





### Meadows et al.: The Limits to Growth (1972)

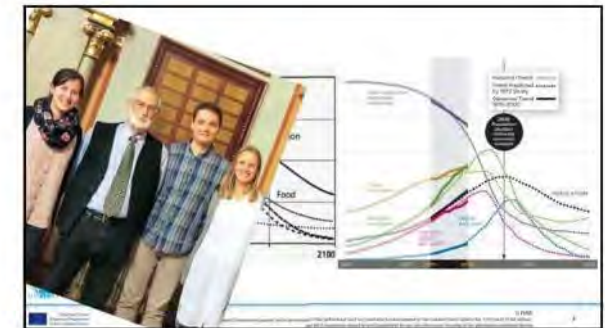
• Aim: to draw the attention of governments and international organisations by focusing on and investigating a threat to humanity.

Research (1900-1970)

- Population
- Industrial
- Food production
- Pollution
- Depletion of natural resources

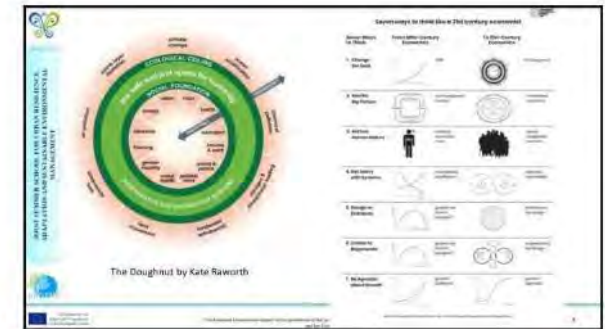
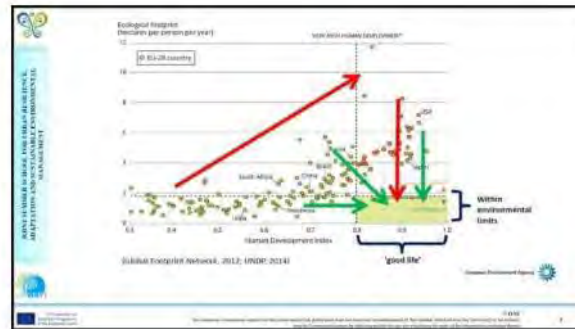
Outcome  
If the current trends in economic growth persist, we will reach the limits to growth by the end of the 21st Century

Recommendation: Zero growth



### Perspectives on growth

- Growth is impossible on the long run due to material limits, leading to collapse pessimists, e.g. Meadows et al.
- Growth and technological advancement go hand in hand, eventually the environmental and social situation will improve Technocrats
- Growth and environmental deterioration is unavoidable, unstoppable, we might as well get the most out of it Opportunists
- Growth is needed to pay for environmental protection Optimists
- Growth is unacceptable, morally wrong, leads to inequality immaterialists, e.g. Schumacher and Daly



### Milestones of Environmental Politics (1)

- Silent Spring by Rachel Carson (1962)
- Foundation of the Club of Rome (1968)
- Appeal from UN Sec.-Gen. U Thant (1969)
- USA: Earth Day, establishment of EPA, Clean Air Act (1970)
- Blue Marble – first Earth picture taken by Apollo 17 (1968)
- „The Limits to Growth“ (MIT, 1972)
- UN Conference on the Human Environment (1972)

### Milestones of Environmental Politics (2)

- UN establishes the „Brundtland Commission“ (1984) which publishes Our Common Future (1987)

Aim:

- To investigate the critical aspects of environmental protection and development, and a realistic proposition to solve the issues
- Recommendation on forms of international cooperation
- Initiation of programmes improving environmental sensitivity and readiness to take action

Results:

- Mapping of environment and development until 2000, while developing a global strategy for the period after that
- Definition of Sustainable Development

### Sustainable Development: „Development that meets the needs of present generations without compromising the ability of future generations to meet their own needs“ - (Our Common Future, 1987)

What is development? What are legitimate needs? How much is enough?

How far into the future? How do we know what those needs are? What does ability consist of? How can it be compromised?

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- UNFCCC - Kyoto Summit (1997)

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- UNFCCC - Kyoto Summit (1997)
- Johannesburg Summit - Rio+10 (2002)
- Rockström et al.: Planetary Boundaries (2009)
- UNFCCC - Copenhagen Summit (2009) – fail ☹

### Millennium Development Goals (2000-2015)

- 1 Eradicate extreme poverty and hunger
- 2 Achieve universal primary education
- 3 Promote gender equality and empower women
- 4 Reduce child mortality
- 5 Improve maternal health
- 6 Combat HIV/AIDS, malaria and other diseases
- 7 Ensure environmental sustainability
- 8 Develop a global partnership for development

### Millennium Development Villages

### Milestones of Environmental Politics (3)

- Rio+20 (2012) – political commitment, „The Future We Want“ document – leading to UN OWG to develop the SDGs (2013)

### The Future We Want: „we commit ourselves to reinvigorating the global partnership for sustainable development that we launched in Rio in 1992. We recognized the need to impart new momentum to our cooperative pursuit of sustainable development. And commit to work together with major groups and other stakeholders such as business, NGOs, universities in addressing the implementation gaps.“

„eradicating poverty is the greatest global challenge facing the world today and an indispensable requirement for sustainable development.“

„we recognize that the development of goals could also be useful for pursuing focused and coherent action on sustainable development.“

### The Future We Want: „we further recognize the importance and utility of a set of sustainable development goals, or SDG's. These goals should address and incorporate, in a balanced way, all three dimensions of sustainable development and their interlinkages. „

„We also recognize that the goals should address and be focused on priority areas for the achievement of sustainable development, being guided by this outcome document, the future we want. Governments should drive implementation, with the active involvement of all relevant stakeholders as appropriate.“

### Milestones of Environmental Politics (3)

- Rio+20 (2012) – political commitment, „The Future We Want” document – leading to UN OWG to develop the SDGs (2013)
- Sendai Framework for Disaster Risk Reduction (March 2015)
- Addis Ababa Action Agenda on Financing for Development (July 2015)
- Paris Climate Summit (2015) - Paris Agreement, a consensus of 196 parties attending it, 174 countries adopted in New York (April 2016)
- “Transforming our world: the 2030 Agenda for Sustainable Development” - SDGs adopted, New York (September 2015)

### Transforming our World

„Enhance the Global Partnership for Sustainable Development, complemented by multi-stakeholder partnerships that mobilize and share knowledge, expertise, technology and financial resources, to support the achievement of the Sustainable Development Goals in all countries...”

