FEDERATION OF AUSTRIAN INDUSTRIES

Raw Material Security 2020+

Raw materials for a resource-efficient industry

Industrieland Österreich

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Member of BUSINESSEUROPE

An Initiative of the Federation of Austrian Industries

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PREFACE

Background

Austria is an industrialised country. The industry is the driving force of innovation and growth. In a direct and indirect manner, it produces around 60 percent of the Austrian added value and thus directly and indirectly employs more than two million people.

Raw materials are the basis of each industrial production. As a consequence, the availability of raw materials at fair prices, meaning internationally comparable, is one of the core prerequisites for the preservation and growth of the industrial base in Austria and Europe.

Various developments on the national, European and international level have led to a considerable increase of raw material prices over the past few years, so that their current share of total costs for companies amounts to 40 percent on average and up to 60 percent when it comes to sector specific values. At the same time the availability of raw materials proves to be increasingly uncertain.

Objective

Against this background, the new initiative of the Federation of Austrian Industries "Raw Material Security 2020+" shall help to ensure the supply of non-energy raw materials, which is indispensable for the maintenance and further development of a strong industrial base in Austria and Europe.

In the framework of this initiative central strategies and measures have been identified that are required for ensuring a secure and cost-effective raw material supply for the Austrian and European industries. Furthermore examples of innovative measures and solutions, that have made the Austrian industry one of the most resource-efficient in the word, shall be presented (see Annex A: "best practice examples").

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Vienna, January 2012

EXECUTIVE SUMMARY

This paper entitled "Raw Material Security 2020+" examines various developments regarding raw materials on national, European and international levels. The problems linked to this subject are of increasing importance for the producing industry. Thus it is necessary to act quickly and pursue a sustainable raw material policy. Hence, a compelling analysis pattern is presented, followed by the illustration of problem areas and a proposal for measures and solutions.

As to fully address this highly sensitive topic not only from an economic and industrial policy perspective but also from a sustainable angle, the overall subject matter will be dealt with in four different areas. In the framework of the initiative "Raw Material Security 2020+" of the Federation of Austrian Industries, necessary measures have been developed to achieve the following key objectives:

- Guaranteeing fair and free access to internationally traded raw materials.
- Ensuring access and exploration of raw material deposits within Europe.
- Increasing resource efficiency as well as recycling of raw materials.
- Maximal added value of biogenic raw materials available in Austria, prioritising material before energetic use.

Supply of raw materials to the EU and Austria in an economically, ecologically and sustainable sound manner must be maintained. With this in mind, the new initiative of the Federation of Austrian Industries foresees a package of measures to ensure the preservation of the industrial base in Europe as well as in Austria.

All political levels, ranging from the provinces to the Federal Government and the European Union, must assume responsibility and implement the necessary measures.

CHALLENGES OF RAW MATERIAL SECURITY

1.

The highly developed Austrian and European industry strongly depends on the availability of resources. Besides natural resources such as water, air, soil and energy sources, a variety of raw materials form the basis of each industrial production.

Due to numerous developments the supply of the domestic and European industry with non-energy raw materials can no longer be taken for granted. In particular, the following trends, which will be discussed in depth within the relevant chapters, are making it increasingly difficult for the industry to be sufficiently supplied with raw materials:

- Increasing demand for raw materials from emerging economies.
- Increasing demand for new raw materials due to new technologies and applications.
- Increasing protectionism of raw material producing countries.
- Strong restrictions and pressure on the environmentally intensive raw material production in Austria and the EU.
- Demands for biogenic raw materials as energy sources are supported by the state.
- Decreasing availability of primary raw materials.
- International raw material markets that are increasingly influenced by volatility and a concentration of suppliers.

The European Commission reacted to these challenges by launching its raw material strategy in 2008, the so-called **Raw Materials Initiative (RMI)**, renewed in 2011. The EU raw material strategy addresses the issue by means of three pillars:

1. **Ensuring raw material imports from non-EU countries.**
2. **Enhancing the extraction of raw materials within the EU.**
3. **Expanding the recycling of raw materials and resource efficiency.**

Subsequently this paper will address the subject in a similar approach.

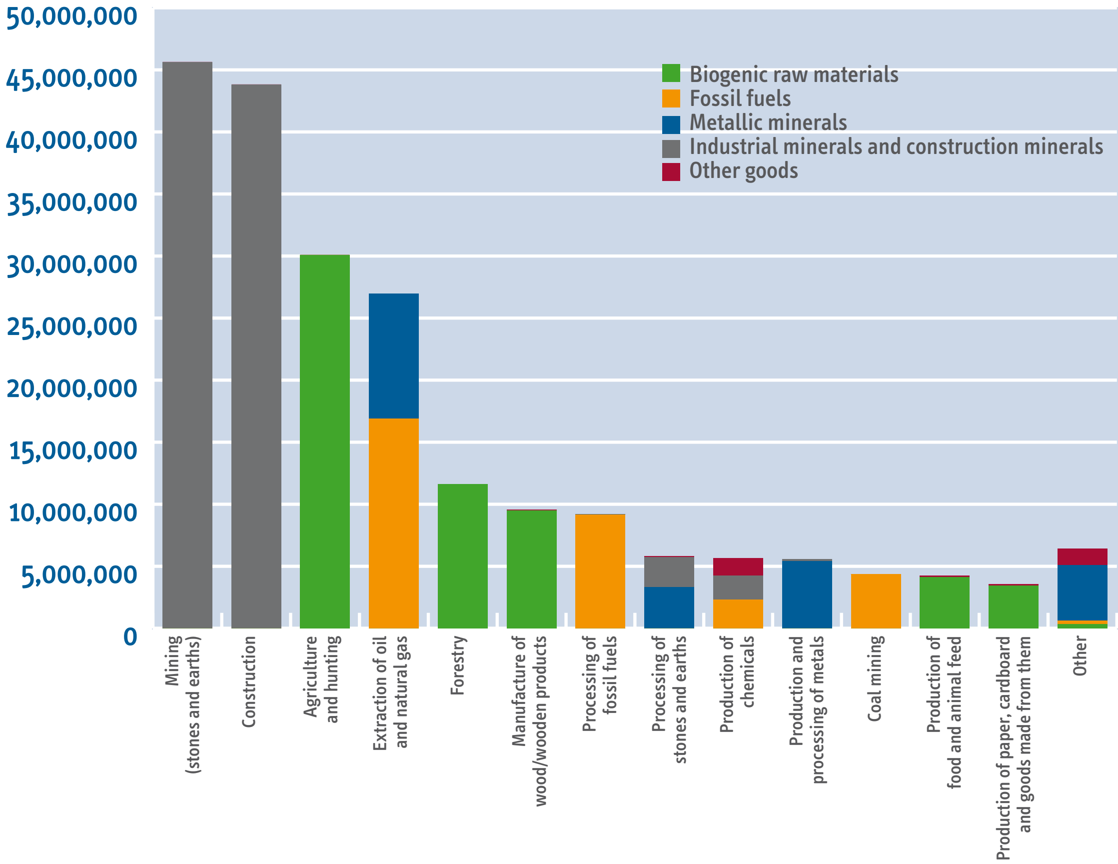
The empirical evidence of the initiative is derived from the "Risk Panel" of the Federation of Austrian Industries. More than 200 stakeholders and experts are interviewed on various raw materials and energy related topics every half a year. The interviews initially take place for a period of 6 years and are personally answered by key persons of selected organisations. Information compiled on the basis of the interviews is regularly made available to participants and forms a valuable basis for decision-making.

Raw material use in Austria

Generally four important groups of non-energy raw materials that are used in various sectors of the domestic industry can be differentiated: **metallic raw materials, industrial minerals, construction minerals** and **biogenic raw materials** (see Annex). Metallic raw materials and industrial minerals play a crucial role in numerous sectors ranging from aerospace technology, electrical engineering and electronics industry to the automotive industry. Construction minerals such as sand, gravel and crushed (solid) rock are used in almost every area of daily life from road, railway, path and canal construction to residential, office and industrial construction. Regarding non-energy use, biogenic raw materials are mainly found in the paper and fibre industry as well as in a variety of fields which use wood as a base material.

