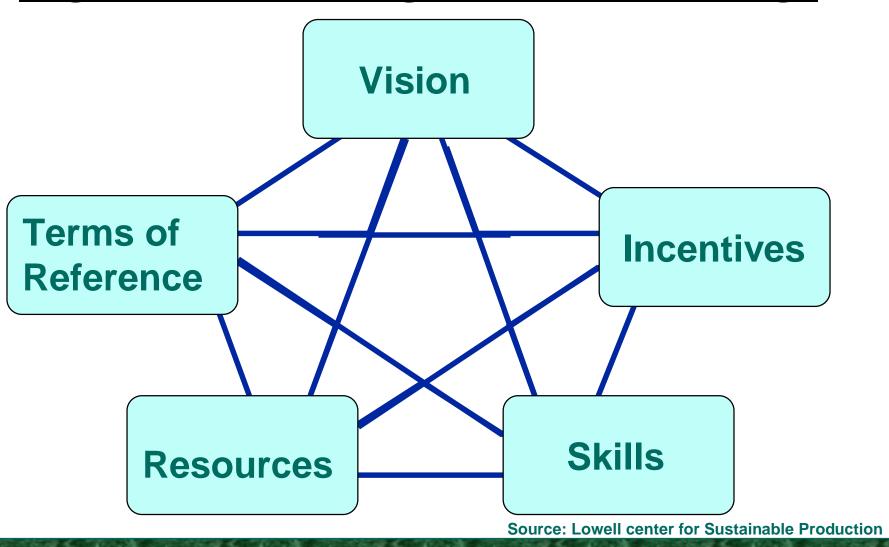
- Systems

influence

PRØDUCTS PRODUCTION Mgm SYSTEM **STRATEGY** VISION **VALUES** 

- Tools

#### **Ingredients for Organizational Change**



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What roles can management systems play to help us make progress toward corporate and regional SD?

## **Quality Management System**

ISO 9000 series is focused on improving product quality through better management of production processes;

ISO 14000 series focused on improving quality of environmental management through improved management of corporate environmental aspects and impacts;

## Safety Management System

**Enhance safety management through:** 

- Improved fire protection;
- Reduced accidents;
- Improved technical safety of installations;
- Improved occupational health and safety

Approaches are based on national regulations and upon the <u>OHSAS 18001guidelines</u>.

#### **Social Accountability**

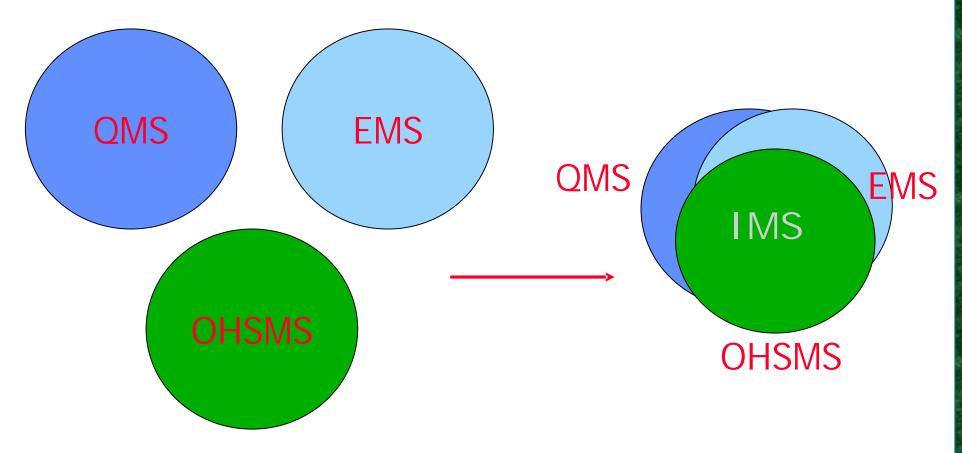
International Standard SA 8000 – promoted by 'Social Accountability International,' based on ILO Conventions and Universal Declaration of Human Rights;

## **Corporate Social Responsibility**

There is an increasing awareness of the need for organizations in both public and private sectors to behave in socially responsible ways;

The ISO organization is now developing an ISO 26000 to provide guidelines for social responsibility (SR)

