



Circular Economy Strategy VORAU



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FOREWORD

For several years now, the Vorau region has been committed to sustainable and green projects in the community – and beyond. It is home to innovative companies in the fields of energy, environmental and building technology, plant construction and ancillary construction. Bit by bit the municipality makes its contribution to get organized in a sustainable way and represents green management by example – with the Impulszentrum Vorau as the innovation and management centre/establishment. The aim of the Impulszentrum is to strengthen the sustainable use of resources and the link between research & development and practice. It is the industry mix and the networking with other impulse centres and clusters that make the Impulszentrum Vorau a breeding ground for innovative ideas. Practical findings and forward-looking development approaches are intended to encourage and motivate building operators for energy efficiency measures. Not only in the energy and building sector but also in other fields, the Vorau region aims to contribute to a resource efficient and low carbon economy and strive towards a Circular Economy. Within the Greencycle project the municipality directs at the goal of achieving this. The region takes up this challenge and commitment and embraces the responsibility for an implementation of necessary measures.



CEO Impulszentrum Vorau, regional officer of the economic chamber
Ing. Herbert Spitzer

SUMMARY – OVERVIEW

This paper gives an insight in the municipality's actions towards a circular economy. In cooperation with local authorities, facilities and businesses – with the Impulszentrum Vorau as the main coordinator – measures were developed and discussed in regard to the published strategy paper of the European Commission and the Sustainable Development Goals. Especially in the energy, waste and mobility sector have been developed some strategies. Motivated by Styria's re-use activities, mentioned in the provincial waste management plan, Vorau wants to take these examples for itself and operate the latter more intensively in the region as well.

The same applies to the energy supply of the municipality. Strengthened/Supported by an advantageous location (wind, sun, etc.) the region aims for striving towards a self-sufficient and low carbon region with an enlargement and improvement of renewable energy systems.

Mobility-wise, Vorau intends to facilitate alternative systems (f.e. car-sharing, micro-public system) for individual sustainable mobility; this requires a functioning/active public relations and awareness raising among the community members, which the municipality also wants to increase. This presupposes that the measures and strategies are incorporated into local politics and that they are accorded importance and significant relevance.

To measure and evaluate the impact of the implementation of the strategies striving towards a Circular Economy, Vorau plans to create measuring systems, f.e. a metering system to analyse the influence of institutive actions in the energy sector. With collected data the visualisation of implemented actions is possible and facilitates a promotion for further/additional actions.

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1 GENERAL BASICS

1.1 What is circular economy?

Circular economy is a growing topic, especially in the European Union, that promotes the responsible and cyclical use of resources possibly contributing to sustainable development.

The European Union embraced the concept of a circular economy as its key strategy towards a more sustainable use of natural resources. In 2015 the European Commission adopted a strengthened circular economy package that aims at maintaining the value of products, materials, and resources in the economy for as long as possible, and at minimizing the generation of waste as an essential contribution to the European Union's (EU28) efforts to develop a sustainable, low-carbon, resource-efficient, and competitive economy.¹

The European Commission defines the circular economy as an economy, which maintains the value of products and materials as long as possible. Waste and resource use are minimised, and when a product reaches the end of its life, it is used again to create further value. This can bring major economic benefits, contributing to innovation, growth and job creation².

The Circular Economy Model can also be distinguished between technical and biological cycles³, ⁴.

¹ https://ec.europa.eu/growth/industry/sustainability/circular-economy_en

² ibidem

³ <https://www.ellenmacarthurfoundation.org/>

⁴ <https://www.qualityaustria.com/news/circular-economy/>

The biological cycle is about reintroducing biologically-based materials (food, wood, cotton, etc.) into the natural system through processes like composting or anaerobic digestion. These cycles regenerate living systems, such as soil, which provide renewable resources for the economy. Technical cycles include recovering and restoring products, components and materials through procedures and strategies like reuse, repair, remanufacture or recycling.⁵

A circular economy encourages sustainability and competitiveness in the long term. It can also help to:

- preserve resources – including some which are increasingly scarce, or subject to price fluctuation
- increased material and energy efficiency
- save costs for local industries
- unlock new business opportunities
- build a new generation of innovative, resource-efficient business – making clean products and services
- create local new jobs
- create opportunities for social integration and cohesion

Therefore, a circular economy will be of major importance with a growing world population and hence an increase of demand for natural resources.

