Technology & Society now!

Englisch für das Berufliche & Technische Gymnasium
Band 3

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Vorwort

Mit dem vorliegenden Band findet die Lehrwerkreihe „Technology & Society now!“ ihren Abschluss. Inhaltlich und methodisch werden die Ansätze der Bände 1 und 2 zur Fortbildung der berufsrelevanten Kommunikationskompetenz für mündliche und schriftliche Äußerungen in der englischen Sprache fortgeführt.

Aufbau des Lehrwerks

Band 3 der Reihe „Technology & Society now!“ enthält ebenfalls sechs themenspezifische Module und einen Skills-Teil. Wichtige Aspekte in der Entwicklung unserer technikorientierten Gesellschaft werden angesprochen. Dazu gehören Formen und Probleme der Nutzung von Energie (Modul 13 - From traditional to renewable energies), eine exemplarisch angelegte Sicht auf die Zukunft in Wissenschaft und Technik (Modul 14 – Engineering the future), ein Einblick in die Geschichte, Produktion und Trends in der Textil- und Modebranche (Modul 15 – Clothing the world of today), die Betrachtung verschiedener Facetten der Globalisierung (Modul 16 – Aspects of globalisation), der Blick auf unterschiedliche Formen und Zwecke internationaler Zusammenarbeit (Modul 17 – International cooperation) und schließlich der Fokus auf die Entwicklung und die Folgen zunehmender Verstädterung (Modul 18 – Urbanisation).

Die Module folgen unterschiedlichen Konzepten. Sie bilden das jeweilige Thema aus verschiedenen Blickwinkeln mit einer großen Vielfalt von Textsorten ab. Dabei besteht Gelegenheit zur Vorbereitung auf das jeweilige Thema (Einstieg), zur Kontextualisierung und Analyse unter Nutzung eigener Erfahrungen und Recherche sowie zur gelenkten Meinungsäußerung und kritischen Auseinandersetzung (Präsentationen und Diskussionen) sowie der sprachmittelnden Kompetenz (Mediation). Alle Module geben Gelegenheit zur Beschreibung und Auswertung von Grafiken und Schaubildern. In den Wortlisten zu den Modulen werden außer den themenspezifischen Lexemen auch Phrasen aufgeführt, die sich der unmittelbaren Erschließung entziehen oder wegen ihrer Ausbildung und Struktur aneignenswert erscheinen.

Die Texte im Skills-Teil können zur Vorbereitung auf die Abschlussprüfung im Fach Englisch genutzt werden. Sie greifen die Modulthemen auf, fügen ihnen jedoch neue inhaltliche Facetten hinzu. Die Aufgabentypologie und insbesondere auch die Textvolumina richten sich hier an den Vorgaben der länderspezifischen Prüfungsordnungen aus.

In diesem Buch wird grundsätzlich die englische Standardorthografie verwendet. Bei allen Fremdtexten wird die jeweilige Orthografie beibehalten.

Mit dem vorliegenden 3. Band der Reihe „Technology & Society now!“ und insbesondere mit dem Fokus auf Sachtexte wollen wir, die Autorinnen und Autoren, einen Beitrag zur Fortentwicklung der (fach)sprachlichen, fachlichen und auch analytischen Kompetenzen der Lernenden leisten. Wir hoffen, dass uns dies gelungen ist. Helfen Sie uns, das Lehrwerk zu optimieren, und lassen Sie uns wissen, was es in der nächsten Auflage, im nächsten Druck zu verbessern gibt. Schreiben Sie uns unter lektorat@europa-lehrmittel.de. Über ein Echo, gleichgültig, wie es ausfallen mag, freuen wir uns.

Im Herbst 2019 Autoren und Verlag

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13 From traditional to renewable energies

Getting started

TASK 1

In groups discuss and write a report on where the energy comes from that you, your family and friends use and what you use it for.

