Baltic University Program
Regional university network

Central aim of the Baltic University Program is to distribute knowledge to entire region so as to achieve a common understanding of the nature and dimensions of the challenge we are facing.

Sustainable Baltic Region

one of the first courses

developed by Baltic University Program *(Uppsala University, 1997).*

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Krosno
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Brno
Dnipropetrovsk
Zvolen
Kosice
Ivano-Frankovsk
Nitra
Bratislava
Kherson

мітками!

Lecture 1.

The Road towards Sustainability.

A historical perspective

Sustainable Baltic Region course.

Baltic University Program

The Road towards Sustainability

1. Islands – global lessons from micro-worlds
2. The environmental dilemma – a history of scientists and social constructions
3. Baltic region eco-strategies
4. Paradigms of sustainability

Literature

1. **The Road towards Sustainability.** A historical perspective. *S.Sorling* (Ed.) – Uppsala: BUP, 1997. – 48 p.
2. **Программа действий.** Повестка дня на 21 век и другие документы конференции в Рио-де-Жанейро в популярном изложении / Сост.: М. Китинг. – Женева: Центр «За наше общее будущее», 1993. – 70 с.
3. **Дейлі Г.** Поза зростанням. Економічна теорія сталого розвитку. – К.: Інтелсфера, 2002. – 312 с.
4. **Гор А.** Земля у рівновазі. Екологія і людський дух. – К.: Інтелсфера, 2001.

1. Islands – global lessons from micro-worlds

Case 1. Easter Island (1)

- 1722 - Dutch admiral ***Roggeveen***
  - a few thousand people;
  - ***miserable*** state;
  - constant wars among themselves;
- 50 years later – ***James Cook***
  - fast diminishing number of inhabitants;
- ***But:*** the Polynesian marvels – almost 7-meter stone sculptures (600) are well known in the world!!!

How it could happened?!

How these wretched creatures have produced such marvels?!

Clive Pointing. A Green History of the World. – London: Penguin, 1991

Case 1. Easter Island (3)

Pointing, 1991

- First Polynesians – 20-30 persons;
- Uncomplicated island ecosystem

  (30 types of plants, a couple of kinds of lizards, plus some fish);
- The humans brought a species of hen, sweet potato;
- Community grew to 7 thousand people.

Case 1. Easter Island (4)

Pointing, 1991

- Community grew to 7 thousand people;
- First clans were formed;
- People spent their energy on arts, ceremonies and mnemothechniqs;
- Cult of birds;
- Worshipping ancestors (*поклоніння предкам*);
- Cult sites, sculpture;
- Wooden roads;
- Ceremonies competition;
- Intensive forest cutting.

Case 1. Easter Island (5)

Pointing, 1991

- Intensive forest cutting resulted in:
  - no fishing (no boats),
  - soil erosion,
  - no harvest and food;
- in a **100** years population decreased by 50 %;
- The speed of these changes prove several hundreds sculptures which are still lying around near quarry in different stages of completion.

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The decisive factor was Self-destructive behavior

Case 2. Hawaii (1)

Alfred Crosby. Ecological imperialism, 1986

- 1778 – James Cook arrived in Hawaii:
  - Strongly isolated island:
    - 96% of plants live only there;
    - The only generic (widespread) mammal is a species of bat;
  - Flourishing Polynesians community
- But they also went through a disaster;
- The decisive factor was **diseases**, caused by changing lifestyle:
  - leaving traditional areas;
  - cutting sandal trees, which were used as currency in trade.

Case 2. Hawaii (2)

A.Crosby, 1994

- Epidemic disease (lack of immunological protection);
- Population decline in order of **75-95 %;**
- Europeans brought disease to a virgin soils.

Case 3. **Cape Verde, New Zealand**

Lindskog & Delaite, 1996

- Absence of local population;
- Vast and luscious forests;
- Abundance of streams;

Portuguese brought domesticated animals (goats !)

Green islands became barren, stripped and droughts.

