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Disputed Nature

Biodiversity and its Convention

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Content

Introduction

Biodiversity loss is the most important global threat, not climate change. At least, that is what researchers at the Stockholm Resilience Centre say. The planetary boundaries model they have developed is currently the most popular systematisation of global processes.

The findings on biodiversity are indeed shocking: species are vanishing at such high speed that researchers are talking in terms of a sixth major mass extinction happening within human history. Except that this time it will not be caused by a geological disaster, but by human beings, our production and consumption patterns and our modes of living. The consequences of this process are completely uncertain. What is clear is that they affect the fundamentals of life on the planet: abundant diversity is the foundation of evolution and the secret of its success. The "rivet hypothesis" illustrates this principle: we are acting like someone who enjoys popping the small rivets out of an aircraft, convinced that it can stay airborne without them – but at some point, the fun will end badly.

The incisive analysis and alarming statistics are not matched by a proportionate public awareness or a political agenda. We know a vast amount but we are taking very little action. Summed up in a nutshell, all the talk is about the climate. Indeed, climate change has virtually been hammered into the public mind, and – albeit with certain shortcomings and contradictions – has penetrated the political mainstream, from Argentina to Zimbabwe; even North Korea is an upstanding member of the Framework Convention on Climate Change (UNFCCC). Global environmental policy increasingly resembles a crusade against CO_2 – by common consent, the environmental Public Enemy No. 1.

Given the attention devoted to climate change, the biodiversity community struggles. Complaints about this are routine, and hardly further their cause. There is no sense in starting a competition over which is the greater evil. Studies like those done by the Stockholm Resilience Centre suggest one key conclusion: the global environmental crisis is multidimensional and must be perceived as such, and tackled politically. Herein lies the immediate danger of the excessive emphasis on the climate discourse. Part of the reason for the climate's dominance is certainly that climate policy has far closer links with big business interests, and is perceived by many actors as an element of "green" modernisation that can also help to open up new business segments.

However justified the concern about climate change, its dominance can become equally dangerous. It can pave the way for questionable technologies, all of which can be rationalised in terms of combating climate change. Climate change now has a stringent and popularised narrative; by comparison, the debate about biodiversity does not have an easy time, but it does bring a necessary element of complexity into the discussion of global environmental policy.

That said, biodiversity has popular narratives of its own: the threatened status of elephants, orangutans or other "charismatic species" is vividly featured in the images of the large nature conservation organisations. So the dominant idea in the public mind has become the link between biodiversity and nature conservation. This also influences the perception of the Convention on Biological Diversity (CBD) which, along with the Framework Convention on Climate Change (UNFCCC) and the United Nations Convention to Combat Desertification (UNCCD), belongs to the UN's trio of Rio Conventions.

But the CBD is about much more than the conservation of nature and species; it is a complex convention which sets out to regulate access to "genetic resources", and is already propagating a fateful paradigm with this dubious concept. The CBD also extends to nature as transformed by humans. People have systematically turned nature to their purposes by selective breeding, thereby also creating a form of biodiversity. Genetic engineering radicalises and fundamentally modifies this human redesigning of nature. Not only does genetic engineering makes human-designed nature a trading commodity, but also paves the way for patenting and monopolising seed, plants and even animals. That is a far-reaching process which fundamentally reshapes society's relationships with nature – and is therefore eminently important for current (development) policy debates.

We are in the middle of this process and the ensuing political disputes. It is no coincidence that genetic engineering has become a topic of huge controversy. It is, we think, a fundamental topic for discussion, because biodiversity is not just about the conservation of nature but also – and especially – about the appropriation of nature. Social and environmental conflicts over land use are intimately linked to the question of the appropriation of nature.

The CBD is also a central venue for another important debate about the relationship with nature. Economisation and monetisation of nature's services are viewed as the future of a new policy of nature. This approach has made its mark on the CBD but remains fiercely contested.

The CBD takes up these complex questions – that is its great achievement; clearly, it cannot solve them. But the CBD has become an important international forum for the debate on these issues, as well as a regulato-

ry starting point. So it is our belief that, irrespective of the limitations of UN Conventions, the discussion of biodiversity and the CBD is a matter of great paradigmatic and practical significance. Unfortunately, many development-policy-oriented groups in civil society have lost sight of this and largely left the monitoring of the CBD to a few large environmental organisations. Another unhelpful aspect was that in the context of the CBD, the debate about equitable access to biodiversity – conducted under the popular heading of "biopiracy" – turned into a specialised debate that was highly complex and hard to assimilate or even follow, so that before long only a tiny minority were able or willing to do so.

The present publication introducing this complex issue area is a joint attempt by the Centre for Research and Documentation Chile-Latin America *(Forschungs- und Dokumentationszentrum Chile-Lateinamerika e. V. – FDCL)* and the Heinrich Böll Foundation to clarify the vital development-policy significance of the discussion over biodiversity. It is not a systematic reappraisal of the many fields addressed by the CBD – we are deliberately selective because we want to take up and present two key and current fields of conflict: the discussion about an economic approach in nature conservation, and the new, radical forms of genetic technology. Both thematic complexes will play an important role at the forthcoming Conference of the Parties to the CBD in December 2016 in Cancún, Mexico. It has also become an urgent necessity to mobilise civil society actors in both the global South and the North for a critical discussion of these issues.

A short introductory overview of the genesis and history of the CBD aims to clarify the context of these current debates, reveal the contradictions of the CBD, and sound out the options to influence the process. The publication is not addressed to CBD specialists but provides an up-to-date introduction for the particular benefit of those who have not followed the debate about biodiversity policy and the CBD in depth.

Overview of the CBD

CBD stands for the Convention on Biological Diversity. It was adopted in 1992 at the Rio Conference also known as the "Earth Summit" and entered into force on 29 December 1993. As a Convention it is binding for the signatory states. The Secretariat of the Convention has its headquarters in Montreal, and the Brazilian ***Braulio Dias*** is the present Executive Secretary. The meetings of the States Parties currently take place every two years. Here once again, the English abbreviation COP – Conference of the Parties has been naturalised in German. From 4 to 17 December 2016, CBD COP 13 will take place in Cancún, Mexico.

The central body of the CBD is called the Subsidiary Body on Scientific, Technical and Technological Advice. Neither the name nor the abbreviation SBSTTA are particularly easy to recall. Over time it has become the most important organ charged with preparing the resolutions of the COP. Also part of the permanent structure of the CBD is the WRGI – Ad Hoc Open-ended Working Group on Review of Implementation of the Convention – the role of which is to monitor the implementation of the Convention's objectives.

Two protocols are intended to support more specific formulation of central objectives of the Convention: The Cartagena Protocol on Biosafety adopted in 2000 primarily regulates the trade in genetically modified organisms, while the Nagoya Protocol of 2010 aims to ensure access to genetic resources and equitable sharing of the benefits arising from their use. In English this goes by the designation ABS – Access and Benefit Sharing. The conferences of the contracting parties to the Cartagena Protocol are called MOP – Meetings of the Parties and have been held in conjunction with the COP in recent years. Insiders therefore talk about COP-MOP. In 2010, again in Japan, the currently valid strategic plan containing the Convention's Aichi Targets was adopted. The targets are named after the prefecture in which the venue for the negotiations, Nagoya, is located. The pronunciation can be practised here: https://www.howtopronounce.com/aichi/

The CBD's flagship publication is the Global Biodiversity Outlook, which provides an overview of the state of biodiversity, ecosystems and the implementation of the Aichi Targets. Outlook 4 was published in 2014; the abbreviation GBO has not become widely established: https://www.cbd.int/gbo4/

Established in 2012, the Intergovernmental Platform on Biodiversity and Ecosystem Services (IPBES) is not a CBD body but is intended to support it. Its role consists of continuous scientific analysis and collection of data on the various aspects and issues affecting biodiversity on a global scale. It is an intergovernmental scientific advisory body, analogous to the IPCC (Intergovernmental Panel on Climate Change).

The CBD is notable for being a convention that is relatively open to the participation of civil society and indigenous organisations. The CBD Alliance is the network of NGOs which critically follow CBD processes. During the COP and the meetings of the SBSTTA the Alliance publishes a newsletter – ECO.

Genetic engineering is a key issue addressed by the Convention. GMO has become established internationally as an abbreviation for "genetically modified organism". However, the Cartagena Protocol refers to LMO – "living modified organism". Luckily this was clarified by the CBD Secretariat in 2013: "In general use the term living modified organism (LMO) is considered to be functionally the same as genetically modified organism (GMO)".

It all began at the 1992 UN Conference on Environment and Development in Rio de Janeiro | Photo: Mario Roberto Durán Ortiz (© BY 3.0)

1 How it all began

1.1 Biodiversity – the stellar career of a concept

The concept of "biodiversity" can lay claim to a truly breathtaking career. Until 1980 the term only crops up sporadically (usually phrased "biological diversity"), but the occurrences multiply exponentially and in record time it ends up being used for the naming of a UN Convention. Meanwhile the concept has become an integral – almost naturalised – part of political approaches, international treaties and everyday language.

The birthplace of the concept of "biodiversity" is generally identified as the National Forum on BioDiversity that was held in 1986 in Washington DC. Considering that the concept had been in use previously, it was probably less of a birth than a milestone in a complex but extremely rapid process of integrating biodiversity into the political mainstream. That conference brought together scientific and political actors who settled – though not without contention – on the concept of biodiversity and thereby steered the future of nature conservation towards new territory. The concept addresses the well-known fact, readily confirmed by common sense, that life is characterised by a vast diversity of forms.

Biodiversity, then, is a very recent concept; it originates, unequivocally, from the USA and is the product of an interaction between the academic and the political world. Part of its back-story was that as environmental discourse expanded in the 1970s and 1980s, the public became more aware not only of environmental pollution but also increasingly of the extinction of species. The popular researchers *Anne and Paul Ehrlich* had published their book "Extinction" in 1979. (In Germany it was published in 1983 under the title *"Der lautlose Tod"* – Silent death.) *Paul Ehrlich* was already renowned for his 1968 book entitled "Population Bomb", which emphatically warned against the supposed "overpopulation" of the planet. In Germany, "species death" (*Artensterben*) was long the dominant concept for the loss of biodiversity.

Another important influence during the genesis of the concept was evolutionary research, and most notably *E.O. Wilson*, who is generally credited with a crucial role in coining and disseminating the biodiversi-

ty concept. Evolutionary researchers were pointing out the significance of diversity for the evolution of life. In this light, the extinction of species is much more than a perhaps regrettable loss of life forms – it is an attack on the foundations of life on the planet.

The concept of biodiversity was thus able to hook into current debates, but also to offer them a new scientific and political perspective. The protection of nature or the "stewardship of creation" was no longer just the romantic reflex of rebels against modernisation, but a scientifically founded strategy for safeguarding survival on the planet. As a result of the rapid acceptance and naturalisation of the concept of biodiversity as something positive, worth keeping, today there is little or no trace or recall of this as a departure from a centuries-old former dominant paradigm: mastery of nature, which tended to be seen as a hostile force, was the dominant model of thinking and policy-making. A good example of how very much our present-day environment is a product of the "conquest of nature" (*David Blackburn*), with complete disregard for biodiversity, is the taming of the "wild River Rhine" in the 19th century. The straightening of the Rhine led to the destruction of riparian woodlands and meadows, and to a drastic reduction in fish stocks. Although there was considerable resistance from the affected population, there was no universal awareness of the problem of biodiversity loss: it was a consequence of the conquest of nature that went almost unnoticed.[1]

The successful introduction of the concept of biodiversity marks a distinct turnaround in the dominant attitude to nature: the heroic subjugation of nature as a feat of civilisation has been played out – now the focus is on the endangerment of nature rather than nature as the danger. Today this seems so self-evident that we have almost lost sight of how recently this about-turn happened. Its essence is incorporated in the biodiversity concept itself – the descriptive-seeming term actually combines a description with a valuation: diversity is a concept with positive connotations. Critical to its success, however, was probably yet another factor: its "substantive indeterminacy" (*Uta Eser*), which initially led *E.O. Wilson* to doubt that the concept had any future, proved the basis for its political and communicative success. For it allowed the most divergent interests and actors to live with this concept and charge it with very disparate meanings. What for many initially appeared to be an updating of dusty old nature conservation soon proved to be a comprehensive new framing of the significance of nature for humanity.[2]

In this context the relationship with nature is also tied into development policy. For in the 1980s another concept is likewise pursuing an even more meteoric and extremely influential career: sustainable development. Development is thereby associated directly with the use of nature or "natural resources". This was intended to overcome the detachment from nature of past economic theories and development policy strategies; many saw this as a clear step in the right direction. However, it soon became clear that this new guiding concept was also full of ambiguity.