13.1 What is energy?

The word "energy" is derived from the Greek word "energeia" [ενεργεία], which is made up of "en" meaning "in" and "ergon" meaning "work". "Energy" was first used in the English language in the 1660s and referred to "power". In the 19th century scientists started to use the word as we use it today to mean "the ability to do work". This energy or power we get from resources can be categorised as **primary** and **secondary** energy.

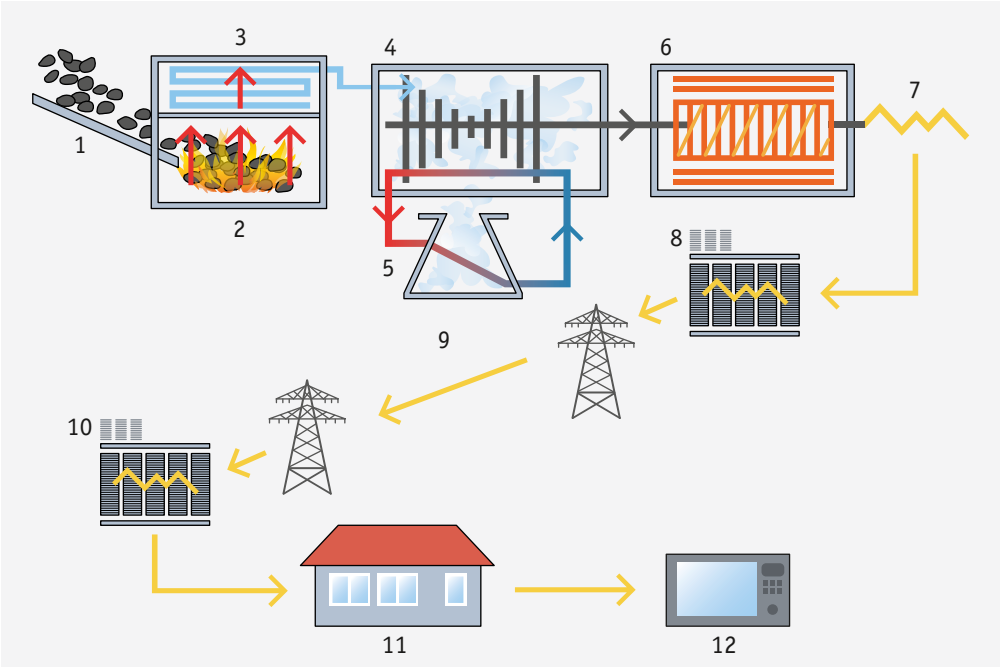
Primary energy is the energy that is found in the natural environment and that has not been subjected to any human processing. It is energy contained in raw fuels such as oil, coal, natural gas, peat, shale, biofuels such as wood and sugar cane and geothermal energy.

Secondary energy sources derive from the transformation of primary sources. Petrol is extracted from crude oil and electricity is generated from power stations using processed coal, oil, nuclear fuels, natural gas, biofuels, biomass, and from sources such as hydroelectric plants and solar installations. (166 words)

Ratcliffe-on-Soar power station in Nottinghamshire, England

TASK 2

In groups work out and write down how you think a power station works. Then compare your description with the diagram on the next page and the results of Task 3.



TASKS **3**

Work with the diagram

1. Match the following descriptions of what happens in a power station with the numbers on the diagram:

   Pylons: High metal towers carry electricity along overhead cables to wherever it is needed.

   Generator: The turbine is linked by an axle to a generator, so the generator spins around with the turbine blades. As it spins, the generator uses the kinetic energy from the turbine to make electricity.

   Step-down transformer: Once the electricity reaches its destination, another transformer converts the electricity back to a lower voltage safe for homes to use.

   Furnace: The fuel is burned in a giant furnace to release heat energy.

   Appliances: Electricity flows all around your home to outlets (sockets) on the wall. They make a very indirect connection to a piece of coal hundreds of miles away.

   Boiler: In the boiler heat from the furnace flows around pipes full of cold water. The heat boils the water and turns it into steam.