„most ambitious effort yet to place goal setting at the center of global governance and policy”

### Transforming our World

„The future of humanity and of our planet lies in our hands... We have mapped the road to sustainable development; it will be for all of us to ensure that the journey is successful and its gains irreversible.”

The journey “will involve Governments as well as parliaments, the UN system and other international institutions, local authorities, indigenous peoples, civil society, business and the private sector, the scientific and academic community – and all people.”

### The SDGs

### The SDGs are ...

- Universal
- Integrated
- Transformational

### Good governance?

(public and private!)

- Accountable
- Transparent
- Collaborative
- Inclusive
- Participatory
- Efficient
- Responsible  
Polluter pays principle?  
Primum non nocere  
– first, to do no harm
- Evidence-based
- Committed

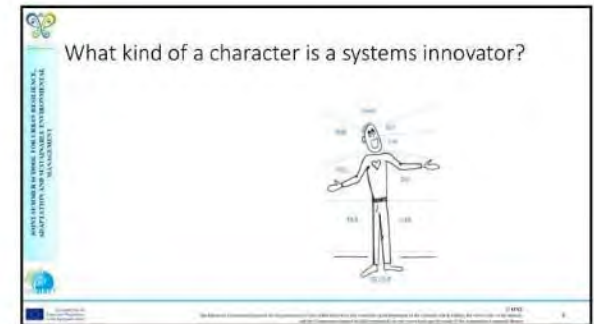
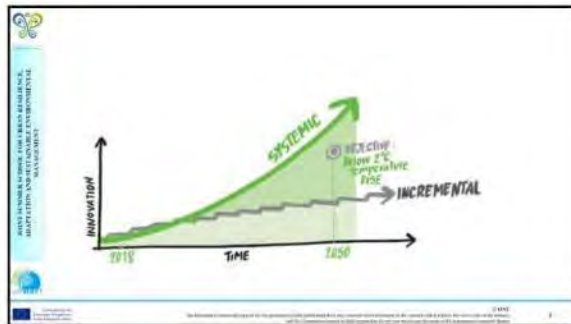
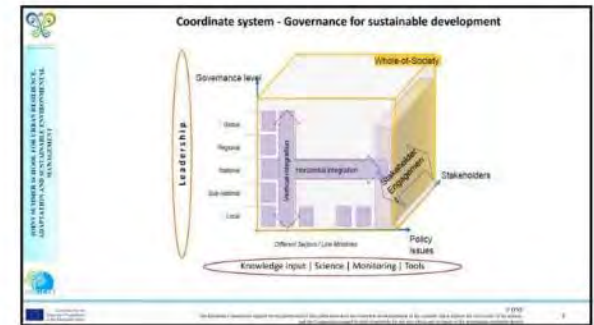
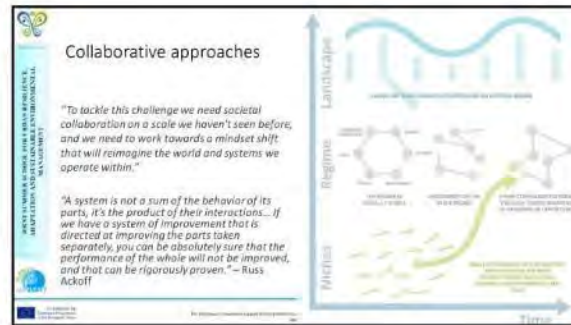
### The border of Haiti and Dominican Republic



### Dynamism and unpredictability in complex systems

SIMPLE	COMPLICATED	COMPLEX
Having a linear cause-effect relationship	Having a non-linear cause-effect relationship	Having a non-linear cause-effect relationship with emergent properties
High predictability	High predictability	High predictability
High predictability	High predictability	High predictability
High predictability	High predictability	High predictability
High predictability	High predictability	High predictability
High predictability	High predictability	High predictability
High predictability	High predictability	High predictability
High predictability	High predictability	High predictability
High predictability	High predictability	High predictability

Level of Complexity	Examples	Implications for hierarchy, control, and expertise	Implications for interventions
Simple	Constructing a village water supply	Clear command chain essential; drilling teams focus on their protocol	Can use a logframe; checklists
Complicated	Linking small scale producers to markets	Knowledge intensive as cause and effect not self-evident	Careful planning, multiple types of expertise, lagframe
Complex	Changing tax incentives to favour small-scale producers	Politicians and battlefield commanders excel here; adaptive management; large pool of diverse expertise	Attempt many experiments; generate a lot of feedback in order to select strategies that work; Failure = learning
Chaotic	Initial response to diseases	Ideal for strong personalities who like to dictate solutions as they can take absolute control	Just act with instinct



“Our experience in studying and teaching systems thinking has led to the admission of a systems thinker as someone who...”

Source: The Systems Thinking Playbook by Linda Booth Sweeney, Dennis L. Meadows.

Exploring Systems and Administration	Forming Challenges	Formulating Solutions	Designing Solutions	Implementing Solutions	Reflecting & Adapting
Systems Thinking	Defining Challenges	Developing Ideas	Testing & Piloting	Reflecting & Adapting	
Knowing Capabilities & Resources	Identifying Opportunities	Evaluating Potential Solutions	Marketing & Mobilizing Others	Monitoring & Learning	
Network Development	Facilitating Collective Creativity	Setting Goals	Collaborating with Others	Showing Persistence	
Transdisciplinary Communication	Shared Visioning	Formulating Strategies	Coordinating Action	Scaling-up	

### Reflecting & Adapting

**Description**

Given emerging conditions, individuals begin to re-examine their “road map” with a clear view of the intended destination. This includes evaluating progress relative and changes in the process and assessing a “what is done” mentality. Individuals also participate voluntarily among others in the collective vision, objectives, strategies and processes of resources and the process of need to adapt their resources or capabilities to resources. Learning involves learning to adapt to an agile and flexible system putting to use a solution without and being open to other.

**Assessment Criteria**

1. Individuals present resources when better beyond their own red when circumstances changed during an intended process or when by their own request.
2. Individuals report about changes in strategies and focus in the face of new demands, showing analysis and/or progressive adaptation.
3. Individuals reveal that their personal feedback strategies in their goals, strategies and objectives when participating in a shared destination, e.g. by encouraging open discussion, learning requests, etc.
4. Individuals present situations in which they able to adapt and flexible manner putting in place strategic solutions and support others to do so.

### The goal of a system innovator

To become more effective at:

- Improving the performance of a system
- Uncovering ‘unintended solutions’, while at the same time...
- Reducing the likelihood of negative ‘unintended consequences’.

