Regional and local optimisation of material flows and cycles

Areas of action, case studies and recommendations for municipalities

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Postfach 14 06
06813 Dessau-Roßlau
Tel: +49 340-2103-0
info@umweltbundesamt.de

/umweltbundesamt.de
/umweltbundesamt
/umweltbundesamt
/umweltbundesamt

Authors:
Maic Verbücheln and Sandra Wagner-Endres
German Institute of Urban Affairs (Difu)

assisted by Martin Gsell and Günther Dehoust
Institute for Applied Ecology (Oeko-Institut)

on behalf of the German Environment Agency (UBA)

Editing:
FG I 1.1. Jens Günther
Patrick Diekelmann (Difu)

Layout:
Sebastian Schaar | creative workers club

Translation:
Claire Tarring

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Contents

Foreword

For more than ten years, the Global Footprint Network research organisation has been calculating the ecological footprint of more than 150 countries – with alarming results for Germany. It calculated that the country's sustainably usable renewable resources for the whole of 2017 had already been consumed by 24 April 2017 (German Overshoot Day). This illustrates very effectively that Germany's consumption of natural available resources is much greater than our theoretical share of the world's resource capacity, and comes at the expense of future generations.

The challenge of protecting natural resources needs to be tackled by society as a whole. On a regional and local level in particular, resource consumption can be reduced in real terms by optimising and closing materials cycles. The people who can influence this are to be found in administration, politics, civil society, the business sector, small and medium-sized companies, industry and agriculture. The particular role municipalities can play in improving resource efficiency has been highlighted in the German government's resource efficiency programme (see Section 2).

Against this backdrop the German Environment Agency (UBA) commissioned the German Institute of Urban Affairs (Difu) and the Institute for Applied Ecology (Oeko-Institut) to run a project entitled "Improving resource efficiency by optimising regional and local material cycles and flows: Obstacles and opportunities" or "RegioRess" for short. This booklet is one of the outcomes of RegioRess and has been designed to give guidance to municipal actors on optimising material cycles and flows. It contains information about the opportunities to be found in various areas in municipalities and outlines specific examples from practice in five case studies where material flows and cycles have been optimised. Different areas of action have been investigated, with examples also taken from outside Germany – from Switzerland and Sweden. Success factors and obstacles have also been identified and solutions and courses of action derived for municipal actors. This booklet is intended for decision-makers and employees in municipal administration, municipal utilities and local politics.

Within the scope of RegioRess, interviews were held with representatives from Bielefed city council and environmental services, Zürich city council, Stockholm city council and university, Rosenheim public works department, Herford recycling exchange (Arbeitskreis Recycling e.V.), Duisburg Business Development Agency, NRW Efficiency Agency, social cooperative Regios eG, Energie- und Ressourcen-Management GmbH, Porta Möbel GmbH & Co. KG and Deutsche Post DHL Duisburg. The involvement of these different regional and local actors in the study facilitated a practical analysis of the issues the project was set up to resolve. The UBA, Difu and the Oeko-Institut are extremely grateful for their contribution and for the information given.

1. RegioRess: The project

The research project “Improving resource efficiency by optimising regional and local material cycles and flows: Obstacles and opportunities” (FKZ 371493 1000) was undertaken on behalf of the German Environment Agency (UBA) within the scope of the environmental research plan of the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU).

Background

Natural resources such as raw materials, soil, water and air form the basis of everyday life and economic activity. In order to consume fewer natural resources and use them more efficiently and sustainably, there needs to be a comprehensive circular economy and a radical change in our approach to raw materials. To improve resource efficiency in Germany, the previous German government launched the German Resource Efficiency Programme (ProgRess) in 2012. The aim of ProgRess is to secure a sustainable supply of raw materials, improve resource efficiency in production, design products and shape consumption in a way that conserves resources, and build a resource-efficient circular economy.

Opportunities in municipalities

Considerable opportunities for improving resource efficiency – largely ignored in the past – are considered on a regional and local level. Municipalities in particular have a key role to play in optimising material cycles as many material flows, such as water supply and wastewater disposal (e.g. residual materials, sewage sludge), and a number of waste streams (e.g. biogenic fractions) are mostly organised along municipal or regional lines. Municipalities can also influence other material flows both directly and indirectly (e.g. urban planning, vehicle fleets, procurement), adopt a control function and serve as an important actor in local networks. This potential has also been identified by the federal government, with the important role municipalities play in resource efficiency clearly stated in ProgRess II in 2016.

The research approach

RegioRess identified and evaluated the opportunities and potential for optimising regional and local material flows and cycles to improve resource efficiency and effectiveness, and drew up recommended action plans for groups of actors in municipalities as well as for the regional economy and citizens. One other booklet has already been published entitled “Ressourceneffizienz in Kommunen – Stoffströme und Stoffkreisläufe auf der regionalen und lokalen Ebene optimieren. Handlungsfelder, Fallbeispiele und Empfehlungen für die lokale Wirtschaft und Zivilgesellschaft”.

Extensive research and analysis was carried out on existing ideas, concepts and examples of improving resource efficiency in municipalities, with more than 200 approaches or projects reviewed. By applying a multi-stage procedure, five different case studies

concerning regional and local material, energy and finance streams were selected, which were then analysed in greater depth. The objective of this investigation was to identify the prerequisites for success and the barriers encountered in order to develop solutions for designing and implementing resource efficiency in a regional and municipal context.

Building on this, framework conditions for successful implementation were elaborated and appropriate policy recommendations made. Answers were also sought to the question of how regional and municipal management processes can be developed in a much more integrated way.

The project commenced in 2014 and concluded in 2018. The project's final report can be viewed on the Environment Agency's website (www.umweltbundesamt.de).

2. Material flows and resource efficiency – Challenges and areas of action

What are the challenges we face?

For years our society has been facing environmental challenges that are yet to be resolved, such as climate change, rising marine pollution and the depletion of natural resources. These problems are exacerbated by our economic model, whose basic principle of growth is associated with a high demand for resources and the generation of waste, along with consumerism in society, which is geared to constantly new products with shorter lifecycles. Furthermore without resource-conscious planning, trends such as global urbanisation processes inevitably lead to resource depletion and shortages. Consideration should be given to the fact that the entire value-added chain has environmental consequences – i.e. from recovery, processing, use and recycling all the way to disposal. The use of fossil raw materials has a negative impact on the natural balance. Just how relevant these developments are can be seen from the information box.

The protection of natural resources primarily concerns environmental protection and the economy. With its high proportion of industry and manufacturing, Germany is dependent on a secure supply of raw materials – particularly from imports. The cost of materials is also a key factor in our competitiveness because they are the largest cost item in manufacturing, much higher than energy and staff costs. A shortage of raw materials can push costs up even more.

For years natural resources have been used far above their regenerative capacity – this jeopardises our environmental asset base and increasingly poses risks to the economy.

Infobox 1
Figures on resource use

- A twelvefold increase in the global consumption of fossil energy sources in the 20th century
- Increase in the depletion of natural resources by a factor of 34
- 16 Mg materials are consumed in the EU per capita per year– of which 6 Mg is accumulated as waste
- China used 6.6 gigatonnes of cement in three years (2011-2013); in the entire 20th century the USA used just 4.5 gigatonnes (1901-2000)
- Despite a slowdown, the International Energy Agency is assuming a 30 % rise in energy demand between 2017 and 2040
- According to the Global Footprint Network, the entire world population is currently living as if we had 1.7 earths at our disposal (as at July 2017)
- Germany consumes 403 million tonnes of fossil fuels, 602 million tonnes of minerals, 25 million tonnes of metal ores and 272 million tonnes of biomass

Sources: COM (2011) 571, The Roadmap to a Resource Efficient Europe, Brussels 2011; US Geological Survey und IEA New Policies Scenario, 2017; UBA: The Use of Natural Resources – Report for Germany, Dessau-Roßlau 2016.

Infobox 2
ProgRess II

listed the following activities, among others, to boost resource efficiency in municipalities:

- strengthening/enshrining the guiding principle of "future-proof municipalities"; focus on conservation of resources
- establishing specific information and advice services for municipalities
- supporting municipal activities for a stronger alignment of business development and resource efficiency

Action needs to be taken. This was also reinforced in a report by the International Resource Panel, according to which the annual demand for raw material could rise from its current level of 85 billion tonnes to 186 billion tonnes by 2050 if nothing is done about it. Looking at individual sectors, e.g. the mobility sector, it is clear that it is not enough just to switch to (battery) electric engines as there is limited global availability of key resources such as lithium and coltan. A fundamental shift in transport policy is therefore needed (Zimmer et al. 2016).