   Turbine: The steam flows at high pressure around a wheel that is a bit like a windmill made of tightly packed metal blades (see picture on p. 9). The blades start turning as the steam flows past. This turbine converts the steam's energy into kinetic energy.

   Homes: Electricity flows into homes through underground and overhead cables.

   Fuel: Some power plants run on coal, while others use oil, nuclear power, natural gas, or methane gas from decomposing rubbish.

   Electric cables: The electricity travels out of the generator to a transformer nearby.

Turbine blades on a steam turbine rotor used in a power station

Step-up transformer: Electricity loses some of its energy as it travels down wire cables, but high-voltage electricity loses less energy than low-voltage electricity. So the electricity generated in the plant is increased to a very high voltage as it leaves the power plant.

Cooling tower: The giant cooling towers make the turbines more efficient. Boiling hot water from the steam turbine is cooled in a heat exchanger, called a condensor. Then it is sprayed into the giant cooling towers and pumped back for reuse. Only a small amount of the water used escapes as steam from the towers themselves, but huge amounts of heat and energy are lost.

2. At the heart of every power station is the turbine. There are three main types of turbine: a) steam turbine, b) gas turbine and c) combined designs. Using the internet find out and describe how these three types of power station turbines function.

Work with language

Find definitions in English for the following words and phrases:
voltage • generator • kinetic energy • transformer • furnace • condensor.

Mediate. In German write a description of how a power station functions for a magazine aimed at readers aged between 12 and 16 years.

Going beyond the text

Power stations vary in their efficiency, i.e. in the amount of energy locked inside the fuel which they convert to electricity. Do research on the internet and write a report on which are the most efficient power station designs and fuels.

13.2 Is there an alternative to oil?

TASK 4 **Getting started**

In groups think of and list ways in which oil "runs the world".

Two Reasons Oil Will Continue to Run the World

By Jude Clemente

Anacortes Oil Refinery, Washington State, USA

Supplying 33 % of all energy, oil is the world's primary fuel. Oil is so important that global demand is ever-growing: 67 million barrels per day in 1990, 77 million barrels per day in 2000, and 91 million barrels per day in 2014. I'll never understand the animosity of some Westerners toward critical fuels that they depend on every day, making their lives easier in ways their great grandparents only dreamed of. Oil, after all, is the reason the world is truly globalized.

1. More Cars, Trucks, Gasoline, and Diesel Fuel

Thanks to derivatives gasoline and diesel fuel, the ongoing dominance of oil in the rapidly expanding vehicle market just now reaching into developing Asia is about as sure a thing as we have in our energy/environment discussion today. If there's ever going to be common ground between fossil fuel companies, liberals, conservatives, environmental groups, the anti-oil crowd HAS to get over that fact. The power of oil is simply overwhelming. There are now about 1.2 billion passenger cars alone, over 98 % of them rely on oil. The fleet is expected to reach 2 billion by 2035 and over 3 billion by 2050, with developing Asia leading the way thanks to rising personal incomes. [...] The world consumes about 24 million barrels per day of gasoline and 27 million b/d of diesel fuel every day, a staggering 1.5 million gallons every minute. Like it or not, more oil is a numbers game. The U.S., for instance, has 82 cars per every 100 people; China has just 7. And India has just 4 cars per every 100 people – and 385 million kids under the age of 15. Focused in heavy-duty vehicles, diesel could eventually surpass gasoline to become the number one transportation fuel worldwide, as commercial activity can only grow. When nations become more developed, their heavy-duty truck sales are tracked closely with changes in GDP. Despite noise and emission concerns since it's less refined, diesel engines are also making

headway in the passenger car market, offering up to 40 % more efficiency.