MATERIAL USE IN AUSTRIA, IN TONS

Proportion of various raw material groups in selected fields



Source: Schaffarzik, Anke; Krausmann, Fridolin; Eisenmenger, Nina (2001): „Der Rohmaterialbedarf des österreichischen Außenhandels." Social Ecology Working Paper 125. Vienna: IFF Social Ecology

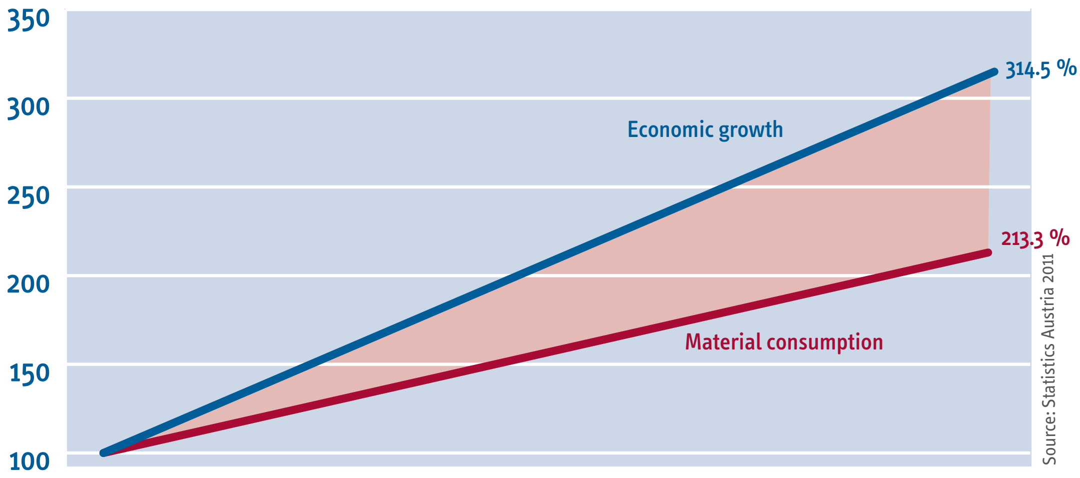
Resource efficiency

In addition to the supply of non-energy raw materials, their careful and efficient use is of growing importance. Increasing resource efficiency reduces ecological impacts and is at the same time of increasing importance as a cost and competitive factor.

The concept of “material services” is promising in this context. As with “energy services”, “material services” focus on the actual needs of consumers. The consumer, for instance, might require light or heat, not however electricity or gas. The situation is similar with regard to raw materials in products where there is generally an interest in the “material service” as opposed to the raw materials per se. This provides opportunities to the concerned industries to integrate innovation and development that go beyond the direct production of materials (e.g. glass, paper), such as raw material efficient and low-emission service concepts (e.g. packaging, carriers of information). The Austrian economy has consistently been further developing its material efficient production and closed material cycles (recycling) for already several decades. This resulted in increased decoupling of raw material consumption from economic growth and thus strengthened resource efficiency (see graph).

DECOUPLING OF RAW MATERIAL CONSUMPTION FROM ECONOMIC GROWTH IN AUSTRIA, 1960 TO 2007

Development of material consumption (DMI*) in relation to economic growth (GDP) (indexed description, 1960 = 100%)



*DMI (Direct Material Input) is defined as domestic raw materials consumption including raw material imports.

Principles for the use of non-energy raw materials:

- The producing industry is the driving force of innovation and growth. The producing industry's success in international competition ultimately results from a high level of resource efficiency. Each and every production unit from efficient domestic production contributes to global resource conservation.
- The extraction and exploitation of raw materials in production are linked to costs and a certain environmental impact. It is thus both economically and ecologically reasonable to reduce the consumption of raw materials as much as possible, regarding the production per unit or the supply of material services.
- Innovation and technology are key to further increase material efficiency, as well as to close further material cycles and thereby decouple economic growth from resource consumption even more.
- Cost efficiency: Reducing the use of raw materials is not an end in itself. Thus the costs resulting from the reduction of the use of raw materials (e.g. recycling and material efficiency) need to be compared with respective benefits. This requires a comprehensive approach that takes into account complete life cycles along value added chains.

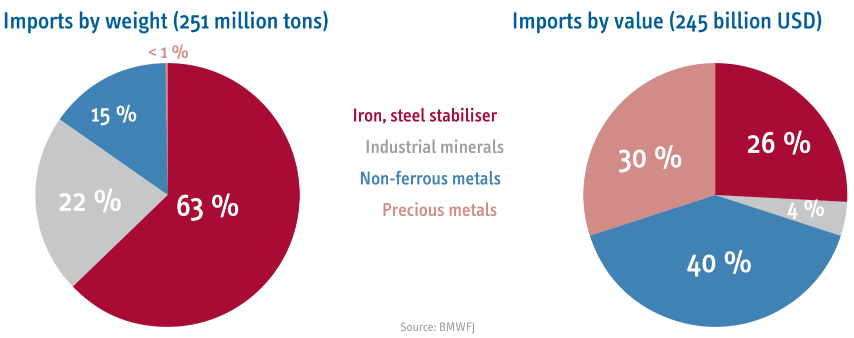
ACCESS TO INTERNATIONAL RAW MATERIALS

2.

Even though Europe is rich in mineral resources (also see Chapter 3), numerous raw materials need to be imported to Austria and the EU for further processing. This especially applies to metals and industrial minerals as their deposits are limited in Europe and internationally traded. About 251 million tons of non-energy raw materials, worth 245 billion US dollars, are imported yearly to the EU. This roughly corresponds to 60 percent of the amount of non-energy raw materials needed in Europe.

ANNUAL IMPORTS OF RAW MATERIALS TO THE EU

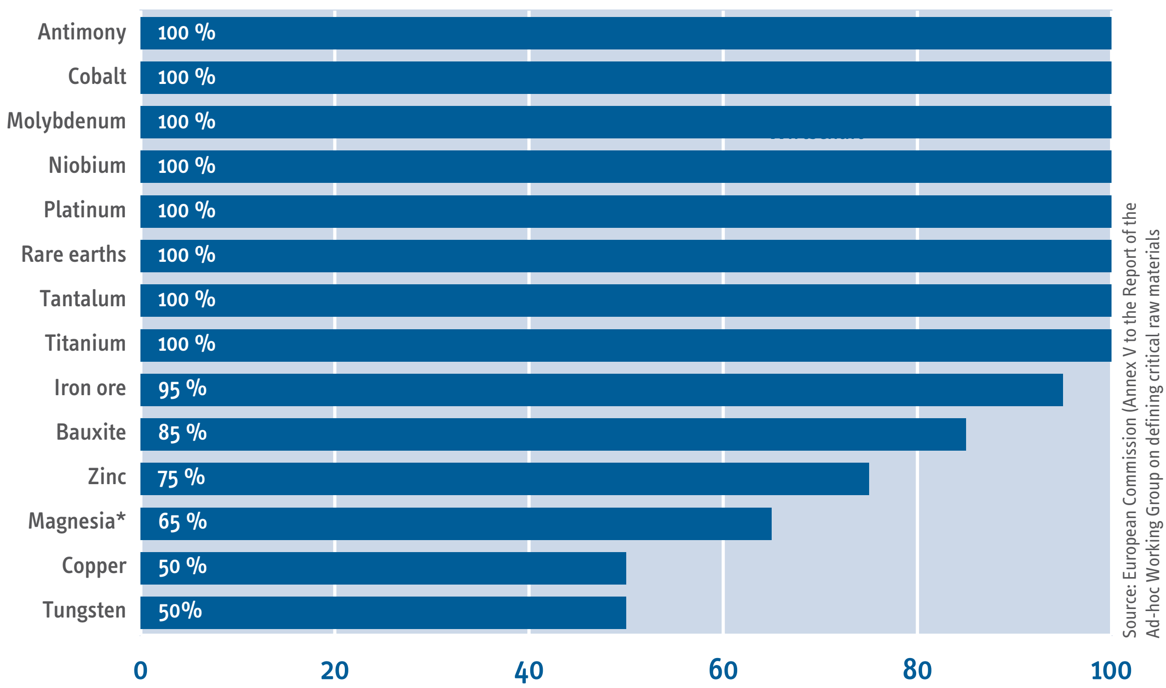
2008, in million tons



The European industry's dependence on imports

For a number of types of raw materials Europe is entirely or at least largely dependent on imports. This tendency is even further increasing as raw material deposits in Europe are either not present, coming to an end, untapped or are non-accessible.

