

*Wake up!
Climate change
is here!*

Teacher's handbook for the ADAPTA CLIMA programme





 adaptaclima II


SUDOE
Interreg IV B


UE / EU - FEDER / ERDF


Adesval
REGIÓN DE VALLE DEL CAUCA
DEPARTAMENTO DE CALDAS



SUMMARY

Introduction	1
An experiment for the imagination	3
What is climate?	5
What is climate change?	11
What evidence have we got of climate change?	14
What is the greenhouse effect?	15
What changes are foreseen for the future?	17
What can we do?	19
ENERGY	21
ATMOSPHERE	25
WATER	29
EARTH	33
RURAL AREAS	37
Activities for children	41
Glossary	54

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Introduction

Rural development programmes managed by local action groups, have more than shown their usefulness in promoting development in rural areas, bearing in mind the multi-sectorial needs of the local population.

The Development Association Valle del Alagón (ADESVAL) contemplates, thanks to its Local Development Programme, a special priority towards the environment and action related to its conservation. The local action group has worked in recent years on specific projects related to this issue, in collaboration with other national and European groups and entities.

ADAPTA CLIMA II is a SUDOE territorial cooperation project co-financed by the Community Initiative INTERREG IV B. It springs from its forerunner, ADAPTA CLIMA, like other projects co-financed by the south-western European zone in previous calls. The main beneficiary is the Association of Sustainable Municipalities of Cantabria. Apart from the Association of Municipalities and ADESVAL another eight beneficiaries also participate: as Spanish partners, the Government of Andalucía, the Iberian Association of

Waterfront Municipalities of the Douro (AIMRD), the Government of Galicia and Neiker (Basque Institute of Agricultural Research and Development); as French partners, the Climatological Association of Moyenne-Garonne and of the South-

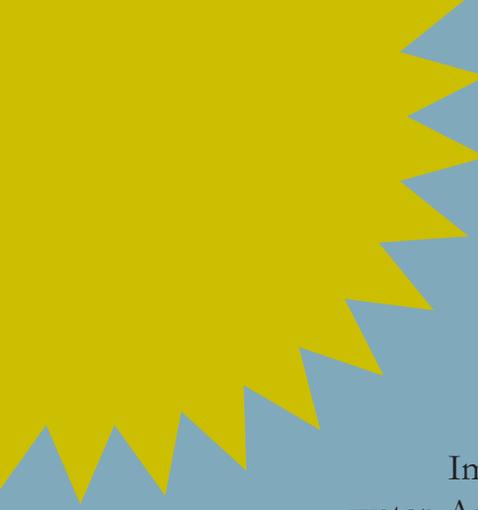
west (ACMG) and the Dordogne Chamber of Agriculture; as Portuguese partners, the University of Trás-os-Montes and Alto Douro (UTAD), and lastly, to mention Bodegas Faustino as associate partners. The Project arises from the need to capitalize on the studies, analyses, conclusions and recommendations of ADAPTA-CLIMA I. This capitalization is established as being very important so that the work already carried out can be used and appreciated in the different territories. The capitalization will be understood as being synonymous of “specific action taken on the basis of the studies and recommendations of the scientific community”.

By participating in ADAPTA-CLIMA II, ADESVAL continues its strong commitment to material that fights climate change, given that the results gained in previous stages can be tremendously useful for local development in the Alagón Valley. Right now, it is a question of moving from theory to practice by applying the affirmative-action measures in the associate territories. The project intends to become the reference in the south-western European zone at climate change level, being fundamental in information and sensitization for all of society and a guidance and assessment tool for the European political and economic sphere. ADESVAL leads one of the training and awareness-raising activities together with

the Government of Galicia. During the course of this action, the present product was put together in the form of A Guide to Good Practice for training and raising awareness in Children about Climate Change, the aims of which are to make the school-age population aware of the problems of climate change and adaptations to it, it being an educational and entertaining product which is useful for pupils to work on the overlying topic of Climate Change. The fact that it is presented translated into the four official languages of south-western Europe (Spanish, Portuguese, French and English), will enable the product, which will be available from the moment it is published, to be used in any school. The Guide to Good Practice slots perfectly into the project, as it is a durable product, available both in hard and digital format, and what is more, with possibilities of new contents being introduced in the future. This way we avoid the product becoming out-dated on the project finishing, allowing for a durability which contributes to making the school population aware of the problematic nature of climate change.

From the local action group, we hope that it reaches the highest number of schoolchildren possible in any of these countries, and that it has the repercussions that such a highly topical subject as climate change deserves.

Óscar Alcón Granado
Presidente ADESVAL



An experiment for the imagination

Imagine we put a frog into a container of very hot water. As it comes into contact with the water, it would immediately take a great leap to save itself. We would do exactly the same; this experiment is not at all surprising.

However, put this imaginary frog in a cool container. It will stay there quite happily. Then put the container on a low, almost imperceptible heat and observe: the frog continues to play around in the water. Now turn up the heat a little: the frog is still quite happy in the water. If you repeat the operation several times you will observe two things: the frog doesn't notice, doesn't get alarmed and continues in the water even though it is getting hotter and hotter and that due to the effect of the heat it falls asleep...and if nothing wakes it up and the water continues to get hotter, it will die.

Well, the frog is us and the container is our planet. When you read this book, you will understand what we are talking about, and you will see that we need to wake up the frog that we all carry inside us in order to save it. But to wake up from the warming of our planet, information is needed...

CO₂





6 questions about climate change to wake up the conformist frog.

What is climate?

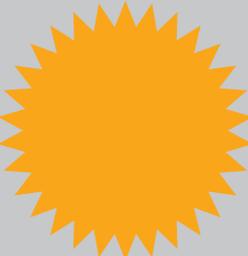
Climate is characterised by the meteorological situation that prevails in a particular place and for quite a long time. That is why it is necessary to differentiate it from the weather, which refers to short term variations in an area. Therefore in a dry climate, a heavy rainstorm may occur one day, even though the tendency in that place is drought.

We need to understand that climate is a system on a planetary scale of great complexity. Many factors intervene in its behaviour, which causes the registering of great climatic differences depending on the different places we go to on the planet and also if we move in time. We know, for example, that in the present Sahara desert, in Africa, thousands of years ago the weather was warmer and more humid, that there were much colder periods all over the planet with blocks of ice and others hotter than at the present moment. The study of climate in the past is called Paleoclimate.

The variability in the climate and its contrasts are the

result of the effect of the sun's energy when it reaches the Earth and comes into contact with the atmosphere, the hydrosphere (the areas of water on the planet), the cryosphere (places where the water is in solid form), the lithosphere (the ground we tread) and the biosphere (ecosystems and living beings of the planet). The functions of each one and its mutual relationships make up climate. Let's give some examples, in order to understand it better:





Examples of the action of the biosphere on climate:

Research has shown that cows can burp up to twice a minute giving off an average of 908gs of methane per day. If we add to this the million and millions of animals that are on the planet, we can see the enormous quantity of methane given off. This gas in suspension creates a film that produces the so-called greenhouse effect, without which the climate would be much colder. During the process of photosynthesis plants on land or plankton in the sea, extract carbon dioxide. This gas is fundamental for the greenhouse effect and therefore if there is more or less of it, the climate will be affected.



