Bavarian State Ministry of the
Environment and Consumer Protection

Guideline for the Implementation of Municipal Waste Prevention Concepts

Contents

Preface

Dear Ladies and Gentlemen,

the European Union (EU) Waste Framework Guidelines from 2008 have made waste prevention first priority in waste management. Waste prevention includes minimization of the amount of waste as well as reduction of hazardous consequences of waste. All EU member states are obligated to set up their own waste prevention programs. The German waste prevention program predominantly addresses German municipalities.

Against this background, this practice-oriented guideline for waste prevention was elaborated by the Resource Lab of the University of Augsburg, the Bavarian Environmental Agency, the cities of Munich and Augsburg, and the administrative district of the village Miesbach, by order of Bavarian Environmental Ministry. More than 100 Bavarian municipalities were involved. The results of this guideline are based on an empirical survey of all Bavarian municipalities and the newest scientific perceptions in the field of waste management.

The guideline contains procedures for waste prevention in municipalities, as well as numerous suggestions for their implementation and "Best Practice" examples. It enables measurement of waste prevention for the first time. Indicators are "Carbon Footprint", "Amount of Waste", "Consumption of Resources", "Utilisation of Water", and "Toxicity".

The guideline provides a significant contribution to the protection of climate and resources. With its implementation in all Bavarian municipalities in the areas of prevention of demolition waste or the introduction of green IT and web forms, up to 680,000t of waste or 222,000t CO_2-equivalent could be saved per year.

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Overview

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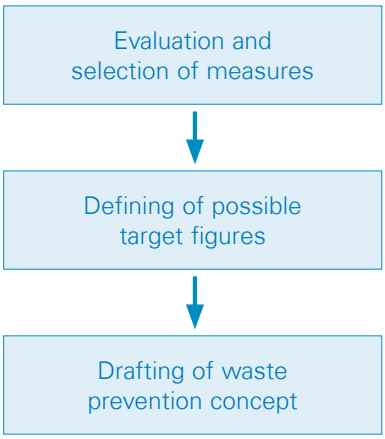

Instructions for the use of the "Guideline for the Implementation of Municipal Waste Prevention Concepts"

This guideline comprises recommendations and references for local authorities that serve as an instruction for the development of a waste prevention concept. This step-by-step instruction was developed, applied and optimized in collaboration with cooperating authorities. Local authorities can use this guideline to simplify the development process of a waste prevention framework. The implementation will involve all areas of responsibility.

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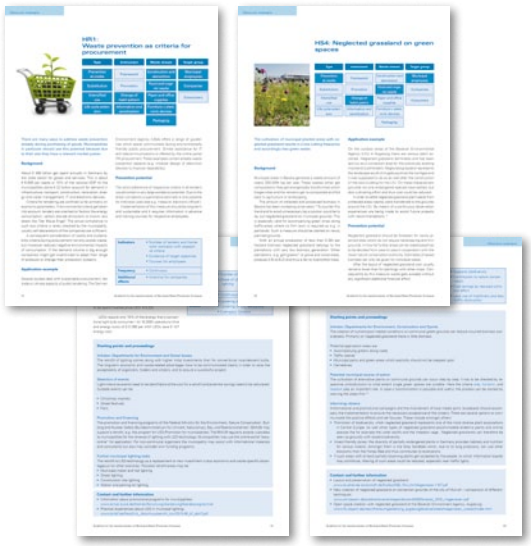

Measures Catalogue

The suggested measures are recommended to be implemented in local authorities. For the establishment of a holistic waste prevention framework, it is advisable to select measures of all different categories, if possible. The categories distinguish the measures type of impact (reduction at cradle, substitution, intensified use, and life cycle extension) and the type of action the municipality takes (change of habitual pattern, regulation, promotion, information).

The wide selection of measures ensures that different target groups and waste streams are addressed and that the vast array of available instruments is taken advantage of. The suggested measures catalogue is exemplary, not conclusive.

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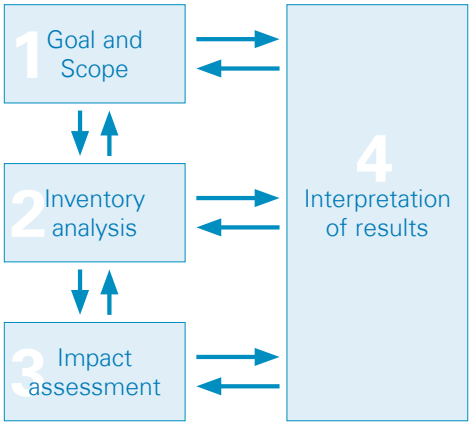


Life Cycle Assessment (LCA)

For five of the proposed measures, environmental impacts of the entire life cycle were calculated with the method of Life Cycle Assessment (LCA). These assessments not only quantify the potential of waste prevention, but also outline emissions, resource depletion and impacts for human health. With the results of the LCA it is possible to evaluate waste prevention measures regarding their potential for protecting health and environment, taking into account the entire life cycle (as required by the European Waste Framework Directive (WFD) (DIRECTIVE 2008/98/EC).

Instructions for the use of this guideline

Stakeholders

Before the actual process of the compilation of a municipal waste prevention concept starts all necessary stakeholders have to be identified and involved. It would be beneficial for the concept, if a broad political consensus could be achieved. It is a question of a cross-sectional task into which all divisions or departments of a municipality and, where appropriate, the offices of the district administration have to be involved, because all of them can either directly or indirectly influence the generation or avoidance of waste. During the preparation of the concept both decision-makers of higher hierarchical levels and individual employees of the particular subject areas should be engaged equally. Doing so can assure that waste prevention will be taken into account as a criteria in all future actions and decisions, internally and externally.

All stakeholders together comprise the project group for the creation of the municipal waste prevention concept under the lead of a coordinator.

In order to strengthen climate and resource protection, waste prevention can also be embedded in the municipal guiding principles.

Kick-off event

In order to best prepare the project group for the upcoming task, it is advisable to start with a kick-off event. For this meeting all identified stakeholders as well as interested individuals of the municipal practice are to be invited. Structure and contents may vary according to the composition and size of the project group; following aspects should be covered:

- Background information: What is waste prevention and why should a municipality engage itself?
- Status Quo: Which activities exist already and which potentials have been identified so far?
- Upcoming proceedings: Which are the objectives of the project group and which steps will follow?
- Framework conditions: Which realization horizon is planned and which funds and resources are available?

Concept development

The actual process of compiling a municipal waste prevention concept consists of three steps.

1 Evaluation and selection of measures

The evaluation and selection of measures (guideline elements) is the objective of the first phase and forms the basic structure of the waste prevention concept.

At the beginning of phase 1 there is an inventory. Topics of this inventory are existing potentials (e.g. thrift shops, stores) and already accomplished waste prevention activities. These potentials will be recorded by the members of the project group in their particular divisions and units. Data sources are interviews with employees as well as analysis of existing data (e.g. development of paper consumption in recent years, cost for office furniture etc.).
Developing an action plan or a catalogue of measures already during the inventory may serve as an aid for determining potential aspects to be evaluated.

The inventory serves as a decision-making tool for the selection of guideline elements. By means of a workshop members of the project group debate and discuss the gathered information of the individual divisions and units. If desired at this point priorities can be defined (e.g. a focus on selected waste streams or instruments). For the subsequent selection of measures in particular these criteria should be subject of discussion: appropriateness, feasibility, cost-benefit balance and possible problems during implementation and their overcoming.

The result of the first phase is a plan of action as a suggestion of the project group.

2 Defining of possible target figures

In order to maintain the motivation during the implementation, it is of importance to agree upon defined goals for the selected measures. Only by this a monitoring of results is possible.

Objectives should be defined for each measure individually in order to incorporate specific characteristics. Ideally this happens within the relevant units which are responsible for implementation. By this employees get involved in the process and their motivation to achieve their set up and agreed upon goals increases.
Possible target dimensions can be illustrated e.g. as:
Direct quantification: measurement of practical waste prevention (e.g. donate 100kg of food per month to a food bank; reduce paper consumption by 10% year-on-year)
Indicators: advice for waste prevention by means of

- Input-indicators (e.g. subsidy of a thrift shop, number of visitors per month of an online repair guide)
- Output-indicators (e.g. number of repair cafés offered in the municipal area per year, counselling inter views per month)

Benchmarks: successive accomplishable goals (e.g. implementation of a ‘soft bulky waste removal’ until 2020, reusable-quota as terms of lease for municipal sports areas until 2030).

Next to the formulation of target figures it is important to determine the time frame until these goals have to be achieved. As for the target figures employee motivation can be increased by determining time schedules, as long as the employees get involved into the decision making process.

The second phase drafts verifiable target figures for the selected measures to be taken and defines time schedules for their implementation.

The table shows possible results for a fictitious city.

Measure	Example for a target figure
Waste prevention as a criteria for procurement	20% of all tenders take into account waste as one of the eco-logic criteria
Paper saving office	Reduction of paper purchases by 10% each year
Counselling interviews before the demolition of buildings	5 performed consultations per month
Water dispensers	Set up one water dispenser in each municipal pool
Soft bulky waste removal	Use this type in 40% of all removals until 2020
Repair Café	4 conducted events per urban quarter per year
Thrift Shops	Sponsorship with € 5,000 annually
Digital repair guide	20,000 clicks on homepage per year
Courses for employees about waste prevention	One course per year

Drafting of a waste prevention concept

In the third phase the waste prevention concept will be drafted by the project group.

Next to the measures and target figures the concepts also includes the necessary framework conditions and responsibilities as well as the drafting of specific steps for implementation of individual actions and advice for the inclusion of the necessary divisions, departments and offices. In intermediate and final workshops all necessary aspects of the concept will be discussed and defined.

The result will be a waste prevention concept which should then be put into action (waste prevention plan) and get balanced.

Measures catalogue

Structure of action sheets

Action Sheets will be structured in a way that they start with general information. Here a short, general description, an application example and advice about the implementation are given. Moreover, as far as possible, exemplary prevention potentials and cost are given. As the prerequisites for implementation and impact of each measure differ amongst others by size and structure of the municipality, these potentials and cost will always be calculated for a specific scenario. Thus a rough estimate of the expected waste prevention success can be accomplished.

Indicators	Here mentioned indicators point to waste prevention potentials by the respective measure. That includes both direct measurable data (e.g. sales revenues) and indirect pointers (e.g. number of stores selling used goods).
Frequency	Frequency indicates in which intervals waste prevention occurs by this specific measure. The manifestation ranges from continuous (e.g. water bar) via several occurrences per year (e.g. repair café) to single events respectively upon request (e.g. consultancy service before the demolition of a building).
Additional effects	Possible additional effects which go beyond the mere measure itself show up amongst others as an enhanced sensitization (e.g. of employees) or by other positive effects in the social area (e.g. qualification of long term unemployed people).

Tables provide further information about indicators, frequency and additional effects.

Advice for implementation (Starting Points and Proceeding)

The advice for the implementation form the second part of the action sheets. These hints act as an aid for the municipalities, single departments and offices concerning the implementation of the respective waste prevention measures. The starting points incorporate both the support for this action (e.g. reduced waste collection charges for thrift shops) and suggestions towards the responsible realization (e.g. the development of an own thrift shop).

Action matrix

The municipality may take action by

- Change of habit pattern (H): By these measures the municipality itself takes action and adjusts e.g. existing processes or establishes new procedures.
- Regulation (R): Directives and regulations provide the legal framework for waste prevention.
- Promotion (F): The municipality may contribute to waste prevention measures and structures by means of ideational or financial support.
- Information (I): Change of mindset and sensitization are essential supporting measures for waste prevention. They enhance other actions depending on the target audience and waste stream or they are a prerequisite for their successful implementation.

