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FRESH-UP
ECONOMICS

Strategies to make economies 'future fit'

by Magdalena Prieler and Andreas Novy

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1. Overview

What does sustainability mean?

The term sustainability originally comes from forestry; one should only fell as many trees as will regrow through new plantations, keeping tree populations and yields constant. The concepts of weak and strong sustainability provide different answers to the question of what it means to maintain a sustainable stock.

Weak sustainability is applied in environmental economics and is based on the principle of interchangeability; natural capital (natural resources) can be replaced by physical capital (e.g. machines or material infrastructure) and human capital (e.g. knowledge). The three areas of environment, society and economy exist separately and interact through the exchange of resources. Physical capital is denoted by the economic sphere, human capital by the social sphere and natural capital by the ecological sphere. Sustainability means **keeping the total value of the capital stock** (the sum of the three types of capital) constant and increasing it where possible. Natural, physical and human capital are comparable and mutually substitutable, i.e. interchangeable, by means of one measure, namely money. In order to carry out this exchange, methods of comparison are needed, for example a cost-benefit analysis.

Markets, in which the three forms of capital are traded, can be created. This leads to commodification, meaning that free goods, like air and water, which are foundational for life, are turned into commodities, which can be traded like any other good. It is therefore not seen as problematic if natural capital is shrinking today as regions turn into deserts, as long as at the same time physical capital is increased, for example by building roads. Due to interchangeability, environmental damage can be compensated financially. Those who fly can 'offset' the emissions caused with compensation payments, for example into reforestation projects.

The key concept of weak sustainability is **optimization** - the neoclassical concept of the best possible allocation of scarce resources. In order to allocate resources optimally, externalities have to be considered and calculated. Externalities are caused by actors without them bearing the resultant costs. For example, when a company emits polluted air from a chimney without installing filters or paying compensation to those negatively affected. If externalities are not included in the price, the optimal market outcome does not correspond to the optimal social outcome, which results in market failure due to false price signals. The **internalisation of external effects**, such as monetary compensation for environmental damage, is therefore the central instrument in the concept of weak sustainability: By means of 'right prices', environmental burdens which have been externalised up to now are internalised, i.e. included in prices. Examples are levies or taxes on polluted water or air as well as emission certificates. Weak sustainability follows the **polluter pays principle**: Whoever generates ecological and social costs should also bear them. However, what the 'right' price for the extinction of a species or degradation of ecosystems should be is not so clear.

Strong sustainability is at the heart of the debates in ecological economics, which go beyond discussing an optimal allocation of resources. Strong sustainability is based on the principle of embeddedness: the economy is a subsystem, embedded in society and the biophysical sphere. Strong sustainability assumes that economic and social life is based on **irreplaceable, interwoven ecosystems** that **must be preserved**. Economic activities are confronted with ecological limits. The substitutability of nature with other types of capital is limited. Instead of the idea of optimisation, strong sustainability requires a

holistic and systemic view of social-ecological systems and a reasonable **deliberation** between alternatives. From this point of view, the three areas of environment, social affairs and economy are in many respects incommensurable, meaning not comparable with a measure, and therefore not mutually interchangeable.

In the understanding of strong sustainability, nature is not a stock of resources (capital), but a complex ecosystem that provides humankind with vital functions. Nature has an intrinsic value because there are qualitative differences between produced capital and nature; the former is reproducible (e.g. new bridges can be built), the destruction of nature is often **irreversible**. 'The fish in an aquarium can be made into a fish soup, but fish soup cannot be made into fish for an aquarium'.

Strong sustainability is based on the **precautionary principle**: possible damage or pollution to the environment that could become dangerous for people must be avoided or reduced, even if there is not certainty that it will occur.

	Weak sustainability	Strong sustainability
Meaning of Sustainability	Maintaining or increasing the overall value of the capital stock	Maintaining irreplaceable 'stocks' of critical natural resources and ecosystems
Key idea	Interchangeability of natural capital and other types of capital (machinery, human capital, money)	Embeddedness; Substitutability of nature with other types of capital is limited
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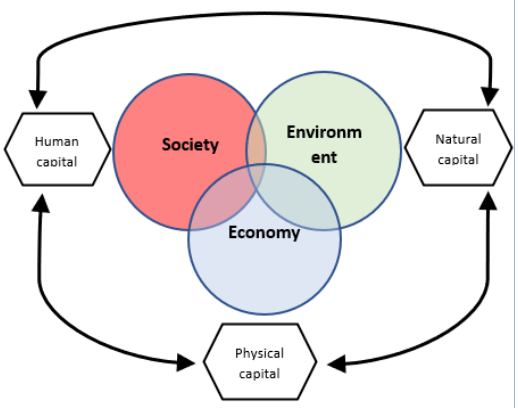
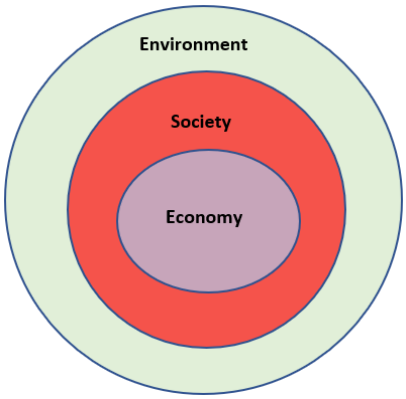
Graphic re-presentation		
Consequences	Monetary compensation for environmental damage (compensation payments)	Human activity can have irreversible consequences
Economic disciplines	Environmental Economics, Resource Economics	Ecological Economics

Table 1: Comparison of strong and weak sustainability[1]

Strategies to make economies 'future fit'

What should a transformation towards a climate-friendly, sustainable economy look like? The following strategies differ in their basic assumptions and approaches.

[1] Own representation on the basis of: Novy, Bärnthaler, Heimerl, 2020, p. 27-30

The **market-liberal strategy**, based on neo-classical ideas as well as those of Friedrich von Hayek, sees the **market** as the institution that combines individual action and social welfare. This is represented by the image of the 'invisible hand', which represents action that unintentionally **leads to an optimal social outcome**. It regulates supply and demand by means of the market mechanism. Thus, pursuing one's own interests can serve the common good better than any economic planning. The state is seen as a coercive apparatus whose influence on concrete economic action must be minimised. Free market economy and free trade are the best prerequisites for sustainable economic activity. If there is a functioning market and property system, one can trust that the upcoming **transformation will succeed spontaneously** with the help of market processes. The task of market-liberal policy is solely to ensure the appropriate legal framework. Within this model, the spectrum ranges from libertarian positions that seek to minimise state intervention (in the tradition of Hayek) to neoclassical positions that opt for correcting market failures (for example, through a carbon (CO2) tax). Market failures can be avoided if ecological goods, such as good air and water quality, are given a price, since scarce resources and production factors are thereby optimally used. The associated expansion of markets is resulting in the commodification of more and more aspects of life that previously had no price.

The strategy of a **socio-ecological transformation** results from the huge environmental challenges of today. It is inspired by Karl Polanyi, various socio-economic theories, socio-ecological transformation research and partly also Keynes. According to this strategy, a fundamental transformation is needed, which opens new paths towards a **sustainable and just economy**. Within this strategy, the spectrum ranges from pragmatic to radical ideas of socio-ecological transformation. A **pragmatic** position is, for example, that of the German Advisory Council on Global Change (WBGU), which proposes a new global social contract for a sustainable global economic order. This approach to **ecological modernization** combines social and systemic innovations. A strong public sector, good public technology and innovation policy and public infrastructure together create opportunities for 'transformation by design'. However, economic growth remains important for solving distribution conflicts by distributing an ever larger 'cake'. Economic, social and ecological sustainability can be achieved by **decoupling economic growth from resource consumption and emissions**.

Amongst others, the degrowth movement calls for a **radical socio-ecological transformation**. It stresses two main obstacles to sustainability, that have to be overcome: the growth imperative and the tendency towards commodification of all areas of human life. As absolute decoupling neither has happened until now, nor is a viable strategy for the radical reduction of material use and emissions needed, it calls for turning away from the imperative to grow the economies. Instead of growing material prosperity and consumption, the focus should be on growing **human well-being and sufficiency**. Therefore, **decommodification** is needed, as many areas are not suitable to be traded as goods on the market. If fundamental basics of a good life, from fresh air and water, to good education, public health and public transport are provided to everyone, rather than traded on markets, well-being depends less on (growing) income and consumption.

This is a vision of a profound transformation, leading to a truly sustainable and equitable economy. The approaches are political and strongly rely on social movements - such as Fridays for Future - to build up pressure 'from below' coming from civil society, in order to initiate systemic changes. It involves resistance to undesirable developments (e.g. lignite mining) as well as new forms of sustainable economic activity such as the Commons movement, social entrepreneurs or cooperatives. The following table compares the principles of the different strategies:

	Market-liberal strategy	Pragmatic strategy of a socio-ecological transformation	Radical strategy of a socio-ecological transformation
Inspired by	Hayek, neoclassical economics	Polanyi, Keynes, socioeconomics, environmental economics, ecological economics	Polanyi, socioeconomics, ecological economics
Goal	Securing market organisation, competitiveness, growth	Decoupling economic growth from increasing consumption of resources	Moving away from growth imperative, socio-ecological alternatives
Commodification	Yes	Partly	No
Transformation	Spontaneous transformation	Transformation by design	Social innovation aiming at systemic change

Table 2: Strategies for sustainable economies[2]

[2] Own representation on the basis of: Novy, Bärnthaler, Heimerl, 2020, p. 55.

2. Background information

The following text is based on the book 'Zukunftsfähiges Wirtschaften' written by Andreas Novy, Richard Bärnthaler and Veronika Heimerl.[3]

Multiple ecological crises

Since the 1970s, scientists have warned about growing ecological problems caused by growth-oriented industrial production and the Western mode of living. In the meantime, we are in the middle of **multiple ecological crises**, first and foremost the **climate crisis**. Energy systems, transport infrastructure and industrial agriculture which are based on fossil fuels emit greenhouse gases, which prevent the heat of the sun from escaping the earth´s atmosphere. Today the atmospheric greenhouse gas concentration is the highest in the last 800,000 years. As a result, the global average temperature has risen by more than one degree Celsius since the pre-industrial era. This also radically changes the water cycle, as the Earth's atmosphere absorbs water faster. Precipitation becomes more irregular and more intense. Weather extremes like floods, long dry periods, snow chaos, forest fires and hurricanes are the result.

Climate change is particularly dangerous as the earth's systems don't function linearly. When so-called **tipping points** are exceeded, unpredictable and sometimes mutually reinforcing changes occur. These tipping points cannot be precisely determined and exceeding them is usually irreversible. One tipping point is the melting of ice in the arctic. As global warming leads to the thawing of permafrost in the Arctic, this enables the decomposition of bacteria that release methane which further accelerates the warming. Furthermore, the melting of Arctic ice can lead to radical periods of heat and cold, as it affects the Gulf Stream. Unusual hot or cold periods can cause crop failures and reduce food yields. Heat and drought also promote forest fires, which in turn result in the loss of CO2-storing forests. The earth system and climate are complex - they cannot be completely regulated.