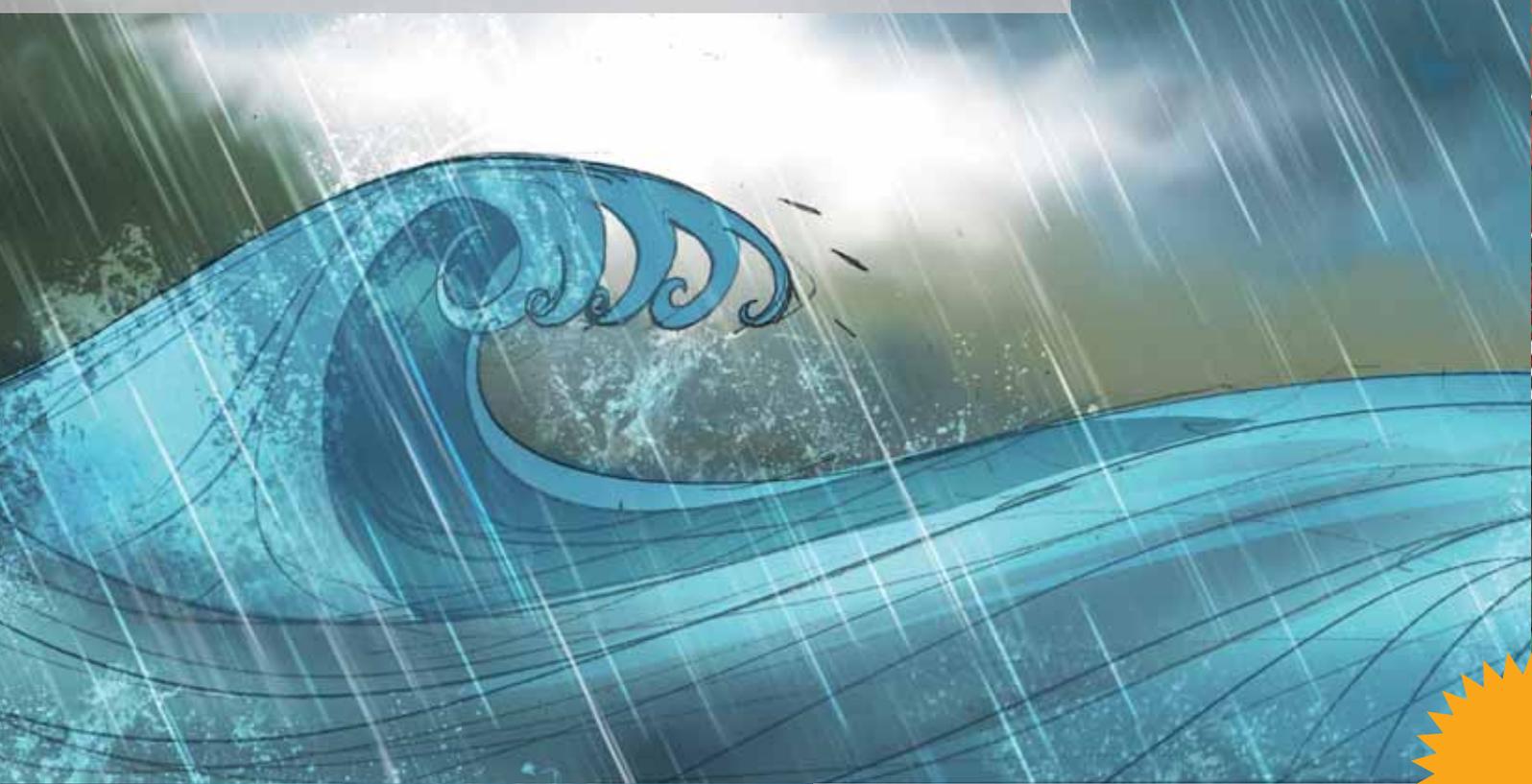


Examples of the action of the **lithosphere** on climate:

The solid part of our planet shows all sorts of formations, like mountains, sunken areas, valleys, volcanoes, islands, etc. The absorption and reflection of solar energy will vary depending on the location it is affecting. Therefore, when we go up a mountain we notice a drop in temperature. Did you know that when the Tombora volcano in Indonesia erupted in 1815, it provoked a drop of three degrees in world temperature? This was due to the sulphur thrown out, which reached the stratosphere (more than 45km away) causing, amongst other irregularities, the sun to not fully reach the surface, and there not to be summer one year in a lot of places.

Examples of the action of the **hydrosphere**
on climate:

Water changes temperature very slowly and this capacity regulates temperatures on Earth and works like an excellent coolant. This makes, for example, oceanic climates different from continental ones.



Examples of the action of the **cryosphere**
on climate:

The ice of the Antarctic reflects up to 90% of solar radiation to the exterior, when the average in areas of ice is 30%. This allows the planet's temperature to be regulated and not heat up too much in the same way that if we paint a house white; it helps it to be cooler.



Examples of the action of the **atmosphere**
on climate: :

The atmosphere is made up of different gases. Carbon dioxide, together with other gases, produces the greenhouse effect, as we shall see later on. If it wasn't for the greenhouse effect the average temperature of the planet would be -18°C instead of the 15°C that we have at present.



What is climate change?

There is an urgent need for our planet to understand climate change. Until now Earth has been adapting to different changes in the climate, given that this is dynamic and so its regulation depends on many factors. But these changes are on scales of thousands of years and that is why people think that the climate remains stable. The causes which provoked the transition from colder periods (called ice ages) to other warmer ones, like the present (called Holocene) have always been natural.



What is different about present climate change, is that it is being produced by human activity and therefore of anthropogenic origin. Man's industrial and economic activity is overburdening the planet with gases, transforming ecosystems, altering life and producing an overload of rubbish and waste which are taking the climate towards an irreversible change of very worrying consequences.

The climate remains stable, thanks to a relation of balance between all the factors that influence it, like passengers on a small raft, who, in order to keep it afloat need to distribute their weight. Nowadays, due to man's contaminating action, the weight is being unbalanced and we could overturn the raft.



What evidence have we got of climate change?

The first voices of alarm were raised publicly in 1979 at the World Conference on climate in Geneva. Later would come world acceptance of the Kyoto Protocol in 1997, where governments of the world proposed measures to slow it down. Another worthy effort was the setting up of the IPCC (Intergovernmental Panel on Climate Change): since 1988 thousands of scientists and experts from all over the world, voluntarily and objectively, contribute to investigate climate change and its risks. To date, five reports have been made and with each one, more is known and research methods improved in such a way that scientific certainty of our being immersed in a transformation of the climate due to human activity has grown.

The most notable evidence and what first raised alarm, was the current referred to as El Niño in Central America which, with meteorological catastrophes, showed that the climate was warming up.

The rise in temperature of up to 2.5°C in the Antarctic Peninsula, which is melting great surfaces of ice, is additional proof.

An imbalanced climate, like the serious droughts in Japan in 1994 at the same time as China suffered the worst floods of the century. In the United States, over the twentieth century hurricanes and floods became common.

In 2003, a historic heat wave was recorded in Spain and in other European countries. Scientists agree that what these phenomena and many others which are being studied around the world have in common, are climatological disturbances



What is the *greenhouse* effect?

The same thing happens on planet Earth as inside a greenhouse, where heat is maintained and plants benefit from this. If in a greenhouse this effect is achieved by being covered in plastic, which acts like a warm coat, on the planet it is achieved by a series of gases which retain solar energy and stop it escaping into the exterior. These gases are carbon dioxide, methane, nitrous oxide, ozone, water vapour and others created by man. The greenhouse effect is therefore natural and necessary for life; without it we would freeze.

But the present problem is that man is tipping enormous quantities of gases from his industrial and economic activity beyond the needs of the planet and its capacity of balance, and as a consequence we are overheating. This warming provokes a series of consequences: climatic catastrophes, desertification, salinization of the sea, rising sea-levels, changes in biological cycles, etc.

What changes are foreseen for the future?

