



Workbook for participants #6

Interactive worksheets for distance learning



Blue gold

Our drinking water and climate change



Full name Group/class

E-Mail address

Phone number Date



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Dear teachers and parents,

The following **workbook for participants** is part of the learning pack “Blue gold – Our drinking water and climate change”. It is aimed at **students and participants** in projects working through this learning pack in online classes.

Instructions on using the learning pack should be issued by a **teacher**. Teachers can find further information on this as well as other learning packs at [dw.com/learning-environment](https://www.dw.com/learning-environment)

Most worksheets require a program compatible with PDF files, such as [Adobe PDF-Reader](#) or similar. These are free-of-charge and enable participants to fill out forms. You will need a stable internet connection to watch the films.

i Help

Dear student,
Dear participant,

This **workbook** relates to the issue of “Blue gold – Our drinking water and climate change”.

You can fill out the worksheets on the computer or laptop and save them. There are some helpful tips below.

How do I fill out the worksheets?

1. Go to the worksheet you wish to use.
2. Read the task thoroughly. Add your answers to the text field on the worksheet. Keep your answers as short as possible. You can only write in the text field.
3. Once you have filled out all the text fields, rename the PDF document and save it. If no file name has been agreed upon, it should include your last name (the file name should not be too long and should not contain any special characters).
4. You can now send your teacher your work in the saved PDF file, for example, as an attachment.

Before you begin, write your name and contact information on the **› title page**.

How do I find films and articles?

Watching films

On some worksheets, you will be asked to watch a **film**.

By clicking on a film title, you will be taken to the web page where you can watch the film. If that doesn't work, you can copy the link in brackets into the search box of your browser.

Reading articles

Other worksheets relate to articles you will need to read in order to complete certain tasks. Each article is included with the corresponding worksheet.

By clicking on the title of an article, you will be taken directly to the article without having to scroll.

Tip

At the top of each page, you will find a navigation menu.

By clicking ↶, you will return to the page you last looked at.

The ? will take you to this help page.

Click → [table of contents](#) to go back to that page.

You can use the arrows ← and → at the bottom right of the page to move between pages.

Something isn't working?

If there is anything you don't understand or if you are having technical problems (such as with the internet or the PDF file), please ask an adult for help!



Worksheet 2

Word puzzle for the film “Blue gold – the dwindling resource of water”

Watch the > film “Blue gold – the dwindling resource of water” (dw.com/p/3cbck).

1. Match up the start of the sentences 1 – 6 with the correct endings A – F.

We get drinking water ... 1	A ... periods of drought are getting longer and more frequent.
It's becoming warmer ... 2	B ... from lakes, rivers, ground and rainwater.
Groundwater stores ... 3	C ... at around 70%.
More than 2 billion people ... 4	D ... the growing world population and climate change.
Water scarcity is being worsened by... 5	E ... have no access to clean drinking water.
Agriculture uses by far the most water ... 6	F ... are increasingly disappearing.

2. In which cities is most water consumed and in which cities is least water consumed? Match water consumption rates with the right city.

City	Water consumption (per day and per person)
• Beijing	447 liters
• Berlin	114 liters
• New York	100 liters
• Kampala	24 liters



Worksheet 3

List of words

Read the [▶ article "Tackling the growing threat of water conflict"](#).

In it, Charles Iceland, director of water initiatives at the World Resources Institute, explains how water scarcity can aggravate existing conflicts in society.

The text contains some uncommon words and concepts. Some are already in the table below. Are there any other words in the text that you don't understand? Note them in the **table**.

What do these words mean? Research online or in books. Please write their definitions in the right-hand column.

Word/Concept	Definition
Water conflict	
Water scarcity	
Climate change	
Desertification	
Threat multiplier	
Non-violent conflict	
Diplomacy	
Hotspot	

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Article 1

Tackling the growing threat of water conflict

Climate change and rapid population growth are among the reasons for rising water insecurity. Charles Iceland of the World Resources Institute spoke to DW about how it's driving conflict in Africa and across the globe.



Ever more of the world's population is living with water insecurity and is unable to consistently access safe, clean drinking water.

A number of factors, including climate change and poor water management, are worsening water scarcity, which coupled with other social problems like rising inequality and ethnic tensions, are threatening conflict between states and within states.

Charles Iceland, director of global and national water initiatives at the World Resources Institute, spoke to DW about disputes over the essential resource and how they can be avoided, as well as the new Water, Peace and Security (WPS) tool that forecasts where water disputes are likely over the next 12 months, and how they might be avoided.

DW *What is a water conflict and what does it look like?*

Charles Iceland In many places throughout the world, there's just more and more demand for water with respect to what's available. Sometimes the conflicts are nonviolent – like in Australia or California where people go through the legal system or they work their issues out without violence. But in a lot of places, the problem is grave enough and the ability

to resolve the problem is not well developed. So you can see the wrestling over these scarce resources develop in violent ways.

DW *Where would you say are the regions and countries in which water, water scarcity, water quality are playing a role in conflict?*

Charles Iceland Populations are growing very quickly in sub-Saharan Africa – going up fourfold between 1960 and today. Resources have either stayed the same or you have a reduction in resources, because of climate change or because desertification is reducing arable land. So you have a lot of violent conflicts between these smallholder farmers and pastoralists wrestling over scarce land and water resources. We've seen over the past couple of years pastoralists massacring farming communities and retribution by farming communities.