And contrary to what we keep hearing, not even the rich U.S., easily the largest consumer in the world, is a saturated oil market. Some 16.5 million cars were sold in the U.S. last year; about 120,000 of them were plug-ins, easily the largest electric vehicle market in the world. Truck and SUV sales, meanwhile, were over 8 million. In the U.S., vehicle stock can stay on the road for over 20 years. There are legal obstacles: but that gas guzzler you thought disappeared but really just got scrapped to Mexico has broader potential. Used vehicles make up less than 20 % of total car sales volume in China, compared to over 70 % in the U.S. China is selling nearly 25 million new vehicles a year, and only 75,000 of them run on electricity. It's certainly not for a lack of trying: each plug-in hybrid Chevy Volt sold in the U.S. has been supported by over $250,000 in government subsidies. Over a 10-fold advantage in energy density and highly established global infrastructure give gasoline especially the cost advantage over electric vehicles, a crucial consideration for the poorer nations now crashing the global vehicle market.

2. 83 % of the World Has Just Started to Consume Oil

The idea that the world has really just started to consume oil is one that is very difficult for some Westerners to accept. It's easy to see why: we have all the oil that we need and want. Americans consume over 2.6 gallons of oil products every day, and there are 255 million oil-based cars in the country. But, most of the world doesn't have it as easy as we do. A rising 83 % of the world is undeveloped, and the transport demands for the poor are just now coming to light. The developed OECD nations use 50 % of the world's oil but are just 17 % of the population. The rich consume 1.6 gallons of oil products a day, while the poor consume just 0.32 gallons. Given the importance of oil, this five-fold disadvantage for the poor is indeed a moral issue: oil-dependent Westerners are the ones leading the anti-oil charge. Our hypocrisy just isn't selling in the developing world. Why would it? Poor people wanna be rich too. From 2010–2030, the poor nations are projected to add 800 million new registered vehicles.

Oil pump in West Texas

After vehicles, the second emerging oil market to watch could be jet fuel. Boeing affirms that commercial aircraft in the world will double to over 40,000 by 2032, with Asia-Pacific becoming the focal point of aviation. Jet fuel demand in the region has more than doubled to over 2 million b/d since 2000. Indeed, twinned with electricity, oil is the cornerstone of modernity where more demand indicates higher standards of living. (791 words)

13

Work with the text TASKS 5

1. Present in chart form the growth of the following as described in the text:
   a) oil production,
   b) car production,
   c) cars per one hundred people.

2. Explain what the author means when he writes that
   a) oil is making our lives easier.
   b) "the power of oil is simply overwhelming".
   c) the United States is not a "saturated oil market".
   d) electric vehicles cannot compete with petrol and diesel driven vehicles.
3. Comment on the author's view that anti-oil westerners are hypocritical.
4. Examine the author's statement that diesel engines offer up to 40 % more efficiency (than petrol engines).
5. Analyse and comment on the author's optimistic view of the world's consumption of oil.

Mediate. Translate the paragraph beginning "Thanks to derivatives ..." into German.

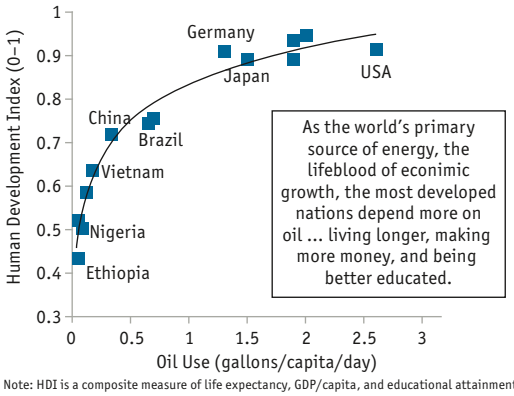
Research work. Examine the author's statement that "we have all the oil that we need and want". Find out what oil reserves we have and how long they will last if the number of new vehicles in poor countries increases at the rate the author suggests.

Discussion. In groups discuss how realistic the author's thesis is that higher standards of living in poor countries will inevitably mean more vehicles and a higher consumption of oil in those countries.

Work with the diagram

The graph used by the author implies that there is not just a correlation (a connection between two or more features, events, ideas, facts but with no causal effect) between oil use and human development but that oil use actually causes and promotes human development. For example, there is a correlation between the consumption of ice cream and deaths in swimming pools, but there is no evidence that the one causes the other.