THE EU'S DEPENDENCE ON IMPORTS, EXAMPLES OF RAW MATERIALS



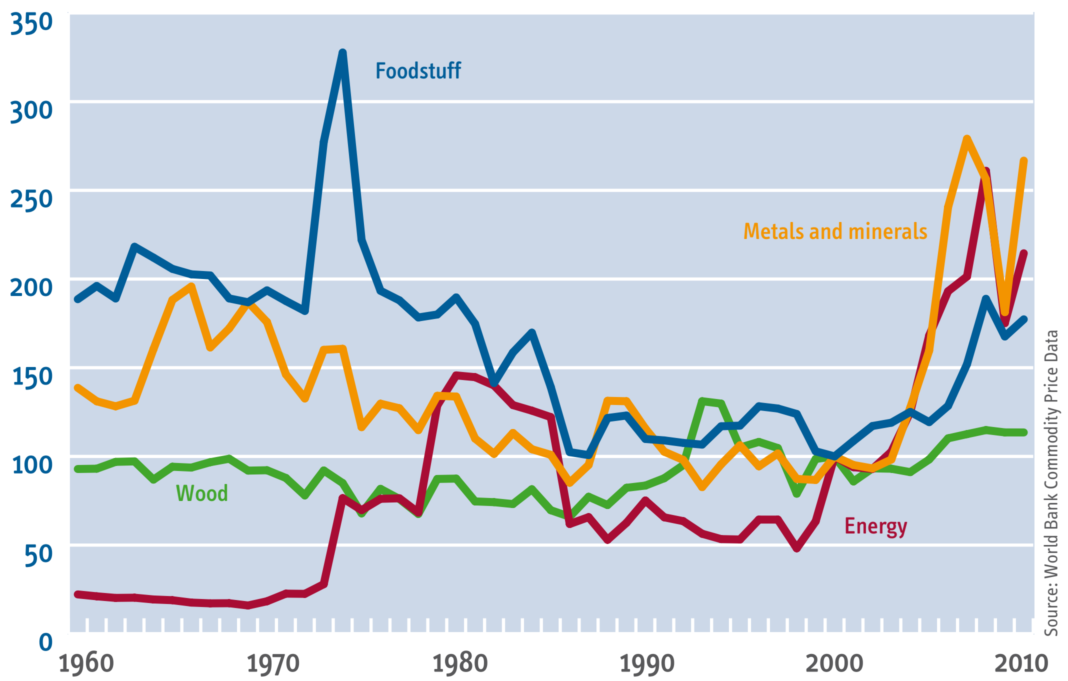
*Geological Survey

The dependence of the European processing industry on raw material imports is not a disadvantage per se, provided a fair and free access to raw materials is guaranteed on international markets. However, international markets are increasingly shaped by developments hampering the industry's access to globally traded raw materials. These developments are due to the fact that the majority of the global mining production is derived from politically unstable countries.

Price developments on international raw material markets

Since the late 1990s a sharp increase in raw material prices can be observed. This continuous increase began after several decades of decreasing price indices for metals, minerals and other raw materials. Thus, the prices for several types of raw materials increased by up to 300 percent during the last decade (see graph).

PRICE DEVELOPMENTS OF RAW MATERIALS, 1960-2010
Price Index, real year 2000 US$, 2000=100



Moreover there are clear indications that the raw material markets have changed permanently. In the meantime, periods marked by high prices last seriously longer than in the past, recently four to five years. This situation is mainly due to the increasing demand of emerging economic powers like China or India for raw materials. For instance, China's share in the global consumption of base metals (copper, lead, zinc, nickel) has increased from about 5 percent in the early 1980s to over 30 percent.

Due to a concentration of suppliers, price increasing effects may also occur with raw materials that are not "rare" from a geological perspective. Moreover, over the last few years an increasing volatility of raw material prices has been recorded, especially through the emergence of spot markets for raw materials. To minimise risks and volatility related to spot markets, raw material derivative instruments that are actively used by companies making intensive use of raw materials, have been created. However, the resulting derivative market has led to an increasing involvement of financial investors, many of which having speculative interests. The increased market participation of such financial investors also leads to a situation where raw material derivatives often cannot develop their risk mitigating effect. Instead, higher volatility as well as additional price increasing effects can be observed.

Protectionist policies of producing countries

The development of rising prices as well as the difficulties of availability on raw material markets is aggravated by protectionist policies of producing countries. These policies often consist of the introduction of export duties (customs duties, taxes) and restrictions on exports (quotas, licences). This results in a double price system leading to a significant variation in domestic and international prices for certain raw materials. In most cases the aim is to attract investments and production in the area of higher added value from foreign countries as well as to give the domestic industry a global competitive advantage.

Focus: An insight into China's raw material policy by the examples of rare earths, tungsten and magnesia

China dominates the global production of rare earths at 97 percent and in many cases their further processing. With regard to the production of magnets the share amounts up to 80 percent. China has long pursued a policy of export regulations for this strategically important group of raw materials by means of export quotas and export licences. As a general rule, Chinese export quotas were 50,000 to 60,000 tons until 2009. The current demand outside of China stands at 50,000 tons. However, in 2010 a considerable reduction to 30,000 tons as well as an increase in export taxes on individual rare earth products occurred. A steep increase in export prices and shortages in international availability of rare earths were the consequence. (See Chapter 4 for the use of rare earths.)

In the case of tungsten, with a 78 percent share in its global production and having by far the largest reserves, China is in a leading position. However, China only exports tungsten in processed form. In addition, the export of processed raw materials per se is also limited in quantity and taxed separately.

Regarding the availability of magnesia, which is the basis for producing refractory materials that are required in the production of steel, cement and glass, the Chinese raw material policy plays a central role as well. Through the use of export taxes and export licences, foreign producers are facing about 40 percent higher costs for the export of a ton of magnesia and thus have a significant competitive disadvantage to Chinese producers.

In early 2012 the WTO issued a final ruling on export restrictions and duties imposed by China on a group of raw materials (various forms of bauxite, coke, fluorspar, magnesium, manganese, silicon carbide, yellow phosphorus and zinc). The case was brought to the WTO courts by the EU, USA and Mexico. The WTO ruling declared almost all Chinese export duties and restrictions illegal and incompatible with the multilateral trading system.

As emphasised by the OECD, export restrictions imposed by producing countries have complex negative consequences. Such a policy may trigger a negative spiral and thereby permanently hamper free international trade. Moreover, export restrictions can have a long-term inhibiting effect on investments.

The opportunity to make use of such protectionist policies is enhanced by the fact that the extraction of numerous raw materials is concentrated in the hands of few countries. Often two or three countries account for 50 to 70 percent of the global production of raw materials.

Inequality in the acquisition of shares in mining and raw material production projects abroad constitutes a further challenge. Some states block foreign investments for strategically relevant areas such as the mining sector in their own country, whilst at the same time acquiring shares in foreign projects. State shares in mining projects and raw material trading houses are perceived by some industrialised nations as a way to financially support projects alongside a strategic national raw material policy in areas where shortages are to be expected or a strategic long-term benefit can be determined (e.g. “Jogmec” in Japan and “Kores” in South Korea).

It can be concluded that the combination of a high concentration of raw material production at state and business level, the EU’s strong dependence on imports, an increasingly protectionist policy of exporting countries and an increasing worldwide demand for raw materials due to growing industrialisation, all contribute to the fact that the European industry is severely affected by non-sustainable price developments, global competitive disadvantages as well as shortages in the availability of raw materials.

Key objective of the initiative of the Federation of Austrian Industries:

As it is less and less guaranteed that the European industry will have fair and free access to internationally traded raw materials, the European Commission and the Austrian Federal Government need to launch activities and take concrete measures as to maintain and allow further developing of the industrial base in Europe.

Necessary measures:

- Pro-active raw materials diplomacy of the EU and Austria (inter alia, entering raw material partnerships with producing countries, integrating raw material aspects into bilateral and multilateral dialogues, and closely cooperating with other affected industrialised nations). In this context the role of the European External Action Service and other relevant Commission services is crucial.

