

# Sustainable developments for a safe future 1

(Red numbers show the corresponding slides)

Let us first define Sustainability: 2

In ecology, **sustainability** (from *sustain* and *ability*) is the property of biological systems to remain diverse and productive indefinitely. Long-lived and healthy wetlands and forests are examples of sustainable biological systems. In more general terms, sustainability is the endurance of systems and processes. The organizing principle for sustainability is sustainable development, which includes the four interconnected domains: ecology, economics, politics and culture. Sustainability science is the study of sustainable development and environmental science.

Sustainability can also be defined as a socio-ecological process characterized by the pursuit of a common ideal. An ideal is unattainable in a given time/space but endlessly approachable and it is this endless pursuit that forms a sustainable system in the process (ibid). Healthy ecosystems and environments are necessary to the survival of humans and other organisms.

This Venn-diagram shows the interdependence even somehow clearer. 3

Only the area, where all three pillars are coming together, we have sustainability. The UNESCO defined goals for sustainability. I like it very much, because it shows a complete picture, what we have to keep in consideration. 4

These 17 goals, which are defined here, show in my opinion a complete picture on goals, necessary to achieve, to come to a sustainable development of our world.

We can also look from another point of view to this sustainability goals. We have in former presentations already discussed about mega trends and its power for developments within the societies. The owners of the company Haniel are publishing a newspaper (unfortunate only in German language) for employees and customers, called: Able to shape a future for grandchildren (in German: Enkelfähigkeit) 5

I like this very much, because they are focused to shape a future, in which our children can feel comfortable. In their approach, they define mega trends and derive business possibilities out of this. This they take as a basis to develop and change their company. With this approach, they are very well outperforming a lot of companies. It is their pace maker for its change management.

We find a lot of similarities between this mega trend and the UNESCO goals.

We are not seeing the refugees, who we discuss controversy at present time, in the mega-trends. Be aware, these refugees are not a mega trend. These refugees emerge out of temporally violations in different areas of our world. This are the refugees, we can still manage. It will become much worse, if the refugees, emerging out of climate changes and lack of drinking water will appear. They have only the alternative to find a place to live or to die. This people will be very aggressive and out of social boundaries. In our own interests, we should decisive start to do everything, to make the entire world a place, possible to live in.

For making the world a place, possible to live in, we have three principal areas, which are mandatory to fix: 6

1. reducing of greenhouse gas emission to stop global warming
2. To assure the accessibility of drinking water to all people
3. To use extensively recycle circles, to prevent damages for our environment, due to damages caused by waste.

In these three subjects we will dig somewhat deeper in the following presentation. But please have in mind: These three subjects we must fix and we must know how to fix it technically. I doubt that violence, arising from nationalism, ethnic differences and abuse of power, will give us a lot of hurdles and there is the risk, to lose the focus on a necessary sustainable development.

However, we must manage that all together. Globalization, global connectivity and increase of worldwide spreading information and knowledge, should help us, to inform about the needed changes and keeps hopefully the guys, blocking this, under control.

How we can address this task, by balancing interests of diverse groups in our society? A very important systematic, which address nearly all subjects, is the consequent introduction of a circular economy

The **maintenance 7** of a product is the process to keep it in good condition, without changing user.

The **reuse/redistribute 8** is to reintroduce a product for the same purpose and in its original form, following minimal maintenance and cosmetic cleaning.

**Refurbishment 9** is the process of returning a product to good working condition by replacing or repairing major components that are faulty or close to failure and making cosmetic changes to update the appearance of a product, such as changing fabric or painting.

**Re-manufacture 10** denotes the process of disassemble and recovery at the sub assembly or component level. Functioning reusable parts are taken out of a used product and rebuilt into a new one. This process includes quality assurance and potential enhancements or changes of components.

**Recycling 11** is the process of recovering materials for the original purpose or for other purposes, excluding energy recovery. The materials recovered feed back into the process as crude feed-stock. If this results in a reduction in quality, it is often described as down-cycling. Processing to improve material or product quality is described as up-cycling.