The actions will be categorized as

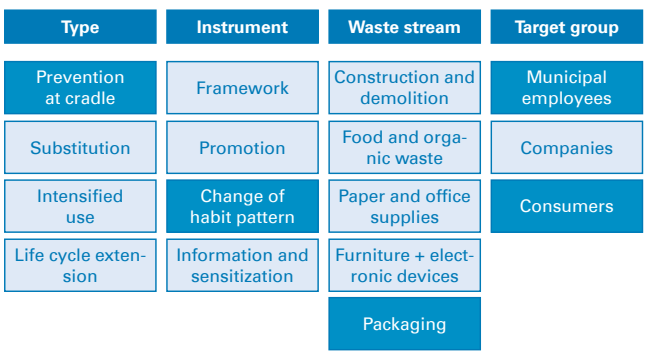
- Reduction at cradle (R): It will be avoided that a material flow emerges which could turn into a waste stream later. Reduction of waste at the cradle generally starts already during the project-/ process-planning (e.g. decision for invest or purchase).
- Substitution (S): Out of several options the one with the least waste will be chosen. The term substitution refers to the time of the implementation of the action and describes the decision towards a less waste alternative like reusable products instead of disposable products.
- Intensified use (N) and life cycle extension (L): Already circulating materials and products will be used longer or more intense. These measures reduce the demand for new products on the one hand and render in-use products into waste at a later time.

Some of these measures attach both as a means of reduction at the cradle and as well at later stages during the product life cycle. As well there are several options for municipalities to get involved. These measures are being situated at the first possible category.

	Reduction at cradle (R)	Substitution (S)	Intensified use (N) & Life cycle extension (L)
Change of habit pattern (H)	**HR1** Waste prevention as criteria for procurement	**HS1** LED technology in lighting	**HL1** Mobile repair centers
	HR2 Tap water in carafes	**HS2** Water bar	**HL2** Soft bulky waste removal
	HR3 Cooperation of the departments for environment, construction and real estate	**HS3** Electronic forms, documents and processes	
	HR4 Paper saving office	**HS4** Neglected grassland on green spaces	
		HS5 Design of electronic offices	
		HS6 Information material on USB-sticks	
		HS7 Tablet computers for municipal and district councilors	
Regulation (R)	**RR1** Extended warranties for products and goods	**RS1** Refillable printer cartridges	
		RS2 Reusable precept for catering on public space	
		RS3 Reusable precept in sports facilities	
Promotion (F)		**FS1** Diaper service	**FL1** Repair café
		FS2 Mobile dishes	**FL2** Second hand stores and Thrift shops
			FL3 Components exchange
			FL4 Waste prevention center
			FL5 Cooperation with food banks
Information (I)	**IR1** Sensitization of architects and engineers towards waste prevention		**IN1** Information service at registration office
	IR2 Counselling before demolition		**IL 2** Digital repair guide
	IR3 Citizen initiative: information and sensitization		

Brief description

The brief description is given for each measure to facilitate the consideration of these aspects during the selection of the measure by the municipality.
The brief description allows at first glance a categorization of the measures according to type, starting point, waste stream and target group. The corresponding characteristics are highlighted in dark blue.



HR1: Waste prevention as criteria for procurement

Type	Instrument	Waste stream	Target group
Prevention at cradle	Framework	Construction and demolition	Municipal employees
Substitution	Promotion	Food and organic waste	Companies
Intensified use	Change of habit pattern	Paper and office supplies	Consumers
Life cycle extension	Information and sensitization	Furniture + electronic devices	
		Packaging	

There are many ways to address waste prevention already during purchasing of goods. Municipalities in particular should use this potential because due to their size they have a relevant market power.

Background

About € 480 billion get spent annually in Germany by the state sector for goods and services. This is about € 6,000 per capita or 13% of the national GDP. At the municipalities alone € 32 billion account for demand in infrastructure, transport, construction, renovation, energy and water management, IT and electronic devices.

Criteria for tendering are confined so far primarily on economic parameters. If environmental criteria get taken into account, tenders are oriented on factors like energy consumption, carbon dioxide emissions or known eco labels like 'Der Blaue Engel'. The actual compliance to such eco criteria is rarely checked by the municipality; usually self-declarations of the companies are sufficient.

A consequent consideration of waste and sustainability criteria during procurement not only avoids waste, but moreover reduces negative environmental impacts of consumption. If the demand volume is big enough companies might get incentivized to adapt their range of products or change their production systems.

Application example

Several studies deal with sustainable procurement, fair trade or climate aspects of public tendering. The German Environment Agency (UBA) offers a range of guidelines which assist communities during environmentally friendly public procurement. Similar assistance for IT and telecommunications is offered by the online portal ITK-procurement. These examples contain already waste prevention aspects (e.g. modular design of electronic devices to improve reparability).

Prevention potential

The strict adherence of respective criteria in all tenders would contain a very large avoidance potential. Due to the sheer complexity a quantitative estimate is only possible for individual uses (see e.g. measure 'electronic offices').

Implementation of this measure should be long-term and sustainable and it requires information in advance and training courses for respective employees.

Indicators	• Number of tenders and framework contracts with respective criteria • Existence of target objectives • Courses for employees
Frequency	• Continuous
Additional effects	• Incentive for companies

Starting points and course of action

Initiator: central procurement, all units and divisions

Procurement as a municipal unit shall obey next to economic also environmentally oriented criteria. In correspondence with their market power the municipality should appear as driver of innovation for ecologic products.

Pooling of procurement

The pooling of procurement offices, maybe in cooperation with other municipalities, enhances demand power of the state sector and may set incentives through sufficient order volumes for companies to establish environment friendly products and services.

Qualification and information

Decision makers and stakeholders in procurement need to be sensitized accordingly for waste prevention and get informed about environmental effects. Lifecycle-thinking is inevitable for a sustainable procurement.

Targets and incentives

The specification of targets (like 'at least 50% of all tenders contain criteria for waste prevention') and suitable incentives motivate for implementation.

Specific criteria

During procurement following items shall be considered:

- Durability
- Quality
- Modular design / suitability for disassembly
- Reparability
- Contained materials (toxic or dangerous)
- Energy efficiency.

For construction and renovation it should be paid attention to keep and maintain existing structures and buildings as far as possible, as these represent 'the within these structures and buildings objectified resource- and energy consumptions'. Moreover following criteria play a role:

- Used materials
- Standardized construction parts
- Incorporation of secondary parts
- Reparability / accessibility.

Contact and further information

- Measure C VI 4 of the contentual implementation of Art. 29 of EG-guideline 2008/98/EG, p. 272ff: www.umweltbundesamt.de/sites/default/files/medien/461/publikationen/texte_38_2013_abfallvermeidungsprogramm_krause_bf_0_0.pdf
- Guidelines of the German Environment Agency (Umweltbundesamt, UBA): www.umweltbundesamt.de/themen/neue-uba-leitfaeden-fuer-umweltfreundliche
- Guidelines to ITK-devices: www.itk-beschaffung.de
- Consideration and incorporation of waste avoiding aspects during public procurement: www.bmub.bund.de/fileadmin/Daten_BMU/Pools/Broschueren/abfallvermeidungsprogramm_bf.pdf > Measure 29, p. 67

HR2: Tap water in carafes

Type	Instrument	Waste stream	Target group
Prevention at cradle	Framework	Construction and demolition	Municipal employees
Substitution	Promotion	Food and organic waste	Companies
Intensified use	Change of habit patern	Paper and office supplies	Consumers
Life cycle extension	Information and sensitization	Furniture + electronic devices	
		Packaging	

Most communities can be proud of their potable water. They should canvass for its consumption, be it that during meetings drinking water is being served in carafes. This saves packaging.

Background

Drinking water is the most important, best monitored, cheap and above all calorie free good. It comes from the water pipe, requires no packaging, no hauling, no storage and no transport with a car. Never before the consumption of mineral water and soft drinks on the basis of mineral water was as high as today. Here municipalities should start campaigning on their own account, to award drinking water with a more important reward again in the society.
They could start within the own scope. Following measure HS2 purified drinking water can be served in carafes. Alternatively it is available directly from the tap. Carafes and glasses could be marked with the community emblem and support the CI.
The water can be embellished both optically and flavorfully by some lime or mint leaves to seduce guests and employees to higher water consumption. This leads to better physical and mental performance and helps to prevent headache and dizziness.[1]

Potential and additional effects

The avoidance potential is identical with the one of the water bar. So with 100 employees up to 506kg waste can be avoided annually. If the water is tapped directly from the water pipe, the environmental effects of the water bar cease. Consequently only the provision of drinking water and the production of durable carafes contribute to the environmental balance.

Additional effects are an increase in performance by higher water consumption, a possibly improved corporate identity and staff satisfaction as well as financial savings by mineral water substitution.

Indicators	• Extracted quantity of drinking water • Number of available carafes
Frequency	• Continuous
Additional effects	• Improved performance • Corporate Identity • Financial savings

Contact and further information

- Drinking water in Germany is good to very good. Drinking water regulations: www.bmg.bund.de/glossarbegriffe/t-u/trinkwasser.html
- Information about the purity of drinking water from independent sources: www.ugb.de/vollwert-ernaehrung/trinkwasser-in-gefahr/
- Composition of drinking water : www.lfu.bayern.de/wasser/trinkwasserbeschaffenheit/index.htm

HR4: Paper saving office

Type	Instrument	Waste stream	Target group
Prevention at cradle	Framework	Construction and demolition	Municipal employees
Substitution	Promotion	Food and organic waste	Companies
Intensified use	Change of habit patern	Paper and office supplies	Consumers
Life cycle extension	Information and sensitization	Furniture + electronic devices	
		Packaging	

Progressing digitization enables savings of paper. There is no need to print everything and if so it can be done in a space and paper saving manner. The human eye is not accustomed to read longer documents on a screen, get all the meanings and yet do corrections on it.

Background

Despite an ever stronger digitization of processes and the use of electronic media the amount of waste paper did not decline significantly in recent years. Following actions help to reduce paper consumption:

- Procurement of tablet computers for municipal and district councilors
- Use of paperless media like e-Mail and telephone
- Refrain from printing e-Mails and documents, especially of unimportant information
- Use back side of misprints or drafts as scratch paper or notepads
- Online-use of documents, formulas and receipts
- Receive faxes per computer as pdf-files
- Use of towels made out of cloth instead of using paper towels; organize a kitchen service: the ones, who regularly wash used towels, do not need to buy coffee, sugar, milk etc.

As a means of transparency in paper consumption each employee should record and understand his or her own personal print quantity per month.

Potential and additional effects – indicators

With the consumption of more than 240kg per capita and year, Germany belongs to the largest consumers of paper products worldwide.

Municipalities can reduce their own consumption considerably with measures in favor of a paper saving office and thus can be a good example to 'their' economic enterprises. The contents of implementation determines the potential for waste prevention. Additional effects are time savings by more efficient work, a sensitization of staff and conservation of the environment.

Indicators	• Decline of paper use in units • Change printer default settings • Double sided printing/copying
Frequency	• Continuous
Additional effects	• Reduced workload • Sensitization • Conservation of the environment

Contact and further information

- For further information and prevention potential refer to Netzwerk Papierwende: www.papierwende.de
- For further information and avoidance potential refer to Verbraucherzentrale Bayern: www.verbraucherzentrale-bayern.de/recyclingpapier

IR3: Campaigns for citizens: information and sensitization

Type	Instrument	Waste stream	Target group
Prevention at cradle	Framework	Construction and demolition	Municipal employees
Substitution	Promotion	Food and organic waste	Companies
Intensified use	Change of habit patern	Paper and office supplies	Consumers
Life cycle extension	Information and sensitization	Furniture + electronic devices	
		Packaging	

By informing and sensitizing their citizens about waste prevention the municipality contributes indirectly to the reduction of waste, primarily of municipal wastes but as well of demolition waste.