1.2 Rio 1992 – the birth of a Convention

In retrospect the fact that just a few years after its emergence, a concept as vague as biodiversity is embraced for the naming of an important international convention seems almost miraculous. For although the Convention on Biological Diversity, adopted in Rio de Janeiro in 1992, has remained in the shadow of the Framework Convention on Climate Change, it has in fact become the most important international agreement for the conservation of nature. The fact that the Convention was adopted in Rio at all was anything but expected.

The framing of the generally recognised problem of the degradation of nature as "biodiversity loss" came, as already mentioned, from the USA. The principal locus of the problem, however, and hence also of solutions has been and remains the global South: this is where the vast majority of terrestrial biodiversity is found. The tropical rain forests alone are thought to account for 80 per cent of global species diversity. And whenever the subject of forests came up, countries of the South always reacted defensively to international regulation; even in Rio, the attempt to adopt a forest convention failed. Why did biodiversity do better?

A key achievement of the Convention on Biological Diversity was to develop an internationally recognised definition of biodiversity. It thereby created a binding framework for international and national policy approaches and research initiatives.

Within the wording of the CBD, biodiversity is defined as follows: *"For the purposes of this Convention:*

1 How far modern Germany is a product of the subjugation of nature is shown in the brilliant study by David Blackburn (2006): *The Conquest of Nature. Water, Landscapes and the Making of Modern Germany.*

2 Ute Eser trenchantly articulates the background to the success of the biodiversity concept. "Today it oscillates between ideological overload ('life on Earth') and reductionist curtailment ('genetic resources'). That is exactly what made it so successful politically: Only its substantive indeterminacy made it possible for other groups in society to be able to subscribe to it and articulate their own interests." (own translation from German source). The paper by U. Eser and other worthwhile articles on the concept of biodiversity can be found here (in German): http://snu.rlp.de/fileadmin/content/pdf/Info_Material/Stiftung/denkanstoesse/Denkanstoesse07.pdf

'Biological diversity' means the variability among living organisms from all sources including, inter alia, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part: this includes diversity within species, between species and of ecosystems. 'Biological resources' includes genetic resources, organisms or parts thereof, populations, or any other biotic component of ecosystems with actual or potential use or value for humanity."

The three objectives of the Convention are defined as follows: *"…the conservation of biological diversity, the sustainable use of its components and the fair and equitable sharing of the benefits arising out of the utilization of genetic resources, including by appropriate access to genetic resources and by appropriate transfer of relevant technologies, taking into account all rights over those resources and to technologies, and by appropriate funding."*[3]

It is striking that "genetic resources" is defined immediately after "biodiversity" – and indeed, this is one key to the concept's success in the context of the Convention. Now the hazy concept, which often simply stands for the "diversity of life", has been enriched with the idea of genetic resources. Nature as biodiversity is thus redefined as resources that have benefits for human beings. So it is not a matter of romantic nature conservation but the preservation, mobilisation and use of resources. The classic economic definition of resources is "inputs for the production of goods and services". The CBD brings this presumed aspect of biodiversity, the generation of benefits for humanity, right to the forefront.

Furthermore, the Convention also frames biodiversity as the diversity of ecosystems and variation within species – in other words, it goes far beyond the original concept of diversity of species.

The commanding priority of the concept of "genetic resources" corresponds to the objective of "sustainable use". The Convention thus explicitly combines conservation and use. Today this seems banal, and has long since turned into a hollow and much misused slogan in German: *"Schützen durch Nützen!"* ("Protection through utilisation!"). In the run-up to the 1992 Conference this was not so self-evident, and such an explicit combination of utilisation and conservation of "natural resources" was certainly an innovation. The CBD is probably the most visible and influential expression of the move to combine the idea of protection with benefits and utilisation, and thus ultimately to incorporate it into an economic calculus.

A further key concept in the definition of objectives is the idea of "fair and equitable sharing" of the benefits from the use of genetically resources. This definition rapidly became shortened to Access and Benefit Sharing (ABS), and finally culminated in a dedicated protocol: the 2010 Nagoya Protocol. The ABS complex is a pivotal aspect of the continuing development of the convention and has emerged as a thoroughly relevant orientation framework.

One further decision made in Rio de Janeiro was fundamental for the development of a global environmental governance system: the text of the CBD specifies that genetic resources are the property of their respective governments. The CBD explicitly enshrines the principle of national sovereignty over biological and genetic resources. This provision has a back-story: in the development of the UN system after the Second World War, the concept of national sovereignty over natural resources was an important factor for the countries of the global South. For colonial regimes had undermined the property rights of the original countries to their own natural resources with lasting effect: one need only think of the role of the large oil companies. Whilst the principle of national sovereignty over natural resources is being anchored ever more explicitly in the UN system, in the domain of genetic resources

Genetic resources: Plant samples in the gene bank, part of CIAT's Genetic Resources program, at the institution's headquarters in Colombia. | Photo: Neil Palmer (© BY-SA 2.0)

3 https://www.cbd.int/convention/text/default.shtml

Ramsar & Co. – one convention rarely stands alone

The CBD is not the first international convention that sets out to protect species-rich ecosystems. Back in 1971, the Convention on Wetlands of International Importance especially as Waterfowl Habitat was concluded in the Iranian city of Ramsar; hence it is generally known as the Ramsar Convention. In the meantime, 169 states have become signatories. The achievement of the Convention is to have brought the conservation of wetlands onto the international agenda. The largest Ramsar sites in Germany are the protected Wadden Sea tidal flats in Schleswig-Holstein and Lower Saxony. Another ancestor of the CBD was the Washington Convention, the purpose of which is stated in its full name: Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). And finally, mention should be made here of the Convention on the Conservation of Migratory Species of Wild Animals negotiated in 1979, also known (or less well known) as the Bonn Convention.

But one can go even further back: in 1946 (!) the International Convention for the Regulation of Whaling was concluded, with the noteworthy objective of both conserving whale stocks and developing the whaling industry. All these conventions are aimed at individual aspects of nature conservation; they exist to this day, and have created their own structures. In contrast to these specific conventions, which also reflect the interests and influence of the major nature conservation organisations, the CBD is the first convention with a fully comprehensive approach.

the principle of "common heritage" of humanity continued to prevail. In 1983, the Food and Agriculture Organization of the United Nations had enshrined the concept of common heritage in the International Undertaking on Plant Genetic Resources. Less than 10 years later, it was definitively buried by the CBD.

The governments of the countries of the global South had always expressed mistrust about the idea of common heritage, considering it a pretext for appropriation by hegemonial powers of the North. The anchoring of the principle of national sovereignty in the CBD went back to clear positions adopted by the countries of the South, who saw such anchoring as a success. Other stakeholders were dissatisfied. In particular, indigenous organisations along with a few NGOs were focused on the issue of indigenous peoples' and farmers' rights.

But indigenous stakeholders were themselves susceptible to the narrative of the "green gold of genes". The CBD clearly exhibits the hallmarks of its time: the most diverse stakeholders (corporate groups, governments, indigenous peoples) credit genetic resources with vast potential to generate benefits and hence profits and wealth. All the possible beneficiaries of this wealth are keen to contribute their viewpoints to the negotiation process. Given the fixation on securing the expected profits by creating the ABS mechanism, other questions tend to be neglected: the discursive framing of biodiversity as a genetic resource was simply nodded through, opening the door for the commercialisation of nature and the creation of new property rights.

And one further circumstance contributed to the breakthrough in negotiations over the CBD: the USA did not sign the Convention. This favoured the perception that the CBD was a success achieved by the countries of the South. In reality, however, very different and sometimes antagonistic stakeholders were able to incorporate their interests into the CBD and therefore live happily with the outcome of the negotiations:

- The traditional conservation organisations and the influential IUCN (International Union for Conservation of Nature and Natural Resources) felt that their interests in an international convention to strengthen nature conservation had been realised. The CBD does indeed have a strong nature conservation component, which is not being relinquished even as the convention develops. The CBD is the major international convention for nature conservation and for the expansion of protected areas, though that is by no means its only role.
- For the governments of the countries of the South, the explicit recognition of national sovereignty over biological resources opens up the prospect of assured access to the highly promising utilisation of the same.
- The emphasis on the right to "access" to genetic resources matches the expectations of the private sector. Likewise, the establishment of the language of resources in the Convention bears the hallmark of economic interests.
- The special role of indigenous peoples and traditional knowledge is acknowledged in the Convention. Paragraph 8j became an important anchor of indigenous rights in the international system. The CBD introduces the "equitable sharing of benefits" arising from the knowledge of indigenous peoples and traditional communities into international governance. And for indigenous peoples, this sparks the hope of being able to share in the wealth from the "green gold of genes".
- For science and research establishments, the CBD creates a definitional framework and thus performs an important orientation function. This applies particularly to all gene banks for the conservation of genetic resources.

The marked heterogeneity of elements that come together in the design of the Convention make the CBD into a "relatively open terrain of compromise" (*Ulrich Brand*) that is receptive to highly diverse expectations and targets. Thus, the CBD can be seen as the convention which is open to indigenous peoples' rights, on

the one hand, whilst at the same time being branded by critics for driving forward the economisation and monetisation of nature.

One paragraph in the Preamble to the Convention is also of great significance and contributes to the view of the CBD as a progressive factor in international governance structures. The wording reads: *"Noting also that where there is a threat of significant reduction or loss of biological diversity, lack of full scientific certainty should not be used as a reason for postponing measures to avoid or minimize such a threat..."*[4]

In this passage the CBD enshrines the precautionary principle – without mentioning it by name – in a treaty that is legally binding in international law. The current discussion about free trade agreements (CETA, TTIP) has revived the international significance of the precautionary principle as a focal issue for public debate. The European restrictions on genetically modified organisms (GMOs) are based on application of the precautionary principle. TTIP and CETA might result in the loss of the precautionary principle's vital function within the EU.[5]

It is undisputed that the CBD is becoming the central component of an evolving system of governance in the environmental and nature conservation field. In this regard, the compromise wording of the text passed in Rio allows for very different applications and perspectives. The Rio Convention defines a playing field and a few rules of play, but who occupies and controls this playing field and by what power, remains unspecified. And to this day, this ambiguity determines how the CBD is perceived.

1.3 The CBD and the precautionary principle

A central point of reference and discussion for international environmental policy is the precautionary principle. It urges and enables measures to be taken to avert damage, even when there is no absolute (scientific) certainty. *"At the international level, participants in the United Nations Conference on the Environment and Development in 1992 committed themselves to applying the precautionary principle for the protection of the environment."*[6] That is how the German Federal Environment Agency (UBA) sees it. Unfortunately it is somewhat more complicated – but it is illuminating to look at the complications. To be precise, the precautionary principle is expressly mentioned in the Rio Declaration,[7] but as a "precautionary approach", which is strangely associated with a cost-benefit analysis: *"In order to protect the environment, the precautionary approach shall be widely applied by States according to their capabilities. Where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation."* The text is a typical outcome of complex negotiations. On the one hand, it is the product of a strong lobby from countries in Europe and the global South and

Agrobiodiversity: ex situ – in situ

The CBD is aimed not only at the conservation of biodiversity as found in nature, but also at plants and animals bred by humans, i.e. agrobiodiversity. This comprises all components of biodiversity of direct relevance for agriculture and food, the totality of which make up the agro-ecosystem. It is thus an extremely broadly framed concept which encompasses not only crop plants and animals but also micro-organisms that are important for soil fertility.