⁵ [https://www.ellenmacarthurfoundation.org/circular-economy/concept and](https://www.ellenmacarthurfoundation.org/circular-economy/concept-and)

<https://www.qualityaustria.com/news/circular-economy/>

In December 2015, the European Commission propounded a package to support the EU's transition to a circular economy. In March 2019, the Commission reported on the complete implementation of the action plan. All 54 actions included in the 2015 plan have now been delivered or are being executed. This will contribute to boost Europe's competitiveness, modernise its economy and industry to create jobs, protect the environment and generate sustainable growth.



Figure 1: Visualisation of Circular Economy (European Parliament)⁶

Why circular economy?

As global population increases rapidly, demand for everyday basic goods such as food, transportation and manufactured products is growing at high speed. This demand is putting an enormous strain on our planet's resources.

A circular economy development path in Europe could result in a 32% reduction of primary material consumption by 2030, and 53% by 2050.⁷

⁶ <http://www.europarl.europa.eu/news/en/headlines/economy/20151201STO05603/circular-economy-definition-importance-and-benefits>

⁷ <http://cicerone-h2020.eu/nproject/ourmission/>

With sustainability becoming a key part of the global agenda, the circular economy is a crucial tool for decoupling economic growth from further unsustainable resource use and increased CO² emissions.

The circular economy offers an alternative solution to our current model of take-make-dispose, reducing waste and extraction of raw materials, as resources are continuously reused and repurposed to create new products.

1.2 Initial Situation

As an EU member, Austria set itself a long-term goal of the 2050 strategy. Its politics act in accordance with environmental policies beyond the 20-20-20 targets. These adhere to a reduction by 80-95% of GHG emissions (compared to 1990 levels), the increased use of renewable resources at 20% and enhanced energy efficiency at 20%. Although few goals have been already achieved (share of renewable resources), experts still see an enormous potential in optimizing the sustainable management of product life cycles and therefor resources. “Cradle-to-cradle” – from a linear economy to a circular economy. Various municipalities, like the Vorau region, established numerous approaches to decrease the environmental external effects and create an improved system to achieve climate/environmental goals (2020 and 2050) inspired by the Sustainable Development Goals published by the UN 2015.



Figure 2: Sustainable Development Goals

1.3 EU-Commission Paper

In December 2015 the European Commission developed and adopted a Circular Economy Action Plan to shift present economy towards a circular one. This was argued to boost jobs and growth while developing a carbon neutral, resource-efficient and competitive economy. The EU paper emphasizes that the transition has helped the EU back on a path of job creation, employing more than four million workers 2016 in relevant sectors to the circular economy, which indicated an increase of 6% compared to 2012. The action plan promoted a systematic approach across entire value chains. With it, the Commission has mainstreamed circular principles into plastic production and consumption, water management, food systems and the management of specific waste streams. This was made possible by strong support and engagement of Member states, the European Parliament, the business community and citizens. It has also contributed to moving towards the achievement of the 2030 Agenda for Sustainable Development.

In the annual written update on the progress made on the implementation of the action plan in 2019 following bullet points were mentioned:⁸

- Circular design and production processes

Design stands at the beginning of products' lifecycle and is essential for ensuring circularity. The Commission has promoted the circular design of products, together with energy efficiency objectives. This includes Ecodesign and Energy Labelling measures on material efficiency requirements of products (availability of spare parts, ease of repair, facilitating end-of-life treatment).

⁸ <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52019DC0190&from=EN>

Additionally, the Commission has tasked the European Standardisation Organisations with developing horizontal criteria to measure durability, reusability, reparability, recyclability and the presence of critical raw materials.

- Empowering consumers

An active engagement of citizens in changing consumption patterns contributes to a transition towards a more circular economy. Offering consumers accurate environmental information on products supports the individual consumption choice (Information on durability, reparability, carbon dioxide footprint, etc.). Consumers will also be able to make informed choices based on reliable information. These methods/information can shift purchasing decisions towards more sustainable choices.

- Turning waste into resources

An efficient waste management is essential for a circular economy. 2018 a revised waste legislative framework for a modernised waste management in the Union entered into force. This includes new ambitious yet realistic recycling rates, clarified legal status for recycled materials and by-products, reinforced rules on separate waste collection, minimum requirements for Extended Producer Responsibility and strengthened waste prevention and waste management measures (incl. marine litter, food waste, critical raw materials). Farther, the Commission has clarified the relation and relevance of different waste-to-energy processes with a view to avoiding unnecessary loss of valuable resources through landfilling and incineration.

