EBP Group

Energy Transition Toward a Low-Carbon Society

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1. The Paris Agreement and National Climate Neutrality Targets

The global climate is changing rapidly. Scientists have been warning the international community of catastrophic global warming since the 1970s, and the past decades have already witnessed evidence of notable and rapid warming with devastating consequences for life on earth. The human alteration of the climate has by now become detectable in any single day's weather and earth has already exceeded 1.0°C warming compared to pre-industrial temperatures (Sippel et al., 2020; IPCC, 2018). It is estimated that as the climate becomes hotter, social repercussions will worsen globally. These effects could cost 3% per annum of global GDP through 2050 (Galey, 2019).

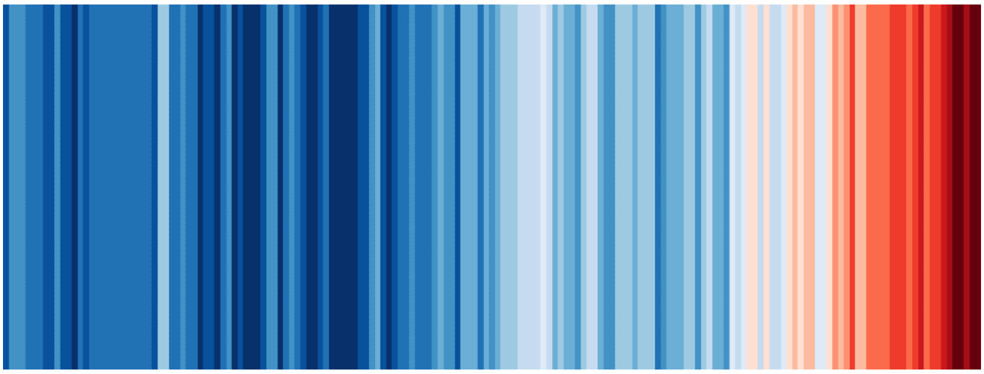

Figure 1: The so-called warming stripes (Ed Hawkins, 2021) show global temperature deviations for every year from 1850 to 2020.

Governing a crisis as vast and complex as climate change requires a joint global approach. The Paris Agreement, an agreement signed by 195 state parties in 2015, constitutes the core of international climate policy today. In the Paris Agreement, the parties agree on limiting the increase in global average temperature to well below 2°C above pre-industrial levels; and to pursue efforts to limit the increase to 1.5°C (Conference of Parties, 2015). For the world to reach this goal, countries will have to achieve net-zero emissions by 2050 at the latest. In practice, this means that any greenhouse gas emissions still occurring in 2050 should be fully offset by "negative emissions" (e.g., reforestation, carbon-capture-and-storage from ambient air).

The Paris Agreement sets a global goal but leaves it up to countries to develop national policies to reach the goal. Each party of the Paris Agreement therefore should submit nationally determined contributions (NDCs), which set their own goals and strategies of achieving these climate ambitions. Progress is to be reported biannually and the NDCs updated every five years. NDCs can, for example, include a national net-zero emissions target by 2050, and sector-specific policies to achieve these targets. There are a variety of instruments to reach climate neutrality, and countries choose different paths. However, regardless of the status quo, countries are expected to raise their ambitions with each NDC update. The "race to zero" therefore needs to happen simultaneously and jointly across all nations, sectors, and companies.

1.1 Country Agreements

Figure 2: Activists demonstrating for 100% renewable energy at COP21 in Paris.

Brazil

Overall, Brazil's NDC commits to reducing emissions in 2030 by 50%, compared with 2005. The NDC also includes the objective to reach emissions neutrality by 2060. In the energy sector, Brazil intends to achieve 45% up to 50% of renewables in the energy mix by 2030. Regarding forest protection, Brazil established a goal of eliminating illegal deforestation by 2028, restoring and reforesting 18 million hectares by 2030 and recovering 30 million hectares of degraded pastures.

Chile

Chile signed the Paris Agreement and completed its second NDC at the end of 2019. Mitigation goals in this second NDC include an emissions cap of 95MtCO2e for the year 2030, a peak in 2025, and a carbon budget for the period of 2020-2030 of 1.100MtCO2. Additionally, Chile has a Longterm Climate Change Strategy. In March 2022, the Chilean Congress has approved a framework law on Climate Change including new instruments to regulate emissions as well as adaptation to climate change.