The CBD does not stipulate individual provisions for the conservation of agrobiodiversity. Rather, it makes general references to its significance, and sets one important signal: the conservation of biodiversity *in situ,* i.e. in nature, should take priority – even within agrobiodiversity – over *ex situ* forms of conservation such as seed banks.

The significance of the conservation of agrobiodiversity has been universally recognised in the meantime. Just a tiny number of crop species – around 30 – are the source of 95 per cent of the global food supply. Old crop varieties and livestock breeds are disappearing, and genetic diversity along with them. The remaining varieties and breeds are vulnerable to diseases and are increasingly falling under the control of a few firms.

This and further information can be found in the Information System on Genetic Resources, GENRES: http://www.genres.de/3/cultivated-and-wild-plants/key-figures/

The CBD defines agrobiodiversity as follows: *"Agricultural biodiversity is a broad term that includes all components of biological diversity of relevance to food and agriculture, and all components of biological diversity that constitute the agricultural ecosystems, also named agro-ecosystems: the variety and variability of animals, plants and micro-organisms, at the genetic, species and ecosystem levels, which are necessary to sustain key functions of the agro-ecosystem, its structure and processes."*
https://www.cbd.int/agro/whatis.shtml

4 https://www.cbd.int/convention/text/default.shtml
5 This is presented at length in a Greenpeace publication written by Christoph Then (in German): https://www.greenpeace.de/sites/www.greenpeace.de/files/publications/wer_ttip_und_ceta_saet_wird_gentechnik_ernten-report-160426.pdf
6 https://www.umweltbundesamt.de/en/precautionary-principle
7 The Rio Declaration is the official concluding document of the 1992 Earth Summit: http://www.un.org/documents/ga/conf151/aconf15126-1annex1.htm.

Agrobiodiversity at risk | Photo: Alba Sud Fotografia
(cc BY-NC-ND 2.0)

from NGOs to incorporate the precautionary principle in one of the Rio documents. On the other hand, there is also tangible influence from the USA and other countries who are more sceptical about the principle and who succeeded in weakening the wording to an "approach" and establishing a link with "cost-effective" environmental protection.[8]

In the text of the convention, on the other hand, the concept of the precautionary principle does not appear as such, but in its place a clear and consistent description of the same (see above).

For all the linguistic imprecision of the Rio texts, they accomplish the feat of incorporating the precautionary principle into the international legal system. The significance of this fact is not to be underestimated and lays the foundation for the CBD to become the convention that critically addresses and tackles the regulation of genetic engineering.

8 For Hartmut Meyer this wording reflects the new tendencies in environmental protection at that time under the Reagan administration. The very informative text by Hartmut Meyer (2007) about the precautionary principle in the CBD can be viewed here: http://genok.no/wp-content/uploads/2013/04/Chapter-30.pdf

An ecosystem service: pollination by bees | Photo: Andrew Mandemaker (© BY-SA 2.5)

2 Conceptual fine-tuning

2.1 Nature as service provider

In 1992 the fledgling notion of biodiversity took off in Rio de Janeiro as an internationally recognised concept. Today's debates, however, can only be understood against the backdrop of two further conceptual elaborations in the context of the CBD: the first is the establishment of the idea of ecosystem services; the second, the attempt to develop an economics of biodiversity (for more on this, see 2.2).

"The principal framework for expressing the 'usefulness' of biodiversity is through the concept of ecosystem services", states the Secretariat of the CBD.[9] The critical milestone for the establishment of the concept of ecosystem services is the Millennium Ecosystem Assessment (MA) that was commissioned by the Secretary-General of the United Nations and published in 2005. Since then, the language of ecosystem services has conquered the world and become more or less ubiquitous. *"The concept of ecosystem services (ES) has taken the environmental science and policy literature by storm, and has become almost* the *approach to thinking about and assessing the nature-society relationship."*[10] Yet the somewhat awkward and unappealing concept has not made its way into everyday parlance.

The main concern of the MA was to emphasise the fundamental significance of nature to human well-being. In particular, it is concerned with presenting the conservation of nature as the essential foundation for human life, thereby reinforcing its rational basis. The MA defines ecosystem services as "benefits that people obtain from ecosystems", and establishes distinctions between supporting, regulating, provisioning and cultural services. The MA is also explicitly addressed to those in politics who need to be motivated to give due regard to ecosystem services in their decision-making.

Specifically in order to become politically influential, the MA, soon followed by the CBD and other

9 https://www.cbd.int/iyb/doc/prints/factsheets/iyb-cbd-factsheet-ecoservices-en.pdf
10 http://www.conservationandsociety.org/article.asp?issn=0972-4923;year=2013;volume=11;issue=4;spage=343;epage=358;aulast=Lele

players, make ever-increasing use of the ecosystem services concept. Yet this simultaneously establishes an extremely human-centred (anthropocentric) view of nature. What does it actually mean when the existence of fish in the sea is presented as a service for humankind? Ecosystem services are a narrative construct that bends nature to human purposes. In doing so, it confuses the functions of ecosystems with the provision of services for humankind. Theoretically questionable as this may be, it was nevertheless a successful ploy for science and research: it frees nature conservation from the suspicion that it only protects rare species or unwelcome bugs of dubious benefit, and makes clear reference to the benefits for humankind.

The ecosystem services approach frames the relationship between humans and nature in a language that is familiar to economics, and paves the way for the further discursive rejuvenation of nature conservation. It is hard to overestimate its status within the framework of the CBD: *"It is the primary implementation framework of the Convention on Biological Diversity (CBD)"*, according to the guidelines published in 2004 on this issue.[11]

Bolivia's critical position

Diego Pacheco, for many years Bolivia's chief negotiator in the CBD, assesses the CBD process as follows: *"We are totally against mainstreaming biodiversity and ecosystems with a profit-oriented, pro-market approach. Natural resources are the treasures of the poor. We are against taking biological resources out of the hands of local communities and indigenous people and making natural resources mere commodities. We believe it is not right to move biodiversity conservation and its sustainable use into plain economic terms to achieve the objectives of the CBD".*

According to Pacheco, the CBD has gone off course: *"When CBD was concluded for the first time in 1992… it was considered as something very positive for developing countries. But somewhere along the line CBD has lost its track and now its approaches for implementation of its objectives favour market forces. Through the present mode of mainstreaming biodiversity, CBD gives leverage and power to the private sector and the market forces for utilising the natural resources only for their profits. Everything connected with nature is being commodified, putting at risk the livelihoods of indigenous and local people, and of the common goods."*

http://www.downtoearth.org.in/interviews/cbd-has-lost-its-track-39376

2.2 Natural capital – the economic about-face in biodiversity conservation

The attempt to develop an economics of biodiversity is the second key area of conceptual fine-tuning in the context of the CBD. At a meeting of the environment ministers of the G8 group in Potsdam in 2007, an initiative was launched at the behest of the then German environment minister, *Sigmar Gabriel*, to produce a report about "The Economics of Ecosystems and Biodiversity" (TEEB). The model was declared to be the Stern Report which had expounded on the economic importance of climate policy in 2005. Since the Stern Report was seen as a successful model for the mainstreaming of climate policy, especially for actors in the UN system, the hope was to repeat this success in the area covered by the CBD. *Pavan Sukhdev*, who like *Stern* came from the finance sector, was appointed to head the study. The study's envisaged aim was to promote a better understanding of the true economic value of ecosystem services, and hence to contribute to achieving the objectives of the CBD.[12]

The TEEB report was central to the notion of establishing a new narrative in environmental conservation: the (economic) value of biodiversity and of ecosystem "services" is not visible, and is therefore neglected. This is now identified as a decisive cause of biodiversity loss, and a terse solution called for: "put a value on nature".

The TEEB approach directly influenced the CBD, and the second of the strategic Aichi Targets adopted in 2010 (see Section 3.2.) bears clear hallmarks of the TEEB approach: it provides that by 2020, the value of biodiversity should have been incorporated into national accounting systems.

Under the TEEB approach, nature is now seen as "natural capital". Tellingly, Germany's TEEB implementation body has been named "Natural Capital Germany". Such a choice of wording attempts to frame nature entirely in terms of economic categories so as to render it visible and manageable for economics.

The TEEB approach has not only won accolades but has also provoked a global debate about the monetisation and financialisation of nature. The economic valuation of nature (and its services) is clearly pivotal to the approach, implying a valuation of nature in monetary terms beside others. But is that even possible or desirable? Or does this approach merely create a vision of nature that is subject to economic valuation, and consequently, open to exploitation?

Whatever the case, this makes the CBD an important arena for debating this matter of principle. This of

11 https://www.cbd.int/doc/publications/ea-text-en.pdf

12 "to promote a better understanding of the true economic value of ecosystem services and to offer economic tools that take proper account of this value. We are confident that the results of our work will contribute to more effective policies for biodiversity protection and for achieving the objectives of the Convention on Biological Diversity".
http://ec.europa.eu/environment/nature/biodiversity/economics/pdf/teeb_report.pdf p. 11

Natural capital: tropical rainforests in the global South |
Photo: Chris_Bartnik (© BY-ND 2.0)

all developments confirms that the times of naive environmental conservation are now in the distant past. Approaches like those expressed in Aichi Target 2, cited above, seek to justify the conservation of environment and biodiversity in new terms, as a management instrument. The CBD is thus a part and a promoter of this economic approach. Criticism of this development has been voiced by very few of the States Parties, among them Bolivia in particular (see Infobox). Bolivia's critical position harmonises with many analyses carried out by civil society organisations.

At the same time, however, contradictions and divergent positions are also emerging within the CBD. Even if Aichi Target 2, in particular, shows how far the TEEB approach has infiltrated the mainstream of the Convention, the actions of a few governments, NGOs, social movements and indigenous organisations have kept other approaches alive and well within the CBD process.

3 Milestones in the Convention's development

3.1 From Rio to Cartagena

In the years following Rio, the discussion about genetic engineering and its products – genetically modified organisms (GMOs) – gained eminent importance. They obviously pose a major challenge *vis à vis* the CBD's fundamental concern with safeguarding biodiversity. What are the consequences for biodiversity if genetically modified plants or animals are released into the environment? This is a different line of inquiry from the question that generated most public attention in the debate over GMOs: how harmful is genetically modified food to human health?

Indeed, the debate about genetic engineering has become one of the most important questions of principle for the future of land use and for feeding the human population. Deciding how to deal with genetic engineering involves much more than weighing up health risks: the rampant spread of gene-based technologies not only entails incalculable ecological risks but also makes agricultural producers ever more dependent upon seed firms and the patents that they hold.

The great achievement of the CBD is to raise the issue of GMOs in the international debate from the viewpoint of biosafety, and make a link with the precautionary principle. The foundation for this is laid in Article 19, paragraph 3 of the Convention text:

"The Parties shall consider the need for and modalities of a protocol setting out appropriate procedures, including, in particular, advance informed agreement, in the field of the safe transfer, handling and use of any living modified organism resulting from biotechnology that may have adverse effect on the conservation and sustainable use of biological diversity."[13]

Following on from Rio and from this paragraph, there begins a complicated round of negotiations which ultimately leads to the passing of the Cartagena Protocol in the year 2000. A protocol is a legally binding international agreement that is attached to another treaty (the CBD in this instance) and makes reference to it. It must be negotiated separately and is only binding upon the states that also sign the protocol.

The negotiations over the Cartagena Protocol were arduous, controversial, and highly instructive. The largest agricultural export countries (with the exception of Brazil) had come together in the Miami Group to fight any restrictions on trade in GMOs. Although the Protocol's character as a compromise is plain to see, it nevertheless succeeded in staking out several important cornerstones that are fundamental for global environmental policy. Crucial factors in the achievement of these results were intensive lobbying by NGOs and the mobilisation of protests against the World Trade Organization (WTO), which reached their peak in Seattle in 1999. Seattle helped to force the WTO into a severe crisis of legitimation, which paved the way to pass a significant protocol within the framework of the CBD. After all, the relationship to other trade agreements, and particularly to the WTO, was a key question: ultimately, regulating the international trade in GMOs was the Cartagena Protocol's primary concern.

