



LIECHTENSTEIN
GROUP

Annual Review



2021



**LIECHTENSTEIN
GROUP**

Annual Review 2021

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Our vision

Feeding the growing population of the world, climate change and the decline in biodiversity are *the* global issues of our time.

Through our entrepreneurial activities, we are contributing to overcoming these challenges.

Our sectors



AGRICULTURE & FOOD



FORESTRY



RENEWABLE ENERGY



REAL ESTATE

Our principles



INNOVATION

Constant innovation drives improvements across our portfolio and beyond.



SUSTAINABILITY

Commercial success must always be aligned with environmental and social objectives.

*Ladies and gentlemen,
friends and colleagues,*

Over the past year, we unfortunately continued to face the significant challenges posed by the Covid-19 pandemic. Yet, just as we did in 2020, through 2021 we worked effectively to overcome these challenges together, and I am delighted to report that, despite coronavirus, the past fiscal year has been yet another successful year for the Liechtenstein Group. Our corporate reorganization, which occupied a great deal of our attention in the past few years, reached a successful conclusion and, in the third quarter, RiceTec was the final enterprise to be integrated into the Liechtenstein Group. Our new organizational structure now paves the way for us to move forward on our established growth path at an even faster pace.

May I extend my warmest thanks to all those involved in the successful integration of business operations into Liechtenstein Group.

A YEAR FOCUSED ON NEW INVESTMENTS

During the course of the past year, we succeeded in further developing our existing enterprises, as well as taking on a number of exciting new investments in our distinctive verticals. Details of our investment activities can be found on the following pages. Going forward, our plan is to invest further in fast-growing companies with the aim of positioning the Liechtenstein Group on an even broader foundation. In this context, it is important that such businesses are a good fit for our portfolio, and we need to be convinced that we are the right owners for these. New investments will only be made if we have the relevant know-how and networks, and if we can add value as well as generate intercompany synergies.

WE AIM TO FURTHER DEVELOP OUR CORPORATE CULTURE

Another objective is the further development of our corporate culture, based on the principles of sustainability and innovation. In our particular industries, a long-term and holistic perspective is needed in order to take appropriate account of ecological, economic and social aspects.



Going forward, we will continue to promote the exchange of views and ideas and collaboration between our enterprises; this strengthens a sense of cohesion and fosters innovation within companies. Our Code of Conduct, published last year, provides additional guidance on priorities in our day-to-day work; we aim to work with enthusiasm, we are curious and willing to break new ground, and in our dealings with colleagues, clients and suppliers, we are transparent and respectful.

SIGNIFICANTLY IMPROVED COMMUNICATION CREATES ADDED VALUE

I am also especially delighted to report that, over the past few months, we have implemented significant improvements in our internal communications. Besides the newly launched Newsletter, this year for the first time, our Annual Review is being published in adapted magazine form and will hopefully provide an even greater insight into the Liechtenstein Group's diverse activities. Moreover, going forward, the Annual Review will be dedicated each year to one of the Group's four verticals. This year, for the first time, and appropriately following on from the LIECO Forum, our focus will be on forestry. As you read the Review, you will have the opportunity to read numerous interesting reports on this key area of the Group's operations. And, also for the first time, we will be reporting in detail on the philanthropic projects we support.

I would like to extend my heartfelt thanks to you all for another year of outstanding service under difficult circumstances. May I wish you all the very best, good health and every success for the year ahead!

CONSTANTIN LIECHTENSTEIN
CEO & Managing Partner

CODE OF CONDUCT:

In the summer of 2021, the Liechtenstein Group published its Code of Conduct. This serves as a common guideline worldwide for the Group's executives, employees and stakeholders, setting out policies for day-to-day business, and compliance with shared values and principles. All employees are required to comply with the business principles contained in the Code of Conduct.

Our Code of Conduct can be found here:



Austrian heritage, *global presence*

The Liechtenstein Group is owned by the Princely Family of Liechtenstein and headquartered in Vienna. We manage a portfolio of companies, operating globally in the sectors of agriculture & food, forestry, renewable energy, and real estate.

→ RICETEC
TEXAS, USA

→ HUNTER REAL ESTATE
→ ELV ASSOCIATES
BOSTON, USA

→ RICETEC
BRAZIL

→ PARELMO
URUGUAY

→ LÜRSSEN (LIECO)
→ TESVOLT
GERMANY

→ RHONE REAL ESTATE
SWITZERLAND

→ NTG
SPAIN

→ RICETEC
INDIA

→ ESTATE AND FORESTRY OPERATIONS
→ ORGANIC ESTATE OPERATIONS
→ RENEWABLE ENERGY
WIND POWER
→ PRINCELY WINERY
WILFERSDORF

→ KALWANG FOREST
→ RENEWABLE ENERGY
HYDRO POWER
→ LIECO
KALWANG

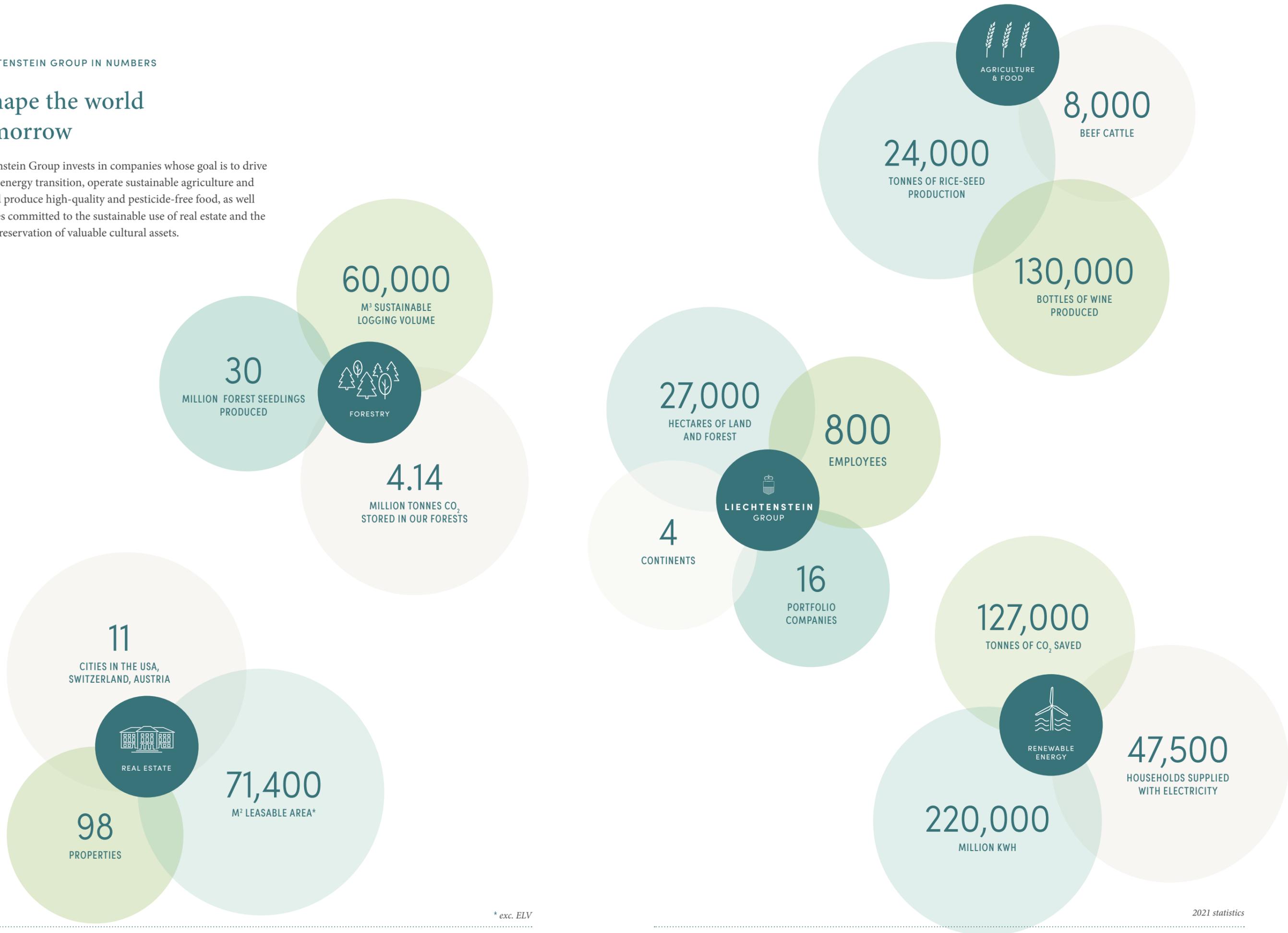
→ LIECHTENSTEIN GROUP
→ REAL ESTATE VIENNA
VIENNA

→ PRINCELY WINERY
VADUZ, LIECHTENSTEIN

→ PV-INVEST
KLAGENFURT

We shape the world of tomorrow

The Liechtenstein Group invests in companies whose goal is to drive forward the energy transition, operate sustainable agriculture and forestry, and produce high-quality and pesticide-free food, as well as companies committed to the sustainable use of real estate and the long-term preservation of valuable cultural assets.



* exc. ELV

2021 statistics



New investments 2021

We pursue a long-term investment strategy with an international orientation, focused on the core sectors that we know and understand.

We see ourselves as a provider of capital and long-term partner with both operating experience and strategic competence in our sectors.



Ladies and gentlemen,
friends and colleagues,

The past year was a very successful one for the Liechtenstein Group. We actively explored our existing areas of business for new investment opportunities, and expanded our portfolio by adding new enterprises.

Before we enter into an investment, the target enterprise undergoes a detailed due-diligence review. Here, topics such as market and competitive position, finance and tax, legal issues and management quality are thoroughly examined. We invest in enterprises that complement our portfolio in a meaningful way and enable synergies – innovative and fast-growing companies managed sustainably from an economic, social and ecological perspective. From the hundreds of prospective investments available to us, in 2021, following in-depth analysis, we entered into three very exciting partnerships, and more are close to conclusion.

May I take this opportunity to offer my warmest thanks to our dedicated Investment Team, which always engages with the relevant specialist fields full of motivation, enthusiasm and absolute professionalism!

In the area of Renewable Energy, in March 2021 we acquired an investment in PV-Invest, an Austrian solar-power developer and operator, active in eleven countries in western and eastern Europe. The European solar industry has huge growth potential, and we aim to play an important role in this sector in future.

In addition, in November we invested in German company TESVOLT, a global leader in energy storage technology for the commercial and industrial sectors. The world needs strong energy storage solutions to achieve the transition to renewable energy sources, and it is our belief that TESVOLT, as a technology leader in this sector, will play a vital role in the market.

In the agricultural sector, in December we invested in the Spanish Nature Talent Group, a biotech firm supplying customers in over forty countries with cutting-edge biofertilizers, biostimulants and bio-protection products. The bio-input market is one of the fastest-growing areas of agriculture, driven by the necessity to reduce the environmental footprint of agricultural production.

At the end of the year, we also made a strategic investment in Anterra Capital, a venture capital fund invested in young and innovative agtech companies. We are convinced that through this cooperation we will gain access to attractive networks and have the potential to make co-investments in agricultural technology firms.

Our new investments for 2021 already present exciting synergy opportunities in relation to our existing portfolio enterprises. TESVOLT, for example, with its energy storage systems, perfectly complements those companies producing electricity from renewable energy sources. Through its products, NTG is able to create solutions for RiceTec customers and thus complement RiceTec's products.

We look forward to researching and developing these new opportunities jointly with our employees, and we will continue on our path of supporting the growth of sustainable and impact-oriented enterprises in our four investment areas.



JOHANNES MERAN
CIO & Managing Partner



Fewer chemicals in agriculture and forestry

Why we invested in Nature Talent Group

The increasing importance of sustainable agriculture, the need to reduce emissions from food production, and regulatory pressure in the direction of biological solutions have brought double-digit growth to the market for biologicals* over the past ten years. Furthermore, the demand for products that can deal with the increasing pressure of abiotic stress – still the greatest challenge faced by farmers, with global harvest losses of over USD 20 billion annually – is driving demand for alternative input solutions. As sustainability-oriented investors, we advocate climate-friendly agricultural solutions that can improve crop yields and crop quality, reduce emissions and residues, and increase profitability for farmers.

In 2021, the Liechtenstein Group led an investment round in NTG (Nature Talent Group), a leading Spanish provider of biological solutions for agricultural and forestry systems.

NTG has a sector-leading product portfolio of biofertilizers, biostimulants and bioprotection products. The company supplies customers in over 40 countries, focusing on the Spanish and Latin-American markets as well as countries of the Middle East and North America.

NTG is the parent company of Biobab, a research and development enterprise based in the Canary Islands, Spain, specializing in research and development in residue-free high-tech bio-input solutions, and also of Legume Technology, a research, development and distribution company based in Nottinghamshire, UK, which develops, produces and sells microorganisms for legumes. NTG is also the parent of Green Universe Agriculture (GUA), a production and distribution company headquartered in Madrid, with subsidiaries in Chile, Mexico, Colombia and Peru.

Our partnership with NTG aims to support the company's ambitious growth plans, to promote its research and development activities, and to assist in expansion of the company's global commercial operations. In addition, we will also examine and promote potential synergies with our existing portfolio companies.

The market for biologicals* presents immense future growth potential. On the one hand, farmers are asking for new tools to reduce their dependency on chemical products, cut their environmental footprint, and assist them in creating more profitable, biodiverse and resilient ecosystems. At the same time, consumers and political decision-makers are demanding more nutritious and naturally grown food and a greater respect for the environment. We look forward to playing an active role in the growth and transformation of the bio-input sector, and believe NTG to be the perfect partner for us on this journey.

**Biologicals are products of non-chemical or synthetic origin which protect plants against disease or pests, or which support and stimulate the vitality or performance of a plant. They consist of either bioprotection products or biostimulants.*



JORGE FERNANDEZ VIDAL
Investment Director
Liechtenstein Invest GmbH





In combination with flower meadows or grazing animals (preferably sheep), PV plants can indeed support soil regeneration.