At the same time, **biodiversity is shrinking** at an alarming rate. Already today there are around 20 percent fewer species than at the beginning of the 20th century. And worldwide, one-eighth of our animal and plant species are threatened with extinction. Especially industrial agriculture contributes to the extinction of species to an unprecedented rate through deforestation and the use of pesticides and machinery. Additionally, the increasing concentration of **air pollution** from industrial and car exhaust gases, particulate matter and heating and cooking with wood or coal causes serious problems. Next to accelerating climate change, air pollution leads to heart diseases, strokes, lung diseases and cancer. Air, water and soil pollutants cause nine million deaths worldwide, three times as many as AIDS, tuberculosis and malaria combined.

In order to prevent a further escalation of the climate crisis, the member states of the United Nations have agreed to keep the rise in the global mean temperature 'well below 2 degrees Celsius' compared to the pre industrial era, with a target of 1.5 degrees. In order to limit global warming to two degrees, greenhouse gas emissions have to be reduced by 40 to 70 percent by 2050 compared to 2010 and have to be zero by 2100. If this trend reversal does not succeed, large parts of the earth will become uninhabitable for humans before the end of this century. Natural disasters hit poorer countries and marginalised groups harder. While the Netherlands is protected from rising sea levels by cost-intensive dams, Bangladesh has no comparable protection. Extreme climatic situations are accompanied by major flight movements. According to the World Bank, by 2050 more than 140 million people could be forced to flee due to climatic changes. Nevertheless, the consequences of the climate crises are still not recognized for granting asylum.

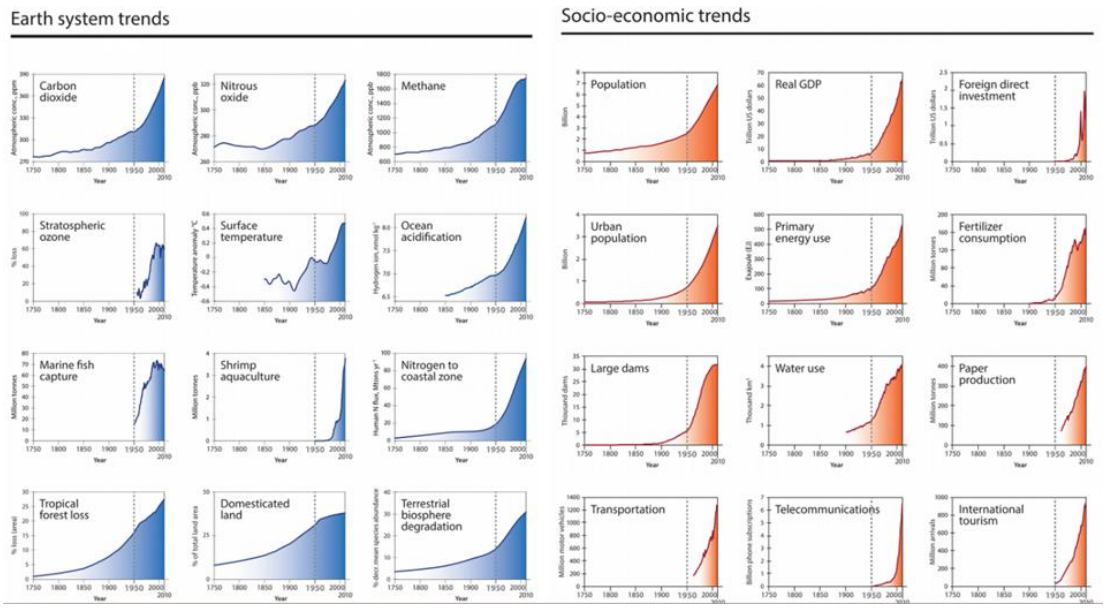
[3] Novy, Bärnthaler, Heimerl, 2020

Historically, the early industrialized and now rich countries of Europe and North America are responsible for most of the emissions and therefore the crossing of planetary boundaries. Looking at the emissions per capita, as before it is the wealthy few that stress the planet. While the poorest half of the world´s population emits only about 10% of total global emissions, the richest 10% are responsible for around 50%.[4]

Ulrich Brand and Markus Wissen speak of an '**imperial mode of living**' in Europe and the US, a non sustainable lifestyle at the expense of others. It is built on global inequalities and exploitation. The current production and consumption model of the West benefits mostly oil and car companies as well as consumers in rich countries. Europe's population can access raw materials and consumer goods from other parts of the world at low cost. In order to respect planetary boundaries, resource consumption must be limited, which will exacerbate distributional conflicts. Until recently, the costs were mainly passed onto future generations and the Global South. The latter is becoming increasingly difficult however, as the West's supremacy is wavering.

The great acceleration

The starting point of the multiple ecological crises can be traced back to the Industrial Revolution, which brought about a fundamental transformation: a uniquely productive mode of production and massive increases in material wealth were made possible by an equally massive increase in the consumption of natural resources and emissions. These exponential growth dynamics are called '**the great acceleration**'. The following chart illustrates some important biophysical as well as socio-economic indicators, which begin to rise with the Industrial Revolution. From the middle of the 20th century onwards, the trend towards **exponential growth** becomes apparent. A life-friendly climate is thus threatened by the prevailing resource intensive economic model. Its problems are not capitalism's failing, but are in fact the unintended consequences of capitalism´s success. Starting from Europe, captitalism has brought prosperity, social achievements and cultural emancipation to ever larger parts of humanity for two centuries. However, the drastic human impact on our planet is also reflected in ecological crises such as climate change, species extinction, over-exploitation of natural resources and high pollutant levels, which together begin to threaten our very existence.



Graphic 1 The great acceleration[5]

[4] Oxfam, 2015

[5] Steffen, Broadgate, Deutsch, Gaffney, Ludwig, 2015, on the basis of Global IGBP Change – International Geosphere-Biosphere Programme, 2015

Economic growth

The Western model of civilization is based on growth. Historically, economic growth provided the basis for avoiding distribution conflicts by increasing the 'cake', in other words promoting economic growth as a method of achieving prosperity rather than redistribution. It was a democratic compromise that ensured social peace during welfare capitalism in North America and Western Europe. Nowadays, the world's economy is almost five times the size it was half a century ago. If growth would continue at this rate, the economy would be 80 times that size by the year 2100[6].

Also the concept of the **green economy** remains firmly committed to growth. The goal of green growth is to combine increasing production and income with reduced resource-intensity. It strives for changing production patterns without questioning the underlying expansion-oriented logic of the economic system, in order to leave the existing way of life unaffected. Theories of a green economy assume that natural resources (natural capital) and produced goods (physical capital) can be substituted. The idea is that technological progress and increased productivity can raise the standard of living today, and with the increased wealth, the lost environmental quality can be restored at a later stage through 'green' investments. Environmental destruction is seen as reversible. Economic growth according to green growth theories can and should be decoupled from material consumption and emissions by increasing efficiency. Hereby, a decrease in material or emission intensity per unit (e.g. less emissions per vehicle produced) is called **relative decoupling**. In order to meet the two-degree target, however, **absolute decoupling** would be required, whereby emissions and material consumption would decrease in absolute terms despite continued economic growth. Absolute decoupling has so far only been achieved in selected periods and for individual countries, mostly because these countries (like Denmark) have outsourced their resource intensive production processes to other countries (like China). Globally, no absolute decoupling has taken place. The technological requirements for absolute decoupling would be enormous. On top of this, the savings potential of efficiency increases is in most cases only partially realised, as reduced consumption in one sphere leads to increased consumption elsewhere. This is called the **rebound effect.** Products may become cheaper through technological progress, which in turn creates more purchasing power for additional consumption. For example, if cars use less fuel, people save money on refuelling, which they may spend on driving longer distances or flying.

[6] Jackson, 2009

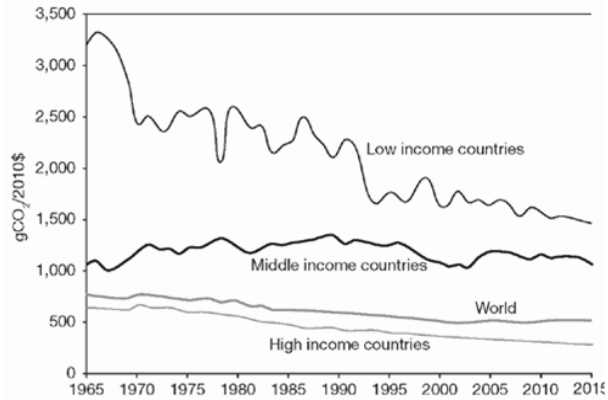


Figure 1 Annual carbon dioxide emission intensities, 1965-2015[7]

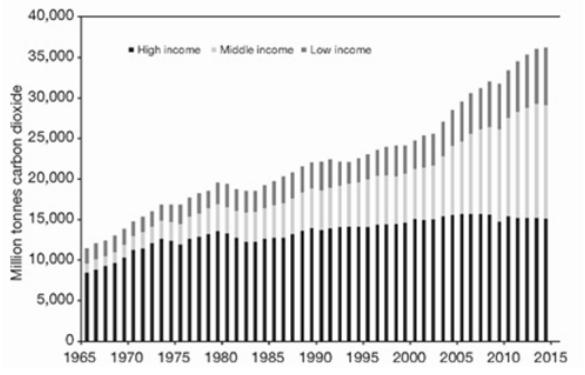


Figure 2 Annual carbon dioxide emissions by world region, 1965-2015[8]

The two figures above show the carbon dioxide emission intensity per dollar as well as the absolute carbon dioxide emissions. The falling emission intensity (figure 1) depicts the relative decoupling happening during the last decades, especially in low income countries. Globally, relative decoupling has been minor. Despite that trend, the world is far away from an absolute emissions reduction. The second figure shows that no absolute decoupling has happened - emissions are still rising along with economic growth.

Empirically, no trend towards sustainability can be identified. On the contrary, global energy demand rose more than 40 percent from 2000 until 2017. Eighty one percent of this demand is still met using fossil fuels. The fossil fuel industries continue to dominate the global economy; eight of the world's ten largest companies in 2018 were from the oil, automotive and energy sectors. Together with like-minded politicians, unions and the media, these companies form an influential **fossil power bloc** that defends the status quo.

The coal, oil and automotive industries have so far successfully defended their ownership (of fossil resources) and their markets (for motorised private transport and 'cheap' energy). Without addressing issues of power, it will be difficult to combat the climate crisis.

Although the fact that the world as we know it is threatened has diffused into mainstream media and reached the political agenda, thanks to movements like Fridays for Future, ambitious climate action is still missing. We are in what Tim Jackson calls a '**growth dilemma';** giving up on growing our economy seems to result in economic and social collapse, while further pursuit of growth risks destroying global ecosystems that form the very base of our existence.[9] It is evident that we cannot rely on economic growth any longer. Business as usual is no longer an option. Another mode of production, consumption and living is indispensable. But what on earth might this look like?

