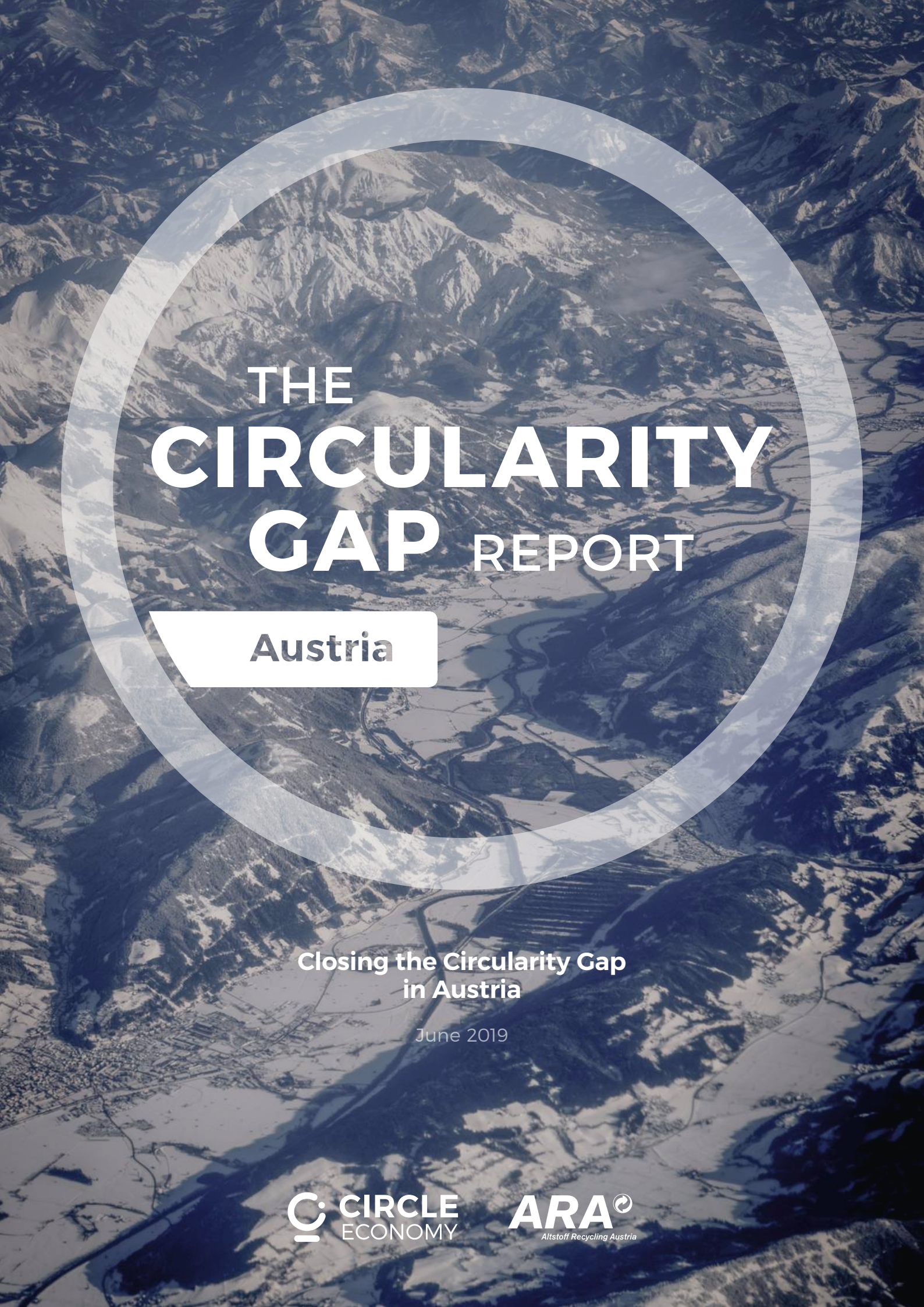


THE CIRCULARITY GAP REPORT

Austria

Closing the Circularity Gap in Austria

June 2019

CIRCLE ECONOMY

ARA
Altstoff Recycling Austria

About Circle Economy

We work to accelerate the transition towards a circular economy. As an impact organisation, we identify opportunities to turn circular economy principles into practical reality.

With nature as our mentor, we combine practical insights with scalable responses to humanity's greatest challenges.

Our vision is economic, social and environmental prosperity, without compromising the future of our planet.

Our mission is to connect and empower a global community in business, cities and governments to create the conditions for systemic transformation.

circle-economy.com

About ARA

ARA has been a driving force in the Austrian recycling economy since 1993. Originally conceived as a packaging compliance scheme and non-profit company, ARA has long since established itself as a recycling expert, a driver of innovation in resource management and the go-to partner for bespoken waste management solutions. Today, ARA is recognized internationally for the quality and range of its services.

As market leader, ARA is engaged in numerous R&D projects from ARA Circular Design and social studies to digitization of logistics, material flows and resource management.

With respect to the 2018 EU circular economy package, its new and ambitious targets and the related EU Action Plan, ARA puts emphasis on fact-based, effective and cost-efficient strategies for the transition towards a circular economy.

ara.at

FOREWORD

The transition towards a circular economy is often seen in the very limited context of post-consumer wastes. As Austria's market leader in packaging recycling, we wanted to paint the bigger picture of raw materials, minerals, biomass, and fossil fuel and their relevance for Austria's societal needs. We now have a benchmark and a starting point to identify priorities and come up with appropriate actions to increase our circularity rate.

Taking far-reaching economic and environmental policy decisions lacking a sufficient data basis would have been merely speculative and not in line with our goals that are efficiency and effectiveness.

Christoph Scharff
CEO Altstoff Recycling Austria AG (ARA)

Austria is taking a pioneering role in the transition to the circular economy. This Circularity Gap Report - Austria shows how Austria is performing as a country in comparison to the global average of 9,1%. In this epoch of climate breakdown, with profound societal and economic challenges, our vision of a circular economy is an inclusive, sustainable and future-proof model for development. We have done this work with hundreds of businesses and dozens of cities around the world. With this report commissioned by ARA, Austria becomes the first country to bring national perspective to this global debate.

Austria has developed a strong social partnership over the years, with a strong record in recycling. We hope that all stakeholders - policymakers, industry, academia and civil society - will build on the great ideas put forward in this report, and jointly map a path to faster and scalable action.

Harald Friedl
CEO Circle Economy

IN SUPPORT OF THE **CIRCULARITY GAP REPORT AUSTRIA**

Elisabeth Köstinger

Federal Minister for Sustainability and Tourism, Austria

"The United Nations Sustainable Development Goals underline the importance of a sustainable use of resources. With the Circular Economy Package (CEP) and the Action Plan, the European Union has declared its commitment to pave the way for sustainable production and consumption in our common economic area. Austria is among the leading countries in this field. Now it is important to take the next steps based on a scientific background to make our progress towards a circular economy planned and measurable.

Harald Mahrer

President of the Austrian Federal Economic Chamber (WKO)

"To achieve sustainable consumption and production the transformation to a circular economy is crucial. This accompanied with resource and energy efficiency will also help to reach the goals of the Paris agreement. The report gives an excellent and comprehensive overview and data set, where we stand and where action is needed and possible to be set. A good evidence base is essential for targeted measures.

Monika Mörth

Managing Director, Federal Environmental Protection Agency, Austria

"At the end of the day, a comprehensive circular economy is a key requirement for long-term economic activity in our global society. The present country report offers a database as a basis for political discussion and will hopefully be imitated in numerous other countries across the globe.

Helmut Rechberger

Professor and Head of Research Center for Waste and Resource Management at TU Wien, Vice Chair Circular Economy Coalition for Europe (CEC4Europe)

"Reporting the state of Circularity is an important first step towards a better understanding of our physical economy. However, currently Circularity is still a quantitative concept and has to be upgraded with qualitative approaches in order to become purposeful with regard to sustainability goals.

Marion Huber-Humer

Professor at the Department of Water, Atmosphere and Environment, Institute of Waste Management, University of Natural Resources and Life Science, Vienna

"The world's population is expected to strongly increase within the next decades; thus, the lifestyle of this growing population, meaning how people life, how they consume and behave is an essential factor, and will become most probably a factor, that will even have a higher overall impact than each newly developed and improved technology or business model and management concept. Circular Economy approaches, therefore, cannot be limited to the implementation of innovative and improved recycling technologies, to the technical optimization of resource efficiency, or introduction of new business models. Sustainable Circular Economy approaches must also change people's attitude, our consumer behavior, our lifestyle.

Johann Fellner

Professor and Head of the Christian Doppler Laboratory for Anthropogenic Resources, Vienna

"Long-term sustainability requires among others a fundamental shift in our resource use, away from a linear towards a circular economy. The present report not only shows that Austria (as probably all economies around the globe) still has a long and difficult way ahead to accomplish this transition, it also provides valuable information on the group of resources that should be in focus to substantially increase the rate of circularity.