Several mathematical models exist which establish what the climate will be like at the end of the 21st century. These models vary depending on whether human beings continue contaminating as they have until now, or on the other hand, they reduce greenhouse gas emissions on a world scale.

The most pessimistic forecasts talk of more frequent heat waves. In our Mediterranean area, the average winter temperature will rise up to six degrees and in summer 3.8 degrees.

In Extremadura, by the end of the century, an increase in the minimum and maximum temperature of some 4°C is forecast, apart from a decrease in rainfall of 20%, according to data from the Observatory of Climatic Change of Extremadura.

The ocean will rise, putting coastal areas and beaches in danger.

Ice will continue to disappear and according to experts it is possible that by 2050 the Arctic will almost be without ice.

The ocean will become more acidic and this will negatively affect its life forms.

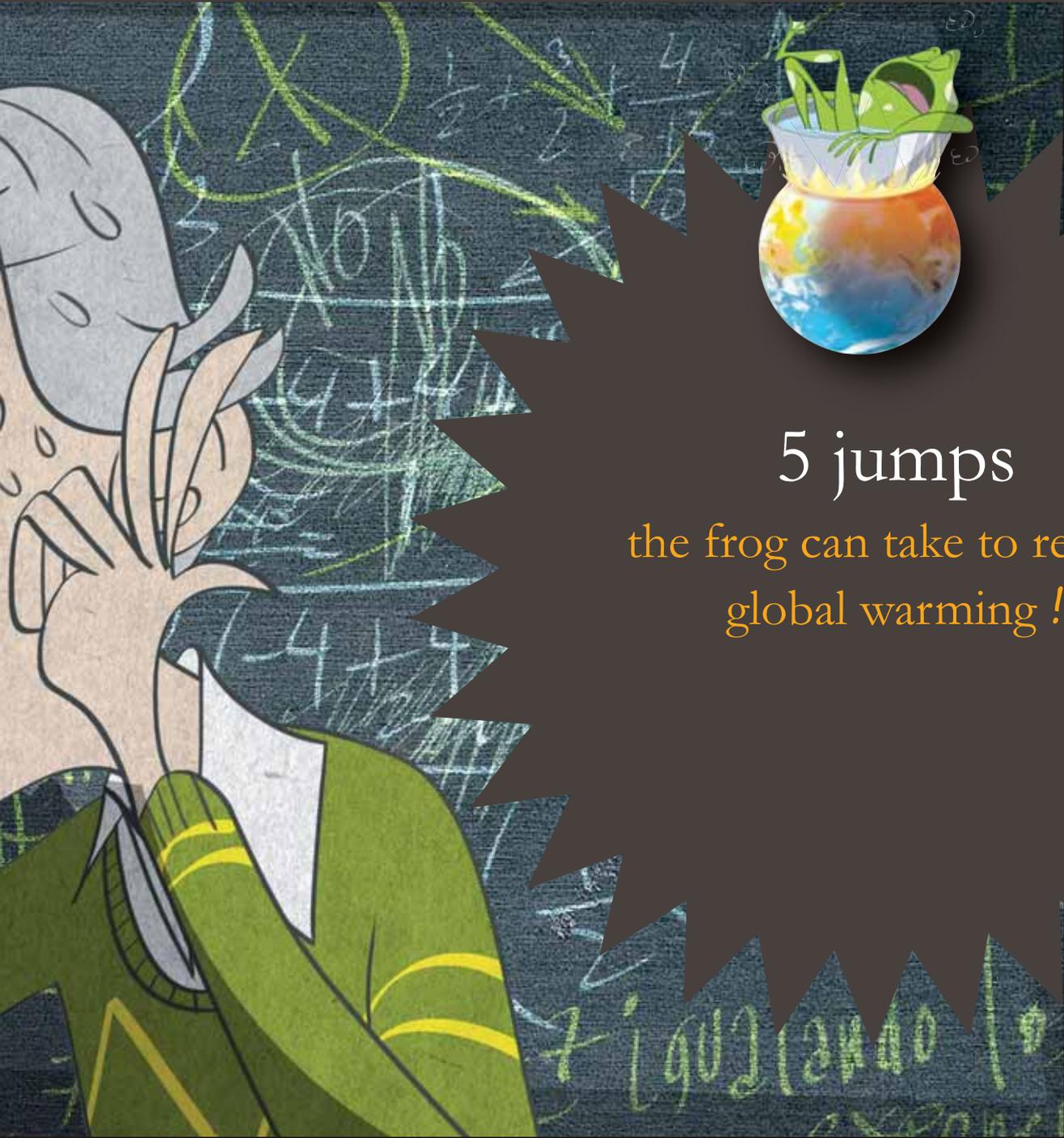


What can we do?

The problem is collective and planetary and therefore requires a planetary response. The first thing is to be informed and encourage everyone to fight against climate change. As a political objective, governments have proposed not to go over the average temperature of the planet in preindustrial times by more than 2°C.

Citizens with small but far-reaching daily decisions can do a lot, as will be proposed below.





5 jumps

the frog can take to reduce
global warming !





1. ENERGY

Our society constantly needs to generate energy for its activities. Houses are illuminated and heated with energy; we cook, work, travel and even entertain ourselves consuming energy.

To maintain our electricity system, we need to consume fossil fuels and this generates more CO₂ which is given off into the atmosphere and that is exactly what we need to reduce, the volume of carbon that we emit.

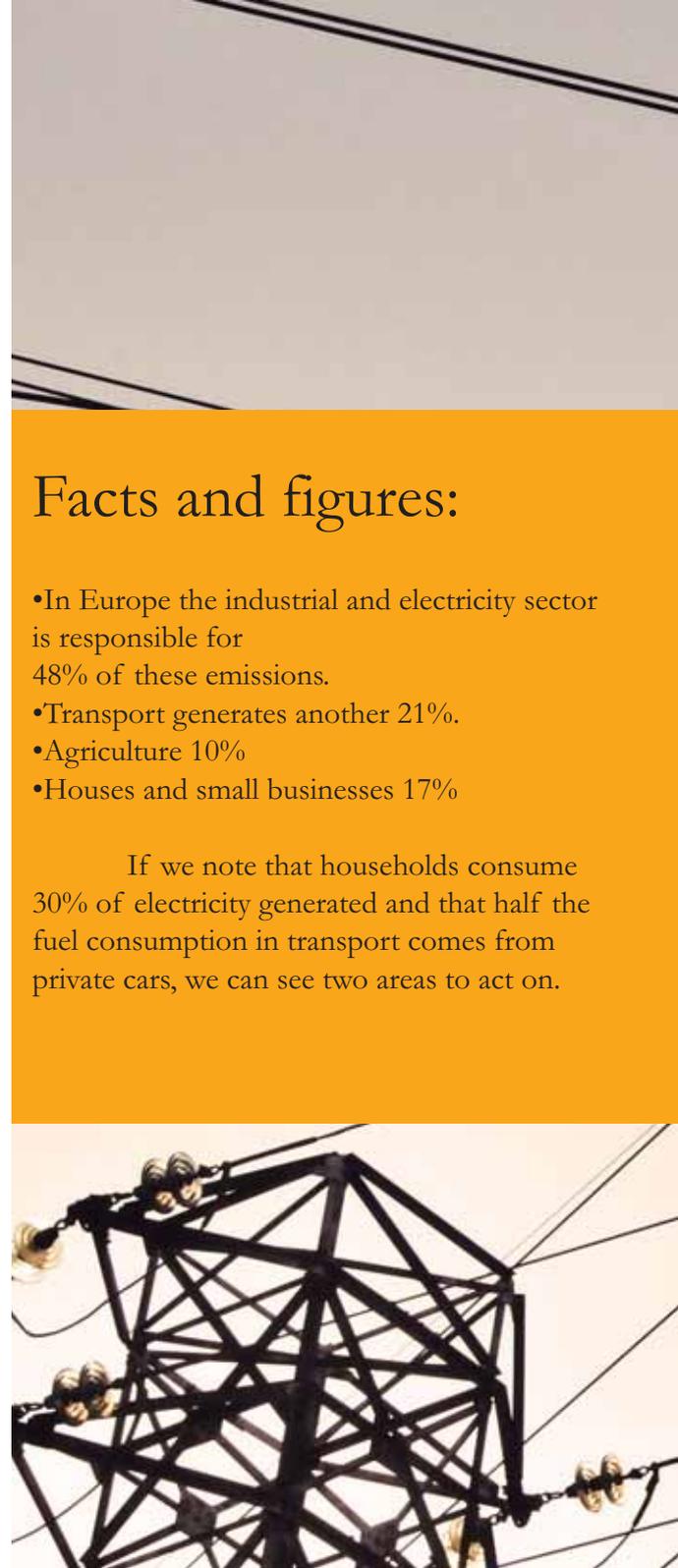
How can each of us save energy?