Without going into the complex technical details, the following points are the Protocol's highlights:

- The Protocol established "prior informed consent" as the basis of international trade in GMOs. The burden of information rests with the exporting country. Thus, GMO exports must be identifiable; the recipient country must be informed about them, i.e. that it is receiving not just soya but genetically modified soya. The much discussed instrument for this is called AIA – Advanced Informed Agreement.
- The Protocol refers clearly to the precautionary principle, describes it, and thus gives national governments the option of restricting the import of GMOs in order to avert risks.
- The provisions of the Protocol make it a requirement for national governments to develop their own regulations on biological safety. It thus creates an international framework and a starting point for national policies to regulate GMOs under the aspect of biological safety. This is a clear success *vis à vis* the genetic engineering industry.
- The Cartagena Protocol takes priority over the WTO and cannot simply be overridden by WTO provisions – at least, that is how the Protocol can be interpreted. Unfortunately the relevant passages are not so unequivocal as to rule out different interpretations. In any case, most analyses of the Cartagena Protocol agree that it at least builds up a strong position in relation to other trade agreements.[14]

13 https://www.cbd.int/convention/articles/default.shtml?a=cbd-19.

14 Good overviews of the complex relationship between the WTO and the CBD can be found here: http://shodhganga.inflibnet.ac.in/bitstream/10603/49080/14/9_chapter4.pdf or http://www.sawtee.org/Research_Reports/R2005-05.pdf.

After Rio, disputes over genetic engineering and its products (GMOs) heated up | Photo: public domain

3.2 From Cartagena to Nagoya

Another milestone in the development of the CBD was the adoption of the Strategic Plan in The Hague in 2002, which was confirmed at the UN+10 Summit held in Johannesburg in the same year. The strongly and clearly worded document proclaims the central strategic aim of achieving a significant reduction in biodiversity loss by 2010.[15]

In the following years, the reference to this strategic aim proved to be ambivalent. On the one hand, the clearly articulated and comprehensible aim greatly facilitated better communication about biodiversity and the Convention's main concerns to a broad public. What is more, it is an aim that has never really been disputed. On the other hand, however, this broad consensus was also fateful. For naturally, it had to be conceded at the COP in Nagoya, Japan in 2010 that the main objective from 2002 had not been achieved. Once again, this left the CBD – in keeping with the UN system as a whole – looking like a "toothless tiger", making policy announcements but not following through. In fact the CBD does not provide for sanctions in the event that objectives are not achieved; the Convention is not a sanctioning mechanism but more of a motivating mechanism.

The failure of the Strategic Plan of 2002 made it necessary to draft a new one, which laid the foundation for the resolutions of Nagoya. 2010 would thus become a new key year for international biodiversity policy. The COP in Japan passed two documents which remain fundamental to this day: the Aichi Targets and the Nagoya Protocol.

The 20 Aichi Targets give the CBD a manageable and clearly articulated horizon for action. Even if targets like "mainstreaming biodiversity" remain fairly hazy, the Aichi Targets also contain a few numbers and quantified targets, which often draw greater attention than other parts of the document. The target of halting the loss of biodiversity is renewed for 2020. According to Aichi Target 11, by 2012 at least 17 per cent of terrestrial and inland water areas and 10 per cent of coastal and marine areas should be conserved through effective protected areas. Aichi Target 5 states that the rate of forest loss is to be halved by 2020 and reduced to zero where feasible. Also of note is the demand for the abolition of all subsidies that harm biodiversity.

These very concrete targets have also earned the Aichi Targets a good image in the international NGO community. Generally – and bearing in mind that they are a product of negotiations and compromises – they are seen as a highlight of international processes and picked up as a positive reference point. The question is not so much whether the Aichi Targets are adequate or appropriate, but whether and how their implementation is progressing.

The second important outcome of the 2010 Conference of the Parties to the CBD in Japan was the adoption of a further protocol. Its official name is somewhat off-putting: "The Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization to the Convention on Biological Diversity". That is why it is often referred to more snappily, but not necessarily correctly, as the Protocol on Biopiracy or by the abbreviation ABS, which succinctly expresses its core concern: access and benefit sharing.

The aim of the Nagoya Protocol was to take up and concretise important provisions of the convention. Pains were always taken to consider very diverse interests: the interests of transnational corporations and of the governments of the North which often supported their efforts to access the genetic resources of the South, the interests of the countries of the South in participating in the use of these resources (both for research and commercially), and the interests and rights of indigenous peoples and traditional communities who should be

15 "to achieve by 2010 a significant reduction of the current rate of biodiversity loss at the global, regional and national level as a contribution to poverty alleviation and to the benefit of all life on earth."
http://www.wwf.de/fileadmin/fm-wwf/Publikationen-PDF/Erhalt_der_biologischen_Vielfalt.pdf

The Nagoya Protocol or "Who gets what?"

Under this title, in 2012 the Church Development Service (EED) of the Protestant churches in Germany published an excellent analysis of the Nagoya Protocol, which also gives an overview of the complicated details of the ABS complex. Its summary reads:

"An overall assessment of the Nagoya Protocol must be less than flattering. In large part, what the international community resolved with great pomp in Nagoya goes no further than the obligations already contained in the CBD. The concept of 'use' has been distinctly restricted by definition, since it now only includes research and development. The developing countries have succeeded, however, in bringing the use of all components of a genetic resource under the rules of the Nagoya Protocol. They have likewise succeeded in getting the actual phase of value creation – commercialisation – covered by the regulations on benefit sharing. Incomprehensibly, this does not apply to the use of genetic resources by indigenous peoples and local communities. This and other shortcomings of the Protocol are grave." (p. 26, own translation from German source)

https://www.brot-fuer-die-welt.de/static/shop-eed/EED_Nagoya_Protokoll_2012_deu.pdf

The fact that the ABS approach also contains elements that local communities can latch onto is shown by the work of Natural Justice. A good overview with examples of how local communities can utilise ABS can be found here:

http://naturaljustice.org/wp-content/uploads/2015/09/Access-and-Benefit-Sharing.pdf

http://www.community-protocols.org/

permitted to share in the benefits arising, e.g. from the development of medicinal plants. Given the collision of such diverse starting points and complexes of interests, a unifying protocol is a difficult undertaking, as can easily be imagined. The adoption of the Protocol happened in spite of this, since the Japanese management of the negotiations was intent upon avoiding a "second Copenhagen" – i.e. the spectacular failure of the climate negotiations in the Danish capital in 2009 – at any cost, and bulldozed through a text negotiated in a small committee format. Despite its unavoidable character as a compromise, the Protocol contains sufficient positive elements to be approved by the overwhelming majority of the international NGO community as an important step towards the recognition of indigenous rights. The then WWF Secretary General, *Jim Leape*, for instance, refers to the Protocol as a historic success.[16] However, any unduly euphoric assessment should be tempered with reasonable doubts. For while the Nagoya Protocol sets out a legal framework for the ABS complex, the extent to which this really results in safeguarded rights and effective sharing of benefits can only be proven in practice. Initial experiences show that the Convention and Protocol present organised indigenous peoples and traditional communities with an instrument which enables them to claim their right to have a say and to share in the benefits when knowledge and "resources" are utilised. What it cannot do is dismantle extremely asymmetrical relationships: while indigenous communities often supply the underlying raw material for what is subsequently marketed as an end product, the development of a medicine, for example, from plant to market launch is so complex and costly that their capacity to influence this process remains marginal.

3.3 The CBD intervenes: new and emerging issues

In the year 2000 the CBD adopted a moratorium on genetic use restriction technology (GURT), better known as terminator technologies: these denote a development in genetic engineering that makes crop seeds infertile. This prevents the "unauthorised" distribution of patented seeds by producers and embeds the property

Tomato diversity: the Nagoya Protocol is to regulate the access to and utilisation of genetic diversity | Photo: IBVderBLE (© BY-SA 3.0)

16 https://www.welt.de/wissenschaft/article10624452/Artenschutzkonferenz-feiert-historisches-Ergebnis.html

A view biased purely towards CO_2 not only leads to wrong analyses of problems, but also to the wrong kinds of solutions | Photo: Zappys Technology Solutions (CC BY 2.0)

rights of seed firms in the genetic structure of the seeds themselves. The moratorium had been preceded by a recommendation of the CBD's Subsidiary Body on Scientific, Technical and Technological Advice (SBSTTA) and an intensive information and public relations campaign by NGOs, with the ETC Group leading the way. GURT technology is an instructive example when it comes to spelling out the potential and the limitations of the CBD.

Critical voices in civil society certainly have the potential to exert influence within the CBD. An important new avenue has proved to be the possibility of submitting proposals for themes to the SBSTTA under the heading of "new and emerging issues". This can also be done by NGOs. Fundamental to this is the Convention's relatively broad approach in terms of content, since it not only aims to maintain the genetic diversity of nature, but also that of crop plants, and traditional knowledge about this diversity. The embedding of the precautionary principle in the CBD is another important starting point for critical debates. In the discussion about GURT technology, civil society also managed to come up with an effective epithet ("terminator") that encapsulated a complex question in an attention-grabbing way, and thus to enable a broad debate. The existence of the SBSTTA means that there is a body to which demands can be addressed. Recommendations from the SBSTTA certainly carry weight, because they have to pass through a double-eyed needle: i.e. both an evidence-based scientific review and a majority vote on a UN committee. The most important finding from the discussion over GURT technology, however, is that a moratorium imposed by the CBD need not be a toothless tiger – on the contrary: the moratorium has lasted to this day, and has probably been a lasting impediment to the development of terminator technologies, if not blocked them altogether. The *de facto* moratorium adopted in 2010 is binding upon the States Parties, but without sanction mechanisms. The big problem is, of course, that the USA does not number among the States Parties. Nevertheless, the moratorium resolution has proved effective: corporations based in the USA could still develop and test the technology in the USA, but with little hope of exporting it.

The CBD adopted a second, far-reaching moratorium on the theme of geo-engineering at the 2010 Conference in Nagoya. *"Deliberate and large-scale manipulation of the planetary environment to counteract anthropogenic climate change"*[17] is the short and succinct definition from the Royal Society (2009).

Within the framework of international climate science, geo-engineering techniques have become more and more publicly acceptable in recent years. The majority of IPCC scenarios now make the assumption that forms of geo-engineering (in the sense of "negative emissions technologies") are unavoidable in order to achieve the global targets on climate change, namely to keep global temperature rise to below 2° or 1.5°. Once again it can be seen as a great achievement of the CBD and the NGOs actively working on this issue that complexity and the precautionary principle are not immediately sacrificed for the sake of an unconditional struggle against climate change. Nevertheless, the CBD decision on geo-engineering is indicative of clear weaknesses which are accounted for by conflicts within the States Parties. Among other things, it provides for exceptions for "small scale scientific research". Moreover, the decision supplies no binding definition of geo-engineering, probably because it could have far-reaching practical consequences. The decision's greatest weakness, however, is that in the view of many geo-engineering advocates (especially those on the research side), it does not constitute an actual moratorium but only a request to the governments. Thus, from a climate policy perspective there is a governance loophole and a justified concern that geo-engineering projects might take place in spite of CBD resolutions. Not only would this have geopolitical consequences,

17 The CBD's provisional definition is more complex: "Without prejudice to future deliberations on the definition of geo-engineering activities, understanding that any technologies that deliberately reduce solar insolation or increase carbon sequestration from the atmosphere on a large scale that may affect biodiversity (excluding carbon capture and storage from fossil fuels when it captures carbon dioxide before it is released into the atmosphere) should be considered as forms of geo-engineering which are relevant to the Convention on Biological Diversity until a more precise definition can be developed." https://www.cbd.int/climate/geoengineering/

but it also harbours substantial risks for people and ecosystems.

