

## WORKSHEETS ON CLIMATE CHANGE

# The threat to tropical rainforests

and international climate protection



# The threat to tropical rainforests and international climate protection

Forests are of major significance for many ecosystems as well as the Earth's climate system. They serve as a habitat for numerous species – the Amazon rainforest, which measures around 3.7 million km<sup>2</sup>, holds around 10% of the world's species. Forests also perform an important function in the hydro-climatic processes of the Earth. They contribute greatly to evaporation and temperature regulation, help protect soil, maintain the quality of drinking water and offer protection from natural disasters such as avalanches and landslides. But above all, forests serve as gigantic carbon sinks which can store CO<sub>2</sub> in their biomass for long periods. One square kilometre of the Amazon rainforest can store up to 20,000 tonnes of carbon.

The threat to forests – particularly in the tropics – is one of the greatest environmental problems. While we've known about this challenge for years, so far not enough has been done to stem destruction at the international political level. The consequences of deforestation affect not just the biosphere system, they also have a multifaceted impact on humans. Even though most attention is directed at destruction of tropical rainforests and mountain forests and their great potential for genetic resources, the sparse, open tree stocks of arid regions in the tropics and, to a lesser extent, the forests of more temperate latitudes are also under threat. Maintaining and protecting existing tree stocks is a matter of the utmost global concern, because we have to ensure that they fulfil their diverse ecological, economic and social functions.

Although there is widespread knowledge of these functions, the destruction of forests continues inexorably for various reasons (e.g. population pressure, economic interests, ignoring the risk of forest fires in dry periods). Political approaches to the problem of deforestation and damage to forests are often counteracted by opposing usage practices. That makes the didactic duty of informing pupils about this issue and sensitising them to global forest protection all the more important.

This can be achieved not only by looking at the pressure on domestic forests (e.g. in Germany damage to forests from acid rain and bark beetle infestation) but also personal joint responsibility for the destruction of tropical

forests (e.g. through usage of tropical precious woods or high meat consumption – rainforests are also being destroyed in large measure for cultivation of soy as feed or for grazing areas – or excessive paper consumption). Reduced meat consumption and the use of recycled paper are measures that each and every individual can put into action.

In light of the rapid onset of climate change, the role of forests, particularly tropical rainforests, is once again attracting increased attention in international climate policy. Around 17 to 20% of climate gases enriched in the atmosphere worldwide can be traced back to changes in land usage and forestry, and the destruction of large forests is of prime importance here. In some developing countries such as Brazil, Indonesia and the Congo, deforestation is by far the greatest source of emissions. But the diverse causes of deforestation also demonstrate that preserving the forests is no easy task.

Since the beginning of the new millennium, the UN has been more intensively preoccupied with world forest reserves. Protecting the forests was included in Goal 7 of the Millennium Development Goals ("Ensure Environmental Sustainability"). The REDD (Reducing Emissions from Deforestation and Forest Degradation) programme launched by the UN in 2008 aims to finance forest protection measures with compensation for CO<sub>2</sub> emissions. Countries which protect or increase their forest stocks will receive compensation from the international community, so creating an economic incentive for activities and political measures which protect forests.

However measures for climate protection which are currently under discussion in Europe could also facilitate the destruction of rainforests, including so-called biofuels, which have become the subject of a particularly heated debate. But it is worth maintaining forests and protective measures can serve multiple purposes beyond climate protection alone. The commitment of the international community of states will play an important role in determining whether we manage to significantly reduce the rapid destruction of tropical rainforests, and with it the potential for worldwide climatic consequences.

## Use in the classroom

The lesson modules below address an issue which will already be known to pupils from the lower secondary grades. Tropical rainforests play an important role time and again – and not only in geography lessons. Less known are the carbon cycle and the ability of trees to store CO<sub>2</sub>. And the extent to which climate change impacts on forests is an issue which has been more intensively discussed of late.

There are numerous points of entry for this topic. One good place to start is an analysis of the destruction of tropical rainforests worldwide and, as an example, the island of Borneo (**M 1 and M 2**). Alternatively, referencing a current news report on an issue like land grabbing or palm oil cultivation could also offer a starting point. In the first development phase, pupils gain an insight into the scope of worldwide overexploitation of tropical rainforests and present initial hypotheses for the long-term consequences of these developments (**M 3–M 5**). After examining the carbon cycle more closely, the vital role forests play in the global climate system is outlined and dis-

cussed (**M 6–M 10**). The terms “CO<sub>2</sub> sink” and “CO<sub>2</sub> source” are explained using **M 7 and M 10**, before pupils look at the long-term consequences of rainforest clearing for the climate system in **M 11**. Possible consequences of climate change for tropical rainforests are explored in **M 9**. The impact of individual actions and the ways in which pupils themselves can help protect rainforests and the climate are outlined and discussed in **M 12 to M 15**, based on the example of meat consumption.

Using the examples of Brazil and Indonesia, the destruction of tropical rainforests is placed in the context of international climate policies (**M 16 and M 17**). At this point the role of emerging nations in climate protection should also be discussed. The aim here is to start thinking about options in forest protection and the numerous positive effects of avoiding deforestation. **M 19** deals with the options available to Germany in supporting forest protection before **M 20** finally offers a critical view and discussion of a supposed climate protection measure – biofuel – from the point of view of climate protection.

### Further reading:

FAO (2012): State of the World's Forests 2012. FAO, Rome.

<http://www.fao.org/docrep/016/i3010e/i3010e.pdf> (Accessed 30.01.2014).

FAO (2010): Global Forest Resources Assessment 2010. FAO, Rome.

<http://www.fao.org/docrep/013/i1757e/i1757e.pdf> (Accessed 29.01.2014).

Gerber, P. J. et al. (2013): Tackling climate change through livestock – A global assessment of emissions and mitigation opportunities. FAO, Rome.