Background

Environmental awareness, environmental knowledge and continuous engagement are necessary to consider waste prevention sustainably in activities and decision making. This is not only the case for municipal actors but also proves true for citizens and enterprises. Information, education and sensitization take an exceptional position in implementing waste prevention plans.

During actions towards waste prevention not only direct waste avoiding effects are paramount like saved plastic bags by use of bags made out of cloth which are given away for free in a promotional event. Directed information shall strengthen the environmental consciousness of the addressees. By this approach sustainable incentives for action are created which endure longer than the individual promotional events.

Depending on the various actions differing waste streams are affected and target audiences appealed. Many events can be repeated several times (e.g. give away of lunchboxes made of plastics for primary school starters, repair cafés every 3 months).

Application example

The European Week for Waste Reduction (EWWR) pools various events and initiatives around waste reduction since 2009. Main objective is an increase of awareness and sensitization with regard to a sustainable handling with resources.

The annual promotion weeks each have an own specific topical focus under which the contributions get focused. Actors are both administration and community facilities but also enterprises and private people.

The homepage of the EWWR provides information and best practice out of the whole of Europe; the database thus serves as a pool for interested individuals. Own contributions and events get administered online as well.

Prevention potential

The prevention and reduction potential cannot be quantified. If by concerted actions and information a change of mindsets in the population can be achieved, the potentials are to be rated very high.

Indicators	• Number of actions per year • Attained addressees • Budget for wasteprevention actions
Frequency	• Continuous

Additional effects	• Image of the municipality gets 'greener' • Public image of departments (e.g. waste management) increases

Starting points and proceedings

Initiator: Departments for Waste Management, Environment, Education, Social Issues

Many different events offer starting points for municipalities to present the issue of waste reduction and prevention. It should be paid attention to suitable instruments for the target groups. Some best practice examples are:

Lunchboxes and drinking bottles

As a gift for the first day at school lunchboxes and drinking bottles - together with relevant information about their use – not only are 'cool'; moreover they are also waste reducing alternatives to aluminum foils and disposable plastic bottles. This measure is best suited for kids in primary schools and kindergartens.

Second hand clothing shops and tailor's do it yourself support

Especially within clothing, the no longer beloved clothes often become waste without actually having reached the end of their life span. Thrift shops, charity stores or clothes exchange platforms can help to find a new owner for clothes which are still in good order. If something nice is discovered it can be re-used and thus no new clothes are required. As well communal charity bazaars or thrift shops for kids apparel are a chance to get clothes, sports articles and toys cheaply. These types of events could even be extended by an element 'tailoring and sewing'. With sewing machines and material being available, on-site skilled persons can assist and teach to modify clothes or even to tailor new designs. In the US these events, called 'Swap-O-Rama-Rama', often end with a fashion show. Similar events are widely offered by the repair cafés.
By these kinds of workshops the appreciation for resources gets strengthened. At the same time new capabilities get conveyed, creativity and awareness of life get aroused. The municipality can organize such events by themselves, support financially or provide materials respectively the necessary infrastructure (e.g. sewing machines borrowed from schools etc.).

Gift-, give- or marvel-boxes and repair facilities

Small 'second hand shops of the special kind' are located in many German cities. In accessible covered structures, garden sheds or wardrobes no longer needed stuff in good shape can be placed there: books, clothes, electronic devices or fitments. Whoever needs something out of this, may take it. This 'swap shop' works completely autonomous.
In busses of the Hamburg public transport association, small bookshelves are placed behind the drivers' seats. You take one, you bring one. Some of the offered books are every once in a while taken from the municipal charity shop.

Contact and further information

- Ideas collection of the Bavarian Environment Agency for the recovery of municipal wastes: www.abfallratgeber.bayern.de/publikationen/doc/vermeidung/abfallvermeidung.pdf
- Ideas for events of the NABU towards waste prevention: www.nabu.de/imperia/md/content/nabude/abfallpolitik/140123-nabu-aktionsideen-abfallvermeidung.pdf
- European week for waste reduction: EWWR Guide of Good Practices. www.ewwr.eu/docs/case_studies/EWWR_Guide_GP_EN_LD.pdf
- Resource protection and creativity: Swap-O-Rama-Rama. ec.europa.eu/environment/waste/prevention/pdf/Swaporamarama_Factsheet.pdf
- Locations of Giveboxes: www.givebox.eu

HS1: LED-technology for lighting

Type	Instrument	Waste stream	Target group
Prevention at cradle	Framework	Construction and demolition	Municipal employees
Substitution	Promotion	Food and organic waste	Companies
Intensified use	Change of habit patern	Paper and office supplies	Consumers
Life cycle extension	Information and sensitization	Furniture + electronic devices	
		Packaging	

For light-intensive municipal activities preferably Light Emitting Diodes (LED) should be used (e.g. at Christmas markets). Next to the energy savings waste can be avoided due to the longer durability. This however is only valid for replacements or new investments.

Background

Compared to conventional lighting technologies Light diodes (LED) are superior in energy efficiency, i.e. the relationship between emitted light output measured in Lumen and the used energy.[2] Due to their very low energy consumption, long lifetime and wider service intervals LED provide a technological mature alternative to conventional lighting. This is true above all for big community events like Christmas markets, but also for construction site und street lighting.

Next to the significant increase in energy efficiency (a minimum of 50% in present municipal retrofitting projects[3]) LEDs are advantageous with regard to waste prevention. With a life expectancy of usually 15,000h a LED can be longer used than a conventional light bulb with a lifetime of 1,000h.[4] As the sockets are identical for both light systems, the retrofit of standard light bulbs, e.g. Christmas markets, is possible without additional invest in infrastructure.

At these much frequented events next to cost reduction and waste prevention the municipality can take an exemplary function for the private users by presenting the LED technology with broad impact and visibility.

Application example

The city of Augsburg retrofitted in 2012 the lighting of the Christmas market and of the Christmas tree with modern and energy efficient LED. With todays' LED-technology it is possible, to let the LEDs emit in warm and decent light colors. Thus the acceptance of the merchants and visitors was ensured.

3,500 LED-bulbs are responsible for an environment friendly lighting of the Christmas market and allow during the one month duration of the event a decrease of energy cost from € 6,000 down to € 550. Due to the durability and low failure rate the higher acquisition cost pay off in shortest time.

Prevention potential

Considering an illumination timeframe of 15,000h either 1 LED or 15 light bulbs will be required. One LED weighs 180g, a light bulb 24g; including packaging with LED technology a waste amount of 1.36kg can be avoided in this timeframe. Per kilogram avoided waste € 3.92 have to be spent (market price LED: € 5.32).

LEDs require only 15% of the energy that a conventional light bulb consumes.[5] At 15,000h operations time and energy costs of € 0.288 per kWh LEDs save € 147 energy cost.

Indicators	• Number of LEDs • Share of LED on all municipal lighting
Frequency	• Continuous
Additional effects	• Lowering of energy cost • Lowering of CO_2 emissions • Exemplary function

Starting points and proceedings

Initiator: Departments for Environment and Social Issues

The retrofit of lighting comes along with higher initial investments than for conventional incandescent bulbs. The long-term economic and waste-related advantages have to be communicated clearly in order to raise the acceptability of organizers, traders and citizens, and to assure a successful project.

Selection of events

Light-intensive events need to be identified and the cost for a retrofit and potential savings need to be calculated. Suitable events can be

- Christmas markets
- Street festivals
- Fairs.

Promotion and financing

The promotion and financing programs of the Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety (Bundesministerium für Umwelt, Naturschutz, Bau und Reaktorsicherheit - BMUB) may support a retrofit, e.g. the program for LED-Promotion for municipalities. The BMUB regularly awards subsidies to municipalities for the renewal of lighting with LED-technology. Municipalities may use the online-portal "easy-online" for application. For non-communal organizers the municipality may assist with informational materials and consultants but also may consider own funding programs.

Further municipal lighting tasks

The retrofit to LED-technology as a replacement or new investment is also economic and waste-specific advantageous for other branches. Possible retrofit-areas may be:

- Municipal indoor and hall lighting
- Street lighting
- Construction site lighting
- Station and parking lot lighting.

Contact and further information

- Information about promotional programs for municipalities: www.bmub.bund.de/themen/forschung-foerderung/foerderprogramme/
- Practical experiences about LED in municipal lighting: www.bmbf.de/files/KinL_Abschlussbericht_korr2013-06_bf_abA7.pdf

HS3: Electronic forms, documents and processes

Type	Instrument	Waste stream	Target group
Prevention at cradle	Framework	Construction and demolition	Municipal employees
Substitution	Promotion	Food and organic waste	Companies
Intensified use	Change of habit patern	Paper and office supplies	Consumers
Life cycle extension	Information and sensitization	Furniture + electronic devices	
		Packaging	

To convert up to now as paper existing forms, documents and processes into electronic copies not only corresponds to the requirements of e-governments but also saves paper.

Background

The headline 'e-Government' serves as an umbrella term for the digitization of previously analogous processes. These include besides political participation (e.g. e-voting) as well as forms, applications, documents and files in all communal areas – population statistics and registration, trade, construction or social affairs. Each citizen in Germany has two to five contacts with administration per year[6]. If all of these administrative matters would be processed electronically, unnecessary use of paper could be avoided.

Even though in many municipalities occasional matters are partially or fully digitized here a big potential for development exists[6] both concerning quantity and quality of the online services. With the present situation just 52% of the users are satisfied. This primarily is due to the existing services (e.g. number of available online services) and the missing option to accomplish the entire process digitally. Often the services of a municipality are restrained to the download of forms which then have to be printed and sent back or returned as paper copies.

Application example

The Bavarian e-Government strategy 'Vom Blatt zum Byte' ('From paper to byte') starts at an increased citizens awareness and processing efficiency. The digital administrative cycle shall be closed. This is only possible with a complete electronic process starting with a question of a citizen to the completion by the administration.[7] Municipalities may use the necessary digital services (e.g. authentication or payment functions) without additional charge.[8]

The e-government map shows already implemented projects. Up to now in Bavaria two municipal and eleven regional projects have been introduced; thereof eight refer to the provision of geodata.[9]

To citizens, communal administrations are the most important points of contact for many topics. Consequently the implementation should be done primarily by the communities. With the help of model municipalities a guideline 'Way to the E-Government Municipality' ('Weg zur E-Government Kommune') is being developed.

Prevention potential

The digitization of processes which have been accomplished and documented on paper up to now results in a virtually complete prevention of otherwise required paper. Solely the required hardware will turn into waste after useful lifetime.

The eco-balance of electronic forms shows the prevention potential in detail.

Indicators	• Number of available digital processes • Number of processed administrative acts per month/year • Share of digital applications to paper ones
Frequency	• Continuous
Additional effects	• Customer orientation • Time savings • More efficient administrative processes

Starting points and proceedings

Initiator: all units and divisions

The digitization of processes may occur at various starting points and addresses all subject areas and divisions. These need to be identified and evaluated within the municipality.

Potential course of action

For a successful organization of digital services in hindsight of the acceptance by the citizens a tool of the marketing branch, the so-called marketing-funnel, can be used. This approach presents success factors during design, implementation and use in several steps:

1. The first decisive success factor is the knowledge of the services to the citizens. The citizen needs to have the possibility to inform him/herself about the offerings or needs to be informed before such an offer.
2. Citizens need to have a necessity which this offer supposedly will cover. Here useful offerings which assure an easier handling need to be identified by the municipality.
3. The way how services are designed (user friendliness, image, etc.) has to attract the interest of the citizens which eventually have to use these services.
4. The citizens' satisfaction can serve as an indicator for improvements and further offerings.

Pilot project

The usability and efficiency of the e-government law get tested by means of pilot projects since December 2013. Eight municipalities shall get interconnected to cooperate closely. The experiences and findings shall be provided to all communities by means of a guideline in mid-2016. Therein further advice for improvement and proceedings will be contained.