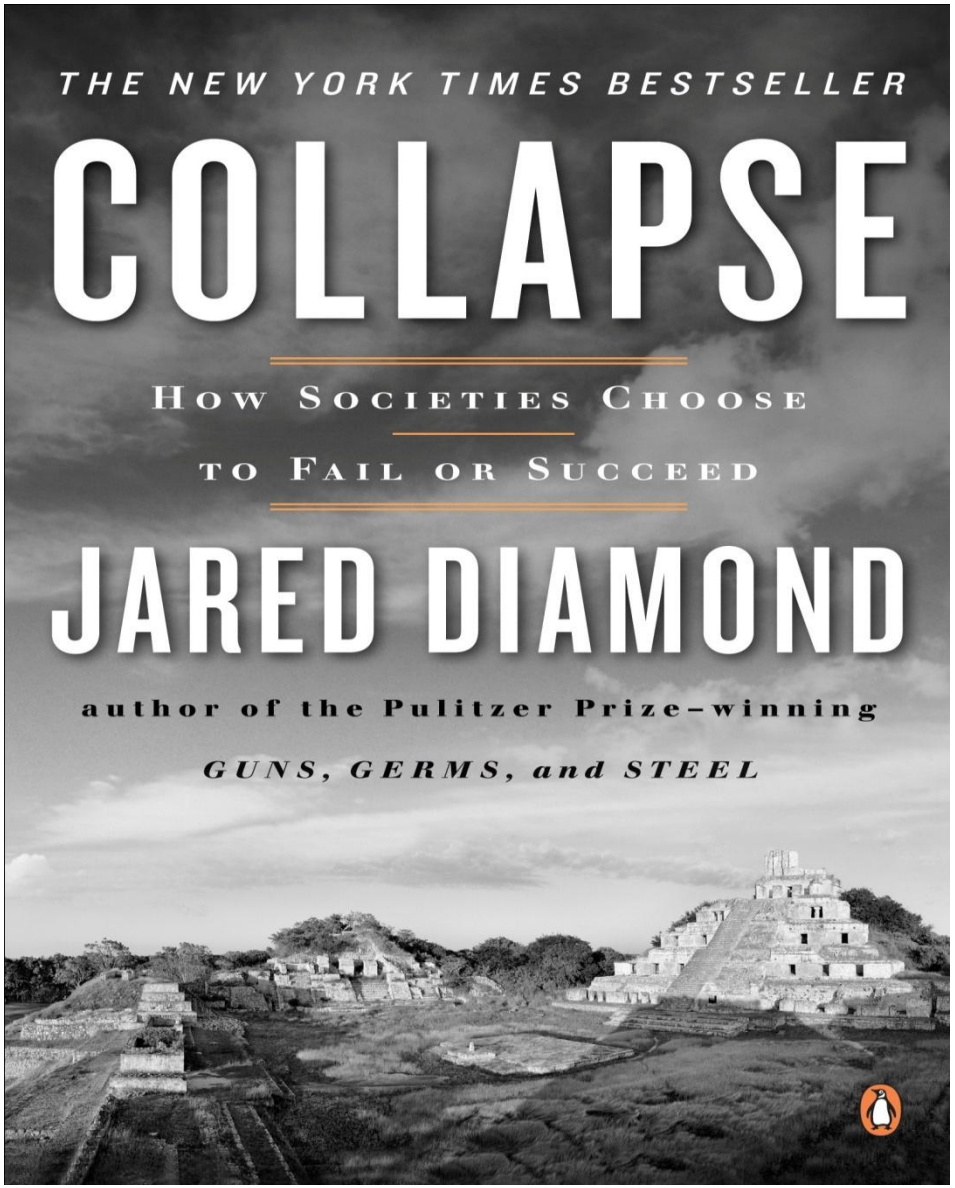
(*безплідні, голі і засушливі*)

Lessons from Micro-World

- Several stories about relationships between man and his changed environment;
- Dismal environmental encounters between Europeans and biota of ocean islands;
- XVIII-XIX centuries - an early conservation movement;
- Investigating connection between environmental decay (especially deforestation) and climate change;
- Global role of tropical ecosystems;
- Place of human greed and selfishness (жадібність та егоїзм).

