

CAN TECH
SAVE THE
WORLD
AND
ART HEAL IT?


Dear Visitors,

Switzerland is world famous for its clean air, clear waters and pristine forests. Clearly, Swiss environmental policy has achieved much. However, in the face of challenges such as climate change, ample room for action lies ahead. Environmental issues are highly complex and intertwined with the global effects of industrial development and exploitation of natural resources.

Therefore, we need cooperation on many levels to address the complexity of our common challenges. Switzerland intends to do its bit by (amongst other things) reducing emissions, finding and sharing innovative solutions and helping others to build a more sustainable world.

We are proud to present you some highlights of the Swiss start-up scene in the environmental protection domain in this exhibition and prompt some reflection through the art pieces by the art-tech platform BeFantastic.

Presented by

 Schweizerische Eidgenossenschaft
 Confédération suisse
 Confederazione Svizzera
 Confederaziun svizra

Embassy of Switzerland in Singapore



Fabrice Filliez
 Ambassador of Switzerland to Singapore and Brunei Darussalam

In collaboration with



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Switzerland. Picture-perfect Landscapes, Cleantech and Art

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Switzerland is widely known for its picture-perfect scenery, shaped by mountains, clear lakes and rivers, cows and green meadows. Behind this idyllic backdrop lies a country wholly committed to cleantech – developing clean technologies to create a world that is more respectful of natural resources, to make the transition to renewable energies and to ensure greater biodiversity.

Join us on a journey through the most beautiful Swiss landscapes and discover some of the businesses working to make our lives decidedly more sustainable. Explore the thought-provoking and interactive art pieces by the techart platform BeFantastic, which seek to challenge our relationship with our environment.

Like all other countries, Switzerland is confronted with the challenges of global warming. In tackling the many questions associated with climate change at the national level, Swiss businesses and not-for-profit entities have come up with some interesting solutions, as illustrated in this exhibition.

Many complex challenges lie ahead of us all and Switzerland intends to do its bit by finding and sharing innovative solutions to build a more sustainable world.

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“
We are using
resources as if we
had two planets, not
one. There can be
no plan B because
there is no planet B.
”

Ban Ki-Moon
8th Secretary General of the UN

Swiss Cleantech Pioneers


A small country in geographical terms, Switzerland has no fossil energy sources of its own. This fact has undoubtedly been one of the push factors behind a national drive to seek out creative solutions, with the desire to think outside the box, be more ambitious or simply to see things differently. It has also given rise to some notable enterprises, particularly in the field of clean technologies. Below are some Swiss entrepreneurs who have made their mark in this field and continue to help break new ground.

Raphaël Domjan
Between 2010 and 2012, eco-explorer Raphaël Domjan sailed around the globe on PlanetSolar using only solar energy – the first time ever a journey of this kind was achieved by any means of transport. A keen advocate of experimental ecology, he has been working on the SolarStratos project since 2014, with the mission of reaching the stratosphere with a solar-powered aircraft and being able to witness the stars shining in broad daylight.



Bertrand Piccard
A passionate aeronaut and aviator, Bertrand Piccard has taken up many a challenge that was thought impossible. For example, he completed the first non-stop round-the-world hot-air balloon flight and initiated the Solar Impulse solar aircraft project. Son of an oceanographer and grandson of an aeronautical physicist and aquanaut, Piccard circumnavigated the globe with André Borschberg aboard Solar Impulse in 17 stages, powered solely by solar energy. He now manages a foundation to support renewable energies and cleantech.

Josef Jenni
Josef Jenni is unquestionably one of the pioneers of solar energy in Europe. He began marketing solar thermal systems as early as the mid-1970s. His achievements include the construction of the first completely solar-powered house in Europe, in Oberburg in the canton of Bern.



Markus and Daniel Freitag
In 1993, the Freitag brothers retrieved an old tarpaulin from a lorry with the idea of turning it into a shoulder bag. Initially they hand-stitched the bags in their small apartment in Zurich, using old lorry tarpaulins, seat belts and the inner tubes of bicycle tires. Today, Freitag markets its bags all over the world. A prototype is even exhibited at the MoMa in New York. The Freitag brothers are now considered pioneers of the global circular economy.

Swisstech: an Innovation- Friendly Environment

The political system and geographical proximity in Switzerland make it possible to have close cooperation between regional and federal political bodies, the private sector, civil society and the research community. Close dialogue between these different stakeholders makes for a favourable environment of ecosystems that foster Swiss innovation.



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Thanks to encouragement and support from the public authorities, Swiss innovation is especially strong in small and medium-sized enterprises (which represent 99% of the Swiss private sector) and start-ups, but also within research centres, which have developed around the federal institutes of technology in Zurich (ETH Zurich) and Lausanne (EPFL), and in most cantons, which have thematic research institutes and start-up incubators.

In addition, the Vocational Education and Training system, provides a combination of on-the-job training with classroom education in vocational schools. This is one of the main ingredients of an approach deeply rooted in the Swiss DNA: building bridges between sectors and the various levels of government.

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The presence of international organisations in Geneva, such as the United Nations Office (UNOG), the World Trade Organization, the International Committee of the Red Cross and CERN, drives this capacity to innovate further in different and sometimes complementary fields. Most of these organisations, which are working on how to address environmental challenges and are concerned with cleantech, are working with Swiss research centres to find sustainable solutions.

In addition to this, Switzerland's political system is based on direct democracy, which means the electorate is regularly given the vote on various issues, among them energy and climate strategies. For decades, Switzerland has been actively committed to environmental protection, renewable energy production and, more recently, climate protection.

The 2030 Agenda

A Concrete Contribution by Switzerland

The ever-growing challenges facing the world, including environmental protection, can only be overcome if the international community works together and coordinates its efforts.



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The UN member states adopted the 2030 Agenda and its 17 Sustainable Development Goals (SDGs) in September 2015, undertaking to implement them both nationally and internationally. Swiss diplomacy made a major contribution to the development and adoption of the 2030 Agenda.

The SDGs take into account the economic, social and environmental dimensions of sustainable development. Several of them are closely linked to the use of cleantech, and Swiss cleantech companies are therefore working on a daily basis to implement these ambitious goals.