[7] Jackson, 2016, p.142

[8] Jackson, 2016, p.144

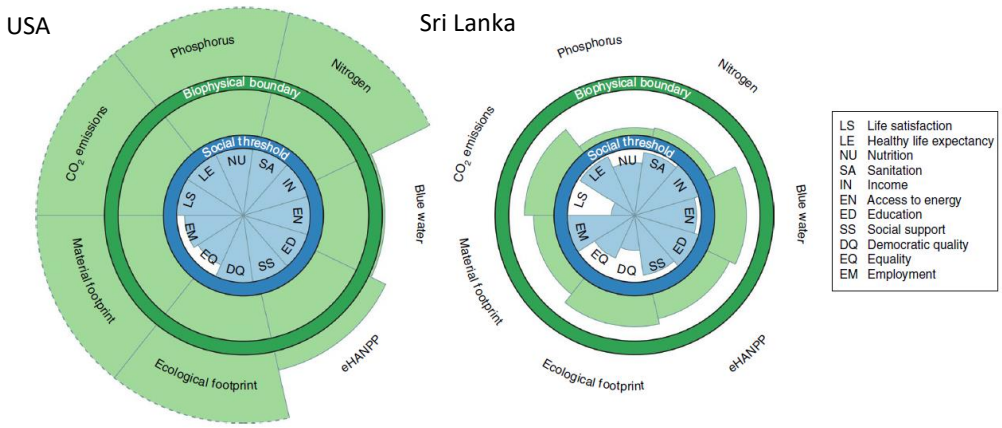
[9] Jackson, 2009

What would a good life for all within planetary boundaries look like?

There are not enough resources for all people to enjoy the material standard of living of an average European. Therefore, the Western resource-intensive standard of living cannot be generalized worldwide. In the current way of provisioning it is not possible to reach well-being for all within the ecological limits.

Kate Raworth proposes in her book *Doughnut Economics*[10] that the aim of economies should not be the growth of GDP, but ensuring that everyone has what is essential for life while simultaneously ensuring that critical planetary processes are not endangered. She uses the image of a doughnut shape with an inner and outer ring as a **safe and just space**, in which humanity should operate. Inside this 'doughnut', the resource use is high enough to reach a social foundation of wellbeing (inner circle) but low enough to not transgress planetary boundaries (outer circle). Building on the 'safe and just space' framework, O´Neill et al. suggest the adoption of a 'human needs-based' approach. Nutrition, sanitation, income, access to energy, education, social support, equality, democratic quality and employment are the needs which should be satisfied.

Furthermore, they include two measures of human well-being, namely self-reported life satisfaction and healthy life expectancy to measure 'the good life'. For measuring the safe space at the national scale they combine national consumption-based environmental footprints (ecological footprint, material footprint) and planetary boundaries (measures: CO2 emissions, phosphorus, nitrogen, blue water, eHANPP) which they downscaled to the national level.[11] This approach gives us an idea of what a good life for all within planetary boundaries could look like, and makes us realise just how far we are from achieving this. Currently, no country fulfils all basic needs whilst not transgressing sustainability thresholds. Strategies to improve provisioning systems so that needs can be fulfilled more sustainably are needed. Both sufficiency and equity play an important role in that. Climate policy which strives for a dignified life for all people requires **redistribution policies** and depends on collective decision making and collective provisioning.



Graphic 2 National performance relative to a 'safe and just space' for the United States and Sri Lanka[12] Ideally, a country would have blue wedges that reach the social threshold (nothing is white inside the social threshold) and green wedges within the biophysical boundary (nothing is green outside the biophysical boundary).

[10] Raworth, 2017

[11] O'Neill, Fanning, Lamb, Steinberger, 2018

[12] O'Neill, Fanning, Lamb, Steinberger, 2018, p. 91

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The key concept associated with weak sustainability is **optimization** - the neoclassical concept of the best possible allocation of scarce resources. In order to allocate resources optimally, external effects, so-called externalities, have to be considered and calculated. Externalities are caused by actors without them bearing the resultant cost. For example, when a company emits polluted air from a chimney without installing filters or paying compensation to those negatively affected. If externalities are not included in the price, the optimal market outcome does not correspond to the optimal social outcome, which results in market failure due to false price signals. The **internalisation of external effects**, such as monetary compensation for environmental damage, is therefore the central economic policy instrument in the concept of weak sustainability: By means of 'correct prices', environmental burdens which have been externalised up to now are internalised, i.e. included in prices. Examples are levies or taxes on polluted water or air as well as trading emission certificates. Weak sustainability follows the **polluter-pays principle**: Whoever generates ecological and social costs should also bear them. However, what the 'right' price for the extinction of a species or degradation of ecosystems should be is not so clear.

Strong sustainability is at the heart of the debates in ecological economics, and goes beyond discussion of optimal allocation of resources. Strong sustainability is based on the principle of embeddedness, not interchangeability: the economy is a subsystem, embedded in society and the biophysical sphere. Strong sustainability assumes that economic and social life is based on irreplaceable, interwoven ecosystems that must be preserved. Economic activities are confronted with ecological limits. The substitutability of nature with other types of capital is limited. Instead of the idea of optimisation, strong sustainability requires a holistic and systemic view of social-ecological systems and a reasonable

deliberation between alternatives. From this point of view, the three areas of environment, social affairs and economy are in many respects incommensurable, meaning not comparable with a measure, and therefore not mutually interchangeable. For example, compensation payments for flights can never compensate for flight emissions, as the two systems of ecology and economy cannot be offset against each other. As soon as emissions are emitted, they unfold biophysical effects such as the greenhouse effect, which can never be reversed one-to-one due to their complexity. Even if trees are planted as a compensation, they do not bind CO2 as long, as the life span of the emitted C02 in the atmosphere - several thousand years.

In the understanding of strong sustainability, nature is not a stock of resources (capital), but a complex ecosystem that provides mankind with vital functions. Nature has an intrinsic value because there are qualitative differences between produced capital and nature: the former is **reproducible** (e.g. new bridges can be built), the destruction of nature is often **irreversible**. 'The fish in an aquarium can be made into a fish soup, but fish soup cannot be made into fish for an aquarium'.

Strong sustainability is based on the **precautionary principle**: possible damage or pollution to the environment that could become dangerous for people must be avoided or reduced, even if it is not 100 percent certain that it will occur. Environmentally protective government action is therefore required in situations of uncertainty, in order to prevent possibly disastrous damages. Accordingly, it is irresponsible to put forward incomplete knowledge as justification for non-action when there is a risk of irreversible, dangerous damage. Among other agreements and regulations, the UN Framework Convention on Climate Change (UNFCCC) established the precautionary principle for the protection of the environment at international level. The precautionary principle provides justification for the assertion that sustainable economic action should be based on the findings of climate research.

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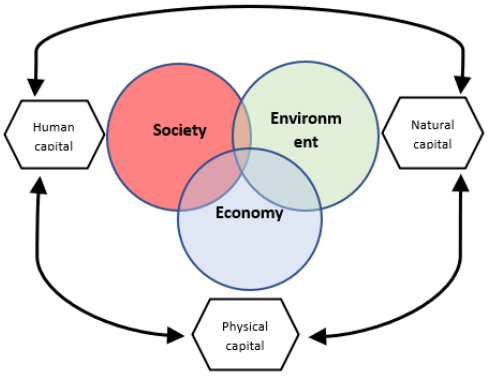
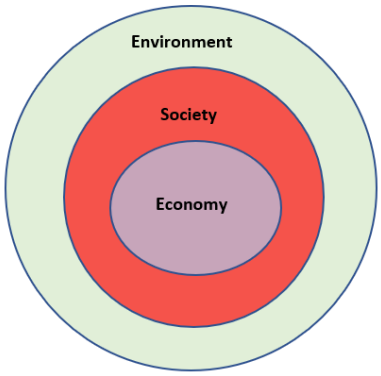
Graphic representation		
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Table 1 Comparison weak and strong sustainability[13]

Strategies to make economies 'future fit'

Evidently, business as usual is not an option. But what should a transformation towards a climate-friendly, sustainable economy look like? The following strategies differ in their basic assumptions and approaches.

The **market-liberal strategy**, based on neo-classical ideas as well as those of Friedrich von Hayek, sees the market as the institution that combines individual action and social welfare. This is represented by the image of the 'invisible hand', which represents action that unintentionally leads to an optimal social outcome. It regulates supply and demand by means of the market mechanism. Thus, pursuing one's own interests can serve the common good better than any economic planning. The state is seen as a coercive apparatus whose influence on concrete economic action must be minimised. Free market economy and free trade are the best prerequisites for sustainable economic activity. If there is a functioning market and property system, one can trust that the upcoming transformation will succeed spontaneously with the help of market processes. The task of market-liberal policy is solely to ensure the appropriate legal framework. Within this model, the spectrum ranges from libertarian positions that seek to minimise state intervention (in the tradition of Hayek) to neoclassical positions that opt for correcting market failures (for example, through a carbon (CO2) tax). Market failures can be avoided

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if ecological goods, such as good air and water quality, are given a price, since scarce resources and production factors are thereby optimally used. The associated expansion of markets is resulting in the commodification of more and more aspects of life that previously had no price.

The strategy of a **socio-ecological transformation** results from the huge environmental challenges of today. It is inspired by Karl Polanyi, various socio-economic theories, socio-ecological transformation research and partly also Keynes. According to this strategy, a fundamental transformation is needed, which opens new paths towards a sustainable and just economy. Within this strategy, the spectrum ranges from pragmatic to radical ideas of socio-ecological transformation. A **pragmatic** position is, for example, that of the German Advisory Council on Global Change (WBGU), which proposes a new global social contract for a sustainable global economic order. This approach to ecological modernization combines social and systemic innovations. A strong public sector, good public technology and innovation policy and public infrastructure together create opportunities for 'transformation by design'. However, economic growth remains important for solving distribution conflicts by distributing an ever larger 'cake'. Economic, social and ecological sustainability can be achieved by decoupling economic growth from resource consumption and emissions.