- Switch off lights at home that you don't need.
- Use energy-saving light bulbs. By doing this you reduce electricity consumption by 75% compared with incandescent light bulbs.
- The fridge is responsible for approximately 25% of our electricity consumption, which is why it is important to have an energy-efficient one. Another fact: 3mm of frost in the fridge means a 30% increase in energy consumption this is why it is important to purchase an appliance with automatic defrosting.
- Have appliances which are A++.
- Try to dry clothes outdoors, using zero energy consumption and consequently it stays in better condition longer.
- 60% of the average household consumption is for heating. By lowering the temperature only one degree 7% is saved in the household bill. Insulating the house well is another way to save energy, double-glazed windows, not leaving doors open, assessing insulation materials or the orientation of the house if building a new one.
- Don't leave appliances on standby: unplug your computer, TV or mobile, by doing that you save up to 10%.

Facts and figures:

- In Europe the industrial and electricity sector is responsible for 48% of these emissions.
- Transport generates another 21%.
- Agriculture 10%
- Houses and small businesses 17%

If we note that households consume 30% of electricity generated and that half the fuel consumption in transport comes from private cars, we can see two areas to act on.







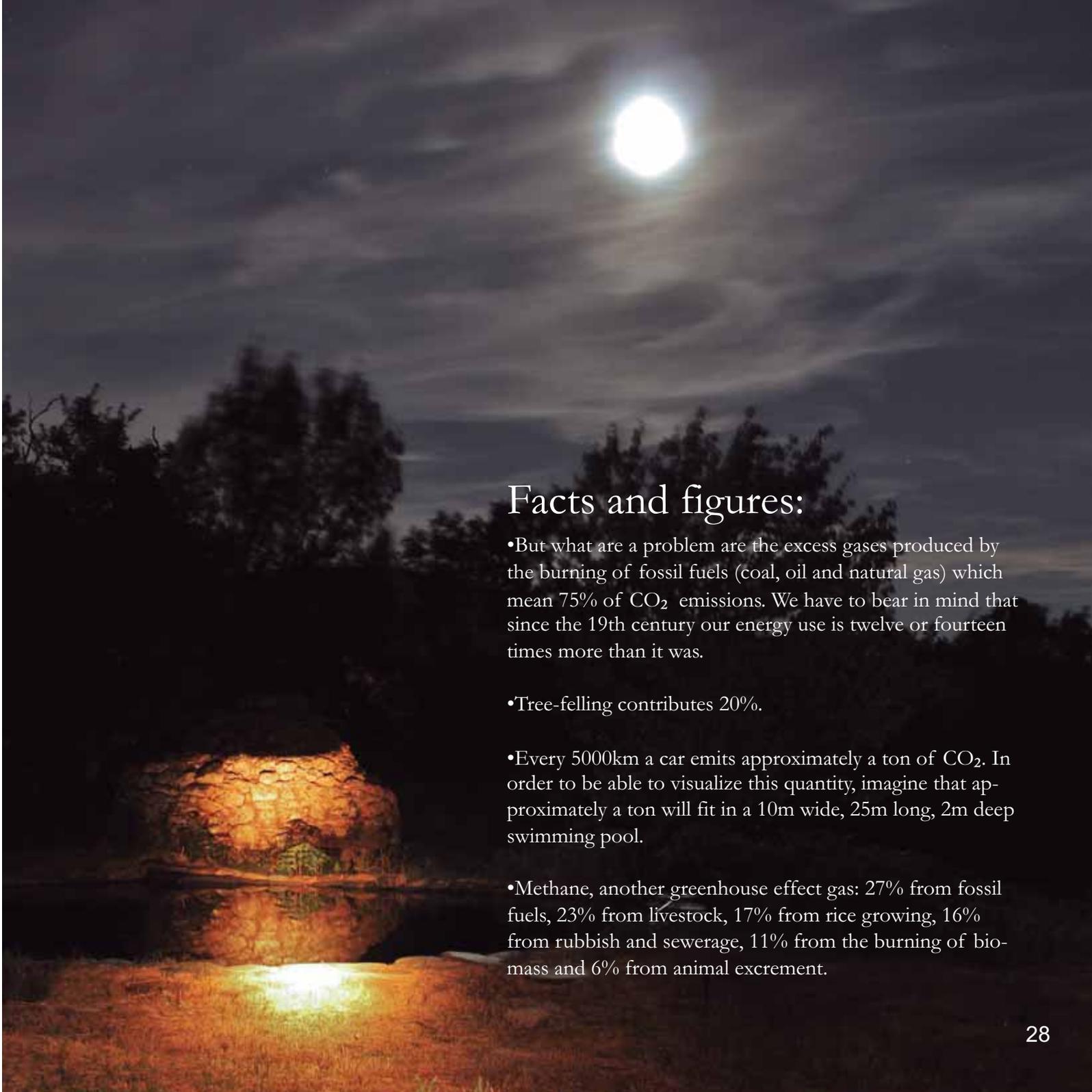


2. ATMOSPHERE

Man also generates CO_2 by breathing, on burning oxygen and generating the energy our organism needs. Plants on the other hand work the other way round, they fix carbon and give off oxygen. The atmosphere maintains its balance with these exchanges. Out of curiosity, if you froze all the CO_2 that mankind expels in one year, you would need the equivalent of a train from Earth to the moon to fill the carriages. However this figure is not worrying, because the oceans, forests and the ground remove this CO_2 in order to subsist. This natural mechanism which absorbs the carbon is referred to as carbon sump.

How can we each clean up our atmosphere?

- Choose local food and products. Ensure they are seasonal which are healthier and tastier. This helps to avoid energy consumption that transport of goods generates all over the world.
- Use public transport or car-sharing. A 1,200km trip generates the same CO₂ as a round-the-world train trip.
- Look for ecological products which do not harm the atmosphere and those which have a flower symbol for detergents, toilet paper, televisions, shoes, paints, etc.
- Use a bicycle for short distances.



Facts and figures:

- But what are a problem are the excess gases produced by the burning of fossil fuels (coal, oil and natural gas) which mean 75% of CO₂ emissions. We have to bear in mind that since the 19th century our energy use is twelve or fourteen times more than it was.
- Tree-felling contributes 20%.
- Every 5000km a car emits approximately a ton of CO₂. In order to be able to visualize this quantity, imagine that approximately a ton will fit in a 10m wide, 25m long, 2m deep swimming pool.
- Methane, another greenhouse effect gas: 27% from fossil fuels, 23% from livestock, 17% from rice growing, 16% from rubbish and sewerage, 11% from the burning of biomass and 6% from animal excrement.