We're also seeing a lot of violent conflict play out in the Middle East. So, for example, in Iraq, a lot of the demonstrations that led to the prime minister's resignation a few months ago. But part of the grievances entailed lack of services, which included lack of access to clean water and lack of access to electricity. They're getting sick. About a year and a half ago, 120,000 people in Basra had to be hospitalized because they were drinking contaminated water.

And it's [water scarcity] is also a problem in places like Iran, Afghanistan and India. So those are some of the hotspots.



Mass protests broke out in the southern oil-rich province of Basra, Iraq, in 2018 and 2019, with people demanding better public services, including access to water

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Article 1

DW *So it could be an interstate conflict, but it could be intrastate as well between various stakeholders in society?*

Charles Iceland When you have violent conflict, it usually plays out at a subnational level. While you have international conflicts over water, those are rarely resolved through violence. So, for example, we have India and Pakistan wrestling over water in the Indus. We have Iraq and Turkey wrestling over water in the Tigris and Euphrates. We have Egypt and Ethiopia wrestling over water and in the Blue Nile Basin. The parties try as much as they can to resolve the issues in a nonviolent way through diplomacy.

DW *Will we see a future of water wars and water as the new oil?*

Charles Iceland Both, like a lot of metaphors, are not really accurate. Wars are rarely fought over water as a single issue. Rather, we see the problem as a threat multiplier. So it's one issue in the background. If you have other issues leading to instability, maybe problems between ethnic groups or anything could trigger violence, the background of having water scarcity, has destabilized the society and made it less able to resolve problems amicably.

DW *How much of a role does climate change play in water scarcity or water quality?*

Charles Iceland We have trouble attributing any particular drought or flood to climate change, but we are seeing very dramatic increases in the incidence and severity of drought in parts of sub-Saharan Africa and the Middle East. So we're having a general decline in rainfall in some of these areas. In some of these areas, the amount of rainfall stays the same but you have very large intermittent drought and flood periods. That's what's been predicted by climate change experts.

DW *What other factors can lead to water scarcity?*

Charles Iceland The management of water resources is a critical factor. So people, in theory might

have enough water in some places, but they're mis-managing it. They're losing water. They are polluting the water. And then there are upstream, downstream issues. There are many instances where the upstream users are accessing water, but downstream users suffer because they're getting less water.

DW *What exactly is the Water Peace and Security tool?*

Charles Iceland We're a consortium of nine organizations in the United States and Europe that are working together to both try to identify hotspots of water insecurity and then try to help local people and the global community do something about this to either avoid conflict or minimize the impacts of conflict. So we've developed a machine learning based model that tries to predict where conflict might break out in the next 12 months. We're using a number of factors – political, economic, social, demographic – that might point at imminent conflict. And to that group of indicators, we add water and food insecurity indicators. We try to identify these hotspots, whether they are water related conflicts and what are the drivers of the conflict.

DW *How can you resolve a water conflict?*

Charles Iceland There are lots of examples on the subnational and international levels where either global or national entities have brought competing [water] users together.

A very good example of this was in 1960, the World Bank brought the governments of India and Pakistan together to develop a treaty that divided up the water in the Indus River Basin. That treaty has come under pressure recently but it's still been able to keep India and Pakistan from having problems boil over – at least to date.

19.03.2020

*Jennifer Collins conducted the interview, which has been shortened and edited for clarity.
dw.com/p/3Z6pf*



Worksheet 4

The water cycle

Read the following **text** on the water cycle carefully. Match the highlighted terms with the corresponding parts of the **diagram** by entering the numbers behind each term into the appropriate field e.g. **1**.

Our drinking water's journey

By the time a drop of water finds its way into our bottles or glasses, it has often undertaken a long journey. The water cycle shows the various stages of this voyage, during which water takes on various forms.

From the sea to the skies: How salt water becomes freshwater

Humans can't drink salt water from the **ocean (1)**. But that changes when the sun warms up the surface of the water. When temperatures rise, countless tiny drops – invisible to the naked eye – rise into the atmosphere as vapor. During this **evaporation (2)**, the salt remains in the sea and the salt water becomes freshwater.