Success with solar photovoltaics

Why we invested in PV-Invest

The ever-more-conspicuous effects of climate change, greater environmental awareness in large parts of the population, rising energy prices and a shortage of fossil fuels are the backdrop against which energy must be generated over the coming years. Added to this is the steadily increasing demand for electricity. The International Energy Agency expects total electricity production to increase more than two-and-a-half fold between now and 2050. All these parameters are leading to significant demand for electricity production from renewable energy sources.

WHY INVEST IN THE PRODUCTION OF RENEWABLE ENERGY?

We believe that the use of renewable energy will continue growing for a variety of reasons. These include rules on carbon emissions, ever greater

economic feasibility, and supportive legal framework conditions worldwide. Moreover, there is a need to mitigate the environmental and social impacts of conventional production technologies and achieve independence from energy imports.

PV-INVEST – MORE THAN A PORTFOLIO OF PHOTOVOLTAIC PLANTS

PV-Invest operates in eleven countries and covers the entire medium-sized PV power plant cycle – from development, planning and finance, to the construction and operation of photovoltaic plants. The company was founded in 2009 and was an early mover in the Austrian and European renewable energy sector. Through a merger in 2016 with KP Solar (a leading Austrian enterprise active in the engineering, procurement and construction of solar plants), PV-Invest secured additional know-how



in project development and the construction of photovoltaic power plants on a usable scale. PV-Invest has invested over EUR 100 million and issued 14 bonds and joint investment products to over 4,000 private and institutional investors. It owns over 90 PV plants and small hydropower plants.

FRESH CAPITAL FOR BUILDING A PORTFOLIO

We are looking forward to advancing the energy transition together with Managing Directors Gerhard Rabensteiner and Günter Grabner and the team at PV-Invest by building a European portfolio of photovoltaic plants and expanding our engineering, procurement and construction (EPC) business.



STEPHAN LANGER
Investment Director
Liechtenstein Invest GmbH



Solarpark Friesach, Carinthia



11

COUNTRIES

91

PV AND SMALL
HYDROPOWER PLANTS

58.8

MWp INSTALLED OUTPUT

Enabling the green energy transition

Why we have invested in TESVOLT

A massive expansion in clean electricity production is vital if the world is to achieve its net-zero targets. However, the growth in renewable energy is exerting immense pressure on existing network infrastructure. Added to this is the fact that the use of electromobility has increased rapidly over the past ten years.

ENERGY STORAGE IS THE SOLUTION

We believe that efficient and reliable energy storage systems are the way forward and that these will play a key role in the transition to renewable energy use. In particular, the market for commercial and industrial energy storage is likely to show impressive growth (>30% p.a.), firstly as a result of lower costs for battery storage systems, secondly due to the increasing number of economically viable applications, and thirdly thanks to political and social support measures for the energy transition. Irrespective of whether companies wish to become entirely independent of the grid, through a combination of clean energy sources such as photovoltaics, wind or cogeneration plants, or merely wish to increase consumption of self-produced green

electricity, whether they need back-up electricity or wish to avoid costly peak loads, intelligent energy storage systems act as enablers in many applications.

IMPLEMENTING CLEAN ENERGY GLOBALLY

When Daniel Hannemann and Simon Schandert founded TESVOLT in 2014, their aim was to develop and manufacture battery systems that store electricity from renewable energy sources with optimum efficiency. The company's founders worked on their own battery management system with the aim of making their products as durable and economical as possible. Indeed they succeeded in this aim, since TESVOLT's award-winning Active Battery Optimizer (ABO) ensures that commercial and industrial storage systems pay for themselves after just a few years. Today, TESVOLT produces its storage solutions in Germany and supplies them to customers worldwide. In addition to the patented battery management system, TESVOLT's energy storage systems have other unique competitive advantages, such as their battery monitoring system (Batmon) and the TESVOLT energy man-



Production of battery storage systems at TESVOLT's gigafactory in Wittenberg, Germany, is carbon neutral.

ager. They also feature lower standby consumption, higher economic efficiency, up to twice the service life, and a far greater flexibility of application compared with competitor products.

FUNDING ROUND SERVES AS AN ENERGIZER

We are delighted to be working together with TESVOLT to further develop the company and accelerate the transition to a new era of renewable energy. By radically reducing our customers' environmental impact, supplying back-up electricity and saving costs, we are providing them with new business opportunities.



The patented battery management system Active Battery Optimizer ensures optimum charging and discharging of battery cells.



TESVOLT-founders Daniel Hannemann and Simon Schandert

"Our aim is to bring affordable, clean energy to every corner of the world, even where people have no access to the power grid."



FRANZ SCHALL
Investment Associate
Liechtenstein Invest GmbH





How is *sustainability* lived in the Liechtenstein Group?

Why is sustainability important to you personally?

The Liechtenstein family has always pursued a long-term, holistic approach and thinks across generations. As the father of three children, I am committed to ensuring that they grow up in an intact environment, and I am convinced that, to achieve this, we must make careful use of our resources. For this reason, sustainability is also

very important to me personally. As entrepreneurs, we should give thought to the impact of our entrepreneurial activities on people and the environment. Sustainable entrepreneurship represents the only right path to long-term success. The short-term maximization of profit at the cost of social and environmental aspects is not desirable, as it causes irreparable harm.

How is sustainability implemented in the Liechtenstein Group?

The companies of the Liechtenstein Group have already engaged for many years with sustainability issues, and indeed we can report a number of impressive success stories. For example, through RiceTec, we are producing rice seed that requires less water and fewer pesticides.

We have also implemented various biodiversity and nature conservation projects within our Austrian operations over the past few years. We

are active too in the areas of afforestation and renewable energy, where we aim to make positive contributions to combating climate change.

Are the projects characterized by particular thematic or regional differences?

Yes, they are, since thematic features and regional circumstances have to be taken into account, and there is a need to consider the economic development status of a country. In Asia, for instance, our priorities are not the same as in Austria. RiceTec is a good example; in India, besides achieving a higher income for farmers, the aim is to ensure food security. In Austria, on the other hand, our activities focus very much on environmental issues, in particular protecting biodiversity.

We also read and hear a lot about sustainability as 'ESG' – to what extent do you view this as 'old wine in new bottles'?

The term 'ESG' (Environmental, Social, Governance) originates from the financial sector and is used to assess companies according to environmental, social and corporate governance criteria. Here, companies like Blackrock, and also LGT, are pioneers in this regard. Generally, I welcome greater engagement on the part of the financial sector with sustainability issues, since this will hopefully lead to more capital flowing into companies with sustainable operations. However, in recent years the term 'sustainability' has been used excessively and is indeed also misused. Nowadays, almost every company declares its commitment to sustainability, while often merely engaging in 'greenwashing'. In any event, for the Liechtenstein Group and its companies, the principle of sustainability is not a new one, and we have been engaging with it for many years.

What opportunities and challenges arise for the business operations of the Liechtenstein Group from a sustainability perspective?

Every area of business in the Liechtenstein Group presents opportunities and challenges in terms of sustainability. Undoubtedly, one of the greatest challenges is the sustainable production of food for a growing global population during times of climate change. Generally, we in the Liechtenstein Group naturally want to make continual improvements and also make the impact of our activities measurable, very much in accordance with the "only what is measurable is manageable" principle. In this regard, going forward we aim to take an even more fact-based and scientific approach.

Which key sustainability issues can be influenced through the business activities of the Liechtenstein Group?

Above all, we can have direct influence in the area of environmental sustainability. The production of clean energy, less use of pesticides and fertilizers, as well as wildlife conservation, are areas in which we are very engaged.

Do you worry that sustainability could also have a negative impact on the earnings of particular business sectors?

No, quite the opposite. I am convinced that sustainable economic management has a positive impact in the long term on the value of an enterprise or asset. We should not forget that there is also always an economic side to sustainability; businesses that operate sustainably will be in a position to better address environmental and social issues. If you are a loss-making business, or depend entirely on subsidies, over the medium term you run the risk of having to reduce your workforce or compromise on

"SUSTAINABILITY" – A CONCEPT IN FORESTRY

Hans Carl von Carlowitz (1645 – 1714), Chief Mining Administrator (*Oberberghauptmann*) from Freiberg in Saxony, is considered the father of the sustainability principle. Carlowitz first coined the term in 1713, in the face of an impending raw material crisis, in his work *Sylvicultura oeconomica*, describing what he referred to as 'respectful forestry'. Only as much timber should be felled as could be regrown through planned reforestation, sowing and planting. To this day, there is still no firm consensus on a standard definition of 'sustainability'.

www.nachhaltigkeit.info



CEO Constantin Liechtenstein

environmental protection measures. This then has a negative impact on environmental and social sustainability.

In which areas of the Group do you consider sustainability to be most important in relation to society?

I believe we are already making a positive contribution, in particular in our three business areas of Agriculture & Food, Forestry, and Renewable Energy. Sustainable food production, or carbon capture through afforestation, are important socio-political topics with which we are fully engaged. In terms of philanthropic activities, we have also supported some excellent social projects: in Austria Sindbad*, and in India, Read India*.

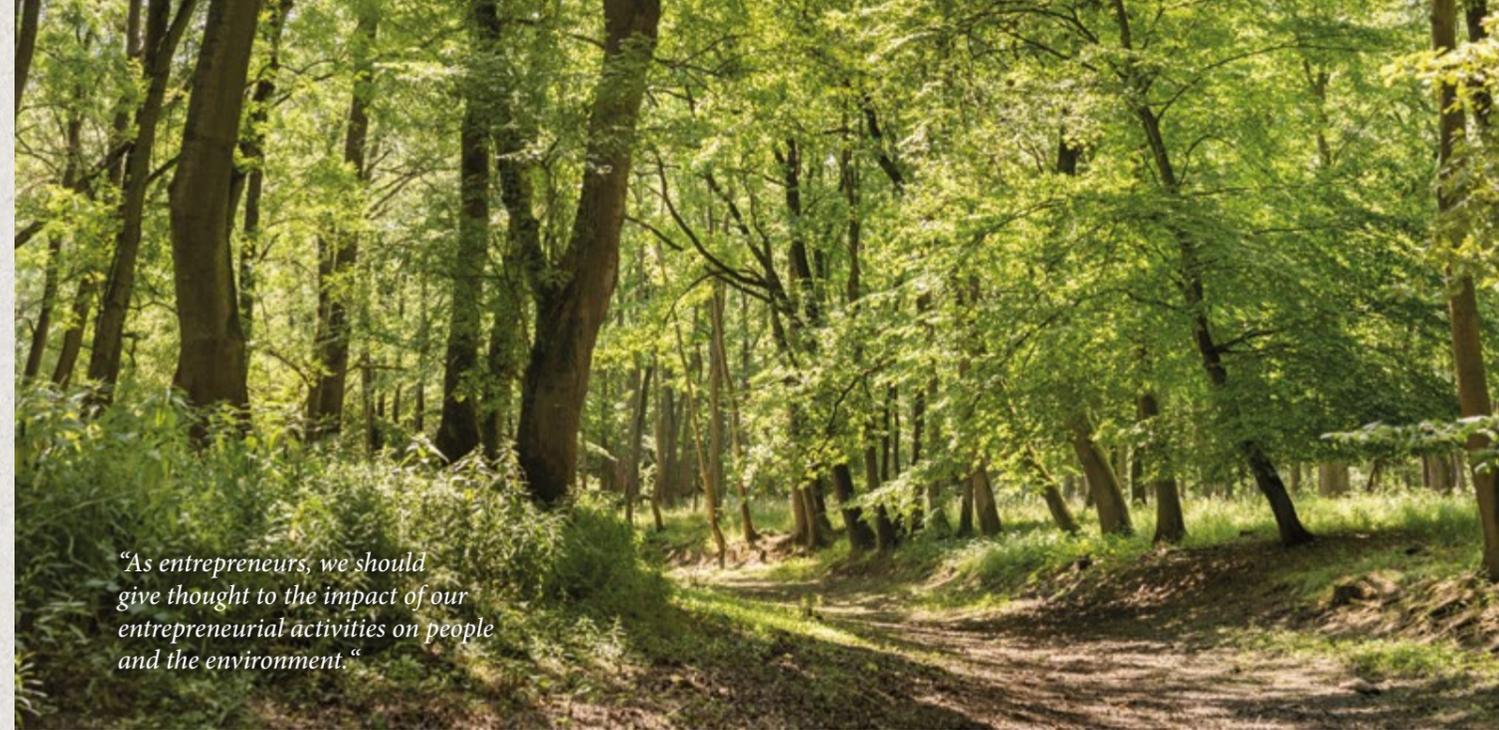
Are there other areas of activity in which you would like to be more involved?

I think, overall, that we are well positioned with our current areas of activity. One area in which we will engage more intensively, going forward, concerns sustainable real estate (*see pages 78 and 80)

concepts. These present some extremely interesting opportunities in which we are keen to invest, provided the fit is right. We focus here on energy and resource efficiency solutions, as well as innovative construction materials. I am convinced, for example, that, in future, timber construction will gain significantly in importance, since timber as a construction material has a substantially better carbon footprint than concrete or cement.

To what extent does the holding company serve as a role model? How can the Group's headquarters truly make a difference?

The primary function of the holding company is to support the businesses strategically and invest in new opportunities that synergize with our core sectors. In addition, the holding company manages areas such as finance, controlling and communication. We primarily see ourselves as service providers for our operations and enterprises, and also provide overall guidance and direction. This is done in close collaboration with the Board and our owner.



“As entrepreneurs, we should give thought to the impact of our entrepreneurial activities on people and the environment.”

What, how and where can employees contribute if they wish to commit to sustainability?

Every employee can make their own positive contribution towards ensuring that the Liechtenstein Group makes even greater progress in terms of sustainability. This could be through new ideas and projects. We welcome the reflections of our employees and invite them to share their ideas with us.



JOIN THE TEAM!

The Liechtenstein Group is always looking for new employees who share our vision and can strengthen our team through their motivation, innovative ideas and a strong sustainability mindset!