3. WATER

Climate change will create important problems for our water supplies: on modifying the water cycle, rainfall will have different distribution patterns; the higher temperatures will alter soil humidity and will cause more evaporation. All this will change distribution and availability of water, creating catastrophic flooding and droughts, and the problem of desertification in significant areas of the planet. As water is essential for life, difficulty in having it or for it to be in good condition for consumption, is something that affects everything: the economy, food, social harmony, health, etc.

The main causes of water pollution are the use of herbicides, fertilizers and pesticides which even reach the deepest levels of the soil. Animal manure on large intensive farms pollutes superficial waters by causing algae to proliferate reducing oxygen and light and as a result reduces biodiversity. This water in contact with the manure becomes a health-risk.

What can we do to keep our water clean?

- An average of 7% of the water we use is for drinking and cooking, 22% for washing dishes and clothes, 20% for sanitary systems, 39% for showers and baths and 6% for washing the car and watering the garden.
- Trees attract water, without trees we head towards desert. We need to plant trees.
- By capturing rainwater in tanks and using it for washing and watering we save drinking water.
- A shower uses four times less than a bath. A dripping tap can waste up to 25 litres a day. If you leave a tap running while you clean your teeth you are throwing away some 15 litres. Small gestures are important.
- Take care with pollutants. Do not pour oils down the drain, nor varnish, paint, or medicines. Take these substances to recycling points. All the poison you tip down the drain reaches the environment and poisons it.
- Administer washing machine and dishwasher water carefully, wait until they are full or use the half-load setting.



Facts and figures: :

- Water is a fundamental resource but not well distributed around the planet. More than 1,200 million people on our planet do not have access to clean drinking water.
- By the end of this century sea-levels will have risen by between 9 and 88cm. Places like the beaches of the Cantabrian or Manga del Mar Menor, the coast of Doñana, will be in danger of disappearing.
- It is forecast that the number of refugees owing to rising sea-levels could reach 150 million people by 2050.
- In the last century we have lost 85% of glaciers in the Pyrenees.







4. EARTH

The Earth heats up more quickly than the sea does, so the greenhouse effect is more immediate. Mankind lives on it and is the first to be affected by our misuse of resources. Let us look at some facts and figures:

Facts and figures:

- The European Union generates 1,300,000 million tons of waste a year. 40 million of which is toxic. This means that each person in Europe, whether adult or child, generates 3.5 tons of rubbish.
- In Europe, between the years 1980 and 2002, the number of birds in agricultural areas fell by 70%. Pesticides and herbicides are killing our birds, polluting the water we drink and destroying the soil. It needs to be made known that 100 to 2,500 years is needed to form only 2,5 centimetres of fertile soil.





What can I do to help keep our soil healthy?

- Encourage people not to use herbicides and pesticides in the country-side.
- Recycle rubbish, using the statutory containers. Every bottle that you recycle saves enough energy to watch three hours of television.
- When shopping, save on containers and bags by trying not to buy pre-packed fruit and vegetables.
- Try not to throw things away that can be repaired or used for other purposes. Be imaginative and frugal.
- Don't change your mobile, computer or television until absolutely necessary. Electrical appliances generate highly pollutant residues and increase every year in our landfill sites. Batteries are also great pollutants; take them to appropriate collection points.





5. RURAL AREAS

The planet is becoming more and more urban; nearly half the population lives in cities, which is becoming an important factor in climate change. A city of a million inhabitants generates 25,000 tons of carbon dioxide a day, 300,000 tons of waste water all of which affects the soil and the local and world atmosphere.

If we leave cities and go to the country-side and to rural areas, we find other problems and also other opportunities. One of the most important activities in rural areas and which is negatively affecting climate change is the agricultural sector, due to bad farming and livestock management.

But in the country, there is also the opportunity to reduce CO₂, given that in the soil is to be found our greatest plant reserves and we know how trees and plants absorb CO₂. That is why a better and more intelligent handling of agricultural activity and increase in woodland areas and undergrowth is necessary.

Agriculture depends on climate and soil; if this becomes a desert or rainfall tables drop, agricultural production will be reduced, which is the scenario forecast by the IPCC for Spain. It is also negatively affected by sudden changes in temperature or torrential rain. These effects are forecast for coming years, from which the agricultural and livestock sectors will suffer the consequences. The FAO foresees that fragile environments in rural areas like the coast, arid and mountainous areas, face the risk of loss of crops, livestock, fishing and forestry resources.



In order to reduce the emission of greenhouse gases, we should go over to organic farming and conservation. This type of farming helps to improve the fertility of the soil and spread biodiversity and at the same time reduce CO₂. The use of herbicides and pesticides should be abandoned in agriculture, because they impoverish the soil, kill insects and birds and produce illnesses in man. Other measures are to stop using nitrogenous fertilizers and promote organic fertilizers. Better management of watering to not waste water. Avoid burning tree-trimmings and use this waste for biomass or fertilizer. Incorporate renewable energy. Opt for feeding animals with local resources and avoid transport of goods.

What can a young person from a rural area do to reduce the impact of climate change?

Be informed and tell friends and family about the situation.

Put into practice the recommendations of this guide to reduce energy spending, save water, not contaminate, reduce rubbish and help to ensure that the natural en-

vironment of the village has more trees, that there are not fires and favour respect for the environment. How can this be done? By participating in programmes organized by school, being watchful at home and running small campaigns. Every little bit helps.

Children in rural areas live closer to nature and this makes them guardians of animals, woods, rivers and seas. Many of them have their parents or if not a neighbour, working at sea, in the countryside, amongst fruit trees, vegetables, livestock, honey or timber; this is why a child is also a good source of information about the coming problems of climate change and about the malpractice which needs to be avoided.

With food, a lot can be done to reduce greenhouse gases.

How? Very easy, by requesting to eat fruit and vegetables which are local and seasonal. If you eat too much meat, eat more vegetables. We also have to choose organic produce and avoid waste

Actividades para niños



Justification for the educational proposal.

Sensitizing and raising awareness about the need to slow down climate change embraces inhabitants of the entire world. From this wish, and with this sense of urgency to act against the inertia that is leading us to put our planet in danger from certain habits, springs this educational material. We wanted to produce this handbook with explanations, advice on good practice and teaching activities on climate change, aimed at pupils of primary education with the aim to raise awareness from an early stage of the importance of everyday actions to conserve and protect the environment. We believe that from this educational intervention we can involve all the family and the surrounding environment, so that the effect of this effort favourably multiplies the benefits for our world.

Amongst its aims and objectives this handbook is to be a teaching aid for teachers when working on core subjects specifically related to climate change, with sustainable development and environment as interrelated elements as set down by the decree 103/2014 of 10 June and by which the curriculum for Primary Education is established for the Autonomous Community of Extremadura. The implicit aim of the activities is to help to promote the development of certain key competences for life-long learning included in the curricular elements, in line with Royal Decree 126/2014 by which Primary

Education is established and with the recommendation 2006/962/EC, of the European Parliament and Council, of 18 December 2006.

The contents and activities are aimed at primary stage, the teacher being able to adapt the activities according to the characteristics of their class-group, simplifying, selecting sessions or parts of session, depending on their criteria as regards the different levels of pupils' cognitive development.

It is useful to present pupils with theoretical knowledge, on which the different development activities are based and that they can find in the material we present to them. Below, a diagram is shown reflecting how the activities are related with the areas in which they can work and the skills they cover.