The journey back to Earth: Why it rains

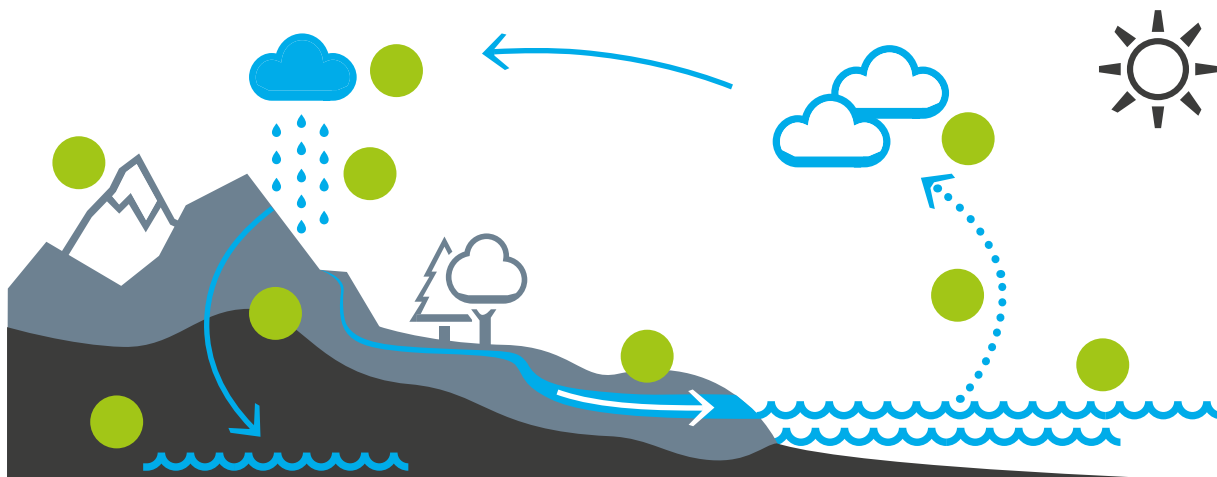
The vapor can appear in the sky as **clouds (3)**. Because it's colder higher up in the atmosphere than on Earth, the water vapor cools and reforms into tiny droplets – scientists call this **condensation (4)**. When it gets even colder, the tiny water droplets collect to form bigger drops. When they're heavy enough, they fall back to Earth as **precipitation (5)**. Depending on the temperature, this can take the form of snow or rain.

Hidden water: How rivers stay topped up

When it rains, some of those water droplets seep into the soil. This infiltration leads to the creation of out-of-sight **underground lakes (6)**. Due to natural processes, this **groundwater (7)** comes back to the Earth's surface in the form of springs, which feed lakes, streams and rivers that eventually lead to the ocean.

The forest: Nature's air conditioner and drinking water delivery system

If you take a walk in a deciduous forest in high summer, you can feel the process of evaporation as it occurs in **rivers (8)** and oceans. As trees store water, evaporation occurs via their leaves. Rising water vapor cools the air. The amount of water on Earth remains the same, regardless of whether it's hidden in plants, **glaciers (9)** or up in the sky. That's because water droplets are contained in an eternal cycle as old as the planet itself. Our supply of this precious resource is secure only if this cycle remains intact.





Worksheet 5

Questions about the article “Staying hydrated in Cairo, Egypt”

Read the > **article “Staying hydrated in Cairo, Egypt”** carefully. You will be introduced to Suzan Ghany, who has access to water for only a few hours a day. Sometimes she has no water at all.

Answer the following **questions**:

1. For how many hours each day does the water supply work in Suzan Ghany’s house in Cairo?

.....

2. What are the problems that arise when locals drill their own wells to access water?

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.....
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3. What is the government doing to ensure the population has access to water?

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.....

4. What is most of Egypt’s water used for?

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.....

5. What water-intensive practices are used in the agricultural sector?

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Article 2

Staying hydrated in Cairo, Egypt

Water is hard to come by in Egypt, which receives little rainfall and is mostly desert. Already below the UN's threshold for water poverty, Cairo is on its way to "absolute water scarcity." Residents of the densely populated city, one of Africa's largest metropolises, face daily water challenges.

Egypt is home to much of the Nile, Africa's longest river, whose fertile banks nurtured some of the world's first cities. For millennia, Egyptians have relied on the Nile to drink and feed crops.

But its waters surge from springs over which Egypt has little control.



Egypt is the Nile's most downstream country. The Blue Nile starting in Ethiopia and the White Nile flowing from the African Great Lakes region join in Khartoum, Sudan, before flowing into Egypt.



Some 1,200 kilometers from Egypt, Ethiopia is building what is set to be Africa's biggest source of hydroelectric power: the Grand Ethiopian Renaissance Dam (GERD).

As the GERD reservoir fills, it could reduce the Nile's water supply by up to 25 %, a study from the University of Maryland found in 2017.

Climate change, which is set to increase evaporation and make rain patterns more erratic, will leave less water to share out. And in hot and dry years with little rain upstream, the GERD's effects on the Nile could be catastrophic. Egypt fears the GERD will limit water for its growing population, which already stands at 100 million.

Even as it reduces flow, the dam could help long-term water security by storing water in wet years and releasing it in dry ones, if the countries through which the Nile flows agree to share it fairly.

Egypt and Ethiopia have yet to agree how much water the latter will allow through the dam as it fills, and over what period of time. Bitter negotiations regarding water rights between Egypt, Sudan and Ethiopia have threatened to flare into war as recently as October.

In Greater Cairo – a sprawling metropolis of 20 million people that is predicted to grow by a further 9 million by 2035 – population growth will strain the city's ability to cope. Residents of poorer suburbs bear the brunt of water scarcity.

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Article 2

Suzan Ghany, a journalist, lives in Giza, a city on the west bank of the Nile within Greater Cairo. Her daily life is restricted by a pipe system that works only for seven hours from the early morning and total water shutdowns that can last weeks.

