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Ecologist's Guide To The Galaxy

Resilient G.A.P.
Glocal Action Project

Today, through this booklet, you are invited to choose a conscious and sustainable lifestyle. On a large scale, to guarantee a future for the planet and its inhabitants, human and non-human; on a small scale, because it is our daily actions and practices that define who we are: it is our choices, even the smallest and most trivial ones, that assign us a place in our society.

Choosing to live in harmony with the planet that hosts us is one of the greatest signs of civilization that can be given in the consumerist and capitalist society we live in. There is wisdom, courage and self-confidence in this choice.

And it is a highly contagious choice: knowing how to communicate this choice in the right way is a source of satisfaction and pride, and it's wonderful to see the inspiration that people around us can draw from even a single person's small gestures. Every one of us can be a role model: these days there's a lot of demand and not enough supply of people to be role models, of people who set an example for others. This was a strong reason for us to create this little booklet, and we are sure it will be a strong reason for you to choose a sustainable lifestyle in harmony with the environment every day.

SUMMARY

READING INSTRUCTIONS

The idea behind this guide is that it can be useful to you in the contexts and places of your everyday life. Each chapter is intended to represent a specific place in a typical city, such as a supermarket or a clothing store.

Within each place of this imaginary city, some topics to be highlighted have been chosen: **Water, Shopping, Food, Energy, Mobility and Waste.**

You can find these themes at the top of each chapter, identified by the following symbols:

These symbols will also recur within each chapter, to emphasise its division into the various themes of interest.

Some places have a more transversal cut between the various themes, and thus are identified by a different graphic.

All the places are collected in alphabetical order but it is not important to read them in such order. The booklet is designed as a guide, so that you can read the chapter that interests you at any given time, or the one of the place where you are in that moment!

At the end of each chapter you will find the sources that were used to write the texts, so that you can dive deeper into the topic (or check that we haven't made anything up!).

INTRODUCTION

Stop, don't turn the page! Yes, we are talking to you, holding this booklet in your hands! We saw you the other day when you threw all that stuff in the trash can. Did you know that more than half of that "junk" could have been reborn as new items? Instead it will end up burned or buried....

Yes, but that's just the tip of the iceberg: nowadays we keep hearing, not without a certain catastrophical undertone, that our planet has fallen into a serious crisis, perhaps the worst of all those ever recorded in history books. You've already figured it out for yourself: we're talking about the climate and environmental crisis. Global warming, melting ice, rising seas, pollution and collapsing ecosystems, disastrous weather events, desertification...the list of red flags is a long one, and it's one that won't let you sleep soundly. And guess who is responsible for all this? It's us, the human race! Scientists have been telling us for decades: our great common home is in danger, and the great transformations that undermine its balance are caused by human activities.

We know it, everyone knows it — you say. The pro-

blem is huge, on my own I don't know what to do to solve it, and really, I can't stand any more inconclusive environmental whining. Well, we're here to help you! How? You see, here's the **EGTTG - The Ecologist's Guide to the Galaxy**, a precious companion created to show you the way to this great interspatial journey to the planet of sustainability. We will start from daily, simple and concrete actions. From everyday choices, where we will be able to give you advice, suggestions and answers to countless questions. And step by step we will arrive to the bottom of it, where utopia lies: on the horizon.

You can rest assured, then, that this Guide is not merely a set of rules not to be broken. The Guide is a launching pad so that you can be active, responsible and involved in the progress. The (zero-emission) engine of change is you! That's why you'll find blank pages at the end of the Guide: you will be able to enrich and complete it with personal notes, the result of the different experiences you will have and that we have not yet imagined. You can also share these and other ideas, impressions and suggestions for improvement on our social channels.

We're counting on you so, see you around! And remember, *"Break this vicious cycle, don't just recycle!"*

AQUEDUCTS

WATER RESOURCES MANAGEMENT

When walking around the city, you may see towers with a large cistern on top: technically, these are **water tower reservoirs**, fundamental structures for the functioning of our waterworks. They store water from the aquifer and then return it at controlled pressure to the various users in the city. **Aquifers** are underground areas where water, more or less confined depending on the type of aquifer, is free to flow due to the effect of gravity. The aquifer has a natural capacity to regenerate itself (recharge capacity) thanks to water infiltration from rainfalls and the

flow of nearby rivers.

Italy ranks first in Europe in terms of water withdrawal for drinking purposes (428 litres per inhabitant per day) and most of the water used for this objective comes from underground - 84% of the total. Using a system of pumps and wells, the water is first made fit for consumption in drinking water plants (if necessary) and then transported through a network of pipes and collection points throughout the territory. Problems arise if the city extracts more than the aquifer can regenerate: the groundwater level drops year after year, and the amount of available water decreases. With lower groundwater heights, there can be greater pollution (less water mass but the same amount of contaminants) and, in the vicinity of the sea, also saline water infiltration, both of which constitute major environmental damages and lead to further difficulties in the provision of water. It is therefore essential for water managers to ensure that they do not extract more than nature can regenerate. This is another reason why it is also important that this management is made public (an achievement reached in Italy in 2011 by means of a referendum), so that both the social (water as a right) and environmental (water as a resource) values of such a precious commodity can be considered.

Great progress has been made, but unfortunately this

decision has not yet been implemented throughout the Country.

Water distribution systems are also subject to water losses. The Italian national average is 39%, which means that 39 litres of water are lost in the pipes for every 100 litres supplied, a symptom of an old and poorly maintained water infrastructure. In order to tackle this problem, water agencies need to replace damaged pipes with the implementation of systems that allow them to monitor the entire network pipe by pipe, so as to detect where the losses are greatest and therefore where to replace or repair the network. The Municipality of Milan, thanks to techniques of this type adopted by Metropolitana Milanese, manages to keep leaks to 11.5%.

Access to water is non-negotiable and it is the job of the State to guarantee it to all its citizens. If management is left in the hands of a private individual without strict regulations on how to act and carry out maintenance, there is a risk that, due to very high costs for citizens or of mismanagement, a section of the population or even entire cities would find themselves with limited access to water or in water emergencies several times a year (such as Messina and Reggio Calabria). We must defend our right to water and demand that it be considered as such, distrusting its definitions of

an economic good, which would in fact place it within market logic. With imminent climate change, Italy, like many other parts of the world, will be hit by drought and desertification, and water will become increasingly difficult to obtain, acquiring more and more value from an economic perspective.

However, to take away or limit a fundamental right is to lay the foundations for a conflict.

ANIMAL FARMING

The dietary habits of most of the world's population, especially those living in developed countries, are largely based on animal foods, especially **meat and fish**. The meat we buy in supermarkets or from butchers is produced through **zootechnic systems**, while fish is produced through aquaculture. Both processes have a high impact

on the environment and are strongly responsible for greenhouse gas emissions that contribute to climate change. You should know that in the second half of the twentieth century, meat consumption increased by about 5 times. Currently, meat consumption per capita averages at 37.3 kg per year (rising to 81.7 kg in developed countries), while fish consumption more than doubled between 1960 and 2010.

One of the biggest environmental problems arising from livestock farming is **land consumption.** In fact, 30% of all non-ice-covered land is used directly and indirectly for the livestock industry: to feed the animals that are slaughtered to produce the meat we eat, enormous amounts of feed must be provided. For example, in the case of soy, 70% of the world's production is used to feed animals.

The huge amount of food used for livestock is highly *inefficient:* there is a parameter called "feed conversion ratio" which defines the amount of feed needed for an animal to "convert" it into body weight. In most widely consumed animals, such as beef, the protein conversion index ranges from 7 to 10, which means

that to produce 1 kg of beef between 7 and 10 kg of food is required, much more than the resources needed to produce 225 g of asparagus (one of the vegetables with the highest impact on greenhouse gas production), which is equivalent to driving a car for 440 metres, while 225 g of potatoes require "300 metres of driving".

Nothing strange, you might think, but (unfortunately) this enormous **use of land** for animal food is highly wasteful in terms of **water and energy resources**, causing deforestation, soil erosion and the loss of biodiversity, which directly increases **greenhouse gas emissions** (in 2006, the FAO - Food and Agriculture Organisation of the United Nations - held the livestock sector responsible for 18% of total emissions, while subsequent studies have claimed it to be more than 50%!) and environmental degradation problems.

Regarding the aforementioned waste of resources, it is worth focusing on the mother of all resources: Water.

You know, livestock farming is responsible for the use of ¼ of the global water supply, which corresponds to all the water used by humans, with a water impact gre-

ater than that of agriculture: on average in Italy, 15'000 litres of water are needed to produce 1 kg of beef (of which 200 litres are used for watering), 4'899 litres for 1 kg of pork, 3'900 litres for 1 kg of poultry meat. Of the various types, beef uses the most resources, with 1/3 of the water consumption coming from beef and milk production. Other water is also used to clean livestock facilities and in the slaughtering process. As mentioned above, the large number of animals and the great usage of resources result in huge greenhouse gas emissions, the largest of which is **methane** (with climate-changing effects 29 times stronger than CO_2), generated in the digestive processes of animals and emitted with their manure. In addition, **70% of the deforested land** in the Amazon rainforest has been used for livestocks (which we ourselves in Europe eat, as Brazil is the largest beef exporter) and almost all of the remaining 30% has been used for animal food production. In order to make room for farmland, whole sections of forest are literally burnt down. This leads to serious problems because, besides destroying one of the world's most unique habitats, the felled trees can no longer carry out their normal function of absorbing carbon dioxide and in addition they are often burnt,

emitting all the carbon absorbed during their lifetime!

Environmental degradation, on the other hand, is caused by overgrazing: the continuous impact of animal hooves on the ground, the uprooting of the flora on which they feed and the slurry they produce cause **soil erosion** (20% of the land used for grazing is subject to soil erosion). This phenomenon consists in the loss of the soil's capacity to regenerate itself and retain water, as well as its resistance, and in its impoverishment in terms of vegetation and nutrients. The soil therefore remains more vulnerable to wind erosion (as is the case with the increase in sandstorms, typical in China in the spring period) and progressively loses fertility. The vicious circle closes with the realisation that the land that has become steadily eroded can no longer be used for agricultural purposes, and that more deforestation will take place in order to obtain new hectares of land!

Aquaculture, on the other hand, is the farming of fish in the sea or on land, even in artificial wells. It provides 43% of fish for human consumption and is the fastest growing food sector. It can be more sustainable than

traditional fishing techniques, which are known to be highly damaging in terms of the destruction of marine environment (just think of trawling: huge nets trapping marine species of all sizes, which can result in up to 90% accidental catches), and of the processes along its chain, including the huge fuel consumption associated with transport and refrigeration.

Going back to aquaculture, and in particular that of most commonly found fish on our tables, it takes around 4-5 kg of fishmeal (feed produced by fishing smaller marine species of little commercial value) to produce a single kilo of finished product. Tuna, one of the most commonly consumed fish, requires 20 to 25 kg of fishmeal. There are also cases where fish are taken directly from the sea and then brought to fattening farms; the number of bluefin tuna has fallen by 80-90% in recent years due to this practice!
The variety of fish products is, however, much greater than the variety of meat products: the implications of aquaculture of different marine species and their different impacts on the environment must therefore be investigated. While carnivorous fish bred in the sea such as salmon and tuna are certainly unsustainable,

mollusc farming is much less impactful, for example, the farming of certain crustaceans such as crabs. There are also peaks of excellence where fish farming constitutes an ecosystem in miniature, with a joint production of molluscs, crustaceans, small fish and algae. One example, which we invite you to explore further, is the American *GreenWave.* The hope is that these systems will one day replace all environmentally harmful fishing and farming practices.

The most responsible environmental choice remains, of course, the adoption of a **low animal food consumption diet**. A vegan diet would be ideal, of course, but it is possible to limit one's impact on the planet by limiting and choosing better animal foods.

This was just a quick overview to give a better understanding of the origins of some of the most popular foods, but everything is connected, and altering the balance of the land and sea means damaging ourselves.

In the **Supermarket** and **House** chapters we have prepared tips for eating sustainable and healthy food!

NATURAL AREAS

When talking about the environment, we often forget that, first of all, we are talking about a *container:* part of the Earth System, of which it reflects the complex balances. Thanks to it, life is possible, and even seemingly minor disturbances to these balances can cause disastrous consequences. The serious environmental issues of today arise precisely in situations of imbalance, where man plays the a role of greater importance: every human intervention has the power to both restore certain aspects of the environment and to devastate others.

For the simple principle of *nothing is created and nothing is destroyed*, it is easy to understand how the container environment is affected by the huge volumes of waste produced by human activity: this waste can only end up in the

atmosphere, in the hydrosphere or in the lithosphere, and the environment comes out more and more contaminated. A common solid waste thrown on the ground can remain in the soil for decades or centuries and release, during the degradation process, dangerous substances that over time *leach* - filter into the ground - polluting groundwater, and then move with it and become part of the water cycle. The changes induced by the persistent presence of these pollutants can manifest in the altered metabolism of microorganisms and arthropods at each stage. The result? The eradication of a part of the primary food chain, which in turn has repercussions at higher levels of the food chain. A glaring and now sadly known example of this is that of **plastic islands** - huge clusters of floating waste in the ocean - where the degradation of polymers spreads micro pieces of plastic that are eaten by fish, which are then caught and end up on our tables contributing to our "synthetic dose". In the **Supermarket** chapter, under the **Waste** topic, you can learn more about this aspect.

Transposing all of this into everyday life: avoid littering the planet with dirt, use the recycling bins or better yet, take your waste home whenever possible to sort it properly. Remember this especially if you are going on

a trip (to the mountains, to the beach…). But know that you can do more: there is nothing stopping you from setting a good example and cleaning up the garbage left by someone else! You can do this, for example, by taking part in the ecological clean-up days organized in your city. There's even a sport called **plogging**: a term made up of the combination of plocka upp (Swedish for collect) and jogging. The objective is to collect the waste on the path of the runner that pollute city streets and parks, but also rural areas and forests. Fun, isn't it?