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- Closing loops of recovered materials

One of the objectives of the Circular Economy Action Plan is boosting the use of secondary raw materials. It requires understanding the key challenges faced by market operators and should rely on a strong and effective Single Market. This implies a substantial reduction of significant market entry barriers for more sustainable and circular products to their trade. For closing the loop a collection and providing information about composition of waste streams is essential for improving the preparation for re-use and treatment – f.e. critical raw materials. This gives investors more legal certainty about the secondary raw materials they purchase. With a creation of common standards and market tools, the Commission aims for an improvement in reintroducing/reselling secondary raw materials.

- A systematic approach: the EU strategy for plastics in a circular economy

This strategy for plastics in a circular economy is the first EU-wide policy framework adopting a material-specific lifecycle approach to integrate circular design, use, reuse and recycling activities into plastics value chains. This requires smart design and proper sorting. The measures include a ban of single use plastic, a target to incorporate 30% of recycled plastic in bottles as well as a 90% separate collection target of plastic bottles, reporting obligations for lost fishing gear, flat fees for plastic waste from ships, extended producer responsibility schemes covering the cost to clean-up litter applied to the products.

These transition actions can be accelerated by:

- An increase of investments in innovations

To accelerate the transition to a circular economy, it is necessary to invest in innovation and to provide support for adapting the industrial base. Over the 2016-2020 period, the Commission has stepped up efforts in both directions totalling more than €10 billion in public funding to the transition. This includes investments in sustainable process industries, waste and resource management, implementation of the EU-waste regulation, sustainable projects, etc.

- A strong Stakeholder Engagement

Stakeholders are driving the transition in different sectors (public authorities, economic actors, civil society, etc.). For example industry engagement has led to the adoption of the EU Construction and Demolition Waste Protocol and Guidelines with the final objective of increasing confidence in the waste management process and in the quality of recycled materials in the sector. Similar, key players from the sector along the food value chain are working together in the EU Platform on food losses/waste.

The European Commission has set out an ambitious vision with its circular economy package – but there is also trailblazing work going on at nation-level.

Whereas the European legislation plays an important role in implementing a circular economy, initiatives at national and regional level also have a significant impact on the development of a circular economy.⁹

EU actions have inspired national debates on circular economy and a majority of Member States have adopted or are in the process of adopting national strategies for the transition to a circular economy. These frameworks are often replicated at regional and local level, bringing the circular economy closer to citizens and businesses.

Some Member States, like Austria, have developed additional national and regional circular economy indicators, thus complementing the overview provided by the EU framework.

⁹https://www.rli.nl/sites/default/files/rli_eu_goes_circular_-_eeac_working_group_on_circular_economy_def_1.pdf

2 LOCAL CIRCULAR ECONOMY STRATEGY

2.1 Situation Vorau

Hence the municipality Vorau (in cooperation with the climate and energy model region; Klima und Energiemodellregion – KEM “EnergieIMPuls”) has developed numerous measures striving for an economy towards a circular economy relating to the strategies set by the EU Commission.

With Vorau as rural community/municipality the implementation of the mentioned strategies above is limited to the local natural, administrative and financial capacity.

The following table of data exemplifies Vorau's dimensions.

Table 1: Statistic data of Vorau¹⁰

Area of Vorau	80,84 km ²	Share of Vorau area
Number of inhabitants	4.706	
Population density (inh./km ²)	58,7	
Number of households	1.744	
Municipal roads	140 km	
Cadastral subdivisions	6 *	
Building area	71,61 ha	0,9 %
Agricultural area	3.733,47 ha	46,2 %
Forest area	3.747,77 ha	46,4 % **
Gardens	142,77 ha	1,8 %

*Cadastral subdivisions: Vorau, Vornholz, Riegersbach, Reinberg, Schachen, Puchegg