“When the water returns, you fill bottles, pans, anything you could find,” says Ghany, who spends an hour at a time filling bottles to use later. She filters water for cooking and drinking and uses unfiltered water for cleaning, washing dishes and in the bathroom.



© Hazem Abdul Hameed

In her neighborhood of Kafr Tuhurmis, 786 households are not even connected to the public water network, official data shows. They rely mostly on bottled water, wells and pumps. Both those with mains supply – such as Ghany – and those without have taken matters into their own hands.

Most houses on the street have drilled for groundwater and use motor pumps to compensate for low pipe pressure. But when residents of her building took that step, says Ghany, the water was not suitable for human use. Industrial wastewater and agricultural runoff plague the Nile, with factories and farms offloading pollutants that sully the river and leach into groundwater.

In October, Egypt’s Ministry of Water Resources and Irrigation hosted Cairo Water Week, an international conference responding to water scarcity. The Egyptian government is focusing efforts on infrastructure, farmers and families.

“Egypt has caught up tremendously in the last few years with regards to scarcity,” says Helmy Abouleish, director of SEKEM, a farming and research organization that invests in sustainable agriculture and has converted desert near Cairo into fertile oasis. “For the first time the government is aggressively addressing this issue in public.”

Egyptian authorities are building sewage plants to recycle water and desalination plants to remove salt from brackish groundwater and the sea. In Cairo, they are installing water-saving taps in public spaces, government buildings and even mosques, where washing rituals take place several times a day. They are also trying to fix leaky pipes and inefficient taps.

But distributing water fairly is as important as reducing wastage, says Harry Verhoeven, a Qatar-based researcher who has written a book on the politics of the Nile. Egypt relies on the river for 97 % of its water needs. “What the number veils, of course, is how that water is allocated internally.”

Eighty percent of Egypt’s water is used in farming, with inefficient practices such as flood irrigation compounding shortages, as well as water-intensive crops such as rice, wheat and tomatoes. Despite pressing water scarcity, Egypt was a net exporter of rice until 2016, after which it intermittently banned exports. Official data is not publicly available, but a report in 2018 by Transparency International, an NGO, found that the Egyptian military has “unrivalled power over public land” and owns, through an agency, several of the country’s major water and agriculture firms.

“As long as people are unwilling to talk about distributional questions – and the ways in which water and environmental issues more broadly are linked to political power – [it] is going to be very difficult to make any progress,” said Verhoeven.

Dezember 2019

Author: Ajit Niranjana
dw.com/african-megacities
 (shortened extract)



Worksheet 6

My water consumption

Figure out how much water you need in a day by filling out the **table** below.

Write other activities for which you use water in the free spaces on the table.

Not all amounts are easy to quantify. For instance, bathtubs come in different sizes and older flush toilets use more water than modern water-saving ones. When showering or washing your hands, it depends on how long you let the water run. Where there are no averages included in the table, you will have to estimate how much water you really use. Note your answers in the table.

Water consumption of (Name) (Date) (Place)

Activity	Average water consumption (liters)	My water consumption (liters)	How often do I engage in this activity each day?	Total (liters)
Showering	12 – 15 (per minute)			
Brushing my teeth				
Cooking				
Cleaning				
Drinking (e.g. tea or water)				
Washing my hands	1 – 3			
Taking a bath	80 – 150			
Washing dishes (by hand)				
Dishwasher	6 – 25			
Using the toilet	3 – 26			
Washing machine	30 – 130			
Overall total				



Worksheet 7

Fill-in-the-blanks text for the film:

“The ways we waste water”

Watch the > film “The ways we waste water” (dw.com/p/3YMI6) and fill in the **blanks** in the text. The terms can be found at the end of the text but are not in the correct order. Check off the terms you’ve already used.

What is virtual water? Let’s take jeans as an example ...

It takes around (1) to make one pair. That’s 53 bathtubs full. How come? Growing the (2) uses most of the water – it’s a very thirsty plant. If the rains fail, cotton fields have to be irrigated.

And if the cotton is to be spun into jeans, it also needs to be colored, rinsed and bleached. That pollutes a lot of water. Virtual water is the (3) that goes into the manufacturing of a product.

Nearly (4) for one kilo of coffee, (5) for a kilo of tomatoes and over (6) for one kilo of beef.

In a country with adequate natural water resources, high consumption is not a problem. Unless of course a lot of it gets polluted.

But in many regions, water is scarce – or supplies have been depleted by (7).

The water level in the Aral Sea has dropped 18 meters because of irrigation in cotton fields. It’s turned part of Uzbekistan into a (8).

Tomatoes are cultivated in the parched reaches of (9) – using water piped into enormous greenhouses.

And in (10), where there’s a shortage of drinking water, the country’s huge coffee plantations are never short of a drop. Coffee is a major export for Brazil.

Europeans import these water-guzzling goods and by extension all the virtual water needed to produce them.

Seen from this perspective, someone living in Germany uses (11), slightly over the global average. But (12) make up only a small part of that. Most water used here is virtual water, hidden in the products around us.