“The purpose of systems thinking is to help us to be clear about our assumptions. To surface, make them explicit, test them and improve them, so that over time, we become less and less and less wrong, and the wiser of that, is to become more and more and more effective.”  
-Nate Silver

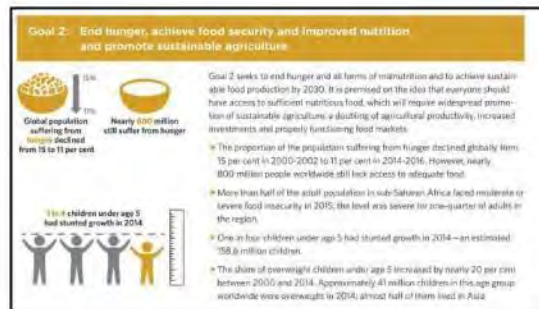
### How do you know you’ve „got it“?

- You’re asking different kinds of questions than you asked before.
- You’re hearing “catchphrases” that raise cautionary flags.
- You’re beginning to detect the key words and feedback loops and leverages in stories you hear or read.
- You’re surfacing mental models.
- You’re recognising the leverage points in stories.

**Thank you!**

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## Seminar - SDG card game



### Goal 4: Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all

Goal 4 focuses on the acquisition of foundational and higher-order skills, greater and more equitable access to technical and vocational education and training and higher education; training throughout life, and the knowledge, skills and values needed to function well and contribute to society.

- In 2013, 59 million children of primary school age were out of school.
- Surveys from 63 low- and middle-income countries between 2008 and 2012 show that children from the poorest 20 per cent of households are more than four times as likely to be out of school as their richest peers.
- Data from 38 countries in developed regions show that, in the majority of these countries, 75 per cent or more of young people had at least minimum proficiency in reading and/or mathematics; the same was true for only 5 of the 22 developing countries with data.
- In 2013, there were still 757 million adults (aged 15 and over) unable to read and write, of whom two-thirds were women.

### Goal 5: Achieve gender equality and empower all women and girls

Goal 5 aims to empower women and girls to reach their full potential, which requires eliminating all forms of discrimination and violence against them, including harmful practices. It seeks to ensure that they have every opportunity for sexual and reproductive health and reproductive rights, receive due recognition for their unpaid work, have full access to productive resources, and enjoy equal participation with men in political, economic and public life.

- Globally, the proportion of women aged 20 to 24 who reported that they were married before their eighteenth birthday dropped from 32 per cent around 1990 to 26 per cent around 2015.
- In 30 countries where the practice of female genital mutilation is concentrated, more than a third of girls aged 15 to 19 have undergone the procedure.
- Based on time-use surveys conducted between 2000 and 2014 in 59 countries, women said they spend 19 per cent of their time each day on unpaid labour versus 8 per cent for men.
- The proportion of seats held by women in single or lower houses of parliament rose to 23 per cent in 2016—a rise of 6 percentage points over the last decade.

### Goal 6: Ensure availability and sustainable management of water and sanitation for all

Goal 6 goes beyond drinking water, sanitation and hygiene to a broader theme: the quality and sustainability of water resources. Achieving the Goal, which is central to the survival of people and the planet, means expanding international co-operation and gaining the support of local communities in improving water and sanitation management.

- 6.6 billion still use unimproved water services.
- 2.4 billion are without improved sanitation.
- 2 billion households affected by water stress.
- Integrated Water Resources Management plans in every region of the world.

By 2030, 6.6 billion people, or 91 per cent of the global population, used an improved drinking water source, compared with 62 per cent in 2000. However, in 2015 an estimated 643 million people were still using unimproved sources or surface water.

Between 2000 and 2015, the proportion of the global population using improved sanitation increased from 59 per cent to 68 per cent. However, 2.4 billion were left behind. Among them were 946 million people without any facilities or all who continue to use open defecation.

Water stress affects more than 2 billion people around the globe, a figure that is projected to rise.

Integrated Water Resources Management plans are under way in every region of the world.

### Goal 7: Ensure access to affordable, reliable, sustainable and modern energy for all

Goal 7 aims to promote broader energy access and increased use of renewable energy, including through enhanced international cooperation and expanded infrastructure and technology for clean energy.

- 4 billion people lacked access to electricity in 2012.
- The proportion of the global population with access to electricity increased steadily from 79 per cent in 2000 to 85 per cent in 2012. Despite these improvements, 11 billion people were still without the essential service in 2012.
- In 2014, some 3 billion people, over 40 per cent of the world's population, relied on polluting and unhealthy fuels for cooking.
- Modern renewables grew rapidly, at a rate of 4 per cent a year between 2010 and 2012.
- Global energy intensity improved by 1.3 per cent a year from 2000 to 2012. About 68 per cent of the energy savings between 2010 and 2012 came from developing regions, with Eastern Asia as the largest contributor.

### Goal 8: Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all

Continued, inclusive and sustainable economic growth is a prerequisite for global prosperity. Goal 8 aims to provide opportunities for full and productive employment and decent work for all while maintaining forest labour, human trafficking and child labour.

- The average annual growth rate of real gross domestic product (GDP) per capita in the least developed countries (LDCs) declined from 4.7 per cent over the period 2005-2009 to 2.6 per cent in 2010-2014. This was less than the target rate of 7 per cent per year.
- While labour productivity increased in the developing region from 2005 to 2015, the value for developed regions was 691 more than twice that of any developing region, and around 20 times greater than the values for sub-Saharan Africa and Southern Asia.
- In 2015, the unemployment rate for women was 8.7 per cent versus 5.8 per cent for men. Gender disparities were most striking in Western Asia and Northern Africa, where the unemployment rate of women was more than twice that of men.
- While the share of adults with bank accounts rose by 20 per cent in five years, some 2 billion people still lack this important financial service.

### Goal 9: Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation

Goal 9 focuses on the promotion of infrastructure development, industrialization and innovation. This can be accomplished through enhanced international and domestic financial, technological and technical support, research and innovation, and increased access to information and communication technology.

- In 2015, manufacturing value added per capita was less than 100 US dollars a year in the LDCs versus nearly 3,000 US dollars in developed regions.
- Globally, energy efficiency and cleaner fuels and technologies reduced carbon dioxide (CO<sub>2</sub>) emissions per unit of value added by 13 per cent from 2000 to 2015.
- In 2013, global investment in research and development (R&D) stood at 1.7 trillion US dollars (equivalent to over 1 per cent of GDP), up from 752 billion US dollars in 2000. Developed regions dedicated almost 2.4 per cent of their GDP to R&D in 2013, while the average for LDCs and landlocked developing countries was less than 0.3 per cent.
- Third-generation (3G) mobile broadband covered 69 per cent of the urban population but only 29 per cent of the rural population in 2015.