#### Integrated management system



# What about the future of corporate and regional management systems?

**Supply chain management?** 

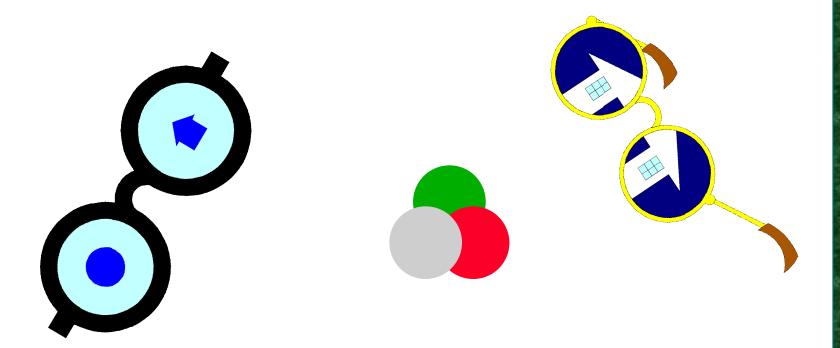
Life cycle management?

**Integrated corporate management?** 

Industrial ecology/ industrial symbiosis approach among companies?

Integrated management of cities, regions, nations?

# Changes in What We Look for and How We Look?



# What are the system boundaries and what needs to be done about these interconnected issues?

- Global Warming;
- Ozone Layer Destruction;
- Habitat Destruction;
- Human Population Increases;
- -Species Losses
- Hunger, Poverty, Terrorism and War?



## Measuring Regional Eco-efficiency – Indicator Development in the Life-ECOREG Project

Matti Melanen and Per Mickwitz Finnish Environment Institute (SYKE)

ICSMM 2006, I International Conference on Sustainability Measurement and Modelling, 16-17

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#### The Kymenlaakso Region, Finland

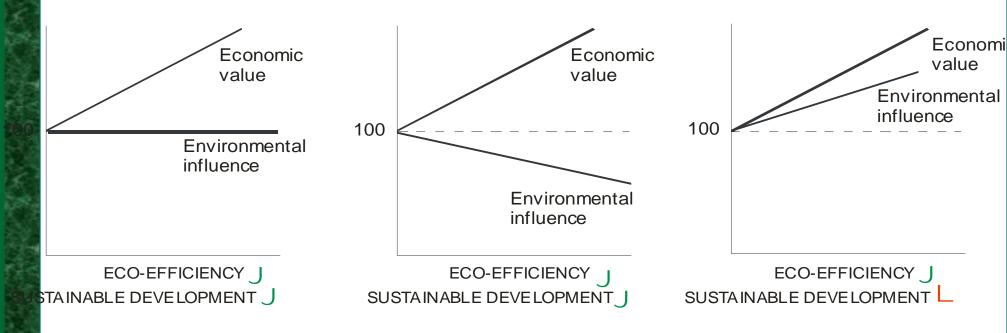


Myllykoski Paper, Anjalankoski, Kymenlaakso. Photo: Myllykoski Paper Oy Don Huisingh, Ph.D. IIIEE - Lund University

#### Eco-efficiency and sustainable development

(Internationally) The prefix eco refers to both economic and environmental performance.

Sustainable development is a goal or a path. Eco-efficiency is one of the means for attaining it.



#### The system boundaries of the ECOREG analysis

#### **Upstream** processes

#### Imports, RoF

- raw materials
- refined products

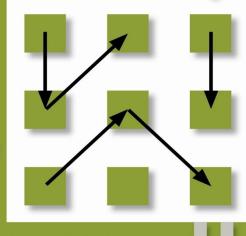
#### Imports, RoW

- raw materials
- refined products

#### Industry-level regional processes

#### Inputs from Kymenlaakso:

- renewables
- non-renewables



#### **Outputs into nature:**

- · emissions into air
- emissions into water
- waste materials
- · dissipative use

#### Downstream processes

#### **Exports, RoF**

- raw materials
- refined products

#### **Exports, RoW**

- raw materials
- refined products

System boundary

Legend: RoF = the rest of Finland RoW = the rest of the world

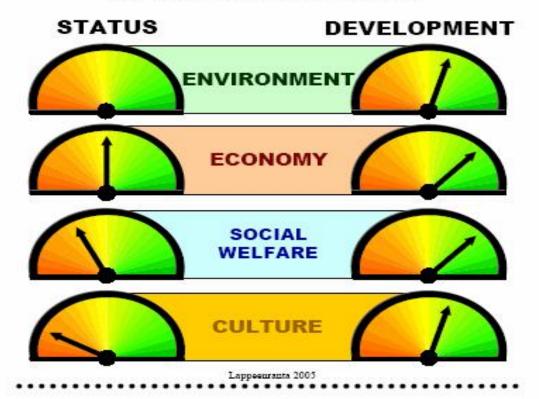
## Application of the indicators in Kymenlaakso: the 1<sup>st</sup> eco-efficiency follow-up report (2000-2004)

A Southeast Finland Regional Environment Centre publication

21EN

Mika Toikka (ed.)