Activity	Natural sciences	Social sciences	Mathematics	Physical Education	Artistic Education	Social and civic values	Competencies to be worked on:
Leap Frog!							Linguistic competency Core science and technology competency Social and civic competency Digital competency
And you? What do you know?							Linguistic competency Conscience and cultural expressions Social and civic competency
With an artist's eyes: I recreate, I imagine, I recycle. I recreate, I imagine, I recycle.					 		Linguistic competency Sense of initiative and entrepreneurship Conscience and cultural expressions
The grey pond and Water thieves experiment.							Linguistic competency Social and civic competency Core science and technology competency
Polluted waters game							Linguistic competency Social and civic competency
Riddle. How much do we consume?							Mathematical competency Linguistic competency Social and civic competency
Red alert CO ₂ is rising!							Digital competency Linguistic competency Social and civic competency
What about building a solar oven?							Core science and technology competency Linguistic competency
Renewable energies game							Linguistic competency Social and civic competency Digital competency
Don't remove my protection!							Linguistic competency Social and civic competency Conscience and cultural expressions
Providing solutions, involving our hands.							Linguistic competency Social and civic competency Sense of initiative and entrepreneurship

1. Introductory Activity

Title: Leap Frog!

Description: A legend and experimental activity on the greenhouse effect.

Aim: Find out about and understand the greenhouse effect.

Timing: An hour and a half.

Materials: A board, paints or marker pens, a sphere or an old plastic ball, two thermometers and a glass bowl or cheese dish that is bigger than the sphere.

Procedures and Development:

First of all, pupils are asked to decorate the sphere so that it looks like planet Earth, they then place it on the board and then cover it with the glass bowl. A thermometer is placed inside and outside the bowl.

The experiment needs to be carried out in a place with plenty of sunlight. If there is not then a table lamp will be used for the experiment to simulate the sun's rays.

After an hour we will see the results and write them down to record them. We will see that the temperature inside the transparent bowl is higher than on the outside.

If we did two parallel simulations, one with a shiny object inside and another with an opaque object, we would see the shinier the object the more light it reflects. This energy reflected in the form of light is not trapped by the glass bowl but can pass through it onto the outside. However, the energy that it projects and emits in the form of heat will remain trapped inside our greenhouse.

On our planet we know that snow has a large part of luminous radiation (albedo), which is why scientists calculate

that the disappearance of the portion of snow-covered parts of the planet's surface will increase the greenhouse effect even more.

Consolidation activity and level of understanding:

Establish a parallelism between the frog and our attitude to climate change. What is happening to us? The teacher can pose the following questions depending on the pupils' age and level:

- Where does the heat in the greenhouse come from?
- Could you explain why the heat enters but does not leave?
- What do you think would happen if we painted the sphere black and if we covered it in aluminium foil?

Play the game Wake up the frog, available on the handbook web.

2. Previous knowledge activity.

Title: And you? What do you know?

Description: It consists of a research activity into their knowledge of the subject.

Objectives: Firstly, to detect previous ideas of the group about climate change carry out a

small-scale social study of the subject, by means of a survey of people around us, which can also help us to find out erroneous information about climate change which can be of great value to us in order to remedy it.

Development of the activity:

The activity will be divided into two parts: firstly, we will give the pupils a paper copy survey for them to complete. Once the surveys have been carried out they will be handed in to the teacher to correct any mistakes. A conversation will be held between pupils and the teacher, about what they thought of the questions and which were more difficult to answer and why. Secondly, every pupil will be given another survey with the same questions for them to interview someone around them on the topic which they should bring the next day.

Once the surveys have been collected, with the information gathered the teacher will work on conceptual contents and available procedures like for example simple experiments that help to understand and raise awareness of the subject. They will clear up any doubts, expand on information and correct misconceptions about climate change which are identified in the surveys carried out.

Survey Model

1. What do you know about climate change?
2. How have you learnt what you know about this subject?
3. What factors are causing climate change and

why?

4. Have you ever heard of greenhouse gases? Do you know what they consist of and what they are?

5. What consequences is climate change having on our planet at present? Do you know what they will be in the future?

6. Is there anything we can do to stop climate change? Could you specify any particular action?

3. Awareness-raising activity about resources, recycling and climate change.

Title: With an artist's eyes: I recreate, I imagine, I recycle.

Description: A creative activity to raise awareness of the need to recycle waste.

Objectives: Understand the importance of discovering new uses for discarded objects. Awaken attitudes towards making good use of resources and encourage the recycling of different everyday materials. Detect previous ideas of the group about climate change.

Materials needed: Card, glue, sheets of paper, coloured pencils, watercolours, felt pens and household waste brought in by the pupils from their homes.

Duration: Two sessions.

Development:

The day before the first session of the game, the teacher informs pupils that they must bring to school an object from home considered to be unusable: metal containers, objects that are broken or don't work, plastic objects, old clothes, worn footwear etc.

For the first session and as a first step, each participant puts the object they have brought on the table; wrapped in such a way that no one knows what is in the package. Secondly, the teacher will ask pupils to exchange objects with their classmates, so that no one has their own.

The teacher then gives out blank sheets of paper, and tells them to open their packages and look at the object they have with an artist's or inventor's eyes for a few minutes, think of and write down what uses they could give to this object in the state it is. After five or six minutes each participant will read out their notes describing the object they got and the new uses it could have. A point will be given for each use the pupil has mentioned. When each pupil has had their turn at saying the uses they found, the other class mates can suggest other ideas that occur to them.

All the points will be counted, to see who has got the most, using their imagination and ingenuity to make use of the resources available and being able to look at things with fresh eyes.

In the second session, the teacher gets pupils to express freely what the concept of climate change suggests to them: it can be a word,

an idea, a sentence, a feeling, whatever occurs to them and their contributions should be put up on the board.

The teacher will ask random groups to be formed of four or five pupils and then proposes that they create a piece of work inspired in their ideas, concepts or feelings that have arisen from talking about the topic. In order to carry out their proposal, they should come to an agreement amongst themselves, about what materials they are going to use and if they are going to create a picture, a collage, sculpture, song, a toy, an invented apparatus etc...

Groups will be invited to use the objects brought from home and can interchange objects amongst each other for their purpose.

4. Water Activities

Title: The grey pond and Water thieves experiment.

Description: A children's story about water pollution and an experiment in which we will see what happens when pollutants enter the water supply.

Aim: Raise awareness about caring for the environment and the consequences of polluting water. Learn to look after this vital resource.

Materials: We need 2 jars or vase-type containers, a knife, two leeks, two celery stalks, white daisies, coloured ink and a jug of water.

Story:

Once upon a time there was a boy who, on walking through a wood, thought he heard a sad lament, as if someone was crying as they sang. Following the sound he came to

a large circular spring, grey and mysterious. The constant sobbing seemed to come from the spring's pool; but on looking into its dirty water he could only see grey fish swimming slowly in circles, and from whose mouths came the sobbing with each lap of the pool.

Amused by the situation, the boy tried to catch one of those incredible talking fish, but on putting his hand into the water, his arm was grey up to the elbow, and an enormous sadness came over him, and at the same time he understood the sadness of those fish; he felt the same as the earth felt, he felt dirty and polluted.

He took his hand out of the water quickly, and ran away. But his hand was still grey, and the boy still felt sad.

He tried lots of things to cheer himself up, but nothing worked, until he realized that he could only feel happy again by returning joy to the earth. From then on he dedicated himself to caring for the country-side, plants, cleanliness of the water, and he tried to get everyone to do the same. He was so successful, that his hand started to recover its colour, and when the grey had completely disappeared, and he felt cheerful again, he dared to return to the spring. And from a distance he could hear the joyful song of the coloured fish that jumped and danced in the crystal clear waters of that magic spring. And that is how he knew the earth felt happy, and he himself felt a deep happiness.