### Goal 10: Reduce inequality within and among countries

Goal 10 calls for reducing inequalities in income, as well as those based on sex, age, disability, race, class, ethnicity, religion and opportunity—both within and among countries. It also aims to ensure safe, orderly and regular migration and addresses issues related to representation of developing countries in global decision-making and development assistance.

- In 56 out of 94 countries with data for the period 2007-2013, the per capita income of the poorest 40 per cent of households grew more rapidly than the national average.
- The share of imports from the least developed and developing countries entering developed countries duty-free increased between 2000 to 2014, from 70 to 84 per cent and from 63 to 79 per cent, respectively.
- The cost of sending money across international borders averaged 7.5 per cent of the amount remitted in 2015, more than double the target rate of 3 per cent.

### Goal 11: Make cities and human settlements inclusive, safe, resilient and sustainable

Goal 11 aims to renew and plan cities and other human settlements in a way that fosters community cohesion and personal security while stimulating innovation and employment.

- In 2014, 880 million people lived in urban slums, or 30 per cent of the global urban population, compared to 39 per cent in 2000.
- In many burgeoning cities around the world, populations are moving outward, far beyond administrative boundaries.
- In 2014, about half the urban population globally was exposed to air pollution levels at least 2.5 times above the standard of safety set by the World Health Organization.
- As of 2015, 142 countries were developing national-level urban policies; of these, 82 countries were already in the process of implementation and 21 had reached the monitoring and evaluation stage.

### Goal 12: Ensure sustainable consumption and production patterns

Goal 12 aims to promote sustainable consumption and production patterns through measures such as specific policies and international agreements on the management of materials that are toxic to the environment.

- In 2000, the material footprint per unit of GDP (amount of primary materials used) of developed regions stood at 23.6 kilograms per unit of GDP, compared with 14.5 kilograms per unit of GDP in developing regions.
- That same year, domestic material consumption per capita in developed regions was 72 per cent higher than in developing regions.
- With six exceptions, all Member States of the United Nations are party to at least one of the conventions (Basel, Rotterdam or Stockholm) dedicated to the management of hazardous wastes and other chemicals.



### Goal 13: Take urgent action to combat climate change and its impacts

Climate change presents the single biggest threat to development, and its widespread, unprecedented effects disproportionately burden the poorest and the most vulnerable. Urgent action is needed not only to combat climate change and its impacts, but also to build resilience in responding to climate-related hazards and natural disasters.

**2015 Paris Climate Agreement**

An average of 83,000 people died and 211 million were affected each year as a result of natural disasters occurring from 2000 to 2013.

In 2015, only 63 countries reportedly had legislative and/or regulatory provisions in place for managing disaster risk.

### Goal 14: Conserve and sustainably use the oceans, seas and marine resources for sustainable development

This Goal seeks to promote the conservation and sustainable use of marine and coastal ecosystems, prevent marine pollution and increase the economic benefits to small island developing States and LDCs from the sustainable use of marine resources.

Marine resources are particularly important for people living in coastal communities, who represented 37 per cent of the world's population in 2010.

The proportion of global marine fish stocks within biologically sustainable levels declined from 90 per cent in 1974 to 69 per cent in 2013.

In 2014, 8.4 per cent of the marine environment under national jurisdiction (up to 200 nautical miles from shores) was under protection. From 2000 to 2016, the share of marine key biodiversity areas that were completely covered by protected areas increased from 15 per cent to 79 per cent.

The five large marine ecosystems most at risk from coastal eutrophication are the Bay of Bengal, East China Sea, Gulf of Mexico, North Brazil Shelf and South China Sea—areas that provided ecosystem services for coastal populations totaling 781 million in 2010.

### Goal 15: Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss

Goal 15 focuses on managing forests sustainably, restoring degraded lands and halting biodiversity loss. All of these efforts in combination will help ensure that freshwater resources are preserved for those that depend directly on forests and other ecosystems, that biodiversity will flourish, and that the benefits of those natural resources will be enjoyed for generations to come.

Global net loss in forest area declined from 23 million hectares per year in the 1990s to 3.3 million hectares per year during the period 2010-2015.

The percentage of global terrestrial, inland freshwater and mountain key biodiversity areas covered by protected areas increased from 16.5 per cent to 33.8 per cent, 33.6 per cent to 16.6 per cent and 18.1 per cent to 20.1 per cent, respectively, from 2010 to 2016.

As of 2015, over 23,000 species of plants, fungi and animals were known to face a high probability of extinction. Human activities are causing species extinctions at rates three orders of magnitude higher than those normal throughout the Earth's history.

Between 1990 and 2010, 7800 species of vertebrates and plants have been declared as locally extinct, affecting 378 countries.

### Goal 16: Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels

Goal 16 envisages peaceful and inclusive societies based on respect for human rights, the rule of law, good governance at all levels, and transparent, effective and accountable institutions. Many countries still face protracted violence and armed conflict, and far too many people are poorly supported by weak institutions and lack access to justice, information and other fundamental freedoms.

Between 2008 and 2014, the femicide rate in developing countries was twice that of developed countries.

At the peak in 2011, 34 per cent of the victims of human trafficking at the global level were children, up from 13 per cent in 2004.

Globally, 30 per cent of people held in detention over the period 2012-2015 had not been sentenced.

The births of more than one in four children under age 5 worldwide go unrecorded. In the LDCs, only in two children have not been registered by their fifth birthdays.

Proportion of child victims of human trafficking worldwide

The 2 children have not been registered by their fifth birthdays in LDCs

### Goal 17: Strengthen the means of implementation and revitalize the Global Partnership for Sustainable Development

The 2030 Agenda requires a revitalized and enhanced global partnership that mobilizes all available resources from Governments, civil society, the private sector, the United Nations system and other actors. Increasing support to developing countries, in particular LDCs, landlocked developing countries and small island developing States is fundamental to equitable progress for all.

Official development assistance totalled 131.6 billion US dollars in 2015, which was 6.9 per cent higher in real terms than in 2014 and represents the highest level ever reached.

The debt service to export ratio fell significantly over the period 2009-2012, dropping from 11.7 in 2009 to under 2.7 in 2012.

In 2015, fixed-broadband internet penetration reached 29 per cent in developed regions, but only 31 per cent in developing regions and 0.6 per cent in LDCs.