**use of Vorau's wood: 30% timber, 70% firewood

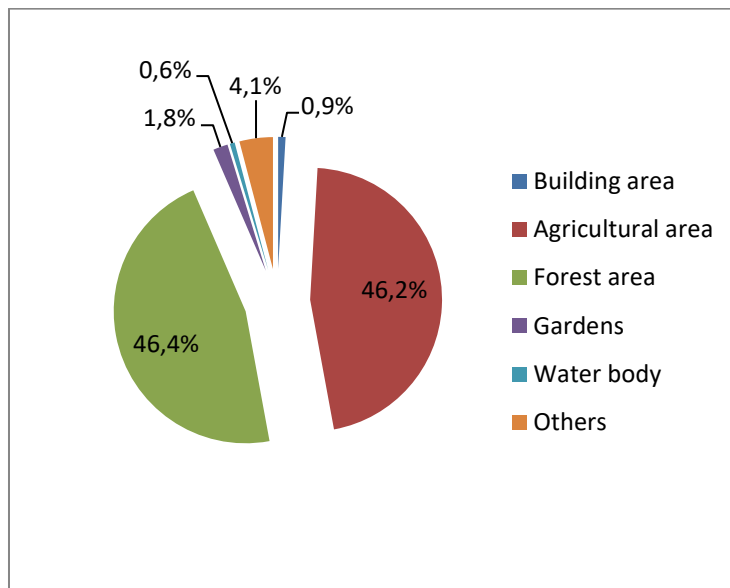


Figure 3: Vorau land use chart

¹⁰ <https://www.statistik.at/blickgem/gemDetail.do?gemnr=62278>

2.2 SWOT Analysis

Strengths	Weaknesses
<ul style="list-style-type: none"> • Resources local available (f.e. biomass, sun, wind,...) • Great commitment by representatives of the municipality • Good teamwork of participating surrounding municipalities • Great willingness for the implementation of energy, environment and climate measures • Companies with focus on renewable resources and energy efficiency based in the region • Great product variety in agriculture and forestry and regional utilization • Impulszentrum Vorau has a good intercommunal communication and management 	<ul style="list-style-type: none"> • Great distance to central areas and urban sprawl • Weak transport connection (no public transport, negative commuter balance,...) • No supply through central facilities possible • Restricted growth potential and Know-how in forestry and agriculture sector • Unavailable local job offers • Low education/training opportunities after compulsory schooling • Disadvantageous business locations (decentral location) • Poor IT supply • Deficient awareness of local purchasing • Construction and extension of facilities without regard to regional needs

Opportunities	Threats
<ul style="list-style-type: none"> • Awareness raising among the community members can shift behaviour patterns • Saving energy costs • Increase in purchasing power, whereby added value remains in the region • Increased security of supply • Rural depopulation can be reduced or even stopped • Positive commuter balance • Optimizing of intelligent structures • Optimizing capital expenditure with development of intelligent structures • Management of information (mayor conference, employee meeting,...) • Creation of regional jobs / synergy effects with increased cooperation • Cooperation with other regions • Establishing a regional circular economy • Networking with other facilities • Strengthening regional momentum • Topic is taken up by politics • Training schools in special sectors • High quality of living conditions 	<ul style="list-style-type: none"> • Strong dependency on persons instead of structures • Loss of information due to deficient organisation • Community members are not to convince of • No settling of new businesses respectively no offering of new technologies • Still negative commuter balance • Loss of purchasing power in the region • High investments • Decreasing number of employed persons • Depopulation causes decreasing customer potential • Emigration of enterprises • Subsidies are reduced or cancelled • Topic is not taken up by politics • Cooperation and exchange of knowledge beyond the region fails

2.3 Transition to a circular economy

Driven by the Federal Waste Management Plan implemented by Austria (at first instance) and in case of Vorau the Provincial Waste Management Plan (at second instance), the country already performs towards a circular economy – especially in the waste sector. Further, with an advantageous location at Europe’s most watery river, financial feasibility, implemented politics as well as available natural resources such as biomass, shares of renewable energy targets were able to meet. In regard to Vorau, at 69,2 %, the electricity generation accounts for the largest share of renewable energy.

However, experts still see significant potential in an improvement. The following sections discuss the current national and provincial strategies with focus on a potential to implement them in smaller administration areas like the Vorau region.

2.3.1 Waste sector

As Austria has developed additional national circular economy indicators such as the waste management (Federal Waste Management Plan), it already met several targets set by the EU.

However, experts still see potential in an improvement of the efficiency and adding value to the waste management. Vorau, as a municipality of the province Styria, practices a strict waste separation system which sets the base for a functional secondary raw materials system. Whereas secondary materials are separated and sold to specialised association for recycling (glass, paper, cans, textiles, lightweight packaging) the biogenic waste is either composted by the respective waste producer or transported to the stipulated treatment plant in Kaindorf (Kompostanlage Dornhofer Karl). Local experts are still indecisive about the potential expansion capacity of adding value to biogenic waste in turning to energy.