Exclusions in Dismal Island Experience

- Successful colonization of Iceland by Norsemen;
- Aboriginals of North America **managed to resist** European colonizations;
- Local population of Greenland was ultimately better suited to climate circumstances then Norsemen.



TED program

- http://www.youtube.com/watch?v=IESYMFtLIis

2. The environmental dilemma – a history of scientists and social constructions

Early societies and environmental impact

- Environmental problems have always been a part of human condition:
  - Hunting;
  - Agriculture with irrigation;
  - Gathering;
  - Landscape intrusion;
  - Handicraft (ремесло).

What is an environmental problem?

A ***tricky*** concept

- In all places in all times we face with human impacts;
- In yesterday conditions today's problems don't look as a problem.

Establishment of Environmental Problems

- Several levels;
- The **physical** level - where detrimental phenomena occur and can be recorded or measured;
- The description of environmental change as a "problem" is an interpretation by **contemporary** scientists (environmentalists, historians, archeologists).

The role of science and scientists

On **intellectual level** problem is discovered and **depicted**, but **not demanded** by society, for instance:

- Bad quality of air in London (*Evelyn, 1661*);
- Mechanism of soil erosion in Alps (*Fabre*,);
- Nature of river floods (*G.Marsh, 1864*);
- Principles of eutrophication (*E.Naumann*, *early XX c);*
- Large-scale acidification *(S.Oden, 1967).*

It is not enough to create knowledge!

"**Political infrastructure**" was needed

- Construction of **environmental agenda** is a social process;
- It takes social interests, social movements, concerned citizens and alarming scientists;
- **S.Oden** was heard because in the 1960s an environmental agenda **had been** formed due to **Rachel Carson** ('*Silent Spring*'), Georg Borgstrom *et.al.*

Importance of environmental agenda: Examples of environmental science stories

- **H.Ahlmann** discovered melting glaciers in Arctic *(Sweden, first half of XX century);*
- **S. Arrhenius** described mechanism of global warming, linked rising annual temperature to human activities. Greenhouse theory *(Sweden, 1896);*
- **G.Callendar** set links between the burning of fossil fuels and rising annual temperature *(Great Britain, 1938);*
- But they did not see this phenomena as an environmental problem. Why?
- Because **society did not recognize it. It was not 'hot' question.**

The environmental paradigm

- Arose when local, scattered and isolated in time and place problems obtained such single unifying characteristic as:

'they were problems of man's relation with his environment'.

- How long did it take? In case of London it took 700 years!!!
- The environmental paradigm was a powerful interpretative tool that was now put into hands and minds of journalists, politicians, scientists, citizens.

The environmental agenda as a social process

- The environmental problematique is maturing as a social phenomena;
- It entangled in more sectors of society;
- Environmental issues become a part of everyday life of virtually every citizen;
- Institutions are built;
- Legislation is being reinforced;
- Policy is widening;
- Scientist could serve a discoverer, a teacher, an advisor, a responsible intellectual.

4. Paradigms of sustainability

Essence of Sustainable Development

"Sustainable Development meets the needs of present generation without compromising the ability of future generations to meet their needs".

(Brundtland Report)

Sustainable Development involves

- Economic efficiency;
- Environmental integrity;
- Social justice.