Which political frameworks and programmes promote resource efficiency?

The importance of resource protection is evident from the goals of international, European and national policies. Internationally, the G7 Alliance on Resource Efficiency was established in 2015 to make resource efficiency a key issue. At its summit in Hamburg in July 2017, the G20 decided to launch an ongoing resource efficiency dialogue with the aim of using natural resources more sustainably. The inaugural meeting of the G20 Resource Efficiency Dialogue was held in Berlin in late 2017. Resources play a considerable role in the 2030 Agenda for Sustainable Development since twelve of the United Nation's seventeen Sustainable Development Goals (SDG) depend on more sustainable management and use of natural resources.

On a European level, the flagship initiative for a resource-efficient Europe is one of the seven flagship initiatives of the Europe 2020 strategy striving for sustainable growth. Improving resource efficiency was also one of the three main pillars for the realisation of Vision 2050's "Living well, within the limits of our planet". Resource efficiency is included in various interrelated policy strategies, such as the EU Roadmap to a Resource Efficient Europe and the EU Action Plan for the Circular Economy.

As part of its national sustainability strategy, Germany is seeking to increase its raw material productivity by 2030 in keeping with the trend in the first decade of the 21st century (Federal Government 2016). Germany's Resource Efficiency Programme (ProgRess), which was agreed in 2012, should also be mentioned. ProgRess is based on the idea that resource efficiency and conservation serve both economic and environmental purposes equally. ProgRess I (2012) established the central ideas and actions to protect natural resources, with reports on the development of resource efficiency to be produced every four years. Municipalities are listed as important actors (land consumption, Federal Building Code (BauGB), waste separation, advice). ProgRess II (2016) places a strong emphasis on the important role municipalities can play in improving resource efficiency. This programme will run until 2019. As part of the National Resource Efficiency Platform, Germany's Environment Ministry regularly provides information on resource efficiency to around 40 institutions. These include trade associations, environmental and consumer protection associations, trades unions and leading municipal associations. The aim of the Resource Efficiency Network is to use its expertise and experience to provide information about resource-conserving manufacturing, products and management, and for actors to network. The focus here is on the business sector.

In future the issue of resource conservation will feature more prominently on the political agenda and, particularly for municipalities, will play a greater role.

Infobox 3
Strategies of resource protection

- Efficiency: increase resource productivity throughout a product's life cycle. Efficient utilisation of resources, for instance through improved technologies
- Consistency: improve resource effectiveness by using ecologically sensitive materials and environmentally friendly technologies
- Sufficiency: change consumption patterns to reduce the use of or demand for resources

How do material cycles and flows influence the use of resources?

Resource requirements can be minimised by pursuing and implementing the strategies of efficiency (e.g. relative savings), consistency (e.g. circulation) and sufficiency (e.g. absolute savings). The approaches analysed here come under one or more of these three strategies and have a direct or indirect influence on material cycles and flows. The optimisation of material flows and the closing of material cycles protect natural resources. Optimised material cycles are aligned to the working of natural ecosystems, i.e. wherever possible residue materials continue to be used during a product's life cycle. Material flow systems are positively influenced by steering or managing material flows so that material and finance streams need fewer or no resources, thus reducing the demand on the environment.

Why are local and regional levels so important?

Resource utilisation always has a spatial connection and local or regional "end consumers". In its flagship 2016 report, the German Advisory Council on Global Change (WBGU) emphasised the global significance of transformation in urban spaces. On a municipal level, large quantities of resources are required and used, e.g. building materials, foodstuffs, water and energy. Local behaviour, i.e. local and regional resource requirements, therefore has a direct impact on global resource consumption and emissions. In parallel, environmentally-aware "resource users" are drivers of innovation. Local actors have the knowledge to identify on-site potential, develop networks and adopt measures. Impetus for innovation should also come from further afield as well of course, in order to avoid too parochial an approach being adopted. However it is precisely at a regional and local level that leverage should be applied, naturally with support from "third parties" too, in order to meet the challenge of conserving resources.

Who are the key actors?

On a local and regional level, municipal politicians, municipal administrations and municipal utilities play an important role, along with actors in civil society, companies and science. They can serve as initiators, networkers, implementers, financiers or supporters.

Why optimise material cycles and flows?

First, the optimisation of material flows has a positive impact on protecting the climate and the environment. Materials can be used in energy (generation of electricity, heat) or as a substance (e.g. sewage sludge as a fertiliser) to meet local requirements. The majority of Germany's raw material demand (almost 70%) is imported, leading to interdependencies. However by using recycled raw materials, known as secondary raw materials, it is possible to substitute primary energy sources and natural resources. The use and optimisation of local material cycles can also lessen the economic shock of price rises for raw materials, and by saving costs on raw materials the burden on the economy can be reduced and regional value creation stimulated.

Infobox 4
The advantages of a circular economy

- The use of secondary raw materials (zinc, packaging, steel, aluminium etc.) in 2005 produced an added value in Germany of 3.7 billion euros
- In the manufacturing sector, 44% of costs are attributed to raw and other materials, 20% to staff and just 2% to energy.

Sources: Association of German Engineers (VDI) Technology Centre, Innovations to combat a scarcity of raw materials, Düsseldorf 2008 and VDI Centre for Resource Efficiency short analysis no. 6, Focus on resource efficiency in operational cost accounting, Berlin, 2014.

In which local and regional areas of action are material flows optimised?

On a regional and local level there is a wide variety of areas that present opportunities for optimising material flows. These include the tasks and opportunities for steering activities found in municipal administrations (e.g. procurement, urban development, environment agency, car fleet), business development (e.g. Zero Emission Park) and municipal utilities (e.g. waste management), as well as process optimisation activities in small and medium-sized companies (SME) and industry (e.g. Ökoprofit) or the activities of civil society initiatives for resource efficiency (e.g. urban gardening, transition town). The illustrationbelow shows the various kinds of actors and areas of action.

Figure 1 shows that municipalities already contribute to conserving resources in many areas of action. Overall the optimisation of material flows is a responsibility right across the board, but it is often primarily dealt with on a sectoral basis and only integrated in part, which is why further scope for optimisation remains.

Municipal areas of action have a considerable influence on material flows and cycles.

Section 3 outlines practical examples of the optimisation of material cycles and flows to improve resource protection.

Figure 1

Actors and areas of action in resource efficiency in municipalities

Source: Difu

3. Optimisation of material flows – Five examples of municipal engagement

What contribution can local and regional material flow management actually make to improving resource efficiency? The five case studies below illustrate both the opportunities and limitations in optimising local and regional material flows. They encompass different material flows (including energy, water, waste, building materials, consumer goods and finance) and different target groups, and offer excellent examples of approaches that can be transferred to other municipalities. Each case study has an overview of the main actors, mechanisms and processes involved, while the text boxes highlight the key actors, success factors and obstacles that have been identified.

3.1 Resource-efficient development of a district: Hammarby Sjöstad in Stockholm

Hammarby Sjöstad is a district in Stockholm whose development on a former industrial site and wasteland started in 1996. In part it involved the treatment of contaminated soil. When it is completed in 2018, Hammarby Sjöstad will be an independent district with around 28,000 residents and extensive office space. One of the stated objectives of this settlement development was the optimisation of material cycles at a district level.