With an existing biogas plant in the neighbour municipality Hartberg, this could offer the ability to add value to biogenic waste (kitchen waste and green cut) by turning it into energy (biogas for heat – long distance heating or for electricity) and supply the regional/local energy demand. With a transport to the power plant and reutilization it would not be necessary to build/establish one in the Vorau region – the utilization of existing establishments/infrastructure saves resources and contributes to a sustainable management. Nevertheless, the main form of biological treatment of biogenic municipal waste is composting, aiming to generate a product rich in humins (compost) from biogenic waste. This product can be reintroduced into the cycle for agriculture and treatment of arable land and improve the soil quality (water storage capacity, carbon storage capacity, micronutrients, soil biota etc.). The closest commercial and municipal composting facility is in Riedlingsdorf (Sonnenerde, Gerald Dunst Kulturerden GmbH, Riedlingsdorf).

With reference to establishing and promoting re-use activities in the Vorau region, stakeholders are motivated by realized projects in Styria. They are as followed:

- Subsidies initiatives for re-use
 - Reusable diapers¹¹
 - Reusability at events¹² (G'scheit Feiern)
 - Repair premium/bounty¹³

¹¹http://www.awv.steiermark.at/cms/dokumente/10031187_170666/1c8db7f0/Windelgutschein%20Steiermark%202009.pdf

¹² <http://www.gscheitfeiern.steiermark.at/>

¹³ <http://www.abfallwirtschaft.steiermark.at/cms/beitrag/12736011/148872329>

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- Individual projects
 - "Retourmöbel Steiermark"¹⁴
 - Reusable Styria wine bottle¹⁵
 - Re-Use-Box¹⁶
 - Re-Use of Construction and Demolition waste (EU-project CONDEREFF)
 - Structural activities
 - Businessplan Re-Use¹⁷
 - "ASZ-NEU": resource parks/waste collection centres with Re-Use-Shops (three Re-Use-Shops in Ratschendorf, Leoben and Leibnitz)

The Initiative "G'scheit Feiern" promotes for a sustainable event management with benefits for events supplied with regional food (preferred organic – if not regional available -> fair trade), soft mobility and using exclusively reusable plates and dishes. With these measures the initiative intends to prevent waste and littering. With an involvement and communication of this initiative to local event managers Vorau strives to be equipped with a more circular procedure for planning events.

Additional measure for waste prevention embodies the newly established repair premium by the province Styria. Accordingly to the "Re-Use" study in Styria, the forecasted quantities of reusable used goods from the waste streams of old furniture, old electrical equipment and old textiles amount to around 4000 tonnes per year. Thus, with the newly set up repair premium the repairing of electrical and electronic waste is subsidised to 50% of arising expenses.

¹⁴ <http://www.abfallwirtschaft.steiermark.at/cms/beitrag/11643363/134988588/>

¹⁵ <http://www.awv.steiermark.at/cms/beitrag/10031455/170666/>

¹⁶ <http://www.awv.steiermark.at/cms/beitrag/12649799/143441161>

¹⁷ http://www.abfallwirtschaft.steiermark.at/cms/dokumente/11472859_134988588/0f58d654/Re-Use_STMK_Businessplan_final.pdf

For further reusable goods local repair services are communicated and advertised on online network platforms, such as “reparaturführer”¹⁸ or “repanet”¹⁹. With an enhanced provision of information about these services to community members at f.e. waste collection centres, the municipality endeavours to promote more re-use activities.

The Individual Project “Retourmöbel Steiermark” pursues the object to add value to used furniture from the furniture retail market by re-preparing these goods for sale by social integration companies (SIUs) – like the Carla shop in the nearby region Hartberg, this shop is Caritas sponsored shop. A further project is the reusable/refillable Styrian wine bottle supporting and motivating the collection of glass bottles for refilling with Styrian wine. With this motive, local businesses in Vorau started to recollect their bottles (wine, juice or must) for cleaning and refilling them, which saves energy required for the recycling of glass bottles. Another motivation project is the Re-Use-Box for reusable small ware. The collected ware is sorted by social integration companies and prepared for reutilization and sold in their Re-Use-Shops (f.e.: Carla Shop in the adjacent region Hartberg). Again as already mentioned, the introduction of these services would prolong the life of resources and goods in circulation, which Vorau wants to accomplish - either with the use of already available establishments (Carla Shop) or the foundation of an own re-use shop or similar action (f.e.: flea market).

With these initiatives respectively projects Styria set several examples of an improved and more towards circular economy striving waste management which the region Vorau wants to focus on and develop to. The Vorau region wants to see these “Best Practice” examples as a motive to establish re-use activities as well in the future.

¹⁸ <https://www.reparaturfuehrer.at/>

¹⁹ <https://www.repanet.at/>

A conscious local sustainable waste management targets for resource reduction, reducing straining our natural resources/primary resources which results in saving resources, avoiding waste, reduce poverty and preserve regional added value. Hence, the region Vorau intends to act/work towards the mentioned projects in future.