<http://www.fao.org/docrep/018/i3437e/i3437e.pdf> (Accessed 30.01.2014)

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## Within the series of *Worksheets on Climate Change* the following publications are available in English:

- Global climate change – General issues
- The melting glaciers – Glacial lake outburst floods in Nepal and Switzerland
- Sea level rise – Consequences for coastal and lowland areas: Bangladesh and the Netherlands
- Going under! The threat of rising sea levels for the small island nation of Tuvalu
- The threat to tropical rainforests and international climate protection
- Climate change and food security – Trends and key challenges
- Extreme events and climate change – Insurances for developing countries

See: [www.germanwatch.org/en/worksheets](http://www.germanwatch.org/en/worksheets)

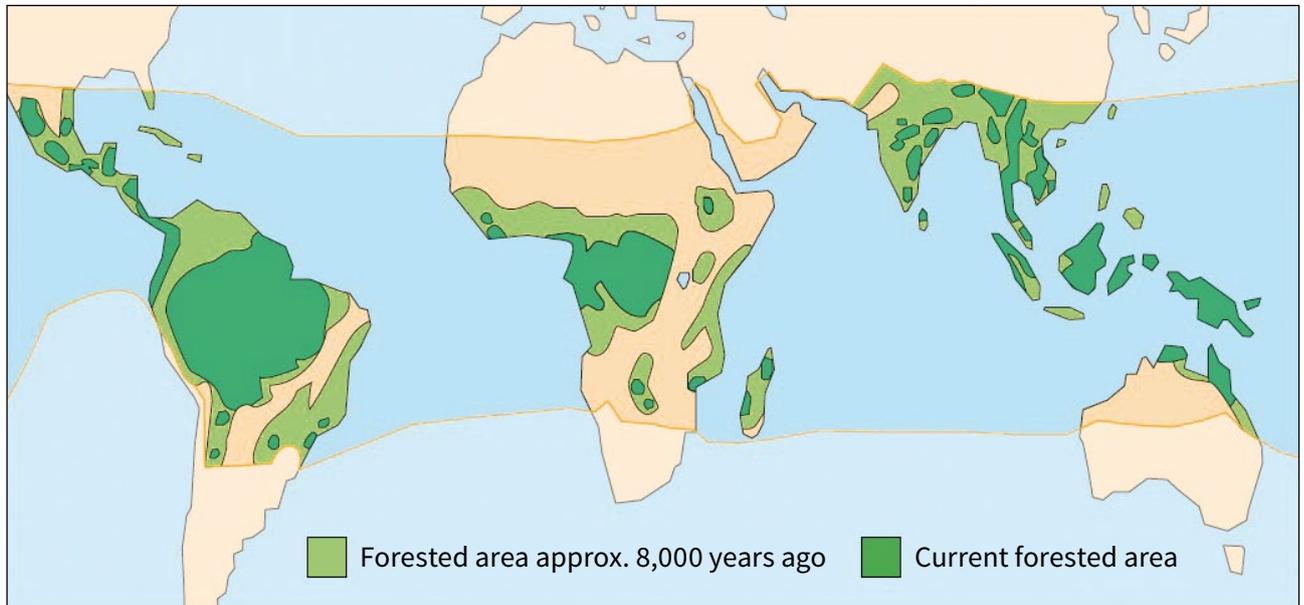
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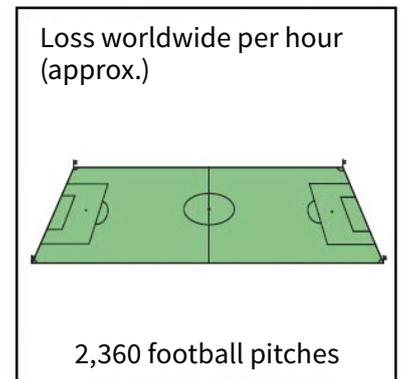
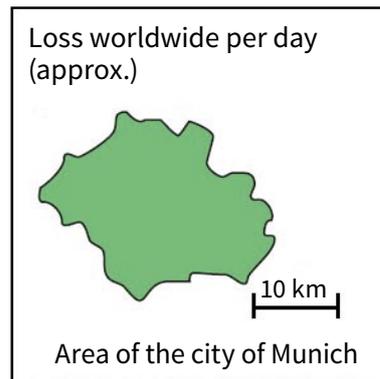
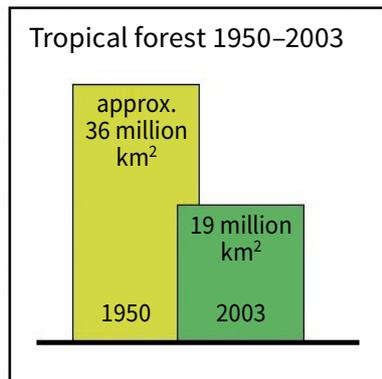
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For Global Equity and the Preservation of Livelihoods.