1. Consult the Human Development Index in Wikipedia on the internet (en.wikipedia.org/wiki/Human_Development_Index) and compare the figures given there with the figures given in the diagram. Point out the information that the author has left out of the chart.
2. Examine the figures for countries with lower oil use than the United States and compare their Human Development Index with that of the United States.



Note: HDI is a composite measure of life expectancy, GDP/capita, and educational attainment

More oil use signifies more human development

13.3 Global warming and climate change – fact or fiction?

TASKS
6

Getting started

1. **"Global warming" and "climate change" both refer to the same phenomenon but emphasise different aspects of it. Define the words (global + warming and climate + change) used in both expressions and outline the way the two terms differ in meaning and emphasis. Include in your report a definition of the difference in meaning between "climate" and "weather".**
2. **Define the term "greenhouse gases" and their role in climate change. Explain how far they derive from human beings and how far from natural events.**

Climate change: what's so alarming?

By Bjorn Lomborg

Carbon emissions are rising – and faster than most scientists predicted.

But many climate-change alarmists seem to claim that all climate change is worse than expected. This ignores that much of the data is actually more encouraging than expected.

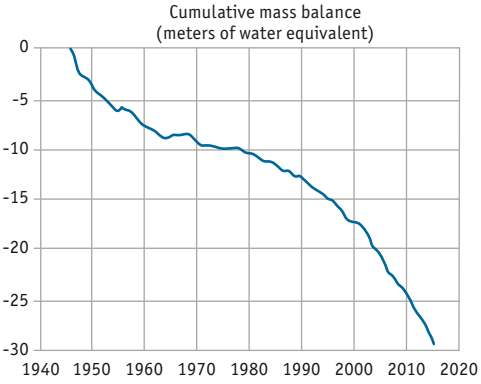
Yes, Arctic sea ice is melting faster than the models expected. But models also predicted that Antarctic sea ice would decrease, yet Antarctic Sea ice is increasing.

Yes, sea levels are rising, but the rise is not accelerating – if anything, two recent papers, one by Chinese scientists published in January 2014, and the other by U.S. scientists published in May 2013, have shown a small decline in the rate of sea-level increase. We are often being told that we're seeing more and more droughts, but a study published in March 2014 in the journal Nature actually shows a decrease in the world's surface that has been afflicted by droughts since 1982.

Facts like these are important because a one-sided focus on worst-case stories is a poor foundation for sound policies.

Hurricanes are likewise used as an example of things getting worse. But look at the U.S., where we have the best statistics: if we adjust for population and wealth, hurricane damage during the period of 1900-2013 actually decreased slightly.

At the UN climate conference in Lima, Peru in December 2014 attendees were told that their



Loss of ice and snow in glaciers 1945–2015

countries should cut carbon emissions to avoid future storms like Typhoon Hagupit, which hit the Philippines during the conference, killing at least 21 people and forcing more than a million into shelters. Yet the trend for strong typhoons around the Philippines has actually declined since 1950, according to a study published in 2012 by the Journal of Climate.

Again, we're told that all things are getting worse, but the facts don't support this. This does not mean that global warming is not real, or a problem, but the one-sided story of alarmism makes us lose focus. If we want to help the world's poor, who are the most threatened by natural disasters, it's less about cutting carbon emissions than it is about pulling them out of poverty.

The best way to see this is to look at the world's deaths from natural disasters over time. In the Oxford University database for death rates from floods, extreme temperatures, droughts, and

