1 RESCUE the Anthropocene

Urgent action for the great transformation

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The world at the ultimate crossroads!

As has been shown in the RESCUE report (Günther et al. 2018), global greenhouse gas (GHG) emissions continue to rise despite the implementation of various climate protection measures. In 2017, fossil GHG-emissions were 37 gigatons (Gt) about 63% above 1990 levels (EK 2019). Additionally, global materials extraction has accelerated in the last decades to more than 90 Gt in 2017, which is a fifteen-fold increase compared to 1900 (UNEP 2019). Currently, an estimated four out of nine planetary boundaries have now been crossed as a result of human activity, which would drive the Earth System into a much less hospitable state. The four are climate change, altered biogeochemical cycles (phosphorus and nitrogen), land-system change, and biosphere integrity (Rockström et al. 2009; Steffen et al. 2015).

According to Günther et al. (2018):

the UNFCCC's1 Paris Agreement was adopted in 2015 to keep the increase in global average temperature to well below 2 °C above pre-industrial levels; and to limit the increase to 1.5 °C (UNFCCC 2015). Nevertheless, global existing policies are insufficient and projected to result in about 3.3 °C warming above pre-industrial levels (Climate Action Tracker 2019).

The use of primary materials in Germany increased by 4% from 2000 and amounted to 2.64 billion tonnes (gigatons = Gt) in 2014.

The current tragedy is that improvement or turnaround in the global trends is not in sight. On the contrary, every year it gets more dramatic. No one can currently predict whether we have already passed the 'tipping points' and reinforcing effects are already having an accelerating impact. No one can predict whether we have not already irretrievably destroyed system elements here or there.

Urgent action is needed to ensure that humanity preserves the life-giving functions of our natural environment. In order to face these challenges, a fundamental transformation across all societal groups and economic sectors is required.

And much worse, this is nothing new – this has been known since the Club of Rome report in the seventies. Already in the 1990s, targets for dematerialisation and decarbonisation were formulated (90% down or, in other words, a factor of 10 in productivity). This is the content of many conferences, publications, political declarations of intent, policies and treaties. Looking at the development since the 1990s, much knowledge has been generated but little has been achieved.

As a reminder, the ‘basic requirement’ of sustainable development is that the functions of the environment, i.e. the natural foundations of life in their various roles, are no longer endangered for this and future generations.

This means that our present anthroposphere must become ‘SMALLER’ to create space for the biosphere. That it must become ‘DIFFERENT’ (more productive, dematerialised, circular instead of linear) in order to meet the target of 5–8 tonnes of resource use by 2050. That it must become ‘FAIR’ to enable sustainable development for other regions and future generations. Also ultimately ‘NEUTRAL’, greenhouse gases, toxins, plastic waste must be reduced to zero as quickly as possible.

The path to this is the ‘Great Transformation’

This transformation needs a broad perspective in analysis and implementation. The interactions between resource conservation, climate protection, energy supply, lifestyle, economic growth – to name just a few subsystems – require a systemic and interdisciplinary approach.

Figure 1.1 From ownership and linearity to happiness and circularity – necessary changes in our anthroposphere – the great transformation.

At this stage in history, and perhaps for all time to come, our actions must be guided by the recognition of how little we know about our planet's 'survival' system and its susceptibility. As a precautionary measure, we should therefore, attempt to minimise anthropogenic effects on this system. We should strive to prevent as far as possible any negative consequences, assuming that an undisturbed biosphere will continue to exist in a way humanity can survive and live in an agreeable manner. This precautionary principle must constitute the main guideline for all human activity if sustainable development is to be our primary aim.

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In a multi-year UBA research and cooperation project of its own, with external support based on research projects, possible solution areas for this transformation process for Germany were identified based on several scenarios. These paths and visions of the future are archetypes of sustainable development and can serve as blueprints for other regions and countries. Of course after adaptation to the general conditions in other countries.

Various studies and the results of the RESCUE ('Resource-efficient Pathways towards Greenhouse-Gas-Neutrality') project are presented in Part II of the book.

I would like to go into more detail on some of the insights that I consider important. There are plausible and sustainable pathways towards a greenhouse gas-neutral, post-fossil and resource-saving Germany in 2050 based on technologies that already exist today (technological feasibility). These paths are also possible trajectories for other regions.

Climate and resource protection complement each other. However, there are risks – decarbonisation and dematerialisation must always be achieved together (systemic approach necessary).

All sectors (consumption – housing – energy production – industry – transport – agriculture and land use) must be considered together (cross-sectoral coupling) and measured against their services (e.g. mobility).