Waste has a long life, some almost eternal, and the pristine places are less and less! Besides being a sign of incivility, the indiscriminate abandonment of waste in the environment has serious repercussions on future generations. To better fix ideas, therefore, here is a memo on the time it takes for everyday objects to decompose. These times represent a decomposition in environmental conditions, and are indicative estimates: there are studies that report, for example, an infinite time of complete decomposition of many plastic materials.

WASTE	TIME	BIN
GLASS BOTTLE	1 MILLION YEARS	GLASS
DIAPERS	450 YEARS	MIXED RECYCLING
PLASTIC BOTTLE	450 YEARS	PLASTIC
ALUMINIUM CAN	80-200 YEARS	METAL
SYNTHETIC PLASTIC	50-80 YEARS	MIXED RECYCLING
NYLON	30-40 YEARS	MIXED RECYCLING
PLASTIC BAG	10-20 YEARS	PLASTIC
CIGARETTE BUTTS	1-5 YEARS	MIXED RECYCLING
APPLE CORE	2 MONTHS	ORGANIC
NEWSPAPER	1 MONTH AND A HALF	PAPER
BANANA PEEL	2-5 WEEKS	ORGANIC
PAPER TISSUE	2-4 WEEKS	ORGANIC (IF NOT COLOURED)

As you walk through your city, try passing through a park, and pay attention to how your perception and the conditions around you change regarding perceived heat, humidity, and air quality. Notice anything? Since small ecosystems with different plant and animal species live together, natural areas are great at for **self-regulating** the conditions within them. This causes weather and environmental conditions to be dampened in a park compared to the rest of the city. This property becomes particularly important in highly urbanized and cemented cities, where concrete surfaces and paved roads reflect little solar radiation, retaining much heat. Combining this effect with emissions from vehicles and heating systems, we get the **heat island** effect, which spreads from the more densely urbanized areas - typically the city center - to the less urbanized ones - usually the suburbs. The result is that temperatures within the city are higher than in nearby agricultural areas, from 0.5 to 3°C higher! Urban green areas therefore play a key role in containing this phenomenon. *Greenspaces* - parks - and *bluespaces* - rivers, canals, streams, ponds - within the city mitigate temperatures not only within the city, but also in the vicinity. The micro-scale air circulation is in fact modified by the

presence of parks or rivers: effects similar to breezes are created so that the air in parks and over rivers, being less warm, goes to replace the warm air of the neighboring anthropized areas (the warm air is less dense than the cold air and therefore tends to move upwards). In this way, a micro-scale **atmospheric recirculation** phenomenon is triggered, which makes it possible to avoid the phenomena of sultriness and stagnant air typical of highly urbanized cities. The more the network of parks and rivers is spread over the city, the more this effect can occur at a larger scale!

Several researches also recognize the significant health benefits ensured by the proximity of a park to one's home or by the act of frequenting one, with effects of stress reduction, mood improvement, pollution reduction. Therefore, and not only to fight the heat, it is important to defend, respect and live the parks of our cities, but also to ask for the creation of new ones: it is not only a matter of love for nature, but also of quality of life and, in a not too unlikely future, of survival.

## IMPACTS AND CONSEQUENCES OF AGRICOLTURE

As you probably know, as a would-be ecologist, much of the food that ends up on our tables comes from the ground. Indeed, agriculture is the basis of our survival: **11% of the earth's land** surface is used for agriculture, which alone accounts for **13.5%** of total greenhouse gas **emissions** (the food industry as a whole accounts for 23% of total
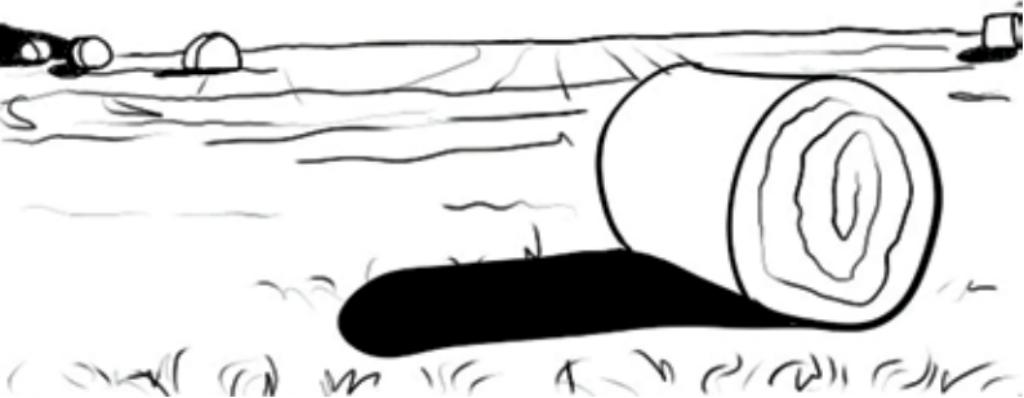
greenhouse gas emissions).

But how is it, you may ask, that something as natural as agriculture has such an impact on our planet?

Between the 1940s and the 1970s, the so-called *Green Revolution* took place. Since then, scientific innovation in the field of genetic engineering applied to seeds and the evolution of agricultural techniques have made it possible to significantly increase world production, thus keeping pace with population growth and the increase in food consumption. Indeed, per capita calorie consumption rose by over 40% between 1981 and 2003 (from 1891 to 2'695 kcal per person per day). This staggering increase in demand has led to an uncontrolled expansion of crops, the main cause of **deforestation**: consider, for example, the palm oil crops in South-East Asia, where an area of 28'000 square kilometres of forest between Indonesia and Malaysia has disappeared in just 15 years.

So, while on the one hand this agricultural revolution has guaranteed food resources for a developing planet, on the other hand it has led, through the abuse of technological innovations, to a disruption of the environmental balance. That's right, abuse: because technology is a tool, and it is up to us to use it well or badly.

Take, for example, the genetic modification of seeds: while on the one hand it can favour cultivation in extreme climatic conditions, on the other hand it can, if abused, lead to a drastic reduction in **biodiversity**.

The direct impacts of agriculture on our planet are many. The massive use of artificial **fertilisers** to enhance growth is responsible for more than 80% of global emissions of nitrous oxide, a greenhouse gas 265 times more potent than CO_2. Compared to the 1950s and 1960s, the use of these fertilisers has increased by 700%! Another factor to consider is their dependence on the use of **fossil fuels** as fertilisers and plant protection products are largely derived from oil.

Another problem is excessive **irrigation** which, especially when carried out in hot areas, causes **salinisation** of the soil: pure H_2O evaporates while salts accumulate in the soil in excess of the amount beneficial to the soil itself. Some studies attribute the collapse of Mesopotamian civilization to this phenomenon. Moreover, the first environmental impact associated with agricultural production is the consumption of water: 3'000 litres of water are needed to produce 1 kg of rice

and 1'300 litres for 1 kg of wheat. For fruit and vegetables the impact is lower, 960 litres/kg and 320 litres/kg respectively on average.

All these phenomena lead to the enormous problem of **soil erosion**: due to over-exploitation, the soil is stripped of valuable organic substances, water, mineral salts and fine particles, losing fertility and heading towards desertification. In the last 40 years, 30% of the available arable land has been consumed by erosion, including 970 million tonnes in Europe alone.

Not only food and feed, but also **energy and fuel** can be obtained from agriculture. There are three main products: biogas, biodiesel (popular in Europe) and bioethanol (popular in the Americas). Biogas comes from the digestion of special bacteria in a closed, oxygen-free environment and is used to produce electricity and heat. Biodiesel, on the other hand, is used in the transport sector and is already a reality: from 2020, the minimum biofuel content in commercial petrol and diesel throughout the EU is set at 10%.

The problem with **biomass** lies in the difficulty of assessing its actual sustainability. First-generation bio-

mass, such as maize and beet, takes space away from agriculture for food purposes. In many cases, such as the palm oil used in many biorefineries, the deforestation caused by the expansion of crops is more polluting in terms of greenhouse gases than the use of normal fossil diesel, and more harmful to the biosphere. Therefore, it is essential that biomasses are adopted that are independent of the food sector, perhaps by exploiting degraded or marginal land: the new EU regulations are moving in this direction, preparing a definitive cut in the least sustainable biofuels by 2030. What we can do in the meantime is to collect the organic waste in our homes in the best possible way, because biogas is certainly the most intelligent way to transform our waste into a resource.

You will therefore have understood that we have difficult challenges ahead: securing food and energy for all without contributing to the destruction of soil, biodiversity and climate is perhaps the greatest struggle of our time. If we think that about **30% of the food produced in the world is thrown away** and that only ¼ of the same amount could feed 800 million hungry people, we understand that there are resources, but

solutions must be implemented to ensure food for all. We need you to help us undertake the ecological revolution, united we can do it! By buying environmentally friendly food products, everyone can make a difference. In the chapter **Supermarket** you will find lots of tips and in the chapter **Animal Farming** you can see why adopting a diet low in animal-derived foods is more sustainable!

HOUSE

Living in a sustainable house is possible if you take a few steps, starting with avoiding unnecessary things and minimising waste. Before buying something new, always ask yourself if it is necessary: one way to find out is to wait a few weeks before buying it to see if the item is superfluous. For furnishing rooms, it is best to choose wooden furniture from local producers or second-hand furniture that would otherwise be taken to landfill or have damaged furniture repaired. For household appliances, a European standard categorises them according to their energy efficiency class. The classes range from A+++, which corresponds to the highest energy saving, to D, which corresponds to the highest consumption. Choosing an A+++ appliance means saving 30 to 60% energy. It should be noted that when

washing dishes, water and detergent are saved by using a good quality dishwasher rather than washing by hand. Another good reason to buy efficient appliances is of an economic nature: the Italian government, under the so-called Ecobonus, offers a 50% tax deduction on the purchase of appliances of class A+ (A for ovens) or higher!

How often do we not worry about where we throw things away? Or rather, how often do we not worry about throwing something away? How many times do we say to ourselves "it won't make a difference anyway"?. But does it really? The gesture of throwing something away, seemingly so small and trivial, is not so small when you consider that another 7.7 billion people will perform this action one or more times during the course of the day. Eurostat estimates that each person produces around 200 kg of household waste per year.

This is why it is necessary to develop an individual conscience based on the circular economy and which, in the domestic sphere, can find the right expression in the so-called **3 Rs Rule**: Reduce, Reuse, Recycle.

REDUCE
STRICT AVOIDANCE   REDUCTION AT SOURCE

REUSE
REUSE   PREPARING FOR REUSE

RECYCLE
WASTE SORTING   RECYCLING

ENERGY RECOVERY
DISPOSAL
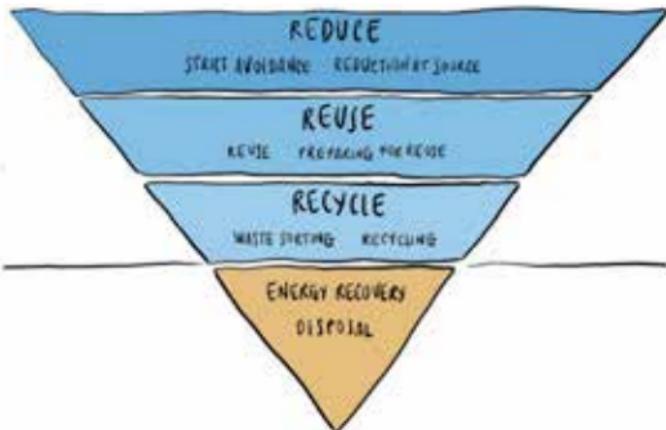
1st R: REDUCE

Reduction can be defined as the full range of measures and actions taken before a substance, material or product becomes waste, so we should always adopt reduction as the first virtuous option.

Reducing can be applied in the more narrow sense and also as reducing at the source.

Reduction in the narrow sense means limiting the amount of goods we use and consume, especially in larger quantities than we actually need. Very often, today's society offers us wild and wasteful consumerism, but it is up to us to decide whether we want to become aware of the issue and act accordingly. The easiest way to do this is to ask yourself: "Do I really need this?". Buy fruit and vegetables in bulk, drink tap water and

use reusable bottles to get rid of plastic ones, buy detergents and personal care products on tap, as well as drinks, eliminating the waste containers in which these products are typically sold. Also, avoid single-use products, especially if they are made of plastic, for which there is a disincentive under European Directive 904/2019. But remember that even a bio-plastic disposable can't beat a reusable item when it comes to sustainability, the "it's biodegradable anyway" excuse only goes so far!

Source reduction, on the other hand, means efficiency in the production and distribution chain. It occurs when manufacturers produce the same good using fewer resources than their competitors. It is therefore good to pay attention to and read up on which companies pay the most attention to this.

2nd R: REUSE

To reuse means to recover and reuse products or their components, even after they have finished performing their intended function. The product has not yet become waste and can continue not being waste if it is reused, either completely or in part.

Reuse addresses the same problem as Reduction, namely limiting the formation of new waste, but in a sli-

ghtly different way: if we cannot do without a product, once we have finished using it, we can take a series of actions to clean and repair it and then use it again for the same or a different purpose, or consider selling, exchanging or donating it. This way, we can extend the useful life of the product and generate neither new waste nor the need to buy a new good.