- The Austrian Federal Government must considerably intensify its presence in resource rich countries by dispatching high-level delegations as to achieve better access to raw materials.

- Reforming the European trade policy by giving appropriate weight to raw material supply aspects.

- Violations of international trade law must be pursued actively by the European Commission by making full use of available legal instruments, preferably in broad international cooperation (see WTO case against Chinese raw material export restrictions).

- Critically reviewing potential international concentrations of suppliers and taking antitrust measures against resulting market distortions if necessary.

- Supporting investments in extra-European mining and processing projects for strategcally important raw materials while respecting European social and ecological standards (e.g. government guarantees).

- Urging for a level playing field for foreign investments in mining and raw material production projects.

- The destabilising impact on raw material derivative instruments by mere speculative use is to be observed and stopped, if necessary.

RAW MATERIAL DEPOSITS IN EUROPE AND AUSTRIA

3.

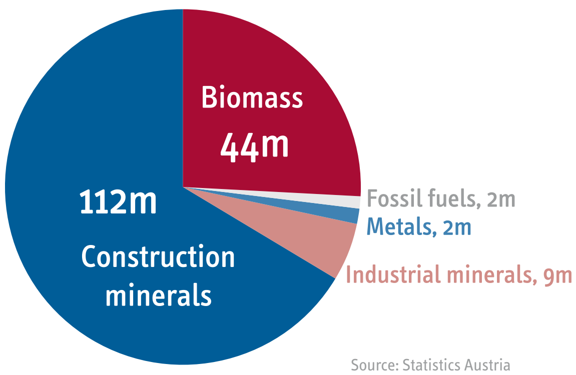
Austria as well as Europe are rich in a number of valuable raw material deposits. The following are worth mentioning: Ores (such as tungsten, iron ore and iron glance) and industrial minerals (such as inter alia, magnesite, talc and salt) that are traded globally due to their economic value; as well as construction minerals (such as sand, gravel, clay and natural stone) that are widely available and extracted in very large quantities, but are however rather limited in their transport area in terms of tradability.

Yet, knowledge about raw material deposits within the EU and new exploration technologies enabling the development of deposits that are difficult to access, show a large margin for improvement. Intensifying the exploration of new deposits is necessary for securing future demand for raw materials. Research intensive processes such as the exploration of deposits, however, are not yet defined as research and therefore do not enjoy research-related tax privileges. The so-called "Frascati Manual" issued by the OECD is the main point of reference for countries with regards to defining eligible research costs.

The majority of raw materials extracted in Austria, roughly two thirds, are construction minerals. Biomass represents slightly more than a quarter, industrial minerals and metals about 7 percent and fossil fuels only about 1 percent. For the Austrian mining industry, tungsten (the largest deposit in Europe and top 5 producer outside of China), magnesite (three Austrian mining sites), talc (largest deposit in Central Europe) and the planned extraction of lithium (one of the largest deposits in Europe) are particularly significant.

Resource extraction in Austria

2008, in million tons



Source: Statistics Austria

Legal framework

Due to the increasing restrictions to access raw material deposits, a shortage of supply from European sources is to be expected. With the exception of few member states, a lack of information of raw material deposits suitable for extraction and thus also long-term spatial planning concepts do not sufficiently exist. Once raw material deposits are assigned to building land, infrastructure or other purposes, a subsequent extraction of raw materials is often impossible. A problem related to this is the overlap between deposits that have already been designated and protected areas in the framework of groundwater as well as nature and landscape protection. On the EU average, these Natura 2000 sites amount to 16.9 percent and thus a non-negligible share of national territory.

The resulting severe limitations regarding the access to new deposits thus inevitably leads to shortages in the supply of domestic raw materials that are however geologically sufficiently present and potentially usable for the domestic industry. Although Natura 2000 regulations do not generally exclude activities like the extraction of raw materials, consistency in the implementation of these regulations is often lacking. Guidelines by the European Commission ("Non-energy mineral extraction and Natura 2000", 2010) were set up to tackle this problem by allowing potential extraction activities on Natura 2000 territory while ensuring the highest level of environmental protection.

Besides the problem of lack of knowledge and restrictions regarding access, raw material extraction in Europe is subject to a series of varying legal frameworks. These are reflected in the costs and duration of approval procedures. Spatial use planning conflicts and legal limitations related to deposit access is further proof for that.

Within the EU, it is not unusual to have eight to ten years pass from the discovery of a raw material deposit and the beginning of its extraction, whereas the duration of procedures varies greatly in the respective countries. This is due to a number of varying legal requirements on national level.

Focus: The Austrian Raw Materials Plan of the Federal Ministry of Economy

The Austrian Raw Materials Plan was labelled a best practice example by the EU as it helps to secure access to raw materials on a long-term basis in a so far unique way in Europe. The Austrian Raw Materials Plan was commissioned in 2001 and finished in mid-2010. However, this plan is to be seen as "work in progress" and needs to be constantly adapted to the economic framework conditions.

The process so far included the following working steps:

- Recording of known raw material deposits in Austria,
- systematic and qualitative evaluation of all deposits,
- investigating and adapting to potential conflicts in spatial use,
- and securing access to defined raw material areas on a long-term basis by integrating results in regulatory procedures.

The following effects were hereby achieved:

- Continuously ensuring access to construction minerals for each planning region for at least 50 years for loose rocks and at least 100 years for solid rocks.
- An ensured access to 395 high-quality raw material deposits due to mainstreaming these into spatial planning (inter alia, construction raw materials, ores, industrial minerals).
- Reducing the transport distances of construction minerals by 10 percent and reducing the costs for raw materials as well as the annual CO_2 emissions by more than 1 million tons.

The work carried out in the framework of the Austrian Raw Materials Plan, represents a decisive contribution to sustainable contemporary raw material policies.

Key objective of the initiative of the Federation of Austrian Industries:

The access to raw material deposits and their exploration in Europe must be ensured and facilitated for the extractive industry in order to achieve a double effect: A reduction of import dependency as well as raw material exploitation adhering to the highest international environmental standards.

Necessary measures:

- European-wide harmonisation led by the European Commission for: statistical investigation of raw material deposits, integrating raw material deposits in spatial planning concepts (see best practice Austrian Raw Materials Plan), as well as approval procedures.

- Approval procedures for the extraction of raw materials are to be evaluated on a European and national level and to be simplified to a one-stop-shop method.

- The prospection and the exploration of raw material deposits must be taxed preferentially as research expenditure. To this end the definition of research in the "Frascati Manual" should be adapted accordingly.

- Educational emphasis on the raw materials sector. Increasing the awareness for the relevance of raw materials for society and industry, educational institutions and competent ministries.

- Supporting investments and development work for the environmentally friendly extraction and processing of strategically important domestic raw materials.

- The Austrian Federal Government needs to check for potential deregulation of legal frame works for mining. Legislation (e.g. mining waste directive, open-cast mining regulation) needs to be examined in terms of practical and non-bureaucratic procedures in full compliance with environmental and safety standards and are to be adapted if necessary.

- The Natura 2000 mineral extraction guidelines by the European Commission ("Non-energy mineral extraction and Natura 2000") are to be applied EU-wide without restrictions.

RESOURCE EFFICIENCY

4.

Resource efficiency is defined as the efficient use of raw materials to achieve an optimum production output. Concrete measures of resource efficiency are possible in various areas: increasing material efficiency (i.e. reaching a high output at low consumption) or expanding the use of secondary raw materials and closing recycling cycles as far as possible. It must be considered in this context that even the highest level of resource efficiency always requires a minimum of materials and leads to a minimum of waste.

The industry is able to make an important contribution to make society as a whole more resource-efficient. Resource efficiency measures at industry level need to be facilitated as to decrease the European industry's import dependency and at the same time strengthen its competitiveness. It must be borne in mind that an industry using its resources more efficiently is at the same time a more competitive industry.

Recycling

Besides using raw materials from natural deposits it is in many cases possible to recycle them. Recycling comprises all procedures and measures aimed at gathering, further processing and converting materials that are waste materials and waste products. Essential goals of raw material recycling are to conserve primary raw material sources, to reduce raw material imports, to save energy and to reduce damage to the environment.