An example of a synergy between resource protection and climate protection is the idea of 'Power to Liquid' (PTL) in aviation instead of choosing biofuels as the technological path. Since we propose a solution for aviation within the given infrastructure – we avoid building a new technological path (e.g. fuel supply, Aircrafts, engines, among others) with the associated consumption of resources. PTL is also much more resource-efficient than bioenergy. However, we need a lot of renewable energy for this and we need to start building the PTL system quickly. This path is certainly quicker to realise than a complete shift of aviation to a new technology path. This path avoids land-use competition with food and fibre (Lehmann 2017).

In all scenarios, raw material shortages (e.g. copper) are already foreseeable today if the pathways proposed in the RESCUE Study are implemented globally. This is not a shortage of quantity, it is a shortage of production

quantity at a time – if everyone wants to achieve greenhouse gas neutrality – the quantity of installed renewable energies – which still need a lot of metals today – increases at a certain time. Various solutions are conceivable, the simplest solutions needing less raw materials per installed capacity and substitution by other materials. Another is to reduce the amount of energy required – here through energy efficiency and, just as importantly, resource productivity. We have no shortage of renewable energy – we have a raw material and resource limitation.

I am particularly pleased that we have succeeded in the ‘GreenSupreme’ scenario in taking a look at a transformation path that can be implemented globally and meets the Paris objectives. What do I understand by global implementation? Starting from an unfair distribution of materials in the different regions of the world, we end up in a world where everyone acts with his or her share of materials – greenhouse gas neutral.

This scenario would be a path for the world to achieve the sustainability goals. Not surprisingly, it would mean zero growth of the gross national product in the industrialised countries in the medium term. After a period of growth through transformation, we have frozen our ‘material prosperity’ at its current relatively high level. This gives other regions the chance to catch up and be carbon neutral in 2050. However, this scenario also shows that we still have a lot to do to achieve better resource use. It shows once again that the limiting factor is not renewable energies, but raw materials and resources.

One issue that has become increasingly important in the creation of scenarios and the formulation of policies is the question of lifestyle. Our private consumption, the wealth we accumulate, the way we achieve our well-being, is essential for achieving climate protection goals and a fair distribution of development opportunities in this and the next generations. It starts with food, affects the life span of products and does not stop at the number of flights per person and year. The question of ‘how much is enough’ is difficult to answer – without limiting our lifestyles we will not achieve the goals and global injustices will become increasingly severe.

System-Policies

System-Policies must become the norm because policies seeking to solve individual environmental, societal, economic, and institutional problems one at a time, without taking inter-dependencies among them into account, cannot protect the environment nor can it lead to a sustained human economy.

(Schmidt-Bleek et al. 2014)

‘System-Policies’ have several pillars and prerequisites:

- One premise – we need a more or less consistent way of measuring the ‘material rucksack’.

- We need data, for example, to calculate the different solutions in retrofitting building – this data must be evolved – let us start with the indicators we have today.
- They have to be transparent, linear and easily understandable. Clearly, they will improve, through science, as in the case of greenhouse gases and will generate better and more reliable data.
- However, let us start with MIPS, COPS, TMR, RMC or whatever you like.
- Clearly we need also a land-use Indicator to lower the overall land-use of humanity.

An open question that needs to be examined very soon is how much resources we need for the various services and sectors. Just as we now set targets for the greenhouse gas emissions of a country's sectors, we must do the same for the different services and their resources use we need. Unlike greenhouse gas neutrality, it is a more complex analysis. Nevertheless, the usual policy cycle must be followed when formulating this policy. So measurement – determination of the goal – formulation of policies, measures and instruments – implementation – monitoring – and then again from the beginning.

Looking at the nexus of resource policy and biodiversity, it has been shown that resource policy approaches basically work in synergy with the goals and measures of the Biodiversity Strategy and vice versa.

All policy proposals formulated today include a very high number of individual measures. In resource protection, only 'soft' measures and instruments are currently implemented. And very few countries are starting to implement resource policies – not consistently and quickly enough in my opinion.

At present, raw materials policy, resource protection, climate policy, agricultural policy and other fields are not interlinked. The example of environmentally damaging subsidies shows that we spend a lot of money on the wrong things – even though society and politics are not prepared to reduce them (Köder et al. 2016).

Important pillars of such an integrated Policy are substitution and avoidance. Substitution is replacing of greenhouse gas- and resource-intensive technologies, services and products with decarbonised and dematerialised alternatives. Avoidance is the reduction of the consumption of products and activities through efficiency, sufficiency and consistency, leading to low greenhouse gas emissions, low primary raw material consumption and resource consumption.

I would like to mention just a few – of the many measures and instruments – along the policy cycle: Labelling – we need to know what is inside the products we buy, we use – the services we receive. Labelling, albeit crude, of the resource use of products, allows us to decide which of them is the better one. For this to be possible, we need to improve and broaden the database we have and make it available to planners and people as open source.