Contact and further information

- Pilot Project E-Government; www.bmi.bund.de/DE/Themen/IT-Netzpolitik/E-Government/modellkommune/modellkommune_node.html
- E-Government-Map: www.e-government-landkarte.de/

HS4: Neglected grassland on green spaces

Type	Instrument	Waste stream	Target group
Prevention at cradle	Framework	Construction and demolition	Municipal employees
Substitution	Promotion	Food and organic waste	Companies
Intensified use	Change of habit patern	Paper and office supplies	Consumers
Life cycle extension	Information and sensitization	Furniture + electronic devices	
		Packaging	

The cultivation of municipal planted areas with neglected grassland results in a low cutting frequency and accordingly less green waste.

Background

Municipal areas in Bavaria generate a waste amount of nearly 200,000t lop per year. These wastes either get composted or they get energetically transformed within biogas sites and the remains get re-composted and fed back to agriculture or landscaping.

The amount of collected and processed biomass in Bavaria has been increasing since years.[10] To counter this trend and to avoid unnecessary lop a solution could be to lay out neglected grassland on municipal grounds. This is especially valid for accompanying green strips along traffic-areas where no firm lawn is required as e.g. in parklands. Such a measure should be started on newly planned grounds.

With an annual production of less than 0.35t per hectare biomass neglected grassland belongs to the plantations with very low biomass generation. Other plantations, e.g. golf greens[11] or grove and wood areas, produce 3.5t to 6.2t and thus a ten to twentyfold mass.

Application example

On the outdoor areas of the Bavarian Environmental Agency (LfU) in Augsburg there are various plant societies. Neglected grassland dominates and has been laid out as a conversion area for the previously existing moorland (Lechheiden). Neglected grassland represents the landscape south of Augsburg since the Ice Ages and it was supposed to do so as well after the construction of the new building for the LfU. On these characteristic grounds not only endangered species have settled, but also cultivating effort and thus cost could be reduced.

In order to settle neglected grassland plant seeds from protected areas nearby were transferred to the grounds around the LfU. By means of a continuous observation experiences are being made to assist future projects with recommendations.[12]

Prevention potential

Neglected grassland should be foreseen for newly planned sites which do not require hardwearing and firm grounds. In how far further areas can be rededicated has to be decided from case to case in cooperation with the lower nature conservation authority. Estimates of saved biomass can only be given for individual cases.

After the layout of neglected grassland cost usually remains lower than for plantings with other crops. Consequently by this measure waste gets avoided without any significant additional financial effort.

Indicators	• Amount of communal lop • Share of neglected grassland to green areas • Number of mowings per time
Frequency	• Continuous

Additional effects	• Supports biodiversity • Contribution to nature conservation • Cost savings by reduced cultivtion effort • Less use of machinery and less traffic obstruction

Starting points and proceedings

Initiator: Departments for Environment, Construction and Sports

The creation of nutrient-poor habitat conditions on communal green grounds can reduce incurred biomass considerably. Primarily on neglected grassland there is little biomass.

Potential application areas are:
- Accompanying greens along roads
- Traffic islands
- Municipal parks and green areas which explicitly should not be stepped upon
- Cemeteries

Potential municipal course of action

The cultivation of alternative plants on communal grounds can occur step by step. It has to be checked by respective units/divisions to what extent single green spaces are suitable. Here the criteria size, function, and location play an important role. In case a transformation is possible and useful, the process can be started by starving the areas first.[13]

Informing citizens

IInformational and promotional campaigns and the involvement of local media (print, broadcast) should accompany the implementation to ensure the necessary acceptance of the citizens. There are several options to communicate the positive effects and set focuses. These include amongst others:
- Promotion of biodiversity: chalk neglected grassland represents one of the most diverse plant associations in Central Europe. As well other types of neglected grassland accommodate endemic plants and animal species like for example the violet salsify and the meadow sage. Neglected grasslands can therefore be seen as grounds with raised biodiversity.
- Insect-friendly zones: the diversity of partially endangered plants in Germany provides habitats and nutrition for various insects. Amongst them is the Grey Sandbee which, due to its long proboscis, can use other blossoms than the Honey Bee and thus contributes to biodiversity.
- If such areas with at least partially blooming plants get accepted by the people, to which information boards may contribute, littering of such areas could be reduced, especially near traffic lights.

Contact and further information

- Layout and preservation of neglected grassland: www.bluehende-landschaft.de/fix/doc/NBL-15-Licht-Magerrasen-1107.pdf
- New creation of neglected grassland on conversion grounds of the city of Munich – comparison of different techniques; www.anl.bayern.de/publikationen/anliegen/doc/an34002brackel_2010_magerrasen.pdf
- Open space creation with neglected grassland at the Bavarian Environment Agency, Augsburg: www.lfu.bayern.de/natur/freiraumgestaltung_augsburg/biodiversitaet/magerrasen_wiesen/index.htm

HS5: Design of electronic offices

Type	Instrument	Waste stream	Target group
Prevention at cradle	Framework	Construction and demolition	Municipal employees
Substitution	Promotion	Food and organic waste	Companies
Intensified use	Change of habit patern	Paper and office supplies	Consumers
Life cycle extension	Information and sensitization	Furniture + electronic devices	
		Packaging	

For typical office tasks like word processing and mail conversation generally only little computational power is required. These can be provided with very small systems.

Background

A big share of all workplaces today cannot function without suitable IT-hardware. These are specifically computers, monitors and input devices (keyboard and mouse).

Primarily electronic information and telecommunication devices are subject to ever shorter innovation cycles. Accordingly the operating life is only a few years despite the fact that the devices did not reach their entire useable life. By these short operational times a big waste volume is generated over time.

An appropriate design of this hardware can contribute to waste reduction. This is on the one hand the de-materialization of electronic workplaces, i.e. the provision of the same performance with smaller devices. On the other hand systems can be chosen so that in case of a technological improvement just the relevant parts need to be replaced. This always can occur when new software asks for a larger memory or a more powerful processor. Likewise devices which provide a modular design can be repaired more easily or just the relevant components can be replaced.

Application example

Since 2013 already the city of Augsburg offers in the new central procurement portfolio an 'eco-PC' in a miniature casing. This smaller casing with a volume of just 1.9dm³ and a weight of 1.6kg can be attached directly to the monitor.

Prevention potential

For each computer workplace approximately 5kg waste can be avoided and 300kg CO_2 equivalent be saved. Detailed information about the reduction potential is provided in the eco-balancing report 'Electronic workplaces in the municipal administration'.

Indicators	• Framework contracts and tenders with respective criteria • Number of workplaces with Mini-PCs or similar
Frequency	• Continuous
Additional effects	• Incentives for enterprises to produce such devices

Starting points and proceedings

Initiator: central procurement, all units and divisions

To take into consideration aspects of resource efficiency and waste reduction during procurement of electronic devise, it is appropriate to build on framework contracts with suppliers.

Availability of suitable devices

The community needs to provide the opportunity in advance to purchase smaller devices or devices with exchangeable/repairable components. The respective hardware should be available in a central procurement catalogue. By this means advantages can be emphasized directly. Ideally before each order of IT-devices it will be checked if there is an alternative which should be preferred due to aspects of waste reduction.

Qualification and information

Decision makers and actors in procurement but also individual divisions need to be sensitized for respective waste prevention issues and be informed about environmental effects. Thinkable are courses for responsible and competent employees or the use of informational material via mail.

Concrete criteria

During procurement of IT-devices following criteria should be considered:

- Size and weight
- Modular design / possibility for disassembling
- Reparability
- Contained materials (toxic or dangerous)
- Energy efficiency

Contact and further information

- Guidelines to IT-devices: www.itk-beschaffung.de
- Determination and development of environmental protection potentials within the IT technology (Green IT): www.umweltbundesamt.de/sites/default/files/medien/378/publikationen/texte_22_2015_gruene_software.pdf

HS6: Information material on USB-Stick

Type	Instrument	Waste stream	Target group
Prevention at cradle	Framework	Construction and demolition	Municipal employees
Substitution	Promotion	Food and organic waste	Companies
Intensified use	Change of habit patern	Paper and office supplies	Consumers
Life cycle extension	Information and sensitization	Furniture + electronic devices	
		Packaging	

The dissemination of information on USB sticks avoids paper waste and saves printing cost.

Background

Information like city leaflets, climate reports, waste statistics or press kits usually get printed, if applicable get a spiral binding and are given away. After use this material gets wastepaper. As well not expended issues also become waste.

By digitizing information and publishing on USB-sticks this wastepaper potential can be avoided. The data carriers can be reused after the original use has been accomplished. If not all originally available devices are needed, the data can be erased and the USB-sticks can be reloaded with new data.

Potential and additional effects

The avoidance potential of wastepaper depends on the volume of the measures. Additional effects besides the potential cost savings are a positive image and a target audience oriented provision of information.

Indicators	• Number of available information on USB-sticks • Not printed pages
Frequency	• Continuous
Additional effects	• Positive image • Target audience oriented provision of information

Application example

The press kits of the provincial capital Munich about the Octoberfest are distributed electronically on USB-sticks. Printed copies are only available upon request. By this measure serving about 5,000 journalist contacts a large amount of paper waste can be avoided annually. Additionally leaflets get replaced by QR-Codes which can be scanned. Public relations exclusively occurs online.[14]

HS7: Tablet computers for municipal and district councilors

Type	Instrument	Waste stream	Target group
Prevention at cradle	Framework	Construction and demolition	Municipal employees
Substitution	Promotion	Food and organic waste	Companies
Intensified use	Change of habit patern	Paper and office supplies	Consumers
Life cycle extension	Information and sensitization	Furniture + electronic devices	
		Packaging	

The large amounts of paper which occur by drafts and protocols can be avoided if tablet PCs are being used.

Background

Reports, drafts, templates, resolutions and protocols often comprise several hundred pages. These documents need to be on hand for municipal administration, district-, city- and municipal councilmen and women so they can come to profound decisions. Depending on the size of the municipality often several dozen copies get printed per event, get used for a few hours and then disposed.

If information and documents get distributed electronically they can be recalled on tablets and thus paper use gets obsolete. At the same time this allows access to all recent data files.

Potential and additional effects

At an assumed paper expenditure of 100 pages per month and councilor in a municipality with 10 councilors the use of 60kg paper can be avoided.

With a little training annotations and comments can quickly be inserted into electronic documents. Search functions facilitate the allocation of certain phrases compared to paper documents.

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Indicators	• Number of tablets for councilors • Number of not printed documents
Frequency	• Continuous
Additional effects	• Broad spectrum of use • Facilitates work • Saves cost

Application example

The city councilors of the cities Fürth, Schwandorf and Unterschließheim shall be named exemplary for Bavaria: they already have introduced tablets for their councilors.

Contact and further information

- Unterschleißheim buys 'Ultrabooks' for each city councilor: www.merkur.de/lokales/muenchen-lk-nord/landkreis/unterschleissheim-stadt-kauft-47100-euro-tablet-computer-jeden-stadtrat-3582986.html
- Schwandorfer city councilors get equipped with tablets: www.mittelbayerische.de/region/schwandorf-nachrichten/stadtraete-werden-mit-tablets-ausgestattet- 21416-art1158422.html
- Digital revolution in the city council Fürth: www.nordbayern.de/region/fuerth/digitale-revolution-im-stadtrat-1.3301317

RS1: Refillable printer cartridges

Type	Instrument	Waste stream	Target group
Prevention at cradle	Framework	Construction and demolition	Municipal employees
Substitution	Promotion	Food and organic waste	Companies
Intensified use	Change of habit patern	Paper and office supplies	Consumers
Life cycle extension	Information and sensitization	Furniture + electronic devices	
		Packaging	

Refillable print cartridges can be used several times. There are numerous service providers who collect empty cartridges, clean and refill them.