**Biochemical feedstock 12** is used to denote chemical components of biological form that can be returned to the biosphere.

**Cascading 13** components and materials means putting them into different uses after end of life across different value streams and extracting, over time, stored energy. Along the cascade, the material order declines.

**Biochemicals extraction 14** consists in applying biomass conversion processes and equipment to produce low-volume but high value chemical products, or low-value high-volume liquid transport fuel and thereby generating electricity and process heat fuels, power, and chemicals from biomass.

In a `bio refinery` such processes are combined to produce more than one product or type of energy.

**Anaerobic digestion 15** is a process, in which microorganisms break down organic materials, such as food scraps and manure in the absence of oxygen. This technique produces bio-gas and a solid residual. Bio-gas, made primarily of methane and carbon dioxide, can be used as a source of energy like natural gas. The solid residual can be applied on the land or composted and used as a soil amendment.

**Composting is 16** a biological process during which naturally occurring microorganisms (e.g., bacteria and fungi), insects, snails and earthworms break down organic materials (such as leaves, grass clippings, garden debris, and certain food wastes) into a soil-like material called compost. Composting is a natural way to returning biological nutrients to the soil.

A **bio-gas 17** is a gas, produced by breakdown of organic matter in the absence of oxygen. It is a type of bio-fuel.

The **biosphere 18** denotes the global sum of all ecosystems on the planet, including all life forms and their environment. This corresponds to a thin layer of the Earth and its atmosphere- extending to about 20 km.

**Soil restoration 19** is that stage in the biological cycle, when materials are made available to plants and other organisms. Order -or `coherence`- is rebuilt over time, with the input of energy, primarily from the sun.

The stage of **farming/collection 20** is the harvesting by humans of organisms regenerated in the biosphere, whether through farming, hunting or fishing.

So, we have now our butterfly diagram completed. See at the bottom of the diagram the hint, that we should care on energy recovery and land fill recovery. Leakages of the system must be minimized.

This circular economy covers a wide area for sustainable development. It must become a common approach for future business models and business cases.

Let us now come to a subject for sustainable development, what is clearly known, but the actions are not fully in place at present time. This is the human right of accessibility to drinking water. The withdrawal of drinking water in the different regions of our world is increasing. Slide **21** shows clearly, that we must react.

Drinking water is not a common good. It is a necessary good for everyday life and for economic activity, perhaps even the most necessary one, especially since water is essential for life and public health. The right to water for personal and domestic use, to satisfy basic human needs, has been protected under international human rights law. Today, all nation states have at least ratified one human rights convention which explicitly or implicitly recognizes the right to water, and they all have signed at least one political declaration recognizing this right. Not surprisingly, there is a huge debate going on the privatization of water – the debate focuses on the provision of water services, but it may include sanitation.

Opponents of privatization argue that this is incompatible with ensuring the international human [right to water](#), that private sector participation leads to tariff increases and that it effectively turns a public good into a private good.

But what do we know about the impact of water privatization? Many examples of best practices *and* failures can be found. However, statistical studies comparing public and private water utilities show little difference in the *average* performance. The reality of governance and regulation is not black and white. It is always context and country specific.

Nevertheless, only if the human rights for accessible drinking water are assured, we will have sustainable development and less refugees problem.

During my stay in China, I could see some clear defined efforts, to assure the drinking water accessibility for the people. The Yangzi river is not known as a clean river, but as a river, where you could rely on, that water is always available. The Chinese build the three gorges dam. This assures, that the water continues flowing the entire year. **22** You can see how big is the impact at the environmental. It is necessary to serve China with drinking water and energy. **23** It was forecasted, when they started to build the dam, that the water could provide 6 % of the energy, used in China. When it was finished. It served 2% of China's energy use. That shows, how strong the Chinese economy was growing during that time. With this dam it was assured that for all downstream located cities, a reliable water supply over the year was assured. In the town, I was working, in Changzhou, the drinking water was taken out of the Yangzi. **24** To assure drinking water quality from that water out of the Yangzi river required some efforts. It is expensive and not possible to install on all places, all over the world. However, here in Changzhou it was at least a reliable water-source available. Beginning of June 2017, we got the message, that in south Africa, already now, the continuous supply of drinking water cannot be assured. **25** The African continent will suffer first from global warming. All the drinking water projects, planned in south Africa must be built faster. Prices of drinking water will increase. We will have no real other chances, to build up closed cycles, to assure drinking water availability in most places on earth. It will cost us a lot of money and a lot of efforts, to keep the access to drinking water as a human right.