## M 1

## Decline in tropical forests



## Forest loss in figures

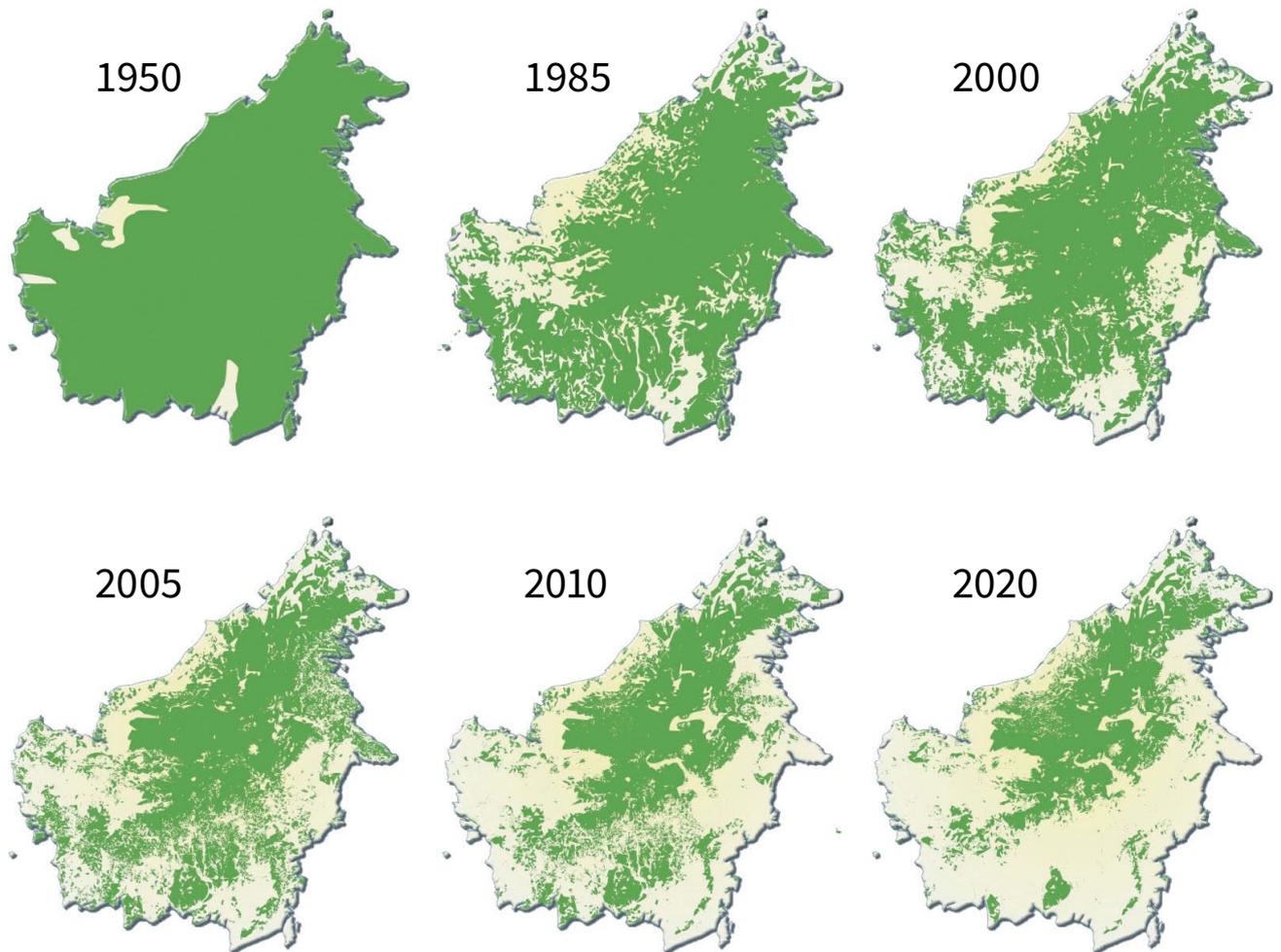


(Source: own translation of Overde (2006): Die Tropenwaldmappe. Informationen zum Thema „Tropenwald“ Schatzkammer der Erde und bedrohtes Paradies. <http://www.overde.de/lehrer/materialien/tropenwaldmappe.html>, accessed 29.01.2014)

## M 2

## The destruction of tropical rainforests in Borneo

Deforestation in Borneo, 1950 to 2020

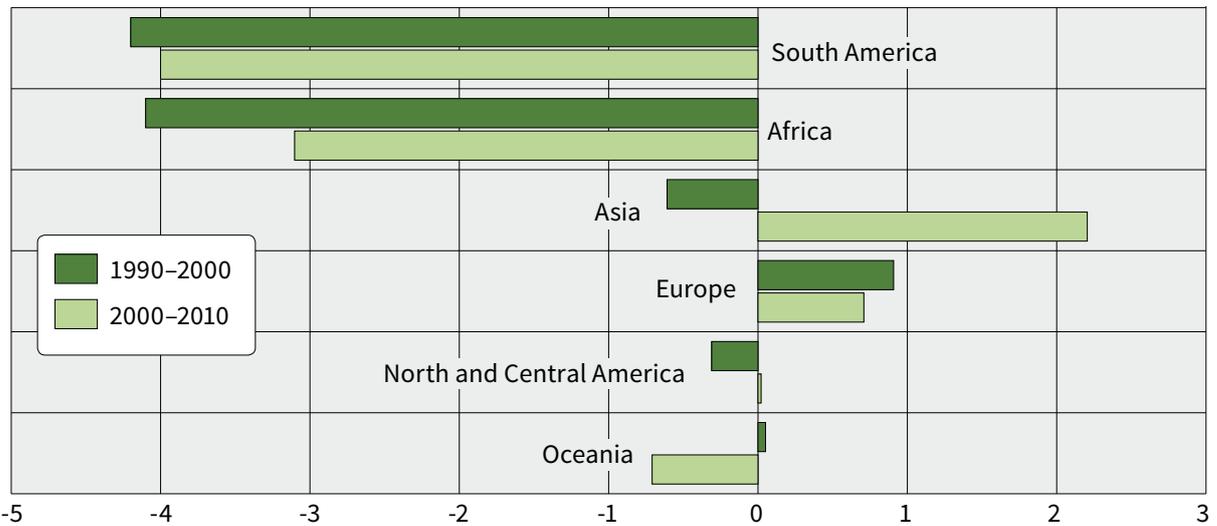


(Source: Borneo Orangutan Survival Schweiz: <http://www.bos-schweiz.ch/img/01/deforestation.jpg>, accessed 29.01.2014)

## M 3

## Forest areas and decline by region

Annual change in forest area by region, 1990–2010 (in million hectares per year)



(Source: FAO (2010): Global Forest Resources Assessment 2010. FAO, Rome. <http://www.fao.org/docrep/013/i1757e/i1757e.pdf>, accessed 29.01.2014)

Example countries (proportion of forest in overall land surface in %)

	1990	2000	2010	Country area in 1,000 ha
<b>Africa</b>				
Burundi	11.3	7.7	7.0	2,568
Côte d'Ivoire	32.1	32.4	32.7	31,800
Ghana	32.7	26.8	21.7	22,754
Rwanda	12.9	13.9	17.6	2,467
Senegal	48.5	46.2	44.0	19,253
South Africa	7.6	7.6	7.6	121,447
Swaziland	27.4	30.1	31.4	1,720
<b>Asia</b>				
China	16.8	19.0	22.0	942,530
Bangladesh	11.5	11.3	11.1	13,017
India	21.5	22.0	23.0	297,319
Malaysia	68.1	65.7	62.3	32,855
Myanmar	59.6	52.6	48.3	65,755
Vietnam	28.8	36.0	44.5	31,008
<b>Europe</b>				
Albania	28.8	28.0	28.3	2,740
Belarus	35.6	37.8	41.6	20,748
Germany	30.8	31.7	31.8	34,877
Estonia	51.0	52.9	52.3	4,239
<b>North America</b>				
Canada	33.6	33.6	34.1	909,351
USA	32.6	33.0	33.2	916,193
<b>Central and South America</b>				
Brazil	61.5	58.3	62.4	832,512
Costa Rica	50.0	46.5	51.0	5,106
Ecuador	49.9	42.8	35.6	27,684
Cuba	18.7	22.7	26.1	10,982
Jamaica	31.9	31.5	31.1	1,083
Nicaragua	53.8	45.6	25.7	12,140
Panama	58.8	57.9	43.7	7,443
Peru	54.8	54.1	53.1	128,000
<b>Oceania</b>				
Micronesia	90.6	90.6	91.4	70
Papua New Guinea	69.1	66.5	63.4	45,286
Solomon Islands	98.9	84.7	79.1	2,799
Samoa	45.9	60.4	60.4	283