China

China recently proposed updates to all of its NDC targets, among which are the goal to reach peak emissions before 2030 and to achieve 1,200 GW of installed wind and solar power capacity by 2030. Furthermore, China announced its goal to achieve carbon neutrality before 2060. China is already the largest producer of renewable energy in the world and climate action is continuously updated in its five-year plans.

Germany

The German government adopted the Climate Action Plan 2050 in 2016. Germany's long-term goal is to become largely greenhouse gas-neutral by 2045. Goals for 2030 were adopted in the Federal Climate Change Act in 2019. It codifies the 2030 sectoral targets for energy, industry, transportation, buildings, agriculture, and waste, and defines annual sectoral emission budgets.

Switzerland

Switzerland ratified the Paris Agreement in 2017, committing to an emissions reduction target of 50% by 2030 and 70 to 85% by 2050, compared with 1990 emissions. In August 2019, Switzerland strengthened its goal to net zero emissions in 2050. For the period 2022 to 2030, the new Swiss CO2 law, among other policy instruments, increased the CO2 tax to CHF 210 (EUR 190 or USD 230) per ton of CO2.

United States

The US re-joined the Paris Agreement in February 2021. Under the agreement, the US originally pledged to reduce its emissions 25% from 2005 levels by 2025. Twelve US states and at least 165 cities are planning to make their electricity supplies 100% renewable. Further, President Biden, as a candidate, made a bold pledge to cut all greenhouse gas emissions from the nation's electric sector by 2035 and to make the country carbon-neutral by 2050.

2. Reaching for Net Zero

2.1 Net Zero Strategies: From Public Policy to Private

According to UNFCCC (2020), "the number of commitments to reach net zero emissions from local governments and businesses has roughly doubled" during 2020, as many prioritize climate action in their recovery from COVID-19. Cities and regions with a combined carbon footprint greater than the emissions of the US, and companies with a combined revenue of over $11.4 trillion (equivalent to more than half of the US GDP), are now pursuing net zero emissions.

As of beginning of 2022, the Race to Zero Campaign, mobilizing actors outside national governments, has brought together 1,049 cities, 67 regions, 5,235 businesses, 441 of the biggest investors, and 1,039 Higher Education Institutions worldwide. According to a major report published by the Data-Driven EnviroLab, as of September 2020, more than 800 cities, 100 regions, and 1,500 companies have joined a global effort to decarbonize their societies and economies. The pace of change is rapid, and it is supported by citizens' interest all over the world, with a wide cultural, economic, and political spectrum.

To reach climate neutrality by 2050, governments have wide range of policy instruments at their disposal. Existing policy solutions today already show this variety of paths towards net zero emissions. The regulatory framework that is used in different countries to ensure successful compliance includes a range of sectoral obligations and targets, emission norms, carbon taxes, emission trading schemes, and offsetting schemes. In many countries, the set of instruments is diverse, and different sectors are subject to multiple regulations.

Still, the world is struggling to achieve the 1.5°C target, and pricing carbon alone does not guarantee the development of a carbon-free alternative technology. Research, development and innovation, voluntary commitments, and strategic engagement of the private sector are urgently needed for the development of hands-on solutions. Economic sectors and institutions, public and private, will have to find their way through this extremely dynamic environment, having to adapt, and also needing to position themselves early by demonstrating co-responsibility, commitment, and concrete actions to comply with their commitments.

Having a net zero strategy for local and national governments, public institutions, and private firms, will quickly become the norm. It will be key to ensure that these strategies are developed and implemented efficiently, effectively, and with full participation.

Three elements of lowering emissions are crucial for reaching net zero by 2050: Energy efficiency and lowering energy demands, decarbonization of our economy through renewable energy and electrification, and offsetting emissions.

2.2 Energy Efficiency and Lowering Energy Demand

According to IRENA (2017), up to 32% of global emission reduction potential through 2050 will stem from increased energy efficiency and reduced demand. Hence, the reduction of energy demand and energy efficiency measures must make up roughly a third of our climate ambitions in the coming decades. To maximize these outcomes, smart solutions such as cogeneration-based heating systems and batteries for private households are needed. Cities and regions around the world have been active players in developing innovative solutions at the local level. This action is crucial: cities are key actors in increasing energy efficiency and lowering energy demand, as they often control local energy efficiency standards for buildings and can make large gains with existing technologies (IRENA, 2017).