Here are just a few examples of "creative" uses to give new life to many everyday objects:

- From tomato puree cans to small flower pots
- From old T-shirts to household rags
- From old newspapers to original gift paper
- From old glass jars to chandeliers

3rd R: RECYCLE

Recycling means reprocessing materials that are now considered waste because they have reached the end of their life in order to recover the material from which they are made and transform it into new materials, products or substances. The aim of recycling is to reduce the amount of waste to be disposed of in other ways (by incineration or landfill) and above all to reduce the demand for new raw materials. And what better thing to ask for than for waste to become a secondary raw material?

For this to happen properly, waste must be sorted correctly. We have to get rid of the idea of " hey just throw everything together". This belief probably stems from the fact that few people know what happens to our waste once it is picked up by the waste trucks. You can read more about this in the chapter Landfill.

Here we give you some practical advice on how to separate waste correctly:

- If you have any doubts, always check the information provided by your municipality or the waste management company. The most immediate way is certainly using the web
- Separate packaging made of different materials (e.g. glass jar from metal cap)
- Remove food residues from containers
- Do not put dirty and greasy paper, receipts, used handkerchiefs and baking paper in the paper bin
- Do not put ceramic objects, crystal, mirrors or light bulbs in the glass
- Do not dispose of toys (unless you see the recycling symbol on the surface) and small appliances in plastic
- Minimise the size of the waste before throwing it away
- The *Junker* recycling app can give you an extra help!

However, we must remember that not all materials can be recycled indefinitely, and that recycling requires energy and sometimes additional resources: the first two Rs are always preferable to the third!

The topic of energy, when applied to domestic context, is really rich in suggestions. Thinking about electricity for domestic use, for example, you know that in Italy it is very expensive. Looking at the latest Eurostat analysis, conducted in 2017 on the cost of kWh *(kiloWatt hour)* for electricity in Europe, we are seventh in the continent.

In this situation, making environmentally friendly choices is also economical and an effective and proven way to reduce your energy bill is to produce your own energy with **photovoltaic panels**. For some time now, mechanisms have been in place to make this technology more affordable for citizens: for more information, check out our website, there will be a page we will keep updated and up to date with the latest regulations!

Remaining on the economic question, the economic situation for private individuals is also improved by the fact that technological progress is driving down the price of panels. Today, a panel costs about a third of what it did just ten years ago!

GSE, a subsidiary of the Ministry of the Economy and in charge of promoting the development of renewable energy and energy efficiency in Italy, has recently created a fantastic portal (www.autoconsumo.gse.it) that allows anyone to get, in just a few minutes, an estimate of the cost of installing a system capable of meeting their energy needs: just enter your address, the size of your roof and your family's annual consumption (which can be tracked on your bill).

Depending on the weather, the panels can sometimes produce more than we need and, on the contrary, remain inoperative when we need them. To overcome this problem, we can buy a domestic storage system, that is, batteries that accumulate energy surpluses and then return them in times of shortage. Alternatively, we can sell the excess to the electricity grid, and then buy the uncovered needs. The problem in this case would be that the selling price is much lower than the cost of buying it from the grid: for this reason you can request compensation from GSE through the mechanism of the **Scambio Sul Posto** – SSP (on-site electrical

power exchange). And what if the old lady living on the third floor opposes the installation of the panels during the residents' meeting? There is one last resort: continue buying all the electricity from the grid, but at least apply for a **Guarantee of Origin** (GO), a certification that attests the renewable origin of the electricity production. If, on the other hand, you want to check the energy mix of your current supplier, it is important to know that since 2009, companies selling electricity are obliged to inform their customers about their **energy mix** (e.g. 20% renewable, 43% natural gas…) of the last two years. This information must be available on the companies' websites and also, at least once every four months, on their bills.

The big issue linking savings and sustainability in housing, however, is **energy efficiency**. Saving energy starts with each of us making small actions: not keeping lights on unnecessarily, moderating winter heating and summer air conditioning temperatures are all very important. However, there are some factors that do not depend on the habits of the individual. More than two thirds of Italy's building stock, in fact, dates back to before the 1980s, when there were still no specific regulations on energy efficiency. For this reason, most of our buildings are 'energy sinks', unable to gua-

rantee thermal insulation.

Energy efficiency measures are a wise choice already in the medium term, with a rather short payback period. There is a wide range of possible measures to choose from, and here are just a few:

- **Thermal insulation:** this is a series of layers of insulating material applied to the walls or rooves to ensure better insulation.
- **Changing windows and doors:** windows are the centres of heat loss in the house, replacing them with new insulating models is a very effective choice for better insulation of the building.
- Condensing boilers: they are more efficient than traditional boilers (up to 98%) and have lower emissions too!
- **Heat pumps:** an even better alternative to condensing boilers, they provide air conditioning, heating and hot water without the need for combustion (which generates pollutants) as they are powered by electricity. If the electricity comes from your own photovoltaic panels, savings are guaranteed!
- **Energy monitor:** a great start for a smart house! For around € 200-300, you can monitor the consumption of individual appliances at all times

and know the cost of the energy they use. With a dedicated app, you can become an expert on consumption and costs and optimise usage and activation times. More advanced appliances can also decide how to manage your home, such as when and how to turn on the heating.

Some of these interventions may seem economically prohibitive. Fortunately, the State intervenes to promote energy efficiency through the same mechanisms seen for photovoltaic panels: once again, we refer you to our in-depth page.

A final tip, at no extra cost, is to use household appliances at times when electricity is "cleaner". There are two basic rules: avoid the classic peak times - e.g. dinnertime, especially at weekends - and try to seize moments when the sun is shining and the wind is blowing, to put it simply. A sunny summer afternoon is ideal. We encourage you to consult www.electricitymap.org from time to time, which provides real-time emission intensity for your region.

Let's close with a theme that so very dear to us Italians, and which links this topic to the next: pasta. There is a widespread belief that the water has to boil and wiggle in the pot throughout the cooking process. Well, this is false. The temperature of the water is about the same whether it is boiling like crazy or just slightly boiling: 100°C. Trying to get ourselves and others used to this and other tricks can really make a difference in the long run.

For optimal nutrition at home you need to pay attention to your eating habits and build up a sustainable diet. Each type of diet affects the environment differently, and this obviously depends on the consumed food. To get an idea at a glance, you can use the double food pyramid developed by BCFN, a tool that links the national dietary pattern recommended by nutritionists (such as the Mediterranean diet) with the environmental impacts of foods. The graphs show that animal-derived foods have a high impact on soil, water use and greenhouse gas emissions. **Beef** is the most impactful of all: it requires about 20 times more land and produces 20 times more emissions per unit of protein than

a common vegetable protein such as beans or lentils. In comparison, chicken and pork are certainly more efficient sources, but still three times more impactful than vegetable protein. Overall, the average daily protein intake exceeds the required amount, particularly in diets of people in the West.
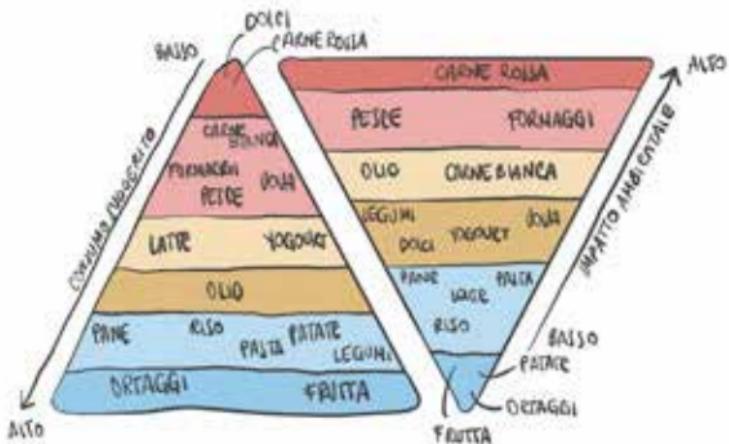
Small changes in our diet can make a **substantial difference.** Compared to an average American diet, simply halving the consumption of animal foods can significantly cut our environmental impact, reducing both land use and CO_2 equivalent emissions by more than 40%.

Emissions of some common foods

per 100 kcal

per kg of protein

Wheat Legumes Pork Beef Poultry
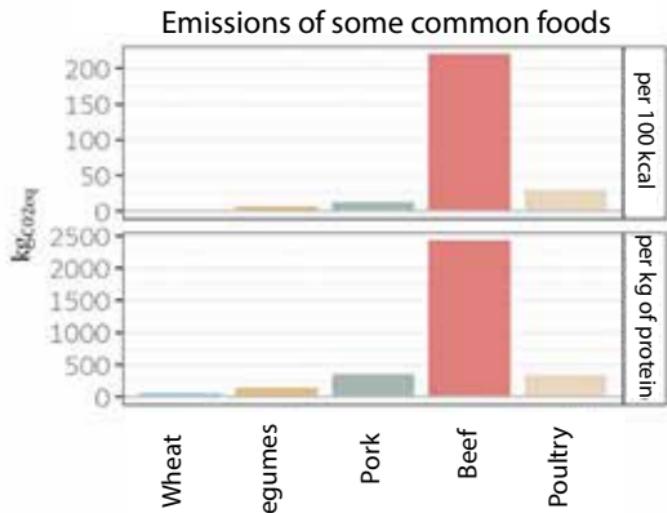
The IPCC has analysed healthy diets that offer high emission mitigation potential, such as flexitarian diets, which have low animal food consumption, vegetarian diets, which exclude meat and fish, and vegan diets, which eliminate all animal-based components. An average German citizen can reduce their emissions by 25% with a vegetarian diet and 50% with a vegan one. Reducing the consumption of meat and animal by-products is an affordable way to reduce one's ecological footprint immediately and significantly.

One thing is now clear: the classic barbecue with friends, where meat invariably dominates over any

other food, is a real ecological bomb. Even among friends, we are playing the game of reducing our environmental impact!

Water is a part of our lives that we take for granted, at least in Italy. We've had access to water in our homes since we were born and, excludiing extraordinary situations (pipe works, interruptions in service), we have probably never been unable to use it for more than a day. Taking things for granted, however, is never a good rule of behaviour, and in fact Italy is one of the countries that uses (and wastes) the most water for drinking purposes in Europe: 428 litres per inhabitant per day. This is despite the fact that Italy has a number of areas where water is scarce: a striking case in point was the excessive water collection on Lake Bracciano, which brought it to very low levels in 2017, with entire districts of Rome left without water for several days.

How can we improve our habits when dealing with water? First of all, let's not think of it as a resource to be taken for granted, but as a social right to be respected, protected and preserved: in a perspective of resource scarcity, the water we consume in excess of

what is necessary could be lost to our neighbours and to us. So, let's pay attention to the times when we use it: making food, washing dishes and clothes, washing up. Those are all occasions when we can reduce our water consumption by only running the taps when we really need the water. Therefore, short showers, soaping with water turned off, leaks and drips to be fixed. Another extremely effective way to reduce your water consumption is to pay attention to the **food** you eat, which is responsible for very high water use: at www. waterfootprint.org you can find the amount of water needed to produce different foods.

On many of these occasions, however, we use other components along with water, such as soaps and detergents. These enter the water cycle and can become a problem during purification and release into the environment. It is therefore essential to pay attention to the type of detergents we buy, favouring natural and biodegradable ones.

ENERGY POWER PLANTS

THE ENERGY SYSTEM

Electricity really is everywhere: it is so widespread, and its availability so obvious, that it is almost unnatural to wonder where it comes from, or how it manages to get to the socket at home all the time - excluding blackouts. Yet, the system behind it is extraordinarily complex.

The good news is that Italy has a fairly advanced energy system, for two reasons:

•   Emissions caused by electricity production are

low. This is because the share of energy from coal is limited to 10%, hydroelectricity is pervasive and modern renewables, photovoltaics, and wind power, have grown exponentially in the last decade.

- The Italian production system is among the most efficient in the world. That is, Italy manages to produce wealth by minimising energy wastage: with 3.01 MJ/\$, it is more efficient than even Germany (3.55 MJ/\$) and France (4.02 MJ/\$).

Natural gas (still a fossil fuel) now accounts for about half of Italy's electricity production. In 2018, renewables generated (if we include biomass and waste in the total) 41% of national electricity.

Finally, Italy is a net importer of electricity, most of which is purchased from France, where nuclear power is widely used. In 2018, imports accounted for around 16% of domestic production.

Italy has the potential to do better: first of all, by definitively eliminating coal as an energy source, but also by investing more in renewables. Indeed, photovoltaics and wind power have recently experienced exponential growth, especially in the South, where climatic conditions are generally more favourable. Fortunately,

the Italian government intends to continue to promote this expansion in the coming years.

The **renewable energy market** is on the verge of expanding its horizons beyond land, thanks to off-shore wind power. Turbines rooted in seabed or floating, shorter but with a larger diameter than onshore ones, placed in those locations where wind blows strongly and constantly: it is easy to understand how the potential of this technology is extraordinary. Among the many excuses , used by some critical voices to oppose the installation of turbines, there is the one of reducing to zero the alleged impact on the landscape. Italy is currently planning a wind power park of this type, but other countries with much more consistent sea winds, such as the United Kingdom, are already investing heavily in it. Ironically, much of the know-how to build and assemble these turbines is shared with the offshore oil industry. The technology is thus giving major *Oil&Gas* a great opportunity to convert their business model away from fossil fuels, without sacrificing profits.