Eco-efficiency indicators for the Kymenlaakso Region







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## Going Global on Eco-Efficiency

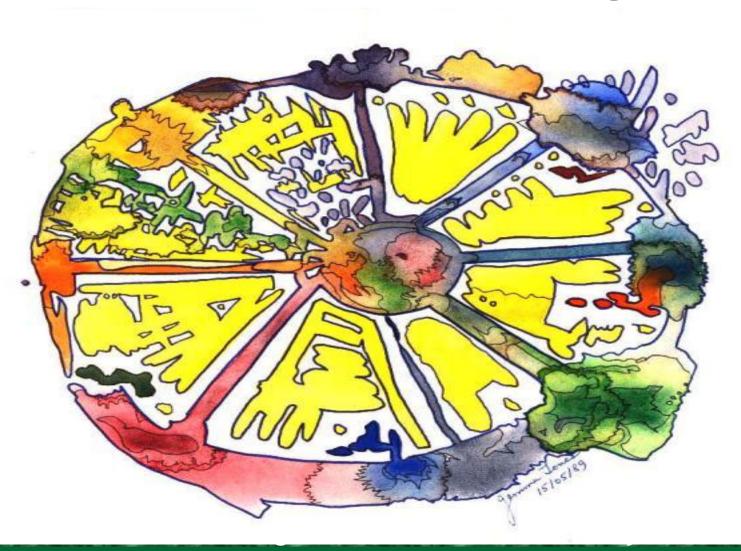
• Finland's initiative towards a new generation of environmental policy

Background paper for the informal meeting of the
 Environmental Ministers 14 – 16. 7 2006 in Turku, Finland

### Overview of this presentation

- What if we succeed?
- What if we don't?

### Where Are We and Where Are We Going?



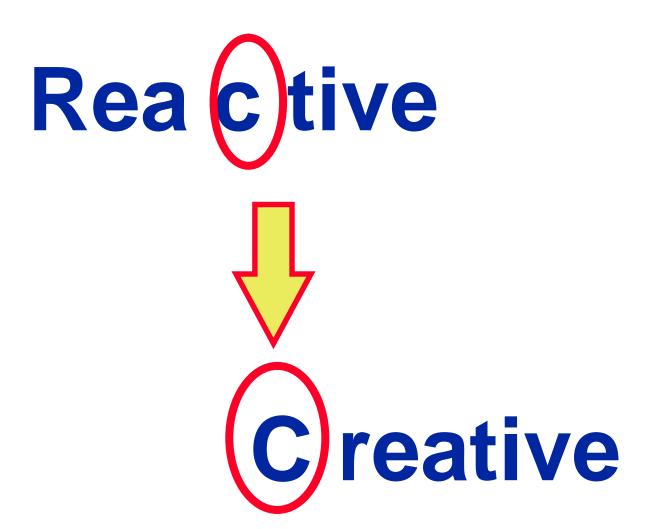
### Levels of thinking and doing

- Think Globally;
- Ally Globally;
- Act Locally and Globally
- Transform Globally

### Where should our



be?