14 Engineering the future

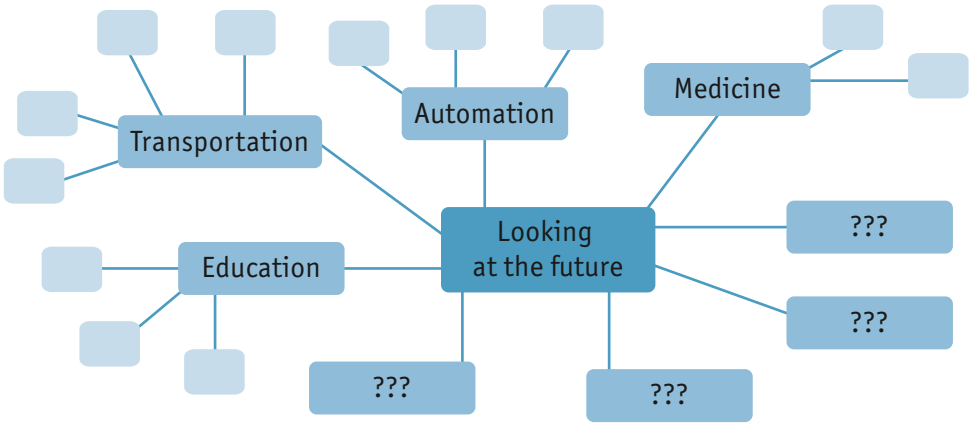
Science fiction provides a narrative form of extrapolating current trends in all fields of technology and society into an imaginary future. Much of this is highly speculative, of course, but more often than not based on facts and developments that were known to science fiction authors at the time of writing. More concretely, planning the future is a key activity at all levels of public administration and corporate research and governance.

14.1 The world in 2050

Getting started

TASK 1

Add your ideas to the mind map below and chart areas where you think striking future developments will occur. State the kinds of changes that you would think most likely to have a considerable impact on how we live or do things. Take current trends into account.



What the future has in store – some ideas

Ray Kurzweil, American author, computer scientist, inventor and futurist, looks at some short- and medium-term developments.

1 Nanobots will plug our brains straight into the cloud

By 2050, nanobots will plug our brains straight into the cloud. It will give us full immersion virtual reality from within the nervous system. Just like we do now with our smartphones, we will be able to do it with our brains; we'll be able to expand our neocortex in the cloud. And forget about memory problems.

2 People reincarnation through AI

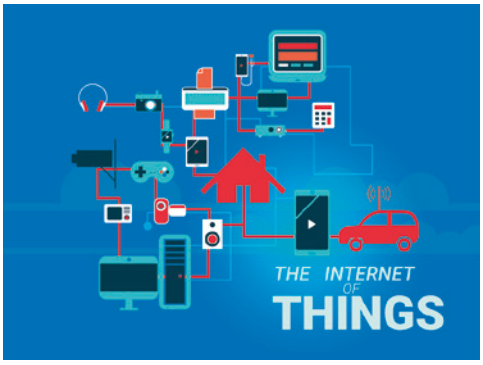
We will be able to "bring back" our relatives through artificial intelligence. By 2050, we'll be able to send nanobots into people's brains to extract memories of loved ones. Augment that with a DNA sampling of the deceased, and it will be possible to create a convincing virtual version of somebody who's passed on.

3 AI will become a positive net job motivator

Many people worry about AI in our lives as they think that in the end robots will replace people and we won't have jobs for ourselves. But according to Forbes, AI will become a positive net job motivator, creating 2.3m jobs in the short term while eliminating only 1.8m jobs.

4 IoT technology will change product designs

IoT technology will soon be in 95 % of electronics for new product designs. And by 2050 it is expected that everything will be connected to the cloud and to the internet.



5 Space tourism: a week in orbit

Space tourism could be feasible in 2050, but likely only for the very wealthy. Rocket companies like Jeff Bezos's Blue Origin and Elon Musk's SpaceX will extend the current limits of space travel enough that tourism will be feasible in the year 2050. But only those who could afford to pay 100 million quid could spend a week in orbit.

6 Self-driving cars will make driving safer

Despite the crashes involving self-driving cars that have hit the headlines in the past, this area of AI could dramatically reduce deaths and injuries on our roads. Not only will self-driving cars reduce traffic-related deaths and injuries, but they could bring about changes in our lifestyles as well. We will have more time for ourselves. The increased comfort and decreased cognitive load with self-driving cars and shared transportation may affect where people choose to live.