Author. Pedro Pablo Sacristán

Development and procedure:

Put two centimetres of ink in one of the glass jars and the same amount of water. Wash the flowers, the leek and the celery stalk. Stand them up in the coloured water and leave them there for a couple of days. In the other jar, simply put the flowers and the other food stuff in clean water. As time passes you will gradually see how the coloured water is

absorbed by the flowers after a day or two. The colouring acts like a pollutant. On drinking the water the plants absorb all the pollutants it contains. The same thing happens with people and animals that drink polluted water.

Consolidation Activity and level of understanding:

Ask participants to observe and number the changes the flowers and the food stuffs have gone through in the different jars.

Ask what they believe to be the cause of those changes and what conclusions we can draw from this test in our daily lives.

Title: Polluted waters game.

Description: Group dynamics with a physical game component.

Aim: Understand and internalize, through the physical and emotional implication of the dynamics, the problem of water pollution and understand the multiplying effect of pollution.

Materials: A blindfold, two sticks of black face-paint and signs with the names of the characters they represent.

Timing: Variable.

Development:

The playing of games is a dynamic and participative way of learning. By means of a capture game we come to conclusions that we can extend to real functioning of natural systems. Players are classified into:

- Polluting particle: 1 participant.
- Plants: 4 participants.
- Animals: 2 participants.
- Person: 1 participant.
- Drops of water: rest of participants.

The teacher will help the contaminating particle to put a black mark on the polluted players and will act as referee and moderator, who therefore as witness observes which participants have been touched by another contaminated one. The polluting particle will have their eyes blindfolded. The drops of water should wander around the room shouting Water comes, water goes!

When the polluting particle finds a drop of water it will be immediately polluted, which will be symbolized by a black drop on the forehead. The plants should try to catch as many drops of water as they can, in order to do so, they should hold onto them without letting go, if any of those captured is polluted, the plant will automatically be polluted and be marked. The animals can capture drops of water or plants, as in the previous case. the person should capture any of the previous characters.

As the game is played, everyone will quickly be polluted, which will show participants how a small polluting particle can pollute all our system.

Consolidation and comprehension activity:

Invite players to draw conclusions about pollution having played the game, get them to number different pollutants, and the effect that they have in the food chain.

5. Atmosphere Activities

Title: Riddle. How much do we consume?

Description: In this activity children will learn and visualize specifically what surface area of vegetation is necessary in order to produce the oxygen each child needs to breathe.

Aims: Raise awareness about the great importance of the existence of forests and of marine plankton in order to maintain the balance of gases in the atmosphere and for our survival. Know and be able to identify the proportional relationship that exists, between the amount of oxygen that each of us needs, to breathe each day and the volume of plants essential to produce that oxygen.

Timing: 40 minutes.

Materials: Ropes, sticks or stones, a tape measure, pencil and paper.

Development:

First of all, a trip to the countryside or to a nearby garden is organized and sticks or stones are gathered on the way.

Once they arrive at the garden, the teacher invites pupils to leave the sticks, stones and the ropes in a particular place and around them a circle is formed and we sit down. The teacher will find out what the participants know about

photosynthesis and how plants produce oxygen. Great emphasis will be given to highlighting that all green plants produce oxygen.

The name of the activity will be revealed to create expectation and motivation. The children should estimate, what surface area of grass is necessary to produce the oxygen a person needs to live for a whole day.

Afterwards it will be explained to them that according to some studies humans consume 360 litres of oxygen a day and that an area of approximately 3m² is enough to cover the oxygen demands of one person. In groups of four or five they will be asked to mark out using the sticks and stones a surface area of grass of these dimensions and they will see the green surface area that each pupil needs for their daily breathing.

Consolidation activity and level of understanding:

Ask questions like the following: In light of the knowledge acquired, what is the total area of vegetation necessary for all the class or all the school to have sufficient oxygen? Why do you think it is possible that in places or cities where there are little or nearly no green spaces it is possible to breathe?

Seaweed together with rainforests produce and liberate oxygen essential to maintain the balance of gases in the atmosphere, this is why we can say that rainforests and seaweed are the Earth's lungs. Can you imagine what would happen to us if the forests and seaweed disappeared due to pollution?

Title: Red alert CO₂ is rising!

Description: The activity consists of an experiment to observe and test how the presence of CO₂ causes the temperature to rise in a glass jar.

Objectives: View the action of CO₂ with respect to the rise in temperature. Raise awareness about the importance of reducing CO₂ emissions into the atmosphere. Teach habits which pollute less. Relate this phenomenon to climate change.

Timing: 20 minutes.

Materials: A glass or small jar, two medium-sized glasses, two large glasses, two small alcohol thermometers, a lamp and a light bulb of more than 60w, bicarbonate of soda, vinegar and a teaspoon.

Development:

Take two medium-sized glass jars and put a small thermometer inside, which will show the temperature inside each of the glasses. Then we will place two large glasses upside down over each of the other glasses covering them like a protective shell, and under a lamp which generates heat. In a few minutes we will see how the air temperature, on the inside of the glasses, will start to rise. In a small pot or glass which will fit inside the glasses, we will mix two teaspoonfuls of bicarbonate of soda and 40ml of vinegar which will produce a reaction of CO₂. We then quickly put the pot of mixture into one of the glasses exposed to the lamplight, next to the thermometer. After a few minutes we will see that in the glass where there is a greater concentration of CO₂ the temperature is higher, due to the greater concentration of the presence of the gas.

Consolidation activity and level of comprehension:

Did you know that we emit CO₂ in our houses? Use the emissions calculator on the handbook's web.

Do you know any of the consequences that uncontrolled emissions of this gas can have as regards the climate? Do you think it has any relation with the greenhouse effect?

6. Energy Activities.

Title: What about building a solar oven?

Description: Build a solar oven.

Objectives: Raise awareness about renewable energies. Experiment with solar energy.

Timing: 25 minutes.

Materials: A pizza box, black card, a transparent plastic bag, aluminium foil, glue, scissors and a pencil.

Development:

First of all, we will cover the pizza box with foil. Secondly, we will cut the card to cover the inside of the box. Then we place a plastic bag inside, which allows the sunlight to pass through and inside the bag we will place a food

item, like for example a ham and cheese sandwich which will be placed on the base of black card.

Once our oven is ready, we will place it in the sun, making sure the box lid is tilted so that it receives sunlight inside and is not in the shadow of the lid. After a few minutes our sandwich will be warm and ready to eat. This oven can reach up to a temperature of 70°.

Title: Renewable energies game.

Description: A dynamic game about the different forms of energy and their possibilities of lasting and being stored and renewed.

Objectives: Raise awareness of the importance of the use of clean energy.

Timing: 30 minutes.

Materials: Cards and signs with the names of the different headquarters or power stations (solar, wind, nuclear and coal) and another with rubbish.

Development:

The teacher will give out name cards of the different roles to be played: there will be five of each power, five sun, five coal, five nuclear and five wind. There will be four electrical appliance cards which work with one of these energies and lightning.

In the place where the activity is carried out four signs with the names of the different power stations will be put in each corner, where each one's resources will be stored and in another place the rubbish sign.

The participants who have resource roles will have to recognize each other by means of mime, and then holding

hands go to their station or headquarters. Then the different electrical appliances (refrigerator, cooker, heater and fan) representing their role and by miming each one will head to a power station, stretch out their hand and when the resource takes hold will start working, running round the space. If the lightning touches their hands the resource is broken and if it is not renewable it will go to the rubbish. In the case of the renewable energies they return to their power station. The electrical appliance will return to its headquarters and look for another resource to work with. The game finishes when the fossil fuels run out.