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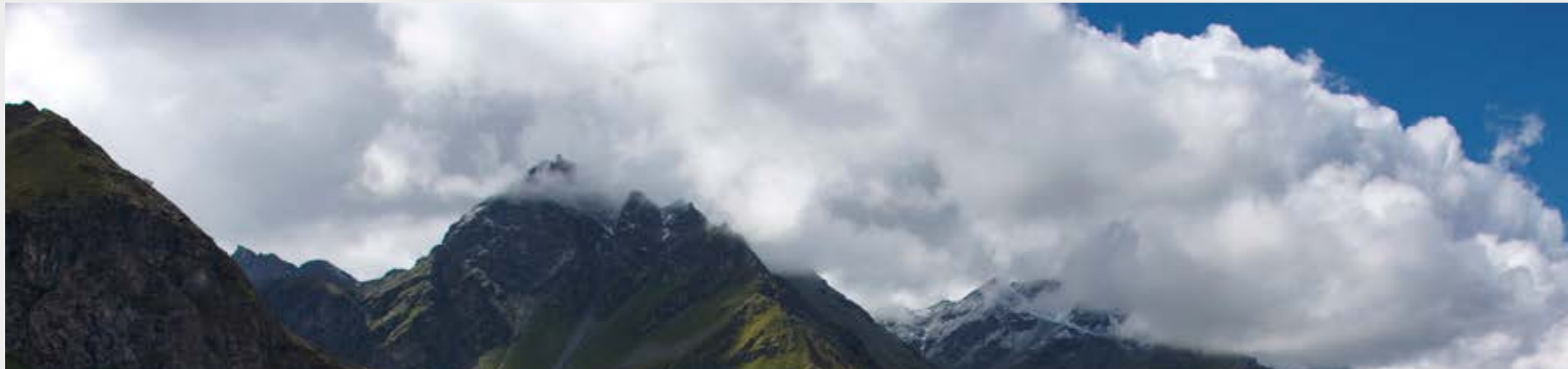
In order to limit average global warming to less than 2 degrees Celsius compared to the pre-industrial period, Switzerland, which consumes a large amount of goods and services, is committed to establishing a framework that promotes sustainability across the country. By 2030, for example, Switzerland aims to reduce its greenhouse gas emissions to half of the 1990 level and to better control natural hazards. In addition to action taken on its own territory, Switzerland is also making a concrete contribution to the implementation of the 2030 Agenda in other countries.

The solutions presented in this exhibition showcase part of Switzerland's efforts to achieve a more environmentally friendly global development. Each of them refers to at least one of the SDGs.

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Sustainable Development Goals







Ensuring Access to Clean Drinking Water

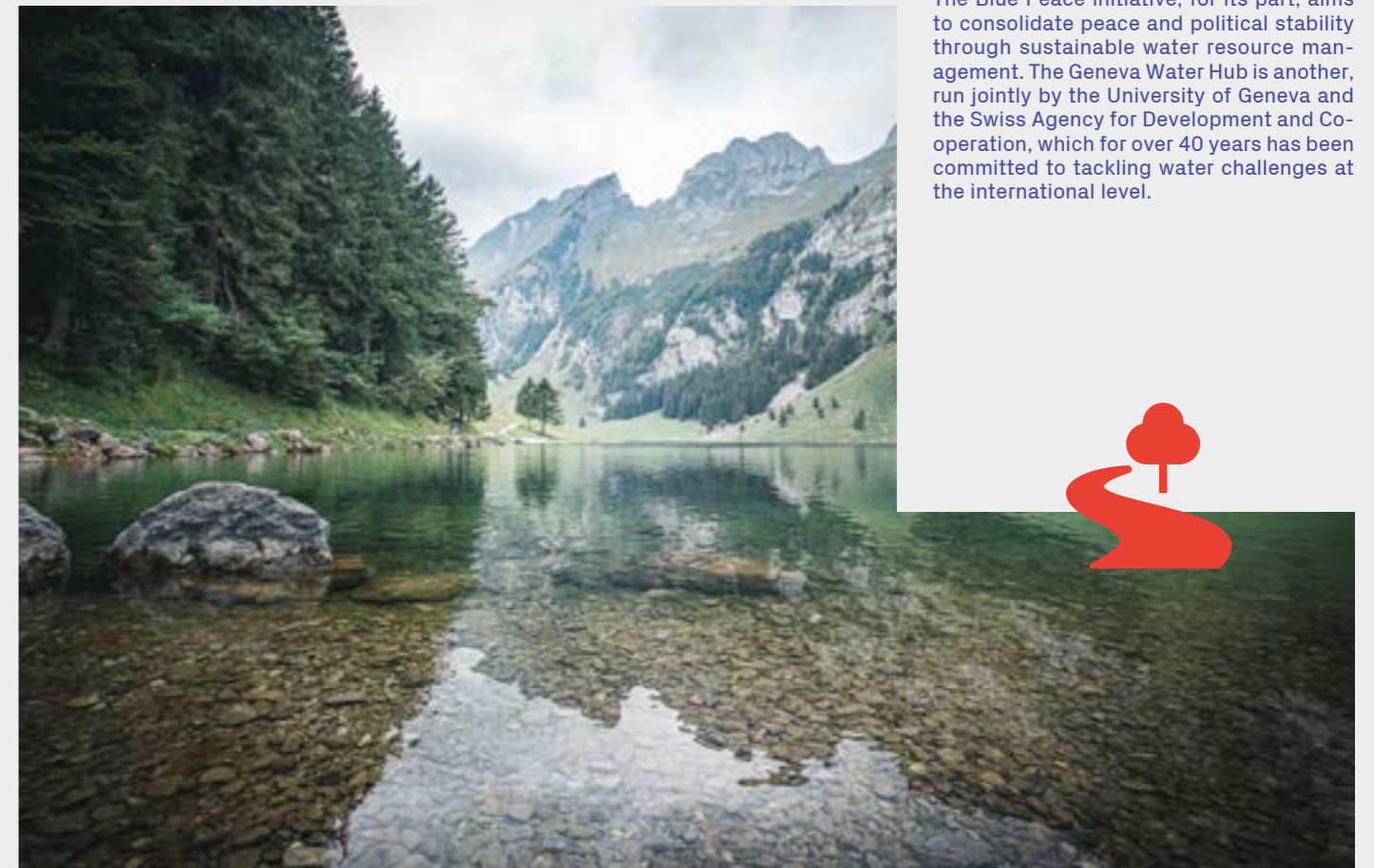
Water is a vital resource and has become crucial not only for development and for combating poverty but also for peace and political stability. Water is a renewable resource, but a limited one, and is very unevenly distributed geographically. The United Nations estimates that more than 780 million people worldwide still face great difficulties in accessing clean drinking water.

Switzerland is known as the water tower of Europe, is the source of the great Rhone and Rhine rivers, and is home to numerous lakes and glaciers. But these reserves do not shield the country entirely from water stress, which is becoming an increasingly frequent occurrence, as in many other parts of the world. Cleantech therefore has a crucial role to play in securing our planet's water reserves.

Swiss technology companies have been working for decades in conjunction with the authorities to ensure good water quality for the public, but also to protect this precious resource. This work has led to improvements in the treatment of wastewater and industrial waste. Although wastewater treatment is under control with almost all buildings connected to treatment plants, Switzerland is nevertheless confronted with the

problem of micropollutants and agricultural treatment residue in the water table. These challenges have led to the development of solutions that often find their way into the export market, having first been tried and tested in Switzerland's cities and mountain regions. These technologies use a variety of sustainable systems to reduce or eliminate entirely any chemicals, the ultimate aim being to deliver clean water without polluting the environment.