EXECUTIVE SUMMARY

From a frontrunner in recycling, to the circular economy. Austria ranks as one of the global frontrunners in recycling. Four decades of dedicated policy and action have led to a situation where 58% of all municipal waste is recycled. The real opportunity now is to leverage this strong position and light the way towards a circular economy that radically reduces primary material inputs, as well as wastes and emissions to nature, whilst at the same time driving business opportunities. This study, the first Circularity Gap report conducted on a country-level, demonstrates Austria's determination of becoming the frontrunner in the circular economy.

A 1.5˚C world makes circularity a must. Austria, as a member of the European Commission, has pledged to contribute towards a 36% reduction in greenhouse gas emissions by 2030, compared to 2005[1]. This responds to the goal of the Paris Agreement, calling for a limit on global warming to 1.5°C above pre-industrial levels. The circular agenda and low-carbon commitment are complementary and mutually supportive. The pathway to a low-carbon future is circular.

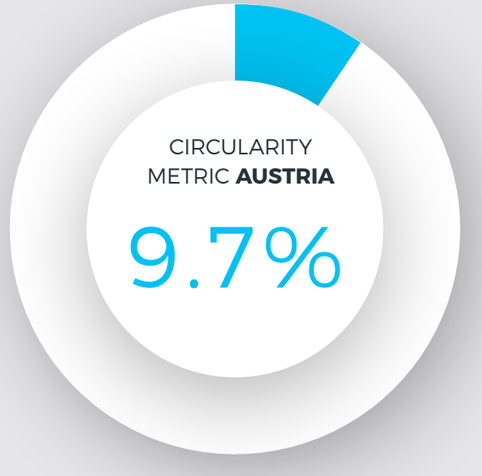
Austria's circularity is on a par with the global average. In the global Circularity Gap Report 2018, Circle Economy concluded that the global economy is just 9.1% circular, leaving a massive 'circularity gap'.[2] Building upon earlier work of Jacobi and colleagues[3], analysis conducted on the Austrian economy suggests a circularity rate of 9.7% - slightly above the global average. Different from the waste recycling rate, this represents the proportion of secondary materials in all materials required by the economy. This study outlines how this number was calculated and how the material flows are modelled through the Austrian economy.

Material footprints behind Austria's societal needs. Unique in this study, is how it provides a first approximation towards allocating resource use towards Austria's societal needs. Based on the analysis, it can be observed that the need's material footprint originates to a large extent (55%) from outside Austria, which is typical for a developed trade nation. Mobility and Consumables are the biggest contributors to Austria's societal need footprint, taking up almost half of the entire consumption footprint, driven mostly by construction flows.

Closing Austria's circularity gap. To boost Austria's circularity, four courses of action have been explored: (1) shifting from fossil fuels to renewable resources (boosting circularity to 9.9%); (2) recycling of all recyclable waste (18.8%); (3) shifting to an economy that simply maintains its current level of buildings and infrastructure, sourcing all construction materials from demolition of old building stocks (11.6%); and (4) ensuring imports with higher secondary content (20.1%). Combined, these four action perspectives can boost Austria's circularity rate from the current 9.7% to 37.4%.

Austria leading the way and the role for Nation States. This report is the first of its kind, where the circularity of a country is assessed combining different approaches. The relevance of the outcomes therefore goes beyond providing an action agenda for Austria alone. In the transition to a circular economy, Nation States have a particular role to play. They not only possess the power to set comprehensive national policies and support mechanisms, but also the potential to influence global action on this topic in multilateral, international forums, such as the United Nations.

In fact, a value of 9.7% is remarkable for an industrialized, trading and growing economy as a large portion of the resource consumption originates from imports and ends up in so-called anthropogenic stocks: Buildings, infrastructure or machinery with decades of use ahead until these masses become available for reuse or recycling.



4 STEPS
TO BRIDGE AUSTRIA'S CIRCULARITY GAP

1. Build a national coalition for action that is both diverse and inclusive.
This will bring together front-running businesses, governments, NGOs and academics to collectively boost capacity and capability, so serving societal needs better and more sustainably.

2. Translate national strategies into regional and commercial pathways.
This will enable regions, cities, industry and business to formulate practical strategies that are aligned to local context, incentives, markets and mandates.

3. Develop decision metrics and a measurement framework.
This will encourage goal-setting, evaluations and peer review, which will in turn serve to benchmark performance and track progress against such longer-term global ambitions as the Paris targets and the UN Sustainable Development Goals (SDGs).

4. Facilitate peer-to peer learning and knowledge transfer.
This will accelerate the international dissemination of effective circular economy policies and practices, fostering a collaborative ethos that helps to grow understanding and speed uptake.

ZUSAMMENFASSUNG

Vom Recycling-Vorreiter zur Kreislaufwirtschaft. Österreich gehört zu den weltweiten Spitzenreitern beim Recycling. Vier Jahrzehnte gezielter Politik haben erreicht, dass 58% der Siedlungsabfälle recycelt werden. Nun liegt eine große Chance darin, diese Vorreiterrolle zu nutzen, um den Weg zur Kreislaufwirtschaft aufzuzeigen, um den Bedarf für Primärrohstoffe, sowie Abfälle und Emissionen in die Natur drastisch zu senken und gleichzeitig neue wirtschaftliche Chancen zu fördern. Als erster 'Circularity Gap' Bericht auf nationaler Ebene bestätigt diese Studie Österreichs Ambition in der Kreislaufwirtschaft eine Vorreiterrolle einzunehmen.

Für das 1,5 ˚C Klimaziel ist eine Kreislaufwirtschaft ein ‚Muss'. Als Mitglied der Europäischen Kommission hat Österreich das Ziel bis 2030 eine Senkung der Treibhausgasemissionen um 36% gegenüber 2005 zu erreichen.[1] Dies folgt dem Pariser Klimaabkommen, globale Erwärmung auf 1,5 °C über dem vorindustriellen Niveau zu begrenzen. Die Kreislauf- und Klimaschutz-Agenda ergänzen und bekräftigen einander, da eine klimafreundliche Zukunft unweigerlich auch die Kreislaufwirtschaft beinhaltet.

Die österreichische Kreislaufwirtschaft liegt im globalen Durchschnitt. Im globalen ‚Circularity Gap' Bericht kam Circle Economy zu dem Schluss, dass die Weltwirtschaft nur zu 9,1% ‚zirkulär' ist und eine massive Lücke in der Schließung von Kreisläufen besteht.[2] Aufbauend auf einer Studie von Jacobi und Kollegen[3] ergab die Analyse der österreichischen Wirtschaft einen Indikator von 9,7% - leicht über dem globalen Durchschnitt. Anders als eine Recyclingquote, repräsentiert dieser Indikator den Anteil von Sekundärrohstoffen im Gesamtverbrauch von Materialien. Dieser Report beschreibt die zugrunde liegende Analyse und Modellierung von Materialflüssen in der österreichischen Wirtschaft.

Der materielle Fußabdruck hinter Österreichs gesellschaftlichen Bedürfnissen. Besonders an dieser Studie ist, dass sie eine erste Einschätzung abgibt, wie die Nutzung von Ressourcen der Befriedigung verschiedener gesellschaftlicher Bedürfnisse zugeordnet werden kann. Laut der Analyse fällt der materielle Fußabdruck hinter Österreichs gesellschaftlichen Bedürfnissen zu 55% außerhalb der Landesgrenzen an. Dies ist typisch für eine entwickelte Industrienation. Nahezu der Hälfte dieses materiellen Fußabdrucks hängt mit Mobilität und Konsumgütern zusammen. Dies wird vor allem von Materialflüssen aus dem Bausektor getrieben.

Österreichs Lücke zur Kreislaufwirtschaft schließen. Um die Zirkularität in Österreichs Wirtschaft zu steigern, wurde das Potential vierer Szenarien untersucht: (1) die Umstellung von fossilen Brennstoffen auf erneuerbare Ressourcen (Steigerung der Zirkularität auf 9,9%); (2) das Recyceln recycelbarer Abfälle (18,8%); (3) die Erhaltung des aktuellen Materialbestandes von Gebäuden und Infrastruktur, sodass der Bedarf an Baumaterialien aus existierendem Abrissmaterial gedeckt werden kann und (4) eine Steigerung des Anteils von Sekundärrohstoffen in Importgütern (20,1%). In Kombination können diese Szenarien den Zirkularitätsindikator von 9,7% auf 37,4% steigern.

Österreich als Pionier für die Rolle von Nationalstaaten. Dieser Bericht ist der Erste, in dem die Zirkularität einer nationalen Wirtschaft mithilfe verschiedener Ansätze bewertet wird. Die Relevanz der Ergebnisse geht daher über eine Aktionsagenda für Österreich hinaus. Nationalstaaten spielen im Wandel zur Kreislaufwirtschaft eine besondere Rolle. Sie verfügen sowohl über die Möglichkeiten, umfassende nationale Richtlinien und unterstützende Mechanismen festzulegen, als auch über das Potenzial, globale Maßnahmen zu diesem Thema in multilateralen, internationalen Foren wie den Vereinten Nationen zu beeinflussen.