2.3 Electrification, Renewable Energies, and Decarbonization

Much of emission-free technology development is based on electrification. To reduce emissions, however, it is crucial to increase low and zero carbon energy sources in the energy mix. Together with energy efficiency measures, renewable energy can achieve 90% of required emission reductions to reach the 2050 net zero target (IRENA, 2021). Renewable energy sources include bioenergy, geothermal, hydropower, ocean, solar, and wind power. Nuclear energy, though largely carbon-free, is not a renewable energy. Furthermore, the accumulation of nuclear waste makes nuclear energy an unsustainable resource. These aspects, as well as questionable profitability, are the reason for many countries not to consider nuclear energy as a feasible alternative low carbon energy source. Electrification will make major contributions to GHG[1] emissions but may require substantial increased investment in energy transmission and distribution to accommodate increased electricity demand and total electricity consumed.

Solar Energy

The most commonly known and widespread renewable energy technology is solar. Through photovoltaics, solar is used to generate electricity and for power-to-heat solutions. One of the main challenges in the future will be exploiting existing potentials for decentralized solar installations on rooftops, as well as storing the energy. Often, solar energy is the cheapest form of energy available today and can be fed into the electricity grid. Solar installations, combined with storage, can aid in reducing peak demand on the grid. Up until now, storage has been an expensive companion to direct solar generation, but costs are rapidly decreasing. Some jurisdictions now require solar installations on all new residential construction and strongly encourage storage to be included.

Wind Energy

Wind energy produced through wind turbines can be deployed onshore and offshore, promising high yields and higher energy output per unit compared to solar panels. As with solar energy, wind energy faces storage challenges, however storage is increasingly affordable. It is also profitable and cost-effective in most regions on earth.

Bioenergy

Next to traditional bioenergy, the combustion of biomass such as wood and charcoal, modern bioenergy has versatile uses such as biofuels, wood pellet heating systems, and bio-refineries. Brazil is an international role model in producing liquid biofuels, with more than 13% of biofuel in the transportation sector.

Geothermal Energy

Geothermal energy, derived from the subsurface of the earth, can be used for heating, cooling, and electricity generation. The technologies needed for application, such as district heating and geothermal heat pumps, are mature and widely used. Iceland, for example, supplies 90% of its heating demand with geothermal energy. Other countries such as New Zealand and Kenya use geothermal energy for electricity generation.

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[1] "Carbon dioxide (CO_2), nitrous oxide (N_2O), methane (CH_4) and ozone (O_3) are primary greenhouse gases in the Earth's atmosphere. There are a number of entirely human-made greenhouse gases in the atmosphere." (for more information visit http://www.ipcc-data.org/guidelines/pages/glossary/glossary_fg.html)

Hydropower and Ocean

Power derived from flowing water is known as hydropower and is one of the oldest sources of energy generation in the world. Through the use of dams, hydropower can function as both a centralized and decentralized source of power. Norway derives 99% of its electricity from hydropower, the largest percentage of any country.

Oceans are a promising source of renewable energy. Electricity can be produced through waves, currents, and tides. However, much of the technology is still at the research stage.

Climate Neutrality in Different Sectors

For the world to reach climate neutrality, many of the technologies deployed today need to be replaced with emission-free alternatives. Deploying carbon neutral technologies has different implications for different sectors. In the transportation sector, for example, fossil fuel dependence will decrease significantly with the deployment of electric vehicles. Certain countries and regions are leading the effort. Norway, for example, has set the goal of zero-emission vehicles comprising 100% of new car sales by 2025.

Other sectors, however, are more difficult to decarbonize, and electrification can only go so far. In their latest report, "Reaching Zero with Renewables", IRENA (2020) has identified seven sectors crucial for decarbonization. Within transportation, shipping, aviation, and road freight are particularly challenging. Strategies such as biofuels, hydrogen, and efficiency gains will be key to reaching net zero in these sectors. California is a role model: along with aiming for 100% emission free passenger cars sold by 2035, the state sets the same goal for trucks. To reach this target, the state invests heavily in research and development, establishes innovation platforms, and sets zero emission vehicle standards for manufacturers (California ARB, 2021).

The challenge of decarbonization can be seen across all sectors: iron and steel production, cement, and other industries are both energy intensive and produce additional process-related emissions. Next to energy efficiency gains, structural change in how these industries work will be needed: circular economy solutions and renewable-energy based production are key to a net-zero future.