It needs also the precondition that we slow down or better stop global warming. Even if America's president Trump does not believe in scientific knowledge, CO<sub>2</sub> is an important element, which to reduce, will reduce global warming.

**26** The slide shows the greenhouse effect and a view on our earth atmosphere. We can see that the whole global warming issue is caused in a thin layer of 20 km around the earth. All emissions and the CO<sub>2</sub> layer are located within the first 20 km around the earth and are keeping the heat. That is causing the main part of global warming. Calculations of global warming were prepared in or before 2001 from a range of climate models under the [SRES A2](#) (The **Special Report on Emissions Scenarios** (SRES), report by the [Intergovernmental Panel on Climate Change](#) (IPCC) that was first time published in 2000) emissions scenario, which assumes no action is taken to reduce emissions and regionally divided economic development.

**27** This slide shows the different scenarios which were calculated for the temperature increase and the ocean level increase, if no countermeasures take place. We can discuss the different scenarios,

but it is never the question that climate change takes place. It is only the discussion, how strong it will affect us.

**28** Let us get a feeling, what it means, if the sea level would rise by 6 m. All the marked areas in red will be under water. In these regions are living roughly 30 % of the population of the world. This will be the potential refugees amount, which will try to survive elsewhere.

**29** CO<sub>2</sub>, which is already emitted to the atmosphere during the last years we see on this slide. We must stop it.

To prevent this horror scenario, we have chances. What we must do: **30**

1. We must stop all fossil fuel combustion. (keep care: avoid nuclear power, which is CO<sub>2</sub> emission free, but has no solution to handle its contaminated waste).
2. We should use solar energy only, which gives the opportunity for balance. In this sense we define solar energy as energy direct converted from sun light (photo-voltaic and thermos solar), wind energy, water power and the use of biomass (as shorter cyclic biomass is used, as better)
3. Energy consumption reducing.

What we must do, to achieve the above defined goal?

**31** You see here a picture from my terrace in Berlin. In my career I was between 2012 and 2016 responsible for a company, producing photo-voltaic. This module produces around 20% of the energy usage I have in my house. That means: If everyone could install 5 to 10 solar modules, the energy for all household uses would be produced. To assure this all the time and sustainable, it needs something more. It needs a connected, virtual power plant software, an energy usage discipline and, and, and....

Let me say especially for photo-voltaic. Nothing is moving, nothing is turning, but it is producing energy. That must be a very reliable energy source. But this source is closely followed by wind-power and water power. Bio-energy is in my opinion for backing up and for using storage possibilities (power to gas) necessary, but it has also already some disadvantages.

**32** This picture shows you the water power plant of one of my friends. It very well integrates in the environmental. This is a very reliably energy source.

**33** On a bigger scale you should see a hybrid power plant. You see here on the picture the hybrid power plant from Enertrac, located in Prenzlau in Germany. This power plant is using wind energy. If it cannot directly supply to the grid, it gives the power to an electrolysis process to produce H<sub>2</sub>. This gas is mixed with biogas and is then used to drive BHKWs. The gas could also be used, to be feed directly in the gas network. The gas power net itself can, by using different pressures, be used as a storage.

And now we come to the chapter energy reduction. We should always consider avoiding using more energy than necessary. We should avoid, to use fossil fuels. We should try to use direct electric energy and not constantly convert from one energy form to another.