The two CBD moratoria show possibilities and potentials of the Convention in key issues of global environmental policy. These rely not only on the CBD's insistence on the precautionary principle but also on its substantive orientation. By making the conservation of nature's diversity its objective, the CBD sets itself apart from all policy approaches that are geared more towards the "engineering" of nature. The victory march of genetically modified organisms in agriculture is causing nature to be irretrievably altered. Much to the credit of the CBD, at least this has now been named as a problem. In addition, the CBD is one of the few components of global governance in which regulatory approaches have been discussed and even put into practice to some extent.

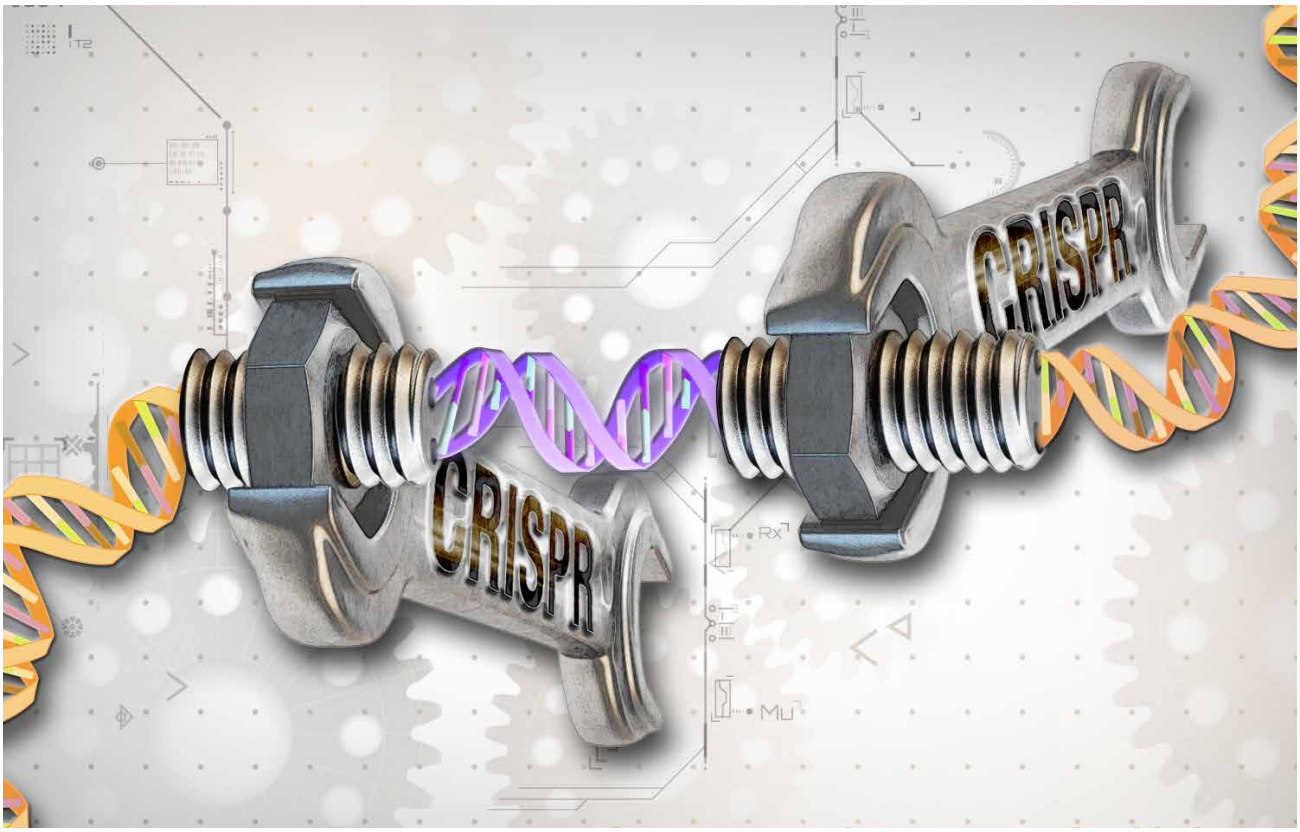
The CBD also gains political impact because its approach of conserving natural biodiversity stands as an opposing pole – in part, at least – to the triumphal march of climate change as the dominant global environmental problem. As justified as the anxiety about hazardous climate change is, the urgency of the situation must not be allowed to justify the use of any and every means – irrespective of their social and environmental implications – in the struggle against global warming. A view biased purely towards CO_2 not only leads to wrong analyses of problems, but inevitably also to the wrong kinds of solutions.

In this way the CBD's fundamental approach is repeatedly and increasingly clashing with climate policies. Climate targets are also meant to be achieved by making changes to land use in the global South – biofuels being a fundamental example of this. Despite any amount of global environmental rhetoric, the cultivation of energy crops is expanding and the consequences for the environment, biodiversity and food security in the countries of the global South are becoming ever more clearly evident. The destruction of Indonesia's forests and conversion into palm oil plantations are one example of this. In the EU, the quantity of palm oil, which is added to diesel, rose sevenfold from 2010 to 2014: it reached 3.2 million tonnes. 45 per cent of the palm oil used in the EU is burned in car engines.[18] And this is only happening so that the automotive industry can improve its CO_2 balance sheet without having to trouble itself with environmental criteria (vehicle size and weight) other than CO_2 consumption. In this light, it seems justified to doubt whether blending palm oil with fossil fuels is an effective contribution to climate change mitigation.

The current approaches to climate policy favour the large-scale cultivation of crops for the production of "biofuel" with supposedly low emissions, a trend that can only be exacerbated by the rising use of biomass to replace plastic and other products. The announced and actively pursued decarbonisation of the economy means doing a lot more than replacing fossil fuels. Around 10 per cent of global crude oil extraction goes into the chemical industry as a basic raw material. This, too, would need to be largely replaced by the use of biomass (a "renewable resource"). Bioeconomics is the banner under which these strategies are being discussed and developed. Climate policy and bioeconomics are becoming an ever more important factor for the dynamics of land use, and are increasingly coming into conflict with the objective of conserving biodiversity and upholding the rights of people whose lives and livelihoods are intimately bound up with biodiversity. This development gives the CBD pivotal strategic significance when it comes to determining basic questions about future developments.[19]

18 The figures are based on a study published in 2016 by NABU and Transport and Environment. An overview of the study can be found here (in German): http://www.spiegel.de/auto/aktuell/biokraftstoffe-europa-giert-nach-palmoel-a-1094940.html

19 A short introduction to the bioeconomics complex with further reading can be accessed here (in German): https://www.fdcl.org/publication/2015-11-01-biomasse-fuer-die-green-economy/



Gene scissors: going back over evolution with an eraser? | Photo: public domain

4 On the path to Cancún – contention surrounds synthetic biology

New forms of genetic engineering have become an important theme of the current debate within and in the context of the CBD. The rapid development of gene-based technologies has revived the old dispute about their dangers but also added to its complexity. Despite the vigour of the discourse among experts, it is difficult for the broader public to keep up with the pace of development. And companies are sensing the opportunity to evade old regulations with new technologies.

Genetic engineering, meaning human-wrought modification of the genetic structure of living organisms, is currently going through a revolutionary change. The consequences can barely be assessed because it is almost impossible to distinguish between researchers' fantasies, propaganda to mobilise financial support, and real trends and their implications. These new technologies not only promise revolutionary advances in medical research, but are also of decisive importance for the future of agriculture and other forms of land use: organisms modified and brought into being using innovative technologies are ever more prevalent in global agricultural production, and the new technologies have the potential to accelerate this process immensely. The subject is complex, and all that will be attempted here is a brief survey of current developments and the associated debates.

The new methods of genetic engineering differ distinctly from "classic" genetic engineering and are generally summed up under the heading of "synthetic biology", or "synbio" for short. The designation "extreme genetic engineering" is also used on occasion. According to *Christoph Then* the new methods can be characterised as follows:

- *"DNA no longer has to be isolated from living organisms but can be synthesised de novo in the laboratory.*
- *The structure of the DNA is no longer dependent on natural templates but can be edited on the computer or assembled from templates of various kinds.*
- *In some cases no DNA need be transferred; instead, the genetic material can be edited directly into the cell."* (Then, p. 144; own translation from the German source)

Two developments in this field merit special attention.

4.1 CRISPR – the gene scissors

"CRISPR is turning everything on its head" proclaims *Bruce Conklin*, one of the highest-profile geneticists in the USA.[20] Indeed, the CRISPR literature is rife with revolutionary rhetoric. The world of research is enthusiastic and electrified.

CRISPR stands for "clustered regularly interspaced short palindromic repeats" and denotes regularly repeated sequences of DNA. CRISPR-Cas9, in turn, is a scissor-like tool with which DNA strands can be cut in order to isolate genes or introduce mutations. The snappy and intuitive acronym CRISPR has also become established as the name of the CRISPR-Cas9 gene scissors. CRISPR is so revolutionary because it is accurate, simple and cheap. Moreover, the industry argues that CRISPR is not subject to regulations on genetic engineering because no genes from one organism are being implanted into another. CRISPR does the same thing as natural mutation but more quickly and effectively, so the propaganda proclaims.

One current debate effectively illustrates the possibilities and risks. CRISPR could be used, for instance, to swiftly wipe out the Zika virus vector *Aedes Aegypti* on the American continent; perhaps by manipulating the mosquito gene sequence in such a way that only male offspring are produced. Based on the rapid succession of generations in mosquitoes, the population would be eliminated in next to no time. CRISPR and similar technologies are referred to as "genome editing" and the accelerated mutations facilitated by this process are known as "gene drives". They are also characterised as the "turbo for evolution".[21] With gene drives it is now possible to go back over evolution, as if with an eraser, and simply eradicate disfavoured species. Many researchers are fascinated by this prospect, others are horrified. Nature conservation arguments are also cited: gene drives are capable of combating invasive species and protecting threatened species.[22] But what if the mutations provoked by CRISPR happen to cross over into other species? And mosquitoes are not just pests for human beings but also food for animals. What consequences might the eradication of a species have on ecosystems and the interaction between species? But the eradication of a single species is only a start: gene drives can restructure entire ecosystems (re-engineering).

Of course, the eradication of species is only one of the many possible applications of genome editing. Essentially there are no limits on the manipulation of genetic material: thus, it can also be used to modify the human genome. The way in which genome editing with CRISPR differs from classic genetic engineering is that the induced modifications cannot be distinguished from natural mutations. The differences lie in the process and cannot be discerned in the "product", the modified organism (or alternatively in the substances that a synthetic-biology organism produces – which is described further below).

The new, fast-paced developments surrounding CRISPR point up two key questions in the debate surrounding regulation in the context of the CBD. On the one hand, genetic engineering needs to be defined so as to include (or exclude) new technologies. On the other hand, a critical question is to what extent products (GMOs or LMOs in the language of the CBD) or processes are regulated. If "products" can no longer be distinguished from organisms occurring in nature, then regulation addressed only to the product will come to nothing.

4.2 Synthetic biology – making nature new and different

Although neither the concept nor the field of research are clearly delineated or defined, the aim of synthetic biology (or synbio, for short) is to develop "biological systems", i. e. life forms, which do not occur in that form in nature. And elements of nature are to be utilised for designing the new life forms. Engineering techniques are being transferred to nature: for example, bacteria can be transformed into small "biological factories". Scientists from various disciplines are working together to develop biological systems with new, defined traits. In this process the systems may not only be artificially generated or replicated, but creatively formed and enhanced with components that have never occurred in nature in this form. *"In summary, synthetic biology can be defined as the design and assembly of synthetic biological entities, which not only strives to modify some of the characteristic traits of an organism but deliberately works towards creating new systems whose properties are primarily human-designed."* (own translation from German source). This is how the German Research Association (DFG)[23] attempts to describe the intentions of synthetic biology. To put it another way, synthetic biology aims to create artificial lifeforms for industrial use. Whilst CRISPR operates within the genome with cutters, synthetic biology sets out to assemble new life-

20 http://www.spektrum.de/news/gentechnik-crispr-erleichtert-die-manipulation/1351915
21 http://www.sueddeutsche.de/wissen/eingriff-ins-erbgut-die-gene-die-ich-rief-1.2867148
22 More about this at: https://www.scientificamerican.com/article/harnessing-the-power-of-gene-drives-to-save-wildlife/
23 http://www.dfg.de/dfg_magazin/forschungspolitik_standpunkte_perspektiven/synthetische_biologie/index.html

forms from scratch, Lego-brick style. On the one hand, synthetic biology denotes a specific area of the new gene-based technologies ("synthetic biology in the narrower sense"[24]); on the other hand, the term is also used to mean the entire domain of new gene-based technologies.