Background

Empty printer cartridges and toner cartridges are no residual waste but potential reusable containers. After a refurbishment they can be refilled or rerouted back in shredded form as secondary raw material to the cartridge production. Each year about 150 million cartridges are sold. It is estimated that 80% thereof end up as residual or hazardous waste after single use. Most cartridges however could be refilled up to 7 times.[15]

Depending on the service provider and ink quality cost savings between 50 to 90% compared to OEM would be possible. If just standard paper is being printed upon quality reductions compared to OEM ink is generally not exising.[16]

In order to prevent a replication of cartridges producers of printers use patents on various small details of cartridges and small chips with encryption. But the refilling of cartridges is legal. As well the legal warranty remains active as long as the cartridges are used appropriately.[17] For example the producer Hewlett Packard explicitly points out that the use of refilled HP cartridges does not interfere with the producers given warranty.

Application example

The environmental logo 'Der Blaue Engel' ('The Blue Angel') which is subsidized by the German Environment Agency (Umweltbundesamt, UBA) rewards more than 12,000 products and services designed to protect mankind and environment. Even for office products the Blaue Engel offers environmentally friendly alternatives.

Refillable toner cartridges with the Blaue Engel label need to comply with the strict requirements for ingredients of the toner itself and the emission thresholds for organic particles. Municipalities may orient themselves on this eco-label and use it as criteria for purchase.

Prevention potential

In a municipality with 50 employees the waste stream can be reduced by 80% if refillable ink cartridges are used. For this calculation it is assumed that per employee and working day 40 pages are printed, thereof 80% as black and 20% as colored print.

In this scenario per year 741 black ink cartridges and 212 color ink cartridges are required. Using regular new products a waste amount of 66.7kg/year accumulates. With the use of refillable cartridges it is possible to avoid 56.3kg waste per year.

As additional effect, besides the avoided waste amount, cost savings of about € 10,300 result.

Indicators	• Number of refillable cartridges
Frequency	• Several instances per year
Additional effects	• Cost savings

Starting points and proceedings

Initiator: central procurement, all units and divisions

Determine compatibility

In order to buy the correct ink cartridges the compatibility of the printer for potential cartridges has to be determined. For some printers it is not possible to buy cartridges from third party suppliers. This is why already during the purchase of the printer it should be obeyed that the printers support refillable systems.

Selection of service provider with high qualitative standards

There are many service providers which have specialized themselves on the refilling of printer cartridges. However these vary considerably in quality and price. Potential assistance is provided by test agencies like Stiftung Warentest or the label 'Der Blaue Engel'.

Set up of a collection point

Empty cartridges can be collected in-house and be sent back to the producer or a service provider. This should be assigned to a designated person.

Sensitization of the employees

Further waste by printer cartridges and paper can be avoided by a better awareness for printing. Misprints, frequent cleaning processes and unnecessary color prints should be renounced. Just what is not sufficient in electronic form shall be printed. For longer documents just the required pages shall be printed using the double side printing function. Misprints can be avoided by using a print preview.

Contact and further information

- Der Blaue Engel (The Blue Angel) informs about environmental friendly products and services: www.blauer-engel.de/de
- Stiftung Warentest evaluates various service providers for refilling of ink cartridges: www.test.de/Tintentankstellen-Sparen-mit-Nachfuellpatronen-1577780-0/
- LfU Bayern (2015): Environmental Agency, leaflets circular economy – printer cartridges and toner www.abfallratgeber.bayern.de/publikationen/doc/infoblaetter/druckerpatronen.pdf

RS2: Reusable precept for catering on public space

Type	Instrument	Waste stream	Target group
Prevention at cradle	Framework	Construction and demolition	Municipal employees
Substitution	Promotion	Food and organic waste	Companies
Intensified use	Change of habit patern	Paper and office supplies	Consumers
Life cycle extension	Information and sensitization	Furniture + electronic devices	
		Packaging	

If for catering on public grounds, events or outdoor gastronomy in pedestrian zones or on broad walkways a reusable precept is given, this belongs both to the provision of food and beverages on reusable tablecloths, dishes, cutlery and cups.

Background

At events usually it is paramount to provide sustenance. Depending on the type of event this is the job of local gastronomy, catering, snack bars or local clubs. If reusable dishes, cutlery and cups are being used or the hot dog and steaks together with mustard and ketchup get served directly in a bun the waste can be reduced by up to 30%.[18]

The prohibition of single-use or better the reusable precept combined with return and pledge obligations for events or markets are established in many communities already. Possible existing exceptional regulations can be rechecked upon their necessity.

It is suggested to consider if reusable precepts could also be extended to gastronomy, street cafés, coffee shops, ice cream parlors, fast-food bars etc. as soon as they use municipal or public ground like pedestrian zones or broad walkways. The municipality may use the reusable precept as well in their own buildings, schools and their sponsored facilities like sports arenas (see RS3). Here solutions should be developed cooperatively with the organizations in order to reduce the waste production and to oppose littering effectively. In how far other state or religious facilities like kindergartens, schools, universities, museums etc. can be integrated has to be determined.

Potential and additional effects

Around one third of arising waste can be avoided if reusable cups and dishes get used. The citizens as guests will perceive such a measure but yet should be sensitized additionally for a reusable precept by local media and municipal leaflets.

Indicators	• Reusable precept yes or no • Waste production
Frequency	• Continuous
Additional effects	• Positive perception by visitors • Raised eating and drinking culture • Less refuse, less littering

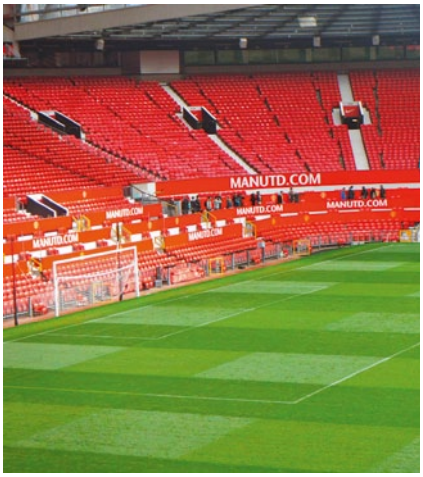
Application example

During major events in Munich pledge systems and reusable packaging and containers need to be used.

Contact and further information

- For major events in Munich on public grounds there is a ban on disposables: www.awm-muenchen.de/gewerbe/entsorgungswege/abfallvermeidung/einwegverbot.html
- Waste prevention and waste separation on markets and street festivals: www.stiftung-naturschutz.de/fileadmin/img/pdf/Publikationen/Studie_zu_Abfallverhalten_bei_Festen/SNB_Studie_Abfallaufkommen_Grossveranstaltungen_final_Maerz_2011.pdf
- Waste avoiding design of events in public facilities (reusable instead of disposables): www.bmub.bund.de/fileadmin/Daten_BMU/Pools/Broschueren/abfallvermeidungsprogramm_bf.pdf > Measure 33, p.70
- Addition to already existing guidelines around reusables for outdoor gastronomy: www.frankfurt-main.ihk.de/imperia/md/content/pdf/standortpolitik/Broschuere_Aussengastronomie.pdf
- Easing of rules for Munich outdoor gastronomy like street cafés: www.muenchen.de/aktuell/freischankflaechen.html
- Magical clean festivals – Handbook of the waste association of Lower Austria for organizers: http://195.58.166.60/noeav/user/nav/dokumente/SF_Handbuch_Sauberhafte_Feste.pdf

RS3: Reusable precept in sports facilities



Type	Instrument	Waste stream	Target group
Prevention at cradle	Framework	Construction and demolition	Municipal employees
Substitution	Promotion	Food and organic waste	Companies
Intensified use	Change of habit patern	Paper and office supplies	Consumers
Life cycle extension	Information and sensitization	Furniture + electronic devices	
		Packaging	

For sports facilities it is suggested to consider in how far the reusable precedent can be implemented under private law by means of a lease agreement or as an accompanying regulation to municipal promotion.

Background

Swimming pools, arenas or other sports facilities belong to public sports arenas. They usually are not sponsored by the municipality but by sports clubs or other third parties. If the facilities belong to the clubs, there are subsidies by the municipalities. So during regular operations and special events, by respecting all safety issues, it should be worked towards a precept for reusables instead of disposables. In lease contracts or tied to grants the reusable precept could be enshrined.

The safety of athletes and spectators has highest priority. Thus on the stands cups made out of plastics have to used, so that in case of throwing the cups in emotional ecstasy they do not harm or damage anybody and don't produce shards. The cups can be reused after cleaning. They can be printed with logos of the clubs or the event.

Potential and additional effects

May the actors succeed in exploiting the prevention potential and promote this accordingly, not only the amount of waste gets reduced but also the clubs act as multipliers for the sensitization of the population.

Indicators	• Number of sports facilities with prohibition of disposable in lease contracts
Frequency	• Continuous
Additional effects	• Sensitization of guests • Raised eating and drinking culture

Contact and further information

- Hannover 96 returns to reusable cups: www.ptext.de/nachrichten/hannover-96-medienservice-hannover-96-hdi-arena-mehrwegbecher-975798
- Prohibition of disposables on federal sports events 2010: www.dosb.de/tr/sportentwicklung/sportentwicklungs-news/detail/news/klimaschutz_im_sport_6_klimafreundliche_grossveranstaltungen_kopie_1
- Soccer World Championship 2006 was the biggest reusable-event of all times with 5.5 Mio. sold beverages: www.umweltdialog.de/de/verbraucher/leben-und-wohnen/archiv/2006-07-11_Umweltbilanz_der_WM_positiv.php

FS2: Mobile dishes

Type	Instrument	Waste stream	Target group
Prevention at cradle	Framework	Construction and demolition	Municipal employees
Substitution	Promotion	Food and organic waste	Companies
Intensified use	Change of habit patern	Paper and office supplies	Consumers
Life cycle extension	Information and sensitization	Furniture + electronic devices	
		Packaging	

A mobile dishes service provides reusable dishes for events and partly dish washer systems are incorporated. The waste stream produced by disposable dishes and cups may be reduced considerably by means of a mobile dishes service.

Background

At festivals the biggest waste stream is due to the usage of single use dishes and cups. One visitor generates 100 to 200g of waste per festival day which consists, besides organic waste, primarily out of polystyrene (single use dishes), cans, paper and cardboard (trays and cups).[19]

The use of a mobile dishes service which consists out of a trailer with powerful dishwashers and sufficient reusable dishes, can contribute decisively to waste reduction. Per hour about 700 to 1,000 pieces of dishes can be cleansed.[19,20] Alternatively in many cases it is possible to just borrow tableware.

A 0.5 liter containing disposable cup out of polystyrene weighs about 10.7g whereas a comparable reusable cup weighs ca. 62.9g.[19] With 100 respectively 400 refills the specific weight per use of the reusable cup declines to 0.63g respectively 0.16g; thus per each cup more than 10g of waste can be avoided. This corresponds to a waste reduction of more than 90%.

Likewise the positive image and the high acceptance of reusable systems can be emphasized. In line with a study about waste prevention at festivals, 85% of the interviewed people stated that the use of reusable cups being more comfortable.[19] The eating and drinking culture is getting better because of the more qualitative dishes, the clean ambience and the contribution to environment protection.

Application example

There are many municipalities, associations or charitable-nonprofit organizations which own mobile dishes services.

MobilSpiel e.V. in cooperation with the waste management organization of Munich (AWM) rents mobile dishes systems for festivals. The mobile system is water proof and suitable for 300 to 1,000 people. All necessary utensils like dishes and sinks are incorporated in the system. It will be delivered, set up, demounted and retrieved by MobilSpiel e.V. On top organizers will get instructed and familiarized in the use of the system.

Prevention potential

Under the assumption of 100 to 200g of waste for a single use dishes per visitor, looking at 1,000 visitors up to 100 to 200kg waste can be avoided per day.