(Source: FAO (2010): Global Forest Resources Assessment 2010. FAO, Rome. <http://www.fao.org/docrep/013/i1757e/i1757e.pdf>, accessed 29.01.2014)

M 4

# Tropical rainforests: a treasure chest

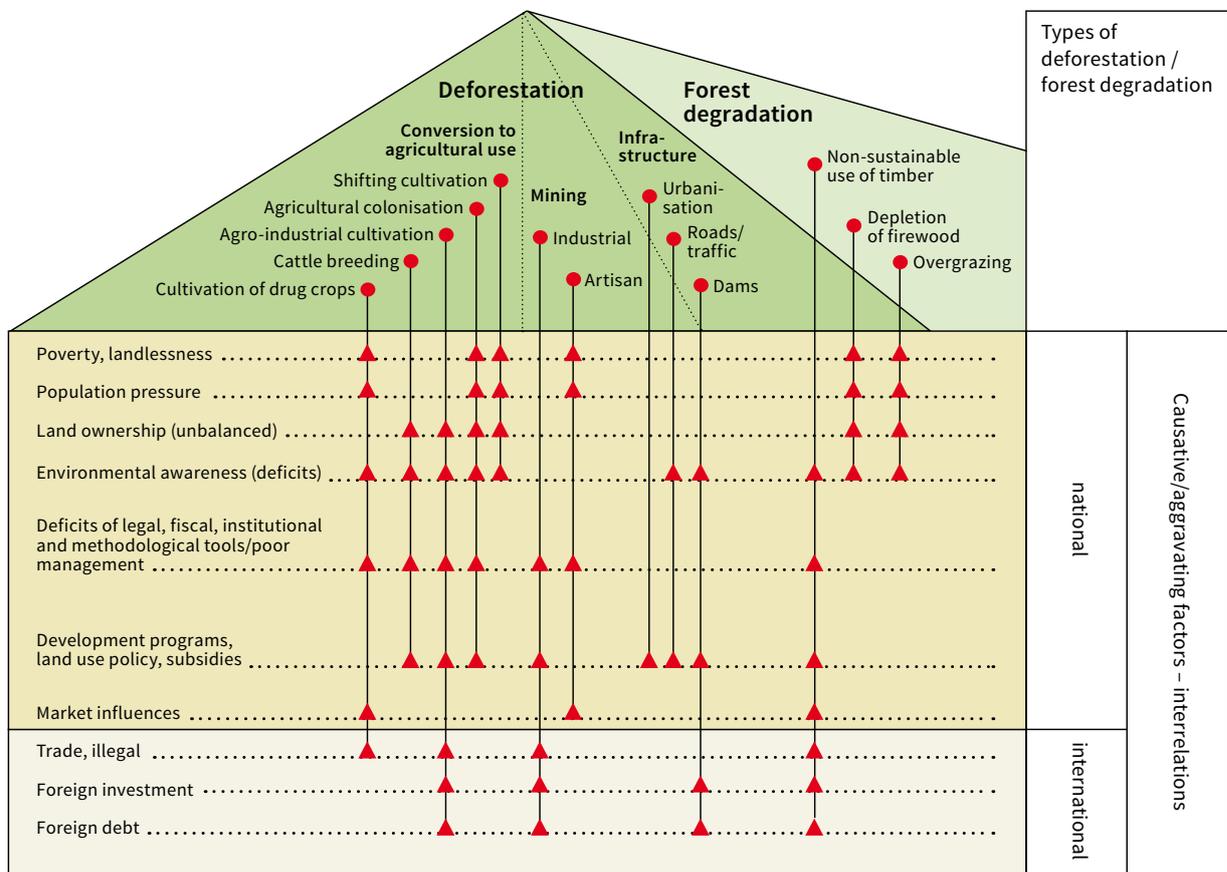
**The tropical rain forests ...**

- ... accommodate 40–50% of all animal and plant species on earth
- ... provide food, e.g.
  - sugar cane
  - mango
  - banana
  - cocoa
  - coffee
  - nuts
  - meat
  - fish
  - honey
  - eggs
- ... provide raw materials, e.g.
  - rubber
  - oils
  - fibres
  - resins
  - rattan
- ... hold the world's climate in balance
- ... provide raw materials for cosmetics and drugs, e.g.
  - antibiotics
  - hormones
- ... form the basis of life for the indigenous peoples (eggs, game, fish, fruit, wood)

(Source: own translation of Latz, W. (2004): Diercke Erdkunde, Bd. 1 Rheinland-Pfalz. Braunschweig, p. 122)

M 5

# Forest clearance and degradation: types, factors and correlations



(Source: own translation from: BMZ (1997): 5 Jahre nach Rio. Tropenwalderhaltung und Entwicklungszusammenarbeit.)