Although the share of LDC merchandise exports in total exports nearly doubled from 2005 to 2014, it still represented only a small fraction of global exports in 2014, at 1.1 per cent.

Halfway per cent of all countries and 18 per cent of developing countries conducted population and housing censuses over the period 2006-2015, a key source of essential data.

ODA totalled 131.6 billion US dollars in 2015, an increase of 6.9 per cent in real terms from 2014

90 per cent of all countries conducted population and housing censuses over the period 2006-2015

1 NO POVERTY  
2 ZERO HUNGER  
3 GOOD HEALTH AND WELL-BEING  
4 QUALITY EDUCATION  
5 GENDER EQUALITY  
6 CLEAN WATER AND SANITATION  
7 AFFORDABLE AND CLEAN ENERGY  
8 DECENT WORK AND ECONOMIC GROWTH  
9 INDUSTRY, INNOVATION AND INFRASTRUCTURE  
10 REDUCED INEQUALITIES  
11 SUSTAINABLE CITIES AND COMMUNITIES  
12 RESPONSIBLE CONSUMPTION AND PRODUCTION  
13 CLIMATE ACTION  
14 LIFE BELOW WATER  
15 LIFE ON LAND  
16 PEACE, JUSTICE AND STRONG INSTITUTIONS  
17 PARTNERSHIPS FOR THE GOALS

SUSTAINABLE DEVELOPMENT GOALS

### Ecological footprint: hectares per person per year

World Ecological Footprint, 2012, UNEP, 2014

World Environmental Limits

Good life

### Thank you!

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## Lecture – Urban environment (general understanding) and urban megatrends

**ХОТ СУУРИН ГАЗРЫН ХҮРЭЭЛЭН БҮЙ ОРЧИН**  
 Үндэстний танилцуулга: Монгол Улсын Их Сургууль  
 • ONE төслийн хэлтэсүүд  
 • URGENT төслийн үүрэгтний зохиурагч  
 Хэргийн төмөр замын хуримт: Хүн амын тэнцвэрт бэлтгэл хот суурин газрын хүрээлэн буй орны талаарх ерэнхий ойлголт

• Хот, хотжилт, хотын өсөлт гэж юу вэ?  
 • Хот яагаад чухал вэ?  
 • Хотын сөрөг үр дагавар  
 • Хотын хөгжлийн талаарх дэлхийн үзэл баримтлал  
 • Олон төвт ба ганц төвт хот  
 • Сайн туршлага

**Хот гэж юу вэ?**  
 Хот нь хүн олноор хурин цугларч, барилга байшин гэгддэг суурьшиж тэмцэж амьдардаг хотын суурин газар юм.  
 Хотжилт гэдэг нь хот, суурин газар болон түүнийг хүрээлэн гадар нутгийн талыг, хотжил юм. Эзл нь тухайн улсын эзэм дэлхийн ийн хүн амын хэдэн хувь нь тухайн хотжил амьдарч байгааг хэлдэг.  
 Хотын өсөлт гэдэг нь хотын хүн амын өсөлтийг урьшиж юм.

**Хот яагаад чухал вэ?**  
 Дэлхийн хотжилт 2000 оноос 2012 он хүртэл 46% өсч, 2050 онд хот суурин газар өсөж байгаа.

1,564,116 км²	0.3%
4,704 км²	3,238,479
46%	1,491,375
36,897,640 км.төр	66%
24,506,517 км.төр	

**Хотжилт болон хотжил**  
 Хотжилт нь хот суурин газрын өсөлтөөс ялгаатай. Хотжилт нь хот суурин газрын өсөлтөөс ялгаатай. Хотжилт нь хот суурин газрын өсөлтөөс ялгаатай.

**УХААЛАГ ХОТ - SMART CITY 2007**  
 Уушгаа хот нь өрсөлдөх чадвар, амьдралын чадварыг дэмжүүлэх, төсвийн үр ашгийг ахиулах, эдийн засгийн нэгтгэлийг бий болгох замаар, өрсөлдөх чадварыг хөгжүүлэх замаар, өрсөлдөх чадварыг хөгжүүлэх замаар, өрсөлдөх чадварыг хөгжүүлэх замаар.

**УХААЛАГ ХОТ - SMART CITY**  
 Уушгаа хот нь өрсөлдөх чадвар, амьдралын чадварыг дэмжүүлэх, төсвийн үр ашгийг ахиулах, эдийн засгийн нэгтгэлийг бий болгох замаар, өрсөлдөх чадварыг хөгжүүлэх замаар, өрсөлдөх чадварыг хөгжүүлэх замаар.

**НОГООН ХОТЫН ҮЗЭЛ GREEN URBANISM**  
 Ногоон хот нь өрсөлдөх чадвар, амьдралын чадварыг дэмжүүлэх, төсвийн үр ашгийг ахиулах, эдийн засгийн нэгтгэлийг бий болгох замаар, өрсөлдөх чадварыг хөгжүүлэх замаар, өрсөлдөх чадварыг хөгжүүлэх замаар.

**ХӨВӨН ХОТ - SPONGE CITY 2015**  
 "Хөвөн хот" нь боргоны усны хөвдөл, агваруулах, дахин ашиглах зориулалттай хот юм. Байгалийн экосистемтэй усны гүйцэтгэлийг бэлтгэх замаар, усны гүйцэтгэлийг бэлтгэх замаар, усны гүйцэтгэлийг бэлтгэх замаар.





## Lecture – Urban megatrends and future cities

**Urban megatrends and future cities intro**
  
 Lecturer: Anila Katona, Central European University & PHYSL
   
 Date: 2022.07.16
   
 Contact: anilakatonah@gmail.com
   
 @akatonah



Мэргэжилтнүүд хотуудыг тогтвортой байдлын сорилтуудыг шийдвэрлэх, илүү сайн дизайн хийх замаар шийдэл гаргахад чиглэсэн засаглалын зохих түвшин гэж үздэг. Барилгын дүрэм, худалдан авалт, урамшуулал, нийтийн орон зайн менежмент, нийтийн аж ахуй зэрэг орон нутгийн тогтвортой байдлын санаачилга, үйлчилгээг дэмжихэд шаардлагатай олон гол нөөцийг хотууд хянадаг.