In recovering materials, waste material is used as a secondary raw material source whereby generally three kinds of recycling can be differentiated:

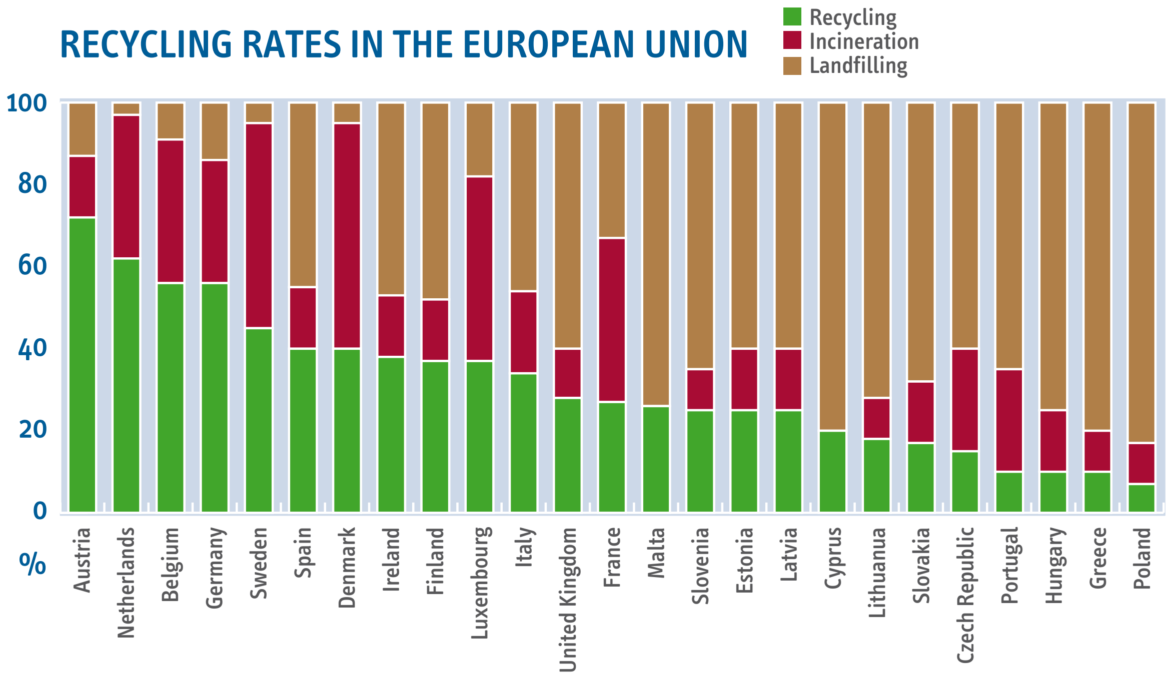
- Recycling on an equivalent material level: production of materials of equal quality (e.g. paper (saving resources regarding fibres by waste paper recycling), waste glass, scrap metal, aluminium).

- Recycling cascade (downcycling): the conversion to materials of lesser quality or other materials (e.g. synthetic materials collected without the materials being separated).

- Recycling of materials to a higher level (upcycling): the conversion to materials of higher quality (e.g. mild steel).

Austria embarked on a path of recycling policy at an early stage. Currently about 53 million tons of primary waste is produced per year. 34 million tons hereof are mineral wastes (especially earths and construction waste). About 60 to 80 percent of these mineral wastes are recycled. Some of the individual waste groups, electronic waste devices for instance, are recycled up to 95 percent, depending on the kind of device. Regarding end-of-life vehicles about 84 percent are recycled and even with the 3.2 million tons of highly heterogeneous solid municipal wastes roughly 32 percent are recycled.

Recycling rates within the EU, however, differ immensely (see graph). Most notably in new Member States low level waste management solutions such as landfilling and incinerating still dominate waste disposal. This is due to often insufficient implementation of the European environmental acquis and partly misaligned public funding. Increasing recycling rates EU-wide is necessary as to mitigate environmental damage and offers significant potentials, not at least for the long-term goal of establishing a single European market for secondary raw materials. This will contribute to a secure raw material supply within the European Union and lowers the EU`s dependency on imports.



Source: European Topic Centre on Resource and Waste Management projected data for 2009, Environmental Outlooks, Copenhagen, April 2007

Focus: Recycling of rare earths

The term Rare Earths (RE) refers to a group of 17 elements that are despite their name in fact not rare but deposits existing globally. Their extraction takes place under complex conditions. The industrial use of rare earths has become more and more important over the last couple of years, especially due to their use for new technologies: wind energy (magnets, turbines), electric motors, energy-efficient lighting systems and catalysts. Shortages in the international availability of rare earths (see Chapter 2) increasingly demonstrate the recycling potential of this raw material.

Currently recycling of rare earths does not yet take place on an economic scale. This is mainly due to difficult dismantling of several RE-containing products as well as the fact that RE recycling requires energy intensive processes. Globally rising prices as well as the increasing availability of RE-containing products as secondary raw material sources in the foreseeable future show, however, that the recycling of rare earths can be economically viable in the medium- to long-term. Furthermore, increasing the recycling of RE has the potential to alleviate the limited availability of this raw material (this especially applies to the group of so-called middle and heavy rare earths). In this context demonstration projects as well as the pooling of technological competence in Europe are necessary steps.

Material efficiency

Besides extraction of raw materials from natural reserves and recycling as to produce secondary materials, increasing material efficiency enables the supply of material services with less material consumption. Thus, for instance, the use and material service of a bottle lies in its ability to store liquid, regardless of the amount of material needed for the bottle's production. Material efficiency therefore describes the relation between output and resource input per product service. An increase in material efficiency thus means to manufacture a certain amount of products using fewer and fewer materials.

Besides the efficient use of materials, their effective utilization also needs to be considered. The concept of material effectiveness goes beyond material efficiency. In addition to the question of whether using a material right, it needs to be considered whether the right material is being used. This means to make use of possible substitution potentials and to develop the use of alternative materials.

Key objective of the initiative of the Federation of Austrian Industries:

To enhance resource efficiency and increase the recycling of raw materials by taking into account the relation of costs and benefits with the aim to increase the industry's competitiveness.

Necessary measures:

General:

- Renounce from regulatory measures such as raw material and environmental taxes provided that they decisively impair the industry's competitiveness.
- Supporting R & D in order to extract secondary raw materials as well as to increase material efficiency and/or material effectiveness in the framework of a priority programme (e.g. new technologies, demonstration projects).
- The Austrian Federal Government needs to check the possibilities of deregulation for relevant plants and activities, in order to speed up approval procedures, improve the protection of resources and simplify day to day operations, in full compliance with the social and ecological safety standards.
- Assigning of relevant industrial sites for activities within the recycling management by responsible authorities.

Material efficiency and recycling:

- European legislation is to be adjusted with the long-term goal of creating a single European waste and recycling market.
- European-wide uniform implementation of raw material relevant EU environmental legislation by member states.
- Preventing illegal outflow of secondary raw materials to third countries. Establishing EU-wide uniform legislation for end-of-waste regulations and controls as well as their uniform and consequent implementation.
- Supply-side measures to close material cycles in the long-term (e.g. "design for recycling") are to be preferred over demand-side measures (e.g. recycled content quotas).
- Evaluating domestic potentials for urban mining and establishing a strategy for their possible use.
- Focusing on the recycling of materials relevant for the industrial location and developing corresponding structures by the industry with active support by the competent authorities.
- Implementing the project "Danube ReGain" to recover valuable industrial raw materials in the context of the Strategy for the Danube Region.
- Avoiding municipal regulations that force waste streams to public incineration plants, whereby an increased regain of raw materials from waste through recycling is prevented.
- Tax privileges for superior waste management solutions of the waste hierarchy (i.e. recycling should be given preference over incineration or landfilling).
- Creating a consultation centre and incentive systems to foster material efficiency on a company level (to enable companies to holistically measure, assess and increase their resource efficiency).
- Expanding the coverage of environmental public funds to support material efficiency measures.

BIOGENIC RAW MATERIALS

5.