Contact us by mail at HR@lgroup.com

17 UN SUSTAINABLE DEVELOPMENT GOALS

In the Liechtenstein Group and its portfolio enterprises, we apply the UN Sustainable Development Goals (SDGs), which function as universally recognized guiding principles for sustainability activities. For information, the UN SDGs are also set out in this year's Annual Review.

The 2030 Agenda for Sustainable Development, adopted by all United Nations Member States in 2015, provides a shared blueprint for peace and prosperity for people and the planet, now and into the future. At its heart are the 17 Sustainable Development Goals (SDGs), which are an urgent call for action by all countries – developed and developing – in a global partnership.

<https://sdgs.un.org/goals>

THE GLOBAL GOALS
For Sustainable Development





Agriculture & Food

By 2050, the global population will have risen from 7.8 billion to just under 10 billion. There will be 2 billion more people to feed, while conserving resources to the maximum possible extent. In this context, we attach particular importance to water management, regenerative agriculture, the reduced use of pesticides and increased use of biologicals, as well as the promotion of biodiversity.

In agriculture and food, we are therefore focusing in our global activities on the production of high-quality food and on resource-saving and future-oriented production and cultivation methods.

Our investment focus encompasses all levels of the food supply chain, concentrating on production and technology.



OUR PORTFOLIO

Agriculture & Food



RiceTec is a world-leading agricultural technology business operating in rice-seed production.

Locations: Texas, USA (headquarters), Uruguay, Brazil, India

CEO: Mike Gumina

Employees: 450 permanent, 280 temporary

Production area: 1.5 million hectares commercial rice-seed

Markets: USA, Mercosur, India; exports to countries including Mexico, Belize, Colombia, Spain, Bangladesh, Vietnam

www.ricetec.com



Winfersdorf Estate Operations are the largest owner-operated arable farm in Austria.

Location: Winfersdorf, Austria

Director: Hans Jörg Damm

Employees: 14-22, seasonally dependent

Production area: 2,500 hectares

Markets: Austria, Italy, Germany

www.liechtenstein-winfersdorf.at



Lichtenstein Organic Estate Operations are currently in a conversion phase. From 2023 they will begin producing high-quality organic food.

Locations: Katzelsdorf and Niederabsdorf-Ringelsdorf, Austria

Managing Director: Markus Fassler

Employees: 1-3, seasonally dependent

Production area: 460 hectares

Markets: Austria, Germany



The Winery of the Prince of Liechtenstein, comprises vineyards in both Austria and Liechtenstein, as well as Restaurant Torkel, which have been in the ownership of the Princely Family for over 500 years.

Locations: Vienna and Winfersdorf, Austria; Vaduz, Liechtenstein

Managing Director: Stefan Tscheppe

Employees: 30-45, seasonally dependent

Production area: 44 hectares

Markets: Europe, Asia

www.hofkellerei.com



Parelmo is an agricultural business specializing in the production of high-quality meat from pasture-fed cattle (c. 8,000 beef cattle, with the addition of sheep from 2022), maize and soybeans.

Locations: Santa Maria Farm in Flores, Uruguay, La Esperanza Farm in Durazno, Uruguay

Director: Ronald Beare

Employees: 13

Production area: 7,408 hectares

Markets: China, Europe, Israel, USA and others



NTG is a leading Spanish provider of natural, residue-free, high-tech biofertilizers, biostimulants and bioprotection products for agriculture and forestry.

Locations: Madrid, Spain (headquarters), Chile, Mexico, Colombia, Peru

CEO: Ignacio Horche

Employees: 73

Markets: Spain, Morocco, Egypt, Colombia, Peru, Chile, Mexico, Italy, UK, Portugal

www.greenuniverse.es

FOR A SUSTAINABLE INDUSTRY:

RiceTec focusing on *intelligent seed* and *social engagement*

Rice is one of the world's most important staple foods. Supplying the growing global population with high-quality rice can only be achieved through a significant improvement in harvest productivity. By 2050, global rice productivity will need to increase by up to 70% to keep pace. RiceTec is committed to supporting farmers with new technologies and programs, at the same time improving the sustainability of the entire industry. The objective is to achieve higher yields, improved grain quality, lower demand for water, fewer greenhouse gas emissions and a lower overall energy requirement for rice production.

Despite the continuing challenges posed by the coronavirus pandemic as well as difficult weather conditions, RiceTec can look back on a successful year during which, in line with its core corporate values, the company created positive added value for employees, farmers and the communities in which it operates.

PRODUCT LAUNCH: INTELLIGENT RICE CONSERVES RESOURCES

At the end of 2021, RiceTec introduced its SmartRice™ onto the consumer market, a product to engage consumers in the sustainability story, promising more efficient use of soil and other resources thanks to a higher rate of photosynthesis and a natural tolerance of pests and diseases, and having a lower consumption of water, nitrogen, and pesticides. The same quantity of rice can be produced from an area that is 15% – 20% smaller, and in terms of nitrogen utilization, efficiency is improved by 15% – 20%. SmartRice™ is expected to cut greenhouse gas emissions by 36%, and cut water usage by up to 30%. Currently, agriculture consumes around 70% of available freshwater, and all the signs are that water will become more and more scarce.



SMART RICE



The aim is to achieve higher yields while at the same time using fewer resources

WORKING FOR THE COMMUNITY

RiceTec attaches great importance to social engagement in the local communities where it operates. For example, during the coronavirus pandemic, as part of its commitment to the health and wellbeing of employees and farmers, Savannah, the Indian arm of RiceTec, covered the costs of COVID-19 vaccination for all permanent employees and their families. Protective equipment against COVID-19 was also distributed to staff and seed-producing farmers. Coverage of hospital costs in the event of hospitalization with COVID-19 was included in the health insurance of all Savannah employees.

In addition to COVID-19 prevention, Savannah is generally active on various health issues, for instance organizing webinars focusing on nutrition, good postural habits when working at home, health and nutrition for women, and other topics.

During lockdown, food was distributed to farming families near the Sonipat and Hyderabad research farms. As part of a fund-raising campaign for the Earth Saviour Foundation (an NGO working to help underprivileged members of society), employees donated food and other essential items such as clothing, blankets and the like.



MIKE GUMINA
CEO RiceTec



COVID-19 vaccination for Savannah employees



For the manual hybridization process, the rice ears are cut



Braford cattle on the Santa Maria farm



Gustavo Listello, Santa Maria farm manager, inspecting the cornfields

The beef cattle on La Esperanza Farm are kept on pasture all year round. Depending on weather conditions, their feed is supplemented with hay or a grain mixture. Parelmo is currently working towards certification of its cattle farming. This involves auditing the facilities of the farm, plus checking the availability of water on the pasture land and the suitability of the land for the needs of the cattle.

The second stage of the certification progress involves certifying that the Parelmo cattle are never given growth promoters (hormones) or antibiotics, nor feed containing ingredients of animal origin.

SEBASTIAN FARIELLO
La Esperanza-Farm Manager



An Angus calf is returned to its mother



Armadillos are also found on Parelmo farms

High-quality pasture-fed beef from Uruguay

Parelmo focusing on certified animal husbandry and sustainable agriculture

Parelmo continues to invest in the integration and development of its farms and, over the coming years, anticipates a substantial increase in beef production. This is all the more reason for the company to seek to implement strict principles of sustainable animal husbandry (such as rotational grazing) and sustainable agriculture in order to further reduce its environmental footprint.

NO TILLAGE

No-tillage farming is an agricultural technique for growing crops or pasture land without prior tillage. As a result, the soil absorbs water better, stores more organic material, and the nutrient cycle is improved.

NO BARE AREAS

Winter cover crops grow across all of Parelmo's agricultural land, helping to increase organic matter, reduce soil erosion and prevent the leaching of nutrients. They assist with weed control and provide a green area for wildlife.

CROP ROTATION

Crop rotation means that different plants are grown in succession on a plot to improve the health of the soil, optimize its nutrient content, and control pests and weeds.

MINIMAL USE OF SYNTHETIC FERTILIZERS AND PESTICIDES

Whenever and wherever possible, fewer and fewer chemicals are being used. New technologies are being analyzed that minimize the use of chemical pesticides and fertilizers.

MONITORING OF BIRD SPECIES AND ECOSYSTEMS

Bird species and populations serve as an indicator of a healthy environment. Their numbers and frequency on both farms are monitored to identify species and keep track of their populations.

SOCIAL ENGAGEMENT

Regular safety training has been shown to reduce the number of injuries and accidents at the company. In addition, support is provided for education and training initiatives. Parelmo is also involved in local communities and maintains contacts with neighbors and farming associations.



RONALD BEARE
Managing Director Parelmo



“We must spread the risk!” *Resilience through flexibility and sustainable management*



The agricultural sector is battling against drought

Rising temperatures and extreme, high-fluctuation climatic conditions are placing an enormous strain on agriculture. Long periods without significant precipitation, crops suffering from drought stress, and damage caused by drought are leading most of all to a significant fluctuation in agricultural yield and quality, depending on weather conditions. A record crop harvest in one year followed by a crop failure the next year is not an uncommon scenario. In order to achieve the best environmental and economic outcome, flexibility of crop rotation (proportion of winter crops and summer crops) needs to be improved in order to respond to changing levels of precipitation.

In order to meet these challenges, the Wilfersdorf Estate Operations (Gutsbetrieb Wilfersdorf) engage in regenerative agriculture, with the maximum-possible year-round greening of arable areas (main crop, cover crop), minimal soil tillage, straw left in situ, the targeted selection of nitrogen- and humus-promoting interim plant cover, and humus formation to prevent erosion.

In addition, special consideration is given to promoting and improving biodiversity, and in the first quarter of 2022, this will include an evaluation of biodiversity measures implemented to date. Following on from this, an analysis is then planned of potential optimization measures and their environmental and economic impacts. The project will be carried out in cooperation with leading experts.

Over the past few years, the importance of ensuring that the ventures of Wilfersdorf Estate and Forestry Operations rest on a number of different pillars – agriculture and forestry, nature conservation, renewable energy, tourism, hunting, fishing, rental and leasing activities – has become increasingly clear. The more diversified an agricultural and forestry business, the greater resilience it will have to deal with climate change, political developments, economic depression, pandemics, and other prevailing challenges.

Eight different crops* were grown at Wilfersdorf Estate Operations in 2021. This enabled weather-induced crop failures to be better compensated.



Oilseed rape: 2,600 kg/ha



Barley: 9,300 kg/ha



Wheat: 5,600 kg/ha



Winter durum wheat: 5,500 kg/ha



Summer durum wheat: 4,500 kg/ha



Maize: 8,600 kg/ha



Sugar beet: 74,000 kg/ha



Soybean (organic): 3,200 kg/ha

*Figures for 2021 harvest

ENVIRONMENTAL PROJECTS

- Extensive participation in the Austrian Program for Environmentally Sound Agriculture:
 - › Site-adapted varieties
 - › Large-scale winter cover planting for humus formation and to counter erosion
 - › Extensive biodiversity areas (annual and perennial), 15% of total area
 - › Wetland meadow and dry grassland management
- Conversion of arable areas into meadows
- Creation of wetland biotopes and hedges
- Regenerative agriculture
- 38-hectare bird reserve in cooperation with local ornithological association
- Extensive cooperation with an organic beekeeper

CERTIFICATES

- **DLG CERTIFICATE** for sustainable agriculture since 2008
- Only company in Austria to receive the **2020 ANDERS WALL AWARD** of the European Commission, Directorate-General for the Environment, Stockholm University and the European Landowners Organization



HANS JÖRG DAMM
Director,
Guts- und Forstbetrieb Wilfersdorf



BIO-GUTSBETRIEB LIECHTENSTEIN

Liechtenstein Organic Estate Operations remain in a conversion phase until 2023. Initial harvest results (though not yet organically certified) are impressive: 4.3 tonnes/ha winter wheat and 3.2 tonnes/ha soybeans were harvested in 2021. Winter barley and pumpkin will be added as further crops in 2022, and crop planning for the first year of organic production in 2023 is currently in full swing.

Wine-growing regions will change color

Drought and heat are changing the wine landscape

In the past, sharp climatic fluctuations – primarily irregular precipitation and extreme temperatures – have repeatedly led to premature budding of the vines. What this means is that temperatures rise earlier than usual, then the vines accordingly begin growing earlier following the dormant winter period, and their winter buds open. Thereafter, however, winter returns with a vengeance, and the buds are harmed by frost. This happened, for instance, in April 2016, leading to a subsequent crop failure of 50%.



Sebastian Gunsch, Head of Production at Vaduz, tending the vines

Hot summers are a challenge too. In the vineyards in the north-east region of Austria, in recent years the climate has become significantly drier, and maximum summer temperatures have risen by up to 3°C. Last year, during the summer months the volume of precipitation was extremely low and, as a result, the young plants became drought-stressed. This ended up delaying their first crop by a whole year.

The measures we are taking to address this include tilling the soil below every second row of vines and sowing special deep-rooting plants to regulate water balance. We also undertake regular and intensive work by hand on the canopy, i.e. the leafy part of the vine. Our aim in doing this is to ensure sufficient shading of the grapes to protect against scorching of the skin – which would alter their aroma – as well as to reduce evaporation in the event of drought, and ensure healthy aeration of the leaves and grapes. Over the long term, no doubt climate change will cause some of today’s typical white-wine regions to change color. In cooler regions where wine has never previously been grown, white wine is now being pressed. And where, previously, white wine was produced, looking ahead to the future we are likely to see more red wine since, as a result of global warming, the natural production of acid in the grapes is becoming more difficult to achieve in areas that are already very hot and dry. The high sugar gradation means high alcohol content which, in terms of taste, is expressed in alcoholic sweetness. This style of wine does not meet the expectations of most white-wine connoisseurs and so, for this reason, in future we can expect to see more red wines originating from these regions, while the white-wine regions will extend further northwards.



STEFAN TSCHEPPE
Managing Director,
Winery of the Prince of Liechtenstein



Princely Winery presents *new wines*



For the Winery of the Prince of Liechtenstein, 2021 saw a continuation of the limitations on wine marketing seen in 2020, particularly due to lockdowns in all sales markets and travel restrictions, with associated delays in the planned expansion of international distribution by the Princely Winery. However, due to the particular stylistic and qualitative emphasis of recent years, retail sales to private and corporate customers could nevertheless be significantly increased.