3,900 liters of water a day

8000 liters of water

southern Spain

salty toxic wasteland

cotton

unseen water

19,000 liters

184 liters

cooking, showering and laundry

production of certain goods

15,000 liters

Brazil



Worksheet 8

Questions about the film “In Colombia, a community goes back to school for clean water”

Watch the > film “In Colombia, a community goes back to school for clean water.” (dw.com/p/2yww3).

Answer the following **questions**:

1. What problems are the people in the film facing in Colombia?

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2. Why is it so dry?

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3. How does the boarding school get clean drinking water?

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4. What does the boarding school provide for the children?

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5. What are the positive impacts of the desalination plant?

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Worksheet 9

Traditional methods for fighting water scarcity in India

Read the [▶ article "India's 'water man' keeping liquids flowing despite crisis"](#).

Answer the following **questions**:

- 1. 600 million people in India are "facing what is termed extreme water stress" – what does this passage from the article mean in concrete terms for people living in the area – particularly for women?

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- 2. How does Rajender Singh's method work?

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- 3. Who benefits from the method?

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- 4. Do you think Rajender Singh deserves to have won several awards for his work, including the "Nobel Prize" for water? Please give reasons for your answer.

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Article 3

India's "water man" keeping liquids flowing despite crisis

India is suffering from the worst water crisis in its history. But Rajender Singh has been working to restore supply to more than a thousand villages, and has rejuvenated 11 rivers using traditional techniques.

It's early morning in the northern Indian city of Alwar, 95 miles (153 kilometers) south of the capital New Delhi. Scores of women have gathered at a municipal tap to get water for their families. Each of them has brought numerous vessels to collect as much water as possible, as supply is limited.

Millions of livelihoods are under threat from India's water crisis, according to a recent report by the National Institution for Transforming India, a policy think tank.

The report says that about 200,000 Indians die every year due to inadequate access to safe water, with 600 million facing what is termed "extreme water stress."

That stress is evident when the water stops flowing from community water taps such as this one. One person left in exactly that situation was 55-year-old Morchi Bai.



Women arrive to at community taps each day to fill up on as water as they can before the source runs dry

"This is not the first time that the water supply has stopped before my turn has come. Again today, I will have to beg my neighbor for a bucket of water," Bai told DW. "The government needs to look at our problems."

Running low

India's rural poor are highly susceptible to the effects of extreme weather and climate change. As many as 63 million Indians do not have access to clean drinking water, as reported by WaterAid, a global advocacy group on water and sanitation. However, there are people battling to bring about change.

Rajender Singh, popularly known as the "water man of India," has brought water back to more than a thousand villages, and has rejuvenated 11 rivers which are now flowing year-round as a result of conserving water through earthen bunds – embankments built to hold water in a catchment area.

For his community-based water management efforts, he has been granted the Ramon Magsaysay award, and the Stockholm Water Prize – sometimes referred to as the "Nobel Prize" for water.

Singh's organization Tarun Bharat Sangh is located just 40 miles from Alwar, in the village of Bheekampura. But water levels at the two locations are considerably different.

Bheekampura is a naturally arid area, but with the lush, green leaves of trees rustling in the breeze, the atmosphere is pleasant; the water stress evident in Alwar is not apparent here. Earthen dams, built by the locals to capture and conserve rainwater, are a common sight.

For 92-year-old Shyoji Ram, the memories of building one such dam alongside his fellow villagers in Bheekampura, under the guidance of Rajender Singh 34 years ago, remain clear.

He compares a dark past with a much brighter present. "There is a massive difference," Ram told DW. "What once was barren land is now filled with water and blooming trees. The river which used to run dry now overflows sometimes."

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Article 3

Working with others, Singh blocked monsoon streams and used hills slopes to gather the water. "Rajender's technique has helped the village see water again," Ram said.

Women at the frontlines

Ram is speaking at a so-called water parliament – a community forum where hundreds of farmers have gathered to discuss issues around water. The forum is taking place at Bheekampura, and caters to residents of Alwar and surrounding districts. It is an inclusive gathering in India's multi-layered society, with men and women of many different castes and creeds taking part.

At the event, Singh thanks people for their efforts in protecting local water supplies. "A community management system is the best method to deal with natural resources," he said.

"We were able to build 11,800 annicuts [dams in India constructed in order to supply waterways leading from it], check dams, and bunds in the last 34 years. We were also able to restore water to around 250,000 wells that had long since run dry."

Addressing the assembly, he explains how "johads," or earthen dams – an ancient Indian method for catching rainwater – can prevent flooding and raise groundwater levels.

The dam's low walls help slow water flow in the wet season, and allow water to percolate into the earth. It remains there once dry weather returns.

Women are often at the frontlines of water stress in India. One of them, Lakhi Bai from the district of Karauli, is attending the parliament to learn ways to combat the severe shortages she faces. "Rajender advised us to form self-help groups for women to construct water harvesting structures to catch and store rainwater," she told DW.

Each structure, with a storage capacity of 1,500 cubic meters per hectare [21,500 cubic feet per acre], was able to raise the water table by about 6 meters (20 feet). "This was quite evident to see in the wells," Bai said.



"The day when no water is left"

Singh emphasizes the urgency of India's current water crisis, saying action must be taken immediately. He thinks that developing an effective system for the management and utilization of water that can be collected in vessels, as well as groundwater, is absolutely essential.