Italian electric power generation (2018)

■ Biomass	■ Wind	■ Gas	■ Hydro
■ Coal	■ PV	■ Geothermic	■ Petroleum
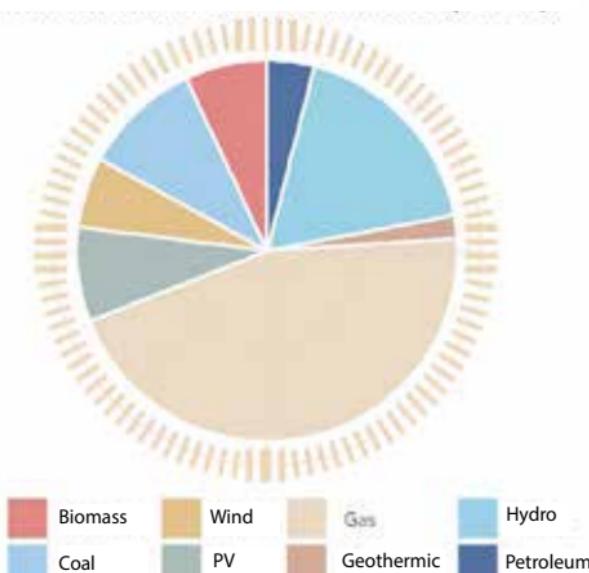
The **alternatives** to fossil fuels, however, do not stop at photovoltaics and wind power: renewables are a constantly evolving, dynamic and innovative world. Among research's fields are those that aim to obtain electricity from saline potential and those that focus on tidal energy, both by water surface and on the sea-abed. Concentrating solar power, a different twin to photovoltaics, is also an interesting commercial appli-

cation and is perhaps the most studied of the emerging technologies.

Leaving aside the technological aspect, it is worth spending a few words about our electricity system, without which it would not be possible to achieve such a precise and pervasive distribution of electricity.
At any given moment, the electricity grid must ensure that as much energy is produced as is consumed. It is a centralised system, i.e. most of the energy comes from a limited number of large power stations. Then, every day, every producer competes to put their energy on the market: everyone sets a price, and only the one who guarantees the most competitive prices will get the OK to sell the next day. A perfect system, until renewables like photovoltaics and wind power came along. Yes, because it is hard to predict how much one will be able to produce in a day's time if they don't rely on fuel but on sun and wind. It can even happen that solar radiation is so intense that wholesale prices drop to zero for a few hours. This discourages the spread of wind and solar power and slows down the energy transition. One solution, apart from technological development - who knows whether renewable energy

storage will soon become a commercial reality - are PPAs (*Power Purchase Agreements*) contracts that lock in the selling price, giving greater security to investors.

It should be made clear that a centralised electricity grid is not the only possible solution for guaranteeing energy for all. A very hot and current topic in the energy sector is that of **microgrids,** electricity networks of limited size that can supply, for example, neighbourhoods, villages and university campuses (e.g. the Bovisa campus of Milan Polytechnic, which is already partially supplied by a microgrid). The main advantage of these small grids is that they are **purposely** built to meet the energy needs of the communities they serve: this reduces waste and, by installing storage systems such as batteries, guarantees a greater quantity of renewable energy. As technology advances, *microgrids* will be able to guarantee self-sufficiency and resilience for local communities, but also, if necessary, connect to the national grid to give it the greater flexibility it needs.

But what can we do from home? Surely the most conscious choice is to sign a contract for the supply of

electricity certified by green energy only (see the topic *Energy* in the section **House** for further information). By doing so, you send a clear message to producers: no more fossil fuels! And while we are aware that the energy transition cannot happen overnight, for economic as well as technical reasons, we are doing our part to contribute to the changing.

LANDFILL

OUR WASTE'S DESTINY

A landfill, in itself, is a place where municipal solid waste and organic waste from people and industries are stored, deposited and degraded.

The decomposition process of each debris can take a long time, up to more than three decades, and involves the generation of *leachate,* a series of slurries that are highly polluting to the soil and the environment. According to European regulations, a landfill cannot be used for undifferentiated waste, as its decomposition

process is far too long, with the risk that various substances may survive underground for more than 1'000 years. Each landfill must be built on solid, non-flood soil and away from places of residence. Among other things, it must be designed for a particular type of waste - hazardous, non-hazardous, inert - and cannot treat others. Its life is limited as it can only accommodate a certain amount of waste, once this has been reached the site is closed. It is certainly not the most efficient or sustainable waste management measure, and in Italy we have particularly negative examples, such as the huge Sicilian landfills, which are constantly being expanded to store new tonnes.

Here is a passage from Italo Calvino's *Invisible Cities*: "The city of Leonia remakes itself every day: every morning the population wakes up among fresh sheets, washes itself with soaps freshly peeled from their wrappings, wears shiny new dressing gowns, take from the most perfect refrigerator tin cans still intact, listening to the latest nursery rhymes from the latest model of device. [...] So much so that one wonders if Leonia's real passion is really, as they say, to enjoy new and different things, or rather to expel, to remove from

itself […]. What is certain is that the rubbish collectors are welcomed like angels, and their task of removing the remains of yesterday's existence is surrounded by a silent respect, like a rite inspiring devotion, or perhaps just because once the stuff has been thrown away no one wants to think about it any more."

The imaginary city of Leonia is a good example to talk about the waste cycle. The most explicit references to the current situation are related to the modern mentality of *consumption-not-reuse* and the lack of information about the disposal process.

The **waste cycle** starts with separate collection, continues with sorting in recycling or waste-to-energy plants, and ends with a recovered product in terms of renewed material or energy. Separate collection is carried out according to different criteria for each municipality, which is responsible for ensuring the transfer of the different categories of waste to the recycling plants. Let's see what different fates await them.

- **Paper:** sorted to separate the usable fibre from the other materials - string, plastic, metal that are

normally incorporated in bales of waste paper; it is bleached to remove inks, so that the cellulose contained in the waste paper is once again a raw material, ready to re-enter the production cycle.

- **Glass:** can be recycled indefinitely, but the melting process requires large amounts of energy. It has to undergo numerous checks to remove the impurities it contains (paper, plastic, ceramic materials, ferrous and non-ferrous metal materials) and, once delivered to the plant, it is treated to produce glass ready for the furnace. The remaining material consists of glass grains, production waste, ceramics and porcelain.

- **Metals**: the recycling of aluminium, the most common metal in the waste stream, is economically and environmentally friendly: 20 times less energy is needed to make it from bauxite. The separation of ferrous materials (cans, tin cans, various tinplate products, ferrous alloys and steel) makes it possible to have the raw material needed for steel production available, saving money and reducing the cost of recycling. In Italy, 77% of

these items are reused to make various types of products, from bicycles to ship hulls.

- **Organic waste:** (in Italian FORSU - *Frazione Organica Rifiuto Solido Urbano*) represents a large part of household waste. Its transformation process takes place in composting plants where the natural process of decomposition of the substance is reproduced at industrial scale - discussed in detail later in this chapter.

- **Plastics:** the various types of polymers are sorted by infrared machines to identify the type of plastic material, and are then conveyed on specific transporter belts using compressed air jets. Recycled plastics are used in the most varied ways from pellet granules to fleece blankets and even for new urban furniture. On the other hand, unsorted or unrecycled plastics can be used for energy recovery through the waste-to-energy process. For more information, see the topic **Waste** in **Supermarket.**

A whole different matter is that of **bioplastics,** which are emerging as a viable substitute for petroleum plastics in many everyday objects. Its main characteristic is that it is of organic origin and 100% biodegradable. It certainly represents a great step forward compared to traditional plastics, but not all that glitters is gold: although it is biodegradable, composting it in plants that process normal organic waste is often not technically possible. Even intuitively, it is clear how different the rate of biodegradation of a bioplastic cup can be compared to an apple core. In addition, although bioplastics are of natural origin, the bioplastics chain, like any other chain, is by no means zero-impact. Therefore, do not fall into the frenzy of bioplastics as a universal solution to all disposables, but try to prefer objects made of natural materials that have a long-life span, and are not disposable.

In Italy, 87.1% of households regularly separate plastic, 71.3% aluminium, 86.6% paper and 85.9% glass. Very satisfactory data to look at. In addition to the amount of separate collection of municipal waste, however, attention should be paid to the quantity of material that is actually recycled. By 2020, the reusage and

recycling of paper, metal, plastic and glass municipal waste should reach at least 50% by weight. The largest quantities of municipal waste per capita are produced in the North-East (541.5 kg per inhabitant), which, despite having the highest level of municipal waste produced, achieves the highest percentage of separate collection, at 68.3%.

Our country thus ranks in eighth place for the number of municipal waste recycled among the 26 European member countries, meaning that in comparison with many others we are still virtuous. Furthermore, Law no. 145 of 30th December 2018 (c.d. "Legge di Bilancio 2019") introduced a number of new measures aimed at increasing the recycling of plastic packaging, the use of biodegradable and compostable packaging and the reduction of single-use plastic products, thus highlighting an issue that is very much on the public's mind. However, the positive news about our behaviour, with a general **trend of improvement** in sorting and recycling and the introduction of new protective laws, is just a drop in the ocean of this management challenge. There is, in fact, the threatening phenomenon of **illegal dumping and burning.**

In Lombardy alone there have been hundreds of infringements: business owners collect waste and bring it to waste disposal centres only on paper; in reality, it is illegally stored in large ponds or easily accessible land and then burnt once it has been filled. These illegal landfills have led to the contamination of a large number of sites, together with the contamination of groundwater with toxic substances and heavy metals. This issue is an urgent environmental challenge that must be addressed and resolved, a real battle for environmental justice: the health of ecosystems and citizens is at stake!

Finally, it is worth considering the role of waste in **energy production**. Depending on the type of waste, this can take two main forms. Some waste, such as plastics and vegetable fibres, are particularly suitable for burning in large plants, known as **waste-to-energy plants or incinerators**. In Italy, this practice involves about 12% of urban solid waste (another name for unsorted waste). This value is close to the European average, but the situation differs greatly from country to country: Ireland and Greece do not have incinerators, while Switzerland burns all its undifferentiated waste. The biggest problem with these technologies is the complex management of emissions: among the most harmful are dioxins, chlorine compounds and particulate matter, as well as nitrogen and sulphur oxides. Over the years, technologies for abatement of these pollutants have become more and more advanced, hand in hand with increasingly stringent emission regulations. The recent *Amager Bakke* plant, built in the centre of Copenhagen, is intended to demonstrate that waste-to-energy does not affect citizens' health. Interestingly, the project includes a ski slope on the roof.

Even waste that ends up in landfills can be converted into energy, this time through **anaerobic digestion**

by bacteria, similar to what happens in biogas plants fuelled by agricultural waste.

More than half of the biogas in France and the UK comes from landfill sites, while in Italy it is around 20%. A landfill site without an electricity generation system is forced to burn biogas, which is formed anyway by the decomposition of waste: not exactly the best from an environmental point of view - nor in terms of efficiency.

In any case, the future that European directives outline envisages only 10% of our waste going to landfill: we should already be thinking about alternative and circular solutions, always bearing in mind, when purchasing, the end that a certain good will come to.

LONG HAUL TRAVELS IMPACTS

Travelling is not only a question of what means of transport to take to work or university, but also encompasses our choices about long-distance travel.
Bus, train, plane and ship are the four main alternatives in this respect.
Subject to geographical, time and financial constraints, it is always a good idea to choose the means of transport with the least impact on the environment.

If it is true that wheeled mobility, if not worldwide then at least European, is showing signs of improvement in terms of emissions, the same cannot be said for

air travel. In 2016, this sector already accounted for 13% of global greenhouse gas emissions, a figure that is likely to increase in the years to come: Boeing and Airbus are forecasting 8 billion passengers a year by 2038, with a doubling number of aircrafts.

Emissions of different vehicles
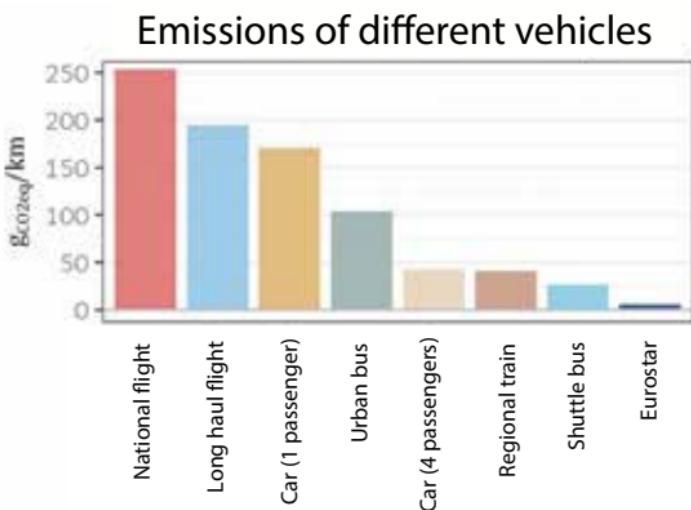
Improved fuel efficiency, greater vehicle loading and the use of biofuels to dilute paraffin, the main fuel for aeroplanes, will play a key role in the future.

Unfortunately, premises are not for the best as the CO_2 equivalent emissions of 1 km travelled by air are 14 times higher than those of a conventional train and 45 times higher than those of a high-speed train. Of course, making comparisons between different means of transport is a delicate operation: the emissions of a vehicle depend on many factors, its modernity, its state of maintenance rather than the number of passengers. In the picture, for example, you can see a comparison of CO_2 emissions, and it is clear that the plane pollutes much more than the train or bus. If you then count the greenhouse effect of exhaust gases, which have a much greater impact if they are emitted into the upper atmosphere, and that of contrails, the gap becomes even more pronounced.

In 2018, 4.3 billion passengers were registered, with large disparities between geographical areas: currently, 36% of global passenger traffic takes place in Asia, 26% in Europe and 24% in North America.

Although the idea of limiting access to air transport is often perceived as a threat to people's right to mobility, it should be remembered that only one out of seven people in the world has already flown once in their life. If it is true that global governance believes in the principles of equality and sustainability as expressed

in the SDGs - *Sustainable Development Goals* - then it is not possible to consider aviation as a sustainable means of transport in the long term: what would happen to greenhouse gas emissions if one in two, rather than one in seven, people flew regularly?