Subsystems (pillars) **of sustainability:**

Biological, economic, and social

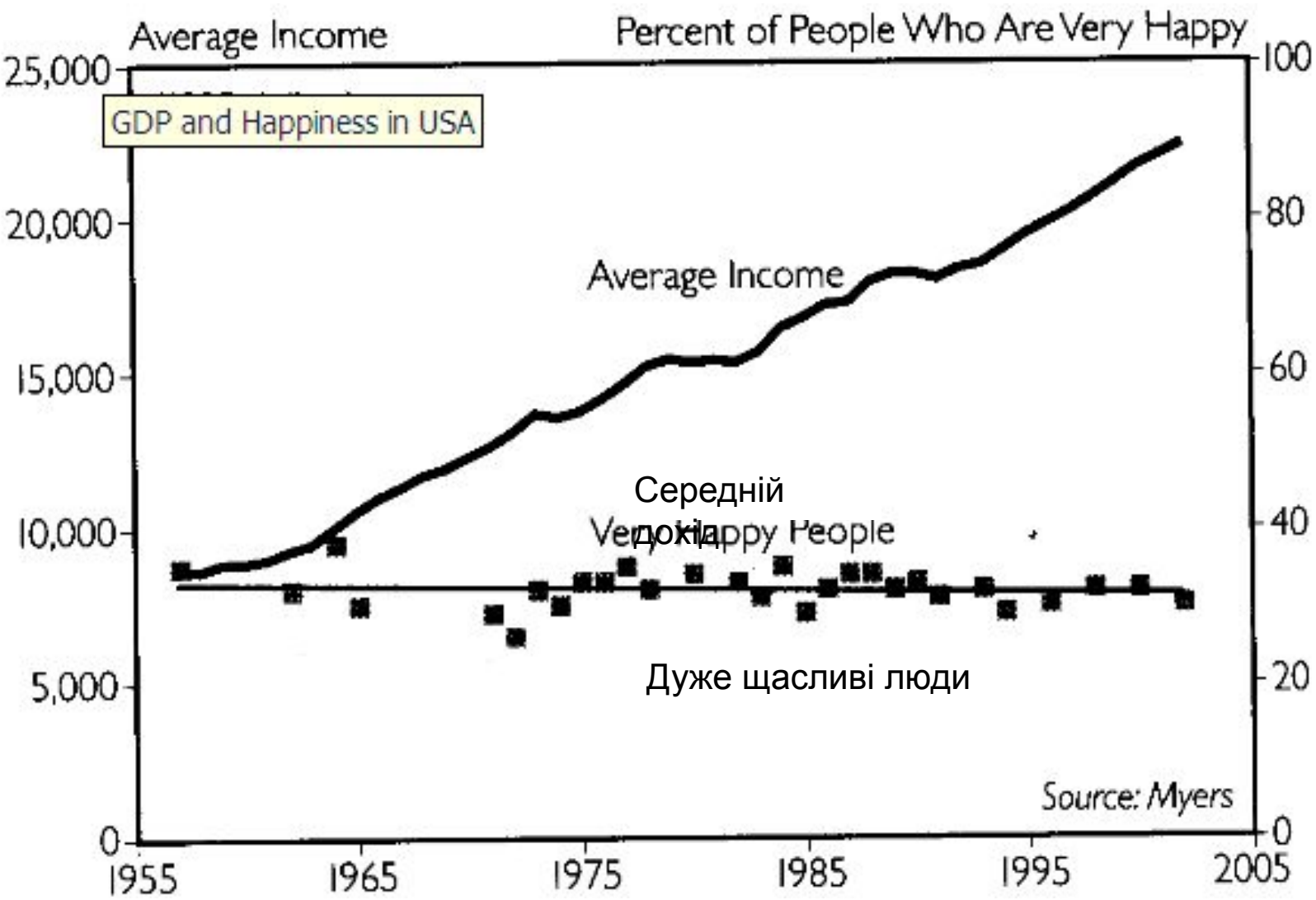
Sustainability is a ***relationship*** between dynamic human economic systems and dynamic but slower ecological systems, in which:

- Human life can develop indefinitely;
- Human individuals can flourish;
- Human culture can develop and
- Effects of human activities remain within bounds so as not to destroy the diversity, complexity and functioning of the ecological life-support system.