Amongst others, the degrowth movement calls for a **radical socio-ecological transformation**. It stresses two main obstacles to sustainability, that have to be overcome: the growth imperative and the tendency towards commodification of all areas of human life. As absolute decoupling neither has happened until now, nor is a viable strategy for the radical reduction of material use and emissions needed, it calls for turning away from the imperative to grow the economies. Instead of growing material prosperity and consumption, the focus should be on **growing human well-being and sufficiency**. Therefore, is needed, as many areas are not suitable to be traded as goods on the market. If fundamental basics of a good life, from fresh air and water, to good education, public health and public transport are provided to everyone, rather than traded on markets, well-being depends less on (growing) income and consumption. This is a vision of a profound transformation, leading to a truely sustainable and equitable economy. The approaches are political and strongly rely on social movements - such as Fridays Future - to build up pressure 'from below', coming from civil society, in order to initiate systemic changes. It involves resistance to undesirable developments (e.g. lignite mining) as well as new forms of sustainable economic activity such as the Commons movement, social entrepreneurs or cooperatives. The following table compares the principles of the different strategies:

	Market-liberal strategy	Pragmatic strategy of a socio-ecological transformation	Radical strategy of a socio-ecological transformation
Inspired by	Hayek, neoclassical economics	Polanyi, Keynes, socioeconomics, environmental economics, ecological economics	Polanyi, socioeconomics, ecological economics
Goal	Securing market organisation, competitiveness, growth	Decoupling economic growth from increasing consumption of resources	Moving away from growth imperative, socio-ecological alternatives
Commodification	Yes	Partly	No
Transformation	Spontaneous transformation	Transformation by design	Social innovation aiming at systemic change

Table 2 Strategies for sustainable economies[14]

[14] Own representation on the basis of: Novy, Bärnthaler, Heimerl, 2020, p. 55.

Glossary

Commodification: Process of turning formerly free resources or public services, like fresh air, water or education, into commodities (products that can be bought and sold). As a result, the market logic of optimisation is applied to more and more areas of human life.

Decommodification: Reverting the trend of commodification by withdrawing resources or services from being traded on markets like commodities.

Decoupling, absolute: Emissions and/or material consumption decreases, while economic output grows.

Decoupling, relative: Emission intensity or material intensity per unit decreases (e.g. less emissions per vehicle produced) relative to economic output. However, in absolute terms, emissions may rise (e.g. if more vehicles are produced).

Great acceleration: The exponential growth dynamics of biophysical as well as socio-economic indicators. It shows the unintended consequences (due to drastic human impact) of capitalism´s success story.

Imperial mode of living: Non-sustainable lifestyle of Europe and the US built on global inequalities and exploitation of the Global South.

Sustainability, weak: Maintaining a sustainable stock means maintaining the overall value of the capital stock. Natural capital, physical capital and human capital are thereby interchangeable and can be substituted by one another.

Sustainability, strong: Maintaining a sustainable stock means maintaining irreplaceable 'stocks' of critical natural resources and ecosystems, on which the economy and social life depend. Those must not be substituted.

Tipping points: Point at which a previously linear development changes abruptly due to a strong acceleration, certain feedback loops or changes of direction

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3. Training material

Handout

Co-funded by the
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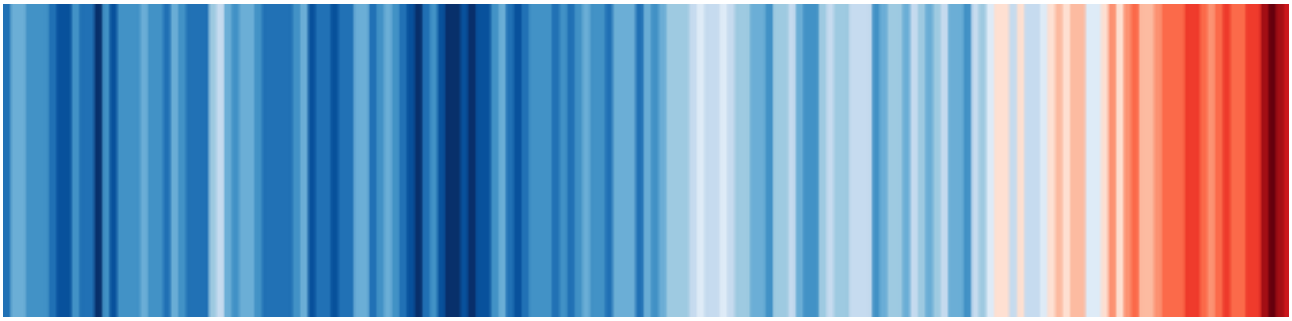
FRESH-UP ECONOMICS

WORKSHOP PROGRAM
CLIMATE AND ECONOMY

Erasmus+ Projekt ECOLIT2 #freshupeconomics

Drafted by Magdalena Prieler and Andreas Novy



Graphic 1 Warming stripes depicting annual mean global temperatures (1850-2018)[15]

[15] Hawkins 2018

Handout: Strategies to make economies future fit

What does sustainability mean?

The term sustainability originally comes from forestry: One should only fell as many trees as will regrow through new plantations, keeping tree population and yield constant. The concepts of weak and strong sustainability provide different answers to the question of what it means to maintain a sustainable stock.

Weak sustainability is applied in environmental economics and is based on the principle of interchangeability: natural capital (natural resources) can be replaced by physical capital (e.g. machines or material infrastructure) and human capital (e.g. knowledge). The three areas of environment, society and economy exist separately and interact through the exchange of resources. Physical capital is included in the economic sphere, human capital in the social sphere and natural capital in the ecological sphere. Sustainability means **keeping the total value of the capital stock** (the sum of the three types of capital) constant and increasing it where possible. Natural, physical and human capital are comparable and mutually substitutable, i.e. interchangeable, by means of one measure, namely money. In order to carry out this exchange, methods of comparison are needed, for example a cost-benefit analysis.

Markets, in which the three forms of capital are traded, can be created. This leads to commodification, meaning that free goods, like air and water, which are foundational for life, are turned into commodities, which can be traded like any other good. It is therefore not seen as problematic if natural capital is shrinking today as regions turn into deserts, as long as at the same time physical capital is increased, for example by building roads. Due to interchangeability, environmental damage can be compensated financially. Who flys can “offset” the emissions caused with compensation payments, for example into reforestation projects.

The key concept of weak sustainability is **optimization** - the neoclassical concept of the best possible allocation of scarce resources. In order to allocate resources optimally, externalities have to be considered and calculated. Externalities are caused by actors without them bearing the resulting costs: for example, when a company emits polluted air from a chimney without installing filters or paying compensation to those negatively affected. If externalities are not included in the price, the market optimum does not correspond to the social optimum, which results in market failure due to false price signals. The **internalisation of external effects**, such as monetary compensation for environmental damage, is therefore the central instrument in the concept of weak sustainability: By means of "right prices", environmental burdens which have been externalised up to now are internalised, i.e. included in prices. Examples are levies or taxes on polluted water or air as well as emission certificates. Weak sustainability follows the **polluter pays principle**: Whoever generates ecological and social costs should also bear them. However, what the “right” price for the extinction of a species or degradation of ecosystems should be is not so clear.

Strong sustainability is at the heart of the debates in ecological economics, which go beyond discussing an optimal allocation of resources. Strong sustainability is based on the principle of embeddedness: the economy is a subsystem, embedded in society and the biophysical sphere. Strong sustainability assumes that economic and social life is based on **irreplaceable, interwoven ecosystems** that **must be preserved**. Economic activities are confronted with ecological limits. The substitutability of nature with other types of capital is limited. Instead of the idea of optimisation, strong sustainability requires a holistic and systemic view of social-ecological systems and a reasonable **deliberation** between alternatives. From this point of view, the three areas of environment, social affairs and economy are in many respects incommensurable, meaning not comparable with a measure, and

therefore not mutually interchangeable.

In the understanding of strong sustainability, nature is not a stock of resources (capital), but a complex ecosystem that provides mankind with vital functions. Nature has an intrinsic value because there are qualitative differences between produced capital and nature: the former is reproducible (e.g. new bridges can be built), the destruction of nature is often **irreversible**. "The fish in an aquarium can be made into a fish soup, but fish soup cannot be made into fish for an aquarium".

Strong sustainability is based on the **precautionary principle**: possible damage or pollution to the environment that could become dangerous for people must be avoided or reduced, even if it is not 100 percent certain that it will occur. Also the UN Framework Convention on Climate Change builds on the precautionary principle. Therefore, economic action should be based on the findings of climate research.

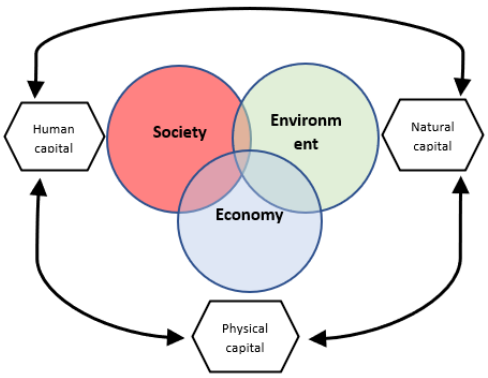
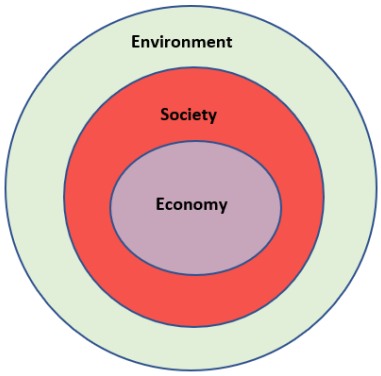
	Weak sustainability	Strong sustainability
Meaning of Sustainability	Maintaining or increasing the overall value of the capital stock	Maintaining irreplaceable 'stocks' of critical natural resources and ecosystems
Key idea	Interchangeability of natural capital and other types of capital (machinery, human capital, money)	Embeddedness; Substitutability of nature with other types of capital is limited
Key concepts	Optimisation (best possible allocation of scarce resources) Internalisation of external effects (polluter-pays principle)	Incommensurability (not comparable with a common measure, e.g. money); Deliberation between alternatives Precautionary principle
Graphic representation		
Consequences	Monetary compensation for environmental damage (compensation payments)	Human activity can have irreversible consequences
Economic disciplines	Environmental Economics, Resource Economics	Ecological Economics

Table 1 Comparison weak and strong sustainability[16]

Strategies to make economies future fit

How should a transformation towards a climate-friendly, sustainable economy look like? The

[16] Own representation on the basis of: Novy, Bärnthaler, Heimerl, 2020, p. 27-30

following ideal-typical strategies differ in their basic assumptions and approaches.

The **market-liberal strategy**, based on Friedrich von Hayek's and neo-classical ideas, sees the **market** as the institution that combines individual action and social welfare. This is represented by the image of the "invisible hand", which is an example of action that unintentionally **leads to a social optimum**. It regulates supply and demand by means of the market mechanism. Thus, pursuing one's own interests can serve the common good better than any economic planning. The state is a coercive apparatus whose influence on concrete economic action must be minimised. Free market economy and free trade are the best prerequisites for sustainable economic activity. If there is a functioning market and property system, one can trust that the upcoming **transformation will succeed spontaneously** with the help of market processes. The task of market-liberal policy is soley to ensure the appropriate legal framework. Within this model, the spectrum ranges from libertarian positions that seek to minimise state intervention (in the tradition of Hayek) to neoclassical positions that opt for correcting market failures (for example, through a CO2 tax). Market failures can be avoided if ecological goods, such as good air and water quality, are given a price, since scarce resources and production factors are thereby optimally used. The associated expansion of markets is commodifying more and more aspects of life that previously had no price.