There is an urgent need to **reduce passenger air traffic** and switch to other modes of transport. A simple measure to reverse the growth trend in air traffic is to increase taxes on paraffin, which, along with international airline tickets, is exempt from taxation in most countries under the 1944 Chicago Convention for the Development of the Airline Industry. Today Brazil, Switzerland, Japan, Norway and the United States tax their domestic flights, and the Netherlands has proposed imposing a European tax on paraffin and flights from the EU.

But aircrafts share the pollution record with another popular means of transport: **cruise ships**. This sector is also growing steadily, with a 6% increase in passengers in 2018 compared to the previous year. The environmental impact of these giants is frightening: the American company *Carnival*, world leader in this sector, claims an average CO_2 emission of 712 kg/km for ships with around 1'800 seats, which per passenger would far exceed even the emissions of an airliner.

A recent European study gives similar figures of 1'200 kg/km for ships with 3'000 passengers. Moreover, these large ships are equipped with endless services, which require huge amounts of energy from the massive diesel engines on board.

Although globally we have a fleet of around 300 ships (compared to 60'000 commercial boats worldwide), their environmental impact is enormous.

In 2012, 12% of anthropogenic sulphur dioxide emissions were emitted by ships, and it is estimated that only 94 cruise ships of the Carnival company released 10 times more sulphur than the total emissions from European cars! In this regard, it should be kept in mind that from 2020 much stricter rules on the sulphur content of fuel for large ships have come into force – the so-called *bunker fuel* - with a substantial reduction in SO_2 emissions. There are further environmental problems linked to cruises, such as the release of sewage, which can occur up to 12 nautical miles from the coast, and waste management, which often lacks the necessary attention.

In conclusion, it is not possible to contain the environmental impact of travelling without questioning the current **tourism system**. The number of international tourists doubled between 2000 and 2016, reaching 1.3

billion people, and this number is expected to rise to 2 billion in 2030. This is a worrying figure, considering that of the 13% of emissions from air transport, 8% are due to tourism. Of course, it also accounts for 7% of global exports and contributes significantly to the expansion of local economies, but it is still imperative to find less polluting alternatives.

Proposals range from **ecotourism** to the development of **local tourism**, and require addressing the negative externalities of tourism in social and economic terms. Austria is relaunching night trains as a sustainable alternative to low-cost continental aircraft, with prices starting at €19 for a seat. Germany is also moving in the same direction: since the beginning of 2020, prices of all train journeys have been reduced overall by about 10%.

Among other advantages of a good train trip, we remind you that with trains you avoid transport to and from the airport, luggage restrictions and queues at the checkpoint. Moreover, booking a ticket is super easy (there are several websites that can help in choosing the best line and ticket fare).

And that's not all, you can even rethink the whole journey experience: while absorbing the beauty of the

scenery, between stops, it is possible to meet new acquaintances.

INTERNET POINT

CONNECTED SOCIETY'S ENVIRONMENTAL IMPLICATIONS

The level of digitalisation that our society has reached is there for all to see: Internet traffic reached 1.1 Zettabytes in 2017 (1 ZB is equal to 1 x 1'021 bytes, which means 1 followed by 21 zeros). All this data is accumulated in huge facilities, called **data centers**, containing hundreds of thousands of servers.

Data centers are tremendously energy-intensive structures: they consume 1% of the global electricity

demand, more than the country of Iran. Counting both energy used to power on and cool them off, this figure rises to around 2%!

Yes, because these huge structures need complex cooling systems, where a fluid, typically air or water, absorbs the heat from the electronic circuits.

As digitalization proceeds, more and more data centers are needed, and more energy is needed to power them. Large IT companies seem to have recognised the problem and are investing heavily in building more efficient data centers: a typical, simple choice is to locate them in cold climate regions so that the ambient air itself cools the servers, without the need for cooling equipment. Another clever option is to use the hot air coming out of the centers for remote heating of homes.

The **origin of the energy** used to power the data centers is, of course, also important. For this reason in 2011, Facebook committed to using 100% renewable energy, followed by Google and Apple in 2012. Google announced that it had reached the target for the first time in 2017, and then again in 2018.

The environmental association GreenPeace regularly publishes a report (the latest is dated 2017, based on

2016 data), called *ClickClean*, which analyses data on the energy management of the world›s largest IT companies, giving a score to each of them.

In this world of giants, a relatively small company has become popular for creating a search engine, Ecosia, which claims to donate 80% of its advertising revenue to certified reforestation projects and pays no dividends to its shareholders. To prove this, financial reports and reforestation receipts are published monthly.

At the time of writing, the company claims to have financed the planting of 149'591'695 trees, a figure that can have a major global impact. Ecosia's detractors argue that relying on the Bing search engine actually pollutes more than Google, as Microsoft is currently powered by less than 60% renewables. To keep up with the other industry giants, Ecosia has been building its own solar power plants since 2018, so that it can sustainably produce the electricity required by its servers.

This, combined with the fact that profits are used to plant new trees and that by 2020 it will produce twice as much solar energy as it needs for its operations,

makes Ecosia not only *carbon neutral,* but also *carbon negative.*

CLOTHING SHOP

How often do we think ‹I don't have anything to wear› and feel the need to buy a new outfit for this or that occasion, when in fact our wardrobe is full? Obviously too often, considering that the average life of a garment has been calculated to be 5 weeks. In recent years, **fast fashion** brands, offering clothes at ever lower prices, have encouraged people to change their wardrobe every season without too much remorse. In reality, the clothing industry hides a dark side.

The production of the various fibres is resource-intensive, in particular for non-renewable resources such as oil, which is the basis for the production of synthetic fibres, the same goes for water, i.e. for the cultivation of cotton. Other toxic substances are used at different stages of the production

process, such as during fabric dyeing which, through industrial discharges, can reach watercourses thus impacting not only the health of workers who come into contact with them during production, but also surrounding communities and ecosystems. Nor can we overlook the fact that many of the clothes on the market today are produced in countries where regulations and controls on environmental impacts, as well as on workers' health and conditions, are far from strict.

This development is not only an ecological problem, but also a social one. In 2013 in Dhaka, Bangladesh, the tragedy of the collapse of a textile factory building and the death of 1'138 workers, highlighted the precarious working conditions in the textile industry. According to the organisation Clean Clothes Campaign, for a t-shirt, only between 0.5% and 3% of the final price goes to the workers, while brand margins are around 12%.

Finally, the transport of clothes from their production site remains a key issue: according to a study by ADEME (*Agence de l'Environnement et de la Maîtrise de l'Energie*), a pair of jeans can travel up to 65'000 km before reaching the buyer, which is 1.5 times the circumference of the Earth.

So, what can we do if we feel like renewing our wardrobe while being careful about our impact?

First of all, don›t throw away your old clothes (if they are still intact) but take them to the collection bins made available by non-profit organisations in various municipalities. In Milan, the initiative is called *Dona Valore* (Give Value) and clothes are collected by cooperatives of the Riuse network, coordinated by Caritas Ambrosiana, which transforms used clothing into jobs for people in difficulty. Therefore, not only green but also supportive, since this activity generates economic resources to help social and educational services in the area! You can attend events such as *swap parties*, where you can bring and exchange your clothes with those of other participants, or buy from organisations that promote second-hand clothing (e.g. the Share - Second Hand Reuse chain of shops, a project developed by the non-profit organisation Vesti Solidale, or the Humana shops) and, lastly, the inevitable flea markets (vintage always has its charm). Before each new purchase, when really necessary, proceed in a conscious way, preferring products made of natural fibres and finding out about brands› environmental and workers protection policies. For example, Greenpeace's **Detox My Fashion** campaign provides information on brands' efforts to reduce the use of toxic substances in their supply chains. Otherwise you can use the Fashion Revolution website

(www.fashionre- volution.org) or the Good on You app. You should prioritise ethical clothing brands: some certifications like the GOTS (Global Organic Textile Standard), the European Ecolabel BioRe, Demeter andNordic guarantee organic and ecological criteria for the produced clothes.

If the previous criteria cannot be followed for any reason, give priority to the durability and multi-functionality of the clothes so as not to multiply purchases over time. *«Buy less, choose well and make it last»* must become a new motto.

Every morning, you get up and then, in the order you prefer, you have breakfast, shower, dress up… and here too, your choices count for the environment. In 2015, the textile industry accounted for 4% of the world's greenhouse gas emissions in the world, making it one of the most polluting industries (more than air transport!). The problems are many. One of them is the explosion of **synthetic fibres**, such as nylon (polyamide), acrylic and especially polyester, which are produced from petroleum and are responsible for a greater amount of emissions than natural fibres. Between 2000 and 2015, the amount of

polyester used in clothing more than doubled!

One of the problems to be considered with synthetic fibres, of which more than 60% of textiles are made of, is that they release **plastic microfibers** during machine washing.

These microplastics find their way through the domestic sewage system to sewage treatment plants, which they can escape to then reach the sea: an IUNC (International Union for Conservation of Nature) report in 2017 states that washing machines are the main source of primary microplastics, releasing 35% of the plastic fragments responsible for marine pollution.

The issue of the fashion industry has become more worrying starting from the 90s, with the emergence of fast fashion: fashion lines designed on one hand to make them easy for consumers to buy at low prices and on the other hand to ensure fast and cheap production strategies by large retailers such as H&M, Zara and Peacocks. Between 2000 and 2017, clothing sales increased from $1.55 to $2.11 million annually, a
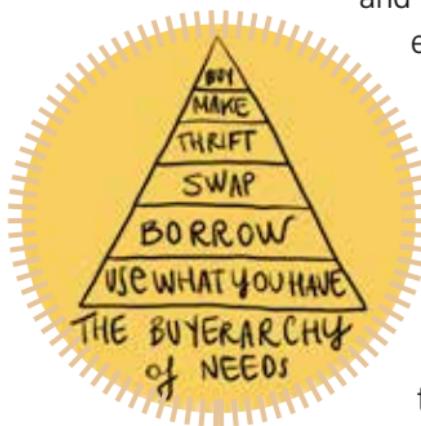
50% increase. While companies used to present their spring-summer and autumn-winter collections, many now offer 10 collections a year, up to 24 for Zara: as a result, the average lifespan of garments over the last 15 years has been halved.

How can we then consume clothes in an environmentally and socially responsible way? Here are **some tips** for your daily life:

- First of all, stop buying and use what you already own: in a study of 18'000 customers, the moving company Movinga found that 80% of the clothes of its Italian customers had not been used in the previous year;
- Plan clothing purchases instead of impulse buying;
- If you need one-off use clothes (occasional sporting activities or events), try to lend or rent rather than buying specific clothing. If you go skiing once a year or to a wedding, why store clothes in your wardrobe and forget about them immediately?
- Repair rather than throw away an item at the first sign of wear;
- To counteract the release of synthetic fibres, there are bags to put clothes in while washing

(*Guppybag and Cora Ball*) that can stop the discharge of these residues.

The textile industry is one of the most impactful in the world in terms of water consumption, using around 79 billion cubic metres of water every year! A simple cotton T-shirt, for example, requires around 2'700 litres of water. This is not only water from irrigation but also from "grey water", which is needed, for example, to dispose of the most harmful herbicides. After all, the cotton industry uses 11% of the pesticides and 24% of the insecticides produced globally.

For synthetic fibres such as polyester, the consumption of grey water is enormous: one kilo of polyester requires a total of 50 to 70 cubic metres of water (compared to 5 to 10 cubic metres for cotton). Much of this water is related to the neutralisation of toxic components in oil aquifers still water.

The problem of water consumption in the textile industry is also strongly linked to droughts, especially in arid countries such as Egypt and India, but also in the southern United States. Indian rivers, whose waters help the world's second largest cotton production,

experience severe droughts up to eight months a year, as in the case of the Indus River. In some contexts, such as India, modernising irrigation techniques is the way forward, while in other countries limiting the use of chemical compounds is a priority. What we citizens can do is to favour fibres with a lower environmental impact, such as hemp and, above all, not to give in to the temptation of fast fashion, but to make purchases measured to needs, always choosing brands that are as sustainable as possible.

COSMETICS SHOP

In order to put less strain on the planet, it is important to take a critical look at all purchases. When it comes to the use of cosmetics and personal care products, the impact is multidimensional. At every stage of a cosmetic's **life cycle**, from the extraction of raw materials to the disposal of waste after consumption, it is possible to identify several environmentally polluting impacts.

To begin with, the transport of raw materials to the production site and the transport related to products distribution generate considerable pollution. For this reason, it would be ideal to buy items close to the extraction and production site.

As far as **raw materials** are concerned, it is important to avoid products that contain petrochemical compounds: not only because fossil materials are becoming scarce, but

also because they are not biodegradable, highly toxic and consequently very polluting. It is better to choose products with organic vegetable ingredients, which are less impactful both during production and disposal, and because they are biodegradable. Combining these products with tools such as biodegradable ear sticks and toothbrushes can make a real difference.

As these products are used for personal hygiene, in most cases they are rinsed off and the residue ends up in the drains, eventually reaching the aquatic environment. Among the most toxic compounds to the ecosystem are triclosan and phthalate. Let's try to always avoid buying products containing these substances.

Another aspect of the implications of the cosmetics industry is animal testing: to avoid funding a company that has no qualms about testing products on rabbits or hamsters, look for cruelty-free certifications.

An even better **alternative** to all these products is **DIY:** as well as being a winning ecological choice, making your own soaps and cosmetics can also be extremely challenging and fun. There are many sources of inspiration online, with tutorials of all kinds and for all occasions.