Complementary activity and consolidation:

Count which of the energies are clean or dirty and draw conclusions as to the use of each one.

7. Soil activities.

Title: Don't remove my protection!

Description: A fun and dynamic activity on the essential role of trees in protecting the soil and avoiding desertification.

Aims: Understand the importance of the function of trees as elements of soil conservation. Foster conservationist attitudes towards nature. Encourage reforestation action.

Timing: 30 minutes.

Materials: Patio or garden, sheets of newspaper or recycled paper, stones and chalks.

First of all, the ground will be divided up using chalk into three squares of approximately 20m². The game starts giving instructions and handing out roles to the participants:

four pupils will be erosive agents; rain, snow, wind and groundwater. The rest will be half trees and half undergrowth and bushes. The undergrowth and trees hold the soil together thanks to their roots. Twenty sheets of paper will be placed in the first square and the pupils who represent trees and undergrowth will position themselves on them, trees standing and undergrowth squatting. Pupils who represent the erosive agents are ready on the edge of the square waiting for the coordinators signal. When they give the signal, the four pupils should go into the square and try to snatch as many papers as they can, whilst the trees and undergrowth defend them with their hands and feet. They can also hold each other's hand to stop the erosive agents getting through. After a few minutes the coordinator will give the sign to stop and write down the number of papers obtained, which symbolize fertile soil.

This second time the participants will go to another of the squares, but this time twenty sheets of paper will be placed on the ground held down by twelve pupils, trees and undergrowth and the others by twelve stones. The signal is given again for the rain and snow etc. After a few minutes, the signal to stop is given and the number of papers obtained in the same time, are counted.

Finally, pupils acting as erosive agents, will go into the last square, which will have 20 sheets of paper held down only by stones and the same sequence of giving the signal is repeated, to start and to finish when all the papers have been taken.

To finish, the teacher will show the re-

sults obtained in the three cases. They will talk about the importance of trees and vegetation to fix and protect the plant cover, and of the great problem and risks that deforestation implies.

Consolidation activity and level of understanding:

With the figures available, the teacher will ask pupils to express in their own words the conclusions they have drawn after going through this dynamic, and provide specific proposals of good practice to avoid soil erosion.

Title: Providing solutions, involving our hands.

Description: Practical workshop on Japanese reforestation techniques, called Nendo dango, which means balls of clay. It involves making small balls of clay, with seeds of different species of trees and shrubs, and scattering them over the ground. The layer of clay, once dry, stops the seeds becoming food for the birds, rodents and other animals, and it is the rain that frees the future trees from their protective coating and helps them germinate.

Objectives: Learn a simple and efficient reforestation technique, with the aim of improving nature, create carbon dioxide sumps and protect fertile soil.

Timing: Two sessions: one of 30 minutes to make the clay balls and another to scatter them in the designated area.

Materials: A plastic bowl for every four or five children, 400 grams of clay, 100 grams of potting compost, humus or manure, 100 grams of a variety of seeds grasses, legumes, shrubs and indigenous trees of the area, Cayenne pepper or thyme and water.

Development:

First of all, we explain to the pupils what we are going to do and what the germination process is of each seed that we are going to use, in what order they will do it and what function each one will carry out. The grasses and legumes first, breaking up the soil, generating a micro climate and providing nutrients in the case of the legumes, which fix nitrogen, so that favourable conditions and temperature are created for the next occurrence: shrub-tree.

The technique consists of coating seeds in clay which will act as protection and provide the appropriate means for germination. The legume seeds will be put to soak three or four hours before, so that they do not absorb the water in the clay and break the clay ball on expanding.

All the material will be placed on a table protected with plastic.

The instructions are the following:

Mix the clay and small seeds and potting compost. Add the cayenne pepper or the thyme which will act as repellent to protect the clay balls from animals. Add water to this mixture. Knead well until of a firm consistency. Shape into a disc-like shape, give.... Cover them and make a small ball of about 2 or 3 centimetres with the help of the table top or between our hands. Let them dry. In summer, dry them in the shade so they do not crack and in Winter, dry them in the sun. The small Nendo dango balls are thrown around the areas we want to reforest

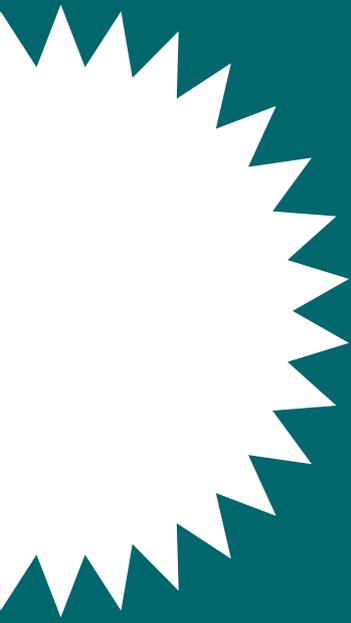
or enrich... The best time to carry out reforestation is in the autumn with it being the rainy season.

Complementary activity and consolidation:

Projection of the film *The man who planted trees*, based on the novel by Jean Giono. <http://www.youtube.com/watch?v=ZSeC67YOFn8>

Reforestation could be suggested on a global level for the whole school, involving families, and tackle nearby area, where there have recently been forest fires.





GLOSSARY

Anthropogenic: produced by man's actions.

Atmosphere: gaseous covering around the Earth.

Carbon dioxide (CO₂): A naturally produced gas, also a by-product of the combustion of fossil fuels and biomass, changes in land management and other industrial processes. It is the main gas in the anthropogenic greenhouse effect that affects the planet's balance of radiation.

Climate: Strictly speaking, climate is usually defined as average state of the weather.

Climate change: statistic variation in the average state of the climate over a prolonged period of time. Climate change can be due to natural processes or persistent anthropogenic changes in the composition of the atmosphere.

Cryosphere: Component of the climate system which consists of snow, ice and permafrost.

Fossil fuels: Carbon-based fuels: oil, natural gas and coal.

Greenhouse effect: Greenhouse effect gases trap heat within the Earth's atmosphere. This is referred to as the natural greenhouse effect. An increase in the concentration of greenhouse gases produces an increase in the infrared opacity of the atmosphere, and this provokes an imbalance which can only be compensated by a rise in temperature.

Hydrosphere: Component of the climatic system which comprises surface liquid, like the oceans, seas, rivers, freshwater lakes, subterranean waters, etc.

Kyoto Protocol: The Kyoto Protocol for the United Nations Framework Convention on Climate Change was adopted in 1997 in Kyoto, Japan. It contains legally binding commitments in which governments agreed to reduce their man-made emissions of greenhouse effect gases.

Ozone layer: The stratosphere has a layer in which the concentration of ozone is greater and is called the ozone layer. This layer is between 12 and 40 kms. Each year, during spring in the Southern Hemisphere, a significant depletion in the ozone layer around the Antarctic is produced. Contributing factors are chlorine and bromide compounds derived from human activity, along with meteorological conditions of the area. This phenomenon is called the hole in the ozone layer.

Photosynthesis: The process by which plants absorb carbon dioxide (CO₂) from the air to produce carbohydrates, emitting oxygen (O₂) in the process.

Renewable energies: Sources of energy which are sustainable, and include technologies not based on carbon, like solar, hydraulic and wind power, along with carbon-neutral technologies like biomass.

Sustainable development: Development which caters for current needs without threatening the capacity of future generations to cover their own needs.



Wake up!







CO₂

 adaptaclima II


SUDOE
Interreg IV B


UE / EU - FEDER / ERDF


Adesval
ASSOCIATION PAYSANNE D'ÉLEVAGE
DE VAL DE LAUNAN