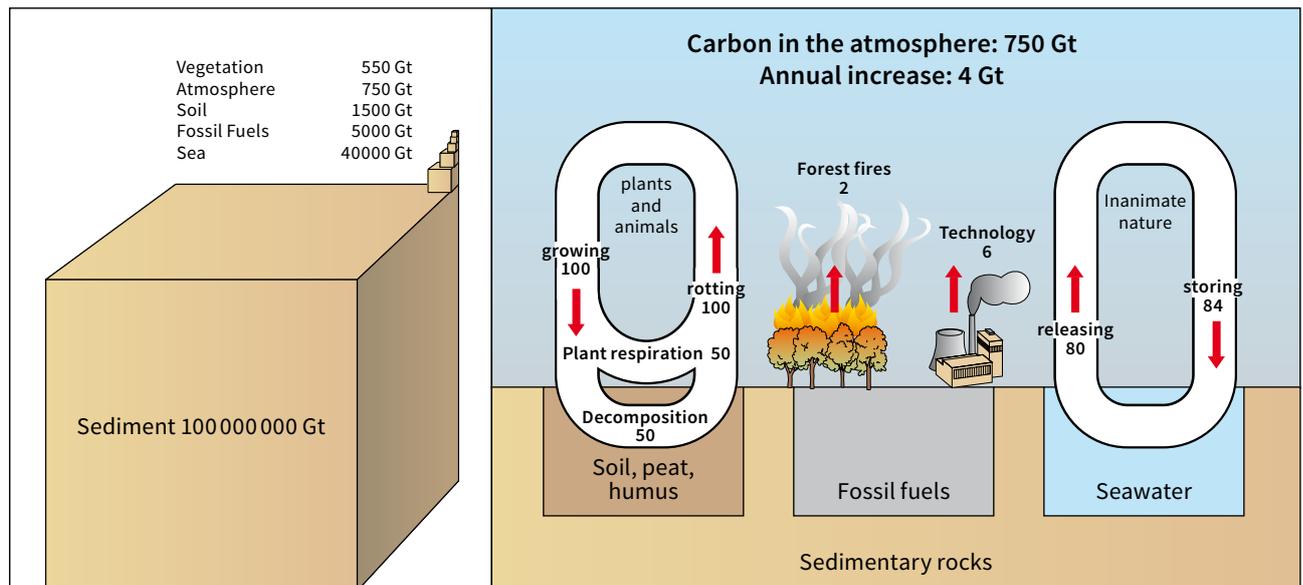
Exercises

1. Describe the extent of forest clearance in the world and as a next step consider regional and temporal differences (M 1–M 3). Use your atlas here.
2. Using M 4 and M 5 explain the short- and long-term consequences of deforestation of tropical forests for the planet Earth and for humanity.
3. Explain the illustration M 5.

## M 6

## Carbon cycles and carbon sinks

(Figures in gigatonnes = billion tonnes)



(Source: altered from Bauer, J. et al. (2001): Physische Geographie. Materialien für den Sekundarbereich II Geographie, Hannover, p. 65.)

## M 7

The forest as CO<sub>2</sub> sink and reservoir

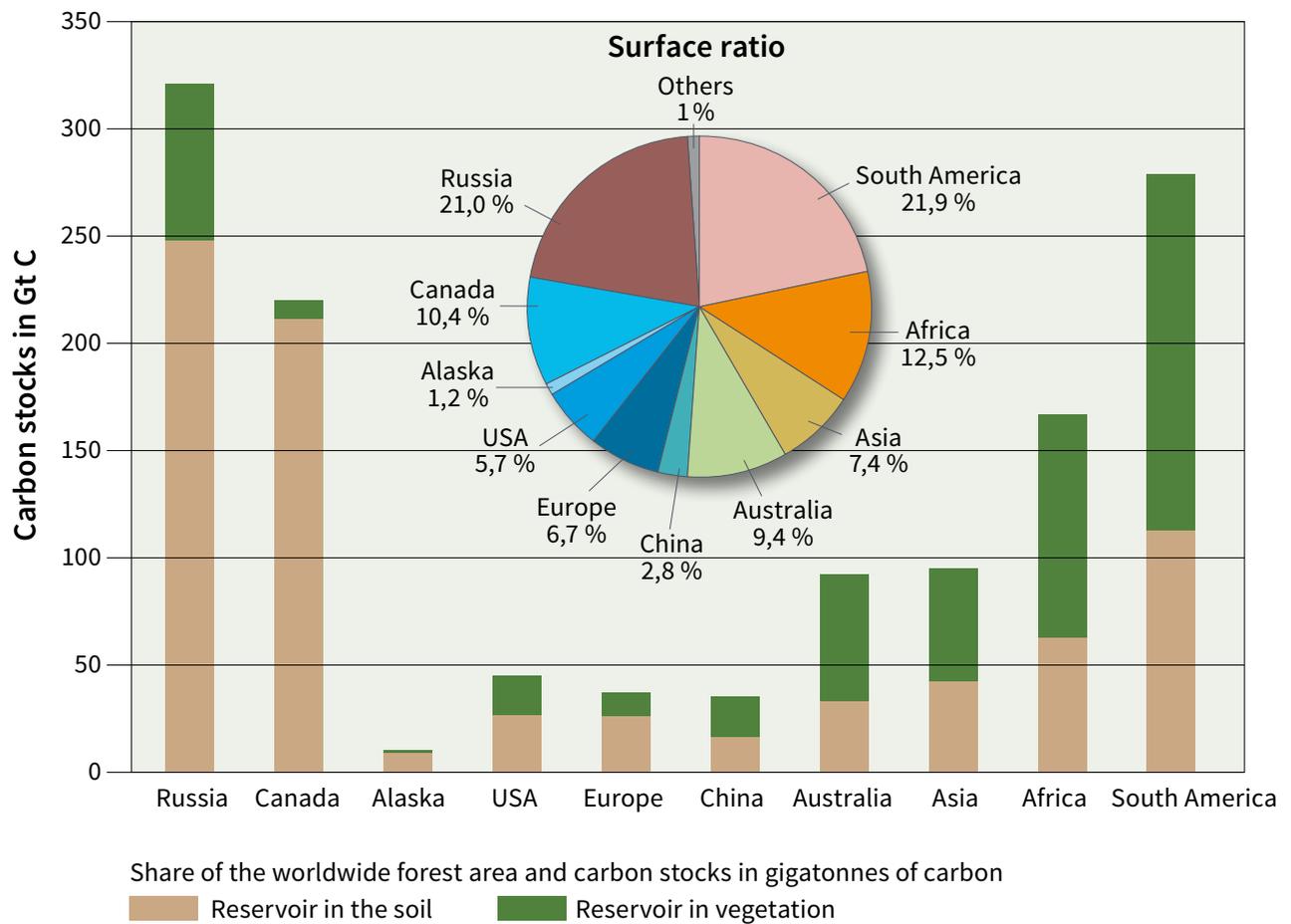
“One ‘natural technology’ which can help reduce the concentration of atmospheric greenhouse gases is the sink function of vegetation, i.e. the bonding of CO<sub>2</sub> by plants, particularly trees [...]. The release of this CO<sub>2</sub> through deforestation is a strain on the climate if forests are not regrown or restocked. In any case there are four reasons why the planting of forests doesn’t help if the emission targets of the Kyoto Protocol or the European emissions trade are taken into account. First, there will be less climate protection in other areas such as renewable energies and energy efficiency. However these are urgently needed for the required transformation of worldwide energy systems. Second, there is still major scientific uncertainty surrounding the calculation of net CO<sub>2</sub> volumes which are associated with reforestation. Third, no-one can guarantee how many years, let alone decades, a forest will remain intact and so continue to

bind CO<sub>2</sub>. Thus, over the last few decades the Amazon rainforest – affected by two major droughts – may have released more CO<sub>2</sub> than it bound. And fourth, considerable social and environmental problems could arise if forests are only optimised in terms of CO<sub>2</sub>. It is becoming apparent that the biodiversity and water supply for new plants are likely to experience regular adverse effects from a purely CO<sub>2</sub> perspective. Reforestation should be carried out in addition to, and not instead of, measures in the areas of energy efficiency and renewable energies. Moreover they should serve to protect biodiversity as much as possible. Not just for climate protection, but also in regard to the many other valuable functions of forests, which could also make an important contribution in adaptation to climate change, there needs to be a large-scale global concept with effective incentives to prevent rapid deforestation.”

