



ErlebnisAusstellung

jahreszeitHAMBURG

Natur. Energie. Klimaschutz.



Nature and Climate Protection Exhibition Guide

GUT 
KARLSHÖHE
Hamburger Umweltzentrum



Dear visitor,

This guide is the key to our exhibition. It contains all the information you need to understand and enjoy seasonsHamburg—an interactive journey that will take you to Hamburg, through spring, summer, autumn and winter and, finally, right into the future ...

The exhibition contains numerous interactive displays, models, films and games about nature, the environment, climate change and also intelligent, nature-inspired technology to assist us in protecting our climate and environment.

We have put our hearts and souls into this exhibition and we hope you enjoy it.

Dieter Ohnesorge

Imprint

Issuer

Hamburger Klimaschutzstiftung
c/o Gut Karlshöhe
Karlshöhe 60d
22175 Hamburg

Phone +49.40.637 02 49-0
Fax +49.40.637 02 49-20

info@klimaschutzstiftung-hamburg.de
info@gut-karlshoehe.de
www.klimaschutzstiftung-hamburg.de
www.gut-karlshoehe.de

Text

Hamburger Klimaschutzstiftung, Gitta Assmann
mpg ErlebnisRaumDesign, Johannes Missall, Oliver Gies

Layout

mpg ErlebnisRaumDesign, Barbara M. Duraj

Pictures

Johannes Art / Hamburger Klimaschutzstiftung
mpg ErlebnisRaumDesign, Barbara M. Duraj, Franziska Wand

Translation

tolingo

Paper & Print

100% recycled paper
eco-friendly inks
printed climate-neutral & low-emission
100% green energy

HAMBURGER
**KLIMA
SCHUTZ
STIFTUNG**

**GUT
KARLSHÖHE**
Hamburger Umweltzentrum

eco print
www.eco-print.info

Index

The story of
Gut Karlshöhe

6



Animal Tourists
Biodiversity

10
11

Kiosk

12

Tree

13

Hot Spots

14

Bicycle

15

Waste bin

16

Hamburg in maps

17

Banana Box

18

Barmbek City Centre

19



Sun Stories

22

Bean Sprout

23

Forsythia Wall

24

Four Seasons

25

Photosynthesis

26

Einstein and PV

27

Parabolic Mirror

28

Snake / Solar Collectors

29

Crows Nest

30

Spring Fever

31



Woodlouse

34

Beehive

35

Beach bar

36

Juice bar 37
Shower Cabin 38
Four Season Technology 39
Eco-friendly Building 40
Refrigerator 41
Mobility Footprint 42



Propeller Principle 46
Wind Farm 47
Migratory Birds 48
Vivarium and Compost 49
Golden Rubbish Bin 50
Biomass (HSE) 51
Sailwinch 52
Wind Generator 53
Autumn Energy 54



Thermal Gallery 58
Heat Exchanger 59
Wood Frog 60
Advent Calendar 61
Bats 62
Standby 63
Polar Bear 64
Snow Globes 65



Future Scenarios 69



The story of Gut Karlshöhe

Gut Karlshöhe, the Hamburg environmental centre, is located in a site imbued with tradition and history: in 1850 Carsten Reimers cultivated these lands in the north-east of Hamburg, establishing a farm here. In 1919, the Gut Karlshöhe was purchased by the State of Hamburg and converted into an educational institute for poultry farming. In the early 1960s, it was no longer profitable to use Karlshöhe for agricultural purposes and the farm slowly fell into disrepair.

A governing committee was set up in 1986, with the “Karlshöhe Environmental Centre” first opening its doors in 1989. With its buildings and 9-hectare outdoor area including woodland, ponds, hedgerows, pastures and orchards, Karlshöhe is the ideal venue for educational environmental events.

Gut Karlshöhe was extensively modernised in 2011, in keeping with the City of Hamburg’s climate protection goals and with a vision of sustainable and comprehensive environmental education. It is now called the “Hamburg Environmental Centre Gut Karlshöhe”. To assist in this, the sponsor Hamburg Foundation for Climate Protection was founded by the city.

A central piece of the renovation work was restoring the large disused stable. The architects succeeded in largely preserving the defining features of the old stable, including the wooden pillars and timbers on the ground floor, while at the same time, using modern environmental technologies to create a highly efficient visitors’ centre.

The interior now caters for a wide range of uses: the centre-piece is the interactive “seasonsHamburg” exhibition which is spread over two floors. The ground floor also houses an inviting café-restaurant and a conference room. Along with the main exhibition, the upper floor also contains the Childrens’ Explorer Shop (KinderForscherWerkstatt). The grounds and “Discovery Trail” (Entdecker Rundweg) are also an essential part of every visit to Gut Karlshöhe.

Let yourself be inspired.



Hamburg

Part 1—Ground Floor

The first part of the exhibition takes you to Hamburg. The giant map on the floor shows the entire city, the river Elbe and the port, clearly illustrating just how green the metropolis is. Given the wide range of different habitats that Hamburg offers, it is no surprise that there is also a great variety of species living here.