Switzerland can also draw on recognised expertise in the water sector, in the political and academic spheres as well as in the private sector and civil society. The Swiss Water Partnership is one of these initiatives, comprising an independent platform that brings together a large number of NGOs, private companies, universities and government. The Blue Peace initiative, for its part, aims to consolidate peace and political stability through sustainable water resource management. The Geneva Water Hub is another, run jointly by the University of Geneva and the Swiss Agency for Development and Cooperation, which for over 40 years has been committed to tackling water challenges at the international level.



The KLS-Filter



Up to 30,000 Litres of Drinking Water per Day – with no Electricity or Chemicals

The KLS filter makes water treatment possible in areas that are not connected to a drinking water supply. The device is based on slow sand and gravel filtration technologies and uses bauxite to remove all undissolved particles, including bacteria and suspended solids. The KLS filtration system is simple to maintain and particularly suitable for high altitude huts, chalets or isolated farms. Depending on the model used, it can treat from 500 to 30,000 litres of water per day. Having been tried and tested in the heart of the Swiss Alps, it can be adapted perfectly to any other part of the world, and can even provide entire villages with clean drinking water. The KLS filter was developed by RWB Group and is manufactured in partnership with Etertub.

About 20 KLS filters are currently in use in Switzerland, mostly in mountain regions. These installations purify water that comes mainly from private springs and is unfit for consumption. The device is also useful for treating rainwater contaminated by rooftops as well as water that is very low in minerals. Two filters are also in use in Burkina Faso and Guinea, where water turbidity and contamination by pathogenic microorganisms are major problems. This filter made in Switzerland guarantees access to clean drinking water at a reasonable price.

www.rwbgroupe.ch



Smixin



Hand-Washing Reinvented

Washing your hands is a simple gesture – one which we repeat several times a day. On a global scale, the water-saving potential associated with it is enormous. The hand-washing system developed by Smixin reduces water consumption by 90% and soap and paper consumption by 60%, all while guaranteeing a high level of hygiene. Thanks to its simple solution of mixing the soap directly into the water, the Smixin device gets your hands spotless in just 12 seconds. The devices can be used in public toilets or outdoors, and are intended specifically for use in public spaces with a large number of people passing through, such as on public transport, and in canteens, schools and restaurants.

Smixin devices are already widely used in Switzerland. Among other places, they can be found in the public toilets in the railway stations leading from Interlaken up to the Jungfrauoch – Top of Europe. And yet Switzerland accounts for just 20% of total sales. The devices can be found in some European countries, including in Berlin's main railway station. But the vast majority are sold in Asia and the Middle East, in places such as Dubai, India, Hong Kong, Manila and Macau.

www.smixin.com



Trunz Water Systems



Safe Drinking Water from Rivers and Wells

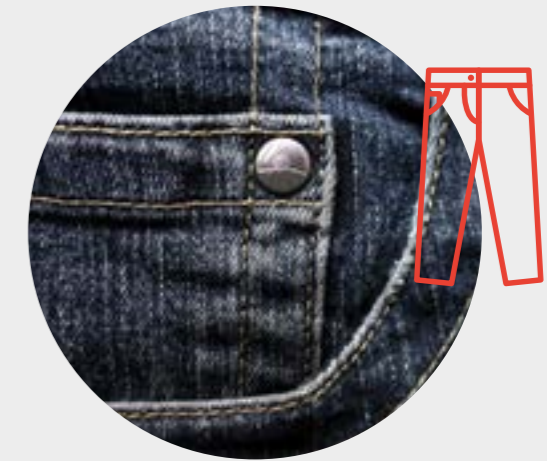
Water from large rivers, lakes and wells cannot be consumed directly. Since 2007, Trunz Water Systems have been developing devices that filter water by ultrafiltration or reverse osmosis (for desalination and brackish water). Depending on the filtration rate required, the devices come in the form of a small trailer, a cabinet or a box containing all the filtration equipment. They are compact and robust, and can be energy self-sufficient, thanks to a mini wind turbine or integrated solar panels. In addition to desalination, the devices destroy all contaminants down to a size of 0.0004 microns, without recourse to chemicals. The cost of treating river water with the Trunz devices amounts to 0.3 cents (in USD) per litre. Already, more than 1,000 facilities are in operation in more than 30 countries, including Australia, South Africa, the United Arab Emirates and Vietnam.

The systems developed by Trunz are highly energy-efficient, with everything optimised to consume a minimum of energy during the water filtration process. The strength of these systems lies in their self-sufficiency, small size and environmentally friendly materials and technologies. They also require minimal maintenance and are automated to a large extent, making life easier for the people who use them on a daily basis all over the world. Depending on the model, they can treat between 30 and 1,200 litres of water per hour.

www.trunzwatersystems.com



Sedo Engineering



Green Jeans are Finally Here!

Every year, more than 15 billion metres of denim fabric are produced worldwide. This requires tens of thousands of tonnes of indigo powder to dye the fabric blue. Sedo Engineering has developed a complex facility that can dye 25,000 pairs of jeans per day. Called Smart Indigo, it uses integrated electrolysis to produce the famous indigo blue without the use of chemicals, and therefore without contaminating the water ejected from the textile factories after dyeing. The system uses only indigo pigment, electricity, caustic soda and water. Several machines are already in operation, for example in China and Pakistan. Switzerland is thus paving the way for a more environmentally friendly textile industry.