Even if there is no official labelling yet, information on how much land, water, biomass and non-organic materials are contained in a T-shirt, for example, is crucial for further development. Based on such labelling, it will then be possible to assess and thus control the consumption behaviour of consumers.

The calculation of a quantity in the area of material use is not as simple as for greenhouse gas emissions. The question arises to which standard should be used as a basis. The associated presumed environmental effect or a lost ecosystem service are different approaches that need to be pursued further. I think that rough figures are sufficient for an initial calculation, so that the price of metals and other materials will have to double over a decade, for example.

This can be achieved with a so-called 'material added tax' (MAT). This has the advantage that it can be levied on imports at a border, just as VAT is today, so such a system would also be an alternative for the EU. Another advantage is that this tax can be passed on from sector to sector, from company to company and that it can then be used to reflect or increase prices for consumers.

This increase in price leads to an increase in resource efficiency in production and also to substitution, as well as the use of secondary raw materials from recycling. This supports and promotes companies that work resource-efficiently. This also leads to investment in research and development, which drives the innovative strength of Germany/Europe as a business location.

It is clear to me that a precise designation of the necessary increase is a weakness of this proposal. But even at the beginning of the discussions on the implementation of renewable energies, we noticed that an increase in the price of energy led to an increase in energy efficiency both in supply and consumption. Now we cannot wait any longer until we have all sorts of scientific results, but we must act quickly and rough steering in the right direction is much more critical than any calculation of the material occurrence, cycle etc., however exact it may be. Political instruments can be readjusted. But it is more important to act at all. Regardless of how high the real prices of copper, for example, are, a relative increase in price only makes sense if we act now.

All this can be observed in the levies on primary building materials. An increase in the cost of building materials together with other policy instruments such as landfill levies, control of mining permits, legal requirements for material recovery and substitution materials, and public procurement create a steering effect. In this way, the more resource-conserving use of primary building materials can be substantially promoted through the use of recycled building materials.

A package of measures which is very important are increasing the options for *rethink, redesign, refuse, repair, reduce, remanufacture, reuse, remodel, recycle, recover* and *increase the lifetime of products*.

In order to avoid obsolescence and to enable this repair society, the following elements of a policy must be realised: the definition of product standards on minimum service life, the introduction of an obligation to provide information on the availability of spare parts and repair services, and the introduction of an obligation to state the guaranteed service life (manufacturer's

warranty statement obligation). To this end, there must be improved framework conditions for repairs. This starts with access to plans and components, goes on to the question of warranty and guarantee, and extends to preferential tax treatment of repair services.

In this context, some words of agreement on the sharing economy should be said. There are examples where these contribute to dematerialisation and decarbonisation – e.g. in the field of mobility in cities. But it can also go in the wrong direction.

Agriculture will have to undergo major reforms – there are various approaches to more sustainable agriculture. Land use is one of the keys to greenhouse gas neutrality by reducing emissions of methane and nitrous oxide through other farming systems.

The removal of CO₂ already emitted from the atmosphere by carbon sinks (CDRs) to reduce greenhouse gases. Here moors, forests and sustainable land use can play an important role. Land is a scarce resource, and land use in all sectors must be lowered.

Ultimately, what remains is our approach and attitude to waste. If we want to establish a circular society, then waste is no longer waste, but a conglomerate of different recyclable materials, which are first used within the existing production chains and then finally returned to nature in various ways. It should be remembered that there can be no complete circularity, partly because there are always unavoidable dissipative losses. On the other hand, because few substances can be used completely – without degradation – again. And not to be forgotten without a design that avoids waste, that supports reuse, even the limited possibilities of the circular economy are not possible.

Urgent action needed – let's hope

As a reminder: By 2050, resource consumption must be reduced by a factor of ten, (reducing by 90 per cent) and greenhouse gas neutrality must be achieved (reducing by 100 per cent). If we analyse the policies implemented today, we still see a great many – regionally different instruments and measures – but all of them lack the impact – the transformative power.

All this is only possible if we start the transformation right now. Consistent and immediate action is necessary!

The hopes of the 1980s and 1990s that the emerging and developing countries would make a leap into the future have not been fulfilled. The hope of the turn of the millennium about the transformation to more sustainable development in the wealthy classes of the world has not been fulfilled. The implementation of the SDGs is also questioned. Lack of education, corruption, lack of transparency and the selfishness of the elites stood in the way of this. Of course an economic system that rewards those who behave greedy, selfish and unsustainable is part of the problem.

However, hope arises when I see that more and more sectors, levels, parts of society, movements, countries, cities are beginning to take a different path.

With individual activities, with regional initiatives and with sectoral approaches. People today have recognised that quick action is necessary, and that it actually should have happened yesterday. It is necessary to implement the transformation on the different levels as quickly as possible.

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