Moreover, as the topic food loss gained increasingly attention in media, several initiatives were founded in the past years to meet this challenge – f.e. with providing publicly available shelves and fridges which allow people and businesses to donate their overrun of food and make it available for third parties. With an existing cold storage house, which got organized in an energy efficient way with photovoltaic systems, the municipality Vorau aims to offer the opportunity to store food. This implies the potential to extend the storage house to a food-sharing facility for community members, which would be optimally communicated with an online platform. This would be an ideal alternative for people who are considering purchasing an additional fridge/freezer – due to lack of space (especially in autumn when the garden is harvested). Additional to these measures it requires active PR and awareness raising. This could have an impact on the individual consumption pattern and perception of the challenge.

Also, in the think tank of the Impulszentrum Vorau, the reusability of old car batteries of diesel and petrol vehicles is being considered – with the potential in including them and using them in electrical storages of houses.

Additional to existing measures in the region Vorau, the Ökopark Hartberg in the neighbouring municipality Hartberg practices numerous projects regarding energy efficiency and sustainable resource management. The researches concern themselves with construction with sustainable and innovative insulating materials made out of cellulose recovered from newspaper, which is collected separately within the waste association Hartberg.

2.3.2 Energy sector

With respect to organising energy in a more circular respectively an more efficient way the region Vorau established in cooperation with the climate and energy model region (KEM – EnergieIMPuls) numerous measures. Vorau, with the Impulszentrum, forms the innovation and main coordination centre and is the responsible authority for project management. Vorau's energy project aims for energy sustainability in the energy and building sector. Not only regional energy needs should be covered, but the Vorau region is to be supported towards a plus energy region. This involves a vertical involvement of all stakeholders (raw material supplier, plant manufacturer and operator, consumer and particularly the population). In the following, targets and visions are presented that are to be achieved within the project duration or via the project in the long-term.

Following measures are planned to implement in terms of changing towards a circular economy:

- Implementing energy efficiency measures in agriculture establishments
- Measures for enhanced efficiency increase
- Measures to increase the direct use rate of photovoltaic electricity
- Installation of additional photovoltaic units on community and private properties
- Expansion of photovoltaic and electricity storage: especially focus on electricity storage because of innovation potential in the Vorau region on cost reduction and technology development.
- Charging stations for e-Bikes and e-Cars at the Impulszentrum Vorau
- Converting the street lighting to LED
- Force exchange of illuminants/lamps in public and private interior
- Photovoltaic-civic participation facility: cold storage house Vorau
- Climate change adapted buildings

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- Increase of forestry for energy production
 - Change to green electricity
 - Substitute heating oil for households
 - Optimisation of existing heating systems
 - High energy construction standards when building or renovating
 - Initiation of measures for climate-adapted behaviour and construction

To tap the full potential, the Vorau region established a measure for providing and store surplus energy. As already mentioned above, with an expansion of photovoltaic units and electricity storage the electricity network gets disburden and increases the intern energy quota. The additional construction of photovoltaic units (300 kWp) in the region with ten electricity storage options/solutions can significantly promote the local economy as well the share of green electricity. Further, the price for photovoltaic storage solutions has recently decreased by 40% within three years with an expected continuous falling in the future years. Vorau's energy report indicates that it is not necessary to obstruct new surfaces but use the already existing well positioned roof and front surfaces. This measure could improve the local/regional eco-balance, decreases the conduction losses due to the storage solutions and provide an economic incentive (for supplier and consumer).

A further potential is the surplus energy provided by solar heat. The energy produced in summer still remains unused as a result of less need in this season. The Vorau region wants to deal with this potential in future researching about storage options of the surplus energy.

As the majority of energy supply in the Vorau region is provided by biomass, the Abbey Vorau, with a forest enterprise of 2900 ha, plays an important role in consulting and supplying with biomass.²⁰ Hence, the Abbey embodies a "Best practice" example in this region, with a circular energy supply being autarkic.

²⁰ <https://www.stift-vorau.at/de/stift/wirtschaft/>

2.3.3 Mobility sector

For any developed country, a large part of the built environment is taken up by our need for people's private mobility. In particular, materials are used for transport infrastructure, production of vehicles, plus the fossil fuels burned to power them.