From 250 visitors onwards already the use of a mobile system may be more cost effective than the usage of disposable dishes.[19]

The implementation of this measure may occur short term and is considered simple to implement.

Indicators	• Avoided waste quantity • Avoided cost for disposal
Frequency	• Several occasions per year

Additional effects	• Improved eating and drinking culture • Positive image

Starting points and proceedings

Initiator: Departments of Environment and Social Issues

The municipality may support the use of mobile dishes services by different means:

- The municipality offers an own mobile system for rent or rents a mobile system from a provider
- The municipality supports the use of mobile systems for big events by offering financial, informative or other measures

In order that a mobile dishes system gets a cost effective and ecologic alternative to single use dishes, the implementation needs to planned thoroughly in advance and the required infrastructure has to be provided.

Suitability of a mobile dishes system

- Economic: a mobile dishes system with sinkinstallations can be economically viable at events with more than 200 to 250 visitors. Therefore it has to be estimated how many visitors are expected and what they will consume in average. Accordingly the expenditures for rental dishes, mobile sink, bail and higher staff costs (most mobile systems need to be handled by two persons), and deposit earnings have to be compared to the expenditures for single use dishes and disposal.
- Image: the renunciation of single use dishes can lead to a positive perception of this event by local media and visitors. This in turn may lead to an increase of visitors and more sales.

Infrastructure

For the operation of a mobile dishes system the following is required: Connector to drinking water pipe; Gully for waste water drainage; Power connection (380V, 16A – depends on type of mobile dishes system); Platform depending on model, about 4 to 8m by 2 to 6m and 2.4 to 3m in height; Power cables and water pipes usually are contained within the mobile system

Planning the reusable system

Reusable dishes get collected or brought back by the customers. If a mobile dishes system is used following pawn system has proved oneself: dishes which have been let at the tables are getting collected and brought to the centrally located mobile system. The redistribution of cleansed dishes back to the booths is done via the mobile system. It should also be considered which amount the pawn per dish shall be in order to influence return rate of the dishes and possible pawn earnings.

Use of pawn donations for charity projects

A collecting box for pawn marks may be used to support charity or other projects in the municipality or elsewhere. Visitors don't reclaim their pawn by dropping the mark into a collecting box and help to support the respective project. Suitable projects will be selected and promoted in advance.

Additional measures for waste reduced events

- Dedicate one person which will be responsible for all environmental aspects and which induces all necessary measures
- Instruction of all employees and assistants about planned measures to avoid waste at the event
- Avoid single-portion packaging, e.g. for sugar, ketchup, milk, jam; instead provide dispenser systems
- Refrain from printing leaflets instead use central advertising banners, ads, social media promotion etc.
- Point out the use of reusable dishes and the desired waste prevention aspect at the booths and thus sensitize the visitors for this topic

HL1: Mobile repair center

Type	Instrument	Waste stream	Target group
Prevention at cradle	Framework	Construction and demolition	Municipal employees
Substitution	Promotion	Food and organic waste	Companies
Intensified use	Change of habit patern	Paper and office supplies	Consumers
Life cycle extension	Information and sensitization	Furniture + electronic devices	
		Packaging	

A mobile repair unit follows the concept of public repair organizations and brings this help even to less dense populated areas.

Background

A mobile repair center takes the idea of repair cafés to rural areas. Repair cafés need, depending on customer acceptance, a certain catchment area so that these events often get organized in cities. For municipalities with low population density the challenge is to find enough interested people for sessions on a regular basis.

The concept of mobile repair centers orients itself on the functionalities of mobile libraries or toys mobiles. Here books, toys or other games etc., is being brought to the various quarters where qualified persons supervise the use of the offers. In similar ways a mobile repair café can be set up. By means of a box van, bus, trailer or any similar suitable vehicle a range of tools and spare parts will be transported to the selected locations.

As an alternative to a special vehicle, a cooperation between municipalities is possible by exchanging information and assistance. Here the idea of a mobile repair system lies on a pure informational basis without physically exchanging any actors; and there is no special vehicle necessary.

Application example

Attached to many existing repair cafés are mobile bike repair facilities, which come close to the concept of a mobile repair facility. At the repair café events in the town of Germering, Bavaria, repair specialists offer help in their mobile bike clinic.[21]

The idea of a mobile repair center is being pursued by many initiatives, e.g. in the city of Stuttgart where it is called 'mobile repair café Hallschlag' or in Tyrol, Austria, organized from the Tyrolian education forum.[22,23] The projects mostly are still in the maiden phase and they differ as well in their concepts. Common for all is the mobility aspect of the repair shops.

Prevention potential

The prevention potentials are estimated to be similar to the ones of repair cafés.

Per meeting about 25 to 30 products can be repaired and thus ca. 50kg of waste can be avoided. Depending on the frequent cycles of the events more waste can be avoided.

Indicators	• Existence of a mobile repair system • Number of addressed locations • Number of participants
Frequency	• Several occasions per year
Additional effects	• Sensitization and raised awareness • Knowledge transfer

Starting points and proceedings

Initiator: department of environment and social issues

The community can operate as an actor itself or take a supportive function for dedicated persons, institutions etc. Thinkable is as well a cooperation between several communities or a county takes organizational responsibility for all of their villages and communities by visiting them with a mobile repair center on a regular basis.

Vehicles

The community may take charge of the procurement and setup of a vehicle for a mobile repair system or win external partners for the project. Possibly the equipment can be taken or borrowed from municipal inventory.

Location and space

The need for rooms varies depending on the type of the mobile repair system. For larger box vans or tents enough space on public ground, power connection and sufficient parking lots nearby are required. For vehicles which are solely designed for transport of tools and parts, or which serve as a pure informational but non-physical repair idea, suitable rooms are required in which the repairs can proceed. These can be e.g. schools, gyms or (parish) community centers.

Contact to dedicated stakeholders

For a successful realization of a repair event dedicated and motivated people and assistants are necessary. Possible institutions/persons can be:

- Charitable, non-profit organizations
- Environment protection organizations
- Craftsmen and Chambers of Crafts
- Municipal construction yard, foreman's shop etc.

Support and financing

The community may adopt the sponsoring or help to look for sponsors. Financial funds are necessary for:

- Procurement and setup of the vehicle
- Running costs for the vehicle
- Equipment (as long as tools, parts etc. have not been borrowed)
- Promotion.

Marketing and information

The municipality may provide advertising space for a successful marketing. As well the event can be disseminated via municipal bulletins to a wider audience. Informational events as well as invitations to interested people and institutions can be supportive marketing instruments.

Contact and further information

- Central Homepage Repair Café: www.repaircafe.org/de/
- Repair Café Germering as an example: http://germering.feg.de/RepairCafe/
- Repair-Initiatives coordinating office Germany: www.anstiftung.de/selbermachen/reparatur-initiativen

FL1: Repair Café

Type	Instrument	Waste stream	Target group
Prevention at cradle	Framework	Construction and demolition	Municipal employees
Substitution	Promotion	Food and organic waste	Companies
Intensified use	Change of habit patern	Paper and office supplies	Consumers
Life cycle extension	Information and sensitization	Furniture + electronic devices	
		Packaging	

In a repair café volunteers and honorary repair specialists help citizens to repair their defect electronic gadgets, bicycles, clothes or furniture.

Background

In 2012 each citizen of Germany produced about 23.2kg of electronic waste in average. Converted to Bavaria this accumulates to nearly 290,000t of thrown away electronic products out of which, according to an Austrian study, up to 60% are still functioning or just need minor repair.

Repair cafés are non-profit events which can accomplish these minor repairs. Here crafts experts offer their expertise and skills voluntarily and for free. Visitors of a repair café can turn in their broken gadgets and do the repair together with the experts and thus help to extend the products usable lifetime. Repair cafés match the recommendations given by the Federal Environment Ministry that the implementation of local repair network structures shall be supported.

The name and the logo 'Repair Café' together serve to pool these efforts and events and provide a platform for information and media exchange. Per month in Bavaria about 2 new repair cafés open. In August 2015 there were already 66; nationwide there are more than 220 repair cafés registered.

Repair cafés achieve a repair efficiency of 60 to 70%. With an average of 40 devices per event this equates to 28 successful repaired products. Nearly ¾ of these gadgets are electronic products, followed by bicycles and clothes.

Application example

In the city of Germering a repair café is being organized by the Free Christian Community since October 2013 on a monthly basis.[21] Initially 7 volunteers started the collaboration when in 2014 already close to 40 assistants provided their capabilities for free. They assist the visitors to repair their own electronic devices, clothes, bicycles, wooden products and many more by themselves. By this within one year nearly 500 products could have been repaired.

Besides the extension of the usable lifetimes of these measures a repair café also serves as a social event with sinkers and suds, as well as a point of contact.

Prevention potential

The cost for a digital starter kit are € 45, onetime. Included are a manual, templates for advertising and the use of the logo. Further cost may arise depending on the individual situation (e.g. rent, electricity).

Per meeting about 25 to 30 products get repaired. At a quarterly turnus the amount of avoided waste is around 200kg.

For each avoided kg of waste initially € 0.22 have to be spent; thereafter cost decrease significantly.

The implementation of this measure can occur on short term and it is considered an easy measure.

Indicators	• Number of events & participants • Number of repaired gadgets
Frequency	• Several occasions per year

Additional effects	• Sensitization and increased awareness • Knowledge transfer • Social event

Starting points and proceedings

Initiator: Department of Environment and Social Issues

The municipality may appear as stakeholder itself or can adapt a supportive function for dedicated people and institutions.

Locations and rooms

The size of the required rooms varies according to number of crafts shops (bike corner, clothes area etc.). The room(s) should be covered and provide power outlets. The event may take place in municipal buildings. The municipality may as well initiate contact to respective institutions (e.g. parish community centers, youth centers). A cooperation between municipalities for a mobile repair café is possible. This can be handled as a mere inter-municipal information exchange and support or it can be setup in physical shape as a mobile crafts shop.

Infrastructure

The municipality may provide locations and tools or organize its procurement.

Contact to dedicated actors

For a successful implementation of a repair café dedicated and motivated organizers and assistants are required. Potential institutions/audiences can be: Charitable, non-profit organizations; Environment protection organizations; Craftsmen and Chambers of Crafts; Municipal construction yard, foreman's shop etc.

Support and financing

The community may adopt the sponsoring or help to look for sponsors. Financial funds are necessary for: Digital starter kit; Equipment (as long as furniture, tools cannot be brought/borrowed); Promotional measures.

Marketing and information

A municipality may provide advertising space for a successful marketing. The event can be disseminated via municipal bulletins to a wider audience. Informational events as well as invitations to interested people and institutions can be supportive marketing instruments.

Safety and liability

As soon as a cooperation has been set up questions concerning insurance and liability have to be clarified. There is no coherent procedure for this. Depending on the cooperation there are several options to legally safeguard the venture. For example volunteers can be insured via the municipality or an association with own insurance coverage can be founded. Especially concerning the repair of electronic devices there are legal precepts which have to be obeyed explicitly to avoid risks. The municipality may support the training of volunteers or provide skilled employees with electronic safety tools (e.g. VDE measuring instrument) for the duration of the event.
A guideline concerning liability issues of repair initiatives is available e.g. at http://reparatur-initiativen.de/seite/sicherheithaftung.

Contact and further information

- Central homepage Repair Café: www.repaircafe.org/de/
- Repair-initiatives coordination point Germany : www.anstiftung.de/selbermachen/reparatur-initiativen
- Imparting and repair in Bavarian municipalities : www.lfu.bayern.de/abfall/abfallvermeidung/gebrauchtwaren/index.htm

FL2: Second hand stores and thrift shops

Type	Instrument	Waste stream	Target group
Prevention at cradle	Framework	Construction and demolition	Municipal employees
Substitution	Promotion	Food and organic waste	Companies
Intensified use	Change of habit patern	Paper and office supplies	Consumers
Life cycle extension	Information and sensitization	Furniture + electronic devices	
		Packaging	

In second hand stores and thrift shops or stores primarily larger furniture, clothes, electronic devices, books and household items get promoted for further use.