A couple of examples:

- www.tuttogreen.it/cosmetici-naturali-fai-da-te/offre, a useful introductory guide to DIY in the world

of cosmetics, which we invite you to consult;

- www.diycosmetics.net, full of recipes and practical tips.
- YouTube also offers several specialised DIY cosmetics channels. Some products are as simple as they are miraculous: coconut butter or coconut oil, for example, can be used directly from the jar instead of chemical make-up removers or moisturisers. If you want to find out more, all you need is a few minutes' reading on the net. It is really surprising how many industrial products can be used as a natural and homemade alternative.

When we go to a cosmetics shop, it is often the case that we are first attracted by the thousands of **packages** of different shapes and colours in which make-up and personal care products are packed. And without even realising it, we find ourselves prey to the design industry, which captures our attention through the design of packagings, leading us to buy the product itself. But if we look at these packages, we begin to realise that every single one we see is actually a product of the same design, which will soon become complete waste: 70% of the cosme-

tics industry's waste comes from packaging. It is important to know that the so-called beauty industry not only uses more packaging than necessary, but most of it is not recyclable.

There are many brands that produce **complex packaging** that mixes various types of plastics made of dark colours, with labels and glues, making recycling a very complicated, expensive and sometimes impossible process. In 2018, the sector accounted for 120 billion of plastic wrappers with a high environmental impact. Some companies, on the other hand, are already committed to reducing the use of packaging or using fully recycled, recyclable or compostable flacons and containers. *Lush Cosmetics* is a virtuous example of a company that sells 35 to 70% of its products without packaging, thus greatly reducing its environmental impact. Other shops like *Negozio Leggero* in Milan offer many products on tap, from vegetable oils for moisturising to perfumes. The best solution is therefore to use aluminium or glass containers that can be filled with products on tap, or to use solid products contained only in a simple paper bag such as soap, shampoo, moisturising serums, toothpaste, deodorant.

The cosmetics production sector consumes a lot of water - 450 litres are needed to produce one bar of soap. One method of reducing this consumption is to **recirculate** the water in the factory. Depending on the raw materials used, the water consumption for cosmetics production changes radically. For products containing petrochemical compounds, the water used in the extraction of hydrocarbons has to be taken into account, for plant compounds the water used for irrigating the fields. Companies do not yet report to the public on their overall water consumption, but in view of the ecological transition it is important that a greater transparency of processes, consumption and emissions of industrial activities are achieved.

ELECTRONICS SHOP

In recent years, the use of electronic devices such as smartphones, tablets and computers has increased exponentially and will continue to grow, especially since forecasts account for the number of people with - at least - a mobile phone in 2020 to be around 6 billion. But behind these technologies lies a production chain based on the massive extraction of metals, large energy consumption, use of chemicals harmful to health and the environment, and inefficient product design.

The **extraction of raw materials** requires the excavation of 30 kg of rock to obtain 100 g of minerals used for a smartphone, specifically lithium, cobalt, copper, gold, palladium, platinum, and silver. In the Democratic Republic of Congo and other countries where these minerals are plentiful, mining has major

impacts on the environment and workers' health, as well as being a source of exploitation and social unrest. It is important to know that 80% of the emissions from electronic products occur during the **production phase.** In this field, Apple is so far the only company that uses 100% renewable energy, while Samsung uses only 1% renewable energy. Renewable or not, the production chain also plays an important role in deciding the sustainability of a product: these chains are exceptionally long, especially in the case of high-tech products, with raw materials coming from Africa and components made in Europe, Japan and America being shipped to China for assembly and then sent back to individual markets for distribution.

Smartphones, tablets and computers have some of the greatest **opportunities** to reduce our impact on the planet and to embrace the values of the circular economy. Too many people are used to thinking of their phones as consumer goods, to be changed just for fashion, without understanding how much this affects greenhouse gases, mineral extraction and the generation of toxic waste. If everyone in the EU waited an extra year on average before replacing their phones, we would avoid 2.1 million tonnes of CO_2 equivalent per year,corresponding to the emissions of about one million cars!

It is therefore essential that each of us tries to extend the life of our electrical equipment as much as possible, avoiding ill-considered purchases. In the event of a fault, go to a repair shop: the European Union is also pushing for the design of these items to be explicitly intended to simplify repair. If you then need to change the appliance, try to get someone to take over and perhaps recondition the old one, and look for a reconditioned appliance yourself. There are companies that do just that: you might be lucky enough to find a computer in perfect condition, perhaps sold by an IT company that needed to change its inventory, at a third of the market price. The ReWare cooperative in Rome is one of the best examples of this in Italy. You can also rely on sites like www.swappie.com, which exclusively deals in refurbished phones (in this case, IPhones). Finally, if it really is time to buy a brand new smartphone, take a look at the manufacturer's environmental responsibility: the picture shows that some manufacturers are much more careful about the sustainability of their supply chain than others. Fairphone, a Dutch company, is certainly the best example of a company dedicated to minimising the environmental impact of its phones.

What happens to an electronic object when it is thrown away? What happens to our mobile phones or washing machines? Their various parts are not considered standard waste because they contain special materials which need specific measures to be recovered. This type of waste has a specific identification name, **WEEE**, which stands for *Waste from Electrical and Electronic Equipment*.

Due to the presence of precious metals and minerals such as gold, silver and cobalt, hazardous compounds such as mercury and cadmium and the batteries they supply, these devices have to be collected properly and subjected to specific waste class treatment. There are five classes: cooling appliances, large household appliances, TVs and monitors, small household appliances, lighting equipment.

The European directive 2012/19/EU foresees for WEEE the application of the *Producer Responsibility Principle*, according to which the producer must be responsible for the collection and management of electronic waste. The **recycling of electronic devices** is not only a problem due to the treatments needed to recover materials and components, but also to the in-

trinsic recycling difficulty of the devices, which is very often caused by an unsuitable product design. In 2014 however, only 15.5% of electronic waste was recycled. Moreover, the useful life of these devices is very short, about two years for smartphones: companies make repairs difficult and it is often cheaper to buy a new product. The *Fairphone* company, in addition to having the least environmentally harmful production process, is also a leader in design that facilitates the repair and recycling of devices.

In Italy, the percentage of collection of this kind of waste amounts to 45%.
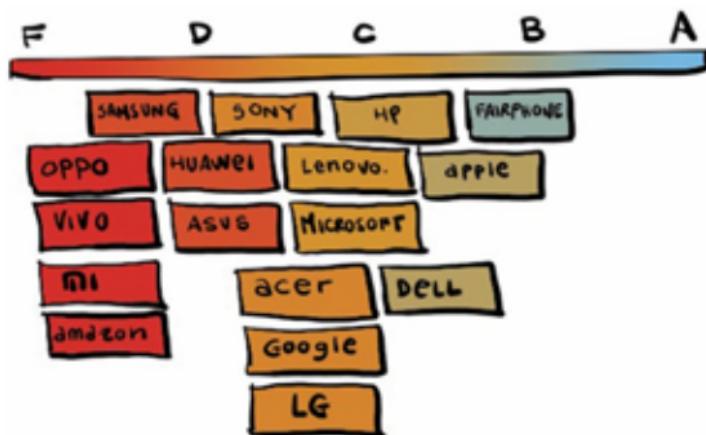
In Italy, there is the WEEE Coordination Centre, which is responsible, through the distribution of collection centres at national scale and agreements with municipalities, for facilitating companies (organised in private collectives) in the management and treatment of collected waste.

Here, due to the precious and rare nature of the metals and components in our equipment, there is a thriving **illegal market** for WEEE, with an estimated 700'000 tonnes of waste managed each year, against the 360'000 tonnes of waste collected and managed legally. To prevent these scarce resources from falling into the wrong hands, and to allow them to be reused for new devices, it is important to take care not only to dispose of discarded electronic equipment, but to bring them to **collection centres** which can then pass them on to treatment centres. You can find your nearest WEEE collection centre on the website of your municipality.

SCHOOL AND OFFICE

There is a big difference between travelling and getting around. In everyday life, when we don't have time, the distances that separate us from school or the office are just gaps to be filled. And to do so, everyone's need is always one: comfort, which in the collective imagination is equivalent to using a car. In Italy, 67% of the population uses a car at least once a day, and this is the result of a s**elf-centred territorial planning** that began in the first half of the twentieth century. In pursuit of the idea that living far from work meant freedom of movement and a higher quality of life, a capillary urban road system was built, based on the compulsive use of the car.

However, the **consequences** of this system had not been foreseen: the transport sector is responsible for 30% of total CO_2 emissions in Europe, 72% of

which are caused by road transport alone.

CO₂ emissions in the transport secotr

Legend:
- Other
- Car
- Aviation
- Railways
- Motorbikes
- Light duty
- Maritime
- Heavy duty
- Road
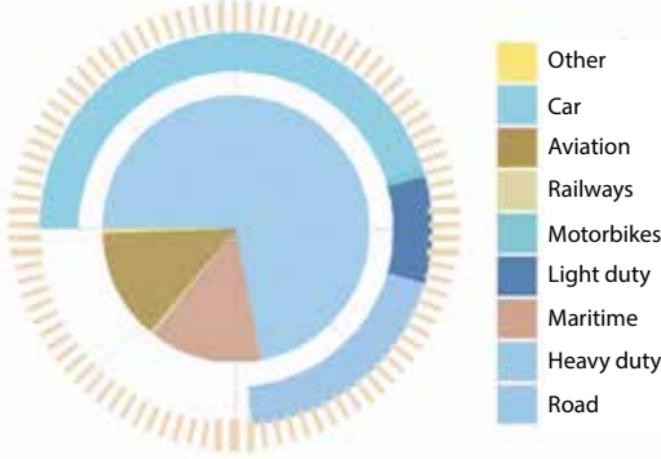
Let's zoom in on **big cities,** where there are already many solutions to turn the tide and adapt to the needs of those who live and work or study within the urban area. The first is called **public transport** and it has the particular advantage of allowing us to do other things while we move (even sleep, if we've been up late the night before). Alternatively, if the lines and schedules of public transport do not meet your needs, consider using a car/scooter **sharing service** (most times, 43% of the fleet are electric vehicles). If the destination

is even within a radius of a few kilometres, it is better to use a **bike** or simply walk. On one side, **active mobility** is a way to fight sedentariness and save time in the gym and on the other side, within a radius of 8 km, it is actually faster than the car (who has never dreamed of overtaking a line of cars in a queue by bike?). The problem of cyclists' safety on the road, where there is a lack of suitable infrastructure, can be overcome by increasing the number of cyclists! As the number increases, car drivers become more aware of the presence of cyclists and improve their ability to anticipate their presence in traffic. If, on the other hand, you really can't do without a car because your workplace is difficult to reach, organise a carpooling system with colleagues who live near you or on your route: sharing rides is another key factor in reducing emissions.

Moreover, in Italy, pollution from light transport has a peculiar aspect: of the 39 million vehicles on roads (65 vehicles per 100 inhabitants) most have low Euro Standard category engines and poor efficiency. They pollute more and take up a lot of space: therefore, consider taking advantage of the incentives to change cars to a more efficient vehicle, or even better to a bike, even an electric one (saving an average of 7'000 euros per year per family). In the Lombardy region they are already

present! The final message is clear, electric cars are not the solution to all evils of mobility, all cars actually, with any type of propulsion, are not a suitable mean of transport for the city and therefore must be removed, at least from historic centres.

If the energy efficiency of homes in Italy is low, what should we say about schools and public buildings? We have compared houses to strainers in terms of their thermal insulation and we refer you to the chapter **House** to learn more about energy efficiency measures in the private sector. Speaking of public buildings, the expression "strainer" could almost be euphemistic. In fact, if on the one hand the public building stock is obsolete and lacking in thermal insulation, on the other hand it lacks any efficient air conditioning system: we have all experienced or heard of those winter days when it is necessary to open the windows wide in classrooms because of the excessive heat.

As in the domestic case, the strongest push for redevelopment could come from the *Conto Termico,* an incentive plan of the Gestore dei Servizi Energetici (GSE), which makes available 200 million euros per year for energy efficiency interventions in Public Administration (PA) buildings. In 2018, only 88 million was paid due to a lack of requests! The funds, therefore, are available and guarantee the reimbursement of even up to 65% of the expenditure. If it is the initial expense that is a concern, the PA has the option of receiving 40% or 50% of the incentive, depending on the type of intervention, in the form of a down payment before starting work. The GSE must be desperately looking for ways to involve the Public Administration: on its website it provides a page dedicated to general PA support and a specific one regarding the Conto Termico for PA. There is also a special email to contact: supportoPA@gse.it

To combat plants mismanagement, instead, an interesting proposal is the one made by Luca Mercalli, Italian meteorologist and environmentalist: make electricity and fuel bills of schools public, as to start discussions between teachers, students and parents. If you fall into one of these categories, don't hesitate to take action - there is so much to improve in schools! Tell your principal about the possibilities of incentives

and ask that bills are made public!

With goodwill and dialogue between all parties, we can begin the rebirth of the Italian school system literally from the ground up.

 The best way to make your lunch eco-friendly at school or the office is undoubtedly to bring it from home. Among the many advantages: you will be able to control and minimize waste, you can be sure of the quality and integrity of the meal, you can keep calories and nutritional needs under control, as well as the environmental impact of food. All this combined with a tendency to save money. Here are some practical tips: plan in advance a weekly menu, cook a balanced meal - satiating but not heavy - and have a kit of containers and cutlery to match the different foods. Many school canteens are adopting sustainable practices, reducing processed foods and animal proteins in favour of organic, local and plant-based foods, but also respecting a set of measures that reduce waste of resources such as food, packaging, cutlery, energy for refrigeration. Among the many interesting projects that aim to change eating habits in cafeterias, *Su-Eatable Life* and *MenoPerPiu* are included: if your

school has its own cafeteria, you could ask, through representative lists or teachers ,to introduce a more sustainable menu.