2.4 Carbon Sinks and Emission Offsets

The transformation of the energy system is an important step towards climate neutrality. Next to limiting anthropogenic greenhouse gas emissions entering the atmosphere, CO_2 removal from the atmosphere constitutes a second crucial component of reaching net zero. Natural carbon sinks such as forests, oceans, and grasslands have been rapidly declining over the past decades due to degradation and land-use changes. It is therefore one of the explicit goals of the Paris Agreement to preserve and enhance these natural sinks (Conference of Parties, 2015).

Next to a decline in area, one can also observe a decline in sink performance. Oceans have witnessed a decline of carbon absorption by 10% over a decade due to biodiversity loss, while forest fires and heat stress impairs forests' carbon uptake abilities (Krajick & Lee, 2009). It is therefore both a challenge to preserve carbon sinks through conservation and reforestation measures and to enhance their performance.

Offsetting domestic emissions through certificates can help enhance these natural sinks. Residual emissions, that remain extremely difficult to mitigate, can be offset by purchasing certifications. The investments are then used for sink enhancement (for example, afforestation) or avoided emissions elsewhere through the development of climate neutral infrastructure.

Sink enhancement can take various forms. In both forests and agriculture, highly potent crops can improve sink performance of vegetation and soil. In oceans, kelp forests or mangroves along coast lines also show great potential for enhancing naturally existing carbon sinks. However, it remains a challenge to prioritize natural areas over other pressing social issues like housing, agriculture, and economic development. Finding legal and political ways to account for the importance of carbon sinks will be critical to their preservation and enhancement.

Many countries see great potential in artificial carbon offsetting through carbon capture and storage technologies (CCS). With CCS, CO_2 is directly captured in the air or during industrial processes, transformed, and stored. In biomass power plants and heavy industries, these technologies have been used for several decades. Currently, much R&D funding is aimed at increasing the capacity of CCS in order to remove large amounts of carbon dioxide from the atmosphere. Challenges such as cost-effectiveness, and hazards through leakages, remain to be solved.

Emission offsets can also be carried out through energy efficiency and renewable energy projects. Even though emission offsetting should not be the first step in achieving carbon neutrality, they can make a relevant contribution and promote markets for energy efficiency and renewable energies during the transition.

2.5 Going Beyond Climate Neutrality

Going beyond climate neutral naturally has positive implications for human- and natural well-being. Combustion-free cities, for example will also reduce noise and air pollution stress of their citizens. A global temperature increase limited to under 1.5°C will safeguard many ecosystems and their biodiversity. There are countless examples of synergies between climate neutrality and further global challenges such as poverty reduction, biodiversity, and gender equality. However, where these synergies do not come naturally, it is our priority to avoid trade-offs and ensure a holistic sustainable approach on energy transition pathways.

3. EBP's Vision and Mission: Holistic Services for a Climate Neutral World

"Net zero" refers to reaching a point at which humanity emits zero greenhouse gas emissions. To be compatible with the goals of the Paris Agreement, this greenhouse gas neutrality (or climate neutrality) must be reached by 2050. Therefore, contrary to carbon neutrality, this concept includes not just CO_2, but all greenhouse gases. As EBP, we therefore define the net zero emission concept as greenhouse gas neutrality by 2050 or before.

According to the latest IPCC (SR 1.5, 2018), some emissions still emitted in 2050 could be offset through natural or artificial offsetting. Carbon sinks, therefore, play an important role in net zero strategies. Those emissions typically occur in sectors that are hard to decarbonize such as agriculture, steel and cement industry, and aviation. Even with offsets, however, these sectors would have to reach zero by 2067 at the latest (IPCC SR 1.5, 2018).

3.1 EBP's Mission Statement

We are convinced that ambitious climate targets are justified and necessary, to ensure that we preserve the planet earth and its ecosystem services for all future generations. The precise definition of targets may differ from country to country. The main challenges are the same and require immediate action, however. We will need to upscale the production of new renewable energy, to replace fossil fuel-generated electricity, and to maximize the flexibility of demand (in order to minimize the need for additional energy storage) and electricity grid integrity. The greater our understanding of impacts to the environment, including harmful emissions, land use, depletion of resources, and decreasing biodiversity, the easier it will prove to reduce final energy demand and to satisfy this demand with carbon-free renewable energy.