Background

In accordance with the German law on life-cycle-management the re- or further use of used products or components avoids wastes. Dedicated to these activities are, next to commercial enterprises, traditionally above all charitable non-profit organizations. These organizations generate manifold social, socio-economic and ecologic benefits[24], which inure to the benefit of the communities in all respects. They produce funds for social projects, employ people who are unlikely to get a job, prepare people who are looking for work in the job market and provide qualification for them. This is why municipalities should support and promote such sustainably active institutions.[24] At the end of the project 'Optimization of the compilation of used furniture with the objective of a higher re-use rate' the Bavarian Environmental Agency (LfU) hosted a symposium 'Sustainability strategies in the used furniture sector'.[25]

The LfU estimates that in Bavaria by roundabout 180 charitable non-profit thrift shops and furniture stores alone[26] about 132,000t of household goods get processed every year; mere dress shops not included. Two thirds of the processed goods get attributed to used furniture (ca. 88,000t/a) and thereof three quarters to furnishings. Hence these organizations alone would transact roundabout 66,000t used furniture per year. On top there comes privately handled used furniture in good shape and partial fractions out of bulky waste.

To the roundabout 180 charitable non-profit thrift shops and furniture stores in Bavaria another ca. 150 dress shops in urban districts and approximately 200 in the counties have to be added.[26]

A survey resulted in an average number of visitors of 100 to 300 per day. The target audiences vary and range from experience-oriented and environmentally aware customers to the ones who need to buy in thrift shops due to their tight financial situation.

90% of the presented goods get donated by private households. Additional purchases are rare. Up to 80% of the furnishings get collected by the employees of the thrift shops whereas the rest is usually being delivered by the donators.

Application example

In Augsburg, the association contact e.V. operates a thrift shop since 2009 and offers on an area of 4,000m² a wide range of furniture, clothes, electronic devices, books and a lot more at low prices. The customers primarily stem from low income conditions but as well donators, collectors and bargain hunters visit contact e.V..

The thrift shop promotes a sustainability concept, in which both social and as well ecologic criteria are being observed. Jobs are getting created and a continuous qualification for the unemployed is provided. Presently around 60 people are employed either in full-time or part-time. Contact e.V. finances itself by the income of € 95,000 per month; the arising profit is being reinvested immediately. According to own statements 3 to 5t of the waste generation is being absorbed by thrift shops in Augsburg.

Prevention potential

Operating an own thrift shop is not the primary task of a municipality. Hence there are seldom such municipal stores. The extent to become involved in a thrift shop may vary. The support of existing stores, if not established yet, can however occur on short notice.

The amount of avoided waste depends on the size of the store. The example of contact e.V. shows an prevention potential of 6 to 7t a day. If 10% of the annual cost would be taken by the municipality one kilogram of avoided waste would cost about 0.7 Eurocents.

Indicators	• Sales revenue • Number of customers • Duration of the transaction of goods
Frequency	• Continuous
Additional effects	• Qualification and training • Provision of jobs

Contact and further information

- Sozialkaufhaus contact in Augsburg e.V. – largest store for used goods in Bavaria? www.contact-in-augsburg.de/Startseite.xhtml
- Brauchbar gGmbH in Würzburg – exemplary not only for Bavaria: www.brauchbarggmbh.de/
- Kempodium e. V. in Kempten – Example for the intermediation and assistance for do-it-yourself: www.kempodium.de/
- Promotion of the re-use or multiple use of products (used goods): www.bmub.bund.de/fileadmin/Daten_BMU/Pools/Broschueren/abfallvermeidungsprogramm_bf.pdf > Measure 30, p. 68

Starting points and proceedings

Initiator: Departments of Environment or Social Issues, and dedicated individuals or institutions

Communities may guide the creation of thrift shops or used goods stores along the following steps or become active themselves during implementation. Already existing shops can also be supported.

Building and infrastructure

Depending on extent and size suitable areas, buildings and infrastructure are required (good connections to public transport, car parking). The sales and storage areas need to be roofed and lockable. The municipality can provide the necessary buildings or let them at a favorable price. In case no suitable object is in the ownership of a community the municipality may assist looking for an appropriate building.

Composition of the executive committee

The success of a used goods store depends on the dedication of the responsible people. Just as important as an appropriate infrastructure is a functional executive committee. Contact should be established to interested people:

- Charitable non-profit organizations
- Environment protection organizations
- Already existing thrift shops and stores
- Volunteer centers
- Regional actors.

Start-up financing and continuous financial support

The municipality may provide the sponsoring or help searching for sponsors. Continuous financial support may be accomplished as measures of waste prevention, qualification and employment.

Marketing and information

The municipality may provide public advertising space and organize promotional events. In municipal bulletins or similar the project may be promoted and donations being solicited.

Logistics

Measures like a ‘soft bulky waste removal‘, in cooperation with the waste removal agencies, may assist the provision of products.

Lowering of disposal cost

Not all donations in kind of private persons are re-usable or can be sold. If a product is getting rejected by the employees of the thrift shop there are two options: either the owner has to dispose the item or the shop takes care of the disposal. In order not to offend and reject potential donators, the disposal should be done by the shop. The municipality may start here by reducing disposal cost for thrift shops and used goods stores or provide contingents for free bulky waste removals.

FL3: Component exchange

Type	Instrument	Waste stream	Target group
Prevention at cradle	Framework	Construction and demolition	Municipal employees
Substitution	Promotion	Food and organic waste	Companies
Intensified use	Change of habit patern	Paper and office supplies	Consumers
Life cycle extension	Information and sensitization	Furniture + electronic devices	
		Packaging	

Component exchanges are stores for used building materials and components like windows, doors or stairs, which accrue during the demolition or conversion work, and which can be removed and re-used. Sometimes also materials like bricks, tiles or wood are being offered.

Background

More than 13.5% of all wastes in Germany result from conversion or demolition work (rubble, including parts of wood, plastics and metals; cf. measure IR2); most of it stems from buildings. If here measures for waste prevention will be set on (e.g. conversion instead on demolition of buildings), large amounts of waste can be avoided. The during conversion-, renovation works or structure removal accumulated and still functioning parts, materials and components can be fed back into the life cycle by means of an exchange system.[27,28] Even the structure removal of brick stones may be economic.

In Bavaria there exists no such construction material or component exchange at present with the exception of such an emporium for historic construction materials in the county of Aschaffenburg. Therefore such institutions are to be set up at least in densely populated areas. This can be achieved by the municipal side as well as by the charitable non-profit side. While in Germany such component exchanges are not seen as necessary from a municipal point of view[24], in the Netherlands large commercial component exchanges work economically for a long time already. Used construction parts need to be donated to such a facility, as for used furniture or clothes to a thrift shop. The donating builder in turn saves the disposal cost.

A component exchange can only function as a network which is known to crafts shops, architects and demolition companies so that builders which reconstruct or renovate know where to bring the used components and materials to and on the other hand the builders which need the used parts, can get these parts on time. Construction parts can only seldom be mediated and exchanged directly as usually constructions and deconstructions do not occur simultaneously. The temporary storage of parts and materials in good order is one of the tasks amongst others of such an exchange.

For the removal of parts by experts of the exchange enough time is required before the demolition of the building. It would also be possible that the demolition company itself removes the useable and desired components, so that these just need to be picked up. This however calls for a training of the workers of the demolition company and the question has to be answered how this would be paid for. The used parts and materials will then be presented in sales rooms and promoted via online portals.

Most frequently resuested parts are doors, gates and windows; these together account for 60% of sales

revenue. The motivations for customers are primarily the unique parts and the cheap prices. In order to function economic, the selection of parts which are to be acquired by the exchange needs to be reviewed critically.

The forum 'Bauteilnetz Deutschland' (Component Network Germany) bundles existing experiences along the re-use of used construction parts and has been awarded already twice as UN-decade project by the UNESCO. Interested people for the installation of such an exchange will get information and support.

Application example

The first construction parts exchange in Germany already exists since 2002 in the city of Bremen. Since then crafts shops and architects support the re-use of used parts and materials via the association 'Alt-Bauteile Bremen' (Used-components Bremen). On 750m² roofed and 50m² open space in total about 1,500 parts are for sale. In addition the used parts exchange offers an internet catalogue which is being contacted by 250 users a day. Here parts can be reserved and be picked up at the exchange. In Bremen 1,200 parts get sold per year.

With incentives like 'component of the week' or the 'annual ecologic evaluation of construction sites', which look at CO_2 and energy savings customer acceptance is being increased. Design suggestions in magazines with focus on crafts, living and gardening also have a big influence on sales revenues of the promoted articles.

Even though in Munich up to now no construction parts exchange has been considered necessary, two best practice examples have become known from within the city: 1984 an entire wooden house has been 'moved' within Munich. From 2011 till 2013 builders and architects with great effort have been able to organize used construction parts for a multi-family house in Milbertshofen without the use of an exchange.

Prevention potential

In 2013 the construction sector in Germany used 521 Mio. t of mineral construction raw materials. The energy-use for the production of construction materials of an average building as stone or cement-construction should correspond with its heat energy and power consumption of 20 years.[28]

A re- or further use of still functioning components, as they are being offered by the exchange, can avoid both about 10% of the annual construction and rubble wastes[29] and avoid downcycling and CO_2-emissions.

Indicators	• Existence of an component exchange • Number of employees • Sales revenue • Number of customers
Frequency	• Continuous
Additional effects	• Produces jobs and qualification of workers

Contact and further information

- Central homepage of the components network Germany: www.bauteilnetz.de/
- Component exchange Bremen – mother of all German exchanges: www.bauteilboerse-bremen.de/
- Component exchange Hannover – service provider with social and ecologic orientation for private and commercial audience: http://bauteilboerse-hannover.de/
- New life for old construction materials: www.landkreis-aschaffenburg.de/wer-macht-was/baugewerbesich/bauenundwohnen/baustoffboerse/
- Orderly retreat construction and re-building of a wooden house in München-Solln: www.abfallratgeber.bayern.de/publikationen/abfallvermeidung/doc/spolien_holzhaus.pdf
- Re-use of used components at a building in München-Milbertshofen: www.bestellen.bayern.de/shoplink/lfu_abfall_00201.htm

Starting points and proceedings

Initiator: Departments of Construction, Environment or Social Issues, and dedicated individuals or institutions

Following prerequisites are required for a successful components exchange:

- Ensured startup financing
- Dedicated employees of a components exchange
  - Stakeholders with expert knowledge (architect, carpenters, etc.)
  - Employees for quality control and selection of components
- Required potential
  - Population of at least 500,000 in catchment area (about 50km radius)
  - High share of ownership and old buildings in stock
- Suitable spaces
  - Storage and sales areas (min. 300m²)
  - Roofed and closed spaces
  - Low moisture

Depending on type and range of municipal engagement there is a range of starting points to set up a components exchange.

Financial support

The municipality may support the components exchange with a startup financing or by an annual contribution. Continuous financial support can also be seen as a means to avoid waste, provide qualification and jobs.

Setup of a network

Contact should be set up to respective stakeholders which are important for the success of the components exchange. These are amongst others architects, demolition companies, craftsmen, planning offices.

Provision of infrastructure

Depending on range and size of the exchange suitable spaces, rooms and infrastructure (connection to public transport, parking) are required. Rooms for sales and storage need to be roofed and lockable. The municipality may provide necessary properties or rent them cheaply. During the startup phase cooperation with recycling centers, thrift shops etc. may be useful. In case no suitable area is in the possession of the municipality, the community may help during the acquisition of respective properties.