- Affordable housing and quality neighbourhoods
- Parks and public spaces
- Cleaning up polluted areas, brown fields and waste dumps
- Water supplies, quality of public waters
- A robust, efficient, low-cost public transportation system
- Energy, energy efficiency, energy reliability
- Improved air quality, keeping air quality high
- Solid waste management
- Resilience

- Хямд үнэтэй орон сууц, чанартай хороолол
- Парк, олон нийтийн газар
- Бохирдсон талбай, бор талбай, хогийн цуглуудлыг цэвэрлэж байна
- Усан хангамж, усан замын чанар
- Бат бөх, үр ашгтай, хямд өргөгтэй нийтийн тээврийн систем
- Эрчим хүч, эрчим хүчний хэмнэлт, эрчим хүчний найдвартай байдал
- Агаарын чанарыг сайжруулж, агаарын чанарыг өндөр байлгана
- Хатуу хог хаягдлын менежмент
- Уян хатан байдал

**One City Plan**  
 A Plan for Bristol to 2030  
 An 850-page plan for the growth and wellbeing of a city of 450,000 people, including a new urban strategy, a new transport strategy, a new housing strategy, a new green strategy, a new digital strategy, a new culture strategy, a new health strategy, a new education strategy, a new social strategy, a new economic strategy, a new environment strategy, a new infrastructure strategy, a new governance strategy, a new resilience strategy, a new digital strategy, a new culture strategy, a new health strategy, a new education strategy, a new social strategy, a new economic strategy, a new environment strategy, a new infrastructure strategy, a new governance strategy, a new resilience strategy.

- Affordable housing and quality neighbourhoods
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- Агаарын чанарыг сайжруулж, агаарын чанарыг өндөр байлгана
- Хатуу хог хаягдлын менежмент
- Уян хатан байдал

**Fail-safe**  
 Probability of failure low – consequences high  
 Амжилтгүй болох магадлал бага – үр дагавар өндөр

**Safe to fail**  
 Probability partial failure high – consequences lower  
 Жасгачилсан бүтэцгүйгийн магадлал өндөр – үр дагавар нь бага байдаг

	Conventional approaches	Tinkering approaches
Mode	Tailor made materials and tools – one function	Modified, multiple functions, experimentation, anchored in local context
Characteristics	Monolithic gray, costly to repurpose	Hybrid (blue-green, gray) potential to repurpose, integrating built and living systems
Management	Often single subcomponent	Adaptive, multiple components
Capital	Mostly financial and manufactured	More human and social
Path dependence	strong	Weaker
Risk approach	Linear thinking, high predictability, fail-safe	Non-linear, high uncertainty, safe to fail, adaptable
Governance	More top-down	More bottom-up, builds on informality

**The High Line, New York City, 2010**  
The High Line, Нью-Йорк хот, 2010 он

**Cheonggyecheon "freeway", Seoul, 2016**  
Чонгичон "сурды зам", Сеул, 2016 он

### Defining Nature-Based Solutions (NBS)

- European Commission (2016): „deliberate interventions inspired and supported by nature, which are cost-effective, simultaneously provide environmental, social and economic benefits and help build resilience...“
- Европейская комиссия (2016): «Преднамеренные вмешательства, вдохновленные и поддерживаемые природой, которые являются экономически и эффективными, одновременно обеспечивают экологические, социальные и экономические преимущества и помогают повысить устойчивость...»
- IUCN (2016): „actions to protect, sustainably manage and restore natural or modified ecosystems, which address societal challenges [...] while simultaneously providing human well-being and biodiversity benefits“

### The many forms of NBS

1. Building greens (external)
2. Green areas connected to grey infrastructure
3. Parks and (semi)natural urban green areas
4. Allotments and community gardens
5. Green indoor areas
6. Blue areas
7. Green areas for water management
8. Densit areas

### NBS can address various urban sustainability challenges

- Green space, habitats and biodiversity
- Environmental quality
- Economic development
- Urban resilience
- Social cohesion and well-being
- Urban mobility

### Challenges

- Substantial gap between the promise of NBS and uptake;
- Sporadic, isolated initiatives that lack strategic coherence, perspective and drivers to scale-up;
- Governance, finance, contestation of worldviews, interests, discourses, processes, power relations, etc all factor in
- To unlock the potential of NBS, a fundamental shift is required – beyond „business as usual“;
- New and additional governance mechanisms need to be developed – PPPs, hybrid/reflexive governance, etc.
- Большой разрыв между идеей и реализацией
- Много изолированных инициатив, никаким стратегических или масштабных
- Управление, финансы, интересы, политика и т. д.
- Новые подходы к управлению - переходный менеджмент?

### NATURVATION

NATURE-based Urban innovATIOn

- Horizon 2020, 4-year project funded by the European Commission;
- Involving 14 institutions across Europe, urban development, geography, innovation studies and economics;
- Seeks to develop understanding of what NBS can achieve, examine how innovation can be fostered in this domain, and contribute to realizing the potential of NBS for responding to urban sustainability challenges.

### Exploring the Potential for Transformative Pathways

- Identifying technical solutions and governance, business & finance innovation
- Urban Nature Atlas initiatives taking place in 100 European cities
- Evaluation of 54 innovation case studies in 18 cities
- 5 City Partnerships evaluate implementation
- Analysis of the policy, finance and urban development conditions in 6 EU countries
- Develop transformative pathways for urban sustainability

### NBS in Singapore

### Therapeutic Garden in HortPark

"We don't have much space. Therefore, everything we do, with regards to green spaces and our mental health has to do in our own backyard. [...] And the trick now it's to bridge between that benefits of nature and how to make it work in the medical context."  
– Group Director, National Parks Board

### Therapeutic Garden in HortPark – Design Principles

"I've put these design principles into a physical space and we contextualise it to our local residents. So we talk about plants that evoke memories, how colours react with someone with dementia...."  
- Director, National Parks Bureau CIB