"When India achieved independence from British rule in 1947, only 232 villages were devoid of drinking water – but the number has today increased to 250,000," he pointed out.

Droughts have increased tenfold, while the chance of flooding is eight times higher, he continued. "Most of the water bodies are facing the effects of pollution, encroachment, sand mining and water extraction."

India holds just 4 percent of the world's freshwater, despite having 16 percent of the world's total population. It is expected that by 2030, water demand in India will have doubled. That could mean severe water shortages for hundreds of millions of people.

Indian Water Minister U.P. Singh is well aware of the potential catastrophe, and the importance of sustainable supply for the future. "India is the world's largest user of groundwater, accounting for 25 percent of the global total. The aquifers are drying up, and with the way the water is being exploited ... there may come a day when there is no water left."

Such a looming bottleneck makes the work of Rajender Singh all the more pressing.



Worksheet 10

Questions about the film “Fishing for water in the clouds”

Watch the > film “Fishing for water in the clouds” (dw.com/p/25Jr5).

Answer the following **questions**:

1. How do the fog catchers work?

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.....

2. What do the people in the area live from?

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3. What effect is climate change having on the area?

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.....

4. Different kinds of fabric were tested to improve the fog catchers?
What should the fabric ideally be able to do?

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.....

5. How has daily life for those in the area changed since they got piped water at home?

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.....

6. Do you have any other ideas for what people could do with piped water?

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.....



Worksheet 11

Group work on innovative technologies

Split up into groups and have the **▶ article “Innovative clean water technologies”** to hand.

Each group should take a closer look at one of the technologies by reading their assigned section and answering the **questions**. Choose one person from your group to give a 2 to 3-minute **presentation** on that technology to the class.

Innovative technology:

1. What is the current situation? What problems are people facing?

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2. How does the technology work?

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3. What advantages does the solution offer to deal with the current problem?

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4. Who would benefit from this new technology? How does it change daily life?

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Article 4

Innovative clean water technologies

Clean fresh water is scarce throughout much of the world, with more than 2 billion people lacking safe drinking water at home. And climate change is adding to the stress. These innovations could help.

Producing drinking water, no power needed

In many parts of the world, the problem isn't just a shortage of water, it's that the available water is dirty. Not surprising considering that 80 percent of the sewage in developing countries is discharged untreated.

That's where devices like the *SunSpring Hybrid* come in. The shiny cylinder houses a self-contained water filtration system that can turn more than 20,000 liters of dirty water into drinking water every day.



Perhaps more importantly, it can be set up quickly just about anywhere, as long as there is a water source like a river or a well nearby.

Built-in solar panels and an optional wind turbine means it doesn't need a power supply, which means it could be used in remote regions without access to electricity or places hit by extreme weather events or natural disasters.

Drinking fog

There are those places where even dirty water is scarce, like the Atacama desert in northern Chile, or parts of the Anti-Atlas Mountains in Morocco. One thing those places do have in common though, is a lot of fog. But you can't drink that. Or can you?



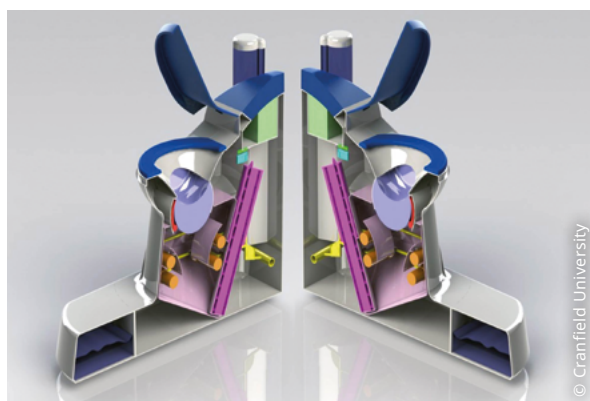
Fog collectors make the seemingly impossible, possible. As the misty mass passes through the weave of large vertical nets, tiny droplets of water get caught on the fabric and slowly trickle down the meshing into a collection system.

The idea isn't new, but people have been tinkering to make fog collectors more efficient and durable, and to bring the technology to the remote areas that are ideally suited for its use.

i Article 4

Don't flush

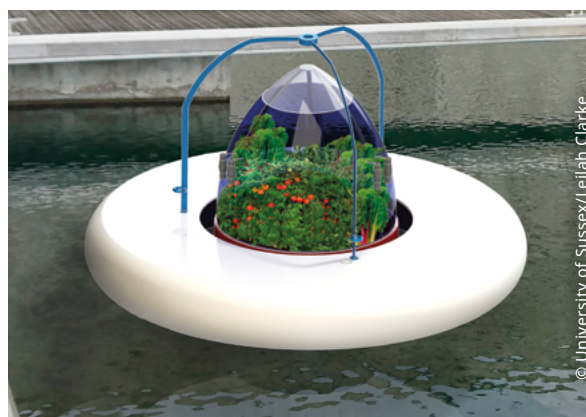
But getting your hands on clean water isn't everything. Using it economically is very important too. One place where we waste a lot of water is the toilet. A single flush on a traditional US toilet can use up to 26 liters of the precious resource. At the same time, one third of the world's population still doesn't have access to a real toilet, a massive burden on the environment and a major health risk. So how can we provide toilets to those who don't have them and avoid flushing so much water down the pan?