How much waste could we possibly produce while sitting in a classroom, at a desk, or in a company? If we sat still all the time probably zero, but we don't: coffee breaks, snack breaks and lunch breaks fortunately exist, but unfortunately, they make us produce waste. A coffee from the vending machines every day produces 365 plastic cups per year: about 1 kilo of plastic per year just like that.

How to make breaks more sustainable? Simple actions are enough: bringing food from home in reusable containers will be good for both your wallet and the dumpster, bringing your own cutlery, and finally bringing a water bottle to avoid buying plastic ones. For coffee and tea lovers, preparing and bringing a thermos or reusable cup will reduce the number of cups used to zero. Otherwise, you can always go to a coffee shop and ask for a cup of coffee, also good to get out of the office or university to take a break - unfortunately at school you can't get out that easily – action which has great social value and helps reduce stress. Finally, if it

is not already being done, you can ask your school or company - personally or through representatives - to introduce differentiated waste collection inside the buildings, with differentiated bins inside each space and in the corridors, and to install water dispensers where you can refill your own water bottles.

ROAD

We are accustomed to thinking of the concept of sustainable mobility as one of many containment maneuvers to cope with the effects of climate change. In reality, the idea is much broader and more concrete: it indicates modes of transport (and in general an urban mobility system) capable of decreasing environmental, social and economic impacts generated by private vehicles. We all agree on **environmental impacts**, but what about **social impacts**? Probably few people understand that noise and air pollution, road congestion and high accident rates, along with the degradation of urban areas and land consumption, are all different aspects of the same problem: urban mobility as it is today, dependent on the widespread availability and regular use of cars, is no longer sustainable.

The effects of heavy traffic and

congestion make mobility a daily concern for citizens: 59% of Italians say so. And there's more. It is predicted that the number of cars could quadruple by 2050 in line with population growth, and that average speed of travel will return to the same as last century: 1.6 km per hour. It is therefore necessary to **rethink the concept of mobility as a whole** rather than vehicle technology.
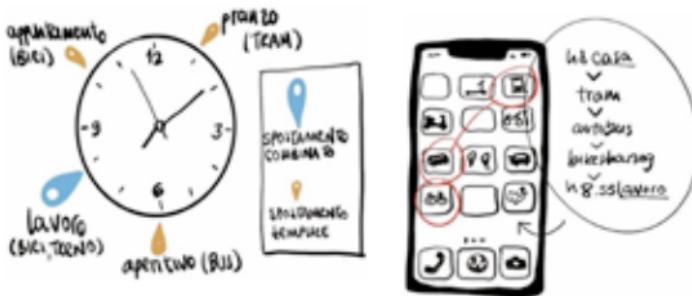
In particular, as far as urban transport is concerned, we are moving towards completely new concepts: sharing mobility, widespread cycling and micro-mobility, also thanks to the availability of new digital technologies. Spatial, temporal and above all commercial integration between modes of travel of all types is a key aspect to really allow users to reduce the use of private transport, to the point of giving up its possession. In this regard, there are already pilot cases of *Mobility*

As A Service (MaaS) in Finland and Switzerland: this is a new business model where consumers can purchase different mobility services (trains, buses, cabs, car, bike sharing and others) from multiple operators using a single payment. The use of multiple complementary services can enable new travel options that compete with door-to-door travel by private vehicle. In addition, expanding the range of services allows individuals to use the most convenient solution on a case-by-case basis, depending on their specific needs. The OECD/ITF model in the city of Lisbon, a simulation in which motorized transport is replaced by the use of three different shared mobility services (ridesharing, micro-transit and rapid mass transit), resulted in the elimination of congestion, reduction of CO_2 emissions by one third and the reduction of public parking needs by 95%.

London and Madrid are some cities that are already moving in this direction establishing Low Emission Zones, as well as Oslo which, in 2015, launched a project with the goal of reducing CO_2 emissions by 95% by 2030. It began by reducing available parking spaces, creating new pedestrian areas and investing large sums of money in public transport. Almost five years later, air quality has improved dramatically and 80% of residents do not own a car. To conclude, technolo-

gical and structural innovation will represent the start of a much broader **paradigm shift** on the concept of mobility itself, a concept in which the car is no longer at the center. What does it then mean to take away space from cars? It means having people on the street and not metal boxes parked for 95% of their life cycle, it means doing good to local commerce, having a quality public space where people not only move but also meet and socialize. It also means having more space to plant trees and help water drainage, removing street parking and reducing heat islands. The overall widening of the range of travel solutions and access to an integrated mobility service will help achieve the goal of resource-efficient, low-emission and socially inclusive mobility.

We spend a lot of our time moving from one place to another. On the way, it's easy to feel the need to throw something away (especially if we don't follow the previously suggested tips on purchases: fewer disposable or individually wrapped products), but are we really sure that these are real needs? Think, for example, when we often find ourselves anxious to throw away wrappings that until

a little while ago were full and certainly heavier and bulkier; it shouldn't then be a problem to take them home to dispose of in the most appropriate way.

It is a fact that one of the dirtiest places in the collective imagination, and not only in the imagination, are streets: used, exploited, trampled, and not deserving of being insulted! In addition to being a deplorable act of incivility, throwing garbage along the street can be subject to sanctions, as in the case of cigarette butts (the law in force since February 2, 2016 provides for fines ranging from 60 to 300 €). And not only cigarette butts: chewing gums, which take 5 years to degrade, are also among the most commonly thrown litter. Please refer to the chapter **Natural Areas** to know about the decomposition times of the most common waste, and to the chapter **Tobacco Shop** to learn more about the implications of the tobacco industry.

When rain reaches the earth's surface, some of it seeps into the ground and some of it runs off the surface. In nature, 90% of rainwater infiltrates, but in our cities, pavement and asphalt make the ground impermeable and the infiltration capacity can be as low as 1%!

High volumes of water remaining on the surface can lead to accumulation and destructive motions with high water velocities, especially on smooth surfaces such as roads, where the flow can also carry waste, sewage and other pollutants.

In our territory there are systems of collection for water draining into manholes. These systems have little flexibility, since their size is fixed. However, climate change is leading us towards more extreme weather events, with more frequent and intense floods: it is difficult to imagine that the current drainage system will always be able to react effectively to these phenomena, reason why damages related to floods and overflows are bound to increase. An effective countermeasure is the disposal of surface water through its infiltration: this is only possible by ensuring the permeability of the soil through drainage methods based on natural principles. These **sustainable drainage systems** propose a series of applications that are based on the filtration of rainwater through a layer of natural material, this way the quality of the drainage water can also be improved, preserving plant biodiversity.

Some examples are:
- Green roofs with plant coverings
- Water collection cisterns

- *Bioswales*, vegetated channels along roads (they can be very wide and tree-lined)
- Parks and green areas
- Gravel filters

What we can do here is to carefully follow the urban planning intentions of our municipality. It is also important to raise awareness among our fellow citizens, because a clean, green, and rurban environment esilient to extreme weather events should be a priority for everyone.

SUPERMARKET

When you struggle to find time to buy from small local retailers, there is no doubt that having a wide range of products all gathered in one place makes the supermarket a favourite shopping destination for many people. The downside of having so much choice is the **waste** of unsold products, especially food with an expiry date. In 2013, the FAO analysed the environmental impact of food waste for the first time, estimating that around one third of global food production becomes waste. In industrialised countries, this proportion reaches almost half of production. This is a huge amount of food, especially if we consider the indirect waste of all the resources used in the food value chain that are thrown away, from water resources, through fuel for transport trucks, to electricity for refrigerated counters.

There is then another form of wa-

ste: that of all the products which, after having passed through the selection process for distribution, remain at risk of being wasted because of their appearance, considered unattractive perhaps only because of some little imperfection. This is the case for most fruit and vegetables. Around 46% of food waste occurs at the processing, distribution and consumption stages, on which we can partly act on to prevent: while shopping, choose **products that you will consume in the short term**, perhaps with expiry dates close at hand. Some supermarkets promote the purchase of **products close to their expiry date** - which does not mean that they have gone bad - by offering them for sale at a discount, but there are even apps, such as *TooGoodToGo* and *MyFoody*, which allow you to find and buy at a reduced price many products offered by stores and restaurants that would otherwise have been thrown away at the end of the day.

In front of fruit and vegetables, let's try not to stop at esthetics; even if in Italy there are no specific awareness campaigns on 'ugly but good' products, we should not consider them to be of inferior quality just because they are slightly dented or have an irregular shape: they have the same nutritional properties and taste as their perfect-looking counterparts.

The sheer size of what supermarkets offer can be so

overwhelming that it can make conscious consumption more difficult, but don't be fooled by marketing hype: shopping by choosing to support brands that are committed to reducing their impact on the environment is the first step to influencing the market in a positive way.

Each of us contributes to the impact our food system has on the planet. We can all strive to make the world a healthier place to live in through small but effective changes in our shopping and eating habits. To understand how what we eat impacts the planet, the chapters on **Animal Farming** and **Agricultural Field** will give you information, while for an overview of less impactful diets, look at the chapter on **House**, Food. While we are at the supermarket, we need to be careful about what we buy and choose carefully what we consume, so here are some useful tips!

Choose plant-based products: this is great advice not only for maintaining healthy habits, but also for making diets sustainable by greatly reducing the environmental impact of food production.

Significantly reduce consumption of red and processed meat: for a sustainable diet, substitute other sources of protein to meat (particularly beef), preferring vegetables such as legumes, cereals and nuts. Animal farming is one of the most polluting activities on the planet.

Increase your intake of wholegrain cereals: buckwheat, maize, rice, barley, rye, wholegrain bread and pasta provide high nutritional benefits (related to their high content of fibre, vitamins, mineral salts, essential fatty acids and other bioactive components) and require less processing than refined cereals, meaning less energy and water for the same amount of food.

Increase your intake of legumes: eating legumes such as beans, chickpeas, lentils and peas is a good way to choose a sustainable diet, as it allows you to replace animal proteins with vegetable ones, which is good for the environment.

Avoid exotic or "miracle" foods: avocado, quinoa, passion fruit, goji berries, may look and taste good, but very often they are foods that are pushed into supermarkets by heavy marketing, are expensive and have

no superpowers compared to everyday foods. Their production and transport (they often come from places far away from us) are certainly polluting and unsustainable.

Reduce the consumption of processed products and ready-made meals: these types of food are becoming cheaper and more and more popular on the shelves, but unfortunately, processed products carry with them the ecological footprint of all the (sometimes low-quality) ingredients. Buying raw materials directly, on the other hand, considerably reduces the environmental impact.

Buy local and zero km food: buying directly from local markets or farms will support the short supply chain, thus eliminating intermediate steps (reducing food waste) and supporting farmers by stimulating the growth of local economy. This not only reduces the impact of the food you buy by eliminating transport and storage/refrigeration emissions, but also makes for healthier eating. There are also autonomous and spontaneous consumer networks, called Solidarity Purchasing Groups (S.P.G.), which are concerned with buying products from ethical and environmentally friendly farms. You can look for them in your city, or

rely on online services: www.cortilia.it.

Buy national products: buying food produced in your Country is actually a good way to reduce the general transport emissions of the product, especially of fresh products. In our case, Italy has efficient agricultural regulations, especially regarding environmental protection.

Consume seasonal products: storing fruit and vegetables out of season consumes a lot of energy. The cost of producing or storing local foods beyond their natural seasonality might be higher than the cost of transporting foods that are in season elsewhere www.verduredistagione.it/calendario/

Avoid buying and eating more than necessary: advertisements, food shops and vending machines are everywhere, often leading us to buy and consume without a real need to and/or to overdo it. Consuming only what we really need can reduce the demand for food by cutting down on excess production and waste. It also helps to stay healthy and avoid excessive weight gain. Limiting consumption of energy-rich (e.g. sweets) and nutrient-poor foods and paying attention to portion sizes are all useful ways to avoid over-con-

sumption. So, arrive at the supermarket equipped with your shopping list (and never go on an empty stomach!) and don't be confused by offers that may lead you to buy something you don't need.

Avoid sugary drinks: carbonated drinks and fruit juices are relatively nutritionally useless and are ,on average, the main cause of excessive sugar intake, so it is better to replace sodas with natural water (avoiding mineral water) and drink it several times during the day.

Buy food with fairtrade certification: fair trade certifications, as well as ensuring respect for workers, are often a guarantee of higher food quality and care for the local area. Especially cocoa, leaf tea, coffee, bananas and brown sugar (more at www.fairtrade.it).

Buy organic food (mainly fruit and vegetables): organic farming is a type of agriculture that only uses natural substances, greatly limiting chemically synthesised ones (fertilisers, pesticides) and respecting the natural cycles of the soil. Food from organic farming is now quite accessible, so preferring those with organic certification means reducing consumption and soil pollution.

When browsing through super-market shelves, one thing stands out: everything is packed! Foodstuffs, household goods, products for everyday life, everything is wrapped in one or more layers of material, very often plastic. These wrappings are called packaging.

Why are they so used? For some products, packaging is necessary, just think of vacuum-packed food or protective packaging for very fragile products. Very often in the food sector, the need for packaging is justified by the need to maintain the quality of the products: on shelves you see biscuits packed two by two, croissants and sweets individually wrapped, vacuum packed sliced meats with layers of plastic separating each slice… Perhaps we have gone a little too far beyond what is really needed, and are cultivating vices we could do without.

In order to understand how much packaging has gone beyond what is necessary, we are helped by the following data: in Italy in 2018, 13.3 million tonnes of packaging was produced, 0.8% more than in 2017, with the amount produced increasing every year. However, by its very nature, packaging is a product that is thrown away before or immediately after its content is

consumed, and therefore ISPRA (the Italian National Institute for Environmental Protection and Research) assumes that the annual production of packaging waste is equal to the quantity produced! In fact, packaging waste accounts for 54% of all waste produced, and plastic packaging accounts for as much as 94% of all plastic thrown away!