Discover the surprising natural wealth of the city! Hear what migratory birds and other wanderers have to say. Take a look at who the “wild” are in our immediate neighbourhood.





Wild Hamburg residents in the urban jungle



Our city—a habitat of international significance

Hamburg's diversity originates from the ice age. Ice glaciers, which were up to four kilometres high, covered the land. Like huge excavators they pushed boulders in front of them. The melted water formed the ancient glacial valley of the Elbe. The remnants of the old scree are the Harburg Mountains, south of the Falkenstein Shore, north of the Elbe. This versatile landscape of river, swampland and moorlands of sandy soil, have attracted a multitude of inhabitants to stay.

Hamburg has the largest variety of animal and plant species: 49 mammals, 160 breeding birds, 17 amphibians, 7 reptiles, 51 fish, 51 dragonflies, 50 day butterflies, 30 grasshoppers, 80 mussels and snails and 1,643 plant species—no other city in Germany can compare! We live in a “jungle”...

Animal tourists and seasonal guests

Hamburg is always worth a visit.

When it is too cold in winter, we often wish we could travel to the warm south. Some of our Hamburg animal species make this come true. They leave the city in autumn to find food or to breed in warmer regions. Other animals come to us as guests from colder countries and find a suitable winter habitat. Some are only passing through and want to re-migrate to their birth places. Others feed for years before they start the trip. It is a constant coming and going.

Where are they headed? Call us!



European Green Capital 2011

Incentive and commitment for us all.

Hamburg 1980: Waters, air and soil are strongly polluted; the state of the environment is a concern. The industry's economic activities are at the expense of nature and our health. Protests mobilise.

Hamburg 2011: The city has learned from its mistakes; it has changed a lot and has become the European Green Capital. Authorities, research institutes, clubs, associations, businesses, countless volunteers and the residents of Hamburg all contributed. This is a reason for pride and joy, but we are just getting started. The aim: In Hamburg, climatically harmful greenhouse gas emissions are to be lowered by 80 percent by 2050.

Hamburg's green jewellery

Trees—individual wonders of nature with perfect outdoor effect!

If you look at Hamburg from the air, you will see a carpet in all shades of green. In addition to meadows and fields, these splashes of colour are mostly trees: Lime tree, maple, oak, chestnut, beech and many others.

You do not need to look for them; they are already at your doorstep. 250,000 trees lining the streets, about 600,000 trees in parks, many hundreds of thousands of trees in private gardens and nearly two million forest trees provide shelter and food for many animals. At the same time, they are oxygen donors, CO₂ storages, noise absorbers, air fresheners and timber suppliers.

What is your favourite tree?



Our “other” neighbours!

City and nature—not a contradiction

You do not need to travel far to discover wild animals. Just turn around! Bats in the car park, sea eagles in the harbour and nesting herons in the middle of Bramfeld. Often we do not notice them, but these fellow citizens live among us.

We have more species here than any other equally sized area in northern Germany. Why? In the countryside, more and more animals and plants are displaced due to intensive agriculture and forestry. The city of Hamburg on the other hand, offers a mosaic of different habitats. These range from the large nature reserve Duvenstedter Brook, to parks and fallow lands, to the green traffic islands or our church tower ... Our “wild species” occupy these places and even get used to us humans—if we let them leave in peace ...



On the saddles, set, go!

Hamburg is changing over.

The bicycle. The ideal means of transport. Cost-effective, environmentally friendly, fitness-promoting, easy, can be taken wherever you go, can be used as a luggage carrier, can be equipped flexibly, looks cool, is weather-proof. For short distances, it is the fastest means of transport—and it can easily be rented in the Hamburg city centre with the “StadtRAD”. Jump on and go!

StadtRAD

Have you already seen these red bicycles with the silver luggage rack? You cannot buy them. But you can rent them. And that at an affordable price. The first half hour is free. Since its launch in July 2009, the red rental bicycles have become one of the most successful and popular rental systems throughout Germany. In 2011, more than 1,000 bikes are waiting for you at 89 stations. And there are more and more. Let’s go!



Bold and brash

—waste bins in Hamburg

Keep an eye out when you're walking around Hamburg: A lot of waste bins at bus stops and around the town are bright red and have speech bubbles on—as shown in the picture here. The slogans are usually funny (you might need a local Hamburg resident to translate) and they are designed to encourage people to dispose of their rubbish properly. Rubbish on the street is not only annoying, but also wasteful. Waste is now a valuable commodity that can be used to make new products and energy.

Tip: If you stand in front of the waste bin for a few seconds, it really does talk—and comments on the fact that the majority of waste cannot be seen because it is in the air ...



Hamburg in maps

A green belt threading through

Hamburg is an exceptional city in many respects. The “Hamburg in maps” exhibit is a series of representations of the Hanseatic city that show why Hamburg is so special. Take, for example, the city's great green belt: a continuous flow of adjoining parks and green spaces that thread throughout Hamburg making it possible for you to wend your way through the whole city in greenery.