The strategy of a **socio-ecological transformation** results from the huge environmental challenges of today. It is inspired by Karl Polanyi, various socio-economic theories, socio-ecological transformation research and partly also Keynes. According to this strategy, a fundamental transformation is needed, which opens new paths towards a **sustainable and just economy**. Within this strategy, the spectrum ranges from pragmatic to radical ideas of socio-ecological transformation. A **pragmatic** position is, for example, that of the German Advisory Council on Global Change (WBGU), which proposes a new global social contract for a sustainable global economic order. This approach to **ecological modernization** combines social and systemic innovations. A strong public sector, a good public technology and innovation policy and public infrastructures create opportunities for transformation by design. However, economic growth remains important for solving distribution conflicts by distributing an ever larger "cake". Economic, social and ecological sustainability can be achieved by **decoupling economic growth from resource consumption and emissions**.

Amongst others, the degrowth movement calls for a **radical socio-ecological transformation**. It stresses two main obstacles to sustainability, that have to be overcome: the growth imperative and the tendency towards commodification of all areas of human life. As absolute decoupling is not happing and is not a viable strategy for the radical reduction of material use and emissions needed, it calls for turning away from the imperative to grow the economies. Instead of growing material prosperity and consumption, the focus should be on **human well-being and sufficiency**. Therefore, **decommodification** is needed, as many areas are not suitable to be traded as goods on the market. If fundamental basics of a good life, from fresh air and water, to good education, public health and public transport are provided to everyone, rather than traded on markets, well-being depends less on (growing) income and consumption. The vision is a profound transformation, leading to a sustainable and equitable economy. The approaches are political and strongly rely on social movements - such as Fridays for Future - to build up pressure "from below", coming from civil society, in order to initiate systemic changes. It involves resistance to undesirable developments (e.g. lignite mining) as well as new forms of sustainable economic activity such as the Commons movement, social entrepreneurs or cooperatives.

The following table compares the principles of the different strategies:

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Commodification	Yes	Partly	No
Transformation	Spontaneous transformation	Transformation by design	Social innovation aiming at systemic change

Table 2 Strategies for sustainable economies[17]

Group work

Case A) There are different approaches to **lower greenhouse gas emissions in the field of industry**. Which understanding of sustainability and which strategy for sustainable economics underpins them?

- **Emission trading:** Within emission trading systems a cap on the amount of greenhouse gases that can be emitted is set. Companies receive or buy emissions allowances, which permit them to emit certain amounts of greenhouse gases. If a company reduces emissions it can sell allowances which it no longer needs.
- **Taxing emissions:** Individual governments or the European Union can tax carbon intense activities. Instead of trading emissions, they could tax greenhouse gas emissions from industry every year a bit higher in order to steadily increase the cost of emitting greenhouse gases.
- **Setting emission reduction targets for industries:** Individual governments or the European Union can also set absolute emission reduction targets for the different industries and thereby make lowering emissions mandatory.

Case B) Also for **protecting climate and biodiversity** in general different approaches get put forward. Which understanding of sustainability and which strategy for sustainable economics underpins them?

- **REDD+:** The United Nations REDD+ program on reducing emissions from deforestation and forest degradation in developing countries creates a financial value for the carbon stored in forests by selling emission reduction units. Those units stand for one ton of CO2 emission which is avoided by not cutting down the forest.
- **Protected areas:** Around the world 11,9% of all terrestrial land is protected area, half of which is explicitly dedicated to biodiversity protection.[18] The definition for a protected area is: “A clearly defined geographical space, recognised, dedicated and managed, through legal or other effective means, to achieve the long-term conservation of nature

[17] Own representation on the basis of: Novy, Bärnthaler, Heimerl, 2020, p. 55.

[18] Hoekstra, Boucher, Ricketts, Roberts, 2005

with associated ecosystem services and cultural values"[19].

Creative commons advice

Author: *Magdalena Prieler and Andreas Novy*

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[19] Dudley, 2008, p.8

Activity 1: Multiple ecological crises

Climate Crisis Table Quiz

Activity title	**Climate Crisis Table Quiz**
Overview	Participants sit together in small groups (3-4 people) and answer questions about the climate crisis, which the trainer reads out. Afterwards, the groups discuss the answers to the thought-provoking questions.
Objectives	● To gain an insight into some of the core issues of the climate crisis
Materials	-
Time	10 - 30 minutes
Group size	Works for all group sizes, or online with programs like Mentimeter
Instructions for trainers	1. Break up the class into small groups. 2. Read out the questions for each round. 3. After each round give the answers to the questions and encourage discussion. What answers surprised them? Why? Round 1 1. Which percentage of the global primary energy supply comes from fossil fuels? A) Around 30% B) Around 55% C) Around 80% 2. True or false? Climate change is a linear process that is currently becoming faster and faster. 3. True or false? Deforestation and habitat destruction can cause the outbreak of new diseases. 4. True or false? Since the beginning of the 20th century, around 20 percent of the species on earth have become extinct. 5. A half degree difference: A how much greater loss of insects is forecasted if the average rise in temperature is 2 degrees instead of 1.5 degrees? A) Twice as big B) Three times as big C) Five times the size Round 2 1. True or false? While the poorest half of the world´s population emits only about 10% of total global emissions, the richest 10% are responsible for around 50%. 2. True or false? The 100 companies and organizations responsible for the highest emissions have been the source of more than 80% of the world's greenhouse gas emissions emitted since 1988. 3. True or false? Already today, more people lose their means of existence due to extreme weather events than due to violence and war. 4. True or false? Worldwide, air, water and soil pollutants cause nine million deaths, three times as many as AIDS, tuberculosis and malaria combined. 5. True or false? In 2016 air pollution caused nearly 30.000 premature deaths in Europe.

Debriefing and evaluation	Answer Sheet Round 1: 1. **C.** Of the total primary energy supply 28% comes from coal, 22% from gas and 32% from oil.[20] 2. **False.** The climate crisis is even more dangerous, as temperatures do not simply rise linearly. If so-called tipping points are exceeded, entire subsystems of the global climate system can collapse. 3. **True.** Many newly emerging pathogens are of animal origin. Habitat destruction brings wildlife closer to human settlements which can lead to the outbreak of diseases. For example, Ebola (origin bat species) is more common after large scale deforestation, and also mosquito-borne diseases are more common in deforested areas.[21] 4. **True**. Particularly industrial agriculture contributes to the extinction of species to an unprecedented extent through deforestation and the use of pesticides and machinery. 5. **B.** Due to a global warming of 1,5 degrees it is forecasted that 6% of insects lose at least half their species range. For a global warming of 2 degrees even a loss of 18% of the insects is forecasted, which means a three times as big species loss.[22] Answer Sheet Round 2: 1. **True**. 2. **False.** The 100 companies and organizations responsible for the highest emissions have been the source of 71% of the world's greenhouse gas emissions emitted since 1988.[23] 3. True. Furthermore, if the climate goals of the Paris Agreement are not met, large parts of the earth will become uninhabitable for humans before the end of this century. 4. **True.** 5. **False.** In 2016 air pollution led to nearly 500.000 premature deaths in Europe.[24]
Tips for trainers	The activity can be shortened by playing only one round or by leaving less time for discussion.

Follow up activity: Climate Crisis Quiz Inquiry

Activity title	**Follow up activity: Climate Crisis Quiz Inquiry**
Overview	In small groups participants find creative ways of communicating the climate crisis.
Objectives	● To deal with one aspect of the climate crises more in depth ● To jointly discover ways of effectively communicating the climate crisis

[20] IEA

[21] Shah, 2020

[22] IPCC, 2018

[23] Griffin, 2017

[24] European Environment Agency, 2019

Materials	Paper, Pens, possibly other material
Time	30 – 60 minutes
Group size	Works for all group sizes
Instructions for trainers	1. Record the correct answers from the quiz on the board. 2. Each quiz group chooses a fact on which to focus. 3. Invite each group to discuss their fact, including its causes and consequences. 4. Invite participants to devise a creative and effective means of communicating these facts to the wider audience. Participants could e.g. devise a mini-drama, a news report, a series of images, a poem, a comic, or something else. 5. Each group is invited to present their fact to the wider group.
Debriefing and evaluation	Honour every group's creative contribution. Option: Together you can try to find out, which were the key elements that helped in effective communication.

A fair share?

Activity title	**A fair share?**
Overview	Participants estimate climate related regional inequalities, and on the basis of the correct answers, discuss those inequalities.
Objectives	● To get a feeling of how disproportionately different areas contribute to climate change
Materials	6 sticky notes (Europe, North America, Central and Latin America, Asia, Oceania, Africa)
Time	25-40 minutes
Group size	Works for all group sizes, ideally at least 10 participants
Instructions for trainers	1. Mark out 6 areas in the room to represent each of the following regions: Europe, North America, South America, Asia, Oceania and Africa. 2. Explain to the group that 10 of them should split up and stand in the marked 'regions' to represent the regions share of a) population b) production based emissions c) historical emissions d) the people at risk (see explanation of terms). 3. When the participants have settled into place let them know the actual break down so they can rearrange themselves according to it. Explanation of terms: **Production based emissions:** annual CO_2 emissions from fossil fuel use and cement production (2013). This is the conventional way to view national emissions, but it ignores imports and exports of fossil fuels and goods and services. **Consumption based emissions:** carbon footprint of all goods and services consumed in a nation (2012), including imports and excluding exports. Compared to the production

<table>
<tr><td></td><td>based emissions, major exporters such as China show lower emissions, while net importers such as the UK have higher ones.