But let's talk about this **plastic** for a moment: why is it so present in the news lately and why do we see the hashtag *#plasticfree* everywhere? Plastic has two great properties: it is cheap and it is durable, which has led to a massive production of plastic objects over the years, of many different types. Its life begins by using compounds derived from oil, through processes that require a lot of energy, but it is the end of its life that is the most worrying. Due to the great diversity of existing plastics (Italian legislation lists 48), "customised" **recycling** processes are needed with massive and careful selection at the plant gate, since often, if different plastics are melted together, the resulting product has poor properties and is no longer usable. According to one study, only 9% of all plastics produced since 1950 have been recycled. Only in recent years has the actual recycling of plastics improved, reaching 43.5% in Italy and 25% worldwide, but in the meantime 79% of plastics produced to date have accumulated in lan-

dfills and the environment. This is the very plastic that we see floating in our rivers and that forms the *Pacific Trash Vortex*, a literal **island of floating trash** between the Hawaiian Islands and California (and it is not even the only one!) existing due to the long degradation times of plastic compounds.

In their long lifespan, plastics also spread through the environment in ways that we do not see as easily as a giant plastic island: in recent years, plastic discoveries have multiplied in unthinkable places, from Italian glaciers to the Arctic, from fish to the salad we eat. But how is this possible? The degradation times of plastic compounds are not determinable, but it is broken down into **microplastics**, pieces of plastic between a nanometre and a micrometre in size, which are dispersed through air and water and are ingested by animals either directly or through biomagnification, i.e. by eating smaller animals that have previously eaten microplastics. Moving up the food chain, microplastics also end up in the food we eat: about 5 grams per week, practically a credit card!

However, looking at data on packaging waste composition, **positive trends** can be identified: paper and glass waste is increasing more than plastic waste (4.9 million tonnes increase for paper, 21 thousand tonnes increase for plastic). This is due both to a greater atten-

tion from the industry to the type of material to be used and also to a change in purchasing habits of consumers. And here we come to two of the main solutions for reducing the impact generated by the **packaging system**: firstly, companies must reconsider whether or not packaging is necessary, and if it remains necessary, produce it with less materials, which can be recycled more easily and avoide mixes of materials that make recovery difficult. Secondly, it is very much up to us: choose products with essential, non-excessive packaging, that are reusable (glass bottles or strong containers that can be reused at home) or easily recyclable (as little plastic as possible and, if plastic, check that it bears the letters PE, PET or PVC or the respective symbols as they are easier to recycle). A big mention should be made of **bulk products**: by buying bulk products we reduce packaging to zero, simply by taking our containers to the shops and bringing them home filled. Many shops and supermarkets in Italy are adopting this system with products of various kinds, from pasta to detergents, but also toothpaste and frozen products. In Milan, an example is the Negozio Leggero, while in Italy, the recent *Climate Decree*, article 7 is entirely dedicated to encouraging the sale of loose products in shops and supermarkets. This means we are moving in the right direction, follow it too!

PET	♻1	POLIETILENTEREFTALATO
PE	♻2 ♻4	POLIETILENE
PVC	♻3	POLIVINILCLORURO
PP	♻5	POLIPROPILENE
PS	♻6	POLISTIROLO

Towards the end of the supermarket, there comes the largest sector: mineral water. Big sectors for big consumption: it is a very deep-rooted habit in our country to consume water in plastic. So much so that we are at the top of the European ranking and on the world podium. It is as if, along with the recommended eight glasses of water a day, a few healthy grams of plastic in the bin were also recommended. And the problem does not end there, but also includes the pollution caused by transporting this water, which in some cases comes from other continents

(if you have been to the States and found yourself holding bottles of well-known Italian brands, you know something about this).

Unfortunately, someone has convinced Italians that *tap water is bad for them*, when in fact it is practically indistinguishable from many bottled waters, since the controls carried out are strict and its content, municipality by municipality, is available to the public. For Milan and its province, it is possible to refer to the website of the sole manager of water services, Gruppo CAP. Additionally, we have been accustomed to the consumerist culture of disposability: the returnable vacuum was abandoned in the 1960s and never reintroduced except in contexts such as restaurants and door-to-door delivery, with immense waste of both plastic and glass. While waiting for it to be reintroduced (who knows, perhaps an example will be taken from other European countries, which are much more virtuous in this respect), it should be remembered that glass is not a sustainable alternative, given the very energy-intensive process of processing it in the furnace. The most environmentally friendly choice is surely the reusable water bottle: versatile and resistant, it is also a much more stylish choice than a PET bottle. At home, we can keep glass bottles to fill with tap water and then put them in the fridge, so they stay cool in the summer!

Thankfully, legislators weren't just passive bystanders: in order to discourage the purchase, a tax of 1 €/kg on plastic and poly-packaging has recently been proposed in Italy, while many disposable plastic items were banned in 2021.

TOBACCO SHOP

THE MANY HARMS OF SMOKING

Cigarettes: bad for us, but for the environment. Worldwide, more than one billion people smoke regularly, for a total of about six trillion cigarettes produced annually.

Their destructive action starts during the **production** and drying of tobacco, which takes about 4.3 million hectares of land in 124 countries, almost all of whi-

ch are low-income, such as Malawi, India and Pakistan (according to the World Health Organisation, 5% of deforestation in developing countries is due to this crop), from which tobacco is then exported abroad. In most cases, **tobacco cultivation** is a monoculture. The plantations, for which hectares and hectares of forest and land are sacrificed, are always the same and the soil is exploited as much as possible, making it vulnerable to erosion and more exposed to the spread of disease. In order to avoid this and to ensure constant growth and development, pesticides, fertilisers and growth regulators are used extensively. In addition, the huge amount of energy used, with over 84 million tonnes of CO_2 equivalent emissions from irrigation alone, contributes to the 0.2% of annual global climate change total, which is equal to the emissions of Peru or Israel and more than double those of Wales. Tobacco cultivation worldwide uses more than 22 billion cubic metres of **water**, meaning that a person who smokes 10 cigarettes a day for 50 years is responsible for depleting almost 1 million litres of water in their lifetime.

As far as the **treatment process** is concerned, 11.4 tonnes of wood are used just to polymerise the leaves (a kind of food aging), contributing significantly to the deforestation already affecting the land to make room for agricultural fields. In addition, more wood will be needed for rolling paper and packages. Changes in the composition of land and soils, combined with the risks closely linked to the use of chemicals, result in the impoverishment of entire countries, loss of biodiversity and raw materials that are economic resources.

Another serious **cost** of the sector is the **social** one. Small-scale tobacco farmers live in exploitative conditions, earning low yields in relation to their work, and find themselves in constant health risks due to the lack of protection from production methods and the substances they inhale on a daily basis. Not to mention that a large proportion of these disenfranchised workers are children, who are in constant contact with nicotine and pesticides that can impair their growth. Considering that the tobacco market is a billion-dollar market, it is remarkable that the people who work at the source of this product live in conditions of constant social blackmail, without being able to guarantee the

survival, livelihood and health of their families.

Considering that 90% of tobacco is produced in developing countries for export and consumption in richer countries, the **transport** of materials also involves a certain level of emissions and therefore pollution. In addition, the production of plastic packaging is a consequence of aggressive marketing strategies aimed at making more money at the expense of the environment.

Once manufactured, cigarettes are then transported, placed on the market, bought and then lit. In this regard, **tobacco smoke** has been classified as a Class 1 carcinogen by the IARC and as an air pollutant by the California Environmental Protection Agency. Tobacco combustion produces more than 4'500 irritant, harmful, toxic, mutagenic and carcinogenic chemicals. Some of these substances, including nicotine, tar, condensate, toxic gases, polonium 210 and cellulose acetate remain trapped in the filter and in the unconsumed portion of tobacco. Therefore, according to ENEA (the National Agency for New Technologies, Energy and Sustainable Economic Development), cigarette butts should be classified and therefore treated as a toxic product for the environment. Instead, they are

routinely abandoned in an uncontrolled manner. In our country alone, an estimated 195 million cigarette butts are released into the environment every day. Every year, 4.5 billion cigarette butts worldwide are thrown away, containing a total of 7'800 tonnes of hazardous chemicals. This exorbitant amount ends up on pavements, in soil, water and surface water. According to recent UN research, cigarette butts rank first among the waste that affect the Mediterranean - accounting for 40% of the total, compared to 9.5% for plastic bottles.

SQUARE – CONCLUSION

So far, the EGTTG has shown as many solutions to climate change as possible, all within everybody's treach. But what do you think, is that enough? Surprise: it is not! Sorry, we are quite demanding, but it is necessary… unfortunately, the good deeds we have told you about in this guide have limited reach! The infrastructure we use (such as roads, railways, buildings, etc.) and the products we consume have an impact on the environment in a way that is partly beyond our "control". With just your own efforts, you can reduce the *carbon footprint* of your daily consumption and activities, but you can hardly reduce it to zero. To give you an example: we have obviously advised you to use trains rather than cars, buses and especially aeroplanes when travelling or moving around but although their environmental impact is small compared to the latter, if the electricity used to power them it's produced by burning fossil fuels, our good deed will be almost in vain and we will only have changed

the problem! And guess what? Political institutions are in a position to bridge this "*gap*". Through laws, decrees and funding they have the power to steer society towards a strong environmental sustainability! But if "will means power", too often "power does not mean to be willing". And governments do not fully play their part. It is therefore our responsibility and yours, to demand concrete and decisive decisions from those who can really take them: like us, politicians must also put in their efforts! This explains why we have written this small chapter entitled **Square**: because it is on the streets of cities, places of peaceful cohesion between people, that we can pursue common goals and demand the will to solve the climate crisis together.

As mentioned before, calling for more ambitious policies for our planet is very important. But there are different ways to do this effectively: we will tell you about the best known and most popular ones. Then, all you have to do, is choose and join in on the fight for the planet, either by participating in initiatives or by joining associations directly! A first form of activism is to participate in the climate **marches**. We all have vivid memories of the two oceanic demonstrations on 15th March and 27th September 2019: millions of young people all over the world (1 million in Italy alone!) took to the streets to send a strong and clear message to tho-

se in positions of power. *"When adults behave like children, children take on responsibility"* was just one of the many slogans chanted by the young voices of the protesters. Politicians, partly out of shame, partly out of responsibility and above all thanks to the constant pressure of the **FFF (Fridays For Future)** youths, are starting to do something: on 28th November 2019, for example, the European Parliament declared a climate and environmental emergency.

See? Taking to the streets is all well and good. But there are other occasions, such as **defenses** where as many people as possible gather for a global cause or even a more local and specific one. Where? At a specific point in the city, often in places of interest for the protest itself: if you are protesting against a municipal action, you will go to the town hall; if you are shouting against the deforestation of Amazonia, you will go to the consulate of Brazil, the main country responsible for this catastrophe. Contrary to processions, during a presidium you do not walk through the streets, you stand in one place. And trust me: this does not make the protest any less decisive and noisy! In recent years, some have not stopped at demonstrations and presences, but have tried to gain political attention for environmental issues through **flash mobs** and **acts of non-violent civil disobedience** (we care to re-

mind all that non-violence is at the basis of each of these modes of activism). This is the case, for example, of the German movement **Ende Gelände**: in June 2019, 6'000 people occupied the coal mine *Garzweiler* in the Rhineland, the most CO_2-emitting place in Europe, with the demand to "abandon coal now!" Also emblematic is the story of the **Extinction Rebellion** whose protesters, in April 2019, blocked London's nerve centres, and hundreds of whom got themselves arrested with the intention of creating a real hiccup in the city's infrastructure, a way to make themselves heard and to bring forward their 3 fundamental demands: a declaration of climate emergency by all public institutions, zero CO_2 emissions by 2025 and the construction of non-partisan city assemblies on climate. Finally, there are also those who fight for the planet by sailing the seas, such as the non-profit organisation **Sea Shepherd**, which monitors the waters and reports illegal fishing boats, whalers or poachers. But what if you want to fight for environmental justice without taking to the streets or occupying coal pits? Well, you can take **legal action**! How? This is how it works: individual citizens or organised groups (called committees or associations) sue a particular body (a private company or even the government!) that they feel is violating their rights. This is known as a **class**

action: a different way of protesting, perhaps more in the office than in the streets, but certainly very effective. There is no shortage of examples: in France, 3 million people have sued the French State for climate inaction, calling it the *"deal of the century"*. Rightly so, we might add! And we are no different in Italy, with the lawsuit **Giudizio Universale,** aimed at compelling the Italian State to take much more action against climate change, to a point where it can no longer back down: to the dock of a court of law. The lawsuit is just the beginning, so we invite you to talk about it with as many friends and relatives as possible. In short, you've seen it for yourself: there are many ways to make your voice heard by those who can bridge the *gap* needed to change things. Let's be clear, all of them are useful and complementary: it is only through the richness of different contributions and the variety of practices that we can tackle the climate crisis and, optimistically, solve it. Everyone has their own style and vision, everyone walks on different paths, but all roads lead to the same destination: a fairer world, with neither winners nor losers, where we can live content with what our planet has to offer. A world inhabited by people in peace with each other and in harmony with nature.

So what are you waiting for? Come down and join us in the square!

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ECOLOGIST'S GUIDE
TO THE GALAXY

By
Resilient GAP - Glocal Action Project

Resilient G.A.P. (Glocal Action Project) is a student association focused on socio-envoronmental knowledge and activism. Non-religious, non-partisan and non-profit, it engages in sharing and disseminating environmentally sustainable practices.

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