Though changes in our consumption patterns and material intensity will be inevitable, the larger part of the solution will be the employment of innovative, green, low-emission technologies. In part, these technologies need regulatory changes in order to constitute valid business models. Most of these technologies are already present today. It is of utmost importance to bring these technologies to market as quickly as possible and as precisely as necessary, and to let other countries benefit from existing experiences.

We should not compare the costs of future actions with the costs of what we did yesterday, as the strategies of yesterday are no option for tomorrow. Instead, we should pursue new actions that will allow us to reach our goals for the future and identify which strategies are the most feasible, cost-efficient, and resilient.

We strongly believe that at EBP, in each and every project, (i.e., in every economic analysis, in every site remediation, in every mobility concept), there are aspects that can be designed such that the project is compatible with the overarching goal of the transition to a low-carbon society, and eventually, a net zero economy.

EBP strives to have a clear picture of the possible pathways to a net zero energy, housing, transportation, and industrial system. Everything we do should solve the concrete problem in question and at the same time avoid being contradictory to the long-term goals and pathways.

We are committed to meet our clients' needs, solve the problems posed in an efficient and robust manner, and at the same time be able to ensure that the proposed steps and actions get us closer to a net zero society, step by step.

To walk the talk and comply with our mission, climate experts at EBP developed scientifically based climate goals and an implementation strategy for EBP Switzerland and EBP Chile itself.

3.2 Analysis

All people, companies, and organizations contribute to greenhouse gas emissions through their daily activities. While for some actors, like commercial airlines, identifying their greenhouse gas emissions may be straightforward, yet for others their contributions are much more indirect. A first step toward transitioning away from fossil fuels is therefore the identification of one's greenhouse gas emissions. Usually, this is done through the creation of a carbon inventory.

At a global scale, emissions can be identified in a sector-specific way: recent estimates show that electricity and heat production comprises 25% of global greenhouse gas emissions, followed by agriculture, forestry, and other land use (24%), and industry (21%). Greenhouse gas inventories can also differentiate between the different types of emissions. This makes sense in the context of waste management, where many different yet highly potent greenhouse gases are emitted, or agriculture, where methane and CO_2 both play important roles.

For countries, states, and cities, sectoral carbon inventories are a standard starting point to develop carbon neutral strategies. For a company, however, which usually operates in one sector only, an additional classification scheme makes sense: since emissions are often indirect and hidden, it is more important for a private actor to identify the types of activities rather than larger sectoral categorizations. The GHG Protocol differentiates between scope 1,2 & 3 emissions.

Scope 1 are direct emissions which result from a company's activity. For example, a company owns a vehicle fleet for transportation purposes. These vehicles burn fossil fuels. Other direct emissions result from processes such as cement manufacturing or stationary emissions through combustion.

Scope 2 emissions are indirect emissions from the generation of purchased energy. This relates to heating, electricity, and cooling of buildings and machinery a company owns.

Scope 3 emissions result from indirect emissions that are not owned by the company. There are many categories and examples, but broadly they can be divided into upstream and downstream activities. Upstream activities result in emissions when the company generates waste, purchases goods and services, or its employees travel for business (including commuting). Downstream activities include investments (for example by financial institutions), product usage of sold goods by consumers, and the end-of-life treatment of their products.

The creation of carbon inventories is key starting point for developing strategies and identifying potential reduction pathways. However, analyzing extends beyond the mere creation of carbon inventories: at EBP, we support our customers in creating the inventories as well as measuring progress and re-assessing strategies on the way. This agile approach guarantees cost-effective and thorough decarbonization pathways.

3.3 Success Stories: Analysis

National Greenhouse Gas Inventory Switzerland

Under the instructions of the Swiss Federal Office for the Environment (FOEN), EBP develops part of the report on the greenhouse gas inventory. This includes a description of the emissions from stationary energy sources, industrial processes, and the use of solvents and from waste management. The greenhouse gas inventory forms the basis of an assessment of whether Switzerland is complying with the reduction goals set out in the Kyoto Protocol. The reports are accessible to the public on the FOEN Website.

Monitoring System for Climate Change Mitigation in Chile

In Chile, the PMR initiative supports strengthening institutional and regulatory competencies to implement the CO_2 tax introduced in 2017, to implement a robust MRV system for greenhouse gas emissions and develop a future comprehensive system of instruments for climate change mitigation. Together with Chilean consultancy Negawatt, EBP developed an MRV system to measure, report and review CO_2 emissions. This includes both the methodological level of the system, as well as the software and hardware required at the technical level, and training for plant operators who are subject to the CO_2 tax.