Historical emissions: CO_2 emissions from energy use 1850–2011. These historical (or 'cumulative') emissions remain relevant because CO_2 can remain in the air for centuries. People at risk: people injured, left homeless, displaced or requiring emergency assistance due to floods, droughts or extreme temperatures in a typical year. Climate change is expected to exacerbate many of these threats.</td></tr>
<tr><td>Debriefing and evaluation</td><td>For the different rounds the 10 people should be spread as follows:

<table>
<tr><th></th><th>Population</th><th>Production based emissions</th><th>Historical Emissions</th><th>People at risk</th></tr>
<tr><td>Europe</td><td>1</td><td>2</td><td>4</td><td>0</td></tr>
<tr><td>Africa</td><td>2</td><td>0</td><td>0</td><td>1</td></tr>
<tr><td>Asia</td><td>6</td><td>6</td><td>3</td><td>9</td></tr>
<tr><td>North America</td><td>1</td><td>2</td><td>3</td><td>0</td></tr>
<tr><td>South America</td><td>0</td><td>0</td><td>0</td><td>0</td></tr>
<tr><td>Oceania</td><td>0</td><td>0</td><td>0</td><td>0</td></tr>
</table>

Discuss with the participants: Are you surprised? How do you feel about your vulnerability to climate risks and your share of emissions? Optionally also discuss: How should emissions be counted: production based, consumption based or based on historical emissions? Why? What have we learnt from the activity?</td></tr>
<tr><td>Tips for trainers</td><td>In case you have less time you can also show the carbon map video http://www.carbonmap.org (2 min) and afterwards discuss the questions (8min).</td></tr>
</table>

Activity 2: The great acceleration

Growth simulation

Activity title	**Growth Simulation**
Overview	Participants simulate linear growth and exponential growth.
Objectives	● To get a sense of the dynamic of exponential growth
Materials	-
Time	According to the group size, between 5 and 15 minutes
Group size	Works for all group sizes
Instructions for trainers	1. For this exercise participants must sit in a classroom setting (in rows). In the case that participants are sitting in a circle, ask them to put their chairs into a classroom setting (rows next to AND in front of each other). 2. Explain to participants that you will now simulate linear growth. Therefore, the first student should stand up and tap the participant next to them on the shoulder. After being tapped on the shoulder, this and every further participant stands up and taps the next person, until the whole group is standing. Meanwhile you time the group. 3. Tell the group how long the linear growth simulation took. 4. Explain to participants that the group will, in a few moments, simulate exponential growth. Explain that the participant in the middle of the middle row (i.e. the most central participant) should start by standing up and tapping two other participants on their shoulders. Those two and all other participants continue the process by standing up and tapping two further participants until they are all standing. 5. Ask the participants to guess how long it will take the group until all participants are standing. 6. Carry out the activity to simulate exponential growth (the simulation is only an approximation of exponential growth, it is a bit slower than exponential growth). 7. Conclusion: Whenever we talk about how much an economy grows (in percentage points) we talk about exponential growth. This is because the basis from which the growth is calculated does not stay the same (as with linear growth), but itself grows every year. This growing basis leads to a completely different dynamic than linear growth.
Debriefing and evaluation	Exponential growth describes a process in which the size of stock always changes by the same factor in equal time steps. Therefore, the rate of increase itself increases dramatically with time. A well-known example of exponential growth in biophysical processes is the spread of water lilies. If there are 10 water lilies on the surface of a pond in one week and 20 in the next, many intuitively assume that one week later there will be 30, then 40 and then 50. This is the linear view of the world which is familiar to us. In fact, there will be 40, then 80, then 160, and in the week before the pond is completely covered with water lilies, they will have only covered half of the pond. Whenever we

	speak about economies that grow e.g. 3% yearly, we are speaking about exponential growth. Therefore, a yearly growth of 3% leads to an economy being double the initial size in only 24 years.
Tips for trainers	This video shows how it works: https://www.youtube.com/watch?v=1_SwKG4Zt60 *Challenges that might occur:* If participants sit very far from each other and cannot really reach each other the simulation might not work that well, or it is at least slower. *Remark:* If participants have tables with water bottles, laptops, etc. in front of them, warn them to take care of their items when standing up, so that nothing breaks.

Input: The great acceleration

Activity title	**Input: The great acceleration**
Overview	Trainer gives an input on chapter 1.2 'The great acceleration'
Material	PowerPoint slide or print out of the graphic 'The great acceleration'
Time	3 - 5 minutes
Instructions for trainers	1. Show the graphic and explain it 2. Conclusion: we cannot go on growing like that, business as usual is not an option. We need another mode of production, consumption and living.

Activity 3: Economic growth

The efficiency challenge

Activity title	**The efficiency challenge**
Overview	In two rounds, participants build boats which should carry as many coins as possible. In the second round, they are instructed to increase efficiency in construction. Afterwards participants discuss the possibilities and limitations of decoupling.
Objectives	• To deal with the possibilities and limitations of decoupling in a playful way
Materials	1 cent coins, Paper, Cardboard, Glue stick, Sticky tape, additional material of your choice Optional: PowerPoint slide or print out of figures 1 + 2 'Annual carbon dioxide…'
Time	30 minutes
Group size	Works for all group sizes
Instructions for trainers	Preparation: Prepare a set of building material for every group. Make sure to have every set in the same composition twice (for round one and round two). The resources included in the set of materials for the different groups should not be the same. One group might for example only get one paper and glue stick, while another group might additionally get a piece of cardboard and sticky tape. Give the groups rather limited material, as the aim is not to keep on building forever. 1. Ask participants to form small groups (e.g. 3 – 5 people). 2. Tell the groups that there will be two phases of 7 minutes of construction. 3. Hand out one set of materials to every group. 4. Instruct the groups in the first round to use the material they have in order to build boats that can carry as many 1 cent coins as possible. 5. Seven minutes of construction time. 6. Tell the group to monitor their building success. 7. Hand out the materials for the second round and instruct the groups to again build boats that can carry as many coins as possible. However, this time the boats need to be able to carry more coins than before, and less material than in round one needs to be used. Challenge the groups to construct their boat as efficiently as possible. 8. 7 minutes of construction time are followed by again monitoring the building success.
Debriefing and evaluation	The additional carrying capacity and the saved materials are the efficiency gain. Start a discussion around the following questions: How much more efficient were you able to get? In how many rounds do you think you could get every more efficient? How much more efficient do you think our economies can get? How did the different sets of resources, influence the size of the efficiency gains your group could realise?

	Introduce participants to decoupling as the aim of the green economy, where increasing efficiency should lead to sustainability. Discuss the aim of green growth, that through decoupling economic growth from emissions and material resource use, sustainability can be reached. Sticking to the boat example, relative decoupling would mean that the groups would manage to build a boat, which can carry the same amount of coins as in the first round, with less material. If that succeeded (very likely), ask the participants if they think that they could build twice, or three times as many boats with less than the material used for the one boat in the first round. Absolute decoupling is only reached in the case of a growing output (economic growth) where less material is used than for the initial, smaller output. Can we keep on growing endlessly while ever using less material and emitting less greenhouse gases? Should we use efficiency gains for 'making up' for growth or to (faster) reduce the pressure on our planet? End the activity with a short input about empirical observations on decoupling: relative decoupling has happened, but globally no absolute decoupling has happened. Relative decoupling does not help us to reach climate goals, as emissions need to be drastically reduced and not only increased at a lower rate which is what happens when economies grow and emissions decline but only relative to the economic growth. Optional: show the trends of absolute and relative decoupling with the ppt slide or print out of figures 1+2.
Tips for trainers	For the debriefing of the exercise read chapter 3, 'Economic growth' An additional, interesting layer of reflection could be about the output of carrying coins. This exercise shows growth in 'more of the same' (capacity to carry coins). However, did anyone consider constructing the new ships for a different purpose? Did anyone think about deviating from 'the rules of the game'? Efficiency is about input and output. Who determines what a good output is? What is efficiency geared towards?

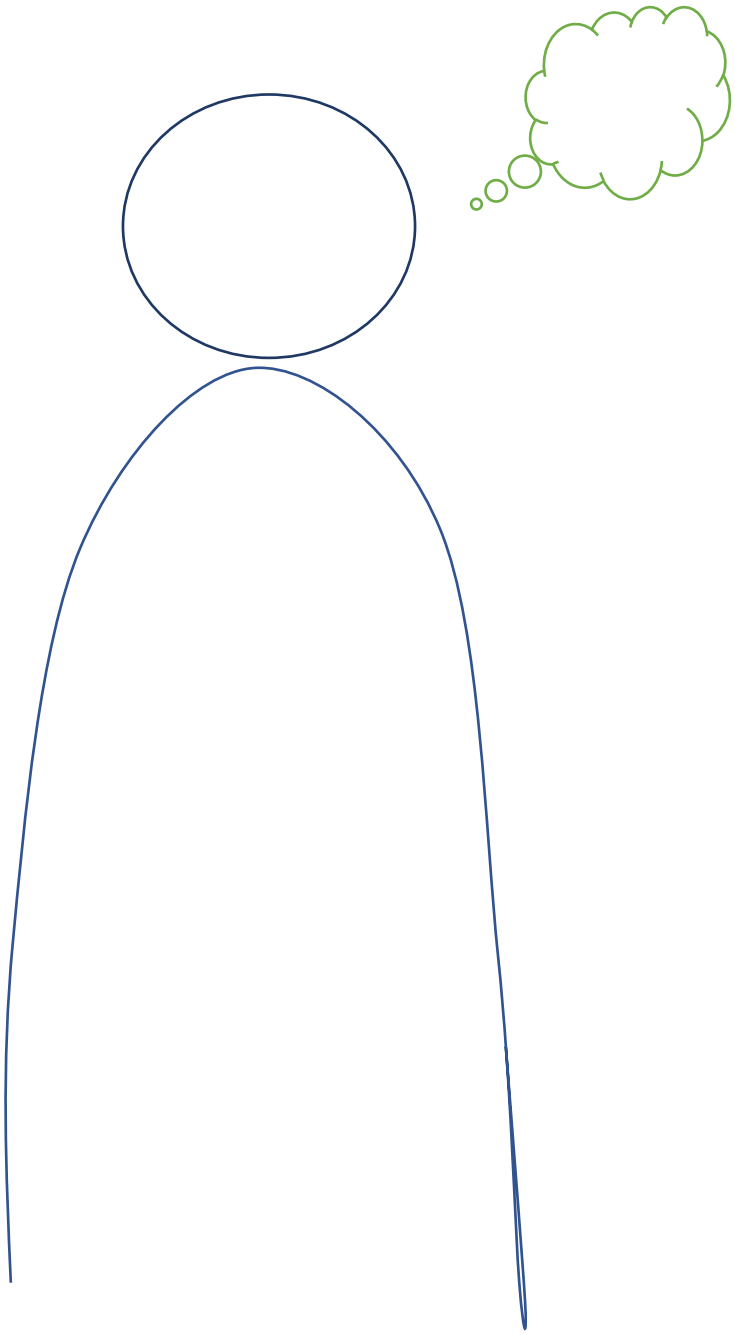
Obstacles to sustainable action

Activity title	Obstacles to sustainable action
Overview	Participants reflect about inner and outer obstacles towards acting in a sustainable way.
Objectives	• To reflect upon one´s personal connection to the topic • To realize where sustainability is systemically disabled and cannot be reached through individual (consumption-based) choices
Materials	Handouts, sticky notes in two colours, pens, or online with tools like Mural or Padlet
Time	20 - 55 minutes, according to which option is chosen
Group size	Works for all group sizes

Instructions for trainers	1. Ask the participants to reflect upon what it is that hinders them from acting in a sustainable way. They should thereby distinguish between inner or internal and outer or external obstacles. 2. Give every participant the handout (next page) and ask them to note down the inner obstacles (those within the person) and the outer obstacles (those around the person). Alternatively they can draw a person themselves. (10 - 15 min) 3. Optional: Ask participants to go together in small groups (3-4 people) and discuss what they have concluded (15 min) 4. Ask participants to note down their inner obstacles on sticky notes of one colour and outer obstacles on sticky notes of a second colour. This can be also done as a result of the small group discussion (3) together as a group. (5 min) 5. Gather and discuss the obstacles as well as the connections between the factors. Try to find general patterns. Categorise the types of obstacles. If desired, that can happen on a big poster that looks like the handout, where participants can add their own obstacles or, if identified, the general pattern behind it. (According to group size and version: 5 – 20 min)
Debriefing and evaluation	Conclusion: many of the obstacles stem from factors outside of ourselves and our control. Even if we want to act sustainably, it is very difficult to do so in many fields and impossible in other regards. If systemic factors disable us from sustainability, individual consumption choices cannot change that system. E.g. If you live in the countryside without public transportation you cannot choose a sustainable mode of transport as an individual. Sustainable and feasible infrastructure solutions would be needed. We need to establish and strengthen sustainable modes of provisioning human needs.
Tips for trainers	*Remark:* Be aware of different social positions and the potentially connected feelings (e.g. shame) related to the incapacity to act in certain ways. Ensure you explore the question: for whom is acting sustainably more easily achievable? You may also discuss the many perceived internal obstacles (such as habits, lack of motivation, lack of skills…) which have deeper roots in socialisation.