### Programming

**ACTIVITIES AVAILABLE**

- Horticultural Therapy
- Horticultural Education
- Horticultural Research
- Horticultural Art
- Horticultural Performance
- Horticultural Storytelling
- Horticultural Writing
- Horticultural Music
- Horticultural Dance
- Horticultural Games
- Horticultural Puzzles
- Horticultural Trivia
- Horticultural Quizzes
- Horticultural Competitions
- Horticultural Exhibitions
- Horticultural Workshops
- Horticultural Seminars
- Horticultural Conferences
- Horticultural Symposia
- Horticultural Roundtables
- Horticultural Panels
- Horticultural Keynotes
- Horticultural Plenaries
- Horticultural Networking
- Horticultural Socials
- Horticultural Dinners
- Horticultural Lunches
- Horticultural Teas
- Horticultural Coffees
- Horticultural Drinks
- Horticultural Snacks
- Horticultural Treats
- Horticultural Desserts
- Horticultural Beverages
- Horticultural Refreshments
- Horticultural Amenities
- Horticultural Facilities
- Horticultural Services
- Horticultural Support
- Horticultural Assistance
- Horticultural Help
- Horticultural Aid
- Horticultural Care
- Horticultural Maintenance
- Horticultural Upkeep
- Horticultural Management
- Horticultural Administration
- Horticultural Operations
- Horticultural Logistics
- Horticultural Finance
- Horticultural HR
- Horticultural IT
- Horticultural Security
- Horticultural Compliance
- Horticultural Risk
- Horticultural Safety
- Horticultural Health
- Horticultural Environment
- Horticultural Sustainability
- Horticultural Resilience
- Horticultural Adaptability
- Horticultural Flexibility
- Horticultural Scalability
- Horticultural Replicability
- Horticultural Transferability
- Horticultural Portability
- Horticultural Mobility
- Horticultural Accessibility
- Horticultural Inclusivity
- Horticultural Diversity
- Horticultural Equity
- Horticultural Justice
- Horticultural Fairness
- Horticultural Transparency
- Horticultural Accountability
- Horticultural Responsibility
- Horticultural Integrity
- Horticultural Honesty
- Horticultural Trustworthiness
- Horticultural Reliability
- Horticultural Consistency
- Horticultural Predictability
- Horticultural Stability
- Horticultural Durability
- Horticultural Longevity
- Horticultural Endurance
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- Horticultural Integrity
- Horticultural Honesty
- Horticultural Trustworthiness
- Horticultural Reliability
- Horticultural Consistency
- Horticultural Predictability
- Horticultural Stability
- Horticultural Durability
- Horticultural Longevity
- Horticultural Endurance

"The aim was to find conclusive medical evidence that horticulture therapy interventions can help with the health of our seniors"  
- Senior Manager, NParks CIB

### Scaling in public parks

BE A VOLUNTEER GUIDE FOR OUR THERAPEUTIC GARDENS

VISIT OUR THERAPEUTIC GARDENS

Refresh & Renew

DESIGN GUIDELINES FOR THERAPEUTIC GARDENS IN SINGAPORE

THERAPEUTIC GARDEN

### Khoo Teck Puat Hospital

"For every square meter of the building, we have three [square meters] of greenery because of vertical and green roof"  
- Former Director, Khoo Teck Puat Hospital

### Khoo Teck Puat Hospital

"Sight, sense, sound - the 3 things that give a healing aspect [...] If patients stay for 2-3 weeks you can start a [horticultural therapy] programme. We have it twice a week for our patients, and these are run by our volunteers here in the rooftop..."  
- Senior Executive, Khoo Teck Puat Hospital

### Kampung Admiralty

"We always desire to have nature. We always desire to have greenery and so on but in the high-density city you can't have the sprawling use of space. So here we have to stack it up."  
- Former Director, Kampung Admiralty

### Kampung Admiralty

"Density doesn't mean giving up anything actually. Whatever you want, we put it in the building. Busy public squares, a great place to eat, apartments, it's in the building [...] Then the gardens [and] really people, kids playing on the swings, old people working out and then gardening upstairs"  
- Founding Director, WDH Architects

### Winnipeg, Canada

#### The Forks

"The city has given us a nod that they're just gonna stay out of it, so as long as we manage it well"  
- CEO, The Forks North Passage Partnership

### Winnipeg, Canada

#### Red River Mutual Trail

What happened is that in 2007 we accidentally became the world's longest frozen skating trail and we got a Guinness record. That suddenly put everything on the radar and people really started to pay attention... – CEO, The Forks North Portage Partnership

"Everyone is smiling. You're on skates and you've made an effort to go outside and participate in something. You might even be commuting to work but you're happy because you're not in a car. It changed the mindset here in every way." – Principal, Scatiff+Miller+Murray

"Raw Almond was an incredible project to be a part of. It gained momentum like lighting a match. A shining beacon, utilizing the river at the hardest time of the year when people don't want to gather." – Co-owner, Raw Almond Restaurant

Change is constant. It's how you self-learn, how you learn from what works and what doesn't. We're pretty willing to make some risks because it often has a payoff, and if it doesn't we kill it real quick, adapt, and we try again... – CEO, The Forks North Portage Partnership

"It's not just a nature-based solution when it's green, it's also a nature-based solution when it's white."

### School gardens of Győr

- "they put the natural world at the students' fingertips" – Vice Dean, Apáczai, 2017
- "Proper care on nature should be practiced. This is the most important new task of school gardens."
- "children should learn that tomatoes are not growing in Tesco" – Principal, Öveges, 2017
- "there are no mistakes in our garden – only experiments" – Teacher, Tulpános, 2017

1. Very siloed, lacking scale-up and institutional capacity.  
Маш тусгаарлагдсан, дэр хүрээ, бэйгүүлэвчин чадавхи дутмаг.

1. Very siloed, lacking scale-up and institutional capacity.
2. NBS is high performance infrastructure & subsystem  
Үүнийг бид өндөр гүйцэтгэлтэй дэд бүтэц гэж үзэх хэрэгтэй. Мөн бид бүх дэд бүтцээрээ ажиллаж байгаа шигээ төлөвлөж, зураг төслийг нь хийх ёстой.

1. Very siloed, lacking scale-up and institutional capacity.
2. NBS is high performance infrastructure & subsystem
3. NBS needs to coexist with traditional hard infrastructure as hybrid systems – smart cities?  
NBS нь эрлийз систем буюу ухаалаг хотуудын хэлбэрээр уламжлалт хатуу дэд бүтэцтэй зэрэгцэн орших шаардлагатай юу?



1. Very siloed, lacking scale-up and institutional capacity.

2. NBS is high performance infrastructure & subsystem

3. NBS needs to coexist with traditional hard infrastructure as hybrid systems

4. Social dimensions: „We shape our cities – then they shape us” – Jan Gehl

Нийгмийн тал нь чухал: "Бид хотуудаа бүрдүүлдэг, дараа нь биднийг бүрдүүлдэг" - Jan Gehl

1. Very siloed, lacking scale-up and institutional capacity.

2. NBS is high performance infrastructure & subsystem

3. NBS needs to coexist with traditional hard infrastructure as hybrid systems

4. Social dimensions: „We shape our cities – then they shape us” – Jan Gehl

5. A great way to connect agendas  
Биологийн төрөл зүйл, уур амьсгалын өөрчлөлт, ойжуулалт, нөхөрлөл зэрэг хэтэлбөрүүдийг хооронд нь холбох гайхалтай арга

6. It's easier to keep what we have, than bring it back.  
Буцааж өгөхөөс өөрт байгаа зүйлээ авч үлдэх нь амар. - хамгаалахын ач холбогдол!