North Carolina Clean Energy: Workforce Development

For the North Carolina Department of Commerce, EBP provided the TREDPLAN analysis tool to assess the long-term job, income, and occupational implications of alternative scenarios for proposed green energy policies and investments. The scenarios involved various packages of investment in a green economy through the adoption of solar photovoltaic electricity generation, offshore wind power, energy storage systems, and energy efficiency programs. The analysis then focused on the implications of alternative policies and investment on jobs, occupational demand, workforce skills, and post-secondary job training.

E-Mobility in the Region of Lüneburg

In 2017 EBP conducted a study on the topic of electromobility in which the entire Lüneburg region, with eleven districts or 18 LEADER and ILE regions, was considered with regard to the following aspects: On the one hand, the study shows perspectives for opening up the public space for electromobility, especially through a charging infrastructure that meets regional requirements, but also through projects and measures to bring electromobility closer to the population. On the other hand, it is important to create framework conditions so that conventional vehicles in private households, and in commercial and public fleets, can be successively replaced by electric vehicles.

Cost-benefit Analysis for Different Forest Carbon Project Alternatives in Chile

In 2020 EBP Chile conducted a study to evaluate different alternatives for the development of a forest carbon project aimed at offsetting the carbon footprint of the renewable energy company WPD. Different types of interventions in forests that generate emission reductions (afforestation, restoration, avoided deforestation and degradation) were analyzed, and their potential results were estimated in different regions of the country. Through this analysis, the most cost-effective alternatives were identified, including the type, scale, and location of the project.

Platform for the calculation of the carbon footprint of buildings (embodied and operational)

EBP Chile has developed and by 2022 applied numerous times and in different countries its carbon calculator for the buildings sector RUKARU, assisting real estate companies to obtain a clearer idea about the impact of their decisions on materials, construction and design of their buildings and assessing mitigation options.

3.4 Strategy

In many sectors, emissions free or low carbon technologies show the highest reduction potential. As Chapter 2 outlines, the deployment of these technologies, combined with the transformation of the energy system with renewable technologies, can produce deep cuts in carbon emissions. At EBP, we support our clients in the deployment of low carbon technologies in the energy, transport, and buildings sectors. These services include resource efficiency and circular economy projects, energy concepts, energy systems, and climate strategy consulting (both mitigation and adaptation). We further strive to support industry in its decarbonization efforts.

The development of an overall strategy, road map or plan is crucial for the development of sector specific solutions. Starting with an overview of key sectors and their CO_2 emissions, reduction potentials can be identified. The strategy includes not only the long-term goal (e.g., climate neutrality by 2050), but also milestones on emission reduction actions in the different sectors.

EBP develops innovative net zero strategies for countries, regions, cities and towns, companies, and individual projects across all sectors. Interdisciplinarity thinking and planning is key to all strategies. For example, the creation of regional energy concepts looks both at the technical as well as the legal framework of the region, while safeguarding participatory approaches to future regional development.

Each EBP client has different needs and goals – both long-term and short-term. Through 30 years of experience across various sectors with numerous clients, EBP provides a great range of tools and expertise to match the client’s needs. Strategies, for example, can take various forms. They either focus on one sector alone, aiming to interconnect different goals such as climate neutrality and technological innovation, or they take a spatial focus. Depending on the situation, the primary focus may need to be on the process, the moderation of participation procedures, spatial energy planning or the evaluation and prioritization of measures. On the basis of these findings, we put forward recommendations as to how best to proceed and establish a team to suit the requirements of the task.

We offer companies tailor-made solutions that enable them to optimally position themselves in matters of climate protection and carbon neutrality, according to their values, business goals and possible options.

3.5 Success Stories: Strategy

Regional Energy Concept for the Regional Planning Communities in Brandenburg

Since summer 2020, EBP Germany has been updating four regional energy concepts dating from 2013. Our clients are the regional planning groups Havelland-Fläming, Oderland-Spree, Prignitz-Oberhavel, Uckermark-Barnim. As part of the project, current scenarios for the development of renewable energies in electricity and heat production are undergoing a thorough review. Building on these foundations, EBP will assess the overall potential for the expansion of renewables, and the four regions will be provided with customized roadmaps for achieving the objectives of the Federal State of Brandenburg.