Other maps show Hamburg's numerous nature reserves, diverse landscapes and environmental educational institutions.

Not only is Hamburg still green, but it is getting greener!



Stowaways and naturalised citizens

There are many ways to come to Hamburg

Your mobile phone comes from America, your TV from Asia and your tomatoes from southern Europe? How about a Chinese mitten crab, or a Spanish slug? You do not need one?

They still come here. When importing everyday goods, we also import plants and animals. Largely unnoticed. Stowaways manage to cross the Atlantic in banana boxes, in the ballast water of a container ship or as an unwanted sailor's gift.

There are many ways to come to Hamburg and once they have arrived here, quite a few alien species multiply and become native. Sometimes this "naturalisation" is fine, but sometimes it can displace the native flora and fauna.

Wild life among gardens, bricks and roads

Unexpected neighbours

It is the gardens, courtyards and the "green roads" with their garden ponds and perennial beds, hedges and shrubs that ensure the most colourful of life.

Wild animals that would otherwise avoid the proximity of man live in confined spaces in our neighbourhood. In the mornings we hear the blackbirds and the tomfits, at lunchtime hawks circle above our heads and in the evenings wild boars could grab themselves the barbecue left-overs in the garden. The animals have become accustomed to our presence. And we can make it even easier for rare species. Considering we offer breeding spaces in stone walls to sparrows, a hiding place in the roof to bats or suitable balcony flower boxes to wild bees. The wild boar, however, rather belongs in the forest.



Part 2—Upper Floor

The stairs lead up to the second part of the exhibition: through the earth towards the sun, like a seedling in spring. Suddenly you find yourself in the midst of a blossoming meadow, surrounded by beautiful flowers with the warm spring sun shining down on you.

Can you discover the bean sprout's secret? Can you catch sunlight? Maybe the man with the wild hairstyle can tell you why it contains so much energy. And who lives in the water and basks on the warm stones?





Sunshine over the harbour

The source of everything

The sun—without which it would be deathly cold. Minus 270 °C—absolute zero. No energy, no life, no human beings. When the sun rises, nature awakes. When spring begins, a new life cycle starts. People, animals and plants all feel alive. The power of the sun breathes life into everything.

The sun governs life for us human beings, since we also have to adapt to the seasons. What can we learn from the sun? The challenges to technology become ever greater as our numbers also constantly increase. Could we humans use the sun's energy to live on our planet in a sustainable way? Can we still provide a liveable environment for our descendants? Can we ensure a stable climate today?

Only those who are willing to change will survive.

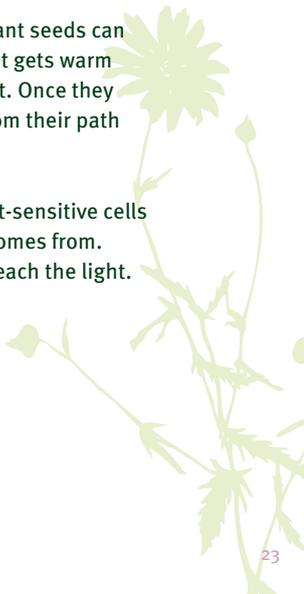


Plants can “see”

The direction is clear. Towards the sun.

Below the ground it is cold and dark. Plant seeds can last a very long time in soil. As soon as it gets warm their stored reserves awaken and sprout. Once they have started, nothing can keep them from their path to the vital sun.

How do they do it? Their “eyes” are light-sensitive cells that recognise exactly where the light comes from. They can even grow around corners to reach the light.





The Forsythia Calendar

Will spring soon be in winter?

Hard to believe: Spring in Hamburg is starting earlier every year. How do we know? We take a look at the Forsythia Calendar. It has a long tradition for us. On 27 March 1945, the penultimate month of the war, in the destroyed city of Hamburg, Carl Wendorf discovered blooming Forsythia at the Lombardsbrücke (Lombards Bridge) for the first time. This was a personal symbol of hope for him. Starting of then, he wrote in his “spring calendar” every year. After Wendorf died, his friend Jens Iska-Holz continued the observations. He discovered that the start of the flowering was slowly advancing, from April to March, almost a whole month.