As a result of conversion to organic farming, further improvements in the typicity and quality of our wines can be expected in future. The 2021 vintage created ideal conditions for this, even though yields in Liechtenstein ended up a little lower due to hail.

In October, “Herrnbaumgarten”, a cuvée of Riesling and Grüner Veltliner, was presented as the first “village wine” in Vienna. Its big brother, “Karlsberg”, will follow in March 2022, spearheading the white wines characterized by origin made by the Princely Winery in Wilfersdorf. In Vaduz, the first “Grosse Reserve” from Herawingert has been bottled. This is setting new standards for Pinot Noir and will also be introduced in March 2022, initially in a limited edition and exclusively in 1.5-liter magnum bottles. The internationally acclaimed wines are available at locations including Restaurant Torkel in Vaduz, which has been awarded a Michelin star and 16 points by Gault Millau.



Vinification in the wine cellars at Wilfersdorf



The changing forest

Climate change has substantial environmental, economic and social impacts. With sustainable management, the forest becomes a carbon reservoir, preserver of our biodiversity and producer of a renewable resource.

We advocate active and sustainable forest management and afforestation using site-adapted tree species. This enables the forest to fulfil its climate functions.

As both a forest owner and owner of a leading provider of forest seedlings and forestry services, we have vast expertise in forestry. The many and varied applications of timber as a product and the environmental advantages of wood as a material in construction and industry are undisputed.

We invest in companies operating in the areas of forest seedling production, forest technology and forest services.



Forestry



The LIECO Group is a leading producer of high-quality containerized and bare-rooted forest seedlings and provides comprehensive forestry and forest-management services.

Locations:

LIECO: Kalwang, St. Martin im Innkreis, Austria
LÜRSSEN: Beverstedt, Großthiemig, Tempelberg, Westerwald, Germany

CEO: Oliver Hilpold

Managing Director: Christoph Hartleitner

Employees: 180-340, seasonally dependent

Production area: 335 hectares

Markets: Germany, Austria, Italy, Slovenia, Romania, Switzerland

www.liecogruppe.com



FORST KALWANG
LIECHTENSTEIN GRUPPE

Kalwang Forest is a forestry business in Styria engaged in the production and sale of high-quality softwood logs.

Location: Kalwang, Austria

Managing Director: Helmut Rinnhofer

Employees: 20

Production area: Total estate 13,364 hectares, of which 3,000 are protected forest

Market: Austria

www.forstkawang.at



GUTS- & FORSTBETRIEB
WILFERSDORF
LIECHTENSTEIN GRUPPE

Wilfersdorf Forestry Operations is a forestry business in Lower Austria, engaged in the production and sale of 90% hardwood and 10% softwood (> 30 different tree species), and also operator of Austria's oldest nature reserve.

Location: Wilfersdorf, Austria

Director: Hans Jörg Damm

Employees: 15-25, seasonally dependent

Production area: 3,560 hectares, of which 250 hectares consist of nature conservation areas

www.liechtenstein-wilfersdorf.at



TITLE STORY

Wrangling over the green lung

The summer of 2021 will go down in history as a season of weather extremes. Many experts are warning that this is just the beginning of climate change. In future, we are likely to see increased heavy rains, floods, storms and heatwaves worldwide, particularly if global warming is not kept at below 2°C. Forests react relatively slowly to changes in their environment and are therefore especially vulnerable to damage and disease. Should humans intervene, and what do current developments mean for the forestry sector?

Julia Holter in discussion with Helmut Rinnhofer,
Managing Director at Kalwang Forest (Forst Kalwang).

THE FOREST – A TRUE ALL-ROUNDER

Due to its multiple and vital functions, for many years a lot of demands have been placed on the forest in the global climate change debate. The forests of the earth form a complex ecosystem that is indispensable to both humans and animals. A “functioning” forest produces oxygen, cleans and stores water, prevents soil erosion, filters environmental toxins, provides a natural sound barrier and offers a vital habitat for numerous species of plant and animal on which, in turn, many other living organisms depend. Out of all habitat types on land, forests are currently believed to be home to the greatest species diversity. Approximately 4,300 species of plant and fungus, and an estimated 5,700 – 6,700 animal species are found in Central European beech forests alone.*

Forests are generally regarded on the one hand as gigantic carbon stores, and on the other as massive global climate regulators due to their evaporation capacity. Added to this, however, there is also the role of the forest as a contributor to the economy and provider of a renewable resource – a role considered controversial in some quarters.

This is where forestry makes a difference; if it has a sustainable focus, it acts to preserve sufficient areas of natural forest. No more is deforested than is afforested. For afforestation purposes, use is not simply made of fast-growing spruce or pine monocultures, but of site-adapted mixed cultures. Vital biotope wood is allowed to rot in the form of dead wood, thereby maintaining a healthy ecosystem. No toxic sprays are applied. Heavy machinery such as harvesters or timber transporters, which severely compact the forest floor, are used carefully and sparingly.

This is how Managing Director Rinnhofer describes the approach taken by his company in Kalwang, Styria: “The timber harvest at Forst Kalwang is largely undertaken using rope cranes, avoiding the need for machines to drive over and compact the forest floor. The removal of individual trees as part of thinning operations increases the amount of light and warmth reaching the forest floor, promoting the growth and diversity of ground

*www.nabu.de



cover. Our maintenance measures involve leaving the majority of the branch and crown mass in the forest, and nutrients and humus are preserved in the forest floor. Our interventions are therefore minimal and have no negative impact on the forest ecosystem.”

WHAT IS SEMI-NATURAL FOREST?

Environmental activists stress that, in most instances, we are a long way from achieving sustainable forestry, and increasingly criticize the lack of dense ancient mixed forests which are necessary for both climate and species protection.

“It is too simplistic to act as if the last two years of drought alone had caused this disaster. It is also a consequence of a forestry sector fixated for decades on softwood – in a country that once was naturally covered everywhere with mixed deciduous forest,” underlined German forest experts in 2019 in an open letter to the then German Federal Minister for Food and Agriculture, Julia Klöckner, following on from Germany’s National Forest Summit. The goal the German federal government set for itself, of permanently removing 5% of the forest from forestry use, was said to be unachievable, and it was claimed there was too much focus on the demands of the forestry sector. “It is not easy to admit that, for over 200 years, the emphasis was on the wrong type of timber tree (spruce) and that, moreover, as a result, artificial, environmentally highly unstable and thus high-risk forest ecosystems have been created. An entire sector of the economy has rendered itself dependent on softwood.”**

In the past, many forest owners relied on spruce or pine – easy to process, high-yield, and low-maintenance. However, numerous research findings and widespread spruce dieback now show that spruce will be among the big climate-change losers in many locations. Tending to have shallow roots, the species will have increasing difficulty contending with drought conditions. Even now, catastrophic forest damage is driving forest owners and forestry businesses to the point where they are scarcely any longer viable.

Generally, forests should be able to adapt as well and as quickly as possible to changing environmental conditions and extremes of weather. For this reason, forest experts believe that forest conversion, towards more stable, climate-fit mixed forests, is of particular importance.

**www.protect-nature.org

SPRUCE

To this day, spruce remains the most important forestry tree species in central Europe, e.g. for state-of-the-art wood technologies such as cross-laminated timber, and as the basis for wooden high-rise buildings worldwide. As a result of climate change, spruce is being pushed back to higher altitudes of both low and high mountain ranges.



What is the approach taken at Kalwang Forest? “Firstly, it must be said that Forst Kalwang lies in the area of the main Alpine ridge, at altitudes ranging from c. 800 to 2,400 m, within spruce-rich coniferous forest (inner Alpine spruce and spruce/pine area). The average precipitation is c. 1,300 – 1,500 mm per year. The vast majority of conifers would therefore be present anyway in the natural forest community and have not arisen through human intervention. In low-lying locations with sufficient soil moisture, beech, fir and sycamore maple complement the mixed coniferous stands. In higher mountain areas, larch and Swiss pine serve to enhance biodiversity as valuable and stabilizing tree types,” explains Rinnhofer.

Semi-natural forests with great diversity of structure and largely native tree species are thus the best equipped to face the future. But, in view of the speed of climate change, can the forest be left to heal itself through natural rejuvenation?

In the summer of 2021, representatives of the European forestry sector answered this question with a loud and clear “No!”. The controversial new EU Forest Strategy for 2030, one of the flagship initiatives of the European Green Deal, presented in July 2021, has been heavily criticized. At the forefront of the strategy is carbon storage in forests and the protection of biodiversity, and one of the ways in which this is intended to be achieved is through a reduction in forest areas available for wood supply (FAWS) by up to 10% of forestland.

In a joint declaration to the EU Commission in October 2021, European forest owners reaffirmed their rejection of the EU Forest Strategy for 2030. They called for a significant adjustment in terms of implementation, arguing that the objective for the future should be to enable realistic and targeted climate protection, and the retention of sustainable forest management.

“We are clearly committed to protecting the climate and biodiversity, and are making a significant contribution towards achieving this. The fact is that, since 1990, Europe’s forest area has grown by 14 million hectares, while stocks of timber have grown by 8.3 billion cubic meters of standing wood. All biodiversity-relevant parameters have improved. At the same time, our forestry and timber industry has evolved to become a highly important economic sector. In Austria alone, a 10% reduction in the resource base would entail a loss of EUR 1.75 billion in terms of total value added, along with 15,400 jobs in the forestry and timber industry,” warned Rudolf Rosenstatter, Chairman of the Austrian Forest Owners’ Cooperative, in a joint press release with the Austrian Chamber of Agriculture and the agricultural association Land&Forst Betriebe Österreich.

Helmut Rinnhofer shares this critical stance on a reduction in FAWS: “One of the principal functions of a mountain forest such as Forst Kalwang is the protective role of guarding against avalanches and floods. An adequate protective effect can only be achieved through healthy



4

BILLION HECTARES OF FOREST
worldwide = 31% of total land mass

4

MILLION HECTARES OF FOREST
in Austria

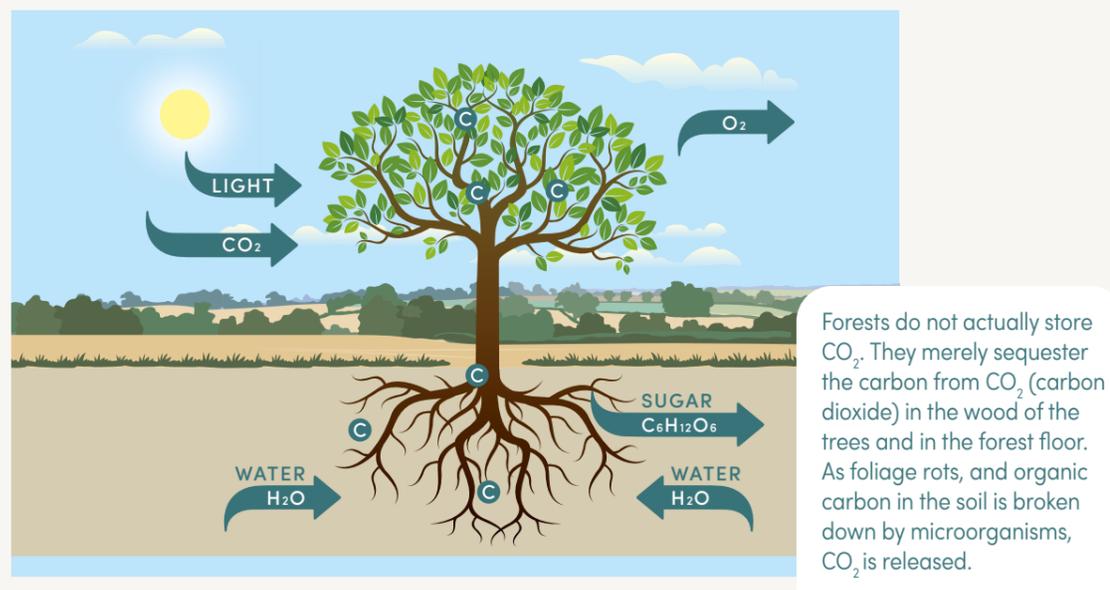
13,500

HECTARES OF FOREST
in the Liechtenstein Group



and vital forests, and these do require appropriate forestry maintenance operations. Afforestation and/or natural regeneration of provenances suited to local conditions, as well as care of young trees and thinning operations, ensure that stable forest stands are able to protect the Alpine regions. The reduction in forest areas available for wood supply means that such forests become increasingly vulnerable to extremes of weather, since as the trees age (over-ageing), their vitality declines, and the requisite regeneration is lacking (decay phase). The existent high quantity of dead wood releases large quantities of harmful CO₂ as part of the rotting process, whereas this would remain stored over the long term within processed timber products in a context of planned forest management.”

HOW DO FORESTS STORE CO₂?



CONSTRUCTION MATERIAL AND CO₂ RESERVOIR

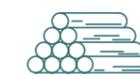
In the often very emotive discussion concerning forestry use, expert opinion is divided. Leaving 5%–10% of forest area unproductive in order to protect biological diversity, as demanded by environmentalists, is claimed by the forestry sector to be counter-productive in terms of climate protection. It is argued that, following a brief phase of inventory buildup, in unutilized natural forests, growth would stagnate and a natural balance between CO₂ absorption (growth) and emission (rotting) would set in. On the other hand, carbon fixation, for instance by using wood as a material, would have a more long-term reductive effect. Moreover, as a sustainable resource, wood has the capacity to replace fossil fuels and materials, and thus sustainable forest management can protect the climate.