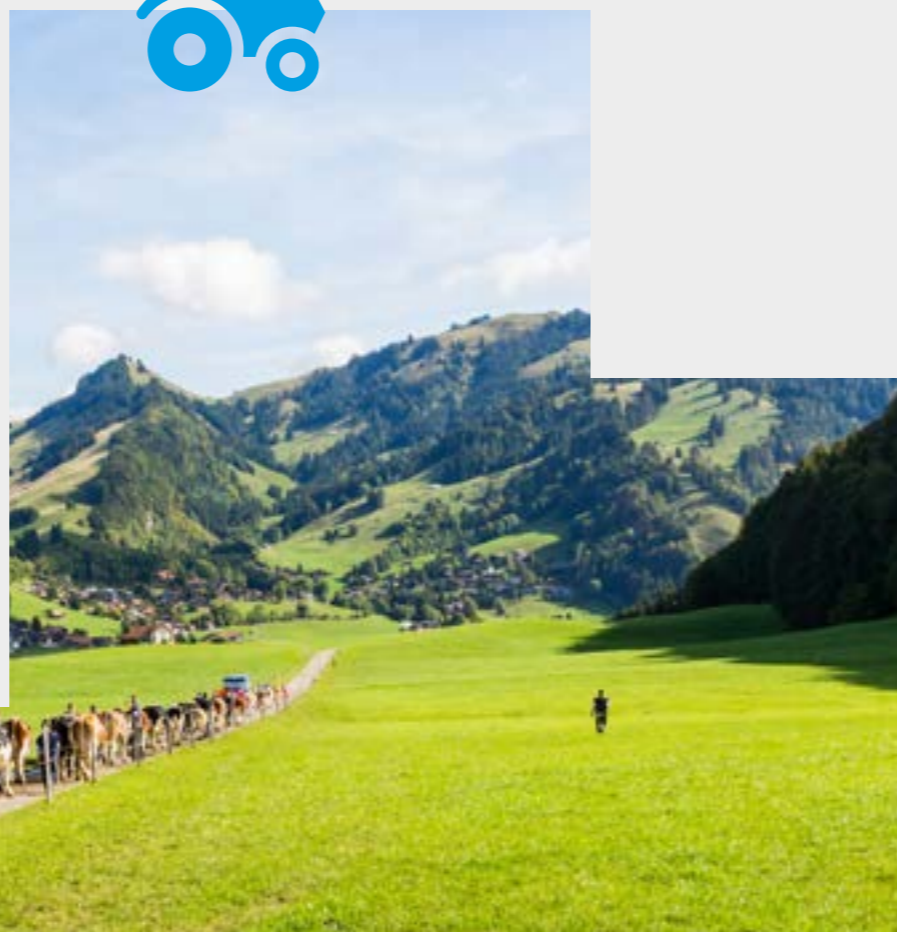
Smart Indigo technology protects the environment and people from exposure to the chemicals typically used in dye for jeans. The Smart Indigo dye is produced locally on jeans manufacturers' production sites, with one single plant able to produce about one tonne of dye per day. The technology uses six times less energy than conventional processes and enables jeans manufacturers to reduce their carbon footprint by a factor of 10. Smart Indigo, a thoroughly Swiss concept, sees itself as a trailblazer for the entire jeans industry. This application of electrochemistry is an example of the huge potential this technology and its associated know-how might unlock for the water treatment sector.

www.smartindigo.com



Maintaining Biodiversity and Developing Sustainable Agriculture

Biodiversity is the natural living heritage of our planet. It is essential to the development of ecosystems and the biosphere, and it helps to mitigate the effects of climate change. At the same time, as the global population continues to rise unabated, humankind must have access to sufficient food. This is where innovation has a crucial role to play: to reconcile the need for sufficiently intensive farming to guarantee food security throughout the world, with maintaining biodiversity and protecting the environment.



Despite Switzerland's pioneering environmental protection laws, biodiversity throughout the country is in an unsatisfactory state. Half of natural habitats and a third of all species are under threat. Over and above effective framework conditions, Swiss companies are developing solutions, tools, products and services that support a societal evolution towards greater sustainability and resilience. Crucially, we must harness the full potential for improvements in agriculture in order to conserve our environmental heritage and, at the same time, ensure food security and the economic viability of family-run farms. All areas of farming are affected by new technologies: soil and crop management, protection for plants and water sources, livestock management, mechanisation and irrigation.

Precision agriculture, which aims to use the right treatment product as sustainably as possible, at the right time and in the right place, is the current trend. Drones, mapping, robots and data management tools based on artificial intelligence (AI) are all being used to help farmers as well. These localised treatments pose fewer problems for cultivated land and enable farmers to constantly scale down their use of chemicals. This drastically reduces the environmental impact and benefits biodiversity. The Swiss Future Farm in Tänikon, a project which is coordinated by Agroscope (Switzerland's centre of excellence for agricultural research), provides a one-of-a-kind platform in Europe for experimentation in digitalisation in agriculture.

Numerous initiatives exist in Switzerland to protect biodiversity and promote sustainable agriculture, both locally and internationally. Through the Swiss Agency for Development and Cooperation (SDC), for example, Switzerland is actively involved in the International Fund for Agricultural Development (IFAD) and CGIAR, exerting influence on the development of sustainable agriculture at the international level. For example, the SDC supports the "Plantwise" initiative, which teaches sustainable methods to reduce crop losses on smallholder farms, the "Agri-Fin Mobile" project, which uses mobile phones to support local agriculture, and the Irrigated Rice Research Consortium, which reduces water consumption for rice production by up to 30%.

Aero41



Less CO₂ and more Precise Treatments

Treating vineyards and crops extensively with large quantities of pesticides will soon be a thing of the past. Aero41, a pioneering European company, has developed spraying drones which can treat even the most difficult to reach vineyards and crops efficiently and in an environmentally friendly manner. Spraying drones with a built-in tank for plant protection products make it possible to optimise pesticide management and analysis of meteorological factors, while at the same time reducing CO₂ emissions in the agricultural and wine-growing sectors. Since the summer of 2019, the devices have also been certified in Austria and talks are currently under way with other European countries.

Aero41 is continuously working on improvements to its drone and its liquid fertiliser nozzles. As it stands, the current system already makes it possible to treat the lower parts of the vine, even under the lowest leaves, where the grapes grow in bunches. Unlike its cumbersome land vehicle counterparts, the Aero41 drone does not cause any soil compaction and keeps operators from being directly exposed to treatment products. Aero41 is also working on the management of data collected by its drones, which provides essential information on crops, but also on how to enhance the intelligence of the drone itself in order to increase its autonomy.

www.aero41.ch



Aqua4D



Clean Irrigation Water Treated with Electromagnetic Waves

Aqua4D has developed a water treatment technology without chemicals, using electromagnetic waves to rearrange the structure of the water molecules, thereby reducing the surface tension and boosting penetration into the soil. It all revolves around the cylinders, where the water enters and is exposed to electromagnetic waves, before coming out transformed, ready to irrigate the fields efficiently. Aqua4D is already being used successfully in more than 45 countries – including Brazil, Chile, Costa Rica, Spain and Tunisia – where it is used on farms for crop irrigation and as drinking water for livestock, as well as in residential buildings (sustainable protection of the water distribution network). Farmers using Aqua4D technology can save up to 30% of water. Not only that, they have access to water of a superior quality, which has a positive impact on their production.

Aqua4D's easy-to-install technology also helps farmers cope with water shortages and reduce the salt content of their soil, which ultimately leads to higher productivity and better quality fruit and vegetables. Application of the Aqua4D technology is not limited to agriculture: it is also effective in any industry that uses large amounts of water, such as mining.

www.aqua4d.com



Wingtra



A High-Tech Drone to Better Understand Crop Health

The vertical take-off and landing drone made by Wingtra provides a number of benefits. Among other things, it enables you to monitor crops quickly and efficiently, identify water stress in certain plants, create treatment plans and monitor the growth of plantations. The drone is equipped with a high-resolution camera (up to 42MP) and multispectral sensors, which together provide aerial readings of unparalleled image quality and precision. The device can thus identify problems on crops to an accuracy of up to one centimetre, enabling producers to better target plant protection treatments, in some cases salvage harvests and reduce crop monitoring costs.