The *Nano Membrane Toilet* just might do the trick. The odorless high-tech toilet uses no water or external power and turns excrement into water (though not of drinking quality) and ash, using the biomatter as an energy source in the process. And as futuristic as this may sound, it's no pipe dream. The design by researchers at Cranfield University won the Bill & Melinda Gates Foundation "Reinvent the Toilet Challenge" and working prototypes are already being tested in the field.

Floating farm

About 97.2 percent of water on the planet is salty, making it unsuitable for the cultivation of food. But Leilah Clarke, a design student from the University of Sussex turned that notion on its head when she created floating farm pods that generate their own fresh water.



The idea is quite simple: As the pods float on the ocean, water evaporates below them and rises in the dome. When the vapor hits the glass, it condenses and runs down the sides, watering the plants growing inside. While still a prototype, farms like this, floating off the coast of sun-drenched desert countries could provide food without tapping into limited groundwater.

30.08.2018

Author: Harald Franzen
dw.com/p/341So



Worksheet 12.1

Project plan: Our water idea

Project participants

Date

Area School At home In the village/town/city

1. What **water challenge** would we like to address? What is our **goal**?

.....
.....

2. We want to solve this problem with the following **idea**:

.....
.....

3. What **materials** do we need for the project?

.....
.....
.....

4. Do we need **money** to implement our idea? Where can we get such funding?

.....
.....

5. Who would we like to **support** our project? Who do we need to contact to get approval, a permit or official **permission**?

.....
.....
.....

6. **Schedule:** When do we want our project to begin and end?

.....
.....

7. What do we want to call ourselves? Think of an interesting **name** for your project.

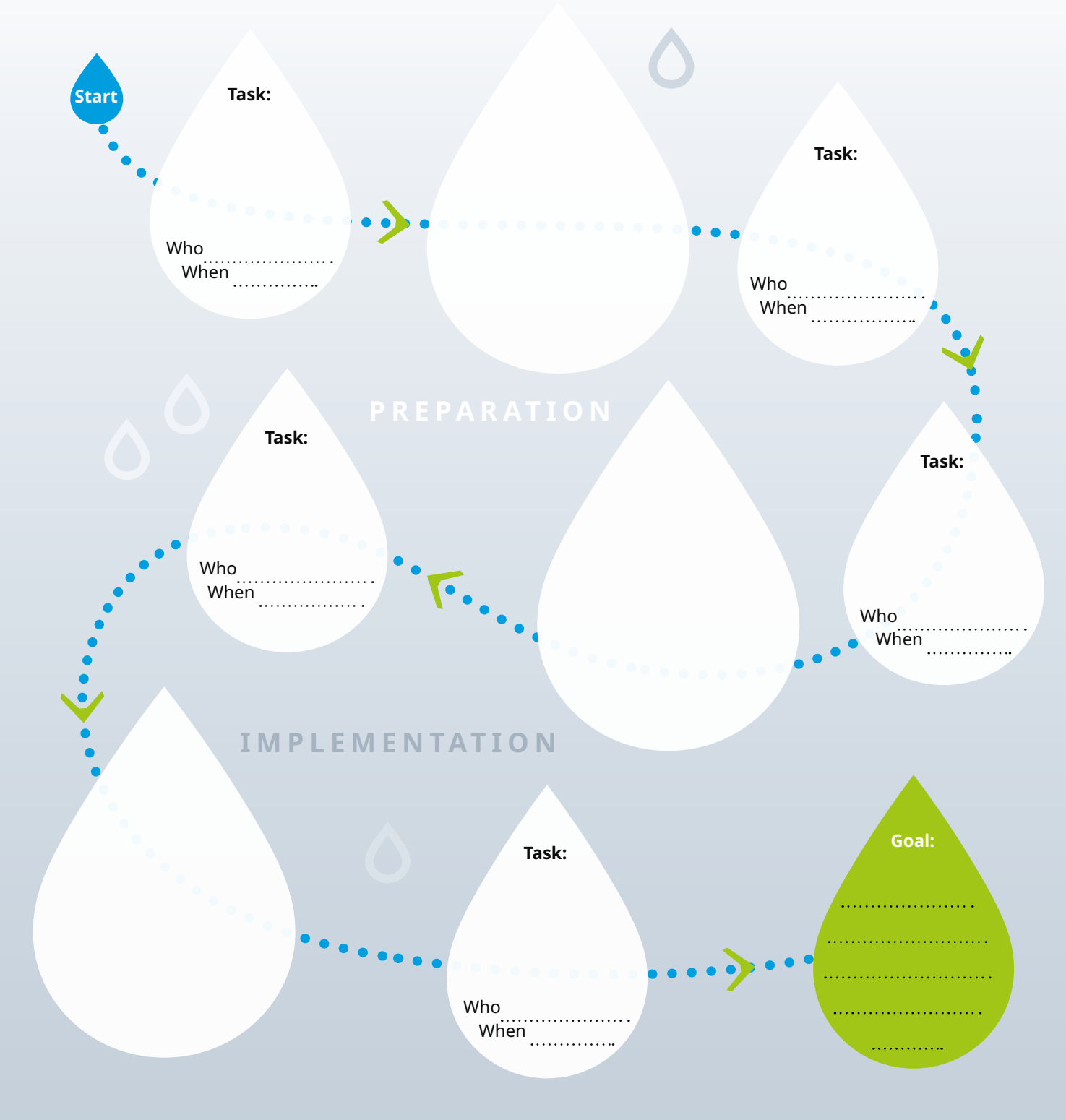
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Worksheet 12.2