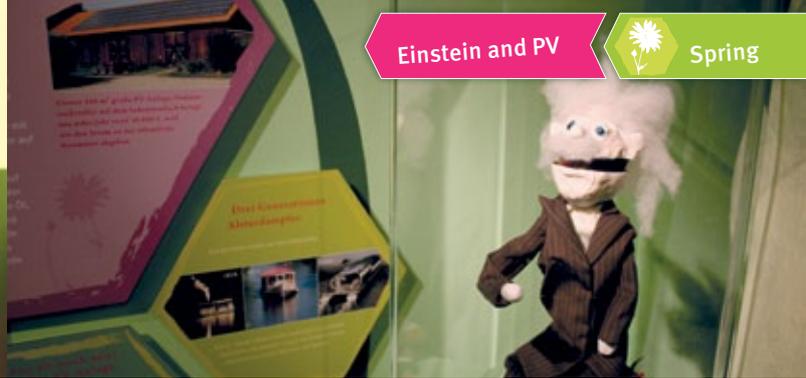
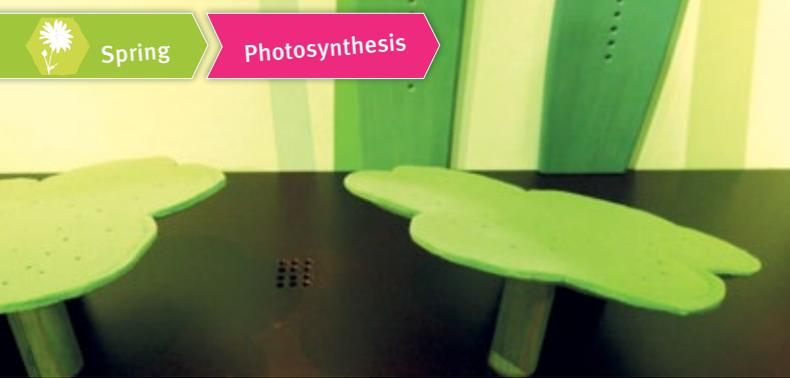
Does the Forsythia already indicate the climate change? At least, it is giving us a clear indication of spring in Hamburg becoming warmer.



The four seasons

It seems perfectly normal. Here in the northern hemisphere, spring begins in March, followed by summer, autumn and winter. A cycle that repeats year after year. Why is it like this? It is because of Earth’s journey around the sun, which lasts exactly one year. This journey is not circular, but more like a “long drawn” circle. Rather like the shape of a coffee bean. On its orbit around the sun, Earth is sometimes closer to the sun, sometimes less close. Is that the reason for the four seasons? One would think so, but it is not.

In our winter time, Earth has the lowest distance to the sun. However, it is our winter time because the Earth is “tilted” towards the sun. The incline is about 23.5 degrees. That is why we get less sun in Hamburg than the equator. And this skew incline axis remains the same during the journey around the sun. In summer we get lots of sun. The South Africans and Australians in the southern hemisphere, however, get hardly any. It is winter there.



Space on our plates

“Steak and fries” from the sun

Without photosynthesis nothing works. Without question. There would be no plants, no animals and there would be no you. Photosynthesis is thus the most important invention of nature. Who made it? The plants. Water, the carbon dioxide in the air and minerals enter their “leaf factories”. They use sunlight as energy. Therefore develop leaves, fruits, seeds and roots. Just about everything a plant needs.

If those leaf factories did not exist, all animals—and also we as humans—would quickly starve. We are not able to produce even one gram of food! Incidentally, air is created as a by-product. This made our life on Earth possible in the first place.

Have we thought about capturing the endless solar energy yet?



Photovoltaics: Electricity from the sun

With free lifetime guarantee!

Did your phone run out of battery? If you have a solar charger you can recharge your phone or laptop directly in the sun. For free! The Gut Karlshöhe also has a “sun station” on its roof. Officially it is called photovoltaic system or is abbreviated as PV system. Actually, it is old technology. More than 50 years ago, the first space satellites worked exclusively with solar power. Huge solar paddles captured the rays and converted them into electrical power.

Today, we have brought this space technology to our Gut Karlshöhe. We do not need to burn any oil, gas or coal for the electricity gained from the sun and thus save carbon dioxide. And the sun shines forever. It provides us with 150 much energy that the whole Earth can be supplied!





Captured sun fire

Blazing heat in focus

Olympic Games in 776 BC in Greece! Priests focus light rays on to a point with large concave mirrors. The unbelievable happens: The Olympic flame is ignited only by the bundled power of the sun.

Today, this principle works the same way. Just to a larger extent: Solar power plants create very high temperatures of up to 500 °C. Electricity is generated with this heat. This is much better than burning coal or petroleum, as the solar power produces no additional CO₂.



Use solar heat

Snakes: Inventor of the solar collector

Why do snakes lie around in the sun so much in spring? They are storing the sun's heat. Their body temperature changes according to the outside temperature. If it is cold outside, the snake will be just as cold. If it is warm, the snake is also warm. This way, it requires less food energy than humans, whose temperature always needs to be kept consistent.

Therefore, snakes are "living sun collectors". Their dark colouring is not only for camouflage, it also lets the snake warm up more quickly in the sun. Humans also make use of this trick: "Black snakes" (tubes) are packed into a "box" or directly mounted on the roof as a tube. The water flowing through the tubes is heated by the sun, runs through the house and releases its heat into a heat storage tank. Then you can shower, bath or heat your flat with the hot water in the storage tank.



Crows nest

Birds' secret tricks:

Inside a bird's nest it is snug and warm. The parent birds protect their young with their body heat. To make sure that it does not get cold when the parents are out the nest is well padded and insulated. In addition to leaves, moss and small twigs, the parents insulate the nest with feathers against draughts and cold.