The risks are the same as for "classic" genetic engineering. At present, the impacts of releases of synbio organisms on natural biodiversity have not been ascertained and no protection has been put in place against unintentional release. For its part, the industry argues that products of synthetic biology are not GMOs but a material identical to the natural products. This debate is no longer pie in the sky: Evolva has already developed synthetic vanillin and Cargill will very shortly launch a synbio stevia sweetener onto the US market – EverSweet is the brand name. A revealing aspect is how Cargill plans to label the product: as "non-GMO stevia".

The introduction of synbio products has massive and sometimes unpredictable consequences for land use. The products of farmers (stevia and vanilla are predominantly produced on family farms) are being replaced by laboratory products that are developed and patented by firms.[25]

One of the most hopeful fields of research in synthetic biology is the production of biofuels on the basis of any kind of biomass (particularly wood, but in future also methane from natural gas extraction) by employing biosynthetically made enzymes. The new biotechnologies will dramatically extend human capabilities to rearrange nature. In contrast to traditional techniques of plant breeding, the phenomenal speed of the rearrangement makes a huge difference. A key aspect of this is the digitalisation of genetic codes. If regulations

Soon just a digital database? The Svalbard Global Seed Vault on Spitsbergen | Photo: public domain

Big data

Great strides are being made in the digitalisation of genetic information, and this is a beacon of hope for the transnational corporations. The world's leading agricultural institutes have joined forces in the DivSeek project. Ed Hammons explainsits purpose: *"The aim of DivSeek is to link and facilitate the use of digital databases that will eventually store the genomes of hundreds of thousands of seed varieties. These databases will also contain information about crop wild relatives and about the characteristic traits of the plants. In combination with synthetic biology methods such as gene synthesis and genome editing, these digital genetic resources can be used to select, reproduce, modify, and utilise key genes – without having to physically transfer genetic material of any kind. This could enable seed companies to access genetic resources without making access and benefit-sharing (ABS) agreements. ABS rules are intended to ensure on an international level that countries in which genetic resources are located or found are compensated for the use of the resources and knowledge relating to them. They are enshrined in various conventions under the auspices of the United Nations, principally in the Nagoya Protocol to the Convention on Biological Diversity (CBD) and in the International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGRFA) of the Food and Agriculture Organisation (FAO). Projects like DivSeek might give companies a way of circumventing these rules."*

Excerpt from the German article "Big Data entdeckt das Saatgut": http://www.gen-ethisches-netzwerk.de/GID/236/hammond/big-data-entdeckt-saatgut. More on this issue in English at http://www.twn.my/announcement/digital_genebanks_final_uslet.pdf.

24 *"Synthetische Biologie im engeren Sinne"* is the linguistic convention used by the Office of Technology Assessment at the German Bundestag (TAB), which has presented a comprehensive report on synthetic biology (in German): https://www.tab-beim-bundestag.de/de/pdf/publikationen/berichte/TAB-Arbeitsbericht-ab164.pdf

25 More on EverSweet and its ramifications: https://www.boell.de/en/2015/11/12/bad-bet-synthetic-biology

Synthetic biology – critical voices

"We are walking forwards blind. We are opening boxes without thinking about consequences. We are going to fall off the tightrope and lose the trust of public."
Gene drive developer *Kevin Esvelt* (MIT)

"The project of deliberately exterminating species is a crime against nature and humanity. Developing tools of extermination in the garb of saving the world is a crime. A crime that must not be allowed to continue any further."
Dr Vandana Shiva, India

Both quotations and more here: http://www.etcgroup.org/content/reckless-driving-gene-drives-and-end-nature

cannot be imposed and brakes applied now, there will be little or no further chance of controlling undesirable developments.

4.3 Synthetic biology and the CBD

For critical civil society groups, the debate about synthetic biology is therefore a central point in their preparations for the Cancún Conference of the Parties. In fact, the CBD is one of the few international arenas in which questions about the new gene-based technologies are vigorously debated. A first, initially modest-seeming expectation upon the CBD is that it should contribute to the clarification of concepts. The field of conflict presented by the new gene-based technologies and synthetic biology is baffling, and the relevant questions of definition are of eminent political significance, because upon them depends the decision as to how far new technologies fall under existing regulations.

The CBD has dealt with the theme of synthetic biology previously, in 2014 at COP 12 in South Korea, where it made what was viewed by NGOs (in this case ETC Group) to be a landmark decision. *"Synthetic Biology has been like the wild west: a risky technology frontier with little oversight or regulation"*, in the words of *Jim Thomas* of ETC Group during the CBD negotiations in Korea. *"At last the UN is laying down the law."*[26]

The most important success in Korea was that the CBD's decision reinforced the precautionary principle, on the one hand, and postulated the urgency of national regulation, on the other. Owing to intensive resistance from countries which view synthetic biology more positively (mainly because they host the headquarters of major agribusiness corporations), a moratorium that 111 civil society organisations had called for in a declaration could not be agreed.

To continue with work on the issue, an Ad Hoc Technical Expert Group on Synthetic Biology was established and a draft resolution on the subject prepared for the Cancún COP. Its proposed definition of "synthetic biology" is repeated in the recommendation of the SBSTTA and will therefore be brought into the plenary at the COP in Cancún. *"...synthetic biology is a further development and new dimension of modern biotechnology that combines science, technology and engineering to facilitate and accelerate the understanding, design, redesign, manufacture and/or modification of genetic materials, living organisms and biological systems".*

The decision about this definition remains controversial, however; it comes to the plenary with brackets, i.e. with proposals for alternate wordings or deletions.[27]

One key expectation upon the CBD Conference in Cancún is that this broadly framed definition of synthetic biology be retained, because it then also covers

New dispute over genetic engineering that denies what it is

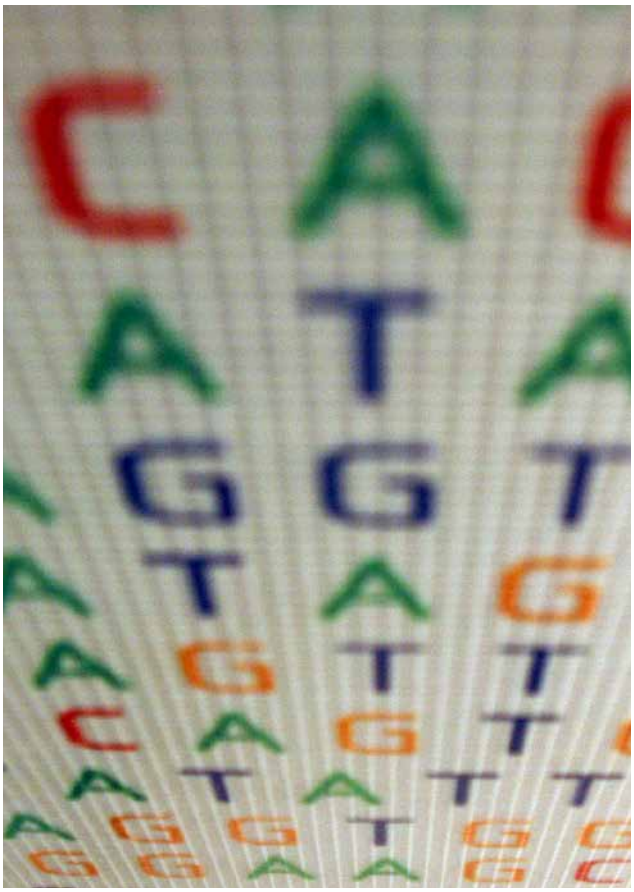
Conflicts over the assessment of new gene-based technologies in the context of livestock and plant breeding are not fought out in the CBD alone, of course, but have also flared up within the EU. And they are already revolving around concrete questions of authorisation. In February 2015 the German Federal Office of Consumer Protection and Food Safety (BVL) certified that an oilseed rape variety produced by means of genome editing was not genetically engineered in the sense intended by Germany's Genetic Engineering Act. In the USA and Canada, Cibus oilseed rape has already been authorised like any conventionally bred variety. In Germany, the Gene-ethical network *(Gen-ethisches Netzwerk)* and other groups have lodged a complaint against possible authorisation; a decision from the EU Commission is awaited.

If plants bred on the basis of genome editing were to be placed on an equal footing with those bred conventionally, this would open up entirely new perspectives for gene-based technology. So at the moment, questions of definition are of eminent political significance. A CBD definition would not necessarily be binding for national governments but could have an important signal effect.

A short overview of the debate by *Christoph Then* is found in the *Kritischer Agrarbericht 2016* (Critical agricultural report; in German): http://www.kritischer-agrarbericht.de/fileadmin/Daten-KAB/KAB-2016/KAB2016_Kap9_277_282_Then.pdf

More on the debate and on the positioning of civil society here (in German): http://www.abl-ev.de/themen/gentechnikfrei/hintergruende-positionen.html

26 http://www.synbiowatch.org/2014/10/regulate-synthetic-biology-now-194-countries/
27 Edward Hammond provides a good overview of the complicated nature of the negotiations here: http://www.twn.my/title2/susagri/2016/sa501.htm



Knowledge about genes: key to the future? |
Photo: Stefano (CC BY-SA 2.0)

new developments and does not exclude them from existing regulations. Such a definition in the context of the CBD can also become an important reference point for national and regional regulations. It is crucial that the definition and amendments to the definition clearly state that the field of genome editing as well as technologies like CRISPR could be included under this definition, and hence could be subject to the provisions of the Cartagena Protocol. A more extensive demand is to impose a moratorium on the release of any organisms modified by means of gene drives.

Civil society has addressed clear demands to the CBD regarding the regulation of synthetic biology: all products of synthetic biology should fall under the Cartagena Protocol on Biosafety's provisions for GMOs. Furthermore, four central elements should guide the decisions of the CBD:

1. application of the precautionary principle;
2. consideration of the relevance of living and non-living components and products of synthetic biology;
3. their impacts on the three objectives of the CBD, and
4. finally, consideration of all direct and indirect effects.[28]

28 Cf. the statement by Helena Paul and Silvia Ribeiro in: http://www.cbdalliance.info/en/wp-content/uploads/2016/04/SQUARE-BRACKETS-MAY-2016.pdf
"While the discussion within the CBD proceeds, it is vital to ensure that existing mechanisms and regulations that apply to Synthetic Biology are not overlooked. Living organisms derived from Synthetic Biology should be defined as LMOs according to the definition of the Cartagena Protocol on Biosafety and thus fall under its scope and obligations. They must also come under the scope of the CBD, especially with regards to socio-economic impacts. Should they not fall under the definition of the Cartagena Protocol, the use of such organisms should be prohibited until regulation is in place that would ensure that no such organisms would be used or released that could lead to severe negative impacts on biodiversity, livelihoods, food security, also taking into account human health. Finally, CBD deliberations on this topic should be guided by four central elements: the precautionary principle; the relevance of both living and non-living components and products of synthetic biology; the potential impacts of organisms, components and products on the three objectives of the Convention and the obligations of the Parties to the Convention; and, finally, consideration of indirect as well as direct effects, also taking into account full life cycle analysis."

5 Mainstreaming biodiversity or the quest for quantifiable nature

"Mainstreaming biodiversity" has been a central concern of the CBD for many years, and is back on the agenda for Cancún. The idea of mainstreaming is broadly used but indistinct and therefore tends towards a certain arbitrariness, because it can subsume anything at all, from school materials to the establishment of national parks to economic calculations.