Der Wert von 9,7% ist beachtlich für eine wachsende Industriegesellschaft mit internationalem Handel, in der ein großer Teil der Ressourcen importiert wird und in das sogenannte anthropogene Lager geht: Gebäude, Infrastruktur oder Investitionsgüter mit Jahrzehnten der Nutzung vor sich, bevor diese Massen für Wiederverwendung und Recycling zur Verfügung stehen.

4 SCHRITTE
UM STOFFKREISLÄUFE IN ÖSTERREICHS WIRTSCHAFT ZU SCHLIEßEN

1. Bildung einer nationalen Koalition, die vielfältig und inklusiv ist.
Auf diese Weise werden führende Unternehmen, Regierungen, NGOs und Wissenschaft zusammengebracht und die Expertise und Leistungsfähigkeit so gesteigert, sodass gesellschaftliche Bedürfnisse besser und nachhaltiger erfüllt werden können.

2. Übertragen nationaler Strategien in regionale und kommerzielle Maßnahmen.
Auf diese Weise können Regionen, Städte, Industrie und Wirtschaft praktische Ansätze ausarbeiten, die auf den lokalen Kontext, Anreize, Märkte und Mandate abgestimmt sind.

3. Entwickeln von Entscheidungsgrundlagen und Rahmenbedingungen für Monitoring.
So kann Österreich die Festlegung von Zielen, Bewertungen und Kontrollmaßnahmen fördern, die wiederum dazu dienen, Fortschritt zu messen und mit langfristigen globalen Ambitionen wie den Pariser Klimazielen und den UN-Zielen für nachhaltige Entwicklung (SDGs) zu vergleichen.

4. Fördern von gegenseitigem Lernen und Wissenstransfer.
So kann die internationale Verbreitung wirksamer Maßnahmen und Praktiken der Kreislaufwirtschaft beschleunigt werden und ein kollaboratives Umfeld geschaffen werden, das dazu beiträgt, das Verständnis der Kreislaufwirtschaft zu steigern und den Wandel zu beschleunigen.

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1 INTRODUCTION

The growing interest in and potential for a Circular Economy in Austria

In Austria, waste management has been well understood and practised for a long time. Its twin functions have been to protect people, the environment and natural resources on the one hand, plus provide raw materials on the other. The EU commission has recognised the high standards of waste management in Austria by awarding it 1st place (shared with Germany in the EU-wide ranking.)[4]

In past years, geological constraints, limited availability of raw materials and geopolitical developments, as well as other social, economic and ecological factors, have significantly increased awareness of the value of anthropogenic resources, recycling, urban mining and circular economy. Fortunately, Austria is able to rely on a deep bedrock of economic and technological know-how, thanks to its universities taking a pioneering role in the field of resource management and material-flow analysis, alongside the country's market-leading plant manufacturers.

In response to the EU circular economy package, Altstoff Recycling Austria (ARA) has also initiated the European research network Circular Economy Coalition for Europe - www.cec4europe.eu - aimed at providing politicians and decision-makers with the latest research results for an evidence-based circular economy policy. In addition, the EU Circular Economy Action Plan and implementation of plastic strategies constituted a central objective of the recent Austrian EU presidency.

Paris and the SDGs

The last four years have seen our more progressive global leaders, in both civic and corporate areas, embracing the two major examples of strategic and ambitious international collaboration announced in 2015: The United Nations Sustainable Development Goals (SDGs) and the COP 21 Paris Agreement. Adoption of the SDGs forms the basis of the universal plan for humanity to eradicate hunger, promote sustained economic development and good health, within global environmental targets. The signing of the Paris Agreement established near-consensus on the need for mitigation of human-made climate change and its impacts, via collective policy and practice. Progress has, however, been painfully slow. Furthermore, with their relatively narrow focus on the energy sector, most national approaches to climate change so far have wholly failed to leverage the game-changing mitigation potential of a circular economy.

Europe is in the race to develop a circular economy

The European Circular Economy package, first launched in 2014 and adopted by the European Parliament in May 2018, is one of the world's most progressive efforts to stimulate the circular economy.[5] Spanning 27 nations in one of the most consumption-heavy regions of the world, the CE package focuses on harmonised legislation to ensure the safe transition of materials from end-of-use towards new products. It also stimulates design for reuse and demands rigid Waste Management Plans from all EU member states.

The 2018 EU Action Plan for a Circular Economy proved even more ambitious. It addresses 54 fields of action in seven chapters all along the industrial value chain and highlights five types of waste: plastics; construction and demolition wastes; food waste; high-tech materials and rare-earth elements; as well as biomass. Amongst other objectives, the Action Plan calls for: (1) an EU-wide strategy for Plastics in the Circular Economy - demanding recyclable packaging in 2030 and banning single-use plastics; (2) an invitation to industry and civil society to discuss how chemical, product and waste legislation should be attuned to alleviate regulatory barriers for a circular economy; and (3) a monitoring framework on progress towards a circular economy.

Nation states are waking up to the transformative power of the circular economy

National governments, public and private actors are increasingly recognising the transformative power of setting targets for circularity and developing nationwide roadmaps. Countries like the Netherlands, Sweden, Slovenia and Finland have announced various circularity targets for 2030 through to 2050. Retail chains have also been informing their suppliers about reduction and recyclability targets for plastics and other packaging materials far ahead of the EU CEP timeline. As a result, both design for recycling and design from recycling have become catchwords across a range of markets, from consumer goods, to construction and infrastructure.

Another important set of transition strategies includes (supranational) government policies that alter incentive structures - for instance, by pricing in externalities, such as carbon emissions, or opening the door to labour-intensive circular business models by lowering employment taxes.

Where do we stand?

The recent global Circularity Gap Report released during the World Economic Forum established the idea that, despite raised interest and priorities, the challenges for a circular economy remain the same: Issues exist in value choices, also with respect to cost and regulatory barriers that have yet to be resolved. Recently, linkages have been made between the circular economy and climate change, which are beginning to resonate more widely.[6]

This has also internationalised the debate, as non-European stakeholders join in and underline their own concerns and wishes. The redistributive aspects of the circular economy and the link with the SDGs have therefore become more clearly established, with some nations expressing fears that their current, extraction-driven economies will be hurt. Business leaders have also highlighted the competitiveness aspects of a circular economy - as circularity touches upon how we design our economy, as well as the way we consume, work and produce. This carries widespread societal significance, too, adding to the rising sense of unease that many layers of (Western) society are feeling towards an uncertain future. Common concerns are giving rise to doubts and insecurities being voiced: How will our planet fare? Will there be work for me? Will I have greater wealth and a higher standard of living than my parents?

Such questions indicate not only the need for a new paradigm, but also the level of criticism it may well encounter. To attract mainstream buy-in, the circular economy therefore needs to address technical issues and provide a compelling, inclusive narrative.

A global frontrunner in recycling, Austria must now address circularity

Austria has seen more than four decades of ambitious recycling and reuse, resulting in an overall end-of-life recycling rate of 29.3% - meaning that almost a third of all generated outputs is now recycled.[3] Recycling of municipal wastes has reached 58%.[7] This foundation of technical know-how, combined with an established political environment and strong business networks, provides a springboard from which to take the next leap towards a circular economy.

However, it remains debatable whether the waste-related recycling rate is the proper indicator for measuring circularity. The ultimate aim of a circular economy is to reduce primary inputs and all outputs to nature. Cycling is a means to this end.

Moving forward from recycling in a traditional sense to take a wider perspective, this study therefore applies the methodology and metrics developed for the global Circularity Gap Report on a country level for the first time. The country focus addresses four key questions in support of the ambition to achieve a higher circularity rate for socio-economic metabolism:

1. **What is our common understanding of circularity, in the first place?**
2. **How relevant are various societal needs in this regard?**
3. **What is the current level of circularity in Austria?**
4. **How can we achieve progress?**

An action agenda empowering people for good

To measure economic sustainability only from a resource perspective, however, would miss the point and misunderstand the purpose. Any successful economic model must meet the needs of the society it serves and not merely manage responsibly the natural resources it uses - it is a matter of people and planet, together. The circular economy is therefore an action agenda with measurable impact framework that extends beyond the remit of mere resource efficiency. As a multi-stakeholder model, its systemic approach boosts capacity and capability to serve societal needs, by embracing and endorsing the best humankind has to offer: the power of entrepreneurship, innovation and collaboration.

2 SIZING AUSTRIA'S CIRCULARITY GAP
THE GOAL OF MEETING SOCIETAL NEEDS AND THE RESOURCE REALITY BEHIND IT

This section presents the material footprint behind Austria meeting seven key societal needs. It explores what resources are used for purposes such as housing, mobility and nutrition. The study also illustrates how raw materials are processed and assembled to become the products that address the country's needs. Visualising what happens at end-of-use sheds light on the accumulation of materials in products, goods and the built environment around us. Furthermore, it reveals that Austria currently achieves only modest cycling of resources back into the economy: all else is wasted beyond recovery or control. These observations provide a clear starting point to identify where different sectors and supply chains should focus their strategies going forward.