Flying takes a lot of energy. A bluetit has to stuff itself with food all day long to supply its muscles with energy—and also excrete it again, so that it does not get too heavy. If you had to eat as much as a bluetit, it would amount to over 100 hamburgers a day and you'd spend half the day on the toilet.

To save energy, the bird may not be too heavy. Therefore, its bones are made of thin walls and air inclusions. The bones of a pigeon are much lighter than human bones. Vehicle and aircraft construction learns from birds and uses similar energy-saving technologies (bionics).

Spring Fever ...

We all experience it.

As it starts to get warmer and the first new flowers can be seen, everyone starts to flirt and fool around. For most birds and many other animals, spring is the main courting and mating season. The reason for this—their young offspring will have warm weather and plenty to eat. By the time that winter arrives, the young animals have become tough and strong. And what about us humans? The fact is, most children are conceived in December and not in the spring. Nevertheless, we still experience it—Spring Fever. But why?



In winter, the hormone melatonin dampens our moods and subdues our desire for activity and flirtation. Sunlight reduces our melatonin levels.



As it gets warmer, necklines plunge, while skirts and sleeves get shorter. These stimuli also cause an increased interest in the opposite sex.



Certain scents indicate that it is spring, without us realising it. The fragrance of moss and leaves in the sunshine subconsciously evokes memories of the past spring.



Summer

Part 3—Upper Floor

Summer in Hamburg—sitting on the banks of the Elbe, enjoying cold drinks and watching the container ships in the harbour. It can also get really hot here at times and then we all welcome the chance to cool down.

Time to think about a few things: What energy type are you? Afterwards, you can watch some “cool” films at the juice bar—chilling out can be really fun. And don’t forget to stick your head in the refrigerator—there you can hear what an old fridge likes to complain about.



In the shade

The success strategy of an underestimated crab

All crabs live in water. All of them? Over thousands of years, a small group of crabs have managed to leave the water and to live in the middle of the land: the woodlouse.

As they still breathe through gills and drying out would be fatal, they have become experts in cooling and water storage. At high humidity and low temperatures they are easily active outdoors. In the summer or in droughts they are drawn to the shade and moisture under stones, tree stumps, cracks in walls or to deeper layers of soil during the day.

What can we learn from these land crabs? In hot summers, the shade and moisture cools us and our buildings down—a lot can be achieved this way!

Keep your cool ...!

The “air conditioning” of bees

Imagine a beehive as being a high-rise building with lots of different departments: There are storage rooms, dormitories and a child-rearing station. Bees keep the temperature in their house at approx. 35 °C all year round.

However, in summer, it always gets hotter in the interior. Young bees could die from the heat. Now, the typical bee “air conditioning” kicks in. With their wings, “cooler-bees” fan the hot air out of the hive and cool air into it. Not enough? Then they take a lot of water drops to the children’s wards. The drops evaporate and in the wind, fanned by the bee’s wings, it cools the air down. We also have modern air conditioners for our houses that cool through evaporation.

Do you know the teaching apiary at Gut Karlshöhe?
Be brave and look at it!



How green are you?

Welcome to the beach bar on the Elbe!

Relaxing on a lounge chair and cooling off in a fresh breeze—this is summer in Hamburg! This is just the right time to be asking yourself just how green you are ... The 15 questions on the Tablet PCs look at what you know about energy: how you use energy at home; what energy has to do with CO₂ and what CO₂ has to do with our climate; and what you can do to use less energy and produce less CO₂.

It might turn out that you have absolutely no idea, or that you are only a theorist, who knows a lot but does nothing for the environment. But it could also be that you are an energy expert who can persuade others to be more conscious about saving energy. By the way: Most visitors find they are “average”: They are quite well informed and act on it here and there, but could definitely do more.

Juice bar

Cool films!

It's summer, it's hot and everything, and you're thinking about cooling off. But what is the best way to cool down? The films at the juice bar can teach you a few good tips even if you can't understand all the dialogue.

You can choose the films by putting the corresponding bottles on the pads next to the screen. The film “Cool House Water” is about air conditioning and cool buildings. “Wet rag Kikerikiri” shows anything you can do with a towel. And the “silent Elbe water hara-kiri” doesn't even have a script—and it's really funny too!



The luck to be able to sweat

Evaporative cooling protects against death through overheating

It's hot, very hot, we are just about boiling. If nothing happens now we will suffer a heat stroke. The brain reacts immediately and instructs the skin: Cool quickly, sweat!

This command is sent to under the skin via the nervous system. This is where our "air conditioning" is located: micro valves (glands) immediately pump tiny water droplets to the skin surface. These evaporate and cool down our bodies. How quickly this happens depends on the ambient air. Wind speed, humidity and sunlight play an important role.



A wall heater which also cools

Air conditioning at Gut Karlshöhe

Next to you, hidden in the walls and roof, are a lot of panels. They heat these rooms. In winter, when it is cold, warm water flows through the tubes of the roof panels. However, it also works in reverse: In summer, when it is hot, cold water flows through the walls and cools this room. The room temperature is regulated by a machine that is outside of the stable.