6. It's easier to keep what we have, than bring it back.

7. Evaluating the multiple benefits of NBS through a broader economic logic.

Эрүүл мэндэд үзүүлэх эерэг нөлөө, сэрүүн агаар, шуурганы үс шингээх чадвар, үерийн зохицуулалт гэх мэт эдийн засгийн өргөн хүрээтэй логикоор NBS-ийн олон талын ашиг тусыг үнэлэх шаардлагатай байна.

**Physi**  
Grow your city - the right way

Location: Porto, PT  
Climate: Mediterranean climate  
Average annual precipitation: 1,237mm  
Mean daily daylight hours: 11.3  
Daily mean temperature: 15 °C  
Challenges: heat, air pollution

**Solution vision**

- an intelligent, mixed reality-capable API
- plug-in into mainstream urban planning applications
- a tool that fills the information-decision gap
- demonstrates benefits and convinces customers
- provides first-order estimates of NBS impacts
- suggest service providers a portfolio of NBS

Information-decision Gap

NBS „A”      NBS „B”      NBS „C”

6. It's easier to keep what we have, than bring it back.

7. Evaluating the multiple benefits of NBS through a broader economic logic.

8. In many cases, the business case doesn't exist in isolation from the public benefits.  
Хэрэв засгийн газар ердийн дэд бүтцийг орлож байгааг хууль эзэмшөөрвөл та NBS-ийн бодит бизнесийн загвартай болно.

6. It's easier to keep what we have, than bring it back.

7. Evaluating the multiple benefits of NBS through a broader economic logic.

8. In many cases, the business case doesn't exist in isolation from the public benefits.

9. 60-70% of infrastructure until 2050 is yet to be built

2050 он гэхэд хотын дэд бүтцийн талаас илүү хувь нь баригдаагүй байгаа нь байгалийг нэгтгэх сайхан боломж юм.

6. It's easier to keep what we have, than bring it back.

7. Evaluating the multiple benefits of NBS through a broader economic logic.

8. In many cases, the business case doesn't exist in isolation from the public benefits.

9. 60-70% of infrastructure until 2050 is yet to be built

10. The knowledge available is growing on an extreme speed: Urban Nature Atlas, OPPLA (EU), ThinkNature (ICLEI & IUCN), etc.

Боломжтой мэдлэг гайхалтай хурдацтай өсч байна. Бидэнд Зүүн Европт мэргэжилтнүүд хэрэгтэй байна!

Thank you!

Attila Katona  
attilaakatona@gmail.com  
@akatona







Хөрсний бохирдолоос хүрээлэн буй орчны чанар, хүний эрүүл мэндэд үзүүлж буй сөрөг нөлөөллийг тодорхойлох нь ихээхэн яарвигтай сэдэв юм. Сөрөг нөлөөллийн тооцоолох судалгаанд хэд хэдэн суурь ойлголт тодруулах шаардлагатай. Үүнд:

- 1. Байгалийн дэвсгэр агууламж (Background level)**  
Энэ ойлголтанд байгаль орны хэрэв үүсгэгч чухуулгаас хүний биед дамжин иржигдэхэд бодис, элементийн хэмжээгээ гадна хоол хүнс, ус, газрын бохирдол, тэмдэгт зэрэг бусад эх үүсвэрүүдээс хүний эрүүл мэндэд үзүүлэх эрсдэлтэй ач үзэж (Eisenreich, Auer, 2009).
- 2. Байгалийн агаарын бохирдолын түр дүн**  
Байгалийн бохирдолын агуулганд түр дүн өөрчлөлтүүд үүсдэг. Жишээ нь: Хөрс, байгалийн бохирдолын агуулганд түр дүн өөрчлөлтүүд үүсдэг. Жишээ нь: Хөрс, байгалийн бохирдолын агуулганд түр дүн өөрчлөлтүүд үүсдэг.
- 3. Хөрс, агаарын үйл явц**  
Хөрс нь өөртөө дотоо, өөрөө өөрчлөгддөг бөгөөд байгалийн бохирдолын түр дүн өөрчлөлтүүд үүсдэг. Жишээ нь: Хөрс, байгалийн бохирдолын агуулганд түр дүн өөрчлөлтүүд үүсдэг.
- 4. Bioavailability and Bioaccessibility**  
Биологийн үйл явцын өөрчлөлтүүд үүсдэг. Жишээ нь: Хөрс, байгалийн бохирдолын агуулганд түр дүн өөрчлөлтүүд үүсдэг.
- 5. Bioaccumulation**  
Биологийн үйл явцын өөрчлөлтүүд үүсдэг. Жишээ нь: Хөрс, байгалийн бохирдолын агуулганд түр дүн өөрчлөлтүүд үүсдэг.

**Хөрсний бохирдолын үүсэх эрсдэл нь урт удаан хугацаанд илрэх шинж багатай явагддаг бөгөөд түүний илрэх хэв шинжүүд нь өөр бусад өвчин болон шинж тэмдэгүүдтэй ижил төсөөтэй шинжтэй учир ялгахад хэцүү байдаг.**

Хөрс болон хүрээлэн буй орны бохирдолоос хүний эрүүл мэндийн сөрөг нөлөөллийн шинж тэмдэгүүдэд...

- Талбай өвдөх,
- Дотор эвгүйрэх, боолжис цутгах
- Цэцэгэр өвдөх
- Ханиалгах, уушги гэмтэх
- Ядарч сувахах
- Арьсны гууралт
- Нүд хуурайших

**Урт хугацааны бохирдолын нөлөөлөл**  
хөрс бохирдуулагч бодис, хүнд элемент, эрдсүүд хүний нэвчсэн тохиолдолд удаан хугацаанд задралгүй хуримтлагдан, эд, эрхтэнүүдэд нөлөөлж эхэлдэг. Зарим тохиолдолд энэхүү нөлөөлөл нь гений мэдээлэлд хадгалагдан удамших аюултай талаар судлаачид сануулж байгаа

- Хорт хавдир, цус багасгах
- Мэдрэлийн системийн гэмтэл, салгах (MR 191626)
- Мэдрэлийн бүрчлэлийн саатах - мэдрэлийн адрал
- Эпигенетикийн үйл ажиллагаа өгсгөхөл (Mason et al., 2010)