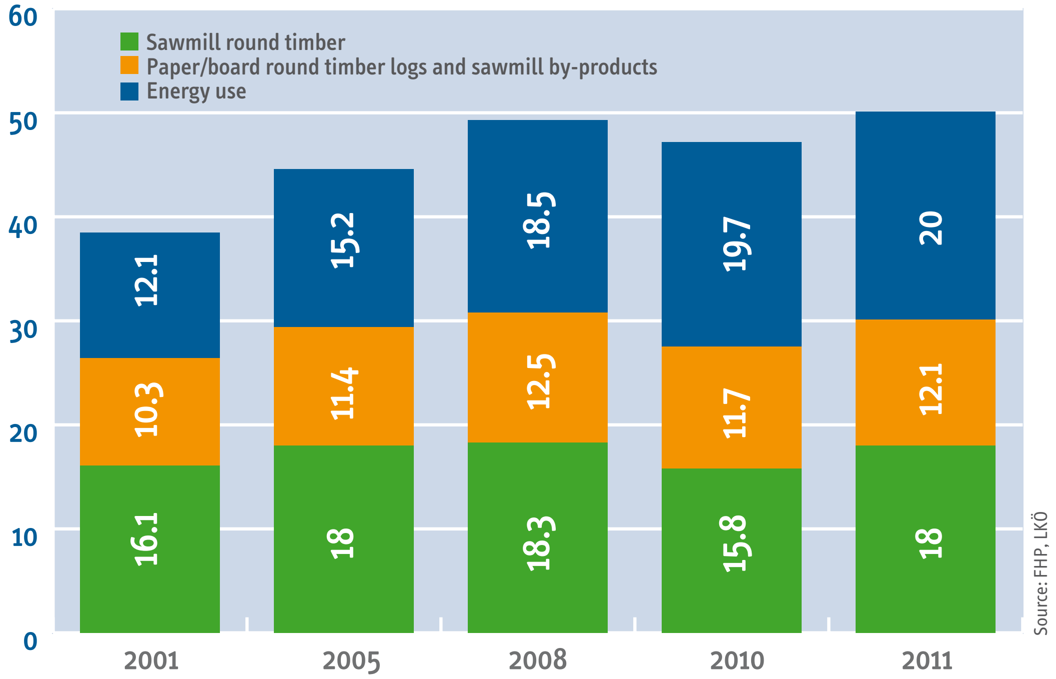
Wood is the most important biogenic raw material available in Austria. Annually a total amount of about 17 million solid cubic metres are used for material production. About 7 million solid cubic metres hereof are processed within the paper and composite panel industry. The demand for energetic use currently amounts to roughly 20 million solid cubic metres and has approximately doubled within a decade.

Facing the set goal for the use of renewable energy (a share of 34 percent of end energy consumption by 2020) and the climate protection goal (16 percent less greenhouse gas emissions compared to 2005 to be reached by 2020), an increasing proportion of wood is used in order to produce energy, which leads to rising competition for the utilization of domestically available biogenic raw materials. This will also continue in the following years.

Although the annual increase of domestic forestry stocks is not entirely exploited, nonetheless large amounts of wood are imported. For instance, imports amounted to about 10 million solid cubic metres in 2009.

DEVELOPMENT OF WOOD EXPLOITATION IN AUSTRIA

material and energetic use, in million cubic metres



The estimation of energy use comprises all forms of energetically utilised energy wood products (apart from lye) from all areas of application and all forms of exploitation including the amounts arising from cascade use of wood (thus double counting of wood streams is possible).

Central objective of the initiative of the Federation of Austrian Industries:

Biogenic raw materials available in Austria are to be used sustainably with the aim of maximum added value, whereby the material use of biogenic raw materials should take clear priority over energetic utilization.

Necessary measures:

- The amount of utilised wood shall be adapted to the available forestry stocks, by considering market conditions and ensuring the multifunctionality of forests. Additional forest potentials that can be harvested shall be used.

- Creating incentives for the use of small-scale forest ownership, e.g. for associations of forest owners.

- Upgrading and expanding modern infrastructure as a precondition for forest management, careful exploitation of reserves as well as for dealing with wind damages in a timely manner.

- Promoting silviculture measures such as maintenance, re-afforestation and supporting natural regeneration as well as post-catastrophe reforesting by the means of agricultural subsidies.

- Improving the information base for forest owners as well as establishing forest management plans, fostering modern planning instruments on the basis of geographic information system (GIS) as well as establishing consulting organisations to professionalise forest management.

- Developing, producing and using sustainable certified biofuels as well as necessary technologies based on long-term supply concepts.

- Investing in modern harvesting methods and logging technologies to make forest management more efficient.

- Energy production by the means of energy wood or short rotation wood, and waste wood or by-products of sawmills (e.g. bark), only in the case higher added value by material use can be excluded and a minimum of energy efficiency (heat and electricity) is ensured.

- Increased use of fallow land to produce energy crops instead of promoting non-cultivation of these areas.

- Better use of transport capacities and existing infrastructure by higher tonnages (excluding gigaliners).

- A strategic concept for the best possible use of all available potentials of biomass aiming at a maximum added value should be established by the two competent departments, the Federal Ministry of Agriculture, Forestry, Environment and Water Management (BMLFUW) and the Federal Ministry of Economy, Family and Youth (BMWFJ).

ANNEX

ANNEX A:
Examples of measures and solutions by Austrian industries

Raw material security

- **Plansee Group:** Ensuring self-supply of tungsten and molybdenum
  By means of long-term delivery contracts, capacity expansion and acquiring company shares, the Plansee Group ensures the supply of its most important raw materials tungsten and molybdenum.

- **RHI:** Increasing self-supply of magnesia
  Recently RHI purchased the Norwegian company SMA Mineral Magnesia AS, a producer of sea water based magnesia that can be further processed to dead burned magnesia. Subsequently, RHI is going to invest up to 70 million EUR in an on-site smelting plant. From summer 2012 onwards RHI will produce up to 80,000 tons of high-quality dead burned magnesia in Norway every year. Moreover, RHI Premier Periclase Ltd., Ireland ("PPL") purchased one of the global suppliers of sea water based (large crystal) magnesia. Due to the increase in capacity regarding European raw material sites and the acquisition of two companies in Norway and Ireland, RHI's self-supply capacity of magnesia raw materials is going to amount to roughly 80 percent from the middle of 2012 onwards.

- **Treibacher:** Ensuring of Rare Earths
  Treibacher Ind. AG is one of the world's largest importers and processor of Rare Earths from China. A local branch in China and long-standing know-how in sourcing gives Treibacher Ind. AG preferential access to Rare Earths. Partnerships with new non-Chinese mines and new recycling technologies also ensure the supply of raw materials in the future.

- **Wolfram Bergbau and Hütten AG:** Ensuring self-supply
  The basic supply of primary raw materials is provided by its own mines in Mittersill. Apart from the production and operation plan, an intensive drilling programme for discovering new local reserves is also carried out.

Material efficiency and recycling

- **Lafarge Zementwerke GmbH:** Conservation of resources through the use of alternative raw materials and fuels.
  In 2009 the Austrian cement industry used about 1.8 million tons of alternative raw materials and fuels to produce 4.6 million tons of cement. 1 million tons hereof were blast furnace slag and fly ash, about 393,000 tons were secondary raw materials and about 382,000 tons alternative fuels. Thereby the use of natural resources is avoided to this extent.

- **Mondi:** Resource: biofuel
  The electrical and thermal energy needed by the company is produced in high efficient CHP plants through the thermal use of biogenic waste lye and biomass combustion at the site Mondi Frantschach itself. Moreover, throughout the year, the factory provides secondary heat for the public district heating network. Besides individual households, the state school complex, the hospital as well as individual industrial companies are integrated in this network. By doing so, Mondi Frantschach contributes significantly to the region's primary energy savings as the quantity of heat delivered corresponds to the required heat for about 8,000 households, which decreases fine particulate pollution and prevents the emission of over 50,000 tons of CO_2 per year.

- **Mondi:** Resource: the raw material wood
  The sack kraft paper Advantage ONE, produced in Frantschach, enables the production of industrial bags out of only one single layer and has a basis weight of 110g/m². In contrast to other available packaging solutions weighing 2x80g/m² (=160g/m²), this results in a reduction of the bag's weight by 30 percent and thus also reduces the material input of wood by the same percentage. This is an example for the sustainable resource use of wood.