Actors

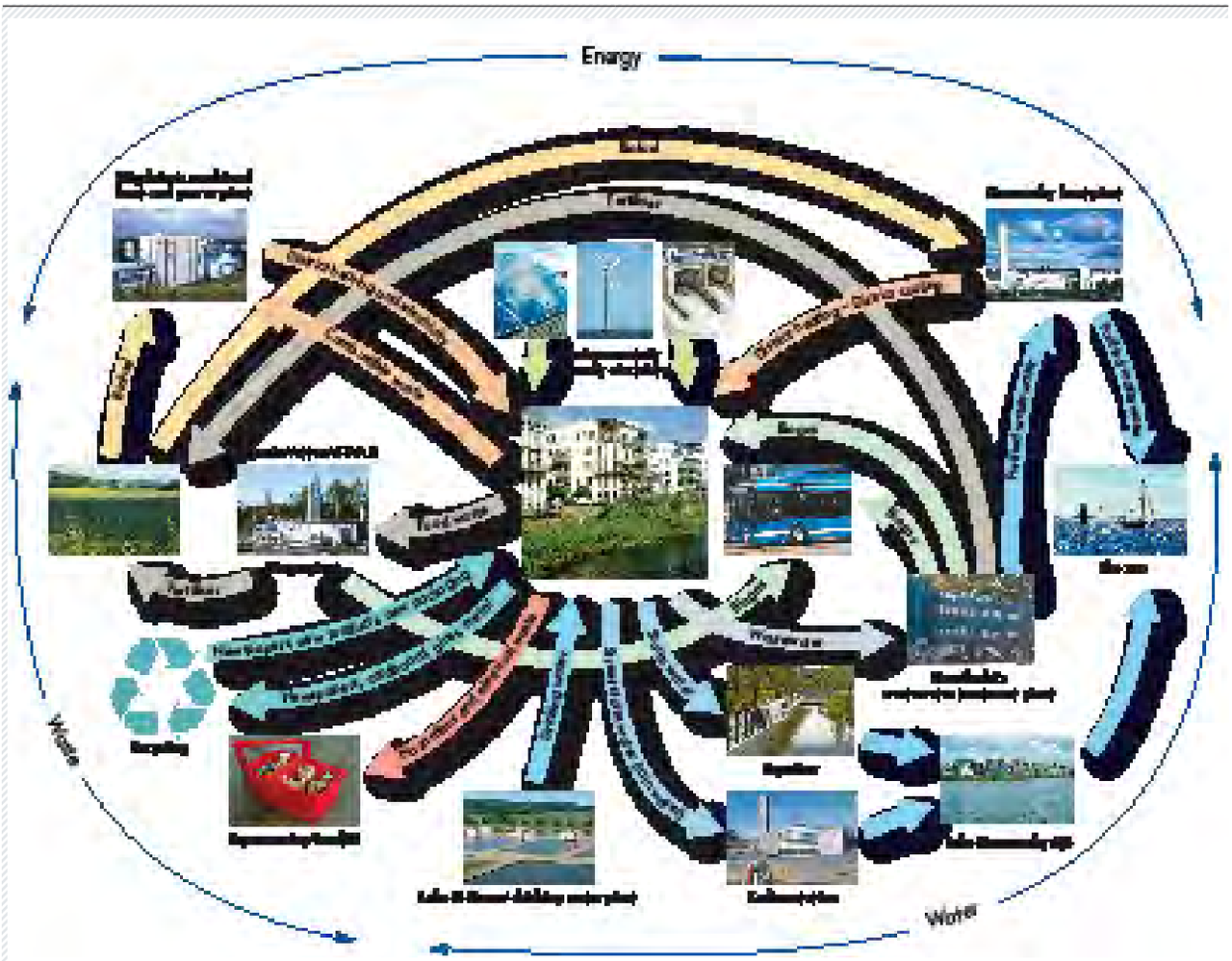
- City of Stockholm (politicians and administration)
- Municipal supply and waste disposal companies (later partially private)
- Building developers
- Residents
- Science

The background to the project was a political requirement dating from 1995 for the district to be "twice as good" as the state-of-the-art construction of a comparable city district – i.e. efforts should be made to achieve a 50% reduction in resource requirements. Planning of the area and its buildings were to be aligned to the principle of natural cycles. It was also specified that local cycles should be closed and energy from local renewable sources used.

In 1996 an environmental programme for the development of the district was conceived. As part of this, an eco-cycle model was developed as the Hammarby model (see below) and in 1997 agreed as the concept for the development. This required the city's suppliers and waste disposal contractors to coordinate their input/output systems more closely by adopting an integrated approach. The model was consequently developed as part of a cooperation arrangement between the municipal organisations of Stockholm Energi (now Fortum), Stockholm Vatten AB and Stockholm's waste companies. The Hammarby model takes an integrated planning approach and consi-

Figure 2

The city of Stockholm's Hammarby model 2014



Source: City of Stockholm

ders cross-sectoral material flows in order to produce synergies. The energy used should come from local renewable sources.

All of this meant that a new district could be created that conserves resources.

Subsequent urban development projects are to benefit from the experience of Hammarby, thus in 2009 Stockholm city council decided to develop the area of the Royal Seaport as a "world class" sustainable district. As with Hammarby, an integrated approach is to be taken to achieve this vision, with the city's administration, public services, developers and businesses already working closely together in the planning phase. The overarching objective is for the district to be "climate neutral" by 2030 – something intended for the city as a whole by 2050.

Why was Hammarby Sjöstad chosen as a case study?

Hammarby Sjöstad is known internationally for its application of industrial ecology in urban development (urban symbiosis). Cities already have high resource requirements, with many of them experiencing economic and population growth. Urban planning is therefore crucial when it comes to optimising resource utilisation. The Hammarby Sjöstad project

focuses on city and district development as an area of action in the optimisation of local and regional resource cycles. It offers an impressive example of the opportunities and challenges faced when developing a local integrated infrastructure.

Obstacles

- Administration structures: lack of "horizontal" communication between the various administrative departments impedes the implementation of integrated approaches
- Lack of resources: time-consuming process management ties up staff
- Downstream environmental requirements: Hammarby Sjöstad environmental programme should have been involved in the process earlier
- Conflict of interest: marketing requirements (e.g. large windows facing north over the water, more parking) and environmental requirements (energy efficiency goal of 60 kWh per m² per annum)
- Conflict in objectives: efficiency versus user behaviour (e.g. water consumption per person)
- „Soft" transfer of objectives and obligations into purchase agreements with project developers
- Policy change after new elections
- Lack of early involvement of residents

Success factors

- Formulation of a political vision: „twice as good"
- Non-partisan political support over a number of legislative periods
- Optimisation of material flows taking different spatial levels into consideration (e.g. block, quarter, district) and linking different sectors together
- Establishment of organisation structures: early involvement of all actors, coordination positions, regular meetings, rapid decision-making paths
- Optimisation of municipal real estate policy: sites for the development of the district should be in municipal hands
- Requirements: environmental programme with clearly formulated objectives and tasks
- Introduction of a monitoring system: prompt and regular review of fulfilment of objectives
- Knowledge transfer: transfer of acquired knowledge, including in relation to communication structures and administrative processes
- Formulation of an environmental programme specific to the district and relevant implementation goals
- As few car parking spaces as possible (here 0.7) and the promotion of alternative forms of transport (cycling, public transport)
- Competitions for architects and developers

3.2 Sustainable business locations: Duisburg Business Development Agency's strategy

The development of resource-efficient business parks is increasingly important in municipalities. The key reasons for this are the implementation of municipal sustainable development goals, based on a growing awareness of climate protection, the finite nature of land resources and the limits of settlement development. Meanwhile the consequential costs of building land improvements in particular are placing a burden on public budgets. Companies on modern business parks are also demanding cheaper energy costs and an attractive operating environment. Around 40% of Germany's final energy is taken by "industry" and "commerce, trade, services" – and consequently by activities that for the most part take place on industrial and business parks. This therefore presents both a challenge and an opportunity for municipalities.

The Duisburg Business Development Agency's strategic approach is based on the assumption that energy and resource efficiency will be increasingly important for companies in future for environmental and economic reasons. For example in the processing industry, raw materials make up 45% of the cost structure, whereas staff account for just 20 % (VDI ZRE 2014). As

Infobox 5
Ökoprofit incentive scheme

ÖKOPROFIT® Duisburg receives financial support from the Ministry for the Environment, Agriculture, Conservation and Consumer Protection of the State of North Rhine-Westphalia (MULNV). The objective is to strengthen companies economically and ecologically for the long term. A system of coordinated measures allows companies to reduce costs and increase their eco-efficiency. Key areas are to lower water and energy consumption, reduce rubbish and increase material efficiency.

Source: https://www.gfw-duisburg.de/dienstleistungen-fuer-sie/kooperationen-partnerschaften/oekoprofit-duisburg/

Actors

- Duisburg Business Development Agency (Gesellschaft für Wirtschaftsförderung Duisburg mbH)
- NRW Energy Efficiency Agency (EFA NRW)
- ThermoPlusWärmeDirektService GmbH
- Zero Emission GmbH
- Company interest groups at Kaßlerfeld/Neuenkamp (IGKN), Neumühl and Mevissen (in planning)

part of the Business Development Agency's portfolio maintenance, companies based there are initially actively assisted with improving their operational energy and resource efficiency.

The "Ökoprofit" incentive programme, in which the Business Development Agency is itself involved, is a tool for providing initial advice and implementing individual companies' actions. The advice is given by the independent North Rhine-Westphalia Efficiency Agency (EFA NRW), which is strategically involved as an ongoing cooperation partner of the Duisburg Business Development Agency. However the agency's focus is also on the overall balance in Duisburg's business parks, with sustainable development as its goal. Projects are therefore being launched with other cooperation partners that take efficiency potential across a number of companies into account too, such as drain water heat recovery through the development of a local waste heat initiative.