However, a background paper by the Naturschutzbund Deutschland (NABU) states that analysis shows how even unutilized forests can absorb carbon over centuries. The assertion that the carbon pool of unutilized forests is “full” after just a few years is refuted. Indeed, over the medium term (for a period of several decades), refraining from productive use of a forest could even contribute more to climate protection than using the forest for wood supply. Forests that evolve naturally

could therefore make a vital contribution to climate protection precisely during the next four decades – the decisive period for protecting the climate – through accumulation of biomass and carbon sequestration.***

On one thing, however, surely all parties to the discussion are now in agreement: time is short. Storms, extreme heat and drought have clearly revealed the need for climate-fit forests. An alliance between policymakers, researchers, environmentalists, the forestry sector and the timber-processing industry is required in order to set the right course for the forest of the future. How does Helmut Rinnhofer see his forest of the future? “At Forst Kalwang we have already arrived at the future. Through use of our geographical information system TimberControl, we are in a position to constantly monitor and document the sustainability of our management activities; key influencing factors such as ongoing growth, the vitality of our forests, plus the proportion of mixed tree species and the quantity of carbon dioxide stored in the trees are all set out in the digital system. Through up-to-date aerial photographs (orthophotos), we are able to respond swiftly to changes in the event of disasters such as storms, bark-beetle infestation or snow breakage and avalanches, adapting our management approach. In addition, we use this tool for planning the timber harvest, afforestation and as a management tool in transportation logistics. All timber usage is recorded and can be digitally tracked throughout, from source location to sawmill. The same applies to all our silvicultural maintenance operations. In short: every tree that leaves our forest is personally known to us and digitally recorded.”

***www.nabu.de



AN EXCEPTIONAL YEAR AT KALWANG FOREST AND ON THE TIMBER MARKETS

Exceptionally dynamic market developments:

- 2019/20 Roundwood prices at a low point (previously lower only in disaster years following windthrow or snow breakage)
- 2020 Reduction in timber harvest quantity due to low timber prices
- 2021 Sharp price rises in the roundwood, sawn wood and processing sectors
Increase in sustainable logging quantity at good prices
Salvage proportion c. 20% below long-term average (largely beetle infestation and storm damage)

“In order to take optimum advantage of these volatile timber market events, it is important to create as many diverse income sources as possible. The aim is to improve the soil as a means of production, to increase biodiversity, and to exploit the natural resources existing in the business.”

HELMUT RINNHOFFER
Managing Director, Kalwang Forest



GUEST CONTRIBUTION:

Future-fit seed is getting scarce

Climate change demands more rapid breeding advances

High-quality seed is the initial resource for creating vital forest seedlings and resilient forests. Due to the increasing frequency and intensity of extreme events (e.g. drought, frost and hail) associated with climate change, the fructification behavior and seed set of forest trees is being impaired. This may lead to lower seed availability and poorer germination capacity.

In the past century, Central European countries such as Austria and Germany invested little in breeding and provenance research and therefore now have limited breeding populations from which to select seeds and seedlings for more drought-tolerant forests. Moreover, climate change requires faster progress to be made in the improvement of trees, so as to ensure adaptation to the future climate, amid a high degree of uncertainty surrounding potential climate scenarios. Traditionally, it takes at least 10 – 15 years to build up seed orchards in order: 1) to obtain high-quality seed; 2) to establish trials for progeny testing; 3) to introduce the improved material onto the market; and 4) to select the best material for the next upcoming breeding cycle.

IS LAB-PRODUCED SEED A SOLUTION?

Another option for accelerating breeding progress and producing climate-adapted forest seedlings is somatic embryogenesis (SE). SE is a technique of classic plant breeding, developed back in 1957, whereby a plant embryo is formed from another plant cell without the need for sexual reproduction through pollination and fertilization. Although the method is known and has been tested with numerous tree species since the 1980s, so far it has only rarely made the transition into broader application.

It is only the use of molecular-genetic methods and the need to achieve new breeding objectives more rapidly in view of climate change (e.g. drought resistance) that has prompted significant investment in biotech companies and global implementation research over the past few years.

The pilot project SpruceSEA (Spruce Somatic Embryogenesis Application Austria) is being implemented under the direction of the Austrian Research Centre for Forests in cooperation with forest-seedling company LIECO and Swedish Biotech firm Swetree

Technologies. The project is intended to speed up the availability of climate-resilient forest seedlings to the forestry sector and focuses in its initial phase on Norway spruce.

PILOT PRODUCTION FACILITY IN SWEDEN

For the selection of suitable provenances and clones, the Austrian Research Centre for Forests has drawn on the results of trials from the 1970s and 1980s to obtain seeds for propagation. These comprise particularly vigorous and drought-resistant genotypes which have already undergone thorough investigation in prior projects. The actual somatic embryogenesis takes place at Swedish partner Swetree, which currently ranks among the technology leaders in Europe. If the pilot facility meets expectations, it can be expanded so as to enable the production of between 2 and 20 million seedlings annually for supply to customers such as LIECO. The last crucial stage then takes place in Austria, where the young SE plants, just a few centimeters high, will be transferred from the lab into traditional seedling containers and then grown into healthy forest seedlings. LIECO's standardized growing conditions are ideally suited for this transfer, but will require a number of additional technological adjustments.

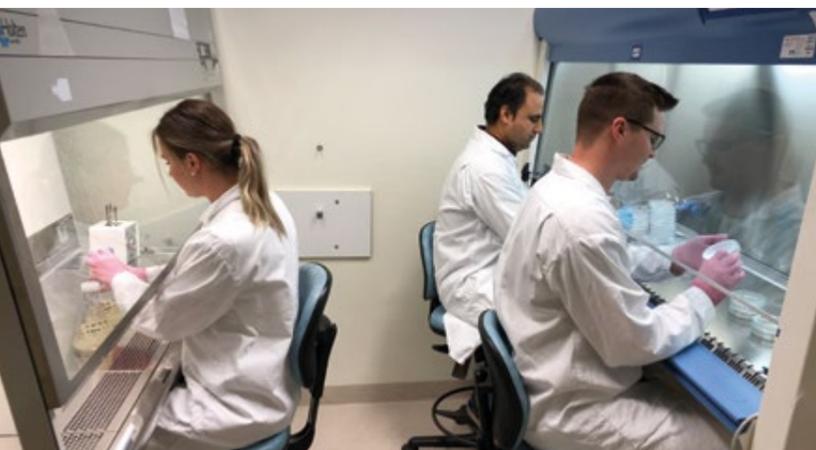
TESTING LONG-TERM SUITABILITY

In order to test the suitability of SE plants, at SpruceSEA, normal seedlings are grown in parallel from the same seed material in order to obtain comparative values for the new process. Both groups of plants are then tested in the nursery with the aim of ensuring further characteristics such as growth rate and drought stress resistance.

As forest trees need to be investigated beyond nursery age so as to test the long-term fitness of the new forest plants, trial plots are being established throughout Austria. These trials will include an appropriate silvicultural system for practical implementation. If SpruceSEA is successful, SE plants could be used on a wider scale in future forests, rendering the forests productive and climate-resilient and thereby creating benefits both for the entire value chain and for society.



SILVIO SCHÜLLER
Austrian Research Centre for Forests (BFW)



Plant propagation in the lab



The process does not require pollination or fertilization



At LIECO, lab-produced plants will grow into healthy forest seedlings



Standardized cultivation conditions are essential



Christoph Hartleitner and Oliver Hilpold

Climate-fit forests

LIECO Group expands its skillsets

P & P AND LÜRSSEN NURSERIES BECOME ONE

The two German tree nursery enterprises recently acquired by LIECO, P & P and Lürssen, have now been fully integrated into the LIECO Group following a merger operation. Both have been involved for decades in the production of forest seedlings in central and northern Germany, producing and selling almost exclusively bare-rooted forest seedlings. Forestry services, from planting, via cultivation, to precommercial thinning are further core elements of their business operations. In order to ensure a standardized market presence and to offer customers the best possible service, Lürssen sells primarily bare-rooted plants. LIECO as a brand has been retained, continuing to offer customers high-quality containerized forest seedlings both at home and abroad.

LIECO: FOCUSING ON RESEARCH AND DEVELOPMENT

Forest management is particularly affected by climate change since, once planted, long-lived forest trees will need to cope with both current and future conditions. The use of climate-fit tree species and the right genetic material is therefore central.

NURSERIES DIVERSIFY PLANT PRODUCTION

With climate change, tree species composition in the LIECO Group's product portfolio is also changing. Spruce, which in some locations is suffering from stress caused by drought, now makes up only just over one third of plant quantities in Austria, while Douglas fir, silver fir and larch, for instance, have increased. Demand for mixed tree species, principally deciduous, is increasing, particularly at Lürssen's sites in Germany.



The increasing diversity of tree species in nurseries also reflects the anticipated diversity in the forests of the future. Although, going forward, spruce will continue to play an important role as a raw material, new opportunities are opening up in terms of innovative silvicultural concepts, particularly in the Alpine region, through the selection of suitable provenances and genotypes, and through combination with other tree species (which indeed includes conifers).



OLIVER HILPOLD
CEO LIECO Group



"Seedling production in nurseries needs to adapt to climate change, as do forest owners. Bud break and the lignification period are heavily influenced by the characteristic of a particular tree species and by genetics. As a result of the frequent late frosts at our latitudes, there is a risk of losses, particularly with supposedly more climate-stable species such as Douglas fir and deciduous seedlings. This requires new measures to be taken with overwintering in order to avoid frost drying and frost damage to sensitive tree species, so that excessive losses can be prevented."

CHRISTOPH HARTLEITNER
Managing Director LIECO Austria

LIECO leads the market in successful afforestation in the DACH region, and is quality leader for containerized forest seedlings in Central Europe as a result of the company's many years of research and continuous further development. Through the merger with the F.O. Lürssen nursery group in Germany, the Group now also offers bare-rooted forest seedlings with guaranteed provenance as well as a comprehensive range of services, in addition to a wide range of containerized seedlings.

LIECO supports multifunctional forest management in harmony with environmental and economic interests through a bundle of measures:

- Increased R & D activities
- Expansion of improved seed resources
- Optimization of plant production
- Further development of silvicultural know-how
- Intensification of information exchange with forest owners
- Professional forestry service

ZERTIFIKATE

ZüF, FfV, RAL, DKV quality mark, quality production of native wood, competent forest partner, *Zertifizierungsgemeinschaft gebietseigener Gehölze* (Native Trees Certification Association)





Afforestation equals climate protection

2021 LIECO Forum looks positively to the future

In November 2021, the LIECO Group hosted the 2021 LIECO Forum at Liechtenstein Garden Palace in Vienna. Under the heading “Afforestation equals climate protection – from research to practice”, around 170 participants attended this forestry sector event.

First-rate presentations, including the latest research results, plus lively, sometimes controversial, debate, ensured that the mood among participants at the Forum was one of optimism. At the end of the day, everyone agreed that the situation is serious and that a lot is being asked of the forest in terms of its role in addressing the problem of climate change. For this reason, the question of how to shape the future must now be addressed collectively, and with courage. Close and constructive cooperation between policymakers, researchers, the timber-processing industry and forestry practitioners is essential to the survival of the entire value chain, from forest to timber.

“Not only does the forest act as a major carbon reservoir, but it also plays a major role in the economy. The sustainable use of timber, a renewable material, helps to protect the climate, while at the same time benefiting the local economy and creating regional jobs.”

ELISABETH KÖSTINGER
Federal Minister for Agriculture, Regions and Tourism



from left: Oliver Hilpold, CEO LIECO Group, Prince Hans-Adam II von und zu Liechtenstein, Elisabeth Köstinger, Federal Minister for Agriculture, Regions and Tourism, Constantin Liechtenstein, CEO Liechtenstein Group, Tom Crowther, Crowtherlab – ETH Zurich, Christoph Hartleitner, Managing Director LIECO Austria

“As longstanding forest owners, the question of climate-fit forests has been one of our prime concerns for many years already and, through LIECO, our aim is to make a positive contribution. For this reason, we are investing in research and development and specifically in breeding resilient, high-quality trees. We firmly believe there is a need to catch up in this area, and that, over the next few years, R&D must be driven forward. Site-adapted afforestation forms the essential basis for future sustainable forestry.”

CONSTANTIN LIECHTENSTEIN
CEO Liechtenstein Group

Recordings of all presentations and the panel discussion held at the 2021 LIECO Forum are available to watch at: <https://www.lieco.at/de/lieco-forum/beitraege>

“Building a Global Restoration Movement from Local Action”

TOM CROWTHER,
CROWTHERLAB ETH ZÜRICH

“The role of the forest in climate change”

HUBERT HASENAUER,
UNIVERSITY OF NATURAL RESOURCES AND LIFE SCIENCES, VIENNA

“Assisted migration of forest trees as a contribution to maintaining the productivity and carbon sink function of European forests”

SILVIO SCHÜLER,
AUSTRIAN RESEARCH CENTRE FOR FORESTS (BFW)

“On the potential of conifer-rich mixed stands in the context of climate change”

THOMAS KNOKE,
TECHNICAL UNIVERSITY OF MUNICH, CHAIR OF FOREST INVENTORY AND SUSTAINABLE USE

“Breeding in climate change and input for afforestation and tree species selection using the example of Sweden”

BO KARLSSON (REPRESENTED BY SILVIO SCHÜLER), FORMERLY OF SKOGFORSK, FORESTRY RESEARCH INSTITUTE OF SWEDEN

“Restor: A Science Based Tool to Enable and Accelerate the Restoration of Earth’s Ecosystems”

CLARA ROWE, RESTOR ECO AG

“The forest of the future – to manage, preserve, or shape?”

PANEL DISCUSSION

ALL PRESENTATIONS
CAN BE FOUND HERE:



Valuable “plus trees”

BFW project secures genetic material for the future



Trees with high-quality seed are marked.

As a result of climate change, many naturally regenerated forests are reaching the limits of their adaptive capacity. As a result, in 2021 the Austrian Research Centre for Forests (BFW) launched their project “Plus Tree Seed Collections”, financed using funds from the EU and the Austrian Federal Ministry of Agriculture, Regions and Tourism. The aim of the project is to secure the supply of high-quality climate-fit seeds and plants with high genetic diversity for the Austrian forestry sector, sourced from domestic stocks.

In Austria – as in all EU countries – seed may only be harvested in selected forests and seed plantations. In total, Austria has over 1,000 seed collections approved by the Federal Forest Office.