A key aspect of the current debate around mainstreaming, however, is the question of how, going beyond the standard rhetoric, biodiversity can be integrated into political and economic decisions in reality. An event on this subject at COP 12 in South Korea yielded informative answers. "Ministers of Finance want facts. They want numbers. They want to know how much you will receive out of this or that investment," said *Carlos Manuel Rodrigues*, former Costa Rican environment minister and Senior Vice President of Conservation International on that occasion. *"When I learned that they speak in numbers – I talked to them in that way."*[29]

The mainstreaming endeavour is directly related to Aichi Target 2 which states that "biodiversity values" are to be incorporated into national accounts by 2020. However, that would require access to the figures, because to achieve effective mainstreaming, there needs to be a way of capturing biodiversity – and hence nature – in terms of numerical data. The hope is that quantifying nature will get it ready for integration into the economic system, and integration will then proceed. From this perspective, the quantification of biodiversity and nature becomes the main focus of mainstreaming – and of the argument over the monetisation of nature.

The CBD and other actors of the UN system have become increasingly and more explicitly committed in recent years to the "natural capital approach" and "natural capital accounting". A Technical Report of the Secretariat of the CBD, published in 2014, gives a good overview of the current trends in the development of natural capital accounting. In the introduction, it says: *"The fact that 'natural capital' is often overlooked is one of the main causes of biodiversity loss. Thus, in order to halt and reverse biodiversity loss, it is essential that decision-makers recognize the values that ecosystems and biodiversity provide, in order to guide policy towards sustainable development and prosperity for present and future generations. Integrating biodiversity into measurement frameworks, in particular into national accounting, is a critical precondition for achieving such recognition."* [30]

This line of argument has already become a kind of mainstream itself: nature is being destroyed because its value is neither being recognised nor integrated into political and economic decisions. It follows that natural capital's invisibility has to be overcome. Of course, companies and their managers are not simply uneducated fools who do not know that our lives, and hence their businesses, depend on a halfway "functioning" natural environment. But this abstract insight is not being followed through in practice because the "services" cannot be incorporated into accounting in a quantified form. If there is any truth in the old management axiom that "if you don't measure it, you can't manage it", then measurement really is the first and sacred duty if mainstreaming is to be accomplished.

Quantification of nature is not a theoretical or rhetorical postulate but a process on which substantial implementation work is taking place. In this regard, it would be wrong to look only at the contentiously debated "monetisation of nature". Under the System of Environmental Economic Accounting (SEEA), considerable methodological efforts are being made within the framework of the UN system to drive forward the biophysical quantification of nature. SEEA is explicitly based on the UN-developed SNA – System of National Accounting, which (since 1953) has been the methodological basis for national accounting systems, and most notably for the calculation of gross domestic product (GDP). Hence, national GDP calculations have been based on one common methodological foundation worldwide since 1953. The GDP that is such a familiar indicator today is a relatively recent phenomenon and the result of an arduous process. SEEA is now the endeavour to systematise statistical data and indicators which capture the interaction between economics and the environment and the state of ecosystems. It is not initially proposing to create a standard measurement unit.[31]

29 'We must talk the same language they talk.' http://www.biodiversityfinance.net/news/talk-talk-finance-ministers-understand-unlock-funds-biodiversity-experts-say

30 https://www.cbd.int/doc/publications/cbd-ts-77-en.pdf

31 "The SEEA is a system for organizing statistical data for the derivation of coherent indicators and descriptive statistics to monitor the interactions between the economy and the environment and the state of the environment to better inform decision-making. The SEEA does not propose any single headline indicator." http://unstats.un.org/unsd/envaccounting/seea.asp

First count nature … | Photo: Sasata (© BY-SA 3.0)

The approach is now being taken forward via the "experimental ecosystem accounting" approach. The biophysical quantification of the SEEA is not synonymous with monetisation, but represents a comprehensive, global approach to making nature quantifiable and comparable.

It will then be equally possible to count fish stocks or cubic metres of wood in forests or the capacity of plants to store CO_2. The fundamental limitation on biophysical quantification arises from the different measurement units used for calculation: wood stocks are expressed in m^3, fish stocks in tonnes or by census counts of different species, and the storage capacity of plants in tonnes of CO_2. But obviously a tonne of fish is not comparable with a tonne of stored CO_2.[32] Even greater difficulties arise in the calculation of "ecosystem services" such as water filtration. Nobody disputes that the quantification of nature (and its services) is difficult and highly complex, but the process is being driven forward nevertheless. The technical report mentioned above proposes the introduction of a standard calculation unit named the "ecosystem capability unit" (ECU). The ECU would serve as a standardising biophysical measurement unit that expresses direct and indirect influences on the state of ecosystems (e.g. pollution or biodiversity loss). The unit of measurement is not convertible into a monetary unit; it is a biophysical measurement unit, which would already be a major step towards capturing nature numerically and thus introducing it into the language that politics and markets supposedly understand. A standardised biophysical quantification system may make it easier to implement mitigation schemes and "biodiversity offsetting" (see Infobox). So when debating the natural capital approach, looking solely at the monetisation of nature would be a blinkered view; other forms of quantification are also far-reaching and controversial.

Nonetheless, the question that arises is how "natural capital" can possibly be incorporated into national accounting systems without monetisation. The possibility of "ecosystem accounts" with monetary valuation is being vigorously pursued by the World Bank-led programme, WAVES – Wealth Accounting and the Valuation of Ecosystem Services, a programme aimed expressly at the monetary valuation of ecosystems. For instance, the stated aim of a pilot programme in Peru (EVA) is to measure the flows of ecosystem benefits, which requires "analysis, mapping and monetary valuation of ecosystem services in a way that is consistent with national accounting."[33]

This brief look at current developments in the economic valuation of nature reveals the fundamental approach – and hence the fundamental problem: it attempts to integrate nature into an economic logic – not vice versa. The system of national accounting is pivotal, and the challenge is to capture nature in such a way that it fits into that system. The paradigmatic significance of this approach can hardly be overstated. It rests on the (barely questioned) assumption that nature is (perhaps not completely, but largely and meaningfully) quantifiable and can be captured in economic categories. Quantified nature is, of course, a social construct, and can still only capture the part that is quantifiable. As a matter of fact, many "ecosystem services" are relatively easy to quantify and monetise. Foremost among these is the quantification of CO_2 storage in trees and other plants. And since (mitigated) CO_2 already has a price, monetisation is easily possible even if methodological questions remain a matter of dispute. But other "services of nature" are not so easy to quantify, especially not the significance of biodiversity. Individual species, for instance, cannot meaningfully be assigned a monetary value, and undiscovered species even less so. The economic valuation of nature must first construct a view

32 "Of note is that, unlike monetary flows which are measured in currency units, physical flows are generally measured in different units depending on the material. Thus, while it is conceptually possible to compile a complete PSUT for all material flows in an economy using a single measurement unit (e.g. tonnes), it is not usual practice". (SEEA 2012, 2.47)

33 "One of its main goals is to pilot the development of Ecosystem Accounts – the measurements of flows of ecosystem benefits into the economy, which requires analysis, mapping and monetary valuation of ecosystem services in a way that is consistent with national accounting." https://www.wavespartnership.org/en/ecosystem-values-assessment-accounting-project-peru

of nature that can be economically valued; in the end, then, all that counts is what is countable.

A further aspect of economic valuation is central and problematic: the destruction of biodiversity is ultimately framed as an information and communication problem. Ecosystem services, thus the valuation argument, are not flowing into political and economic decisions because they are not being adequately registered (i.e. quantified). In this logic, power and profit interests or deliberate appropriation strategies simply vanish. That amounts to breathtaking self-aggrandisement of the economic approach, and would seem ridiculous if it were not so perfectly in step with our times. The cry of "it's the economy, stupid" has grown ever louder in the realms of ecology and biodiversity conservation.

Yet criticism of this approach has also become vociferous. Economic valuation and the natural capital approach have gained ground within the CBD. Actors within the UN system, such as the World Bank and UNEP, are just as important drivers as the large international environmental organisations like Conservation International, The Nature Conservancy or the Environmental Defense Fund. Criticism of this approach is repeatedly dismissed as "ideological", although "natural capital" itself is an ideological construct that is deeply anchored in a narrow occidental rationalism. The naturalisation of a particular cultural tradition means that alternative approaches – for instance, those which take indigenous knowledge seriously – can easily appear folkloric. Despite the efforts by Bolivia and other countries, the alternative concept of "*Buen Vivir*", unlike the natural capital approach, has not found its way into the CBD's conceptual mainstream.

Natural capital in practice: Biodiversity offsetting

Biodiversity offsets are measurable compensations for damage to biodiversity caused by such projects as mining works. The goal of offsets is to achieve at least "no net loss" or even a "net gain". They are predicated on a view that nature's elements are interchangeable.

"Moving on to concerns with biodiversity offsets, experts primarily criticize that the ability to recreate an adequate offset site is limited by our knowledge about biodiversity. Yet, even the most sophisticated biodiversity metrics and indicators are only a partial reading of biodiversity, as there are complex interlinkages and interactions between species and ecosystems that remain hidden to scientific understanding. Second, it is very difficult to recreate the exact conditions for the same biodiversity level to thrive elsewhere. (…) Third, even if it is possible to recreate the same level of biodiversity in another site, this process would take at least several decades and would not contribute to the local provision of environmental services. Finally, and in relation to the previous point, local biodiversity and livelihoods are interlinked. Therefore, if biodiversity is destroyed in one place and recreated elsewhere, what happens to the people whose livelihoods and sustainable development depend on the biodiversity that is being lost?"

https://www.die-gdi.de/en/the-current-column/article/carbon-and-biodiversity-offsetting-a-way-towards-sustainable-development/

… then pay for it? | Photo: public domain

The CBD has not prevented the spread of genetically modified and commercial seed | Photo: Lindsay Eyink (© BY 2.0)

6 Who owns nature – intellectual property rights, agriculture and biodiversity

In a few years of human history, seed that was once a common resource, developed by farmers and freely exchanged among themselves, has become a trading commodity that is concentrated in the hands of a few multinational companies. Today, ten seed corporations dominate 73 per cent of the global market, and 90 per cent in the case of genetically modified plants.[34] The planned takeover of Monsanto by Bayer would dramatically heighten the concentration and interdependency between the seed and chemical sectors.

This is a radical disruption in the history of our relationship with nature: human-used nature is becoming a trading commodity. To enable this to happen, seed, plants, livestock breeds and their "genetic resources" had to become patentable. This is not a self-evident process; it began only a few years ago and has now reached an important caesura, namely the development and utilisation of GMOs: for GMO seed is universally accepted as a patentable "invention", even though its development is only a final touch, resting on foundations of centuries-old crop breeding traditions.

In recent years an agricultural model has proliferated around the world which is based on commercialised seed and GMOs, requires the intensive use of commercialised inputs (agricultural poisons and chemical fertilisers), and cultivates a small number of crops on a large scale. Just four species – wheat, maize, soya and rice – account for 90 per cent of plant production.

Modern agroindustrial farming is extremely relevant to the destruction of biodiversity in two respects: firstly, the expansion of farmed land is the main reason for the reduction of natural and species-rich habitats, and secondly, the concentration on so few species leads to a drastic loss of agrobiodiversity.

The share of GMO plant production has risen drastically in recent years; some 80 per cent of all soya fields are now planted with GM soya.[35] Even though the rise in GMOs has been concentrated in a handful of countries (Argentina, Brazil and the USA) and just a few crops, the change over the last twenty years has still been prodigious and has unleashed a heated debate worldwide about GMOs, in which the CBD is also playing an important part.

One observation needs to be made, however: the CBD has not been able to prevent or even significantly impede the spread of GMO and commercial seed

34 More on this (in German): http://www.keine-gentechnik.de/dossiers/saatgut/
35 http://www.transgen.de/datenbank/pflanzen/1984.sojabohne.html

Agrobiodiversity in danger

There are some 340,000 plant species worldwide. Of these, about 30,000 are considered potentially useful to humankind and around 7,000 are actually used or cultivated today. The number of cultivated plant species and particularly cultivated varieties has dropped sharply since the 1800s. Only about 150 species now play a major part in human nutrition. Nearly the whole calorie intake of the world's population today comes from just 30 plant species, which supply 95 per cent of vegetable food. Harvests of only three main crops – wheat, rice and maize – meet 50 per cent of global human energy needs.

https://www.bfn.de/0313_agrobiodiv+M52087573ab0.html

and the erosion of the diversity of cultivated varieties. Among other factors, this is because the CBD has a relatively subordinate position in the concert of authorities responsible for global governance.