To date three locations have been involved in the activities. Existing corporate interest groups in Kaßlerfeld/Neuenkamp have made a key contribution to their success because of their important role as an interface in communicating with companies. In Mevissen were no corporate interest groups to tie in, therefore opportunities for cross-area cooperation arrangements in its business park were identified to reduce resource consumption, mainly of energy, water and waste, as well as CO_2 emissions, initially through a climate protection sub-concept based on the Zero Emission Park concept.

In addition to a material flow analysis for the entire area and the development of areas of action, ideas for joint action were developed in dialogue with the companies there. As a result, projects such as the joint purchase of electricity, a company travel pass (with the objective of reducing private transport) and the use of heat from a local wood chip incineration plant were targeted. On the Mevissen business park, an interest group of companies was launched by highlighting the synergies generated by adopting shared resource efficiency measures.

The stated objective of the Duisburg Business Development Agency is to support companies on all business parks with improving resource efficiency.

Infobox 6
Zero Emission Park concept

- A zero emission park is an industrial or business park that reduces all the harmful side effects of commerce in the area, ideally down to zero
- The concept is based on the BMVBS-funded pilot project "Zero Emission Park – a cross-state project for the development of sustainable business parks" from 2008 to 2009 by the University of Kaiserslautern
- Building on this, the "Zero Emission Park concept" methodology was developed into the sustainable development of industrial and business parks

Source: Veronika Wolf (2010): "Zero Emission Park" pilot project, 2010.

Why was Duisburg Business Development Agency's strategy for the future chosen as a case study?

Duisburg Business Development Agency's comprehensive strategic approach to improving energy and resource efficiency on all industrial and business parks in the city, and to gradually developing the locations sustainably, sets the benchmark for Germany as a whole. Starting with measures in individual companies, the area's potential is enhanced and co-

Success factors

- Organisation structure: use of interest groups in the business community as the central contact and interface between companies and the municipalities or service providers
- Strategic partnerships: ongoing collaboration between the Business Development Agency (interface with the business world) and the NRW Efficiency Agency (specialist experts) supports the targeting of companies and project development
- Door openers: talk to companies individually about concrete cost savings (how can the business become more efficient?)
- Relevant topics for companies: ensure joint activities are of benefit to several organisations
- Learning processes: introduce successful measures from other locations
- Communication and exchange: make use of regular events or meetings to launch new projects
- Facilitators: encourage continuity by being fixed points of contact for companies and coordinating joint projects

Obstacles

- Preconception that "climate protection is expensive": the issue of climate protection (zero emissions) often raises concerns about additional associated costs
- Cost-benefit levy: amortisation periods that are too long or benefits that are too small hamper investment in efficiency measures

operation projects between companies developed that reduce the consumption of energy, water, waste and other resources for the entire location. The Business Development Agency's strategy is supported here by a broad networking concept that forges long-term partnerships and consequently improves project continuity and development.

3.3 Reuse in regional networks: RECOM East Westphalia

The Verein Arbeitskreis Recycling e.V. and the corresponding "RecyclingBörse!" (recycling exchange) have been involved in the reuse of consumer goods in the Herford area since 1986. The RECOM (Recovery Ecological Management) project was launched by the Arbeitskreis Recycling e.V. It was supported by the Federal Ministry of Labour and Social Affairs and the European Social Fund between 2012 and 2014 as a pilot project in the "CSR – Social responsibility in medium-sized enterprises" support programme. After its conception and implementation in the East Westphalia-Lippe region, RECOM projects were launched in a further four regions in Germany (Frankfurt a.M., Munich, Mönchengladbach and Mittweida). With the conceptual approach of corporate social responsibility (CSR), private sector companies' social commitment to reuse was mobilised and cooperation arrangements and regional networks established.

RECOM has resulted in lasting partnerships being created in the region between social economic enterprises, commercial-private sector SMEs and public waste management authorities (örE) as well as agencies, chambers of commerce, environmental associations and citizens. It has led to an improvement in the conservation of resources through regional reuse in

Actors

- Arbeitskreis Recycling e.V./RecyclingBörse!
- City of Bielefeld
- Environmental enterprises in the city of Bielefeld
- Porta furniture store

both qualitative and quantitative terms. In the Herford area, five collectors' exchanges were supported by the "Recyclingbörse!", collection campaign dates arranged and reuse throughout the district therefore assured. The Porta furniture store was enlisted as a cooperation partner and has since delivered manufacturing rejects and returns for reuse.

Alongside its environmental effects (lower demand for resources in the region), there have also been economic benefits to the RECOM project (e.g. savings on disposal costs for cooperating companies) and social effects (employment and skills for the long-term unemployed, provision of lower-cost used goods).

Therefore win-win cooperation arrangements have been produced that can optimise the utilisation flow of consumer goods in the region for the long term. Alongside better use of goods that have already been produced, WIR e.V. (an association emerging from the project) also champions the pursuit of other waste avoidance strategies nationwide that go beyond an „end-of-pipe“ solution (e.g. consumer awareness about avoiding waste, redesign strategies and legislative initiatives).

The long-term objective is to develop a common umbrella brand across Germany that determines quality standards for reuse and repair centres. Under European legislation, accreditation guidelines for initiatives are to be established and a certification standard developed. Cooperation arrangements with municipalities should also be strengthened to safeguard funding for reuse.

Infobox 7
Information box: Circular economy in Germany

- A new recycling management law (KrWG) has been in force in Germany since 2012, implementing the EU Waste Framework Directive (Directive 2008/98/EC) in German law
- By establishing recycling quotas for municipal waste (at least 65% by 2020) the law boosts waste avoidance and reuse
- Against this backdrop municipalities are increasingly engaging in the reuse of used consumer goods
- Over and above this it has been recognised that reuse initiatives can create jobs
- Regions therefore benefit from reuse in may ways: more work, more local added value, less waste, less consumption of raw materials

Why was the RECOM regional network chosen as a case study?

Taking a systemic view, the RECOM pilot project managed to respond simultaneously to several developments, achieve synergy effects for all the partners involved and improve use of consumer goods in the region, and consequently contribute to optimising regional material cycles. By taking an integrated approach, opportunities for employment and passing on skills to the long-term unemployed were created, recycling management and waste law was implemented and reuse improved. Over and above this, SMEs' interest in accepting corporate social responsibility (CSR) for reuse activities was exploited and strengthened and the consumption of primary resources reduced. The project creates incentives for the long-

Success factors

- Policy and administration: gain support and acceptance on all political levels
- Strategic partnerships: enlist municipalities as financial backers
- Funding: develop a funding concept
- Network management: the socioeconomic initiative serve as points of contact and project coordinator
- Communication: create trust between participating partners and appropriate communications and cooperation structures
- Offer and demand: attract partners from commerce and manufacturing, develop a broad and changing offer
- Marketing: raise profile through regular advertising e.g. for collection and special campaigns
- Awareness of reuse: communicate social, ecological and civic advantages via CSR
- Transfer: exchanges and networking with other initiatives

term involvement and consolidation of networks. However, to boost the environmental effectiveness of such initiatives, consumer behaviour needs to change, new business models need to be introduced and companies need to make the effort to re-design their products and services.

Obstacles

- Political will: lack of political support to safeguard reuse initiatives in municipalities over the long term
- Funding: municipal support, e.g. waste charges, hard to implement

3.4 Municipal resources strategy: Construction in the city of Zürich

The city of Zürich set itself the goal of being a 2,000-watt society by 2050, which has led to the introduction of various measures in energy, construction, the business sector and mobility. Against this backdrop, a resource strategy for construction in the city was developed. To achieve the objectives of the 2,000-watt society, material flows from the construction sector were deliberately chosen as they are among the largest in quantitative terms, with "embodied energy [1]" playing a major role. Furthermore Zürich is a growing city in which there is huge demand for buildings (residential, business, cultural etc.).

In the resources strategy, capabilities in building materials recycling are to be developed in order to process material flows from demolition through intensified clean-up activities and replacement buildings. The proportion of demolition materials is to be markedly increased, with priority given to their use in bound form in building construction and civil engineering, rather than their incorporation in loose form. During demolition, requirements corresponding to standards such as SIA 430 [2] are to be observed in order to recover materials separately, such as concrete rubble, mixed rubble, wood and metals. Recycled building materials (e.g. recycled concrete (RC)) are to be used increasingly in all applications. To minimise possible concerns about the use of secondary raw materials, the quality of recycled products should be enhanced. Against this backdrop, the strategy formulated measures for actors in the city of Zürich, such as the use of RC in building construction as well as environmental conditions when awarding demolition contracts.