**34** A good example for energy consumption reduction is the introduction of the third lane for the Panama Canal. I had the opportunity to provide the hydraulic cylinders for this third lane from the plant in China, where I was responsible for. Reducing energy consumption for water movements, reducing the need of fresh water and giving the possibility to go through the canal with bigger, more energy efficient ships, is in summary a great energy saving project.

I took this example, because not always is this project connected with energy consumption reduction. For this it is necessary to establish organisations, which are distributing the knowledge to reduce energy consumption. For this the industry is founding energy efficient networks.

**35** The first energy-efficient network was founded in 1987 in Switzerland. Certain developments in Switzerland and other countries followed this example. In Germany, an initiative was developed by the Ministry of Environmental, Nature and Nuclear Reactor Safety, to create 30 energy efficient networks between 2009 and 2013. Twenty networks have been developed. These networks are promoted with consultants, who drive the process and help with technical questions.

With the three-phase model, the members of the local energy-efficient networks are guided through a three- to four-year program, which enables the companies, to build up their own energy management and energy management system and gain economic advantages from energy reduction.

**36** After an initial situation analysis of the members companies, the analysis of these collected data can be done. Then the analysis is clustered into modules in which energy-reduction projects can take place. With these actions, the energy management of the member companies can be developed and certified

**37** The United States Department of Energy also developed an initiative for energy savings. With its industrial technologies program (ITP), the department provides tools, trainings and assessments to help companies to develop their energy saving competency. It also provides a database with lessons learned from different companies and follows the target settings of companies. The department guides the companies through the implementation of an energy management system according to ISO 50001.

In China the first energy-efficient network was founded in 2011. They were following the German model. Now in nearly all region of the world the industry has started to implement energy management systems. This gives the tools in hand to save energy.

But let us remember: around 1/3 of energy is used in industry, 1/3 is used by mobility and 1/3 is used by households. So we have the same efforts we discussed for industry use, also to consider in households.

By focussing on new buildings and the general renovation of older buildings, we address the most significant mechanism to reduce energy consumption. However, individuals can implement slight changes to save energy daily.

**38** The slide shows the fundamental areas which should be considered:

1. Install high-quality roof insulation
2. Insulate outer walls avoiding gaps
3. Exchange windows and doors
4. Insulate basement walls and ceiling
5. Use energy efficient household equipment
6. Install thermal solar devices as a heating system
7. Install air exchange system with heat recuperation
8. Install a Photovoltaic System Install a long-term heat accumulator for your thermal solar heating system
9. Install an electronic control system to ensure the most efficient heat use

Energy saving is in the end mind set. So, energy saving must become a culture or behaviour.

Summary: **39**

To assure sustainability, the socio system, the economic system and the ecological system must work together and fit together. The socio system and the economic system should not destroy the environment and using more resources from this earth, than the earth can reproduce in the same time. We should assure, the people can live in the places they are living today, not to destroy their social systems. With other words: we must assure, living stays possible in the regions, people are living today.

That needs political stability, climate stability, the availability of drinking water and the use of resources not above the reproduction rate on earth.

Political stability we skipped here. But a good example to assure political stability is the European union. With the European union the continuous wars in Europe had an end.

For resource protection we proposed the cycle economy. But we have also to consider the energy economy, which is affecting resources and environment. A greenhouse gas free energy production which stops global warming, needs no earth resources. This protects the earth for global warming and assures, that the water reservoirs on earth will not change dramatically. The climate stays stable. With these preconditions, people can stay in their today's living spaces.

This are the key elements to assure a sustainable future. This is not coming by itself. We have to work on it, to make the world sustainable. For this it is necessary to understand the relations and to shape them into a sustainable direction.

We need this basis knowledge all over the world in all social levels and deriving out of this knowledge our internal value system. Only that assures, know body ha the possibility to destroy our living possibilities on earth.

Actual we have in a lot of countries a system, far from understanding these interconnections. They have the potential to be risky for our world. The most powerful weapon against this, is a knowledgeable society.

(Back up slides)