Under the project, seed stocks of exceptional quality are identified and, from these, a number of particularly suitable plus trees are selected, with the vitality, trunk and crown shape of the trees, as well as the spatial distribution, being the most important selection criteria. For purposes of plus tree harvesting, the selected trees are given a discreet permanent marking using an aluminum label roughly the size of a one-euro coin, and their GPS coordinates are recorded. This enables these valuable trees to be located at subsequent harvests.

In Kalwang Forest, 23 trees have been selected and earmarked for future harvesting under the “Plus Tree” project. The trees have not been felled but will be retained for research purposes and to provide future seed reserves.

The project is based in Bärenthal Gene Conservation Forest in the Hagenbach district, situated at an altitude of 1,550 meters in deep sub-alpine spruce forest. The tree population is autochthonous and has most likely not yet been impacted by human activity.



HELMUT RINNHOFER
Managing Director Forst Kalwang



Kalwang Forest is situated at an altitude of between 700 and 2,400 m

As temperatures increase, the tree line is getting higher

At altitudes of 1700/1800 m and above, old trees (100/120 years) are nowhere to be found in the Teichen hunting ground of Kalwang. The reason for this lies in the history of the region; in the 19th century, the forest was the site of large-scale tree felling for charcoal. Although, at the time, a forestry law was already in place to regulate timber harvesting, firstly, too much was felled, and secondly, the reforestation that took place was either inadequate or consisted of the wrong species of tree. As a result, the forest boundary in the region is not a natural one, but has been subject to human influence and is at a relatively low altitude.

Today, the more elevated areas are growing over once again, but are not being actively afforested. Nature is reclaiming its place, something that can be seen from the numerous young trees. As a result of rising temperatures, the tree line is also gradually getting higher. Trees are now growing at altitudes where they could not possibly have grown twenty years ago. This means that, for us as a forestry enterprise, our productive area is increasing. However, at the same time, through targeted clearing activities, we are ensuring that the typical Alpine pastures are retained, since these provide vitally important grazing areas for game animals.

Trees planted in the 18th and 19th centuries that are not suited to the location due to their genetic origin are being replaced after felling with suitable-origin types that are also climate-fit for the future. One interesting aspect of afforestation is the age of the seeds used. Seeds that were harvested as long as 30 years ago (and stored deep frozen) contain genetic information which may no longer be suited to either current or future climatic conditions. Although too slow to cope with climate change, nature is adapting to new conditions. As a result, our present-day seeds are more climate-fit.



MARTIN JEITLER
Head Forester, Silviculture/
Timber Harvesting, Forst Kalwang



Hunting and biodiversity – a contradiction in terms?

Besides agriculture, forestry, tourism, transport and industry, hunting is another activity making use of the natural world that has a significant impact on the natural habitats of wild animals. The original reason for hunting, of capturing wild animals to provide food for people, largely no longer exists. In times of factory farming, animal transportation, CO₂ emissions, etc., the regional use of game meat for human consumption is now acquiring a new and very different meaning in the context of sustainability. However, the debate over hunting still frequently provokes controversy.

The Liechtenstein Group is committed to sustainable hunting management in both Kalwang Forest and Wilfersdorf Forestry Operations. Forestry, agriculture and hunting interact to promote biodiversity using appropriate measures. At the forefront is the preservation, for future generations too, of habitats that are as natural as possible, with a species-rich, healthy and well-structured game population adapted to the local biotope.

The principal game species at Kalwang are red deer, chamois and roe deer. In addition, in one district there is a colony of mouflon, and the number of ibex is continually growing too. Capercaillie, black grouse and hazel grouse are present in all areas. For about fifteen years now, wild boars have also been regular visitors, with numbers steadily increasing.

At Kalwang, great importance is attached to the daytime activity of the main game species. If the game has adequate undisturbed retreat areas – especially above the tree line – the animals can feed at regular intervals in line with their natural behavior, which prevents damage to the tree population. Hunting participants, as well as other visitors to the forest, can enjoy viewing the game.



WERNER RÖSSL
Head Gamekeeper
Forst Kalwang



Originally, the Kalwang forest estate belonged to Admont Abbey, a Benedictine monastery which, in the districts of Langteichen and Kurzteichen, had been engaged in copper mining from 1666 onwards. In 1846, the estate was sold to the "Hammerherren" (Hammer Masters) of Donawitz, the so-called "Vordernberg Radmeister Kommunität" (Vordernberg Furnace Masters' Community) whose activities included mining the Erzberg for iron and the acquisition of forestland for the purpose of charcoal extraction. In 1932 the Ruling Prince, Franz Josef II von und zu Liechtenstein, acquired the forest estate with its current boundaries from Baron Gutmann.

MEASURES FOR INFRASTRUCTURE AND HABITAT IMPROVEMENT IN KALWANG FOREST

- Clearings and individual tree removal to create site-adapted mixed stands with trees of differing age categories (increases decentralized food supply)
- Increasing biodiversity and creating additional grazing opportunities (browsing shrubs) through early thinning and tending to new growth
- Re-cultivation of existing wild grazing areas and setting up new grazing areas
- Keeping Alpine meadows and overgrown avalanche paths open as grazing areas
- Keeping hunting areas free in large forest stands of approximately the same age (guarantee of game quota fulfilment)
- Establishment of red deer and roe deer feeding
- Preservation of undisturbed game retreat areas by directing visitors and adapting hunting strategies



GUEST CONTRIBUTION:

Wild fields for *wild birds*

Hamet: a showcase project for biodiversity

In the Hamet Project Area (Lower Austria) of Wilfersdorf Estate and Forestry Operations, for two years now an extensive science-based pilot project has been ongoing to promote biodiversity aimed at the reintroduction of partridge and at increasing and stabilizing the natural pheasant population. Partridge in particular, which used to be one of the most common inhabitants of agricultural landscapes, has declined so sharply in recent decades that it is now on the red list of endangered and threatened species. A similar situation can be seen with pheasant. The main reason for this lies in the intensification of agriculture and a deterioration in habitat, with a dramatic decline in plant diversity and insect numbers. A specific focus of the project is therefore on the creation of a landscape structure with a wide variety of plants suited to both these endangered species.

Through specially designed game covers containing specific plant combinations, the ground cover and food supply for the wild birds is increased. Grass strips left unmown on the field borders and embankments also play an important role, providing birds and smaller animals with excellent cover, even during times when the rest of the vegetation is not very high. This also makes these areas very attractive as breeding biotopes for ground breeders.

In the project area, partridge and pheasant are humanely released into the wild. To build up a stable population, appropriate habitat conditions need to be consistently maintained over several years (structure, food supply, etc.). In this context, the regulation of predatory game, in particular fox and pine marten, is also particularly important.

With regard to birds of prey subject to strict protection, the Liechtenstein Group supports nature and bird protection organizations such as BirdLife Austria with GPS tracking and monitoring of various species of raptor, such as white-tailed eagle, imperial eagle and red kite. In the Hamet Project Area, these birds of prey occur in very large numbers, which presents a significant obstacle to the reintroduction of partridge.

Even though the majority of measures are primarily aimed at encouraging partridge and pheasant, many other species of bird, insect and mammal also benefit enormously from the diverse landscape structures and wide variety of plants established during the course of the project to date. Over the long term, the aim is to turn Hamet into a model area.



MIROSLAV VODNANSKY
Central European Institute
of Wildlife Ecology



Sowing is undertaken using smaller seed quantities so as to achieve patchier growth, improving freedom of movement and visibility.



Strips of unmown grass on embankments and field margins as a breeding biotope and a place for insects to reproduce, take refuge and overwinter.



Besides pheasant and partridge, other species also benefit.



ENVIRONMENTAL PROJECTS OF WILFERSDORF FOREST OPERATIONS

- Wienerwald Biosphere Reserve: 150 hectares of forest voluntarily designated as a core zone
- 11 hectares at Morávka natural forest reserve in Hohenau
- 30-hectare nest-site protection zone in the Hohenau alluvial forest with partners including WWF (2014)
- Corncrake protection program
- Riparian-strip project along the Thaya (16 hectares excluded from forestry use)
- Restoration of cut-off meanders in the Hohenau alluvial forest and on the Thaya
- Designation of rest areas where hunting and fishing are prohibited
- Maintenance of ecologically valuable meadows

AWARDS

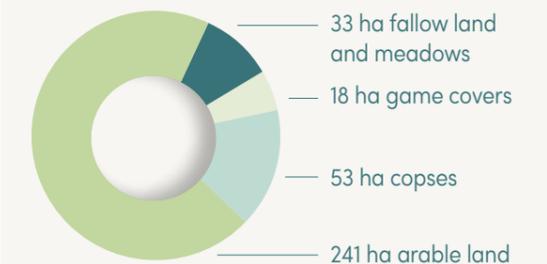
- 2006 State Prize for Exemplary Forestry, category Cooperation
- 2017 State Prize for Exemplary Forestry and State Prize for Climate-Fit Forest Management
- 2020 Anders Wall Award of the European Commission and Stockholm University

ZERTIFIKATE

- PEFC certification for sustainable forestry

HAMET PROJECT AREA

345 hectares under the ownership of the Liechtenstein Group





The forest as a *place of learning* What is the role of forest education?



Sporbach Nature Park is a very popular day trip destination for families.

For over fifteen years, Sporbach Nature Park has been systematically working to further develop its diverse offering with the aim of offering visitors a contemporary nature experience. However, the Park also engages with environmental issues and current trends. Through guided tours and events, the Park's educational mission is fulfilled based on the "Four Pillars" philosophy embraced by Austrian Nature Parks.

AWARD FOR EDUCATIONAL WORK

With its methods and topics, forest education in Sporbach Nature Park offers a "backpack full of opportunities". Each season, around 150-180 groups are offered guided tours by certified forest educators. The focus of these tours is either on seasonal features or on the individual requirements of a particular group. The forest serves as a place of learning, a place of play, of togetherness and also of variety and recreation. Today, it appears more important than ever that children – more than anyone else - are enabled to have adequate access to nature experiences and given an understanding of nature, coupled with knowledge of the forest as a habitat, its inhabitants and contexts. Our forest educators

include education on sustainable development as part of their approach. Sporbach Nature Park is also the first nature park in Austria to have received the Austrian Ecolabel for Extracurricular Education in recognition of these endeavors.

For young people, the relationship with nature experienced as part of a forest trip can form the basis of an affinity between people and nature that continues into adulthood. Engaging in critical reflection on one's own lifestyle as an adult has its roots in relationships and interconnections originating in childhood and adolescence.

THE POTENTIAL OF FOREST EDUCATION

As forest educators in Sporbach Nature Park, we can offer a wide range of ideas on socially relevant issues. For this reason, we are now also working on educational material concerning climate change. This has already been incorporated into our guided tours, and further development of content for these tours will be undertaken under the umbrella of the project Climate Settings. This will give visitors to the Nature Park ideas as to how the Nature Park, as part of a forestry operation, can face the challenges of the future from the perspective of the present day – for a climate-fit future forest.



SUSANNE KÄFER
Head of Nature Park Office



Senior Forester Thomas Rupp and forest educator Fritz Singer.

ELEMENTARY SCHOOLCHILDREN PLANT 60 TREES IN SPORBACH NATURE PARK

Children from Class 3B at the Evangelische Volksschule Leopoldstadt were already actively engaged during the last school year with the issues of environment and climate, as well as associated challenges. This led to the 2BTree campaign. The children not only wanted to learn something about climate change, but also actively do something about it.

And so, in October 2021, the time had come: the task was, over an area of 12,000 m², to plant 3,000 trees at Sporbach Nature Park in the space of just a few days. The class was allowed to assist in this afforestation campaign as part of a school excursion. They were supported by Thomas Rupp, Senior Forester at the Nature Park, and his employees. From them, the children learned a lot of exciting facts about the forest and the planting of young trees during times of climate change. The children planted 60 small Douglas firs over an area of 360 square meters before travelling back to Vienna, full of pride at their achievement. And of course, next spring, they will be heading back to Sporbach to check on "their" little trees.

For their campaign, class 3B was named Climate Class 2021 by the Vienna District and Area Administration.

MELANIE HIRSCH, MOTHER OF A PUPIL IN CLASS 3B AND EVENT MANAGER AT PALAIS LIECHTENSTEIN

Sporbach Nature Park is part of Liechtenstein Group, Wilfersdorf Estate and Forestry Operations, in the Sporbach forest district. The nature park covers an area of around 360 hectares, about one third of which is used by visitors, while the remaining areas provide a retreat for game. Situated in the middle of the biosphere park of the Vienna Woods, Sporbach Nature Park is a very popular day trip destination close to the city of Vienna, and welcomes around 90,000 visitors every year. It is Austria's oldest nature park, having been founded in 1962, since when visitors have been enjoying the unique atmosphere of this landscape park, originally created at the beginning of the 19th century, principally for recreation purposes.

www.naturpark-sporbach.at

AWARDS

- 2020 Energy Globe Award – honorary award
- 2020 PEFC award
- 2018 Austrian Ecolabel
- 2018 BEST of AUSTRIA for audio guide
- 2014 UNESCO award for Nature Park Highlights
- 2012 Austrian Nature Park of the Year



Johannstein castle ruins in Sporbach Nature Park.



Renewable Energy

By 2035, global energy demand is expected to grow by 37% while, currently, 85% of demand is still met by fossil fuels. The energy of both today and tomorrow must be generated in an environment- and climate-friendly way.

In the field of Renewable Energy, this means in particular wind power, hydropower and photovoltaics. We have many years of project development and investment experience, and in recent years have established an installed capacity on our own sites totaling 50 MW.



OUR PORTFOLIO

Renewable Energy



ERNEUERBARE ENERGIEN
LIECHTENSTEIN GRUPPE

WIND POWER

19 wind turbines on our own land, including two self-operated 2.4-MW turbines

Location: Wilfersdorf, Austria

Director: Hans Jörg Damm

Market: Austria, c. 25 % own consumption of PV output



ERNEUERBARE ENERGIEN
LIECHTENSTEIN GRUPPE

HYDROPOWER

7 small hydropower plants on our own land

Location: Kalwang, Austria

Managing Director: Helmut Rinnhofer

Market: Austria



PV-Invest builds photovoltaic and small hydropower plants in Europe.