The panels in the roof ensure that we feel comfortable: There is no draught and the cold air or heat is evenly radiated over the large areas. This way, even lower temperatures can be heated up or higher temperatures cooled down—this saves energy!



Different climate, different houses

Save energy with “low-tech”

Whether we live at the North Pole or the Equator, in the rain forest or in the rainy areas of Europe, we all have one thing in common: we like it to be consistently warm at home. This is why humans have experimented in ways to keep their living-rooms “pleasant” and snug in all climate zones for thousands of years.

The results are astounding inventions: In an Inuit igloo, the temperature can be up to 50 °C warmer than outside. In ancient Persia permanent “wind catchers” cooled the houses, in Greece, entire roads were cooled down through the shade of the houses. And this all works without electricity!

New roommate wanted

Loyalty does not pay

Which appliance in our household runs all year round, day and night without pause? And consumes vast amounts of electricity? Exactly, it’s not the TV or the computer. We usually turn those off at night. But our refrigerator runs continuously and consumes expensive electricity. Old fridges are real power hogs. On average you pay €26 more in electricity per year than for a new energy-saving one. The old fridges do not cut a good figure in our personal “climate footprint”.

Good for your wallet—good for the climate

Look carefully when buying a refrigerator; even smaller fridges are worth it!

(Example: 134 litres, with 3-star freezer)

Category A+++ : Power consumption 100 kWh per year = €20

Category A++ : Power consumption 100 kWh per year = €28

Category A : Power consumption 230 kWh per year = €46



Many roads lead to Gut Karlshöhe ...

You have the choice.

This exhibition is about energy saving and climate protection. If you would like to save energy on your next visit, we have the following suggestions:

Be sporty and come on foot.

A brisk and beautiful walk along the Wandse, the Alster and on the “green” back roads to Gut Karlshöhe. No additional CO2 emissions.

Be social and come by bus or train.

You might meet some nice people; you could read or take a nap. The S Bahn will take you to Wellingsbüttel or the U Bahn will take you to Farmsen; thereafter, the bus line 27 drops you right at our doorstep! CO2 emissions: low. It is distributed among many passengers!

Be lazy and come by car.

Pack your friends and family into the car and you will arrive here conveniently and quickly. Or is there a traffic jam? No parking? Then it will take longer. Unfortunately, your car uses petrol and blows CO2 into the air. And petrol will cost you money.

Be quick and come by bicycle.

By bicycle you will be the fastest in town for short trips. Even a longer bicycle trip is fun! No additional CO2 emissions.





Part 4—Upper Floor

When autumn comes, so do the storms, and we can feel with our entire body just how much energy the wind has. The leaves turn all sorts of different colours and eventually fall from the trees. However the dead leaves become a basis for new life—nature works in cycles. Just as the earthworm tells us—nature does not waste a thing.

Do you see just how simply and perfectly the maple seeds play about in the wind? It looks like some wind turbines have taken a leaf out of their book.



Acrobats of the skies

Aerodynamic seeds use the power of the wind

Sure, we have invented airplanes, parachutes and hang-gliders. However, those have all been around for millions of years. Once again, plants are the models.

Plant seeds have developed various forms: they are propeller flyers, gliders or para-gliders. This way they slow down their fall and ride on the currents and whirls of the wind. This lets them distribute themselves quickly and far-away without using their own energy.

Wind harvest in the North

Dynamos with wings are on the move!

Wind force 6—the sailors on the Elbe and the North German “Windmüller” are excited: strong wind brings a lot of “power”. The generator in a wind power plant is much like your bicycle dynamo. The rotational movement of the magnet produces electricity. In a wind power plant the external energy is derived from the blades that rotate in the wind—the rotor blades—in the case of a bicycle the spinning wheel moves the dynamo head.

The problem: The wind does not always blow equally strong, and sometimes not at all. But we always need power.

The solution: Energy storage and large, networked wind farms on land and at sea.



Migratory birds

Accumulate energy for the flight

Some birds such as tomtits, woodpeckers and buzzards, remain with us. By the end of autumn, however, the last migratory birds leave us. The long flight to their winter quarters is exhausting.

Where do the birds get the energy from for this extreme performance?

In autumn, a type of “inner alarm clock” sets off. Suddenly they begin to eat as much as possible. Birds, who usually sleep in the dark start looking for food even at night, insect-eaters stuff themselves with berries and fruit, herbivores turn into omnivores. Before the flight they double their weight with pure fat deposits. (Imagine doubling your weight within a few weeks.) Then the flight begins. From now on, they use their fat as “aviation gasoline”...

Waste?

Nature knows no waste!

For everything that we produce, waste is generated. For everything that nature produces, no waste is generated. We are doing something wrong. How does nature do it? Any substance that occurs in nature is reused somewhere.

Nothing is worthless. Everything is “organic” and born into a cycle, used, consumed and recycled. A finely tuned network with many biological helpers ensures this. Sort, collect, eat, decompose and transform: A natural “recycling plant”!