Local Energy Strategies in Latin America

Starting in 2014, EBP Chile has introduced the concept of Local Energy Strategies in Latin America, following the Swiss model of "Energiestadt". These Strategies are developed with the municipalities and involve other private and public actors in the territory. Between 2014 and 2021, EBP Chile supported the Chilean government in the creation, implementation, and continuous improvement of a National Program for Local Energy Strategies, today called "Comuna Energética", through which 15% of the municipalities to date have set up their Local Energy Strategies.

Climate Strategy 2050 for the City of Aarau

Following the City of Aarau's review of its energy and climate goals, EBP helped the city to define a new set of goals, to work out viable approaches to achieve these goals, and to include the relevant stakeholders in the process. In 2012, the City of Aarau defined a set of energy and climate targets and developed a corresponding action plan. However, given the dynamic developments seen in recent years in the energy and climate-protection sectors, the city resolved to review its targets and revise its action plan accordingly. EBP supported the city throughout the process to assess the targets “Net Zero 2030” and “Net Zero 2050”, to describe the general approaches and specific measures necessary to achieve the selected targets, to include the relevant stakeholders in the process of developing the new climate strategy, and to help shape the process and organize the relevant workgroups.

Chile E-Mobility Strategy

In 2019 EBP developed the background study for Chile´s electromobility strategy. The project gathered and analyzed regulatory, technological, and economic information to understand the state of electromobility in Chile, analyzed scenarios for its future development and impacts, and proposed measures to accelerate its adoption. The study laid the foundations for a better understanding of policy action and specific measures for promotion and regulation in this field.

3.6 Implementation

Building upon analysis and strategies, energy transition and climate mitigation take place on the ground. These actions may take different forms such as retrofitting buildings, detailing measures in the transport sector, or installing solar panels on roofs and facades. At EBP, we consult our clients on a wide range of implementation action. EBP Chile, for example, implements a variety of community solar infrastructure projects. EBP Switzerland designs campaigns on e-mobility for cities and regions. We design solar rooftops, climate neutral buildings and the transport infrastructure of tomorrow.

According to each sector, the individual portfolio will look different for every client. The wide array of potential measures following the strategy must be considered, and then an individual portfolio is developed.

3.7 Success Stories: Implementation

Brazil - Biogas Production Plant Design from Agro Waste

In South Brazil, a Biogas Plant was designed to receive more than 300 t/day of biomass composed mostly of grape pomace and vegetables, green waste, and the organic fraction of urban solid wastes. The plan consists of six bio-digesters of 5,000 m³, which operate anaerobically to digest the biomass and produce biogas - about 2,000 m³/hour, composed of 60% methane. The bi-omethane produced is first treated to remove sulfidic gases, then com-pressed and injected in the natural gas pipeline system of the local distribu-tor. The digested material returns to the farm as source of nutrients (NPK) and carbon for the soil.

Planning for Photovoltaic Array SBB "Gleistribüne", Zurich

EBP completed the planning for a green roof and photovoltaic array in ac-cordance with DGNB sustainability standards for residential Building F at the Zurich "Gleistribüne" complex next to Zürich Central Station. The photovol-taic array was installed in order to meet DGNB sustainability criteria. The electricity generated from the array will be used by the building’s occupants, with any surplus electricity feeding into the grid. One of the main goals for the Building F project was to obtain DGNB certification. To support this goal, EBP completed the planning for a high-performance and cost-effective pho-tovoltaic array, integrated with a green roof. The result is a photovoltaic array with an output power rating of around 34 kWp and an expected average an-nual yield of 35 MWh.

Green Building and Real Estate Solutions in Chile

The Green building approach reflects the general trend with toward sustain-able buildings, certification schemes, and technological solutions, especially in building design, climatization and energy efficient facades. Adequate ther-mal insulation has always been part of a properly designed building. It sup-ports an appropriate standard for comfort, and it contributes to keeping the energy bills at an acceptable level. Beyond this, it can make significant con-tributions to reaching the necessary climate goals, as well as to lowering local air contamination in highly contaminated cities, such as Santiago de Chile and Mexico City.