The Wingtra drone combines the convenience of vertical take-off and landing with the endurance of a fixed-wing drone capable of monitoring medium to large-scale projects. In addition, it is up to 80% faster than ground-based methods or traditional four-blade propeller drones. The technology is also used in topography, mining, construction and environmental monitoring applications. The Wingtra drone is marketed in more than 40 countries, including Argentina, Australia, Mongolia, Uganda and the United States.

www.wingtra.com



Vatorex



Protecting and Sustaining Bee Colonies

Vatorex has developed an alternative to chemicals to combat varroa mites, the main parasite responsible for the loss of many bee colonies. The system is a simple one based on the principle of heat treatment (hyperthermia), using a heating wire inserted into the wax foundations. The bees can withstand higher temperatures than the mites, which die at 39 to 42°C. Beekeepers, whether amateur or professional, can thus dispense with acid or miticide treatments and thereby protect biodiversity. Vatorex's pragmatic solution is already being used in about ten European countries, most widely in Austria, France, Germany and Serbia.

Vatorex reduces the viral load in the hives. The bees are livelier and produce more honey. Once the system is installed, the beekeeper simply switches it on at the beginning of the season and switches it off at the end, with no need for intervention in between. The system treats the hives automatically, even in the absence of the beekeeper. Vatorex has also developed a remote control mobile application, saving the beekeeper precious time. This innovative solution is easy to implement, and is an essential tool in protecting an endangered species and promoting environmental balance.

www.vatorex.ch



Emission-free Mobility

Transport is the single biggest source of CO₂ emissions at global level. This is also true in Switzerland, where transport accounts for more than a third of total carbon emissions, ahead of industry and private households (each representing around 20%). To reduce the impact on the environment, Switzerland and other countries need to switch to zero carbon transport. Electric or hydrogen vehicles are particularly well-suited to this purpose, provided that the power is generated from renewable energy sources. Swiss companies, in particular, are finding solutions to these considerable challenges.



Switzerland is keenly aware of the problems caused by pollution and has outlined an electric mobility roadmap for achieving a 15% increase in new electric car registrations by 2022. These have increased considerably since 2018, reaching approximately 11% in 2019. Although Switzerland is not a major car manufacturing country, it produces innovative designs for small modular vehicles that are particularly suited to city driving. It is also actively involved in developing hydrogen powered transport, with some innovative solutions already in the pipeline, such as Stadler Rail's FLIRT H2 train.

In the public transport sector, Switzerland has one of the highest rates of train use in the world. It also has first-class infrastructure and one of the world's highest density rail networks, which is largely powered by renewable energy from hydroelectric plants. Switzerland has also been responsible for some important innovations in urban public transport, such as ABB and TOSA buses, which allows fast contactless charging at bus stops, and the e-buses produced by HESS.

Transport is becoming digitalised across the globe, resulting in more extensive use of on-demand transport and, potentially in the near future, driverless vehicles. This is likely to impact the whole of society, resulting in new practices, including widespread teleworking and drones being used for deliveries. Against this backdrop, Swiss companies are developing zero carbon approaches to mobility, such as the FAIRTIQ ticketing app and Bestmile's fleet orchestration platform.

Softcar



The First 100% Environmentally-Friendly Car

Built from biopolymer materials and advanced composites and therefore completely recyclable, Softcar is set to be the world's first 100% environmentally-friendly car. This 100% electric city car, designed in Switzerland, can be mass produced at unprecedented low weight, low cost and low capital investment at assembly plants near major cities, without compromising safety or driving performance. This innovative vehicle has fewer than 2,000 parts, compared to over 40,000 for conventional cars, which makes recycling easier and helps to preserve natural resources.

The idea behind Softcar is to minimise the car's environmental footprint from the point of production and throughout its life until it is eventually recycled. The development team drew inspiration from the «SwatchMobil» city car design from the 1990s and added the latest technologies and state-of-the-art component parts. Softcar is the ultimate city car with a highly streamlined design that reduces the amount of grey energy associated with the vehicle. Mass production is expected to start in 2021.

www.softcar.ch



Futuricum



E-Trucks

Designwerk sells electric propulsion systems for trucks and commercial vehicles weighing up to 40 tonnes under the brand name Futuricum. The company's 100% electric drive systems with integrated batteries can be used for many different purposes: waste collection, distribution, and agricultural and construction logistics. Electric heavy goods vehicles (HGVs) are particularly suited to stop-and-go operations where materials need to be loaded and unloaded. Several Swiss cities have already purchased these non-CO₂ emitting electric trucks which are also cheaper to maintain. The Netherlands and Germany are pilot-testing the vehicles as well.

Designwerk originally manufactured batteries and chargers, but has recently diversified into electric HGVs. Designwerk customises vehicles to suit customers' specific requirements, for example by supplying electric auxiliary power units for dump trucks, cranes and cement mixers.

These electric vehicles create less air and noise pollution and are much quieter than their diesel counterparts, which makes them ideal for goods deliveries and refuse collection in city centres.

www.futuricum.com



Leclanché



A New Era in the Marine Sector

Swiss company Leclanché, a leading provider of energy storage solutions, designs and manufactures battery systems for a wide range of infrastructure and vehicles around the world. These include «Ellen», the world's largest all-electric ferry, which has been shuttling between the Danish ports of Søby and Fynshav since 2019. The ferry is powered by Leclanché's battery system, which provides zero carbon transportation with no fuel or exhaust smells on board. The battery system enables the ferry to travel 41 kilometres: seven times longer than any other e-ferry route. The Ellen can carry up to 200 people and around 40 vehicles. The e-ferry and its highly innovative battery system, which were partly developed in Switzerland, are helping to reduce the volume of diesel used on ferry routes.

Thanks to Leclanché's expertise, the Ellen is powered by batteries with an unprecedented capacity of 4.4MWh that take roughly 30 minutes to recharge. As part of this ambitious project, Leclanché also developed advanced safety technology, including a unique fire prevention system. To stop the batteries from catching fire, foam is automatically injected to cool the temperature if it rises above a certain level. The fleet of e-ferries represents an important milestone for zero carbon water transportation. Thanks to the expertise of Leclanché and its partners, other similar projects are expected to follow.

www.leclanche.com



Green Motion



Stations that make Electric Mobility more Accessible

Swiss company Green Motion designs and manufactures turnkey charging stations for e-vehicles that can be used at home or installed at public service stations. It also provides a software platform for managing charging station networks, including the billing aspects. The charging and IT services are complementary, but can also be provided on a stand-alone basis, providing Green Motion with two gateways to the market. The charging stations, which are compatible with almost all electric vehicle socket types, have already been installed in various countries, including India, China, the US and Israel. Green Motion is also currently designing a solution for electric aircraft, which are gradually becoming more widely available, and onboard chargers for the automotive industry.