Location: Klagenfurt am Wörthersee, Austria

Managing Partners: Günter Grabner & Gerhard Rabensteiner

Employees: 30

Markets: Austria, Germany, Italy, Slovenia, Bulgaria, France, Macedonia, Hungary, Bosnia and Herzegovina, Greece, Spain

www.pv-invest.com



TESVOLT is a global technology leader in energy storage, and produces stationary energy storage systems for commerce, industry, charging station infrastructure and the maritime sector.

Location: Wittenberg, Germany

Managing Directors: Daniel Hannemann & Simon Schandert

Employees: 130

Markets: Europe, Africa, Latin and North America

www.tesvolt.com



From a *mountain hut* in Tirol to an *avocado farm* in Australia

In over 3,000 projects implemented worldwide, TESVOLT battery storage systems not only play a vital role in advancing the global energy transition, but they also help to ensure the basic supply of electricity in places where the power grid is either non-existent or unreliable. They also help with more efficient energy use and save on electricity costs. Both the different projects and their terms of reference vary widely.

In Mali, TESVOLT storage systems guarantee a reliable power supply via solar containers in 25 villages. Projects have also already been implemented in Australia. In 2018, one such project received a “smarter E Award” in the Outstanding Projects category: a farm located south of Perth that aims to produce avocados sustainably and dispense with connections to public electricity or water networks. Using a PV system and various battery storage systems, the farm now operates all year round on almost 100% renewable energy. TESVOLT’s high-performance storage systems drive the pumps that transport to the trees the rainwater stored in underground tanks.

The battery storage systems used in Tirol, Austria, are veritable highfliers. At an altitude of 1,900 m, a large mountain refuge belonging to the German Alpine Club is now able to meet all its daily electricity needs from renewable energy sources, even when skies are overcast. Installing a storage system in the mountains was a challenge, and could not have been achieved without the assistance of a helicopter.



TESVOLT battery storage systems offer solutions for a wide variety of requirements

One of Europe’s largest charging parks for electric vehicles is powered almost 100 % by green electricity, including power from a photovoltaic array on the carport roofs. In order to be able to store the electricity generated, the charging park uses TESVOLT storage systems. Fast electric vehicle charging creates high peak loads, and battery storage enables these peaks to be “met”, i.e. the peak load requirement is generated by the discharging battery, instead of from the grid. Battery storage enables the operator to save additional costs.



SIMON SCHANDERT
Founder of TESVOLT



Self-sufficient in electricity, even under cloudy skies



WHERE DO THE RAW MATERIALS USED IN TESVOLT’S STORAGE SYSTEMS - LITHIUM AND COBALT - COME FROM?

The raw materials come from certified suppliers. TESVOLT storage systems consist of Samsung SDI storage cells. Samsung is a pioneer in the sustainable and equitable extraction of raw materials, and purchases all its raw materials only from certified suppliers.

To this end, it has produced a special supplier code, the Samsung SDI Supplier Code of Conduct, to which all partner enterprises are required to adhere. The principles of this certification include the Responsible Business Alliance (RBS) Code of Conduct and ISO Standard 14001. It means that suppliers do not use child labor and forced labor, guarantee fair, safe working conditions, and comply with applicable environmental standards. Samsung supports the OECD Due Diligence Guidance for Responsible Supply Chains of Minerals from Conflict-Affected and High-Risk Areas.



By 2030, the total number of battery electric vehicles (BEVs) is set to exceed 250 million. In order for this to become a reality, the charging infrastructure will need to be vastly expanded, increasing pressure on the existing grid infrastructure.



MORE URGENTLY THAN EVER:

The expansion of renewable energy needs *practicable framework conditions*

The 2021 United Nations Climate Change Conference (COP26) in Glasgow revealed an all-too-clear picture: the declared objective of limiting global warming to 1.5°C by the year 2100 is likely to be missed by at least 60% – with devastating consequences. The solution to the problem is crystal clear, consisting in the reduction of global greenhouse gas emissions.

Essentially, this is indeed reflected in the climate targets of individual nations, only unfortunately, such targets are set for a point in time in the distant future and often lack any true commitment. This is precisely where the greatest challenges lie in the field of photovoltaics. Governments need to derive practicable framework conditions from their ambitious climate targets that enable the expansion of renewable energy provision to be driven forward. If this transition is too sluggish or faces too many bureaucratic hurdles, investments will be slowed or indeed entirely hamstrung.

Excessively long project development times due to lengthy approval procedures increase both project costs and project development risks.

Prices of components have fallen steadily over the past ten years, making photovoltaics one of the cheapest forms of electricity generation in many regions. However, current global economic developments and the associated rise in the costs of energy and raw materials is also hitting the photovoltaics sector, causing uncertainty on the markets. Over the course of the year, prices for solar modules rose by around 30% and, in current project costings, it

is not possible to offset such an increase through savings on other components. At present, however, the equally high price of electricity is cushioning the impact of higher component prices.

While the logic of expanding solar energy has gained broad public acceptance, opinions vary regarding how this should be implemented. Debate over rooftops and open spaces, as well as land use and land cover impacts, is characterized by emotion and subjective perceptions.



GÜNTER GRABNER
Managing Director, PV-Invest



HOW BIG IS THE CARBON FOOTPRINT OF PV POWER PLANTS?

On average, in the first year of operation, a PV power plant saves the same amount of CO₂ as is generated in the production of all components of the power plant itself. According to a report by the Fraunhofer Institute for Solar Energy Systems (IST), the so-called energy payback time (EPBT) (also referred to as energetic amortization) totals about two years. This means that, during its service life, a solar plant generates at least ten times the energy used to construct it – and this positive ratio is improving.

HOW TO DEAL WITH OLD PV MODULES? RECYCLING IS THE KEY

PV modules have a substantial anticipated service life of c. 30 – 40 years. Once the typical crystalline modules have reached the end of their life-cycle, they can easily be recycled. The recycling of photovoltaic systems is good for the environment, but also economically attractive too, since up to 90% of the valuable materials used in their construction can be reused for new solar plants.

CERTIFICATES

RFU: In 2019, PV-Invest was rated for the first time by Austrian sustainability rating agency rfu, achieving the status "rfu Qualified" and receiving an outstanding "ab" rating.

EFK: The association Energieforum Kärnten was formed in 2009 as a sustainability awarding platform. In December 2019, PV-Invest was awarded an EFK Sustainability Certificate.





Real Estate

Requirements in both the commercial and private real estate sectors are becoming increasingly complex and multidimensional. The challenges posed by climate change in particular call for innovative and sustainable concepts for the construction and use of real estate.

We have experience in managing conventional real estate as well as historical palaces, and invest in a broad range of real estate categories around the world.



HUNTER

»» REAL ESTATE ««

Hunter Real Estate is a Boston-based residential real estate investment and management company. Through the renovation of dilapidated housing, of a 38,000 m² total leased area, already over 15,000 m² of modern social housing (Section 8) have been created.

Location: Boston, USA

CEO: Ralph Jaeger

Total leased area: 38,000 m²



ELV

Associates, Inc.

ELV is a real estate developer for residential and commercial development projects on the east coast of the USA.

Locations: Boston, USA (headquarters),
Washington, DC,
Atlanta, Georgia

President: Scott Jenkins

Total leased area: 143,000 m²



RHONE

IMMOBILIEN AG

Rhone owns a seven-story building with office premises and retail space at Rue du Rhône 21 in Geneva.

Location: Geneva, Switzerland

Total area: c. 4,200 m²



IMMOBILIEN

LIECHTENSTEIN GRUPPE

Liechtenstein Real Estate Vienna leases and manages real estate, including historical palaces and commercial property. Palais Liechtenstein markets the Liechtenstein Garden Palace and City Palace for events and guided tours.

Location: Vienna, Austria

Director: Erich Urban

Employees: 22, plus additional art educators and event assistants as required

Total real estate: 7 properties with c. 29,000 m² rental space; Liechtensteinpark with around 52,000 m²

Markets: principally DACH region, Liechtenstein, USA, Australia, UK, plus China, India, Czech Republic, France, Russia

www.liechtenstein-immobilien.at

www.palaisliechtenstein.com



Innovative concepts are needed for a sustainable real estate sector

As in our other core sectors of Agriculture & Food, Forestry, and Renewable Energy, in the Real Estate sector too, the Liechtenstein Group seeks to play a responsible part in shaping the future. Sustainability will therefore play a major role in our future real estate sector investment activities, bearing in mind that over 40% of global CO₂ emissions are attributable to the construction or operation of real estate.

As a result, going forward, we will have a stronger focus on achieving sustainability goals in the context of our environmental and social responsibilities. This includes, in particular, improving the energy efficiency of existing portfolio properties and newly acquired buildings, optimization of water and waste management, optimum use of sustainable building materials where structural alterations are required, and the provision of housing for socially disadvantaged members of society.

In future, our aim is also to include in the Group's portfolio those innovative companies in the field of building and construction technology with products that can contribute to a reduction in the carbon emissions generated by buildings. With this in mind, three focus topics have been defined:

- **CONSTRUCTION MATERIALS:** development of sustainable construction materials such as modular timber construction, "smart glass" or low-carbon cement
- **CONSTRUCTION PROCESS:** improvement in resource efficiency and personal safety in the construction of buildings and infrastructure using digital models, 3D and 4D printing, robots or portable equipment (e.g. exoskeletons)
- **BUILDING MANAGEMENT:** technologies and processes to reduce resource consumption in the operation of existing buildings, such as intelligent sensors for lighting, modern solutions for energy generation and storage, or maintenance robots.



JOHANNES MERAN
CIO and Managing Partner
Liechtenstein Group

The Liechtenstein Palaces in Vienna

A valuable cultural asset put to sustainable use

The Liechtenstein Garden Palace and City Palace in Vienna have been in the private ownership of the Princely Family of Liechtenstein for over 300 years. While the City Palace was originally conceived and used as a private residence in the vicinity of the imperial Hofburg, the Garden Palace – which once stood outside the gates of the city – served as an official summer residence for the family.

Today, use of the Palaces consists in particular of the hiring out of state rooms for prestigious events, guided tours of the private art collection belonging to the Princes of Liechtenstein, and the limited rental of office space. This mixed-use concept enables long-term preservation of these valuable cultural assets without having to draw on state funding.

EVENTS DURING THE PANDEMIC

Over the past two years, in addition to exclusive private events, the outdoor area of the Garden Palace has also been increasingly used for public events too. The Ehrenhof at the Garden Palace and the Liechtenstein Park have been used in new ways, with the successful cultural festival Summer Rhapsody in the Garden – held over several weeks – plus children’s opera *Bas-*

tien und Bastienne, and markets such as the weekly “fes’chmarkt Deli”, the Mini-Markt and the Christmas market, held for the first time in 2021.

Despite the coronavirus pandemic, amid appropriate health and safety precautions a variety of events took place inside the two palaces, including an exhibition on the Swedish section of Save the Children International, Rätta Barnen, the special exhibition Begegnungen, and the annual ORF event, Long Night of Museums. Other events, such as a benefit gala in support of victims of the terrorist attack of November 2, 2020, the Myki Child Protection Prize, plus the Lednice-Valtice Music Festival, rounded off the calendar of events held over the past few months at Liechtenstein Garden Palace and City Palace.

EFFICIENT AIR CONDITIONING A PARTICULAR CHALLENGE

Both Baroque palaces, approximately 300 years old, have been extensively renovated and restored. However, due to their utilization concept, the question of energy efficiency presents special challenges. Not only is it important to preserve the unique historical architecture and elaborately restored interiors of the

palaces themselves (frescoes, stuccowork, wall tapestries, etc.), but both buildings also house priceless works of European art spanning five centuries, which need to be kept under appropriate conditions.

The two palaces are therefore fully air-conditioned and equipped with cutting-edge technology, which naturally entails high levels of energy use. Over the long term, therefore, permanent solutions need to be found enabling climate-friendly and energy-saving operation of the buildings.

ACTION PLAN INTENDED TO REDUCE FUTURE CARBON EMISSIONS

Over the past few years, numerous measures have already been put in place with the aim of ensuring more energy-efficient operation of the properties belonging to the Liechtenstein Group in Vienna, particularly the City Palace, the Garden Palace and the Alserbachpalais. All buildings use 100% renewable energy. Since 2015, the Garden Palace in particular has converted to LED lighting. As part of general renovation work undertaken from 2008 to 2013, the City Palace was equipped with LED technology wherever possible. General renovation of the City Palace also included thermal renovation, generating an annual saving of around 160 tonnes of carbon.

In 2021, the City Palace was also successfully connected to the district cooling network. With effect from the second quarter of 2022, the palace will no longer use its own cooling equipment, but will instead use the decentralized service provided by utility company Wien Energie, which draws on sources such as residual energy from the Spittelau waste incineration plant, and water from the Danube Canal. This enables significantly more energy-efficient cooling. By the end of 2022, an initial comparison with the energy consumption of the cooling unit previously used will be possible. A saving of up to 60% primary energy is anticipated, and thus savings in terms of carbon emissions totaling approximately 45%.

Humidification systems and fan coils in the gallery rooms of the City Palace and Garden Palace are used to achieve the humidity levels needed for the artworks. Water filtered by the in-house osmosis system, and thus fully purified, is sprayed as required, feeding it into the ambient air in the galleries – this is an efficient room humidification process that also omits the use of chemical additives. The plan is to replace the older fan coils successively with new and substantially more efficient appliances from 2023 onwards.