To support the implementation of the objectives and measures outlined in the resources strategy "Building in the city of Zürich", the Seven Milestone programme was developed. The Seven Milestones are a politically legitimate tool since the requirements

Infobox 8
Concept of a 2,000-watt society

- Developed in the mid-1990s at the Swiss Federal Institute of Technology (ETH) in Zürich
- Primary energy (watts of energy consumption per capita) and greenhouse gas emissions (tonnes CO2-equivalent per capita per year) in Switzerland in 2100 should be 2,000 watts of energy consumption per capita (primary energy level) and 1 tonne CO2-equivalent per capita per year
- Comparable values: in 2013 5,400 watts and 7.2 tonnes per capita
- Efficiency, consistency and sufficiency are the concept's three overarching implementation strategies

Source:https://www.2000watt.ch

Obstacles

- Persuasion: providing information to companies in the building materials industry, as well as developers, engineers and architects, about the quality of the product
- No existing market for secondary products
- Collaboration: interdepartmental collaboration between City of Zürich departments
- Locality/regionality: distance between the site of production and the site of use should be no more than 30 km
- Legal uncertainties: lack of or unclear engineering standards lead to uncertainties for developers
- Economic viability: prices for primary building materials were reduced by private companies to remain competitive in the marketplace compared to RC

listed were agreed by the city council and therefore have to be implemented. The specified standards of the Minergie label stipulate the compulsory use of at least 50% RC for example. The Seven Milestones apply to municipal buildings (new builds and renovations) as well as to the projects of municipal institutions.

Why was the resources strategy Zürich chosen as a case study?

Mineral building waste is one of the largest material flows in quantitative terms and therefore highly relevant. The resources strategy focuses on this specifically because it is concerned with the pathways of resource use available for converting building stock in order to achieve a 2000-watt society. The city is therefore establishing close links between its energy and environmental policies.

Actors

- City of Zürich (e.g. office of structural engineering, department of sustainable construction, public works department)
- Municipal bodies of the city of Zürich
- Engineers, architects, private building contractors
- "Gravel for Generations" think tank and information platform (various actors, including public authorities, architects/engineers, research and consulting, specialist committees and associations)

Success factors

- Objectives and commitments: adoption of the 2,000-watt society into the byelaws of the city of Zürich
- 7-milestones action planning: a city council decision means the listed requirements are binding and must be implemented
- Integrated municipal strategies and objectives: inclusion of the 7 milestones in the energy master plan
- "Start small and build trust": the use of RC was expanded gradually, starting from dividing walls in buildings to all areas in building construction
- Procurement policy: obligation to include ecolabels and consequently secondary materials (e.g. RC) in municipal tenders and bidding procedures for its own properties
- Planning law: under certain conditions (e.g. for high building density), the use of the label can be demanded by the planning office
- Involvement of the relevant actors and persuasion: the building of a network and involvement of research and science (e.g. ETH Zürich)
- Research and development: the sustainable building department routinely has a budget (issued by the municipal council) for scientific studies to develop local resource policy strategies
- Labels and standards: enshrining reuse in existing certificates on the sustainability of buildings, e.g. Minergie ecolabel

[1]Embodied energy is the energy consumed to create buildings, including extraction, processing and manufacture, transportation and assembly. See https://www.designingbuildings.co.uk/wiki/Embodied_energy_in_construction (retrieved 23.06.18).
[2]SIA 430 is a registered standard of the Swiss Association for Standardisation (SNV) and provides recommendations for the removal of building waste in new builds, conversions and demolitions. Among other things it covers planning (including a removal concept), calculation, material, execution, the role of experts, services and scale.

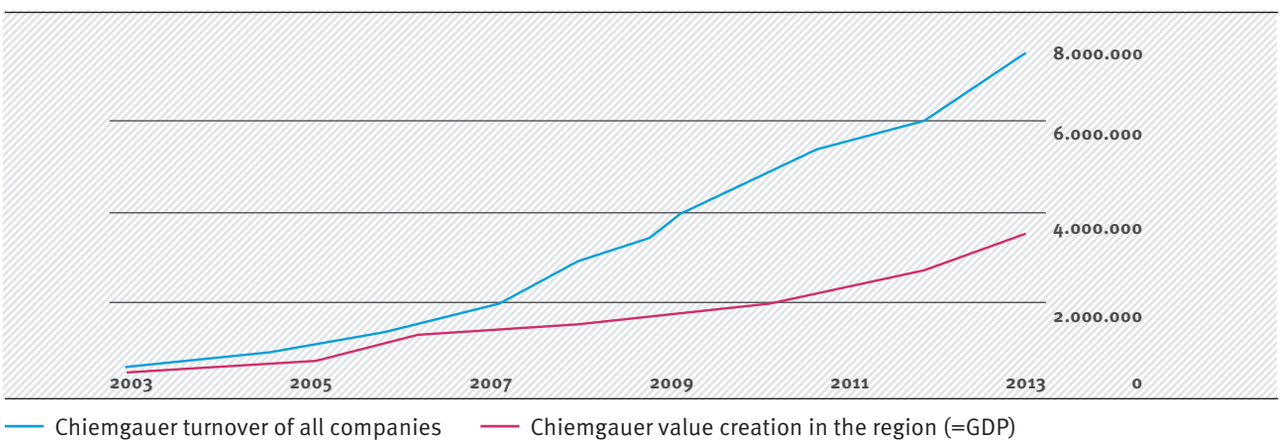
3.5 Adding value to a region with regional money: The chiemgauer

The "chiemgauer" case study highlights the contribution that a regional complementary currency can make to optimising local and regional material cycles. With complementary currencies such as the chiemgauer, the objective is fundamentally associated with increasing the demand for regional goods while reducing the outward flow of financial resources to other regions. Many instruments in classic business development are geared to increasing companies' competitiveness, but a regional currency is a tool for adding value to a region and steering demand more towards regional services and goods.

The chiemgauer was created and developed in an initiative started by private individuals, with "Chiemgauer e.V." serving as its funding agency. Network participants comprise 469 companies from over 140 different sectors in the Chiemgau region, including classic service providers (hairdressers, tailors, painters, car workshops), tour operators, chemists, bank branches, suppliers of occupational safety equipment and insurance brokers, all offering their products and services in the chiemgauer currency. The companies ask for goods and services from suppliers in the region using their chiemgauer and pay part of their employees' salaries in the currency.

Figure 3

Trend in company turnover and regional added value in the chiemgauer network from 2003 to 2014 (in euros)



Source: Own illustration and calculations in accordance with Gelleri (2015)

Obstacles

- Participation: low among companies who are closely associated with national organisations and supply chains
- Traditional consumption patterns: the less needs can be met by the network, the harder it is to change entrenched consumption patterns towards a more regional mode of consumption
- Organisation structures: dependencies resulting from the participation of individuals increase the risk of failure if those actively involved leave the project
- Lack of regional cohesion: greater anonymity and isolation or greater diversity of lifestyles in cities make it hard to develop complementary currency structures
- Use of regional money: if municipal charges, contributions and taxes cannot be paid in the regional currency, its spread/use is limited

Actors

- Chiemgauer e.V.
- Chiemgauer Regiogeld UG (limited liability)
- Regios eG cooperative society
- Companies
- Users

Individuals and private households can also offer services and products, but as a general rule their involvement in the network is as consumers. Consumers can exchange chiemgauer at issuing offices or make cashless payments for their purchases via an electronic chip card, but they are not able to exchange chiemgauers into euros.

In addition to the companies and private households involved, associations in the region are key actors in the chiemgauer network. They offer their services in the network, and part of their membership fees or allowances can be paid in chiemgauer. Meanwhile associations benefit in that 3% of each euro-chiemgauer exchange by a member goes to their desired association. This gives associations an incentive to participate and be active members of the network.

Infobox 9 Complementary currency

- Regional currency systems or complementary currencies represent a form of local exchange trade system (LETS). Many of these exchange and currency systems can be traced to the free economy theory of Silvio Gesell (Gesell 1920) and emerged as a reaction to criticism of the existing money and interest system.
- Many LETS are not directly convertible with official currency systems, which also leads to local economic cycles gradually being shielded from the developments and crises in the global economy and proving resilient to them.

Some municipalities and communes are also members of the chiemgauer network, running issue offices or procuring services. They also support the chiemgauer in non-material ways by actively promoting it and recruiting new members.