Solar energy solutions at the community level in Latin America

Decentralization of the energy sector is part of the energy transition and societal decarbonization. Access to clean energy must be available to all, in urban as well as in rural, and especially remote areas. Decreasing costs for solar energy, microgrids and battery systems have spurred important progress and opened up new possibilities. EBP Chile has developed innovative technological solutions, including Peer-to-Peer solar energy transactions, new management models, such as the formation of solar cooperatives, and financial models that reflect new opportunities in carbon markets. Projects have been carried out in diverse geographical and cultural contexts, including in Santiago, Robinson Crusoe, Patagonia, and indigenous communities in the Andean zone.

4. Conclusion

The transformation of our energy system constitutes one of the greatest challenges and opportunities of our contemporary society. While the urgency of the issue is clear, the solutions are equally visible. At EBP, we believe that renewable energy, the deployment of emission free technology, and offsetting emissions are key to the energy transition and to addressing climate change and environmental degradation. We demonstrate competencies across all relevant sectors and we work as an interdisciplinary team in all of our projects.

Hence, sharing experiences and competencies of energy transitions in different contexts and countries brings great insights and enables continuous learning on climate mitigation at EBP. The global energy transition does not only avoid negative consequences of climate change, but it also promises an environmentally friendly, more equitable and sustainable economy for all.

5. Further Success Stories

5.1 Energy Efficiency and Lowering Demand

Chile: Aysén University Campus
Campus Universidad de Aysén | Chile (ebpchile.cl)
Chile: Energy Poverty Phase II
Pobreza Energética Fase II | Chile (ebpchile.cl)
Germany: Communal Energy- and Climate Mitigation Concept Treuenbrietzen
Kommunales Energie- und Klimaschutzkonzept Treuenbrietzen | EBP | Deutschland
Switzerland: ProChileWatt: Saving Power in Churches
ProChileWatt: Saving Power in Churches | EBP | Swiss
Switzerland: OfficeWatt
OfficeWatt | EBP | Swiss
USA/ Canada: Energy Efficiency as an Engine
Energy Efficiency: Engine of Economic Growth in Canada | EBP | US (ebp-us.com)
USA: Community Choice Aggregation: Long Beach
Community Choice Aggregation: Long Beach | EBP | US (ebp-us.com)

5.2 Electrification, Renewable Energies and Decarbonization

Brazil: REPIC Project for Região Energética Maraú
http://www.regiaoenergeticamarau.com.br/
Chile: Solar-Powered Refrigeration Center
Energización fotovoltaica para refrigeración modular en el Archipiélago Juan Fernández | Chile (ebpchile.cl)
Germany: Evaluation of the German “Shop Window” Program on E-mobility

Evaluation des deutschen Schaufenster-Programms Elektromobilität | EBP | Deutschland
Switzerland: E-mobility Market Perspectives Switzerland 2021
E-Mobility Market Perspectives Switzerland 2021 | EBP | Swiss
The Future of Metropolitan Zurich's gas infrastructure
The Future of Metropolitan Zurich's Gas Infrastructure | EBP | Swiss
USA: Maryland Offshore Wind
Maryland Offshore Wind | EBP | US (ebp-us.com)
USA: Massachusetts DOT Zero Emission Vehicles
Massachusetts DOT Zero Emission Vehicles | EBP | US (ebp-us.com)
Alberta Canada- Pilot Energy/Economic Development Project for Transport and Potentially Hydrogen Economy – In Progress

5.3 Offsetting

Brazil: GHG of the Municipality of São Paulo
https://www.prefeitura.sp.gov.br/cidade/secretarias/upload/meio_ambiente/arquivos/SE_INVEMI.pdf (Executive Summary - Portuguese / English)
https://www.prefeitura.sp.gov.br/cidade/secretarias/meio_ambiente/menu/index.php?p=167735 (Reports)
Chile: Reforestation in Tierra del Fuego
Restauración de Bosques afectados por Castor en Tierra del Fuego | Chile (ebpchile.cl)
Chile: Feasibility Analysis for Carbon Credit Generation at Hacienda Pucheguin
Análisis de Factibilidad para la Generación de Créditos de Carbono en la Hacienda Pucheguin | Chile (ebpchile.cl)
Chile: Generation of Carbon Credits in Forest Management by Private Owners of the Forestry APL, Valparaiso Region
Generación de Créditos de Carbono en la gestión forestal de los propietarios privados del APL Forestal, Región de Valparaíso | Chile (ebpchile.cl)
Switzerland: Development of Swiss Greenhouse Gas Offset Projects
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