Production versus consumption

In this national edition of the Circularity Gap Report (CGR), we have applied the approach employed in the global CGR to the scale of a country. Following the material flow analysis methodology (described in the box below), this raises several challenges. While the whole of Earth can be seen as a relatively closed system, without mass flux beyond system borders, imports and exports of goods are an important issue at country level. On the other hand, data quality for Austria is far better, more consistent and detailed, than for global figures.

In assessing Austria's circularity, the study explores two comprehensive and complementary approaches: one based on production, the other on consumption.

While the production-based approach rather accurately computes the flows that enter and exit the economy using robust data about physical inputs, the economy itself is viewed almost as a 'black box' - only viewing flows in terms of material categories and distinguishing a few biophysical differences like stock building and energetic use. This method is great for understanding what biophysical flows take place in a certain part of the economy within the national territory. This approach has been applied to Austria's biophysical flows by Jacobi and colleagues, which we will discuss in the following chapter.[3]

By contrast, the consumption-based approach uses (less accurate) economic data to allocate material flows to different economic activities. It can trace flows through the global economy as they are used in one sector and passed on to the next.[8,9] Thus, it aims to generate a material footprint for different societal needs which accounts for all direct and indirect flows in Austria and beyond, caused by domestic consumption.

In this analysis, we have combined the two approaches. To increase the accuracy of the consumption-based approach, we calibrated the input data of the Austrian economy, in particular, with the data from the production-based approach. The two approaches allow complementary insights using the same underlying data.

One enables insights on how the production system within Austria needs to be improved for higher circularity, lower primary-material demand, plus reduced waste and emissions. The other one allows insights into what the most relevant consumption categories are when accounting for material uses in Austria and elsewhere. This provides an evidence base for a discussion about Austria's consumption and its impact on global sustainability.

MATERIAL FLOW ANALYSIS: A PROVEN METHOD

A material flow analysis (MFA) is a method used in the field of Industrial Ecology to analyse the input, throughput and output of substances and goods in a system.[10]

An **MFA** can be used to track specific substances, materials, aggregated mass (bulk) and products. Since material flows are accounted for in mass, it is possible to identify the origins, stocks and leakages.[11]

An **MFA** is suitable to use for decision-making in policy, public and private strategy, and can be applied on a global level, regional level, economy-wide level, company level and on a household level.[12]

7 SOCIETAL NEEDS & WANTS

In the following chapter we explain in more detail how material consumption is allocated to societal needs. Here we describe the 7 key societal needs and which products and services they include. Since various products can be allocated differently, here we make our choices explicit. For example, 'radio, television and communication equipment' can be classified either as part of the societal need "communication", or as "consumables". We decided to subsume it under "communication".

Housing and infrastructure

Another need that represents a significant share of a developed country's built environment, is the construction and maintenance of buildings for residential purposes. Related transport for construction and maintenance is included.

Services

The delivery of services to society ranges from education and public services, to commercial services like banking and insurance. The material footprint typically involves the use of professional equipment, office furniture, computers and other infrastructure.

Nutrition

Nutrition covers extraction, processing, storage and distribution of agricultural products such as bread and meat derived from crops and livestock that will be consumed as food. Food products have short lifecycles in our economy, typically being consumed quickly after production

Healthcare

With an expanding, aging and, on average, more prosperous population, need for healthcare services is increasing and these can be materially intensive in diagnostics and therapy. Next to (hospital) buildings, typical material uses include capital equipment such as X-ray machines, other medical goods and pharmaceuticals.

Mobility

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.

Communication

Communication and connectivity is becoming an ever-more important aspect of today's society, provided by a mix of equipment and technology ranging from personal mobile devices, to communication infrastructure and data centres. Increased connectivity is resource intensive, but if used in a smart way it can become an enabler of the circular economy - digitisation can render physical products obsolete, or enable far better use of existing assets, including consumables, building stock or infrastructure.

Consumables

Consumables are a diverse and complex group of products - encompassing such as refrigerators, clothing, cleaning agents, personal care products and paints - that generally have short to medium lifetimes in society. Textiles, including clothing, also consume many different kinds of resources, such as cotton, synthetic materials like polyester, dye pigments, and chemicals. Retail and hospitality services are also included.

MAPPING AUSTRIA'S **BIOPHYSICAL** MATERIAL FLOWS

To present an overview of the current state (based on 2014 data) of the circular economy in Austria a production based approach was applied. Using a Material Flow Analysis, the below figure shows a macroeconomic metabolism of the Austrian economy distinguishing between four resource groups: (1) ores (including waste rock); (2) minerals (non-metallic); (3) biomass; and (4) fossil fuels (as seen in Figure 1). Austria's total import flow of 88 Mt and total export flow of 58 Mt results in a physical net-trade of 29 Mt net-imports.

Of the 192 Mt of domestically extracted, imported and cycled materials that were processed in Austria in 2014, about 50 Mt (26%) were energetically used and thus lost for closed loops, especially in the case of combusting fossil fuels. The main share of the material use (87%) was added to stocks, with most being minerals, as used for buildings or infrastructure. These materials are not available for recycling in the short term, because they remain stored in stocks (such as houses or roads) for as long as they are in use. As a result, even though most of the waste output of 40 Mt can be used as secondary materials, the overall circularity of the Austrian economy remains low. This is a typical picture for a growing industrialised country, with high ongoing consumption of fossil fuels and a large proportion of minerals within the metabolism. When dividing the use of cycled material (17.5 Mt) by the total input of processed materials (192 Mt),

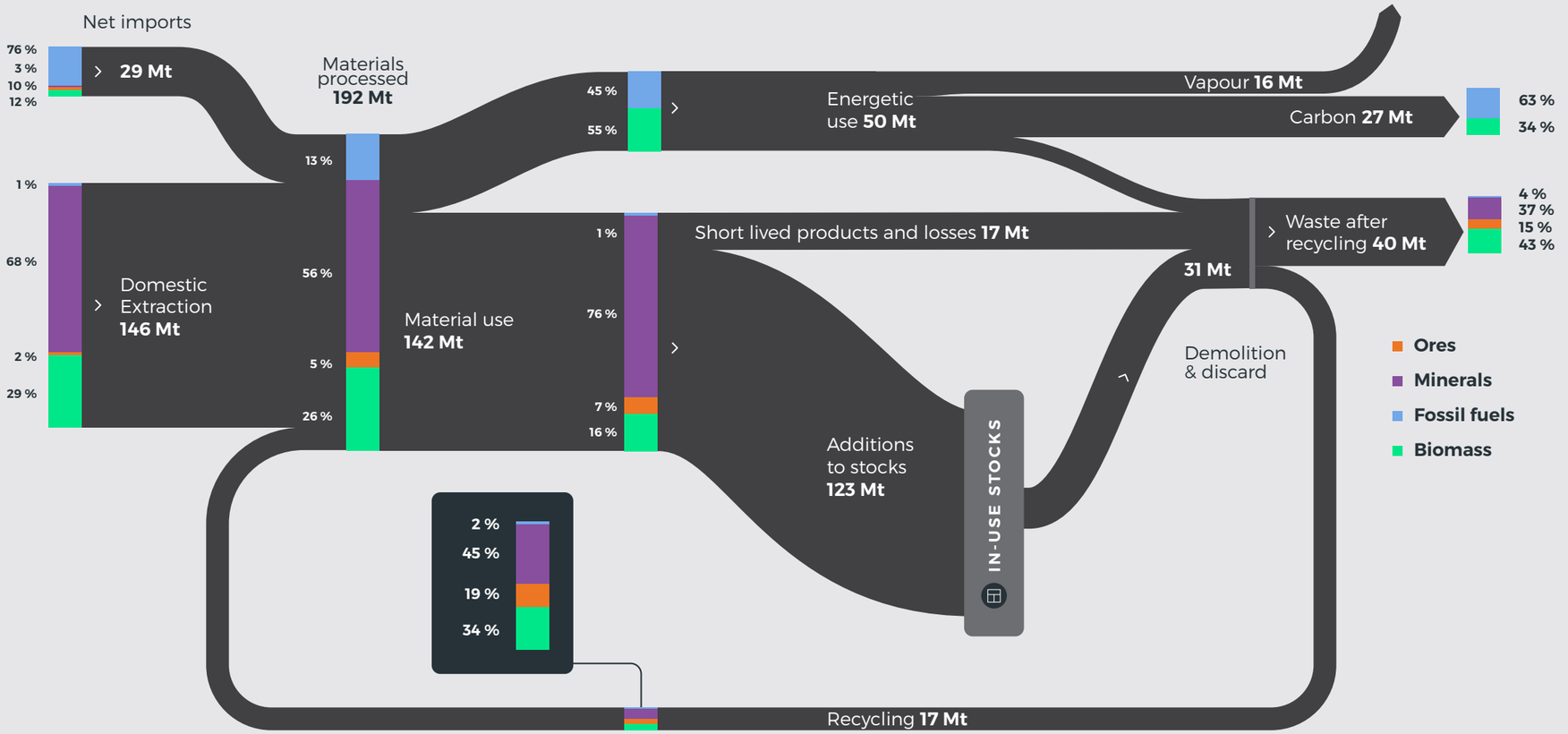
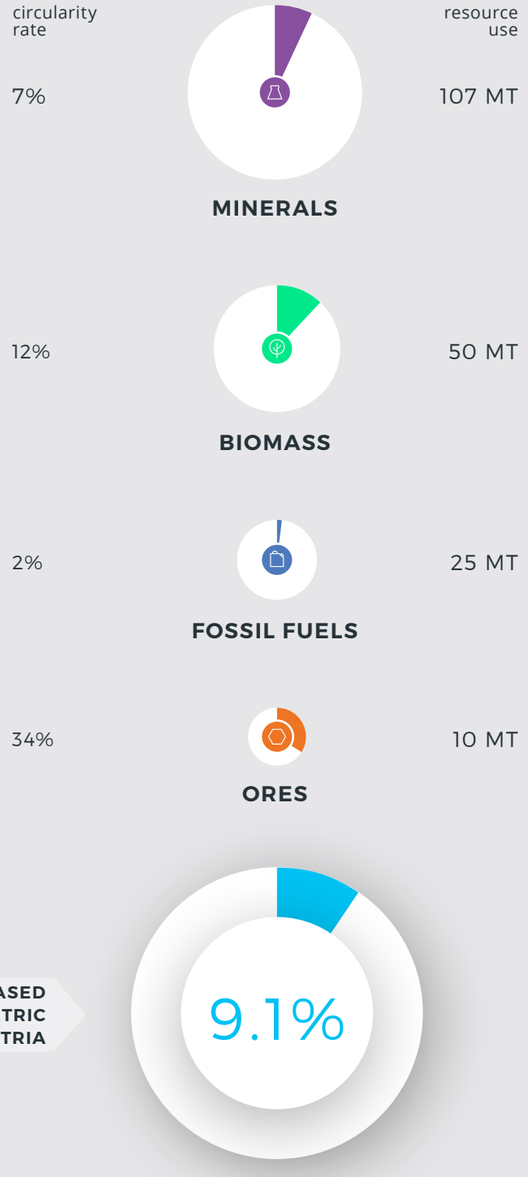