Success factors

- Market research before launch: identify consumer behaviour, central offers and existing value added cycles in order to ascertain potential for regional recycling economy
- Regional economic structure: owner-run businesses, craftspeople and service providers with head offices in the region are more willing to cooperate than large groups
- Local connection and identification with the home region: actors are motivated to participate in the network when it is important for them to be able to promote regional structures directly
- Ease of use and transparency: regular and clearly formulated information flow, transparent payment processes, democratic involvement of all participants and clarity in decision-making processes
- Offers and demand: companies only participate if demand is high enough and stable customer relationships can be established
- Preserve regional links: the sphere of activity should not be very great, as a guide a distance of up to 50 kilometres, so that goods, capital and information flows can be closely linked and personally communicated

Why was the chiemgauer chosen as a case study?

Regional currency can help make economic cycles more regional, shorten transport routes and position high quality products more effectively. A payment and currency system focused on the region means that local resources, material flows and competencies can be mobilised and optimised for use in the region. However in relation to its contribution to a sustainable transformation of society, the input made by a complementary currency can be broader. Beyond its direct contribution, its regional orientation means that public debate, which can also be supported by public relations activities, leads to greater awareness of the environmental and social consequences of global production methods. A crucial debate was held on this in the Chiemgau area. At the same time, through more transparent consumption patterns, regional currencies are a specific and collaborative approach to the issue of sustainable consumption.

4. Routes to optimising material flows and cycles in municipalities

The above case studies show that municipalities and municipal actors are actively optimising material flows in a variety of ways and taking different routes to increasing resource efficiency.

The review of more than 200 approaches to optimising material flows – with the spotlight on Germany – revealed that the issue is primarily being addressed in individual measures and developed by or enshrined in municipalities to a varying extent. There is also no general comprehensive understanding of the issue of "resource efficiency" or of fundamental responsibilities. Resource efficiency is being implemented in municipalities, but it is not necessarily given this name. The review also showed that existing potential for improving municipal resource protection has not yet been fully exploited. To continue developing resource efficiency in municipalities in the long term or to firmly establish it as a cross-sectoral issue, the following four steps have been identified from the case studies that can be used to steer activities:

1. agree objectives and an action plan

2. adapt/create organisation structures or processes

3.make use of information, advice and incentives

4.create networks and secure ongoing development.

This section provides more detail about the four individual steps as well as the success factors.

Step 1: Agree objectives and an action plan

- Enshrine resource efficiency as a municipal development goal (e.g. guiding principle)
- Develop a resources strategy with municipal politicians, administrators and organisations

The implementation of resource-efficient measures generates environmental and economic benefits for municipalities. However as yet no municipality in Germany has comprehensively committed itself to the guiding principle of being a "resource-efficient municipality", although this has happened in other areas such as climate protection. To reinforce the protection of resources in municipalities, greater publicity needs to be given to, among other things, existing approaches and successful examples, highlighting routes to greater resource efficiency in municipalities.

When implementing environmental objectives on a municipal level, there are often conflicting goals (economics, land use etc.). It partly takes political will, but also personnel and financial resources to implement resource protection goals in the face of possible resistance. The strategic development and implementation of resource efficiency measures requires several actors to be involved, which is why clear political aims are both helpful and crucial.

Of particular relevance is the support given to strategies, projects and measures for optimising material flows by actors on a local political level, such as the local council, town administration, county council and mayor. It sends an important signal to all participants, for instance in the municipal administration, and in doing so allows existing activities to be promoted, stepped up and extended. Political objectives also help with implementation when there are sceptics within the administration, as well as increasing the level of recognition, improving image perception and trust, and being firmly embedded in municipal activities (e.g. the purchase of used goods by public procurement). At the same time political support is dependent on party political interests, which is why a certain level of continuity is essential for many projects – including when the political majority changes after elections. Cross-party political support for strategic approaches and projects sends an important signal to all actors and helps intensify existing cooperation arrangements, which also benefits other joint activities.

Extensive, integrated strategies in municipalities for optimising material flows are few and far between and are primarily aligned to particular sectors. The agreement, establishment and development of an integrated municipal strategy (if applicable based on political goals on a state or national level) can serve as a guiding framework for the groups of actors involved. The inclusion of local and regional enterprises – particularly municipal organisations – can also be an important factor in the successful development and implementation of municipal strategies.

Step 2: Adapt/create organisation structures or processes

- Clarify responsibilities and specify accountabilities
- Establish municipalities as a driving force in resource efficiency
- Promote an integrated view of material flows and cycles

Resource efficiency is only partially a statutory duty in municipalities, which is why no comprehensive or overarching responsibilities – for instance in the administrations – can be found here.

Results show that in many cases activities to optimise material flows have arisen either as a result of clear local political objectives and requirements or from the initiatives of individual people in the municipalities. A “facilitator” would be able to approach this issue with the necessary breadth. To strategically embed the improvement of material flows in the administration for the long term, it is also expedient to develop structures and processes in such a way that clear responsibilities and cross-department approaches allow the ongoing development and implementation of measures to improve municipal resource efficiency.

Where measures fall within municipalities’ direct remit, implementation may be more successful as there is less coordination involved, for instance with third parties. Thanks to their own successful measures, municipalities can become the driving force and

initiator of resource efficiency measures in cooperation arrangements within the city and surrounding area and in the local economy. Full consideration should be given to this ripple effect when the concept is being developed.

As indicated above, resource efficiency and conservation in municipal administrations and enterprises is traditionally dealt with on a mainly sectoral basis. The vertical structures that exist in various administrative departments initially offer the advantage of having employees with specialist expertise. As well business development agencies have specific knowledge of local small and medium-sized companies (SME). Municipal supply and disposal companies in the waste, energy and water/wastewater sectors are also aligned primarily on a sectoral basis. However the optimisation of material flows is a cross-sectoral issue in which cross-sectoral exchange and collaboration between actors is crucial, hence horizontal structures would be helpful. Having an administration more geared to integrated approaches would allow existing potential to be exploited more extensively. This relates not only to intersectoral collaboration, for instance in the administration, but also to interfaces between municipal and local companies and civil society. To be able to exploit local and regional potential, organisation structures should be reviewed and processes potentially adapted. Existing structures will be built on in some municipalities, which is why a review of existing approaches appears sensible.

Step 3: Use information, advice and promotion

- Make use of and offer information and advice
- Develop and support demonstration projects
- Tap into and make use of support opportunities

Although in recent years there has been growing awareness of the need to conserve resources, it has not yet led to a dynamic development in the implementation of relevant projects. Processes to raise awareness take time and need to be backed up by specific experience, such as that gained from the successful examples of other projects. Often the actors involved do not identify the specific benefits or need for action without being given extensive information and advice.

Improved exchanges between all the relevant actors in municipalities or the region can be encouraged by communication. In many cases there are no suitable formats or platforms that can make a key contribution to continuing, stabilising and further developing initiatives and projects. Demonstration projects can allow technical opportunities to be highlighted and existing criticism dealt with. This emphasises their technical and political feasibility and also shows possible prerequisites if they are to be transferred to other municipalities or regions.

Incentive schemes for municipalities that directly relate to optimising material flows are also not widely available. However in many cases these are necessary to advance the issue since in many municipalities limited funding is a problem. Existing financial resources in the municipalities are used first for their

statutory obligations. The federal government and/or the EU should undertake a review of whether incentives are being developed in municipalities that relate directly to resource efficiency, and whether and how existing funding sources can be used. Incentive schemes should encompass information, advice, personnel and pilot projects.

Step 4: Create networks and secure further development

- Develop and strengthen cooperation arrangements and networks for resource efficiency
- Boost employee competencies

The integration and amalgamation of existing networks, levels and structures is also helpful when optimising material flows. Municipalities could also have an important organisation and control function (for instance administration, business development). Involvement in existing (e.g. social) structures and networks (e.g. clubs, associations) on a municipal level is extremely beneficial when implementing material flow management systems, strengthening the credibility of projects, improving their image and raising their profile. In urban structures, the inclusion of marketing and social media is possible and may be necessary in order to raise the profile of the project and boost trust or improve its image. Alongside this, other marketing activities can also give greater publicity to projects and access new target groups.

Specialist knowledge and competencies among municipal politicians, administrators and organisations are an important prerequisite for resource efficiency activities. The implementation of resource efficiency measures requires specialist skills and continuity that should be actively supported by giving politicians and administrators specific training.

5. Building blocks for optimising material flow in municipalities

The case studies illustrate that measures to optimise material flows and cycles can differ both in terms of their content and in the strategies adopted to implement them. Furthermore the four steps outlined in the previous section help to derive general building blocks for the implementation of resource-efficient activities in municipalities.

The concluding section of this booklet offers examples, ideas and guidance for actors in municipal administration and politics to implement measures of their own.

Put resource efficiency on municipalities' political and strategic agendas!