7 Charge your iphone with plant power

People will be able to charge their iphone with the power of a plant. Forests can become the energy stations of the future. *Bioo* is a cleantech company capable of generating electricity from plants' photosynthesis.

8 Ocean thermal energy can take us to 100 % renewable energy

Ocean thermal energy is a largely untapped resource and one of the world's largest renewable energy sources. Utility-scale electricity generated through ocean thermal energy conversion will be able to outcompete fossil fuel-based generation and other renewables that require storage and grid balancing. It will play a crucial role in the future energy mix being one of the very few constant energy sources, available day and night, year-round.

9 Drone solution for discovering untouched places

Deep in underground mines, some zones are inaccessible. But work has started to build drones that fly, drive and climb and use laser technology to scan zones, and create a 3D map of them. With this advancing aerial robotics technology we will be able to push human reach to any space untouched by man-made infrastructure.

(573 words)

TASKS 2

Work with the text

1. Decide which of the ideas 1–9 you think will become reality by 2050 and which will not. Justify your decision.
2. State which of these options are likely to be realised within the next ten years. State why.

Research

Go to the internet to find out what the names and terms listed below mean and, in the case of technical instruments or processes, how they work. Work in groups and present your results in class.

nanobots • neocortex • Forbes • Jeff Bezos • Elon Musk • cognitive load • photosynthesis • utility-scale electricity • grid balancing • aerial robotics

14.2 The future in science – some aspects

14.2.1 Dealing with carbon dioxide (CO_2)

14.2.1.1 The problem

It is a well-known fact that carbon dioxide (CO_2), a primary greenhouse gas, contributes to global warming. Billions of tons of it are spewed into the air daily around the world by human beings. To a larger or lesser degree we all contribute to carbon pollution by using energy produced by means of combustion processes used in cars, trucks, planes, ships, oil refineries. But power plants, industrial production, construction, farming also leave a CO_2 footprint. About half the CO_2 that's produced ends up in the oceans or is absorbed by trees and other plants.

Will this landscape be affected?

But what if this CO_2 and other greenhouse gases could be captured and turned into something useful to humankind so that it doesn't get released into our atmosphere? In fact, some research is being done around the world to see if this is feasible. Researchers are looking at ways of turning CO_2 into plastic products, kerosene for jet fuel, and building materials.

Getting started TASK 3

In class gather information about global warming. In addition to what you know or have experienced yourself, collect information from the internet and/or printed media.

14.2.1.2 Looking for solutions

The year 2016 was historic in many ways. One of its most significant moments happened when the Paris Agreement on Climate Change came into force. But tech giant and philanthropist Bill Gates argues that we need much more than a cut in global emissions to solve our climate problem. An energy miracle is needed.

Along with some of the world's richest people he has launched a fund to invest in technology-driven solutions. It will bring together governments, research institutions and billionaire investors who will try to limit climate change.

These technological innovations could help them achieve their goal.

Power generation

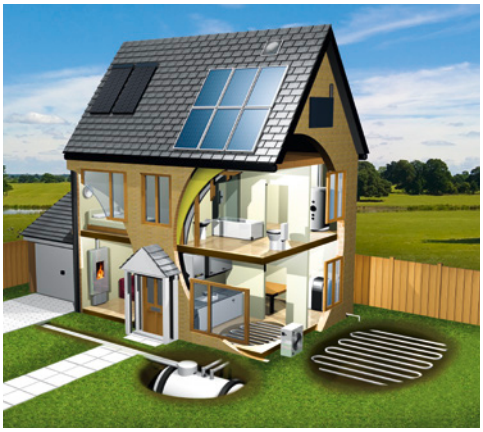
We already know that nuclear power is a way of producing electricity free of carbon emissions, but we have yet to harness it in a way that is truly safe and cost-effective. We may be closer to an answer, however. General Fusion, a Canadian company, aims to be the first to create a commercially viable nuclear-fusion-energy power plant. They say that fusion produces zero greenhouse gas emissions, emitting only helium as exhaust emission. And they claim that fusion energy is inherently safe, with zero possibility of a meltdown scenario and no long-lived waste, and that there is enough fusion fuel to power the planet for hundreds of millions of years.