Figure 1 - The state of the circular economy in Austria in 2014 (aggregated flows) in megatonnes (Mt) per year for a production-based approach. The bar diagrams show the material composition of flows. Please refer to Jacobi et al[3] for additional information.

Austria's production-based circularity is calculated to be 9.1%. This is the same circularity rate that has been found for the global economy as a whole. By comparison, the value is remarkably high for a single, growing (and accumulating) industrialised economy. A closer look reveals that due to use and consumption patterns, as well as chemical and physical properties of materials, the circularity rate varies significantly across the four different resource categories:



THE MATERIAL FOOTPRINT
SATISFYING SOCIETAL NEEDS IN AUSTRIA

Building upon the presented production-based MFA, we applied a combined production- and consumption-based approach as a first attempt to model how the four resource groups (minerals, ores, fossil fuels and biomass) satisfy a country's seven key societal needs. For this, it is assumed that no resource will be consumed directly without any economic activity, as the analysis is based on economic tables for the value chain that relate resources to products for consumption.
For example, it means that we cannot take account of people consuming from their own vegetable garden, since there is no economic transaction involved in converting the resources into products. The transactional (economic) data is used as a proxy for material flows and are thus less accurate than biophysical flow accounting. Therefore, the sizes of the societal needs are better to interpret by their comparative size rather than absolute size.
From left to right, the figures show the extraction of resources (Take), for example through the mining of minerals, metal ores and coal, the drilling for oil, the production of crops in agriculture or forestry to produce timber for construction. The extracted raw materials typically undergo processing (Process), for example in the production of metals from ores, cement from limestone, or refined sugar from beets. Subsequently, these refined materials can be used for the manufacturing (Produce) and assembly of products like automobiles from metals, plastics and glass, or in the construction of roads and houses, or production of fashion garments. These finished products can, in turn, be used to provide services and access (Provide) to products that can satisfy societal needs.

The Sankey diagram (Figure 2) is especially suitable for displaying and interpreting linear processes - still to a large degree typical of the Austrian economy. It is employed to assign all of the resource usage by Austrians to final consumption. However, Sankey diagrams are not well equipped to show feedback processes within business-to-business trade. In a trading nation like Austria, the economy also deals with imports and exports as major material flows. Import and export commodities can range from raw materials used earlier in the value chain, such as sand and clay, up to highly processed goods ready for consumption, like passenger vehicles. The consumption-based approach will reveal how much trade affects the national consumption footprint: import footprints will be added to the consumption footprint, while materials used to produce export commodities will be deducted.

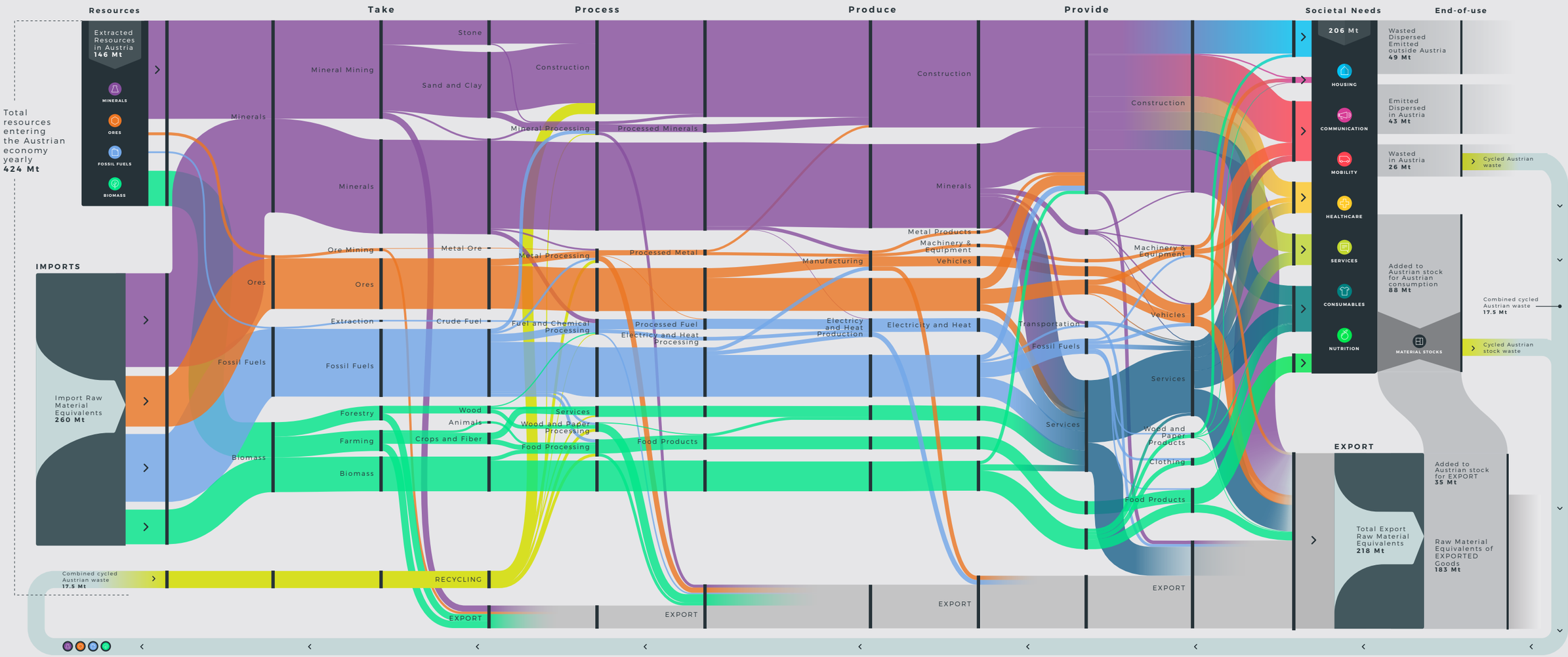


Figure 2 - The material footprint of Austrian societal needs and exports, plus the related material flows into, within and out of Austria, including raw material equivalents (RME) for imports. The figure also shows how the four resource groups (minerals, metal ores, fossil fuels and biomass) satisfy societal needs after (several) transformations along the value chain.

CIRCLE ECONOMY ARA Altstoff Recycling Austria

UNCOVERING THE CONSUMPTION FLOWS IN THE AUSTRIAN ECONOMY

The production-based study provides the following figures as input for hybridisation of the consumption-based approach. Either to satisfy societal needs or produce export commodities, 146 Mt resources are extracted domestically, 88 Mt products are imported and 58 Mt products are exported. For the same given year, 17.5 Mt materials are cycled back into the economy.