Establishing guiding principles and/or resource protection goals in municipal policies is an important step in the planning and implementation of activities in a municipal context. In many municipalities guiding principles and strategic objectives had already been formulated and established. For example in Zürich the objective of the "2,000-watt society" (see case study) was adopted by the city council and enshrined in local government law – with the goal therefore determining the administration's actions. Municipalities with the mission of being "sustainable citizens' communities", mainly found in Bavaria and part of the Agenda 2030 process, are also worth mentioning. "Master plan 100% climate protection" municipalities, which pursue particularly ambitious climate protection goals, can also be found in large numbers in Germany. Meanwhile a city district has been developed in Stockholm under the political directive of being "twice as good". These are impressive examples of prescribed policy in resource-relevant areas and of guiding principles or objectives leading to practical actions that really make an impact.

Infobox 10
Establishing strategic objectives - the example of Osnabrück

A three-tier system was developed:

1. **strategic objectives established for the city from 2016 to 2020**
2. **central areas of action defined**
3. **product objectives established**

Strategic objectives include sustainable mobility, protecting natural resources and reinforcing environmental awareness.

Key spheres of activity here comprise increasing bicycle use, promoting public transport, developing sustainable mobility management concepts, developing sustainable environmental management and support for renewable energies.

A review was also conducted on whether the right leverage for achieving goals was being applied, with adjustments being made from time to time.
See: https://www.osnabrueck.de/stadtziele.html

Source: City of Osnabrück (2015): Strategic Goals for the City 2016-2020 – Objectives and key areas of action, Osnabrück.

Integrated strategies are another important building block in optimising material flows. When developing strategies, municipalities should tie in with the administration's guiding principles or specific political or environmental objectives. These can either be restated (see above) or used as they are. A local or regional cycle or material flow strategy can be developed for one or more material flows by taking into account existing objectives. An integrated approach should be pursued here. This will require more organisation since different actors are participating, but involving them early on secures their willingness to cooperate with implementation and their acceptance.

A process or procedure for their inclusion in strategy development should therefore be developed early on. One example of a municipal strategy is the resources strategy of the city of Zürich, which primarily addresses material flows in building and civil engineering (for more information, see the case study above). Practical examples of strategic approaches can also be found under the term "regional material flow management". Master plans that have already been implemented for optimising regional material flow management include the Environmental Campus Birkenfeld, the bioenergy villages of Mauenheim and Jühnde and Energy Landscape Morbach. In these

examples the focus has been on measures to optimise material flows for the production of energy (heat/electricity). Important foundations have also been laid within the context of Agenda 21 processes: for example in 1996 in Ravensburg, as part of an "Environmental city and municipality development" pilot project, the integrated „Programme 2001 Ecological urban development Ravensburg – Local Agenda 21" was developed that set out the current situation, their goals for ten areas, and a programme for achieving these goals. The programme encompassed environmental planning, ecological urban development planning, water, wastewater, waste, energy, traffic and procurement. The municipality of Ravensburg agreed to the programme in 1996 and its administration was tasked with developing projects and plans. The Agenda 2030 process for sustainable development could be used for other projects here. These examples demonstrate that there are different strategic approaches to optimising material flows in municipalities already exist, and these can either be built on or used as benchmarks.

Promote sectoral and/or integrated approaches!

Integrated approaches should be pursued more in municipalities to tackle the cross-sectoral issue of resource efficiency dynamically. Traditionally there are already specialist departments in municipal administrations that operate in a more integrated way given the nature of their duties, such as environmental or building planning offices. It is possible to tap into the experience acquired in these specialised fields. For instance on large-scale projects, the building planning office – in addition to exchanges on a variety of topics – is in contact with municipal utilities (energy, water/waste water, waste management). The aim should be to develop joint concepts. However integrated approaches are also increasingly being found in vertical rather than horizontal structures, for instance under the term "sector coupling" (e.g. wastewater treatment and energy production).

Infobox 11
Integrated sustainable urban development concepts (INSEK)

Integrated sustainable urban development concepts (INSEK) are one example of an integrated approach in municipalities. Within the scope of INSEK, objectives, guiding principles and areas of activity are described and measures outlined as guidelines for future planning. This integrated overall planning approach is viewed as a framework and action concept to support urban redevelopment processes and includes all key actors in the process. On a municipal level an action approach is therefore pursued that requires coordination between the individual specialist areas in an administration, with a connection being maintained between city administration, individual specialist planning and other activities related to urban development.

Adapt municipal processes and/or administrative structures

Cooperation arrangements within the administration and between departments have considerable potential to offer a systematic view of material flows/cycles. In order to promote integrated approaches (see above), work methods and processes in municipalities should be adapted where applicable. More flexible administration structures may also be sensible here. A change in administration structure is possible, for example by establishing a specialist team which is directly dedicated to the major to promote the cross-sectoral issue of resource protection. However as a rule adaptations to administrative structures are hard to implement.

Infobox 12
Adaptation of the administrative structure in Ludwigsburg

To promote sustainability, integrated urban development has been reinforced in Ludwigsburg. According to the mayor: "The classic administrative organisation is no longer adequate. In order to be able to think and work in a joined-up way, we need new organisation structures." Therefore in Ludwigsburg the cross-sectoral Sustainable Urban Development department was created that reports directly to the mayor. The actions of the entire administration should be aligned to sustainability goals.

Source: Werner Spec (2014), Mayor of the City of Ludwigsburg, in a short film for the National German Sustainability Award.

Therefore project-related work groups that take an integrated approach to conserving resources could be especially helpful here, such as temporary cross-departmental working parties or round tables. Building departments generally have good experience of this as they establish integrated structures across administrations when developing integrated urban development concepts and planning large urban developments. Processes should be designed so that alongside staff within the administration, employees from municipal organisations (e.g. waste, water, energy, housing associations), occasionally from SMEs or civil society as well, are also included. However these more integrated approaches require time and staff. Additional resources would have to be provided internally or supported by the federal government, which has so far been rare. External strategic consultancy services might also be sensible in situations of comprehensive structural change.

Establish a "resource efficiency coordinator"!

The analysed case studies have shown that an established coordinator, i.e. a central interface for long-term activities and network development, is a very important component of success. A resource efficiency "facilitator", who works in the administration and deals with the comprehensive issue of the municipality's resource efficiency and conservation on a cross-sectoral basis, could be expected to play a very helpful role with other actors such as utilities, business development, civil society and SME (e.g. information, coordination, network development). The coordinator can be a staff position, assigned to the mayor, or part of an administrative unit, e.g. the environment or urban development office.

Infobox 13
Role model of a climate protection manager?

Climate protection managers are involved in implementing specific climate protection activities in many municipalities. They are primarily concerned with implementing existing municipal climate protection concepts. All in all the role is to serve as an interface between politicians, the industrial and craft sectors, and the population. These roles in municipal and council administrations were created as part of the national climate protection initiative (NKI).

Example: Frankfurt: https://www.frankfurt.de/sixcms/detail.php?id d=3076&_ffmpar[_id_inhalt]=31368325
=3076&_ffmpar[_id_inhalt]=31368325

Establish cooperation arrangements with external parties

When implementing all kinds of resource efficiency measures on a regional and local level, the involvement and cooperation of the business sector as well as residents and civil society – alongside municipal organisations – is helpful. This is why they can be important cooperation partners for municipalities. The business sector has enormous potential for steering material flows, for instance the use of waste heat in production processes previously released into the atmosphere. Residents and civil society can make suggestions about processes, but are also important for ensuring resource efficiency measures are effective and adhered to, such as waste

separation. In reuse activities, involvement in or take up of offers by local people is also an important driver.

In the RECOM East Westphalia case study, for example, regional cooperation structures between recycling exchanges, SMEs, public waste management utilities (örE) and the administration were created to promote the direct repair or processing and reuse of used consumer goods, sales and manufacturing rejects (e.g. furniture). Waste management utilities play an important role here, ensuring access to material flows and encouraging end consumers to recycle thanks to collection systems and civic amenity sites.

Municipal business development agencies can be initiators driving projects and connecting companies together. They should also have a presence in the network of actors, if applicable as the companies' long-term contact. In the Duisburg Business Development Agency, this role is performed by business park managers. It is also important to include technical partners in order to give actors, e.g. companies, the technical advice and expertise required. Active participation and involvement in the actors' network is crucial to building acceptance and gaining the trust of partners. On a local level, having a project or area manager as a central coordinator for cross-sectoral projects and activities can reinforce the impact of location-based projects. Those responsible need the appropriate competencies and recognition, as well as resources, in order to be effective. The provision of area management resources is a crucial prerequisite and only happens if the political actors and organizations involved are suitably motivated.