ERICH URBAN
Director,
Liechtenstein Immobilien Wien

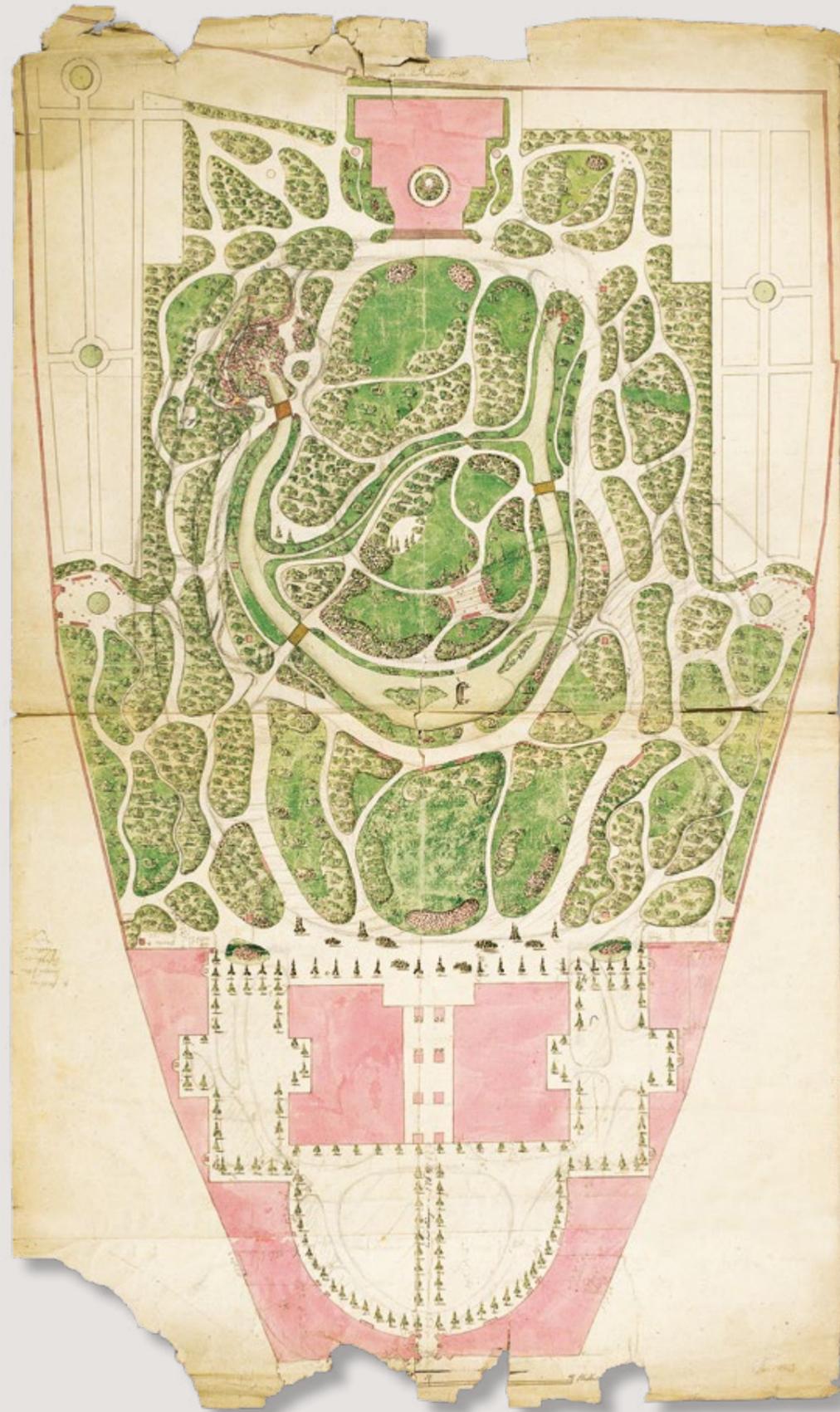


The Square Room in the City Palace is available for events



To protect the artworks, room temperatures must not be allowed to deviate significantly from a value between 21°C and 22°C, and humidity levels must be kept at a constant 50%.





Philipp Prohaska
Design for Remodelling the Garden of the Liechtenstein Palace in the Rossau as an English garden, around 1801

LIECHTENSTEIN, The Princely Collections, Vaduz - Vienna

Cooling effect & biodiversity

The Liechtenstein Park as a green oasis in the center of Vienna



Areas of the park left to grow naturally promote biodiversity

Green spaces in the city mean cooler urban spaces and a better quality of life. In particular, rooftop and facade greening, avenues, large parks and water features are capable of reducing inner-city temperatures by several degrees. In the Liechtenstein Park of the Garden Palace in the 9th District of Vienna, a green oasis has been preserved through the centuries. While the five-hectare park is all that remains of the originally vast marsh landscape of Rossau, if the Princes of Liechtenstein had not stubbornly ensured over the centuries that this remaining land stayed free of development, then no doubt today, this area of the district would also have been developed.

There exists an area at Liechtensteinstraße 48, covering approximately 3,600 m², where nature has been left to itself. The area is unique since, exceptionally for an inner-city space, the site is designated as forest under the 1975 Forestry Act. Trees are only cut back and horticultural work is only undertaken where this is absolutely essential for safety reasons. Although, to the uninitiated, the periphery may seem overgrown compared with the diligently maintained park estate, it benefits an extraordinary diversity of wildlife, including dormice, bats, owls and badgers, as well as centuries-old giant trees and two apiaries. This shows how, given the necessary acceptance, big cities can co-exist with ancient woodland.



GREGOR CZABY
Real Estate Management,
Liechtenstein Immobilien Wien





What's on in 2022

MARCH AT THE PALACE STARTING IN 2022, ANNUAL SPECIAL EXHIBITION IN THE LIECHTENSTEIN GARDEN PALACE

Starting in 2022, our new exhibition series MARCH AT THE PALACE will be held annually, focusing on the personalities of individual princes, the history of princely collecting, new acquisitions, restoration projects, the focal points of particular collections, and new contexts.

Entry to the exhibition is free of charge, and does not need to be booked in advance. An additional number of guided tours to the permanent exhibition in the first-floor galleries (masterpieces from the early Renaissance to High Baroque) will also be offered throughout March each year, at reduced entry prices.

WWW.PALAISLIECHTENSTEIN.COM

SUMMER RHAPSODY 2022

Our highly successful cultural festival Summer Rhapsody in the Garden, staged in the outdoor dining area of the Vinothek & Bar at the Liechtenstein Princely Winery in the grounds of the Garden Palace, will be held from July 11 to August 10, 2022. This year, for the first time, we will be presenting Young Summer Rhapsody, a full programme of events for children and families. Tickets for Summer Rhapsody 2022 are available now.

WWW.SOMMERRHAPSODIE.AT



CHRISTMAS MARKET IN THE LIECHTENSTEINPARK

In 2021, the very first Christmas market was held at Liechtenstein Garden Palace. In the atmospheric setting of the Garden Palace, visitors enjoyed a leisurely drink of punch or mulled wine, far away from more crowded venues. The historic fairground carousel, handicrafts, traditional specialties, jewelry and all kinds of charming wares and attractions make this small but sophisticated Christmas market a very special experience. The market is scheduled to return in winter 2022.

WWW.ADVENTIMGARTENPALAIS.AT



The Garden Palace in the Liechtensteinpark forms the backdrop for our summer program of cultural events

2022 marks the return of our annual special exhibition of works from the Princely Collections

Christmas market at the Liechtenstein Garden Palace

READ India

RiceTec supports social change

READ India, an NGO, has been working in rural communities in India since 2007, and has developed a model in which libraries play a central role, with the capacity to function as a key institution for social change. Savannah, the Indian branch of RiceTec, is supporting Read India in setting up a community center in the village of Lakhnora (200 km north of Delhi). Prior to this, in order to determine the right location, a feasibility study was carried out in the selected regions where Savannah operates, with a focus on rice-growing communities as the ultimate beneficiaries.

“The main objective of this project consists in improving access to information and education, securing livelihoods, and promoting community development through community libraries and resource centers,” explains Smita Mehrotra, HR Business Partner, who is overseeing the project on behalf of Savannah.

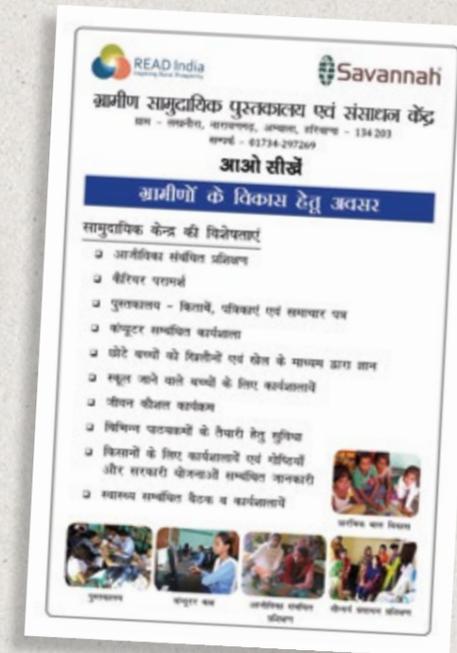
Due to the pandemic, development work on the ground was not able to start until the last quarter of 2021. Savannah has allocated USD 80,000 for

this charitable initiative. From mid February 2022, the community center should be ready to go into service, providing a library, computer training lab and sewing machines for sewing courses. 200 families living in the neighborhood will benefit from the center. For RiceTec staff, there will be regular volunteer programs.

THE PROJECT FOCUSES ON THE FOLLOWING:

- English lessons (spoken)
- Digital literacy through the use of computers
- Lessons in household management and financial literacy
- Raising awareness of the importance of education and empowerment through workshops and focus group discussions
- Improving children’s reading and writing skills through use of the library
- Workshops for teenage girls and boys (life skills)

- Tutoring to help young people prepare for selection tests
- Training for selected community members in center management and librarianship
- Support for families in relation to safe drinking water
- Training in basic health care and hygiene
- Special workshops/training sessions with farming communities on innovative farming techniques, provided by RiceTec and local agricultural experts.



Girls in a computer training classroom



Libraries are at the heart of READ India’s community centers



Female empowerment through vocational training

“Here at the Liechtenstein Group, our aim is not only to take an economically and environmentally sustainable approach, but also to fulfil our social responsibility. We assume this responsibility firstly as an employer of around 800 employees, and secondly through our support of attractive philanthropic projects – which has been ongoing for a number of years and about which you can find out more below. We are particularly grateful to the Group’s owner for the opportunities afforded to the Liechtenstein Group to engage in philanthropic activities.”

CONSTANTIN LIECHTENSTEIN
CEO Liechtenstein Group



Sindbad

Mentoring for young people

In Austria, opportunities and access to education are unevenly distributed, and the Sindbad association aims to address this. The association's vision is of a society in which people from different backgrounds engage with one another and learn from one another, a society in which young people are free to shape their own lives and orient their futures according to their talents and passions, regardless of social background.

In a one-to-one mentoring program, young people in their final year of compulsory school education are supported by their mentors aged 20-35 on the path to further education, and benefit from personal and attentive support during the transition to an apprenticeship or higher education. The mentors – young professionals or students – not only assume social responsibility, but also develop their social skills through their work with young people.

Together, mentee and mentor develop future plans, produce CVs, and prepare for job interviews. Leisure activities may also be part of

the program, depending on individual needs. The one-to-one relationship is accompanied by a support program in the form of modules such as supervision, communication and job application training.

Jointly with Sindbad, supporters such as the Liechtenstein Group have made it possible to reach out to over 2,500 young people during the past five years. The result is an extensive network of pupils, students, young professionals, schools and businesses from which everyone should benefit.

Over the past two years, this cooperation has enabled expansion into other Austrian federal states; nationwide, Sindbad has grown from three to seven locations, adding Linz, Innsbruck, Salzburg and Klagenfurt to the association's existing centers in Vienna, Lower Austria and Graz. An eighth center in Vorarlberg is currently being set up, and will start activities in spring 2022.



Both mentors and mentees benefit equally from this mutual exchange

BECOMING A MENTOR

Interested in supporting a young person on their path to further education, while at the same time benefiting from a life-enhancing experience? If you are aged between 20 and 35 or know someone who is, then why not reach out to us.

We will be happy to put you in touch with Sindbad!



'Summer Rhapsody', staged in the Park of the Liechtenstein Garden Palace, presents a diverse program of cultural events.

Cultural festival

Summer Rhapsody in the Garden

An event that began as a pandemic lockdown idea in spring 2020 has since become an integral part of the summer program at Liechtenstein Garden Palace. The cultural festival Summer Rhapsody in the Garden was launched by the Liechtenstein Group to provide a performance opportunity for Austrian artists who were and continue to be particularly affected by the coronavirus pandemic, with all performance fees paid by the Liechtenstein Group. Around 90 artists from a whole range of genres performed at the event in both summer 2020 and summer 2021, set in the secluded outdoor dining area of the Vinothek & Bar at the Princely Winery in the grounds of the Liechtenstein Park. In total, around 4,700 guests attended the Summer Rhapsody over 32 evenings (numbering around 1,800 in 2020 and 2,900 in 2021). The event is scheduled to take place this year from July 11 to August 10, and tickets are available now.

"Summer Rhapsody is the realization of a project very close to our hearts. The success of this new event series and the enthusiasm of our audiences has encouraged us to continue with this unique project. The festival has brought new life to the Garden Palace; above all, however, we are delighted to be able to support and facilitate cultural activity during these challenging times," affirms Constantin Liechtenstein, CEO of the Liechtenstein Group.

Summer Rhapsody is organized by the team at Palais Liechtenstein – Real Estate Vienna, with top-quality cuisine served by staff of the Vinothek & Bar at the Liechtenstein Princely Winery. In addition, as part of Summer Rhapsody, special guided tours of the Prince of Liechtenstein's art collection are available in the Garden Palace. This has given rise to a magnificent joint project that not only does good, but also creates joy.

"Culture is a means of survival. Sharing the experience of live music, drama, song and literature together with others makes us stronger and happier. At a time like this, full of challenges and upheavals, fear and worry, it is all the more important to be able to experience and take pleasure in what is good, true, beautiful and above all joyful – which means everything enabled by art and culture," affirm artistic directors Mena Scheuba-Tempfer and Melanie Hirsch. "Through Summer Rhapsody in the Garden, we hope to play our part in this."



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For ease of reading, the masculine form is frequently used when referring to persons. In view of the principle of equal treatment and equal regard for all, such references should be construed as applying to all persons.



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