Mobility and Consumables are the biggest contributors to Austria's societal need footprint, taking up almost half of the entire consumption footprint (46 %; 50 Mt and 45 Mt of Austria's consumption footprint), driven mostly by construction flows. The size calculated for Mobility can be explained by the fact that it is responsible for the largest share (roughly a quarter) of the construction sector's mass flows due to the building and maintaining of roads and railways (a calculation based on Wiedenhofer et al.).²¹

In rural areas like Vorau, smart regional planning can increase the attractiveness of local centres to reduce overall mileages, in combination with smart use of emerging technologies.²² For that reason the Impulszentrum Vorau mentioned a few actions to support the current system to convert towards a circular system and adapt local infrastructure and services.

One measure already mentioned in 3.2 expresses a further development of already existing alternative mobility systems – e-mobility and e-bikes. With an expansion with additional electric filling stations the demand of local alternative filling stations for e-mobility would be covered.

With no operating public transport system beyond school hours, the individual transport is dependent on individual motorized mobility/vehicles.

²¹https://www.ara.at/fileadmin/user_upload/Downloads/Circularity_Gap_Report/CGR_Austria_Endversion.pdf

²² ibidem

Due to general deficiency of public transport in rural areas, the Province Styria announced a Micro-public-transport strategy in 2017 discussing and evaluating current transport systems. Functioning projects in Austrian municipalities like Trofaiach (gMeinBus Trofaiach), Ebenthal (Mobil-E Ebenthal) and Assling (Assling Mobil) were analysed and cited as an example for working micro-public-transport systems.

With this empirical value, data and subsidies from the Province, Vorau aims to pursue some research for establishing a micro-public-transport system as well – in any case, it would be important to investigate in the future.

An existing Micro-public-transport system (“Mobil50plus”) in the neighbouring municipality energy region Pöllauertal got established and accepted by the population. This project focuses on the transport and mobility of citizen with no available vehicle for daily routine acquisitions.

Additional, the mobility concept “GUst mobil” accomplished to gain attention in the past years in surrounding Graz (Styria’s capital). It is the most known micro-public transport network, which works in a similar way to a collective taxi with the aim to foster both the local accessibility, as well as the connection to the public transport network. Therefore it allows both – access to a region bus/train station as well as individual transport for daily routine procurement. Meanwhile this system has been expanded which is an opportunity for the Vorau region to join this micro-public transport system.

Another measure to provide local public transport services would be the establishment of a “city bus” like the neighbouring municipality Hartberg. This could be the complement to the operation system during school hours.

Furthermore, according to Vorau’s energy report, three private car sharing projects have been initiated. The car sharing services will be managed via an online platform. Thus, people who allocate their vehicle for shared use and those who are looking for a vehicle will be connected via these platforms.

This aims for an ideal establishment of a constant group of people sharing a vehicle. Vorau's authorities argue that people who drive less than 12.000 kilometres per year per car (as with a second car) have a notable price advantage – fewer costs per year (because the acquisition costs are in no proportion to the actual use). Following exemplary platforms are available in Austria for organising car sharing: www.caruso.mobi

Separate from the micro-public transport strategies as well as the e-mobility the Vorau region joins PR initiatives promoting for physical mobility (f.e. joining the Purzel-Wurzel-Challenge or organising bike races).

2.3.4 Public Relations

With a broad spectrum of public relation strategies, the Vorau region aims strengthen the public performance and gain attention for support of actions towards a circular economy. Following strategies for public awareness raising are planned and intensified:

- Public actions with an emphasis on climate protection at educational institution (f.e. project days at primary schools, polytechnic, kindergarten etc.)
- Actions with an emphasis for a change to green electricity at fairs
- Initiation of measures for climate change adapted behaviour and construction
- Target group oriented information (for builders, renovators, etc.)
- Actions promoting a conversion from heating oil to alternatives/sustainable energy supply
- Establishment of regular energy meetings
- Information events (f.e. economy fair, expert talks about economic advantage of renewable energy etc.)
- Bike events (free bike check, mayor cycling, hosting bike race)
- Excursions to other Best Practice Example regions
- Propagation for climate conscious consumption
- Sustainable climate and energy fair "EnergieIMPuls Vorau"
- Awareness raising for sustainable mobility

An increased interest among the population in the region Vorau was achieved with past information events, which has great potential to enhance with more information events. This is a positive indicator of implemented impulses for encouragement/stimulation of the region - with a continuous propaganda of information of climate protection.