- **Mondi:** Resource: wood/energy/auxiliary materials
  By establishing a modern timber yard consisting of a pulpwood line, a line for sawmill wooden leftovers and sorting, the share of wood from sawmill leftovers in the production of kraft pulp could be increased to 55 percent. At the same time the improved sorting (sorting by thickness) enabled an increase in wood yield by 0.4 percent. Apart from the decrease of specific energy consumption, the improved pulp quality, achieved through a targeted mixture of wood types, in the subsequent paper production process led to a reduction of strengthening materials such as for instance potato starch.

- **Mondi:** Raw material substitution
  By constantly optimising individual process steps, the procedure of internal sizing with ASA (alkenyl succinic anhydride) developed by Frantschach enabled resin glue to be completely substituted by ASA. The amount of glue needed to ensure writeability and printability of the sized paper was thus significantly reduced.

- **Plansee-Group:** Recycling
  Within the Ceratizit division of Plansee Group, investments were made regarding the recycling processes of tungsten. The processing of secondary raw materials thus strongly contributes to the raw material supply of tungsten for the Plansee Group.

- **RHI:** Recycling
  Already in the 90s, RHI focused on recycling and started to reprocess MagCarbon converter bricks from the steel industry. Until now, guaranteeing constant quality of secondary raw materials has been one of the key challenges. In 2010 a total of 80,000 tons of revert material was recycled (in 2009: 55,000 tons). This corresponds to a recycling share of 5 percent of production.

- **Treibacher:** Recycling – full material and thermal recovery of used catalysts from the oil industry
  Treibacher Ind. AG recycles large tonnages of used metal-containing catalysts from the oil

industry. The metal content (V, Ni, Mo) is entirely processed to valuable alloys. The remaining calcium aluminate is sold on the entire European steel industry market. The heat of reaction is internally used for the generation of hot steam and residues of flue gas desulphurisation are delivered to the fertiliser industry. There are no remaining residues.

- **Treibacher:** Efficient production of ferrovanadium
Treibacher Ind. AG is the largest ferrovanadium producer in Europe. Vanadium is produced through chemical/metallurgical extraction of vanadium containing blast furnace slag from steel production. With regards to yield and efficiency, Treibacher Ind. AG is by far the global technology leader.

- **voestalpine:** Processing used sand
The voesalpine Giesserei Linz GmbH processes chrome ore containing old sands from the production process in order to reuse it partly. Apart from the magnetic separation that has usually been used, a fluidised bed separation has also been carried out starting in the middle of 2011. Consequently, the amount of old sands that need to be deposited decreases and 5 to 10 percent of additionally purchased sand, which is a valuable resource, can be saved.

- **voestalpine:** Energy efficiency
Each year the voestalpine Stahl GmbH uses about 2.5 million tons of coal and coke for metallurgical purposes. After metallurgical use the blast furnace gases of coke and coal are collected and used for energy production but also partly as a reducing agent. These blast furnace gases represent an energy recovery of about 10.5 GWh per year (which corresponds to an annual consumption of over 2,300 households) including all relevant resources that could be saved due to the avoided extraction, processing and distribution of primary energy sources.

- **voestalpine:** Internal recycling cycle
Voestalpine sites producing pig iron avoid landfilling by re-entering iron-containing parts of the production process into the internal recycling procedure. At the site in Linz the recycling level of circulating and waste materials at internal and external processing plants amounts to 86 percent. Quantitatively the most important waste used for external application, is dust from steel production extracted by the dedusting system.
The total amount was about 88,000 tons in the calendar year 2010 and is used for zinc and iron recycling. A typical example of an internal measure is the application of oil/water mixtures that go from the rolling sector through the waste oil/used grease plant and further into the blast furnaces to substitute steam. Adding further processing stages continuously increases material efficiency of these internal cycles, for instance by hydrocycloning the washing tower sludge of the blast furnace at the site in Linz.

- **voestalpine:** Recycling cycles
Voestalpine sites producing stainless steel focused on using secondary raw materials and further expanded recycling cycles. In this context the refractory breakout material from melting furnaces (plants, units) for instance is reused as a slag-forming constituent, which decisively saves resources of primary raw materials.

- **voestalpine:** Use of secondary raw materials
  Raw materials needed to separate iron from iron ore are replaced by secondary materials and waste as far as this is technically feasible. At the blast furnace A of the voestalpine Stahl GmbH for example synthetic materials are mainly used from the recycling of commercial, industrial, packaging and household waste. Also used oils and fats are recycled in the blast furnace as a reducing agent to produce pig iron.

- **Wienerberger:** Use of recycling materials
  Sawdust, straw, sunflower seed shells and paper pulp are typical recycling materials from biogenic sources which are used as aggregates for ensuring the porosity of common bricks. Thus the share in the area of wall construction material is comparably high at 11.6 percent, whereas in the production of roof tiles no recycling materials are used. Ash, fly ash and slag are recycling materials that derive for instance from thermal power stations.

  Wienerberger uses different measures to realise the recycling of bricks. To do so, crushed bricks that had been separated from other construction waste via colour scanner technologies, were purchased and tested in production. This way, raw materials could already be saved. Moreover, facade materials from demolished houses, which can be used in the production of facing bricks, are purchased and processed to brick dust.

- **Wolfram Bergbau und Hütten AG:** Increasing the share of secondary materials
  Already today a large amount of raw materials used at Wolfram AG is derived from secondary raw materials (tungsten-containing soft and hard carbide scrap directly from tool production and tools, even after their industrial utilisation). The further expansion of energy-efficient recycling processes (technologies) to process secondary raw materials is planned.

Biogenic raw materials

- **Lenzing:** Pulp production
  At the Lenzing site pulp needed for the production of fibre is gained from beech wood. Lenzing calls the process the biorefinery of wood. 39 percent of the wood is processed to pulp. The entire production process is completely chlorine free. In further processing steps marketable by-products such as acetic acid, furfural and xylose are recovered from another 11 percent of wood. In recent years Lenzing has succeeded in increasing the use of wood substance so that more than half of the wood can be converted into high-quality products and the remaining substances are used as the most important biogenic energy source at the Lenzing site.

  The pulp production of Lenzing AG is not only independent from energy but even produces an energy surplus. Per ton of absolutely dry wood the net surplus in heat (in the form of steam) corresponds to the energy content of 113 kg of fuel oil. Furthermore steam turbines produce electricity from this steam. After deducting the own consumption of electricity for pulp production and related energy systems an electricity surplus of 205 kWh per ton of beech wood remains. Surplus heat (steam) as well as surplus electricity is used for fibre production at the

Lenzing site. The production of fibres from pulp according to the viscose technology is a chemical-technological process consisting of several process stages. The production is effected in recycling cycles through the use of recovery systems. This contributes to recycle a considerable amount of used chemicals.

- **Mondi:** Resource: biofuel
  The dry content of bark used as fuel in the biomass boiler has increased from 50 to 63 percent since the initial installation of an innovative bark drying plant and by using the previously unused heat surplus. This leads to an increased production of eco-energy of 2.9 MW.