Project workflow

Project name





Worksheet 13

Building a mini water filter

Mineral water comes from deep underground. On its journey, it passes through a natural filtration system of soil and rock. This experiment will allow you to simulate the underground journey of water droplets by building a mini filter.

What you will need

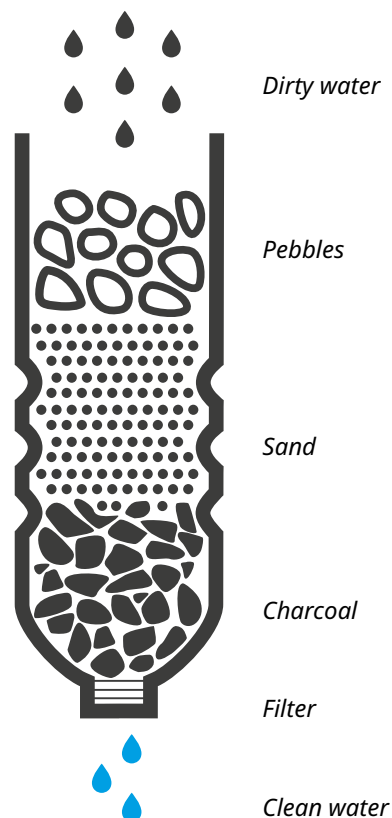
- 1 **plastic bottle** with a cap
- **Scissors** (or a sharp knife)
- **Hammer** (or a large stone)
- A cup of **coarse sand**, a cup of **pebbles** and a cup of **charcoal** (e.g. from a campfire or barbecue coals from the supermarket)
- 1 paper **coffee filter** (or fabric scraps such as an old t-shirt)
- **Bucket** or a bowl
- A **stick** to mix the dirty water (with soil, leaves, etc.)

Warning: Don't drink the water!

The water filter can only remove large particles. Invisible contaminants and pathogens will not be filtered out. Therefore, please don't drink your filtered water.

Instructions

1. Smash the **charcoal** with a **hammer** or large stone to make the pieces as small as possible.
2. Cut off the bottom of the **bottle** (it will be used later to collect droplets) and carefully make two or three small holes in the cap with the **scissors** or knife.
3. Place the **coffee filter** or fabric in the upside-down bottle.
4. Fill the bottle with layers of **charcoal**, **sand** and **pebbles**.
5. To make the dirty water, fill a **bucket** or bowl with water and add soil, tiny sticks and leaves or grass. Give it all a good mix with the **stick**.
6. Ask someone to hold the "water filter" over the bottom of the bottle you put aside earlier to catch the droplets. Pour the dirty water slowly over the first layer so that it doesn't overflow.
7. If the mini filter is working properly, the water should be clear when it drops out.





Worksheet 14

Water cycle in a jar

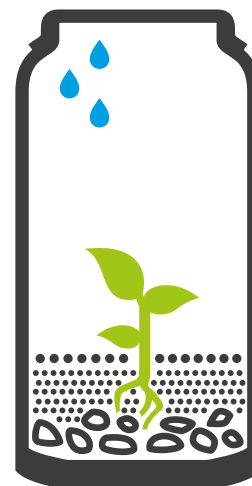
Not a drop is lost on water's never-ending journey. For that reason, the amount of water on the planet doesn't change. This experiment allows you to simulate the water cycle.

You will need:

- 1 big **jar** (e.g. an old mason jar)
- **Cling film** and an **elastic band**
- A handful of **pebbles** and **sand**
- Potting **soil**
- A small **plant** with roots
- A small **spade** or **trowel**

Instructions

1. Put some **sand** and **pebbles** into the jar. Put some **soil** in on top.
2. Dig up a small **plant** using a **trowel**. You can take one from a meadow, for instance, but ask an adult if you're unsure. Your plant, including the roots, should be maximum two thirds as tall as the jar.
3. Insert your plant into the soil and water it. The soil should be wet through but the plant shouldn't be standing in water.
4. Cover the top of the jar with the **cling film** and **elastic band**.
5. Place your jar in a spot with enough daylight, for instance, on a window sill.



Tip

If you want to make the experiment keep for longer, first place a layer of charcoal from your last campfire or barbecue into the jar. That will prevent mold from growing. But the experiment will still work if you don't use charcoal.

Imprint

Publisher

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Department

DW Business, Science, Environment

Responsible

Manuela Kasper-Claridge

Didactical implementation

Independent Institute for Environmental Issues (UfU)

Design

DW Design

Publication date

Mai 2020

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Supported by:



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based on a decision of the German Bundestag

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The multimedia environment magazine

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