The golden treasure in the mobile phone

Finding raw materials in the rubbish

One Hamburger creates about 340 kilogram of household waste per year! Packaging, waste paper, used glass, broken toys, mobile phones. We throw everything into the grey / yellow / blue / green bin.

But actually it is the wrong colour. It should be golden. Because it contains a collection of valuable resources: steel, aluminium, gold, silver, copper and carbon compounds.

They can be reprocessed, recycled, taken apart or melted down as raw material. New products can be made of them. Merely the 1,000 tons of discarded mobile phones per year contain 350 kilogram of gold.



Biomass is energy

From manure, straw and grass clippings

Plants store the sun's energy. Dead or alive, digested or undigested. All biological "waste" such as crop residues, cow dung, hay and grass clippings, as well as left over food are still full of energy and are too valuable to be thrown away. In biogas plants, these natural materials are collected, decomposed and fermented. The result is an energy-containing gas. We can heat homes or generate electricity quickly with it.

Visit our toilets and you will also be part of the organic cycle. Your waste is not just simply flushed away here. Our toilets are vacuum toilets that work similarly to an airplane with a vacuum. When you flush, only a little bit of water is needed—we use rainwater. Your "organic product" remains largely undiluted and can be used to produce energy in the biogas plant at the sewage treatment plant. Thank you for your donation!



Money for muscle power

KWh—the hidden power in our household

On sailing ships most of the work is still done by hand. Only the most modern sailing yachts use electric winches. Electricity instead of muscle power. What is “new” at sea is everyday life in our homes. Each mobile phone, every TV and hair dryer performs “work”. This work consumes energy. If we were to supply this energy with our muscle power, we would surely not have any electrical appliances. It would just be too exhausting. So we use electricity as our “energy slaves”. We have to pay for electricity. The price is calculated by the number of kilowatt hours (kWh) used. This is the most popular size for energy.

For comparison:

A refrigerator uses an average of 100-250 kWh per year.
 An electric sports car (Tesla Roadster) requires 13 kWh per 100 km. A family of 4 uses about 4,500 kWh per year.

Sailing without sails!

The technology of 1920 is being rediscovered.

In 1924 a ship that the world had never seen before was launched. A sailing ship, but without sails. And yet it was powered by the force of the wind. Instead of sails the ship was equipped with two huge vertical cylinders (Flettner rotors), which turned silently. The wind swept past these cylinders and the suction created in this way drove the ship forward.

In 1926 the ship managed to sail the transatlantic route from Kiel to New York, but after this it was forgotten. Only in 2008 was another large Flettner rotor ship launched. The E-Ship1. The aim of that ship is to test the dream of a modern wind powered sea voyage.



Bevor die Kälte kommt, bereiten sich auch die Bäume auf den Winter vor.

Wasser, das in Blättern in Form von Chlorophyll gespeichert ist, würde bei Frost gefrieren und die Zellen zerstören. Um dies zu vermeiden, ziehen die Bäume das Wasser aus den Blättern.

Stattdessen werden die Blätter für Chlorophyll abgebaut und der Kohlenstoff, der in den Blättern gespeichert ist, wird in die Wurzeln transportiert. In den Wurzeln wird das Kohlenstoffdioxid gespeichert, das die Blätter abgeben. In den Wurzeln wird das Kohlenstoffdioxid gespeichert, das die Blätter abgeben.

Die Energie, die in den Blättern gespeichert ist, wird in den Wurzeln gespeichert. In den Wurzeln wird die Energie gespeichert, die in den Blättern gespeichert ist.



Autumn Energy

Before the cold weather arrives, the trees get ready for the coming winter.

If the water stored in the leaves were to freeze, they would burst and lose this water when it thaws later, so the trees shed their leaves instead. However, they first extract the green pigment, chlorophyll, from the leaves and store it in their roots. This is why leaves lose their green colour and turn different shades of yellow, red and brown.

Energy is also stored in chlorophyll and this helps the trees again in springtime, acting as an energy store for the spring growth.





Part 5—Upper Floor

Did it snow more in the past than it does today?
Did the river Alster freeze over more often?
The last “Alstereisvergnügen” (Alster Ice Festival), a huge event on the frozen Outer Alster lake was in Spring 2012—and before that, in 1996 and 1997. But even when it’s not that freezing, you still have to make sure to keep yourself and your house warm and cosy.

On the Alster steamer you can use a thermal imaging camera to see just how good your clothes are at keeping you warm. The Wood Frog doesn’t need these, though, since he has a special trick up his sleeve.

And even if it’s not December: you are still allowed to open the door of the big Advent calendar to try to find out if there’s not a better alternative to a cold stable.



Blue, yellow or red?

Tracking energy wasters

The pictures of the houses you can see here were taken with a thermal imaging camera. This special camera can photograph the temperature. Imagine being able to walk through town in winter and see everything's temperature.

The city would look very colourful. All the houses that lose a lot of heat would shine red. If only a little heat escapes, it would be yellow, and perfectly insulated houses blue or green. These residents are happy about their low heating costs, as they do not "heat the street", but only their own flats.



Do ducks freeze to ice?