Transport causes pollution

Transport

Transport represents 23 % of global energy-related CO_2 emissions. But the demand for transport is going to increase. We have already found alternative ways of powering vehicles, such as electricity. But in order to use it on a wide scale, we need much more efficient batteries and a much more efficient battery-charging technology.

Researchers at the University of Surrey have made a scientific breakthrough. They discovered new materials offering an alternative to battery power which could be between 1,000–10,000 times more powerful than the existing battery alternative. They say "the new technology has the potential for electric cars to travel similar distances as petrol cars without the need for lengthy recharging breaks of between 6 and 8 hours. Instead they recharge fully in the time it takes to fill a regular car with petrol."



Using energy wisely

Food

About a quarter of all global emissions come from feeding the world's 7 billion people, and part of that comes from the consumption of meat. But according to Bill Gates, "There is no way to produce enough meat for 9 billion people." One of the alternatives is to start producing lab-grown meat and to produce meat substitutes that look, taste and feel like the real thing. The company Beyond Meat has created the world's first meat burger that is entirely plant based. It is made mostly from vegetable protein found in peas.

Manufacturing

Making the things we use every day puts an enormous strain on the climate – about 30 % of emissions come from industry. Carbon Engineering, a Canadian start-up, is working on taking carbon dioxide directly from the atmosphere and then using it to produce fuel. According to the company, "direct air capture can remove far more CO_2 per acre of land footprint than trees and plants". The company is already running a demonstration plant in Squamish, British Columbia, that is removing one ton of CO_2 from the air every day.

Buildings

Greenhouse gas emissions of buildings are also significant. We need lighting, power, heating and cooling whether at home or in the office, at school or in a hospital. The combined emissions from these sources contribute almost 20 % of global emissions. Part of the answer is to build smarter cities. That's what Sidewalk Labs,

a company which is part of Alphabet Inc., the parent of Google, is doing. In one of their projects they use digital technologies to analyse traffic flows through cities and hotspots of congestion. This could dramatically reduce air pollution in our cities.

Members of the Breakthrough Energy Coalition (BEC), among them Jeff Bezos from Amazon, Jack Ma from the Alibaba group and Richard Branson, have committed to investing more than $1 billion in new technologies over the next 20 years. (670 words)

TASKS 4

Work with the text

1. State why an energy miracle is needed to solve the climate problem and find reasons not mentioned in the text.
2. For each of the technological innovations described in the text explain its contribution to the reduction of CO_2 emissions. Say why you find these alternatives worthwhile considering or why not. Prioritise them according to feasibility and give your reasons.
3. Comment on the commitment, financial and social, of individuals you may know because of their entrepreneurship shown in the new media.

Research and discussion

1. Go to the internet and look up the names and biographies of some of the members of the Breakthrough Energy Coalition. Work in groups and choose from the following: Bill Gates, Jeff Bezos, Richard Branson, Jack Ma, George Soros, Meg Whitman, Mark Zuckerberg. Present your results in class.
2. Do research and find out about activities in your home town or the region where you live aiming at bringing about a reduction of the CO_2 footprint.
3. Speculate about the degree of success of measures to reduce carbon dioxide emissions. In your view what changes will there be in industry, in society, in our lifestyle.

14.2.2 Biotechnology

14.2.2.1 A definition

What do we know about biotechnology? Most people have only a vague idea. On the website of BIO (the Biotechnology Innovation Organisation) you will find this definition and a summary of biotechnology related activities:

At its simplest, biotechnology is technology based on biology – biotechnology harnesses cellular and biomolecular processes to develop technologies and products that help improve our lives and the health of our planet. We have used the biological processes of microorganisms for more than 6,000 years to make useful food products, such as bread and cheese, and to preserve dairy products.

Modern biotechnology provides breakthrough products and technologies to combat debilitating

Developing tomorrow's food (?)