Alongside the CBD, three other conventions decisively influence the governance of (intellectual) property rights: The UPOV Convention (*Union internationale pour la protection des obtentions végétales*) of 1961 (and developed subsequently) protects the rights of commercial plant breeders. It guarantees them the intellectual property rights to the results of their breeding, but also permits the use of bred seed for further breeding (breeder's exemption) and makes it possible for farmers to resow protected varieties (farmer's exemption). However, the UPOV's approach of recognising and reinforcing the "intellectual property rights" of breeders and firms promotes the development of seed as a trading commodity, and is ineffective for protecting collective and traditional knowledge systems. This development is taken further by the TRIPS Convention (Trade-related Aspects of Intellectual Property Rights). Every country that joins the World Trade Organization (WTO) must also recognise the TRIPS Convention. TRIPS focuses on protecting private property rights and expressly includes biological resources. Thus, it restricts the powers of individual countries to pass national legislation imposing any general prohibition on patenting life forms.

The third in the league is the International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGRFA, also known as the International Seed Treaty), which is aimed at protecting the rights of farmers. It expressly acknowledges "farmers' rights" as collective rights that are founded on traditional knowledge. Like the CBD, it enshrines the model of benefit sharing.

Obviously international governance systems are not homogenous. Hence, the majority of studies note contradictions or some tension between the conventions; a few see this merely as complementarity. Whatever the case, different paradigms for the appropriation of nature are anchored by these conventions: while UPOV and TRIPS protect the private property rights of individuals and firms to biological life forms, the CBD and the International Seed Treaty explicitly acknowledge the common, collective rights and traditional knowledge of farmers and indigenous peoples with regard to natural resources and their respective uses. The conflict between these very different approaches remains unresolved within the international system.

But from the way things have developed over the last twenty years, it can be concluded that the CBD and its regulations are not in a position to prevent the expansion of GMOs or the processes of concentration taking place in the seed sector. This issue demonstrates the significance and the limitations of the CBD: the provisions of the CBD, and particularly the precautionary principle, enable countries that are members of the WTO at least to restrict the expansion of GMOs (as Germany has done); the CBD upholds a regulatory framework which is not subject to the sole dictate of free trade but also anchors the criterion of "endangerment of biodiversity" in international governance systems. Furthermore, the CBD and the Seed Treaty both refer back to collective rights and traditional knowledge. But this also highlights the dilemma: the modern system of law, which has extended the fundamental idea of "intellectual property rights" to manipulated life forms, thereby making them patentable, is perfectly appropriate for that purpose, but not for the protection of collective property. Benefit sharing cannot really solve this fundamental dilemma; it can only modify but not halt the process of privatising biological resources. At this point the limits of the CBD are becoming clear, yet at the same time it remains a forum within the international system where concepts are safeguarded that can be taken up by critical positions.

"Free seed for all" is not in the interest of industrial seed corporations | Photo: Oliver Hallmann (© BY 4.0.)

Anti-GM protest: Via Campesina, a global movement, fights worldwide for food sovereignty | Photo: Ian MacKenzie (© BY-NC 2.0)

7 The CBD – a disputed terrain

The debate about synthetic biology is mobilising and motivating parts of civil society but will only be one of the many themes at the CBD Conference of the Parties in Mexico. Its official motto is "Mainstreaming Biodiversity", bearing in mind that host country Mexico attaches particular value to the biodiversity in the productive sector (agriculture and forestry, fishery, tourism). The priority of the conference will be to address questions of implementation. The rationale for the focus on implementation, among other reasons, is that according to the latest evaluations, currently there is no certainty of achieving the Aichi Targets by 2020. And, as always, a series of "evergreens" or recurrent topics are on the agenda: resource mobilisation, invasive species, the ABS complex, marine protected areas, and synergies with other conventions.

This diversity of themes has done nothing to facilitate a better perception of the significance of the CBD. It lacks the emphasis on "one big issue" that characterises the Framework Convention on Climate Change, for instance. And thus civil society participation in the CBD in recent years has become more and more concentrated around the major nature conservation organisations and groups with very specific interests, such as indigenous groups. Furthermore, individual strands of negotiation such as ABS are increasingly proving so complex that only a small number of specialists are in any position to keep track of developments.

Nevertheless, as our publication hopes to show, the CBD certainly merits much greater attention, for two reasons in particular: Firstly, the CBD deals with questions of fundamental significance. It does not focus only on the loss and destruction of biodiversity but also on the impacts of creating and releasing a second, man-made brand of nature. In this regard the GMOs, in the form known to us so far, are only the beginning. This complex more than most requires global rules, and currently the CBD is the only serious candidate in the international system that can at least initiate preliminary steps towards the essential governance framework. What is fundamental here is the link to the precautionary principle.

Secondly, the CBD is relatively open to the participation of civil society, and its history has been shaped by participation and intervention. The moratoria described are remarkable success stories of civil society involvement. And the fact that the Convention expressly acknowledges the value of traditional knowledge and declares it worthy of protection is remarkable in a world heavily influenced by corporations and patents.

Among the civil society groups involved in the strategic issues of the CBD which this publication addresses, it is worth acknowledging the outstanding role of the ETC Group (Action Group on Erosion, Technology and Concentration). An offshoot of the RAFI (Rural Advancement Fund International) founded by *Pat Mooney*, it has

systematically followed the negotiations for many years and intervened with its own proposals. The ETC Group has also succeeded in raising awareness in and mobilising social movements like Via Campesina on CBD issues. Important publications of the ETC Group have now been made available in other languages through translations organised by the Heinrich Böll Foundation (HBF). In recent years the HBF has made increasing efforts to make the publications equally accessible in the German-speaking world. Naturally, the ETC Group is not the only actor of this kind; the Third World Network (TWN), Friends of the Earth and many indigenous groups have also played important roles. In Germany, particular mention is made of the Ecoropa network with *Christine von Weizsäcker,* who has tirelessly and rigorously followed the CBD negotiations from the very start. It is an example that shows how even a small organisation can exert an influence thanks to personal commitment.

The questions of the new genetic engineering are being taken up actively, intensively and with great expertise by many groups in Germany; the spectrum ranges from Greenpeace to the smallholder association Arbeitsgemeinschaft Bäuerliche Landwirtschaft (ABL). But as a rule the regulatory issues concerning the new gene-based technologies are being addressed without reference to the CBD. This is happening for understandable reasons. The dispute over regulation within the EU is pivotal in the German context, and has certainly resulted in some successes. It was possible largely to prevent GMO plants from being cultivated in Germany, but not from being imported as animal fodder. For the future of the new gene-based technologies, global rules are fundamental. In this way the central question as to the definition of synthetic biology, which is on the agenda within the CBD, may well become a reference point for future regulations in the EU.

When it comes to the development policy debate, the CBD and its themes do not feature to any great extent. Yet themes being negotiated within the CBD are fundamental for the future of land use. In corporate visions, an agricultural sector increasingly based on GMOs will set the scene and bioeconomic perspectives will restructure access to biomass. This is where the various tendencies converge: Synthetic biology is expected to help to process biomass (especially wood) into fuel more effectively and thus contribute to the "decarbonisation" of the economy. These are not wild visions of the future but concrete pathways in development.

The achievement of the CBD is to be debating these questions rigorously – and, of course, contentiously. The CBD is a disputed terrain. By no means is it merely a "good convention" putting up heroic resistance to the "bad" conventions (such as TRIPS, for example). Dubious concepts like natural capital have crept into the documents of the CBD. At the same time, however, the CBD preserves fundamental reference points for a "progressive" policy: the precautionary principle and the idea of equitable sharing of benefits, however inconsistently these may be elaborated. That is why the CBD is too important to be left entirely to nature conservation organisations and specialists.

Despite all the reservations expressed here, in the global mainstream the CBD is the convention that has held together fractious elements. Particularly in view of the new upgrading of land use in the struggle against climate change and the foreseeable greater use of biomass for bioeconomics, the importance of this can not be overestimated. Biodiversity brings an urgently needed complexity into global debates and is increasingly becoming a central arena of conflict.

The CBD addresses issues vital to the future of land use. Photo: logged area in Mato Grosso; forest remnant in a cotton field in the northwest of the Brazilian state, near Xingu Indigenous Park. |
Photo: Pedro Biondi/ABr (CC BY 3.0)

Further reading

Good introductory overviews of the development of the concept of biodiversity can be found in Issue 7 of *Denkanstöße* (in German):
http://snu.rlp.de/fileadmin/content/pdf/Info_Material/Stiftung/denkanstoesse/Denkanstoesse07.pdf

Ulrich Brand has presented a thorough and critical assessment of the development of the CBD (in German):
https://www.rosalux.de/fileadmin/rls_uploads/pdfs/Manuskripte-75-dt.pdf

A brief overview of the Cartagena Protocol and the precautionary principle, by Hartmut Meyer, can be found here (in German):
http://www.gen-ethisches-netzwerk.de/gid/185/meyer/cartagena-protokoll-mut-vorsorge

By the same author at greater length and in English:
http://genok.no/wp-content/uploads/2013/04/Chapter-30.pdf

On the development of the CBD up to the Nagoya Protocol, Günter Mitlacher and Kathrin Blaufuss have produced a succinct and readable survey entitled *"Neue Hoffnung"* (in German):
http://www.kritischer-agrarbericht.de/fileadmin/Daten-KAB/KAB-2011/Blaufuss_Mitlacher.pdf)

The official view is comprehensively outlined here:
http://www.unep.org/biosafety/files/IUCNGuide%20on%20the%20CPB.pdf

On the theme of synthetic biology and other dimensions of biodiversity mentioned here, readable introductions are found in two publications which deal with the theme in the context of the green economy and the bioeconomy:
Thomas Fatheuer, Lili Fuhr, Barbara Unmüssig: *Kritik der grünen Ökonomie.* Munich 2015, published in English as: *Inside the Green Economy – Promises and Pitfalls*, Cambridge/Munich 2016.
Christine Gräfe: *Global Gardening. Bioökonomie – Neuer Raubbau oder Wirtschaftsform der Zukunft?* Munich 2016. The book is now also available at low cost from the Federal Agency for Civic Education (*Bundeszentrale für politische Bildung*).

Extensive, up-to-date materials on synthetic biology are provided on these websites:
http://www.synbiowatch.org/ und
http://www.etcgroup.org/issues/synthetic-biology

And in German: http://www.keine-gentechnik.de/dossiers/synthetische-biologie/

A foundational and thorough book about new gene-based technologies:
Christoph Then: *Handbuch Agro-Gentechnik. Die Folgen für Landwirtschaft, Mensch und Umwelt.* Munich. 2015

A position paper by the small farmers' association *Arbeitsgemeinschaft bäuerliche Landwirtschaft* likewise provides a good overview (in German):
http://www.abl-ev.de/fileadmin/Dokumente/AbL_ev/Gentechnikfrei/Hintergrund/AbL-Positionsapier_neue_GenT-Verfahren_Febr_2016_a.pdf

A detailed and lucid account of the relationship between CBD and TRIPS:
http://shodhganga.inflibnet.ac.in/bitstream/10603/49080/14/9_chapter4.pdf

A very readable introduction to the theme of biodiversity from the viewpoint of the natural capital approach, written by Carsten Neßhöver (in German): *Biodiversität: Unsere wertvollste Ressource.* Freiburg. 2013

An in-depth treatment of the "valuation" of nature and insights into the diversity of the critiques of the goals, methods and attempts at practical application of the "new economy of nature" are here:
https://www.boell.de/en/dossier-new-economy-nature

Quite different, and wonderfully sad and poetic (in German): Marcel Robischon: *Vom Verstummen der Welt: Wie uns der Verlust der Artenvielfalt kulturell verarmen lässt.* Munich 2013

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