What hinders me from acting in a sustainable way?

Note down inner and outer obstacles that hinder you from acting in a sustainable manner.



Input: Exponential growth on a finite planet?

Activity title	**Input: Exponential growth on a finite planet?**
Overview	Trainer gives an input on the growth dilemma (last part of 1.3 Economic growth)
Material	Optional: PowerPoint slide with quote 'Anyone who believes exponential growth can go on forever in a finite world is either a madman or an economist.' Kenneth Boulding
Time	3-5 minutes
Instructions for trainers	Economically, we are in what Tim Jackson calls a growth dilemma. Giving up on growing our current economy means the risk of economic and social collapse. Maintaining growth brings the risk of destroying the planet and with it the basis of our existence.

Activity 4: What could a good life for all within planetary boundaries look like?

How do we envision a good life for all?

Activity title	**How do we envision a good life for all?**
Overview	Participants use the activity of freewriting to get a better understanding of how they envision a good life for all to look like.
Objectives	● To imagine and write down what a good life for all could look like
Materials	Pens, paper Optional: PowerPoint slide or print out of graphic 2 'National performance relative to a 'safe and just space''
Time	20 - 40 minutes
Group size	Works for all group sizes
Instructions for trainers	1. Hand out a pen and paper to all participants. 2. Introduce the participants to freewriting. Freewriting is a practice that helps us to liberate our writer's voice and connects us to our own creativity. It helps us to write down ideas from our unconscious. Freewriting is simple, flexible and forgiving – you can't do it incorrectly. When we freewrite, we try as much as possible to suspend judgment about what we are writing. It is an exercise in getting out of our own way. Some guidelines to achieve that are: ● Use a prompt. If you run out of ideas during writing go back to the prompt. ● Set a timer. Write until the timer rings. Finish your thought afterwards, if you want to. ● Keep your pen moving. Don´t stop writing until the time is over. ● Write quickly, a bit faster than you would write normally. As if you had a lot to note down but only a little time. ● Write a draft, not a text. Use the first word that comes into your mind. Don´t worry about how something sounds or about spelling or grammar. ● Independent of how ridiculous a thought is, go for it! See where it goes. There is no need to filter any idea. 3. Let´s together imagine that instead of plenty of social and ecological problems there could be a good life for all people. What does your vision of a good life for all look like? 4. Write the following prompt on the board: 'There it is! I can see the good life for all. It looks like…' 5. Tell the participants that they have 10 minutes for freewriting whatever comes into their mind in response to the prompt. Time them. 6. Invite participants to share their ideas for a good life for all with the group. This should be voluntary. Participants can either read out what they have written or introduce others to some core ideas.

Debriefing and evaluation	For a good life for all, we need to put the essential things into the centre of our economies. Optional: show video 'Change the Goal: Doughnut Economics': https://www.youtube.com/watch?v=Mkg2XMTWV4g Introduce the framework of a safe and just space for humanity (chapter 4). Optional: use graphic 2 on a ppt slide or print out to explain the framework.
Tips for trainers	For the debriefing of the exercise read chapter 1.4, 'What could a good life for all within planetary boundaries look like?' **Alternative A: Freewriting to questions instead of prompts:** instead of freewriting in response to one prompt you could also ask participants the following three questions, one after each other, and give them 3-5 minutes time per question for freewriting: How do I want to work? What should my relationships look like? What role should money play in my life? **Alternative B: Reflection on what constitutes a good life for oneself:** additional material: if wanted, board or flipchart and calm music for the reflection, 1. Invite participants to reflect individually about what they need for a good life. Ask them to note down some key points. Tell them how much time they have for this reflection (e.g. 10 minutes). If wanted, play calm music during the reflection. 2. Invite participants to share with the group what it is that they think constitutes a good life. If you want, take notes on a board or flipchart (5 – 25 min).

Activity 5: What does sustainability mean?

Input: 'Strategies to make our economies 'future fit'

Activity title	**Input: Participants read the handout 'Strategies to make our economies 'future fit'**
Material	Handouts
Time	10 minutes

Activity 6: Strategies to make economies 'future fit'

Different world views, different policies

Activity title	**Different world views, different policies**
Overview	Participants analyse by which strategies different climate policies are inspired.
Objectives	• To understand the basic assumptions that underpin the market-liberal strategy as well as the pragmatic and the radical strategy of a socio-ecological transformation • To understand by which understandings of sustainability and which strategies certain policies are inspired • To understand the strengths and weaknesses of different strategies
Materials	Handout 'Strategies to make economies 'future fit'' (1 per person) Printouts of Case A and B (1 per group)
Time	30 - 45 minutes
Group size	Works for all group sizes
Instructions for trainers	1. Ask participants to form small groups (3-4 people) 2. Each group can choose to either analyse case A or case B and picks the according printout with the short description 3. Instruct the participants to analyse, for each policy, which understanding of sustainability it is predicated on and which strategy (market-liberal strategy, pragmatic strategy of a socio-ecological transformation, radical strategy of a socio-ecological transformation) it is inspired by. They can use the handout as a help and conduct further research on the policies online if they wish. 4. Afterwards, ask one group that analysed case A and one group that analysed case B to introduce what they have discovered. Use the additional information (section debriefing and evaluation) to add crucial points if missing. 5. Case A) There are different approaches to **lower greenhouse gas emissions in the field of industry**. Discuss with your group which understanding of sustainability and which strategy for sustainable economics underpin those approaches: • **Emissions trading** Within emissions trading systems a cap on the amount of greenhouse gases that can be emitted is set. Companies receive or buy emissions allowances, which permit them to emit certain amounts of greenhouse gases. If a company reduces emissions it can sell allowances which it no longer needs. • **Taxing emissions** Individual governments or the European Union can tax carbon intensive activities. Instead of trading emissions, they could increase the tax on greenhouse gas emissions from industry every year in order to steadily increase the cost of emitting greenhouse gases.

	• **Setting emissions reduction targets for industries** Individual governments or the European Union can also set absolute emission reduction targets for the different industries and thereby make lowering emissions mandatory. Case B) In order to **protect climate and biodiversity** in general, different approaches are put forward. Discuss with your group which understanding of sustainability and which strategy for sustainable economics underpin those approaches: • **REDD+** The United Nations REDD+ program on 'reducing emissions from deforestation and forest degradation' in developing countries creates a financial value for the carbon stored in forests by selling emission reduction units. Those units stand for one ton of CO2 emissions which is avoided by not cutting down the forest. • **Protected areas** Around the world, 11.9% of all terrestrial land is protected area, half of which is explicitly dedicated to biodiversity protection.[25] The definition for a protected area is: 'A clearly defined geographical space, recognised, dedicated and managed, through legal or other effective means, to achieve the long-term conservation of nature with associated ecosystem services and cultural values'[26].
Debriefing and evaluation	**Feedback: Reducing greenhouse gas emissions in the field of industry** Emissions trading is rooted in the core assumption of weak sustainability that natural capital is comparable to other forms of capital and can be substituted by money. Companies which do not reduce emissions can buy themselves out by acquiring emission allowances. Hereby, for example in the EU emissions trading system (EU ETS), it is also possible to buy international credits from emission-saving projects, whereby the global north can hand over its climate protection duties to the global south. The EU ETS was the world's first major carbon market. Emission markets do not 'naturally exist'; they get created by regulation. Establishing markets where emissions are tradable means making a stable climate a tradable commodity. Market-liberals, especially neoclassical economists, support the creation of emission markets, as they see them as a means to correcting wrong price signals by including the previously externalised cost that emissions have for society into the final price. Also some pragmatic proponents of a socio-ecological transformation support emission trading schemes, arguing that they can make emission-intense production more expensive and thereby support less polluting alternatives. Radical proponents of a socio-ecological transformation are against commodifying emissions. They criticize that a stable climate should not be determined by how prices on markets evolve. In contrast to taxing emissions, where the governments earn the tax money and can reinvest it to make a transformation socially just, within emission trading systems, corporations earn by reselling permits which they mainly got allocated for free based on historical emissions and lobbying efforts.[27]

[25] Hoekstra, Boucher, Ricketts, Roberts, 2005

[26] Dudley, 2008, p.8

[27] Spash, 2010

Taxing greenhouse gas emissions can be part of all three strategies. While libertarians like Hayek would not suggest setting up such taxes, for neoclassical economists these taxes can be a means leading to 'right prices'. Proponents of both strategies of socio-ecological transformation would argue that next to making emission-intensive activities more expensive, the tax money can be used to boost green innovations (primarily in the pragmatic view) and to solve inequality issues by redistribution (primarily in the radical view). Instead of making it more expensive to pollute the environment, environmental degradation can also simply be prohibited. An example was the prohibition of CFC in refrigerators, which until then harmed the ozone layer. Prohibiting unsustainably high greenhouse gas emissions is not seen as an option by market-liberals, as this would interfere with the free market.

Proponents of a socio-ecological transformation, on the other hand, regard regulatory interventions as necessary to sustain a stable climate and thereby protect the environment and society in which the economy is embedded. While the concept of weak sustainability favours market instruments and correcting prices, the concept of strong sustainability in many cases calls for strict regulatory intervention in order to protect irreplaceable ecosystems, reflecting the principle of incommensurability.

Feedback climate and biodiversity:

REDD+ builds on the concept of weak sustainability, since it explicitly assumes that nature can be attributed an objective and quantifiable value. Through the price mechanism in the REDD+ scheme, healthy and intact forests compete with other, destructive land uses[28]. This implies that for the mechanism to effectively protect forests, these forests must be valued with a higher price than the potentially different utilizations. As the assessment is subject to larger macroeconomic influences and trends on capital markets, the valuation mechanism might fail when economic conditions change. Proponents of strong sustainability criticize that the average time horizon of REDD+ projects are 20 years, whereas carbon emissions from burning fossil fuels stay in the atmosphere for several thousand years[29].