Calibrating economic information - incorporating the inter-industry relationships, import, export and final consumption from Exiobase[13] - with the resource use and trade data from the production-based study, we are able to open up the 'black box'. However, using the biophysical material flows alone is not sufficient to provide a genuine material footprint for Austria's societal needs. While the biophysical mass of imported goods accounts for 88 Mt, this does not take into consideration the Raw Material Equivalents (RME) of goods. Instead of taking the direct import weight of the good, the RME considers the total resource-use needed to produce it. From this production-based approach, we learn that the Austrian economy, like most developed nations, is net importing. When using the RME of imported goods instead of their direct weight, Austria's material consumption footprint can therefore be seen to increase considerably.[14]

Research by Schaffartzik et al shows that the RME of imported goods is on average 2.95 times their direct weight, and the RME of exported goods (containing both resources from domestic extraction and from extraction outside Austria) amounts to an average of 3.15 times the direct export weight.[15] This means that, on average, by including upstream material use, the product footprint is roughly triple the actual product weight. Applying these RME factors to the direct imports and exports, we derive a total of 260 Mt of import RME and 183 Mt export RME.

While Schaffartzik et al already provides figures for Austria's import and export footprint, it is still necessary to link the flows to the relevant products and industries in the economy. Exiobase helps identify the importing/exporting industries, and Jacobi et al provides information on export products as regards direct weight.[3] Then, guided by the product-based RME data by Eurostat, the import/export footprints can be distributed over different products, thereby taking into account that some import/export products are more resource intensive than others. With these sources combined, it is possible to scale the imports and exports on a product-industry level through the economy.

The representation of the material flows in the Austrian economy, including the RME for imports and exports, can be seen in Figure 2. This also shows how resources flow through the Austrian economy to eventually be transformed into products that are consumed to satisfy a societal need. The export footprint will also be larger than 183 Mt, since our study is attempting not only to account for the raw material equivalents of the goods, but also for the buildings and infrastructure that have been used to produce and transport these export goods.

Upstream material use in satisfying Austria's societal needs

From the total material footprint **(424 Mt)**, 51% **(218 Mt)** is used for export - intended for ultimately satisfying a societal need outside of Austria.
So, reflecting on the export goods RME for Austria, which is 183 Mt, 33 Mt of building and infrastructure footprint is added to the total export footprint, because this stock is assumed to be used for the production and distribution of goods and services for export. The other 49% **(206 Mt)** of the Austrian material footprint is destined for satisfying the societal needs within Austria. This can partially be explained by identifying the important export commodities, which are chemicals, industrial equipment, motor vehicles and services.
These goods have relatively high material footprints, thereby increasing Austria's export footprint.

The breakdown of the footprint for societal needs can be viewed in Figure 3. By quite some margin, the largest societal-needs footprints are for Mobility and Consumables (**50 Mt** and **45 Mt** of Austria's consumption footprint, respectively). 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. The size of the Consumables footprint can be attributed to the fact that it does not only take into account consumption goods, but also the transportation and buildings for distribution, plus retail of these goods. Services **(29 Mt)**, Healthcare **(30 Mt)** and Housing **(27 Mt)** have relatively similar footprint sizes.
The Housing footprint is dominated by the mineral use for construction of buildings, but Services and Healthcare also have a significant mineral footprint for constructing the likes of schools, offices and hospitals. Nutrition's footprint of **20 Mt** is mainly composed of a biomass footprint for imported foods. Lastly, Communication is responsible for **6 Mt** of Austria's consumption footprint.

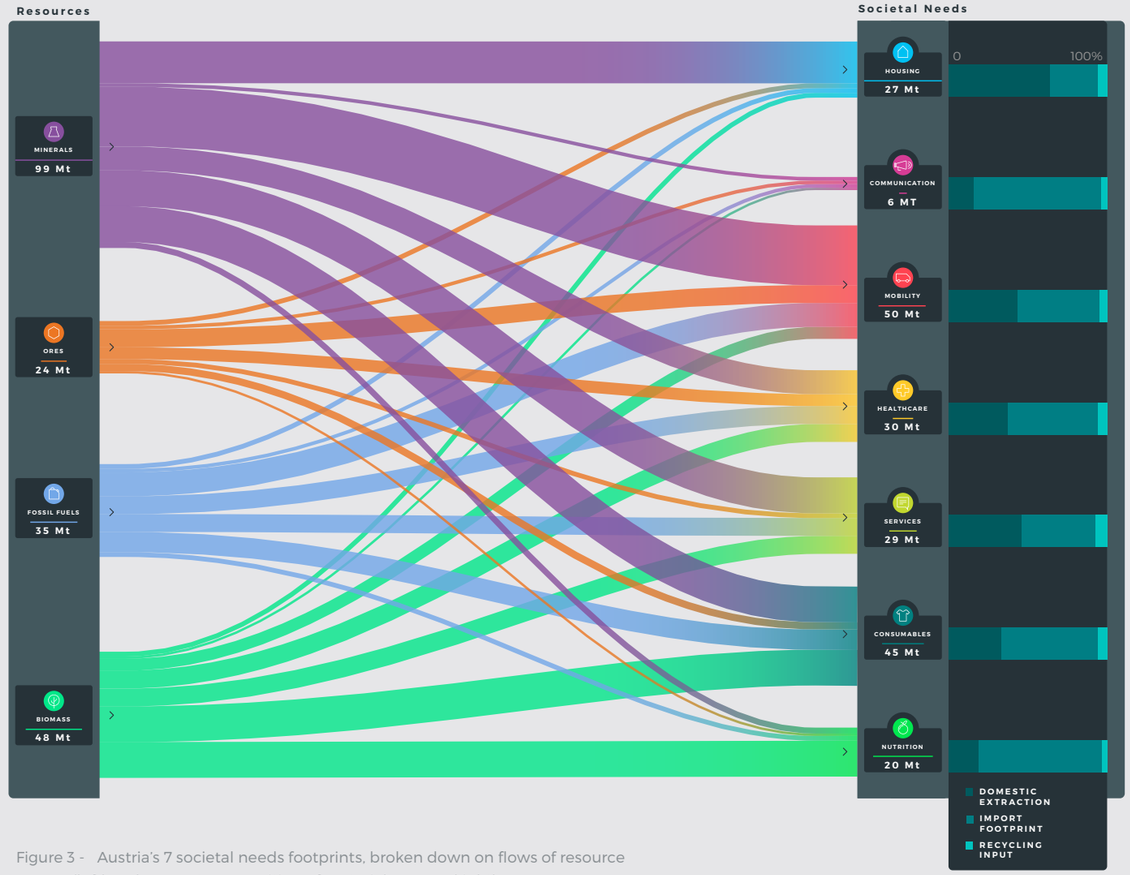


Figure 3 - Austria's 7 societal needs footprints, broken down on flows of resource groups (left) and percent composition of material sources (right)

KEY OBSERVATIONS

1. The consumption footprint originates to a large extent (**55%**) from outside Austria, which is a typical result for a developed trade nation.

2. The exported goods and the buildings and infrastructure supporting export account for roughly half (**51%**) of the total material footprint. This means that the consumption footprint of Austria is roughly half that of the total national footprint.

3. Mobility and Consumables are the biggest contributors to Austria's consumption footprint (**46%**) (almost half of the entire consumption footprint).

3 METRICS FOR CIRCULARITY

This section explains the measurement framework used to assess Austria's circularity, building upon the combined production-based and consumption-based MFA presented in the previous chapter. In the first edition of the global Circularity Gap Report[2], we launched the Global Circularity Metric. This new study builds on the CGR and adapts the Metric to Nation States. This represents original research, as there are no established measurement frameworks yet in existence. Our effort supports the desire of businesses and governments to be able to track their circular performance over time and put trends into context, plus engage in uniform goal-setting and guide future action in the most impactful way. This measurement approach is different from the production-based circularity metric (see page 17), and is therefore expected to have a different result. However, the metrics are fit for different purposes and provide complementary insights.

The Circularity Metric [%]

When the four fundamentals (outlined on Page 23) are considered, it becomes apparent that cycling of materials, is a key factor. To capture this essential dynamic, we therefore suggest that the circularity metric should represent the share of cycled materials as part of the total Austrian material consumption every year (Equation 1). However, we cannot be certain what share of the cycled materials flowing into the Austrian economy will be used to create and support exports, or will be used to satisfy societal needs. Therefore, the metric applies the division of consumption footprint versus export footprint to the cycled materials, in order to calculate the estimated cycled materials used for consumption, expressed in equation 2 as Consumption footprint/Total footprint. The next challenge is determining what exactly is the total for cycled material? From national recycling statistics, we can derive the figures for Domestically Cycled Material (as in the 17.5 Mt cycled within Austria).

Furthermore, we cannot ignore the fact that there must be secondary materials embedded into the imports (footprint). A simple and readily replicable way to include the secondary material is to take the global average of material cycling - 9.1%[2] - for the entire import footprint.