Robert Costanza (1992)

Середній дохід

Відсоток дуже щасливих людей



A safe operating space for humanity

Identifying and quantifying planetary boundaries that must not be transgressed could help prevent human activities from causing unacceptable environmental change, argue **Johan Rockström** and colleagues.

SUMMARY

- New approach proposed for defining preconditions for human development
- Crossing certain biophysical thresholds could have disastrous consequences for humanity
- Three of nine interlinked planetary boundaries have already been overstepped

Although Earth has undergone many periods of significant environmental change, the planet's environment has been unusually stable for the past 10,000 years[1–3]. This period of stability — known to geologists as the Holocene — has seen human civilizations arise, develop and thrive. Such stability may now be under threat. Since the Industrial Revolution, a new era has arisen, the Anthropocene[4], in which human actions have become the main driver of global environmental change[5]. This could see human activities push the Earth system outside the stable environmental state of the Holocene, with consequences that are detrimental or even catastrophic for large parts of the world.

During the Holocene, environmental change occurred naturally and Earth's regulatory capacity maintained the conditions that enabled human development. Regular temperatures, freshwater availability and biogeochemical flows all stayed within a relatively narrow range. Now, largely because of a rapidly growing reliance on fossil fuels and industrialized forms of agriculture, human activities have reached a level that could damage the systems that keep Earth in the desirable Holocene state. The result could be irreversible and, in some cases, abrupt environmental change, leading to a state less conducive to human development[4]. Without pressure from humans, the Holocene is expected to continue for at least several thousands of years'.

Planetary boundaries

To meet the challenge of maintaining the Holocene state, we propose a framework based on 'planetary boundaries'. These boundaries define the safe operating space for humanity with respect to the Earth system and are associated with the planet's biophysical subsystems or processes. Although Earth's complex systems sometimes respond smoothly to changing pressures, it seems that this will prove to be the exception rather than the rule. Many subsystems of Earth react in a nonlinear, often abrupt, way, and are particularly sensitive around threshold levels of certain key variables. If these thresholds are crossed, then important subsystems, such as a monsoon system, could shift into a new state, often with deleterious or potentially even disastrous consequences for humans[4,5].

Most of these thresholds can be defined by a critical value for one or more control variables, such as carbon dioxide concentration. Not all processes or subsystems on Earth have well-defined thresholds, although human actions that undermine the resilience of such processes or subsystems — for example, land and water degradation — can increase the risk that thresholds will also be crossed in other processes, such as the climate system.

We have tried to identify the Earth-system processes and associated thresholds which, if crossed, could generate unacceptable environmental change. We have found nine such processes for which we believe it is necessary to define planetary boundaries: climate change; rate of biodiversity loss (terrestrial and marine); interference with the nitrogen and phosphorus cycles; stratospheric ozone depletion; ocean acidification; global freshwater use; change in land use; chemical pollution; and atmospheric aerosol loading (see Fig. 1 and Table).

In general, planetary boundaries are values for control variables that are either at a 'safe' distance from thresholds — for processes with evidence of threshold behaviour — or at dangerous levels — for processes without

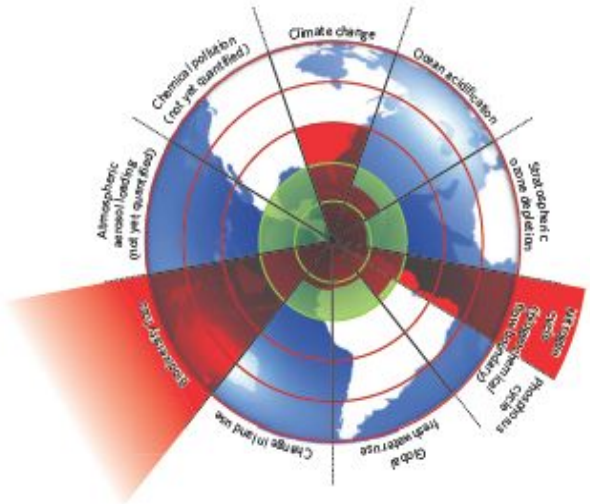


Figure 1| Beyond the boundary. The inner green shading represents the proposed safe operating space for nine planetary systems. The red wedges represent an estimate of the current position for each variable. The boundaries in three systems (rate of biodiversity loss, climate change and human interference with the nitrogen cycle), have already been exceeded.