(Source: own translation of Germanwatch (2011): Der Globale Klimawandel. Ursachen, Folgen, Handlungsmöglichkeiten. Germanwatch, Bonn, p. 62. <http://germanwatch.org/de/3428>, accessed 29.01.2014)

## M 8

## Regional distribution of carbon stocks



(Source: own translation of Hamburger Bildungsserver 2008)

## M 9

## Forests and climate

Forests have important functions in climate processes. They are largely responsible for the exchange of carbon between ecosystems and the atmosphere. Through the albedo, that is, the reflective capacity of treetop surfaces, forests have a direct effect on the radiation budget. For water circulation, too, forests play an important part as a link between the soil and the atmosphere through water storage capacity and evapotranspiration, that is, their transpiration and evaporation. Tropical rainforests, particularly, evaporate large quantities of water. The water vapour stored in the air mass is transported over large distances and boosts clouding and precipitation in dry areas. The evaporation process uses a certain amount

of energy which is stored in molecules as water vapour. As the moist air masses are transported, the energy, too, is carried over long distances. Finally it is released in the condensation of water vapour.

Climatic changes in turn have a considerable impact on forests, which can be seen as complex living entities that are highly adapted to the climate. Changing temperatures, precipitation and wind conditions have a direct effect on forests, their distribution and their growth. In an indirect way the climate can also affect forests through forest fires and the spread of disease.

## M 10

Peat rainforest as CO<sub>2</sub> source

“It has long been known that the deforestation of peat rainforests in South-East Asia reinforces climate change. Scientists have now proved that the CO<sub>2</sub> emissions caused by this are 22% higher than earlier studies had estimated. Most of these studies merely recorded the amount of CO<sub>2</sub> released from the upper peat layers when the layers of organic material, many metres thick, drains and dries out. Only then can oil palm monocultures for the food industry and production of so-called biofuels take place.

Earlier studies failed to reflect the fact that it was not just the degradation of the solid peat on the surface which released CO<sub>2</sub>, but also the large quantities of carbon dissolved in water escaping from bogs via drainage canals. Once this reaches rivers the carbon escapes into the air as gas – CO<sub>2</sub>. According to this new study, this fossil carbon, i.e. carbon which comes from millennia-old submerged

peat layers and is dissolved in water, makes up over 91% of all carbon. The increase in CO<sub>2</sub> concentration in the Earth’s atmosphere caused by humans is a major reason for global warming.

Worldwide, peat bogs store 89,000 teragrams (1 Tg = 1 billion kilograms) of carbon in the ground, 65% of it in Indonesia. The country is the world’s leading palm oil exporter; oil palm monocultures grow on more than nine million hectares of land – particularly in Sumatra, Borneo and West Papua. There are plans for 26 million hectares in the near future.

“Our findings already show: if we destroy intact rainforests on peat bogs and transform them into industrial plantations, we’re contributing to the problem we’re trying to solve,” said Chris Freeman, one of the authors of the study.”

(Source: own translation of Rettet den Regenwald (2013): Biosprit noch klimaschädlicher als gedacht. <http://www.regenwald.org/news/4991/biosprit-noch-klimaschaedlicher-als-gedacht>, accessed 30.01.2014)

## M 11

## Dehydration and “tipping” the Amazon rainforest

“The potential ‘tipping’ of the Amazon rainforest into savannah vegetation is another major risk. By 2080 this region could become a large-scale CO<sub>2</sub> producer. This transformation could be triggered by the self-reinforcing effect of three factors in particular: 1.) dehydration caused by a disproportionate rise in temperature, 2.) further deforestation, as well as 3.) the expected absence of

natural transportation of nutrients via sand storms from Africa’s Sahel zone to Brazil in the event of the greening of the Sahel zone. The various feedback effects could lead to at least a doubling of global warming compared to current projections from models of increased greenhouse gas emissions, which would be higher than at any time in the last 50 million years.”

(Source: own translation of Germanwatch (2007): Die Millennium-Entwicklungsziele und der globale Klimawandel. Germanwatch, Bonn, p. 16. <http://germanwatch.org/de/2674>, accessed 30.01.2014)



## Exercises

4. Explain the circulation of carbon with particular attention to the role of forests and describe the terms “carbon sink” and “carbon source” (M 6–M 8, M 10).
5. Discuss the possible feedback effects of deforestation (M 9–M 11).
6. What role could changes in the global climate and key factors (temperature, precipitation, CO<sub>2</sub> enrichment in the atmosphere) have for tropical rainforests? Include possible interaction with the deforestation factors already explained.
7. Building on the findings of M 9–M 11, explain and discuss possible measures for protecting forests. Supplement this with additional research (e.g. on the Internet).
8. List various causes of the destruction of tropical rainforests (M 9, M 11). Can you think of any other causes? Use the Internet for research.

## M 12

## Keep rainforests off the plate!

“Meat, eggs and dairy products are cheap in this country where they remain the most important products on the plate for many people. Statistics indicate we [in Germany] consume 70 kilograms of meat per head, per year, with an additional 105 kilograms of dairy products and more than 200 eggs. Prices and eating habits are similar among our European neighbours. It is industrial factory farming which keeps these products cheap.

But it is the animals, the environment and also people – particularly in the countries of the global South which produce feed – who pay the true price.

[...]To ensure pigs reach their carcass weight of 115 kilograms in record time they are fattened with a concentrated feed mix. On average it contains just under 15% soy meal. This correlates to around 450 grams soy meal for every kilogram of pork. However these protein-rich pulses for fodder aren't cultivated domestically. Member states of the European Union (EU) import around 35 million tonnes of the beans per year as feed for cattle, pigs, chickens and

turkey; soy beans prefer warm climates, and most EU imports come from South America.

Consequently the soy industry has been booming in Argentina, Brazil and Paraguay for years. Soy monocultures have already spread out to a total of 45 million hectares there – an area as large as Germany and the Netherlands put together [...]. To create room for new plantations, farmers burn rainforests and tropical savannah. Macaws, howler monkeys and tapirs all die in the flames, and with them we are sacrificing the unique biodiversity of South America – all to satisfy our demand for cheap feed and cheap meat.