Green Motion was established in 2009, when Switzerland had fewer than fifty electric vehicles on the road. Its charging stations now have the highest power conversion rates in the world, with less than 4% power loss. They are also compatible with all connector standards defined by car manufacturers. Green Motion ensures that its stations are produced as close as possible to the areas where they will be used. This sometimes means adapting components to specific markets, depending on the local materials available. Alongside its charging stations, Green Motion also develops software for managing charging networks.

www.greenmotion.ch



Effective Waste Reduction, Recycling and Recovery

Switzerland consumes more natural resources than the global average, mainly due to its high levels of prosperity. Public bodies, research institutes, companies and citizens are taking action to reduce their impact on the environment and society. Businesses are innovating and developing technologies for resource management, refuse collection and recycling more effectively with a view to creating a more circular economy.



Global population growth is inevitably putting greater pressure on natural resources. It is therefore essential to find a balance between society's economic needs and the needs of the global ecosystem so that we can fully transition to a system of sustainable development encompassing the environment, the economy and society.

With greater energy efficiency needed in future, recycled waste is becoming an important source of raw materials. With this in mind, traditional waste treatment plants are now being converted into thermal recycling facilities. This is clearly the shape of things to come, with towns and cities ultimately being exploited as urban mines. Through recycling, urban areas will generate the metals and other materials needed for society to function.

Although its consumption of natural resources is higher than the global average, Switzerland is often cited as a model for recycling because of the refuse collection, waste separation and waste recovery methods deployed. Businesses also need to keep innovating to repurpose refuse that is generated on a daily basis. Switzerland has developed expertise in this area which may be beneficial to other countries. Projects backed by the Swiss Agency for Development and Cooperation (SDC), such as the Sanuva recycling plant in Mali, are helping to address waste management challenges around the world.

Selfrag



High Voltage Discharges to Boost Recycling

Swiss company Selfrag aims to minimise the quantities of waste that is not recycled. Its high-voltage pulse fragmentation technology, which is unique in the world, replicates the effect of a lightning strike on a tree. This controlled disaggregation process fragments different materials before reintroducing them into production lines. It gets the most out of the recycling chain by extracting metals such as copper, lead, tin, zinc and aluminium from the slag which is the result of waste incineration at treatment plants. Selfrag has been using this technology in Switzerland since 2017, but could also export it to countries that incinerate large quantities of household waste, including Germany, Scandinavia and the United States.

The slag produced from the incineration of household waste contains valuable materials. For example, just one tonne of waste recovered from an incineration facility contains 7 kilograms of copper on average. Selfrag's fragmentation process allows these valuable materials to be recycled while reducing the amount of slag by roughly a quarter. Selfrag expects to eventually be able to halve the amount of bottom ash. Selfrag's innovative technology takes waste recycling to its logical conclusion.

www.selfrag.com



UHCS



Modular Housing made of Recycled PET

The Ustinov Hoffmann Construction System (UHCS) is a modular construction system using recycled plastic waste, such as PET. UHCS is designed to be produced on an industrial scale through a process of extrusion, which compresses the material. The plastic bricks are assembled like lego to form a cubic post-and-beam structure, with load-bearing walls which can be adapted to different cultural contexts. This system facilitates high-quality construction while reducing the impact of humans on the natural world and produces buildings with better environmental performance. A pilot house will be built in Switzerland in 2021, followed by other buildings all over the world.

PET is the preferred UHCS building material. This material has been chosen because it is non-toxic and available worldwide, although other plastics may be used that are more appropriate to climatic or local conditions.

The modular construction system lends itself to industrial production on a large scale and meets the highest architectural standards. UHCS is also easy to implement, which gives architects creative freedom to develop their own designs.

www.ustinovhoffmannconstructionssystem.com



BioApply



Biodegradable, Compostable Bags

A plastic bag takes five seconds to produce and is only used for 25 minutes on average. But it takes at least 500 years to break down in the environment. Swiss company BioApply is helping to reduce the use of plastic and its serious environmental impact by supplying alternative biodegradable, compostable bags and other items, such as biodegradable crockery. The products are supplied to businesses and individuals to help them sort their organic waste more effectively. Organic waste can be placed in BioApply bags, which are compostable and help reduce the quantity of waste that needs to be incinerated.

Plastic is used in wide range of products, especially packaging, because it is cheap and versatile. The widespread use of plastic is a major source of pollution, especially since the disposal of plastics, including bags, is often poorly managed. BioApply therefore carries two fully biodegradable product lines of compostable, plant-based bags, which are certified as being GMO-free and are as robust as plastic ones. All bags produced by BioApply can be composted at home or at a composting facility. Although BioApply is mainly active in Switzerland, it also operates in France, Germany, the US and Africa.

www.bioapply.com



Tyre Recycling Solutions



Giving Used Tyres a new Lease of Life

Roughly two billion used tyres need to be disposed of each year all around the world. Tyre Recycling Solutions has developed a unique process involving three innovations that allow used tyres to be fully recycled. The first stage involves cutting the tyres into three flat parts, making them easier to transport. Secondly, a water-jet system pulverises the tyre tread into fine powder, free from steel and synthetic fibres. And, thirdly, the rubber sidewalls and carcass are ground to a powder, removing toxic substances such as sulphur. The remaining rubber powder can, for example, be used to manufacture shoe soles, floor coverings and cable casings.

Rubber waste poses a real threat to the environment because it releases pollutants when it is incinerated, landfilled, or dumped illegally. The unique process developed by Tyre Recycling Solutions creates a new material that opens up multiple opportunities. The process can also help the worst affected countries address the problem of storing and recycling used tyres.