ANNEX B:
Examples of the Use of Selected Raw Materials

Selected metallic raw materials

Name	Examples of use
Aluminium	Most important light metal
Antimony*	Alloys, medicine
Beryllium*	Alloys, especially with copper and aluminium; weapons technology
Cadmium	Rust protection, alloys, semi-conductors
Chromium	Alloy component (chromium- vanadium- steel, chromium-nickel-steel, chromium-molybdenum steel), coating metal
Cobalt*	Magnets
Copper	Electrical engineering, bronze, brass
Gallium	Thermometers, solar cells, light emitting diodes
Germanium*	Infrared optical fibres, polyester fibres, radiation detectors, food supplements
Gold	Jewellery metal, gold leaf (beaten gold), electrical engineering, investment, currency hedging
Indium*	Compounds, coating (corrosion coating, plain bearings)
Iridium	Electrodes, spark plugs
Iron	Most important working metal (cast iron, steel), in a wide range of alloys
Lead	Alloys, lead accumulator, solders, corrosion protection, weight
Lithium	Lithium compounds, alloying constituent, medicine
Magnesium*	For particularly lightweight work pieces, magnesium alloys
Manganese	Alloying constituent (manganese-steel)
Mercury	Thermometer, energy saving lamps
Molybdenum	Alloying constituent (molybdenum-steel) to increase heat resistance
Nickel	Alloys (nickel-iron, nickel-chromium, nickel-copper etc.), alloying constituent (chromium-nickel-steel), magnets
Niobium*	Mainly in metallurgy (special steel, improvement of weldability)
Palladium	Catalysis, hydrogen storage
Platinum*	Jewellery metal, catalysis, one of the most valuable metals
Potassium	Alloyed with sodium as coolants in nuclear reactors
Rare Earths*	Needed for various high-technology applications (see Annexe C)
Rhodium	Jewellery metal
Ruthenium	Catalyst, increasing the degree of hardness of platinum and palladium
Silver	Jewellery metal, photography
Sodium	Alloyed with potassium as coolants in nuclear reactors
Tantalum*	Capacitors
Tin	Alloying constituent (bronze), solder (brazing solder), tinplate
Titanium	Lightweight construction, jewellery
Tungsten*	Incandescent lamps, special steels, ballpoint pens (spheres)
Vanadium	Alloying constituent (chromium-vanadium-steel) for heat resistant steel, catalysis synthesis of sulphuric acid
Zinc	Alloying constituent (brass), die cast zinc parts (zamak alloys), zinc coating of steel components

* Part of the critical raw materials defined by the EU

Selected industrial minerals

(Non-metallic mineral raw materials that can be directly used in a production process)

Name	Examples of use
Asbestos	Asbestos cement, asbestos sheets. Prohibited in the EU.
Barite	Deep drilling technology for drilling fluids
Bentonite	Structural engineering, mining and drilling technology, food additive, cosmetics, ceramics
Boron minerals	Insulating material and bleaching agents (perborates), magnets
Diamond	Jewellery stone, drilling, cutting and grinding tools
Diatomite (kiesel-gur)	Filter, pesticide, fertiliser, filling material in thermal insulation
Feldspar	Porcelain, dentures
Fluorspar*	Glass and metal industry
Graphite*	Pencil leads, electrodes, semi-conductor technology, self-lubricating bearings
Gypsum and anhydrite	Construction material, model and moulding plaster, cement
Kaolin	Paper production, ceramics
Magnesite	Refractory material
Perlite	Insulating material
Phosphate	Fertiliser, detergent additive, food additive
Salt	
Sulphur	Production of sulphuric acid, vulcanisation of India rubbers
Talc	Filling material in paper and pulp industry, colour and varnish industry as well as rubber, plastic and ceramic industry
Vermiculite	Cat litter, fireworks, soundproofing and thermal insulation, fire protection
Zircon	Refractory bricks, moulding sand in foundries, abrasives

* Part of the critical raw materials defined by the EU

Construction raw materials

These are mineral raw materials needed in large quantities for construction purposes (such as sand, gravel, clay and natural stones).

Biogenic raw materials

The initiative of the Federation of Austrian Industries "Raw Material Security 2020+" is limited to the consideration of wood.

Rare Earths

Name	Examples of use
Scandium	Stadium lighting, fuel cells, racing bicycles, x-ray technology, laser, aircraft construction, mercury vapour lamps
Yttrium	Energy saving lamps, LCD and plasma screens, LEDs, fuel cells
Lanthanum	Nickel metal-hydride batteries (e.g. in electric and hybrid cars, laptops), catalysts, soot particle filter, high refractive index glasses
Cerium	Automobile catalysts, soot particle filter, safety glasses to protect against ultraviolet radiation, polishing agent
Praseodymium	Permanent magnets, aircraft engines, electric engines, glass and enamel colouring
Neodym	Permanent magnets (e.g. in wind power stations, magnetic resonance imaging scanners, hard disks), glass colouring, laser, CD players
Promethium	Illuminated numerals, sources of heat in space probes and satellites (radioactive element)
Samarium	Permanent magnets (in dictating machines, headphones, hard disk drives), space sector, glasses, laser, medicine
Europium	LEDs, energy saving lamps, plasma televisions (red fluorescent)
Gadolinium	Contrast agent (magnetic resonance imaging), radar display (green fluorescent), fuel elements for nuclear power stations
Terbium	Fluorescent substances, permanent magnets
Dysprosium	Permanent magnets (e.g. wind power stations), fluorescent substances, laser, nuclear reactors
Holmium	High performance magnets, medical technology, laser, nuclear reactors
Erbium	Laser (medicine), fibre optic cable
Thulium	Energy saving lamps, x-ray technology, television sets
Ytterbium	Energy saving lamps, x-ray technology, television sets
Lutetium	Positron emission tomography

ANNEX C:
Top three raw material producing states of selected industrial and metallic minerals

Chart 1: Top three raw material producing states of selected industrial minerals

	First	%	Second	%	Third	%	Cum. %
Bleaching earth	USA	72	EU	12	Senegal	4	88
Graphite	China	60	India	16	Brazil	10	86
Feldspar	EU	60	Turkey	10	Thailand	7	77
Barite	China	55	India	12	USA	7	74
Perlite	EU	54	USA	19	Japan	10	83
Boron	Turkey	53	USA	21	Argentina	12	86
Fluorspar	China	51	Mexico	17	EU	7	75
Zircon	Australia	49	South Africa	28	USA	10	87
Phosphate	Morocco	49	China	18	Israel	4	71
Bentonite	USA	44	EU	24	Russia	6	74
Vermiculite	South Africa	43	USA	22	Ukraine	14	79
Talc	China	37	EU	16	USA	11	64
Magnesite	China	32	Turkey	22	EU	21	75
Kaolin	EU	31	USA	28	Brazil	19	78
Diamonds (precious stones)	Russia	30	Botswana	24	Canada	13	67
Potash	Canada	30	EU	17	Belarus	16	63
Gypsum	EU	23	USA	18	Iran	11	52
Salt	EU	22	USA	20	China	18	60
Sulphur	USA	19	Canada	17	China	16	52

Source: The Raw Materials Initiative (2008)

Chart 2: Top three raw material producing states of selected metallic minerals

	First	%	Second	%	Third	%	Cum. %
Rare Earths	China	95	USA	2	India	2	99
Niobium	Brazil	90	Canada	9	Australia	1	100
Antimony	China	87	Bolivia	3	South Africa	3	93
Tungsten	China	84	Canada	4	EU	4	92
Gallium	China	83	Japan	17	-		100
Germanium	China	79	USA	14	Russia	7	100
Rhodium	South Africa	79	Russia	11	USA	6	96
Platinum	South Africa	77	Russia	11	Canada	4	92
Lithium	Chile	60	China	15	Australia	10	85
Indium	China	60	Korea	9	Japan	9	78
Tantalum	Australia	60	Brazil	18	Mozambique	5	83
Mercury	China	57	Kyrgyzstan	29	Chile	4	90
Tellurium	Peru	52	Japan	31	Canada	17	100
Selenium	Japan	48	Canada	20	EU	19	87
Palladium	Russia	45	South Africa	39	USA	7	91
Vanadium	South Africa	45	China	38	Russia	12	95
Titanium	Australia	42	South Africa	18	Canada	12	72
Rhenium	Chile	42	USA	17	Kazakhstan	17	76
Chromium	South Africa	41	Kazakhstan	27	India	8	76
Bismuth	China	41	Mexico	21	Peru	18	80
Tin	China	40	Indonesia	28	Peru	14	82
Cobalt	DR Congo	36	Australia	11	Canada	11	58
Copper	Chile	36	USA	8	Peru	7	51
Lead	China	35	Australia	19	USA	13	67
Molybdenum	USA	34	China	23	Chile	22	79
Bauxite	Australia	34	Brazil	12	China	11	57
Zinc	China	28	Australia	13	Peru	11	52
Iron ore	Brazil	22	Australia	21	China	15	58
Cadmium	China	22	Korea	16	Japan	11	49
Manganese	China	21	Gabon	20	Australia	16	57
Nickel	Russia	19	Canada	16	Australia	13	48
Silver	Peru	17	Mexico	14	China	13	44
Gold	South Africa	12	China	11	Australia	11	34

Source: The Raw Materials Initiative (2008)

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