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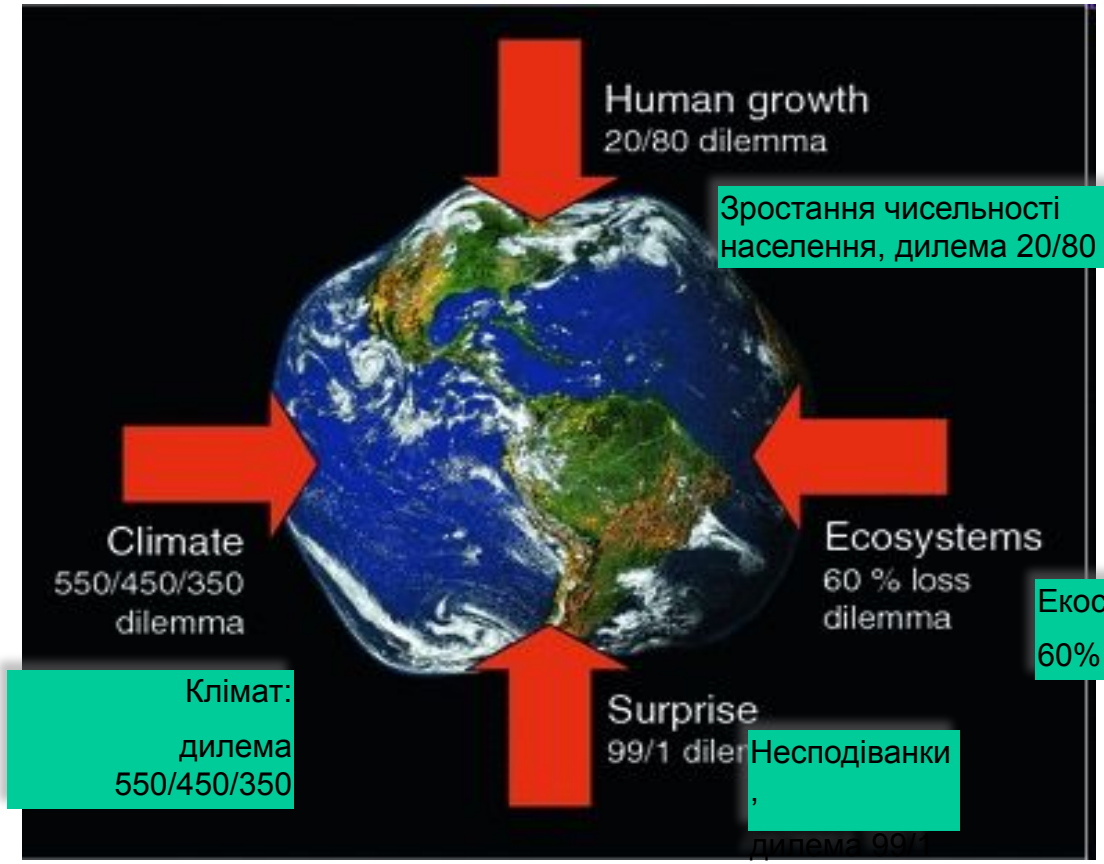
Планетарні межі порушені:

- втрата біорізноманіття;
- зміна клімату;
- нагромадження азоту в природних системах.

The Quadruple Squeeze

(Rockström and Karlberg, 2010)



Зростання чисельності населення, дилема 20/80

Екосистеми:дилема 60% втрати

Клімат: дилема 550/450/350

Несподіванки , дилема 99/1

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