2.3.5 Management and Policies

To complement the active measures striving towards a circular economy, the Vorau region organizes supporting methods and managerially actions. These offered services are as followed:

- Energy consultation (agriculturists, construction companies, etc.) – face to face or via telephone
- Innovationspace for energy- and environment relevant topics at Impulszentrum Vorau. Regular meetings of local experts making research, giving inputs to project ideas and doing networking. Thus, the centre concentrates on regional economy and innovation in the energy and environment sector.
- Consultation for smaller measures (consuming efficiency of e-Equipment, change of heating systems, variable capacity pump change, measures for window sealing, etc.)
- Buying syndicates for a sustainable and efficient technologies
- Subsidized energy-innovations projects: E+Zentren, Smart City Hartberg, Micro TRIGENERATI-ON, REMECRES, Ökomobilfunk etc.
- Project management: this requires a responsible person (head of the project) for organizing and planning the processes around, in and for the project.
- Consultation for private persons: consulting for energy efficiency and renewable energy, for environmental and financial advantages
- Sustainable procurement in public sector (SPP - sustainable public procurement)
- Establishment of a regional and seasonal grocery store offering products from local farmers (Joglland Bauernladen)
- Networking with educational institutions for research, f.e. the University of Technology in Graz supervises research projects with focus on eco-design and its management regarding smart phones, sustainable product services in the building and furniture industry, prevention through sustainable building products and networking with specialists

2.4 Measurement and evaluation

2.4.1 Measurement of measures in energy sector

To measure and evaluate the performance of circular economy, the energy region Vorau came forward with some strategies. Energy-wise the region proposes to introduce an energetic accounting in public establishments as well as schools. With the documentation of the energy consumption and energy savings due to efficient energy management, a motivation for further establishments (public or private) could be achieved. With the monthly recorded energy consumption (meter reading of electricity and heat amount), the visualisation of the potential and resulting success of measures is presented to the participants, who would recognize the saving potential. Potentials of heating, ventilation and lighting systems, regulation and control systems are to be identified. Efficiency is then based on the objectives:

- Reduction of energy costs
- Reduction of energy input
- Reduction of environmental effects (f.e. CO₂-emissions, particulate matter)
- Ancillary effects such as image and health

This can lead to shifting energy patterns and impact the behaviour. The energy accounting relieves the conscious management of energy, the monitoring of consumption development and the planning and efficiency control. Further, the communication of consumption data basis for an energy saving behaviour of the building occupants.

2.4.2 Measurement of measures in waste sector

For measurement and evaluation of the performance of the regional waste management, waste treatment and collection centres document and transfer their data to the EDM (electronic data management). This data bank supports the collection and Visualisation of complex cycles and processes. With this data the efficient waste separation and the resulting environmental considerations/impact can be visualized and predicted. It is operated by the Environment Agency Austria and embodies an efficient processing platform for administrative processes respectively an e-government-compliant reporting system with which companies and authorities unwind reporting obligations. With this provided data it is possible to have an overview over waste streams, recycling rates etc. in Austria. This enables to enhance and/or establish new improved measures.

2.5 Conclusion

The goal of the Circular Economy Strategy is to create synergies between economic and environmental goals. With this intention in mind, Vorau endeavours to change towards a resource and energy efficient economy supported by numerous projects. Required administration persons for an implementation are present at the innovative Impulszentrum Vorau – providing know-how and financial resources for realizing activities. Following are treated with special focus and local priority:

- Car sharing
- E-mobility + filling stations
- Micro-public transport system
- Green Public Procurement
- Provision of information (schools, businesses, privates, etc.)
- Public relations for waste prevention and awareness raising
- Photovoltaic units

Vorau's experts see major potential in an implementation and cultivation of sustainable procurement (green public procurement GPP as well as sustainable public procurement SPP), which would have far-reaching impact on optimizing a circular economy respectively changing towards a circular economy. This forms the basis and therefore the prerequisite for further sustainable and circular projects. Farther, a legal national or regional responsibility would facilitate this process.

Regarding an establishment of a car-sharing and micro-public transport system, Vorau faces the challenge of optimizing the existing infrastructure network and highlighting advantages even with decreased individual flexibility and enhanced time management than before. Experts see this as a main challenge to convince inhabitants of the impact by shifted patterns on their life quality – now and in the future.

For a better impact and implementation there is a need for adopting EU Circular Economy Strategies in the national politics which results in more active projects – with a legal national, provincial and municipality wide responsibility.

However, before the latter can be put in action, there is a need for technical security and know-how, which in turn requires research activities regarding circular economy. Numerous research projects in the province Styria are actively conducted in cooperation with university and/or research institutions – which closes the loop (!) with the local facilities in Vorau.

In total, Vorau is well on the way to becoming a closed-loop economy (circular economy), but there is still massive need for research and action.



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