What's more, within REDD+ programs primary forests can be cut down and substituted by industrial tree plantations.[30] In the concept of weak sustainability, this isn´t a problem as long as the value (in this case for storing carbon) stays the same. In the concept of strong sustainability, complex ecosystems should not be replaced by industrial tree plantations: even though the carbon storing capacity might stay the same, biodiversity and the ecosystem itself would be lost.

Market-liberals welcome programs like REDD+ as they regard market solutions to be the most efficient. As do many pragmatic proponents of a socio-ecological transformation, as cheap options to 'reduce' emissions. However, radical proponents of a socio-ecological transformation criticize REDD+ programs, as they allow countries in the global north and 'their' companies to pay for the 'right to pollute' and thereby maintain their current level of production and pollution, instead of actually meeting emission reduction

[28] The REDD desk, 2016

[29] Phelps et al., 2011

[30] Cabello, Gilbertson, 2012

	targets.[31] Commodifying the storage of emissions allows them to consume more energy from fossil fuels without actually increasing the carbon sequestration, as forests are not even replanted, but only not cut down. Furthermore, they criticize REDD+ as a colonial mechanism that encloses land and forces Indigenous Peoples and forest-dwellers to give up control over their land, resources and traditions.[32] Strong sustainability calls for protecting areas. In the understanding of strong sustainability certain ecosystems are irreplaceable and therefore have to be maintained, e.g. through prohibiting that forest can be logged. This can be understood as applying the precautionary principle of avoiding the risk of irreversible, dangerous damage. Market-liberals would be against prohibiting economic activities like logging in general, as they see it as more efficient to let price signals dictate what should happen. The only regulatory interventions they suggest creating and securing are a property regime and markets. Both pragmatic and radical proponents of a socio-ecological transformation would support establishing protected areas in which certain economic activities are prohibited.

[31] Cabello, Gilbertson, 2012

[32] Cabello, Gilbertson, 2012

4. Interactive learning

Activity 1: Climate Crisis Quiz

Activity title	**Climate Crisis Quiz**
Objectives	• To gain an insight into some of the core issues of the climate crisis
Time	15 minutes
Quiz questions	Round 1 1. Which percentage of the global primary energy supply comes from fossil fuels? A) Around 30% B) Around 55% C) Around 80% 2. True or false? Climate change is a linear process that is currently becoming faster and faster. 3. True or false? Deforestation and habitat destruction can cause the outbreak of new diseases. 4. True or false? Since the beginning of the 20th century, around 20 percent of the species on earth have become extinct. 5. A half degree difference: How much greater is the loss of insects forecasted to be if the average rise in temperature is 2 degrees instead of 1.5 degrees? A) Twice as big B) Three times as big C) Five times the size Round 2 1. True or false? While the poorest half of the world's population emit only about 10% of total global emissions, the richest 10% are responsible for around 50%. 2. True or false? The 100 companies and organizations responsible for the highest emissions have been the source of more than 80% of the world's greenhouse gas emissions emitted since 1988. 3. True or false? Already today, more people lose their means of existence due to extreme weather events than due to violence and war. 4. True or false? Worldwide, air, water and soil pollutants cause nine million deaths, three times as many as AIDS, tuberculosis and malaria combined. 5. True or false? In 2016 air pollution caused nearly 30,000 premature deaths in Europe.
Correct answers and debriefing	Answers Round 1: 1. **C.** Of the total primary energy supply 28% comes from coal, 22% from gas and 32% from oil.[33] 2. **False.** The climate crisis is even more dangerous, as temperatures do not simply rise linearly. If so-called tipping points are exceeded, entire subsystems of the global climate system can collapse. 3. **True.** Many newly emerging pathogens are of animal origin. Habitat destruction brings wildlife closer to human settlements which can lead to the outbreak of diseases. For example, Ebola (whose origin was in a species of bat) is more common after large scale deforestation, and also mosquito-borne diseases are more common in deforested areas.[34]

[33] IEA

[34] Shah, 2020

	4. **True**. Particularly industrial agriculture contributes to the extinction of species to an unprecedented extent through deforestation and the use of pesticides and machinery. 5. **B.** Due to global warming of 1.5 degrees since the pre-industrial time it is forecasted that 6% of insects lose at least half their species range. For a global warming of 2 degrees, a loss of 18% of the insects is forecast, which equates to three times as big a species loss.[35] Answers Round 2: 1. **True**. 2. **False.** The 100 companies and organizations responsible for the highest emissions have been the source of 71% of the world's greenhouse gas emissions emitted since 1988.[36] 3. **True**. Furthermore, if the climate goals of the Paris Agreement are not met, large parts of the earth will become uninhabitable for humans before the end of this century. 4. **True.** 5. **False.** In 2016 air pollution led to nearly 500,000 premature deaths in Europe.[37]

[35] IPCC, 2018

[36] Griffin, 2017

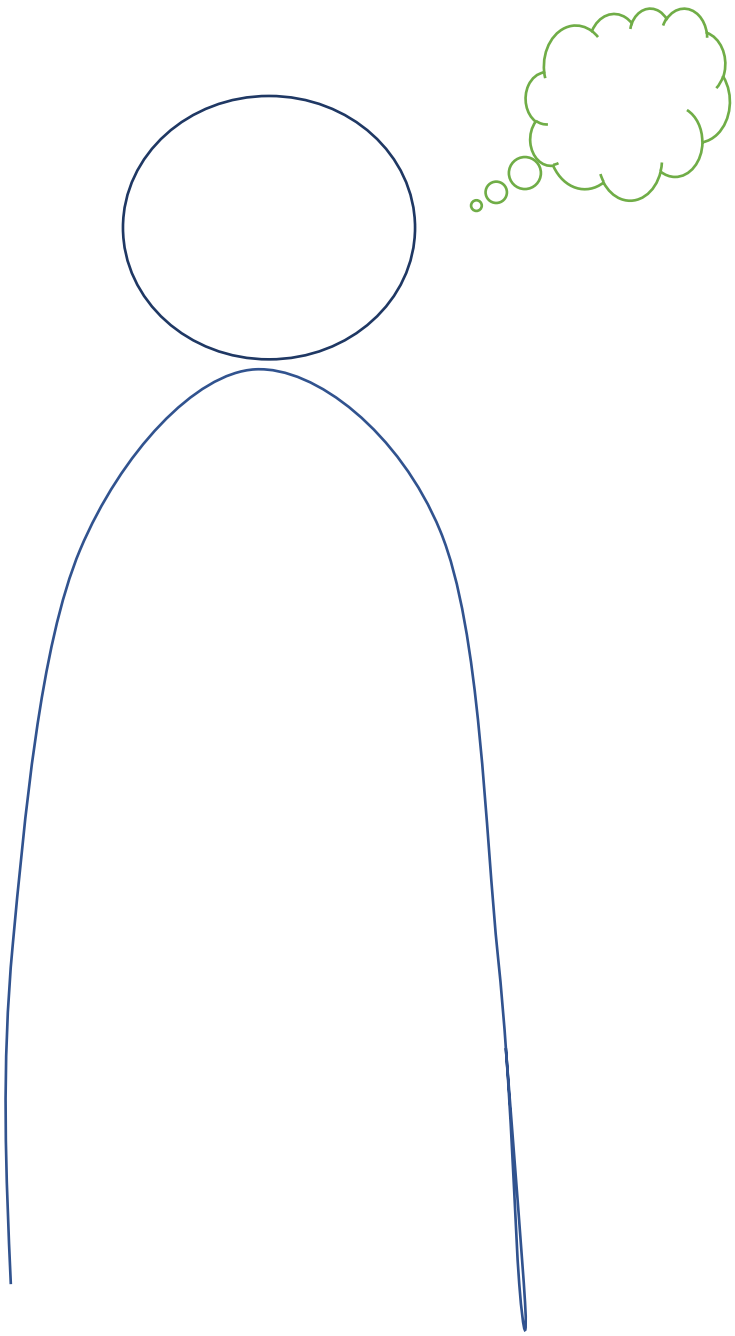
[37] European Environment Agency, 2019

Activity 2: Obstacles to sustainable action

Activity title	**Obstacles to sustainable action**
Objectives	● To reflect upon one´s personal obstacles for living sustainably ● To realize where sustainability is systemically disabled and cannot be reached through individual (consumption-based) choices
Time	20 minutes
Instructions	1. Reflect upon what it is that hinders you from acting in a sustainable way, distinguishing between inner or internal and outer or external obstacles. 2. In the diagram below, note down the inner obstacles (within the person) and the outer obstacles (around the person).
Debriefing and evaluation	Many of the obstacles stem from factors outside of ourselves and our control. Even if we want to act sustainably, it is very difficult to do so in many fields and impossible in other regards. If systemic factors disable us from sustainability, individual consumption choices cannot change that system. For example, if you live in the countryside without public transportation, you cannot choose a sustainable mode of transport as an individual. Sustainable and feasible infrastructure solutions would be needed. We need to establish and strengthen sustainable modes of provisioning human needs.

What hinders me from acting in a sustainable way?

Note down the inner and outer obstacles that hinder you from acting in a sustainable manner.



Activity 3: How do we envision a good life for all?

Activity title	**How do we envision a good life for all?**
Objectives	• To imagine and write down what a good life for all could look like using the method of freewriting
Time	15 minutes
Instructions	1. Freewriting is a practice that helps us to liberate our writer's voice and connects us to our own creativity. Therefore it helps us to write down ideas from our unconscious mind. Freewriting is simple, flexible and forgiving – you can't do it incorrectly. When we freewrite, we try as much as possible to suspend judgment about what we are writing. It is an exercise in 'getting out of our own way'. Some guidelines to achieve that are: • Use a prompt. If you run out of ideas during writing go back to the prompt. • Set a timer. Write until the timer rings. Finish your thoughts afterwards, if you want to. • Keep your pen moving. Don´t stop writing until the time is over. • Write quickly, a bit faster than you would write normally. As if you had a lot to note down but only a little time. • Write a draft, not a text. Use the first word that comes into your mind. Don´t worry about how something sounds, or about spelling or grammar. • Independent of how ridiculous a thought is, go for it! See where it goes. There is no need to filter any idea. 2. Let's imagine that instead of the current situation replete with social and ecological problems, there could be a good life for all people. What does your vision of a good life for all look like? 3. Take 10 minutes for freewriting whatever comes into your mind in response to the prompt: 'There it is! I can see the good life for all. It looks like…' 4. If you want, you may share your ideas for a good life for all in the forum. **Alternative: Freewriting to questions instead of prompts.** Instead of freewriting in response to a prompt you could answer the following three questions, one after each other, and take 3-5 minutes time per question for freewriting: How do I want to work? What should my relationships look like? What role should money play in my life?
Debriefing and evaluation	For a good life for all, we need to put the essential things into the centre of our economies. If you want to, watch the video 'Change the Goal: Doughnut Economics': https://www.youtube.com/watch?v=Mkg2XMTWV4g

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