#@!?, #@!?, #@!?, #@!?, #@!?, #@!?,

## Problem Multipliers vs Solution Multipliers







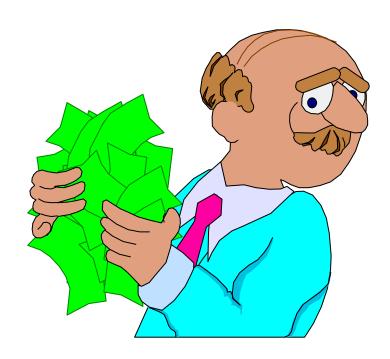




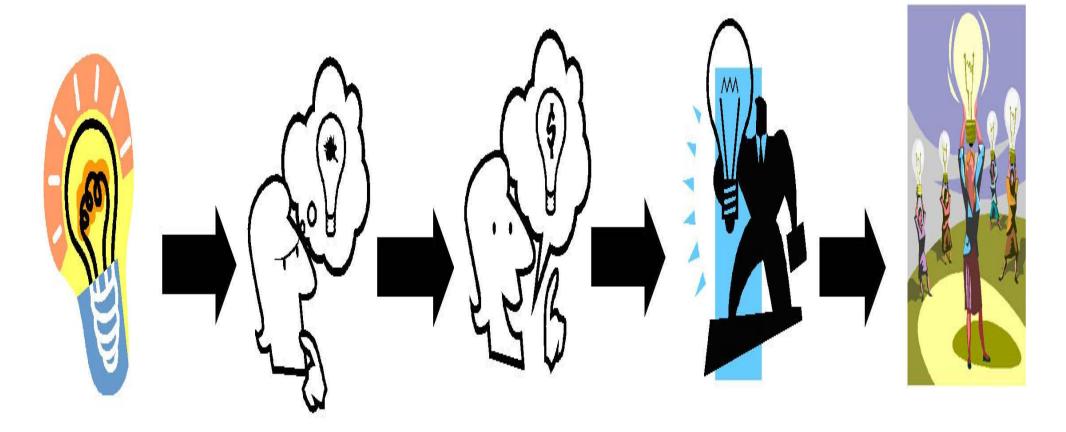




#### From the Tragedy of the Commons...



To the Treasury of the Commons.



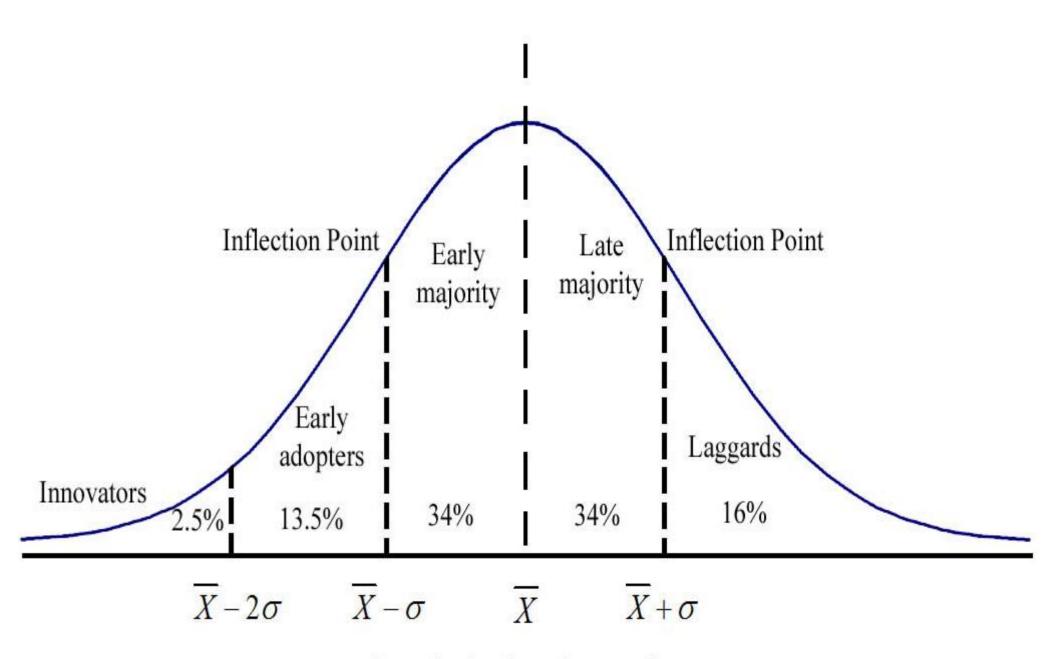
Innovation

Change agent

Innovator

Opinion leader

Rest of the group, organisation or community



Time of Adoption of Innovations

If you don't want to do something, you can always find an excuse.

If you do want to do something, you can always find a way.

-Old Polish Proverb

#### IT'S AMAZING WHAT PEOPLE CAN ACCOMPLISH WHEN THEY WORK TOGETHER.



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# Sustainable Development is a Journey

..... not a Destination!!