Applying all previous steps (see Equation 3) results in a **circularity metric of 9.7%** for 2014:

CYCLED MATERIALS FOR CONSUMPTION / **CONSUMPTION FOOTPRINT**

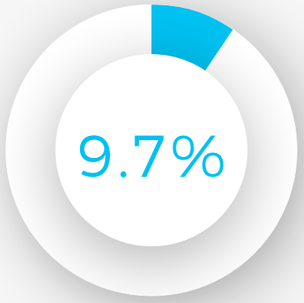
=

CONSUMPTION FOOTPRINT / TOTAL FOOTPRINT × (CYCLED MATERIAL +9.1% IMPORT FOOTPRINT) / **CONSUMPTION FOOTPRINT**

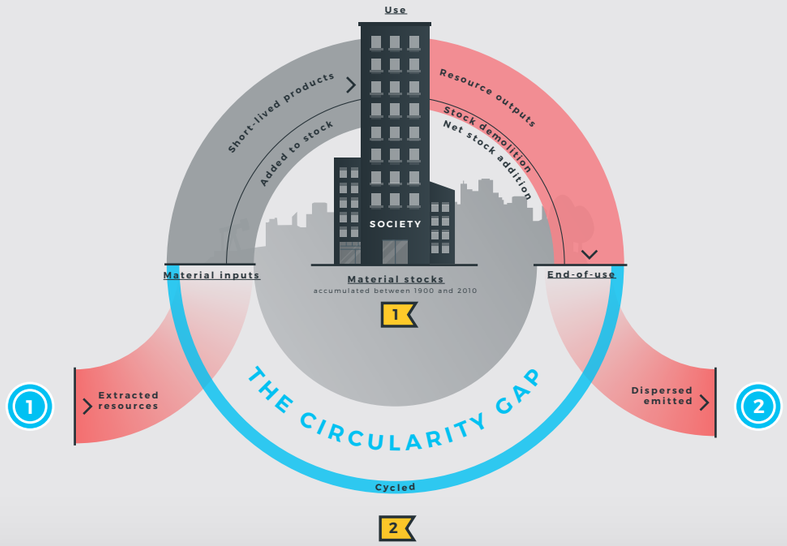
=

49% × (17.5 Mt + 9.1% X 260 Mt) / **206 Mt**

=



CIRCULARITY METRIC AUSTRIA



OBJECTIVES & STRATEGIES

DEFINING THE NATIONAL CIRCULARITY METRIC

The definition of a circularity metric should overlap with its objectives. Furthermore, it is required that the indicator follows in the expected direction as strategies get employed to improve circularity. Therefore, we have identified **2 Objectives** and proposed **2 Strategies** to gauge the metric.

1 Objective 1:

Resource extraction from the lithosphere is minimised and biomass production and extraction are regenerative.

2 Objective 2:

The dispersion and loss of materials to the environment is minimised, meaning all technical materials have high recovery opportunities, ideally without degradation and quality loss; emissions to air and dispersion to water or land are prevented.

1 Strategy 1:

In-use stocks are reconstructed to achieve materially slim infrastructures with long lifetimes and minimal need for energy in their operation - they are built in such a way as to be low-maintenance, readily-repaired and eventually, at the end of their service time, easy to reuse or recycle.

2 Strategy 2:

Material cycling for reuse is optimised, requiring improved collection infrastructure and wide-scale adoption of best-available technologies for (re) processing of resources - eco-design makes recycling easy, plus specification and use of non-circular materials, including fossil fuels, is minimised.

INTERPRETATION OF THE METRICS **SCANNING A NATION STATE: AUSTRIA**

To move from an analysis of the global economy to a subset thereof - whether it is a sector or country - means that the boundary definitions become relevant. Some countries have already committed to becoming a fully circular economy by a given year. The question is what this means: Does it mean that all products and services used in the respective country have to be circular? Does it mean that all products produced in the country and exported abroad need to be circular? Both the production and consumption perspectives on circularity can be useful, depending on how you want to use the outcomes - for example, for policy development.[18]

Austria is a trade nation with significant import and export volumes that account for a large part of the economy. It should be noted, therefore, that such export activity means that not all of the extracted, imported and recycled materials are used for domestic consumption.

Secondary material in the import footprint as an influential factor

Imports also play an essential role as an input for the Austrian economy. The import footprint (import RME) is roughly triple that of the direct import - meaning that two-thirds of resource use and waste production happen beyond Austrian borders. To measure circularity, the share of secondary materials included in the footprint of imports is therefore needed. Due to a lack of specific information, the metric calculation resorts to the global average circularity of 9.1%. Given the sheer size of the total import footprint, this is an influential factor for the Austrian circularity rate. Furthermore, whilst Austria can actively improve recycling of domestic material flows, recycling of waste flows in other countries is beyond the country's direct influence.

Stock building, fuel and food affect the metric

Whilst circularity using this consumption-based approach is measured at 9.7%, it is not a straightforward indication that the economy of Austria is 90.3% linear. The reason for this is that the largest footprints are attributed to societal needs characterised by **stock-building** - namely, mobility (roads, cars) and housing. This means that there is a relatively small proportion of material available for recycling in the same year, as buildings and automobiles obviously have a long lifespan. Similarly, when biomass and fossil fuels are used for **energy** in the form of fuel or food, it keeps them from being used again as a secondary material.

Methodological choices affecting the metric

The science of material flow and lifecycle analysis is as exact as it can be, but many methods exist that handle flows, balances and stocks differently. A choice to be made was between using either a generic RME for a country, or using product-based RMEs for footprint calculations. We have chosen to scale the footprint sizes using the generic RME for Austria specifically, as this employs scientific input-output analysis based on Eurostat data, as well as established academic datasets of lifecycle analysis. Furthermore, in explaining the circularity metric, it is assumed that all recycled materials are evenly distributed over domestically used product and exported products - an assumption that highly affects the outcome of the circularity metric.

Dealing with inaccuracies in footprint calculations

The Sankey diagram (Figure 2, Page 18) is suitable for displaying and interpreting linear processes, but it is not well equipped to show feedback processes in business-to-business trade. This causes inaccuracies related to the final footprint calculation. However, for the biggest contributing flows in Austria, construction flows, this has been corrected with separate Austria-specific data sources - by re-allocating construction flows for transport infrastructure, for residential buildings and other buildings with commercial or industrial use.

4 BRIDGING AUSTRIA'S CIRCULARITY GAP: DIAGNOSES AND REMEDIES

In the previous sections, we have shown how the metrics are derived and the image they portray. In this section, we analyse the findings to arrive at a diagnosis, and subsequently suggest a remedy. As regards the recommendations, the DISRUPT framework has been employed to cover all essential elements of a circular economy. (The framework is described in the box on the opposite page.) The DISRUPT framework has first been applied to the Austrian economy as a whole, and the analysis then zooms in on the specific societal needs, as described in the introduction to this report.

A fossil fuel economy can never be circular

Fossil fuels used as an energy carrier are inherently non-circular. The current 2% circularity of this material flow, calculated using a production-based assessment, is entirely attributable to the recycling of plastics. To increase its circularity score, Austria needs to further shift away from fossil fuels and **prioritise regenerative resources**. Whilst a significant proportion of electricity is generated by renewable hydropower, it remains the case that transportation and heating needs are still largely covered by fossil fuels. This use can only be made circular by shifting to renewable energy sources. The circularity gap illustrates how the circular economy and decarbonisation are interlinked and interdependent.

It would seem logical, therefore, to focus on the national energy transition in Austria. However, this is a narrow view of the need to move to renewable resources. If Austria were to completely banish the use of fossil fuels domestically (with the exception of utilisation for plastic production), the country's circularity would increase from **9.7%** to **9.9%**, which constitutes an uplift in the economy's circularity by only 2%. This small increase is due to the fact that besides domestic fossil fuel use for energy purposes, many imported ready-built products are fabricated elsewhere, often involving a large amount of fossil energy in their production. For example, take the amount of coal required to process iron ore into iron. This too adds to Austria's fossil fuel consumption, which often takes place in regions beyond Austria's influence. In total, 97% of Austria's fossil fuel footprint is created beyond its borders. So, even if Austria switched to 100% renewable power for heating, electricity and mobility, its imports would still add significantly to 'embedded' fossil-fuel consumption, showing the importance of a global energy transition rather than a localised initiative.
It has to be taken into account though, that the overall material use is lowered substantially, namely to 20 % less input. Obviously, there would be several other valuable benefits for the environment and especially climate, as greenhouse gas emissions would decrease drastically. This breakdown of the impacts re-emphasises the need to reduce primary material extraction in the first place (in line with Objective 1), as this would also reduce the embedded energy consumed.

A recycling economy is a big step towards a circular economy

An obvious step to increase the circularity of a national economy is to **use waste as a resource** and increase its recycling rate. Doing so decreases extraction by reducing disposal: a win-win scenario. Austria has already prioritised recycling through policy initiatives, resulting in a relatively high rate of waste being recycled. However, a lot of materials are still being incinerated, landfilled, emitted or otherwise lost within Austria's economy. Assuming the full recovery of a set of products and materials that are recyclable, regardless of the costs, efforts and environmental impacts of the recycling process itself, Austria's circularity could increase from **9.7%** to **18.8%**. This would constitute an improvement of the circularity rate by 94%.