“Our forests are being cleared in ever more dramatic fashion for increased soy production. In recent years in Chaco alone more than one thousand hectares per day have been cleared,” says Marco Andrés Glauser of the social research institute BASE IS in Paraguay. “The soy boom is forcing out cattle breeders who are now creating space for their herds in the tropical rainforests of Chaco.””

(Source: own translation of Rettet den Regenwald (2012): Keinen Regenwald auf den Teller! In: Regenwald Report 04/2012. <http://www.regenwald.org/regenwaldreport/2012/371/keinen-regenwald-auf-den-teller>, accessed 30.01.2014)

## M 13

## Meat production in conflict with the climate

“The primary cause of the destruction of Brazil's rainforests is stock farming. An area of over 160,000 km<sup>2</sup> was cleared in the last ten years alone (2000–2009). Over 70% of this destruction can be traced back to the creation of new pastures. Contrary to its avowed intention of saving the forests, the state is encouraging this development.

While there used to be direct subsidies for land conversion, these days new infrastructure projects and road-building are driving this destruction forward. The rainforest is being made accessible for farmers and cattle breeders who find it ever easier to advance into forested areas and settle in the Amazon region. Land is easy and cheap to come by – and it is often taken illegally. And so over the years Brazil has become the largest beef exporter in the world and with 200 million head of cattle holds the second-largest population after India. The majority of meat produced in Brazil is exported to North America, but around 200,000 tonnes of meat products also reach Germany every year.

The second most significant cause of deforestation in Brazil is the large-scale cultivation of soy for fodder. [...] While the

USA remains the largest soy producer in the world, Brazil is on the way to becoming the largest soy exporter. The countries of South America – particularly Brazil, Argentina and Paraguay – produce over 50% of the world's soy. In Paraguay soy is cultivated across 2.6 million hectares, in Brazil the area is well over 20 million hectares.

However, soy is only indirectly responsible for deforestation in Brazil. Often there are not actual forests being cleared for cultivation, but savannah and already cleared areas. In any case the small-scale farmers who have tilled this land to date are being driven from their land, and in their search for new land they are forced into the forest, which they then clear.

It's not only because of the area required for cultivation that soy production destroys forests. The soy can't get to exporting ports without the massive expansion of transport infrastructure. Huge roads are built, rivers made navigable and ports established. These interventions put a direct strain on the environment, and also open up these regions for new settlers, timber thieves, etc.”

(Source: own translation of Pro Regenwald: [http://www.pro-regenwald.org/hg\\_fleisch](http://www.pro-regenwald.org/hg_fleisch), accessed 30.01.2014)

## M 14 Annual meat consumption per head

### Development in meat consumption (kg per capita and year)

	USA	China	EU 27	Brazil	India
2006	117.8	47.2	75.3	83.6	3.3
2007	117.5	45.5	78.5	86.5	3.5
2008	114.2	48.7	77.2	88.8	3.8
2009	111.2	49.9	76.7	89.7	3.8
2010	110.1	51.2	77.6	96	3.9
2011	109.7	52.4	77.6	98.7	3.9
2012	106.8	53.1	75.9	101.1	4.1
Trend since 2006	-9.6%	+12.5%	+0.8%	+20.9%	+24.3%

(Source: Van de Sand, K. (2013): Die Risiken nehmen zu. Germanwatch-Trendanalyse zur globalen Ernährungssicherung 2013. Germanwatch, Bonn. <http://germanwatch.org/de/7068>, accessed 28.01.2014).

## M 15 Greenhouse gas emissions in worldwide animal breeding

Deforestation, desertification	35.2%
Artificial and organic fertiliser (production and usage)	33.8%
Microbial digestion in ruminants	25.4%
Use of agricultural machinery	1.3%
Other	4.3%

(Source: WWF (2011): Global Klimaerwärmung durch Fleischkonsum? [http://fleischfrage.wwf.de/fileadmin/user\\_upload/Fleischfrage/pdf\\_fleischfrage/Hintergrund\\_Fleisch\\_Klima\\_WWF.pdf](http://fleischfrage.wwf.de/fileadmin/user_upload/Fleischfrage/pdf_fleischfrage/Hintergrund_Fleisch_Klima_WWF.pdf), accessed 30.01.2014, from Koerber, K. et al. (2009): Globale Ernährungssicherung für eine wachsende Weltbevölkerung – Flächenbedarf und Klimarelevanz sich wandelnder Ernährungsgewohnheiten.)



### Exercises

- Use **M 12** and **M 15** to discuss the climatic consequences of high meat consumption, particularly for industrialised countries.
- Come up with recommended courses of action for your class, your family and your friends to make an active contribution to protecting rainforests and the climate.
- Finally, discuss the topic “tropical rainforest and climate change” as a whole with reference to the core arguments in **M 6–M 15**.

## M 16

## Dramatic increase in Amazon rainforest clearance once again

**“In one year an area of the Brazilian rainforest three times larger than New York City has been cleared. The reason could be the growing demand for pastures.**

The clearance of the rainforest in the Amazon region has increased sharply. According to data from the Brazilian government, in May alone 465 square kilometres of rainforest was destroyed. That is almost five times more than in May 2012. Viewed year-on-year the situation is even more dramatic. Since August 2012, 2,338 square kilometres have disappeared. That is an increase of 35% and equates to three times the size of New York City. The year before, Brazilian space agency satellites only discovered a shrinkage of 2,051 square kilometres between August 2011 and July 2012.