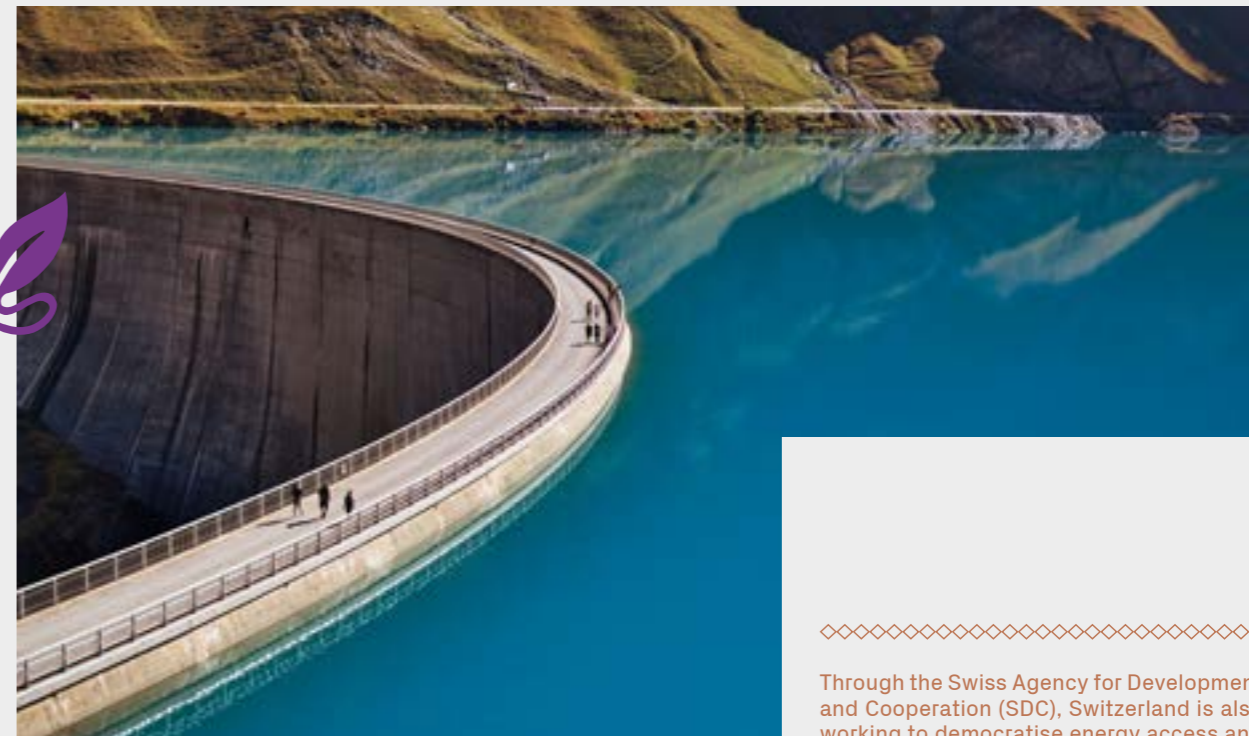
www.trs-ch.com



Reducing the Impact of Climate Change



Climate change has no borders. Our changing climate affects everyone on the planet, although some regions are feeling the consequences more than others. The measures we must take to mitigate climate change sometimes pose a dilemma: how can we reduce the impact of climate change while maintaining a sufficiently comfortable lifestyle for people?



Through the Swiss Agency for Development and Cooperation (SDC), Switzerland is also working to democratise energy access and promote renewable energies. The SDC's Global Programme Climate Change and Environment aims to expand access to clean renewable energies, enhance energy efficiency and improve air quality. In addition to this programme, 'made in Switzerland' solutions such as Studer Innotec inverters are helping to meet the energy needs of communities even in remote mountain or desert regions.



One thing seems clear: a secure and affordable energy supply improves living conditions and enables stable production processes for goods and services. Energy access for all is therefore key to sustainable development, reducing poverty and protecting the climate. Switzerland is committed to developing pragmatic and concrete solutions to these challenges, especially in the areas of air quality and energy efficient buildings.

Until very recently, the pursuit of energy access for all has relied on centralised heavy infrastructure like power plants and distribution grids. Digital and other technologies are changing this, and more local, flexible solutions are now beginning to spread to the four corners of the world. We are seeing the emergence of decentralised storage solutions, microgrids and energy management platforms for connected devices. Working with Leclanché, one of the world's leading battery storage solutions companies, Switzerland is in a position to offer solutions like these.

The Intergovernmental Panel on Climate Change (IPCC) insists that more initiatives like these are needed if we are to limit the effects of global warming. By adopting solutions such as clean technology developed in Switzerland, governments, companies and also households and individuals can play their part in reducing greenhouse gas emissions and saving the environment.

Climeworks



Capturing CO₂ from Air to make Rock!

The technology developed by Climeworks simply and effectively captures CO₂ from air using giant 'vacuum cleaners'. The gas is then mixed with water and pumped 700 metres underground. When it comes into contact with basaltic rock, the CO₂ turns safely and permanently into stone. Iceland is the location of a pilot plant currently deploying this technology. The CO₂ captured by Climeworks is also suitable for other industrial processes, such as manufacturing carbonated water or fertiliser. The Zurich-based company, also active in Italy and Iceland, aims to capture 1% of the world's CO₂ emissions by 2025. The site in Hinwil in the canton of Zurich is already capturing up to 900 tonnes of CO₂ per year.

Founded in 2009 by two engineers from the Swiss Federal Institute of Technology in Zurich (ETHZ), Climeworks has partnered with the Swiss mineral water company Valsér – based in the famous Roman thermal resort of Vals – to supply some of the CO₂ needed for their sparkling water. In Italy, there is a plant where the CO₂ is used in combination with hydrogen to produce renewable energy. Other plants are in the pipeline. Instead of just reducing CO₂ emissions from a plant or company, Climeworks' technology actually enables "negative" emissions by removing CO₂ from the atmosphere.

www.climeworks.com



Solaxess



Solar Facades with Style

Together with the Swiss Center for Electronics and Micro-technology (CSEM), Solaxess has developed a nanotech film that is taking the construction industry by storm. The film can be applied directly onto solar panels to obtain a white or coloured surface without affecting the efficiency of the panel. It works like a selective mirror, scattering visible light to create a white surface while allowing infrared light to reach the solar cells behind. Surfaces covered in the innovative solar film are both more attractive than conventional solar panels and help to insulate the building. Solaxess panels are already in use on the exteriors of buildings in China, Singapore, Sweden and Switzerland.

Solar panels using Solaxess technology form an aesthetic white or coloured surface, which hides the solar cells but does not affect their ability to convert sunlight into electricity. Compatible with any solar technology, the fine film is integrated into the surface of the solar panel during production to suit the needs of the owner or developer. The Solaxess solution is aimed at photovoltaic manufacturers, developers and architects wanting to rethink façades and help expand the use of solar energy.

www.solaxess.ch



Fixit



The Ecological Alternative to Polystyrene Insulation

Fixit is the world's first company to market an aerogel for the environmentally-friendly thermal insulation of buildings. Composed of minerals and over 90% air, Fixit plaster is ideal for the renovation of listed buildings to 21st century standards, reducing their energy consumption. Its high water vapour permeability prevents mould. The aerogel is an environmentally-friendly alternative to polystyrene insulating panels, which are neither recyclable nor renewable. The Fixit Group is already present in 19 European countries including Russia.

Fixit's aerogel, which was originally developed for the aerospace industry, fills an important niche in the construction industry. It was developed in partnership with the Swiss Federal Laboratories for Materials Science and Technology EMPA. An ecological material with very low thermal conductivity (28 W/mK), it reduces the energy needed to heat older buildings while preserving the original appearance of the façade.

Unlike polystyrene, this external insulation material is natural and free from chemicals, and does not affect the aesthetics of the façade.

www.fixit.ch



Studer Innotec



Access to Electricity for All

1.6 billion people in the world are not connected to an electric grid. The Studer Innotec company develops a range of inverters; a power electronic device that makes it possible to flexibly manage the power flow between renewable production – mostly solar – and consumers. This system ensures a continuous supply of electricity by alternating between a battery, renewable energy production and sometimes the grid. Studer Innotec inverters, which are widely used in Africa and Asia, have proven ideal for isolated areas. They are also used in off-grid buildings, such as mountain huts, in-vehicle systems and emergency power supplies for hospitals and industry.