DISRUPT: 7 KEY ELEMENTS OF THE CIRCULAR ECONOMY

The circular economy assumes dynamic systems, meaning there is no specific end-point, but it is rather a process of transformation. The DISRUPT model describes 7 key elements that give direction to this transformative process, with the aim of slowing the flow of resources, closing the loop and narrowing resources flows, while shifting to regenerative resources and clean energy. The 7 elements describe the full breadth of relevant circular strategies and will be used throughout the report.

D — **Design For the Future:** Adopt a systemic perspective during the design process, to employ the right materials for appropriate lifetime and extended future use.

I — **Incorporate Digital Technology:** Track and optimise resource use and strengthen connections between supply-chain actors through digital, online platforms and technologies.

S — **Sustain & Preserve What's Already There:** Maintain, repair and upgrade resources in use to maximise their lifetime and give them a second life through take-back strategies, where applicable.

R — **Rethink the Business Model:** Consider opportunities to create greater value and align incentives through business models that build on the interaction between products and services.

U — **Use Waste as a Resource:** Utilise waste streams as a source of secondary resources and recover waste for reuse and recycling.

P — **Prioritise Regenerative Resources:** Ensure renewable, reusable, non-toxic resources are utilised as materials and energy in an efficient way.

T — **Team Up to Create Joint Value:** Work together throughout the supply chain, internally within organisations and with the public sector to increase transparency and create shared value.

For most recoverable or recyclable materials, it is currently not clear what happens after recovery or recycling - their afterlife isn't included in national statistics. A first step to resolving this issue would be to set up monitoring for usage of secondary resources, preferably in a European context. As mentioned in the introduction to this report, initiatives are underway. In subsequent steps, knowledge obtained from the monitoring system can then be used to set targets for industries or product groups to contain minimum amounts of secondary resources. Set either by the industries themselves or by governments, such targets could also hold for imported products.

Where economic factors prohibit secondary resource production or uptake, tax incentives or subsidy schemes may offer the necessary incentives. Finally, technological developments can be pursued either to enhance secondary resource quality - increasing its value - or to reduce costs.

Another effect of moving to advanced recycling is the reduction of primary material demand, as more secondary materials are available for covering societal needs. In this scenario a 20% reduction in primary material inputs would be achieved, alongside the boost in circularity. This contributes to Objective 1 (reduction of resource extraction) and Objective 2 (material recovery) at the same time.

There is value in Austria's stocks

Many of the imported and domestically extracted materials become productive stocks that last, and provide value, over many years - for example, buildings and infrastructure. The creation of these assets counts as stock addition, which presents two opportunities: to **preserve what's already there** and to **design for the future**. If we envision a future in which Austria does not need to add new materials to its stocks, but can retain productivity by maintaining and utilising its current infrastructure and built environment, the country's circularity could go up from **9.7%** to **11.6%** (a relative increase of 20%).

Furthermore, deploying stocks in use lowers the need for additional primary material demand. As the material demand for maintenance can be covered by material from demolition of stocks, no more construction materials for stock addition need to be extracted. Primary material demand would therefore be lowered by 28%, thus contributing to achieving Objective 1, the reduction of resource extraction.

To maximise the value we get from our stocks, we need to change the way we manage them. An important boundary condition to being successful is to improve our knowledge-base for the materials and products integrated into our economic stocks — for instance, through the use of material passports and improved monitoring of material flows, so the stocks can effectively be used as raw material deposits again. In addition, building regulations and design practices should be updated to incorporate multiple lifecycles of buildings and infrastructures, both for the individual structures and for their constituent materials, elements and products. For buildings, components like doors, staircases, sanitation and lights can already be reused. On a larger scale, the building itself can also be used more extensively. Adaptive urban planning and repurposing of old buildings (for instance, turning offices into houses) can avoid the need for demolition and optimise infrastructure usage.

It is here again that the interdependence between measures comes into play: Adaptive planning also allows for mixing of functions to minimise transport movements and direct traffic flows to get the most out of infrastructure. Then, once distances decrease, alternative modes of transport other than automobiles become more viable, including such as bicycling or walking. In addition, planning for more dense yet attractive cities increases the viability of public transport, which has a far smaller footprint than individual motorised mobility. Finally, in rural areas, smart regional planning can increase the attractiveness of local centres to reduce overall mileages, in combination with smart use of emerging technologies.

Austria is not an island

In the analysis above, we have described three action perspectives to increase the circularity of Austria's national economy: shifting from fossil fuels to renewable resources for domestic energy use; increasing the recycling rate for products and materials by means of current technology; and shifting to an economy that maintains its current stock, rather than consuming materials to build up new stock. These scenarios are effective, but do not address a major determining factor in measuring Austria's current circularity: the effect of imported materials and products.

Currently, the global economy is 9.1% circular. Assuming that Austria's imports, which account for 55% of its consumption footprint, follow this global average, we can conclude that improving circularity would need to include measures that address Austria's footprint abroad. This is a major challenge: materials imported or built into imported products are often beyond direct control of national actors. This means that Austrian businesses in international value chains need to **collaborate to create joint value** with their foreign partners, in order to improve the circularity of their products. Our analysis signposts several distinct factors where a nation's 'potential waste' can be reduced:

- Materials that cannot easily be recycled due to design (laminates, composites);
- Products with planned obsolescence (especially consumer electronics);
- Product design or intellectual property rules that discourage repair or reuse;
- Materials with a high fossil fuel footprint.

The Austrian government can support change, by setting new industry standards, backing or initiating EU tariffs, proposing international agreements that create a level playing field and acting as a launch customer for circular products. If a similar approach to recycling existed on a global level as is laid out for the domestic scenario, then the global circularity rate could triple. So, if Austria could ensure that its imports are three times as circular as the global average, the circularity of the Austrian economy would rocket up 130%, from **9.7%** to **20.1%**.

Austria needs an integral approach to improve its circularity

Focused approaches to becoming more circular, such as those described above, have a positive but limited effect on Austria's circularity when pursued in isolation. Real progress, however, will only be made when these approaches are combined in an integral strategy aimed to improve the circularity of the national economy.

For example, if Austria were able to constrain the material footprint of its built environmental by limiting the need for new stock additions, the materials recovered from this urban mine would also make up a larger proportion of those needed to maintain its stocks. The built environment would therefore be more circular. In other words, the effect of a combined approach would be bigger than the isolated effects of individual measures. So, if we combine the scenarios above into an integrated future vision for Austria, we see potential for the country's circularity to rise dramatically from **9.7%** to **37.4%**. Furthermore, this lowers the need for primary materials by 68%, therefore contributing to Objective 1. The combination of all discussed measures has the maximum effect for the sustainable development of the Austrian economy.

Such synergistic effects provide an opportunity to accelerate the transition towards a circular economy.

Closing the loop requires a vision for how we want to fulfil our societal needs, rather than just a list of what products we (no longer) use. Arriving at a circular economy thus challenges us to rethink city planning, our food system and values such as ownership and rewards for labour. Whilst making choices that affect those values requires political courage, the step-by-step rewards snowball with every step taken - a dynamic, multiplier effect that is typical of disruptive forces.

Though Austria is Europe's frontrunner in recycling today and provides great potential to boost its circularity and reduce its material footprint in the future, the circularity gap remains at 62.6%. This is explained by the following factors.[17] First, there still is more material input needed than is becoming available, because in this growing economy much of the materials are stored in physical assets (and not only in buildings and infrastructure). Second, fossil fuels and biomass are also used for energy and food, which by definition cannot be recycled. Lastly, influencing international value chains to deliver circular inputs into the Austrian economy remains challenging even in an ambitious scenario. This is why we have assumed imports, which currently make up roughly half of the material footprint of the Austrian economy, to remain for the larger part dependent on virgin resources.

5 WAY FORWARD AND CALL TO ACTION

Austria has already laid the basis for a circular economy: the mindset and infrastructure to use waste as a resource are present in the country today. It has also set ambitious targets to prioritise regenerative resources. However, it will still require a more integral approach if **Austria is to move significantly in the direction of a circular economy**.

The next steps will be to preserve and extend lifetimes of what is already made - especially in the built environment - and to start closing material loops. This will require intensive international collaboration, as Austria is strongly connected to its global trading partners. On a more generic level, a taxation shift away from labour and towards consumption of energy and materials is essential to incentivise citizens and business alike, so they demand repairable and long-lasting products, that are sustainable by design. This can be greatly advanced by incorporating digital technology, such as blockchains and material passports, to trace origins, win and secure trust in the quality of materials.

Fundamentally, though, it seems that the economic component is still secondary to Austria's circularity. As seen in the national waste management plan, most end-of-use handling of products and materials is a cost item in the budget of municipalities, citizens and enterprises alike. Without an economic incentive, there will be no significant uptake by businesses and consumers. This means that the rules of the game need to change, so that economic actors start to recognise the value contained in secondary resources and respond accordingly.

CALL TO ACTION

To enable targeted action
to improve Austria's circularity,
the different directions identified in this
report need to be concretized into
practical business models and legislation.

Exchange between policymakers,
businesses and consumers is therefore
needed to position Austria as a market for
circular goods and services that inspires
change beyond national boundaries.

JOIN THE
TRANSITION

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