Infobox 14 Cooperation with external partners

The Duisburg Business Development Agency works closely with the NRW Efficiency Agency. Regular joint steering meetings ensure that the conceptual design and technical realisation of projects are harmonised and coordinated.

Offer information and advice!

Suitable formats or platforms should be used for communication and information. This is crucial to the launch, continuation, consolidation and development of initiatives and projects to optimise local material cycles. The target groups should be residents, civil society and companies and this information can be provided by municipalities or other local actors. Information can be communicated through appropriate established means (websites, flyers etc.). The RECOM project raised the profile of the topic of reuse among local actors and residents by holding information events, advice sessions and networking initiatives. Business development agencies should also be mentioned because specific, policy-driven municipal advice for companies is an important way of establishing and highlighting information about the potential savings companies can make. These advisory services are more easily accepted when their costs are met by incentive schemes (see below).

Municipalities or municipal utilities could also tie in with activities based on giving advice about waste or in incentive schemes for environmental protection (for example on rain water use). Cooperation arrangements (see above) can be entered into here and advice given by neutral and independent service providers. The Duisburg Business Development Agency specifically links its activities to local company associations or their development in order to ensure a shared platform for information and exchange.

Infobox 15
Platform – Gravel for Generations

In 2003 in Zürich the department of waste, water, energy and air launched a study to investigate existing reclamation and disposal routes for mineral building waste and highlight opportunities and risks for the future. The study pinpointed among other things the great need for information about material from demolition. After the study the department set up the “Gravel for Generations” platform for authorities, building owners, architects, engineers, interested companies and in particular concrete producers, which provided information on demolition and using recycled concrete.

Make use of and offer incentive schemes!

Incentive schemes for municipalities relating directly to the optimisation of material flows are currently offered within the scope of national climate protection initiatives, for instance the promotion of resource efficiency networks. Other incentive schemes or competitions can also be used to promote resource efficiency directly or indirectly (for instance funding for urban redevelopment or climate protection).

On a local level it is possible to encourage resource-efficient behaviour among citizens with local incentive schemes. For example a "small" financial incentive in combination with environmental aspects is often enough to convince residents to implement measures or behave as desired. This can include longer-term local schemes as well as individual campaigns. Unfortunately there is generally not sufficient funding in municipalities for direct financial incentives like these since there is no leeway in the municipal budget for voluntary activities.

Boost competencies in the municipality!

Competencies can be boosted and made more practical in events and seminars that offer information and opportunities for exchanges between municipal managers and staff. The involvement of external partners' specialist expertise also means that the administration's offers and services can be improved. Events to optimise material flows on a local and regional level have been offered in the last few years. Information is also available on relevant websites. Information and advice offers on resource efficiency in municipalities are currently being developed (see information box).

In many cases expertise and personal commitment are a trigger for local activities. When the resources strategy was launched in Zürich, the member of staff overseeing it in the building department was an engineer who had years of experience in this area.

A key factor in project implementation is to have sufficient staff in municipal administration or municipal utilities. In many municipalities the staff budget has been reduced in the past to cut costs. Vacancies have not been filled in many cases (e.g. building planning officers), not only leading to a loss of expertise (a so-called brain drain), but also to increased strain being placed on the remaining employees who have ended up being responsible for more areas and tasks. In many munici-

Infobox 16
Resource-efficient municipality – platform created in Austria

- A website with all kinds of information about resource efficiency in municipalities (e.g. procurement, land use)
- Workshops (e.g. information on funding opportunities, legal frameworks and examples of best practice)
- A platform of exchange between municipalities is to be established

Source: http://gemeindebund.at/ressourcen/

Infobox 17
Local incentive scheme to support resource efficiency

- The "Young Buy Old" programme in Hiddenhausen provides support to purchase existing properties. Funding for a survey to protect buyers from surprises and funding the purchase with up to 9,000 euros spread over six years are key. The programme has been successful for many years (launched in 2007).
- In Krefeld in 2008 there was a temporary campaign to increase the number of gas discharge lamps (GDL) collected, for instance by issuing collection boxes. The campaign featured an incentive to return GDLs by paying 0.50 euros per GDL. The campaign had a budget of 500 euros.

palities, planning officers for example are overloaded, resulting in projects to promote environmental transport associations not being dealt with, despite funding being in place. Municipal jobs also compete with higher earning opportunities in the business sector and there are insufficient resources for staff planning and administration. The departure of employees with several years' experience, due to retirement for example, also leads to a loss of expertise.

To counteract this, processes and measures should be established that prevent existing knowledge being lost and maintaining it when vacancies are filled. In the city of Stockholm a review is currently being undertaken on ways of transferring knowledge gained from large, labour-intensive urban redevelopment projects to small projects (known as downscaling). An established process like this could also help safeguard such knowledge for other or new employees.

Aim for cost-effectiveness!

Environmentally sound measures are implemented when they generate economic benefits. They are much easier to implement when cost-effectiveness is involved. However long-term effects should also be taken into consideration here. Projects are frequently only cost-effective from a long-term perspective and this needs to be considered when they are being evaluated. This is also particularly evident in joint projects with companies, for example where there is a requirement for short amortisation periods in the shared use of waste heat. The involvement of large companies in location-related resource efficiency measures involving several other organisations has a pull effect on these organisations, with the consequent requirement to emulate particular practices.

Infobox 18
Making use of support to optimise material flows within the scope of the National Climate Protection Initiative (NKI):

- Energy and resource efficiency networks are promoted. Promotion by network managers is possible if the costs of material and staff are met
- Promotion of energy analyses for wastewater treatment facilities

Information is available from the Service and Competence Centre: Municipal Climate Protection (SK:KK)

Infobox 19
Municipalities are to be incentivised by the resource-efficiency programme (ProgRess)

- As part of the UBA project "kommRess", a concept of a resource-efficient municipality service point will be developed by 2019 to establish advice offers for municipalities
- The website http://ressourceneffizientekommune.de contains information about resource efficiency in municipalities

Infobox 20
Boost competencies through information exchange and cooperation

- Duisburg Business Development Agency works with a technical partner, the NRW Efficiency Agency (EFA). The agency is the centre of competence for resource efficiency in NRW and its expertise is used to give advice to SMEs

6. Summary and outlook

While resource efficiency is still not a priority for most municipalities today, various projects and measures to optimise material flows and cycles are being implemented by municipal actors, primarily on a sectoral basis. Examples of integrated and more horizontal perceptions and approaches are also starting to appear. What is clear is that on a local and regional level, it is inconceivable that there can be a comprehensive optimisation of material cycles and material flows to increase resource efficiency without municipal actors being involved. Municipalities are therefore crucial to the success of resource policies. To increase resource efficiency, it is essential that municipalities take on a variety of roles and be involved in all kinds of activities. Municipalities are initiators, coordinators, moderators, implementers, partners, financiers and supporters of measures to improve resource conservation.

To be able to fulfil the above roles and launch and implement measures, the right institutional framework conditions within the administration, such as suitable processes and organisational and communications structures, are helpful. Projects are also boosted when there are defined and binding municipal objectives, strategies and guiding principles. A legal framework, such as statutory provisions and regulations, and the definition of standards are also important levers for optimising material cycles. Municipalities are also crucial for promoting awareness, raising the profile and conveying the reliability of resource efficiency projects on a local level.

Municipalities can fulfil central roles and services to optimise material cycles and flows, and already do so, however there remains considerable potential in many areas. It should be noted that material flow optimisation in its entirety is not a statutory obligation for municipalities and that all kinds of approaches are being taken as a matter of choice. For comprehensive optimisation of material flows and to make best use of the available opportunities, more information and support is needed to help municipal actors with resource efficiency, for example from the federal government. Support for the development of a mission statement on "resource-efficient municipalities" could also make an important contribution to the establishment of comprehensive and integrated municipal strategies and measures.

The sustainable use of natural resources is one of the greatest challenges our society faces. This has been recognised by politicians on an international, European and national level and substantial efforts are being made to promote their sustainable use. It was stated in Germany's national resource efficiency programme (ProgRess II) that the federal government should be promoting a policy of resource efficiency at a municipal and regional level, supporting "municipal activities to align business development more closely with resource efficiency and the closure of regional cycles. In addition it will provide information and advice on other resource-relevant areas at a municipal level (for example procurement, housing associations, companies in the circular economy, public utilities, transport companies) in consultation with associations and organisations."

Against this backdrop, resource efficiency and thus the optimisation of material flows and cycles in municipalities can be expected to play a crucial role in future.

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