The solar inverters market is growing rapidly to keep pace with the proliferation of photovoltaic installations and an increasing desire among consumers for self-sufficiency, whether on- or off-grid. As products are becoming increasingly complex, Studer Innotec has decided to get closer to its customers by setting up several technical hubs, for example in India and South Africa. Studer Innotec has carried out dozens of installations throughout the world, particularly in Bangalore (South India), where large fluctuations in voltage often disrupt the operation of industrial equipment. Coupled with solar panels, the Studer Innotec devices create the conditions for equipment to perform properly despite fluctuations in the main power supply.

www.studer-innotec.com



CAN TECH SAVE THE WORLD AND ART HEAL IT?

As technology advances at an unimaginable pace, humanity has begun assuming planetary functions that are much beyond its ken with faint awareness of the collective responsibilities that accompany such power. Through the many instruments it utilises to sustain its lifeworlds, it has become an entity whose spheres of influence ranges from the land it lives on to the air it breathes to survive.

While we have been growing conscious of our impact for over half a century, knowledge systems that project the vulnerabilities of both human and non-human actors as a result of our actions are still marginalized for the pragmatic benefit of the ideals that guide industrial logic and free market capitalism.

The extinction risk that accompanies the rise in global temperatures has been central to the accompanying discourse since the moment humankind became aware of this eventuality but the tale of anthropogenic extinction events predates civilisation. What has changed in the last century is an increased recognition of the interdependence of different faunal and floral species towards sustaining the world as we know it.

The preservation of biodiversity has to become central to the designing of human-centric infrastructures and towards this goal the projects exhibited here work towards inculcating empathy towards the vulnerability of non-human life and consciousness towards the manmade factors that threaten them.

The role that technology can play in developing this consciousness cannot be understated and the application of digital tools to narrate the stories of extinct or vulnerable species illustrates BeFantastic's faith in the reappropriation of innovations that have been created to serve humanity's needs and desires towards the welfare and benefit of all life.

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Used to be my Home too

Marc Lee (Switzerland)

For enthusiastic human observers, the sight of wildlife amidst the stark artificiality of the everyday surroundings can be a source of excitement and hope. In the vast expanses of concrete, brick and mortar, that burgeons radially as it does vertically, where our species have found an uneasy comfort, we are often unaware of the ghosts that haunt the cities we inhabit. While contemporary discourse around nature conservation guides our thoughts to be sensitized to the phenomenon of extinction, it can still be difficult to imagine the variety of lives that have shared our homes across time, whose entire species have ceased to exist because of the radical evolutionary pressures imposed on them because of our human activities.

Many species have already become extinct, and plant, animal and fungi populations continue to rapidly decrease across the planet. Is our globalised vision of the world perpetuating homogeneity at a rate at which only domesticated life might have a place in it in the near or distant future? And what effects might such a homogenisation have on our lives and environments?



Used To Be My Home Too is a digital monument to the species that have been bargained to seat humanity as an evolutionary force for other life on Earth.

In this experiment, we are virtually transported via Google Earth to locations of recent sightings of wildlife that have been observed in real time by participants on iNaturalist.org, where we are allowed a moment to register other species who once inhabited this area whose extinctions have been recorded on IUCN's RedList.org.



The Vanishing World

Iskandar Goh (Singapore)
Suma Dodmani (India)
Subhash Maskara (India)
Amanda Chen (Singapore)
Mentor: Marc Lee (Switzerland)

Despite its frequent appearances across popular culture, the progressive destruction of biodiversity is a global disaster that is often overlooked due to its distance from everyday life. The scores of flora and fauna that are under threat of extinction often do not inhabit areas populated by humans today, and the crisis levels of each species reach most people infrequently as statistics or reports in the science pages of newspapers and magazines.

The physical distance can encourage apathy necessitating mechanisms to bring the urgency of the matter closer to home.



The Vanishing World is an interactive documentary exhibition that hopes to evoke empathy through the active engagement of the viewer while elucidating the gravity of the situation.



museTogether

Ajaibghar, Uma Khardekar (India)
 Jyothi Sridhar (India)

Human consciousness has allowed for us to create artificial collaborators whose potential for intelligence far surpasses our own, thus complementing and accentuating our musings. We forge ahead with a positivist belief that this intelligence is capable of joining us in the ongoing dance to find balance with our ecosystems and helping us leapfrog into a radical, open and optimistic future.

With the global climate emergency as the central curatorial provocation, the collaborating artists present museTogether, an assemblage of eleven imaginings of our collective futures, as a fantastical artwork that is simultaneously utopian and dystopian. Commissioned as part of BeFantastic's annual TechArt Fellowship program - BeFantastic Together, the creation of this interactive art piece relies heavily on the Fellowship's core exploration of Artificial Intelligence (AI) and Machine Learning (ML) tools and technologies to tell provocative stories of the climate emergency.

This innovative technology also offers the potential of triggering multiple layers of storytelling as the human viewer frames different levels of detail from near and afar, through the machine's eye.



museTogether presents the opportunity to view these unusual and other worldly visual artworks borne out of a collaborative process between human artist and the machine's intelligence. More excitingly, with the aid of a viewfinder from their personal mobile devices, audiences will be able to delve deeper to interact with each of the eleven digital pieces, each with their own stories. This innovative technology also offers the potential of triggering multiple layers of storytelling as the human viewer frames different levels of detail from near and afar, through the machine's eye.



BeFantastic.in

About BeFantastic:

Established with a firm belief in the UN's Sustainable Development Goals, BeFantastic is an organisation that has worked to bring together artists, technologists and other changemakers to critically engage with issues such as climate change through TechArt. BeFantastic strives to harness digital advances to foster a global community that is inspired by the revolutionary capacities of new media. It is particularly interested in open-source technologies, and the creative and social applications of Artificial Intelligence (AI) and Machine Learning (ML).

BeFantastic Together

At the heart of BeFantastic's programming is its flagship fellowship programme, which was titled BeFantastic Together in 2021. The fellowship brought together 60 artists, technologists and climate action enthusiasts from 7 countries to collaboratively reflect and respond to different aspects of the climate emergency through the use of AI and ML. The programme was also extended to 10 students from Singaporean universities, giving them the opportunity to work alongside professionals from these different fields. The cohort was mentored by creative technologists who have undertaken pioneering projects, including Marc Lee from Switzerland and Ong Kian Peng from Singapore. The programme also featured robust Dialog Sessions, on topics ranging from TechArt practices motivated by climate justice to women leadership in TechArt. The fellowship was conducted online and has resulted in 11 projects representing the concerns of individuals from around the world with respect to the climate emergency.

Four of these projects are represented in this exhibition.

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