*This data seems to confirm the suspicion that the hard-won achievements of environmentalists are being reversed. One reason for the increased clearance of rainforests could be the growing demand for pastures.*

### Changes in environmental policy

*Government infrastructure projects, changes in environmental policy as well as rising prices for soy beans and Brazil's other agricultural products could encourage clearance of the rainforests. Further investigations on the ground are required in order to determine the exact scope of deforestation. First natural causes for the shrinkage have to be determined.”*

(Source: own translation of Die Zeit from 06.07.2013: Regenwaldabholzung im Amazonas nimmt wieder drastisch zu. <http://www.zeit.de/wissen/umwelt/2013-07/regenwald-amazonas-abholzung>, accessed 04.02.2014)

## M 17

## Indonesia – the curse of prosperity?

**“Around two billion tonnes of carbon dioxide are released every year when Indonesia's rainforests are cleared. That is double the entire output of Germany, the largest economy in the EU. A forested area of around 115 x 115 kilometres disappears every year in Indonesia.**

*The island nation destroys its forests faster than just about any other country – and according to the World Bank it is, along with Brazil, the leading producer of greenhouse gases after China and the USA, making it a key driver of dangerous global warming. [...]*

*Along with deforestation, the growing demand for fossil energy sources is also a problem. Motorcycles long ago overtook bicycles as the most important mode of transport, and now millions of Indonesians want to drive cars. Monstrous convoys of traffic roar through the capital Jakarta and other population centres every day. And although the country is blessed with sun, vegetation*

*and geothermal heat, the rapidly increasing hunger for energy is being quenched with ever greater quantities of coal, natural gas and crude oil. CO<sub>2</sub> emissions could increase from a current level of 2.2 billion tonnes to 3.6 billion tonnes by 2030.*

*“We are a typical aspiring developing country and we want our fair share of the world's prosperity,” says Agus Purnomo, head of the National Council on Climate Change, which was convened by the president. But can they really go on this way? For years all of the emerging and developing nations put together have output more greenhouse gases than the old West. Therefore the USA and the EU now want to force countries like Indonesia to reduce their emissions.*

*“There's a strong suspicion that it's precisely the main culprits in the climate problem who are disputing our right to prosperity,” says Purnomo.”*

(Source: own translation of Spiegel Online from 15.12.2009: Kampf für Klimaschutz in Indonesien: Fluch des Wohlstands. <http://www.spiegel.de/wissenschaft/mensch/kampf-fuer-klimaschutz-in-indonesien-fluch-des-wohlstands-a-667124-2.html>, accessed 24.03.2013)

## M 18

## Contributions to sustainable development through climate protection in forested areas

Category of activity	Contribution to sustainable development		
	Social	Economic	Environmental
<b>Expansion or maintenance of forested areas</b>	Secures people's livelihoods; can prevent emigration; influx of foreign population can bring change	Can create lasting income opportunities; protecting forests can also reduce earning opportunities; supply of forest products (wood, etc.)	Maintaining biodiversity; protecting water catchment areas; loss of biodiversity also possible, e.g. if bushland is replaced by plantations
<b>Change to sustainable forestry</b>	Secures people's livelihoods	Creates jobs; increases income; supply of forest products	Positive effect on biodiversity, water and soil; avoids deforestation
<b>Replacing energy-intensive materials</b>	Landowners of forested areas can profit; possible competition with agricultural food production	Increased income and more jobs in rural and urban areas; reduced imports	Non-sustainable harvests can lead to loss of forest, biodiversity and soil
<b>Bioenergy</b>	Landowners of forested areas can profit; possible competition with agricultural food production	Increased income and more jobs; supply of renewable energy; possible competition with agricultural food production	Benefits if firewood extraction is sustainable; energy plant monocultures can have negative effect on biodiversity, soil and water

(Source: from Nabuurs, G.J. et al. (2007): Forestry. In: Climate Change (2007): Mitigation. Contribution of Working Group III to the Fourth Assessment Report of the IPCC, Cambridge)

## M 19

## German support for Brazil's climate protection goals

“Brazil has set itself high climate protection targets: by 2020 Brazil wants to reduce its 2005 levels of greenhouse gas output by up to 39%. To achieve this target they will have to, among other things, reduce the deforestation rate in the Amazon by 80%. Brazil must also meet its obligations to its biodiversity according to the Convention on Biological Diversity (CBD). To achieve these ambitious targets, the country is working closely with Germany's government.

A range of German government projects has been dealing with different aspects of forest protection since the mid-1990s. Currently there are plans for protection of Brazilian rainforests with a total volume of around 330 million euros in preparation or already underway. Brazil's efforts have paid off over the last few years: the rate of deforestation has already been significantly reduced and Brazil is well on the way to hitting its targets.”

(Source: own translation of BMZ: [http://www.bmz.de/de/was\\_wir\\_machen/themen/klimaschutz/minderung/REDD/blick\\_brasilien/index.html](http://www.bmz.de/de/was_wir_machen/themen/klimaschutz/minderung/REDD/blick_brasilien/index.html), accessed 30.01.2014)

## M 20

## Green energy at any price

“ Biofuels ostensibly have an almost neutral CO<sub>2</sub> balance: during growth, the plants absorb exactly the amount of carbon dioxide which they later release in combustion. That means that in contrast to coal and oil, no new carbon dioxide is output. However this comparison is deceptive. Firstly, machines are used for working fields, sowing and harvesting, and that requires energy. The production of fertilisers and pesticides also releases CO<sub>2</sub>. Secondly, and this is worse, the cultivation of cane sugar, palm oil and soy plants leads to large-scale rainforest clearance in Brazil. Cattle breeders, for instance, are leaving their grazing ground in the south because it is being used for the cultivation of energy plants. They're looking for new pastures in the north of the country, mostly savannah or rainforest areas which are ruthlessly cleared or, what's worse, burnt down. The “green lungs” of the world, the rainforests, are being sacrificed for supposedly green technology like biofuels.

To balance out the ostensibly equalised CO<sub>2</sub> balance of green fuels is therefore extremely difficult. Assuming that plantations continue as they have progressed so far, many more hectares of rainforest areas will have to fall victim to biofuels. In the long term the land will be infertile or dried up. From an environmental point of view we have to take a highly critical look at biofuels. [...]

However, biofuels can help quench humanity's hunger for energy to a certain degree. The decentralised biogas exploitation from biological waste such as liquid manure and plant residue is an example of a worthwhile approach to this energy source. The large-scale cultivation of energy plants, on the other hand, causes more problems than it solves. ”

(Source: own translation of SWR (2010): Grüne Energie um jeden Preis.  
<http://www.swr.de/hunger/laender/brasilien/biokraftstoffe/-/id=6756254/nid=6756254/did=6937838/1luaxg/>, accessed 30.01.2014)


 Exercises

12. Describe the role of deforestation in Brazil and Indonesia in international climate policies (M 16 and M 17). How could the climate policies of these two countries impact climate protection?

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13. Explain the development policy benefits of climate protection measures in forested regions. Discuss the implications of the relationship between developing and industrialised countries for reducing deforestation in international climate policies. How can Germany support the protection of rainforests? (M 18 and M 19)

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14. Discuss the role of biofuel as a climate protection measure (M 20). Describe the advantages and disadvantages of biofuel, where necessary using the Internet to research further pros and cons and the current state of discussions.