Exchange heat for cold and cold for heat

Imagine standing bare-feet on the ice of the Alster in the middle of a freezing winter. What happens?

1. Your warm foot will melt the ice a little and you will quickly freeze to it.
2. You will get a bad cold.

There are lots of ducks next to you on the ice but they are quite relaxed. How do they do it? In a duck's leg cold is exchanged with heat: Veins, which carry the cold blood from the foot towards the heart, and arteries, which supply warm blood from the heart, are closely intertwined. In this way, the heat is exchanged in the duck's leg and does not escape through the feet. This prevents them from freezing into ice, as ducks always have cold feet.



The frog in the ice block

Freeze—thaw. Carry on jumping!

Unbelievable: If the North American Wood Frog gets too cold, it freezes itself. Its heart stops beating. Its breathing stops. It turns into an ice frog. In these conditions, it needs no energy at all. It waits for better, warmer times. It protects its cells by storing a type of antifreeze agent. This way the ice cannot destroy its body cells.



The Karlshöher Christmas Story

Searching for a pleasant abode ...

A house is not a house—at least when it comes to insulation, heat technologies and energy sources. Continuous heat loss must be compensated for with intensive heating.

Consequence: High, expensive energy consumption which often damages the climate! This is because fossil energy carriers, which release carbon dioxide in large quantities in turn changes the climate, are normally used. More than a third of Germany's energy consumption is for heat supply.

Hamburg, with its high number of old buildings, has set itself an ambitious goal: By 2050, 80 percent of the CO2 pollution in living areas should be saved.



Bats are real late risers ...

Getting through winter with the “energy saving mode”

When the cold season starts, bats have a problem. Their prey, insects, become scarce and disappear. In order to survive without food in winter, the mammals with wings have developed different strategies. They eat into their fat reserves, look for sheltered winter quarters and snuggle up closely to warm each other. In addition, they go into a type of “energy saving mode”. They slow down their heart rate and lower their body temperature to a few degrees above the ambience temperature. They hibernate and dream of the up-coming spring.



Bye bye, standby-mode!

The secret energy consumers

They hum, shine in the dark and wake up in seconds. Electronic devices are never really off. In standby operation they still consume energy—they are kind of in a “bat mode”.

But in contrast to bats, for which the reduced energy flow during hibernation is vital, we humans have the choice: We could switch off our electronic devices without impaired quality of life; basically we could put them into “Wood Frog mode”. What do you decide?



What is a polar bear doing in Hamburg?

And why is he black?

Many years ago, this polar bear lived in Hagenbecks Tierpark (Hagenbeck Animal Park). Today, he reminds us of the threat of climate change. If its homeland, the Arctic, thaws, its survival is uncertain.

He is perfectly adapted to survive in the freezing cold. His thick fur hardly loses body heat. Cold does not penetrate to the skin. Its hollow hairs direct the sunlight directly on its black-coloured skin. It absorbs heat by light much better than light skin. Under the skin, a 10 cm thick layer of fat protects it against temperatures as low as minus 70 °C. But unfortunately this all does not help if it keeps getting warmer and if its home disappears.



“In the old days, everything was different”

... and in the future?

“Every year we had a lot of snow and we could go sledding and ice skating,” our parents and grandparents often tell us.

Around the turn of the millennium, however, it barely snowed. The few snowflakes that we saw made us long for a “proper” winter. In 2009 and 2010, however, there was again more snow and cold—even though both years were one of the warmest in terms of global average.

What will the future winters be like? Warm, cold or extreme? And how does our behaviour impact on the snow loads of future winters?





Final Part—Upper Floor

The future is uncertain—but this means that we can shape it ourselves. What kind of world would you like to live in?

Climate change has begun: how it continues and what a significant impact it will have on our children and grandchildren remains to be seen—and it depends on the choices we make today.

The screens at the exit of the exhibition each depict two interviews from the year 2100. They depict the same people, but living in different worlds.

What kind of world would you like to live in?



What kind of world do we want to leave our children?

We decide on our future

Being on earth is like sitting in a tent. The Earth's surrounding air, the atmosphere, protects us against the coldness of space, just like a good tent. But the "tent" changes-through our behaviour: It still lets in a lot of solar heat, but it also lets less out. It gets warmer in the tent, hotter and hotter ... In reality, it is carbon dioxide (CO₂) that heats up the earth.

In the 1970ies scientists proposed a 'two degree limit': If we succeed in keeping global warming within 2° only, we can still avoid serious and dramatic changes in climate and nature. But—as emissions have not been effectively reduced since then—it is not clear, if this limit can be kept at all. Still, we should try everything we can to reduce nature consumption and emissions and keep global warming as low as possible.



Gut Karlshöhe

Hamburger Umweltzentrum

Karlshöhe 60d
22175 Hamburg

Phone +49.40.637 02 49-0
Fax +49.40.637 02 49-20

info@gut-karlshoehe.de
www.gut-karlshoehe.de

facebook.com/gutkarlshoehe
twitter.com/gutkarlshoehe

Main sponsors