Provision of employees

Via specific municipal channels employees and assistants may be placed, e.g. longtime unemployed, dedicated retirees, trainees or volunteers.

Information and sensitization

Waste disposal schedules, internet, leaflets, bulletins etc. should contain advice and links towards the components exchange and topical campaigns and special offers.

Components from municipal buildings

Planned demolitions of municipal buildings should be announced as ‘selective demolition’ and be made known to the components exchange. So the municipality contributes to a minimum critical amount of components for a functioning components exchange. In order to ensure the removal of all suitable components, the information should be given several weeks in advance.

FL4: Waste prevention center

Type	Instrument	Waste stream	Target group
Prevention at cradle	Framework	Construction and demolition	Municipal employees
Substitution	Promotion	Food and organic waste	Companies
Intensified use	Change of habit pattern	Paper and office supplies	Consumers
Life cycle extension	Information and sensitization	Furniture + electronic devices	
		Packaging	

In a waste prevention center various measures concerning mediation, repair and reclaiming can be gathered spatially and thus be organized more efficient.

Background

In Germany more than 2.5 Mio. t bulky waste, 0.6 Mio. t waste electronics and 52 Mio. t rubble (data as of 2013)[30] accumulate each year. A part of it can be re-used – by means of thrift shops, repair cafés or component exchanges. Additionally exchange systems for excavation of clean high value materials like silt, clay, sand, gravel etc. should be used for exchange. This material is too good for backfill of pits, quarries and mines. Besides the lifetime-extension as well the intensity of use can be increased if at the waste prevention centers also product servicing facilities would be attached.

In a waste prevention center these measures can be gathered and sorted. By doing so scaling effects can be used which occur by the available infrastructure (buildings, transport fleet, tools or parking spaces), common advertising, marketing campaigns and the available broad pool of employees and experts.

Waste prevention centers act by their diversity of offers and measures both in terms of lifetime-extension, intensified use, promoting re-use and raised awareness.

Application example

The precursor of a waste prevention center can be found in Kempten: the Kempodium is a building complex with a used products store und various workshops including do-it-yourself courses led by trained personnel, for example to build furniture, but also to repair of electronics, bicycles or furnishings. Within the repair café which is held twice a year at present defect gadgets or furniture can be repaired in the wood and metal workshops with the help of skilled persons.

Moreover the Kempodium serves as a meeting point for social events; there will be bike bazars and readings.

All in all the Kempodium offers 10 jobs and it gets financed through the Kempodium e.V. association. Paramount for all activities is the motto ‘give the things a second chance’.

The project is being promoted as best practice example in several publications about waste prevention and it belongs to the measures, which can be implemented on municipal level.

Prevention potential

The waste prevention potential of a waste prevention center strongly depends on the available elements. Information about reduction potentials of individual measures can be found on the respective leaflets.

Indicators	• Existence of a waste prevention center • Height of sales revenue • Number of customers • Number of employees • Repaired gadgets and furniture • Turnover length of goods

Frequency	• Continuous
Additional effects	• Qualification and training • Knowledge transfer • Provision of jobs

Starting points and proceedings

Initiator: Departments of Environment, Social Issues and Waste Management; dedicated individuals or institutions

Communities can support the implementation of a waste prevention center by a variety of starting points.

Building and infrastructure

Depending on scope and size suitable spaces and infrastructure (workshops, car fleet, tools, parking spaces) are required. The municipality may provide necessary properties or rent them cheaply. In case no suitable object is in the possession of the municipality, the community may help during the acquisition of respective properties.

Organization and coordination

The success of a waste prevention center depends on the engagement of the responsible persons and the willingness for cooperation of the individuals. It is possible to build a steering board with stakeholders from the participating institutions but also to install a director who is in charge of the coordination by means of an umbrella organization.

Startup financing and continuous financial support

The municipality can do the sponsoring or assist during acquisition of sponsoring. Measures designed to avoid waste, to provide qualification and creation of jobs can be booked and sponsored continuously.

Employees

Via suitable municipal channels workers can be placed, amongst others longtime unemployed, dedicated retirees, trainees or social volunteers.

Marketing and information

The municipality may provide public advertising areas and organize informational events. In bulletins these projects may be promoted and donations asked for.

Contact and further information

- Measure C VI 5 of the contextual implementation of Art. 29 of the guideline 2008/98/EG: www.umweltbundesamt.de/sites/default/files/medien/461/publikationen/texte_38_2013_abfallvermeidungsprogramm_krause_bf_0_0.pdf p. 285 ff.
- Kempodium e. V. in Kempten – Example for mediation and repair guidance for do-it-yourself : www.kempodium.de/

Life Cycle Assessment (LCA)

Within global production systems, with spatial division of labour, environmental impacts from product supply, -use, and –disposal are mostly opaque. Life Cycle Thinking (LCT) includes different concepts, aiming at a structured description and visualization of these impacts. Existing processes are challenged or new ones designed by LCT approaches.

Until now, the best known and most holistic approach to calculate environmental impacts of goods and services is **Life Cycle Assessment (LCA)**. As an internationally standardized method, LCA results must be comparable. Following ISO 14040 and 14044 every LCA comprises the methodological phases:

1. Goal and Scope: The first phase includes information about the interest in knowledge and the target group of the assessment. The description of the scope of application determines the product system, the functional unit and the system boundaries.[32, 33]
2. Life Cycle Inventory (LCI): The inventory analysis collects material and energy flows of the product system. The flows comprise inputs (e.g. resources, area) and outputs (e.g. emissions in the atmosphere, nutrient input in soil and water).[31, 33]
3. Life Cycle Impact Assessment (LCIA): Within the LCIA, the material and energy flows of the LCI are assigned to impact categories, according to their contribution to the respective impact indicator.[32,34] The impact indicators express the environmental impacts of the functional unit on different compartments of the environment (e.g. atmosphere, water, soil), resource depletion (e.g. fossils, metals, surface, water) or the contribution to environmental processes (e.g. climate change, eutrophication). Indicators have the advantage to combine different substances, units and impact mechanisms into one impact category.
4. Interpretation of results: Results from LCI and LCIA are critically reflected on and interpreted regarding the goal of the study. The evaluation comprises the identification of significant parameters, their analysis and subsequent conclusions and recommendations.[32]

The **selection of the indicators** emerges from the European Waste Framework Directive (WFD) (DIRECTIVE 2008/98/EC) and its definition of waste prevention. The impact categories cover Waste Generation (Waste) as a proxy for the quantity of waste, representative of the impacts on the environment the Global Warming Potential (GWP), Water Depletion (WD), and Metal Depletion (MD) to include negative impacts on the atmosphere, hydrosphere and lithosphere as vital parts of the ecosphere, and finally Human Toxicity (HTox). The ReCiPe method is used for classification and characterization [34] of all indicators except Waste, as it is expressed in units of mass.

Indicator	Unit	Description
Waste Generation (Waste)	kg or t	WD is calculated by the mass of the materials discarded at the End-of-Life of the goods needed to fulfill the basic function (functional unit).The GWP reflects the impact on the atmosphere and is one of the best known and best documented indicators for environmental performance (Klöpfer and Grahl 2009). It summarizes the cumulative greenhouse gas emissions over the product life cycle.Water is a life-enabling substance. Thus, its usage represents a special kind of abiotic resource depletion. The water footprint counts as a widely known environmental indicator.The Mineral Resource Depletion evaluates the use of primary resources, some of them critical for technological progress and the maintaining of certain life styles and consumption patterns.Toxicity Indicators account for the persistence and accumulation of toxic chemicals. HTox measures represent the content of harmful substances in products. Note: According to the European Waste Framework Directive (Directive 2008/98/EC)
Global Warming Potential (GWP)	kg CO_2 eq.	
Water Depletion (WD)	m^3	
Metal Depletion (MD)	kg Fe eq.	
Human Toxicity (Htox)	kg 1.4-DB eq.	

Electronic workplaces in local authorities

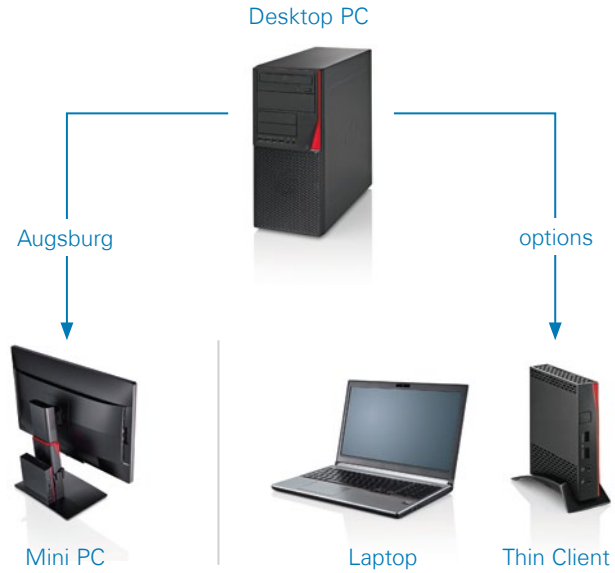
To successfully prevent the waste of electrical and electronic equipment, it is suggested to dematerialize electronic workplaces by securing the necessary scope of service in administrative offices with smaller devices such as "Mini-PC" or server-based Thin Clients (STCs) instead of Desktop Computers.

Analysed systems

Four different systems are being analysed:

A standard electronic working space consists of a workstation, monitor, mouse and keyboard. In the reference case, the workstation is a tower. The alternatives feature a laptop, a mini PC or a thin client as workstations. The thin client requires a server. Since a server supplies 100 thin clients, the server is modelled proportionally per client.

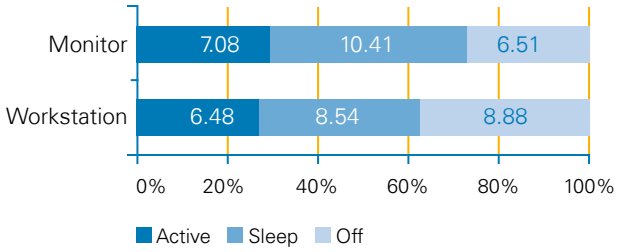
Administration of local authorities and schools are possible fields of application within local authorities.



Assumptions and modelling

The duration of usage is modelled as 4 years. This duration is selected with reference to the common usage time for electronic workspaces within local authorities (expert interviews Augsburg and Munich). The intensity of use and energy demand differs between active, sleep and off mode. The workstation is switched off more often than the monitor. Data about energy demand originates from different European studies.

Type of use [h/d]



Energy demand during usage duration [kWh]

	Active	Sleep	Off	total
Desktop PC	429.68	16.95	21.38	468.01
Laptop	175.83	23.12	11.88	210.82
Mini PC	214.84	8.48	11.09	234.40
Thin Client	63.19	14.64	15.05	92.88
Server (proportional)	8.24	11.56	11.88	31.68
LCD-monitor	195.77	8.24	4.58	208.59

Modelling (Example Thin Client)

We assume that the material composition of all products varied only slightly in the last couple of years, thus allowing us to use older data where needed. This data is adjusted to current conditions by using an adaption factor based on mass. As an example, the factor of 0.54 for the keyboard results from the average weight of a common keyboard today that accounts for 54% by weight of the existing data set.

The modelling is conducted with SimaPro and comprises all components of a Thin Client as well as the energy demand during use.

Components (Thin Client)

Thin Client	1 pc.
Server	0.004 pc.
LCD-monitor	1 pc.
Keyboard	0.54 pc.
Pointing device	1 pc.

Life Cycle Inventory (Thin Client)

Material	
Zink coated steel sheet	785.16 g
Corrugated cardboard/ chipboard	546.00 g
Capacitor	347.02 g
Acrylonitrile butadiene-styrene copolymer	345.74 g
Copper cable	180.60 g
Steel	120.70 g
Circuit board	120.59 g
Electrical plugs	96.75 g

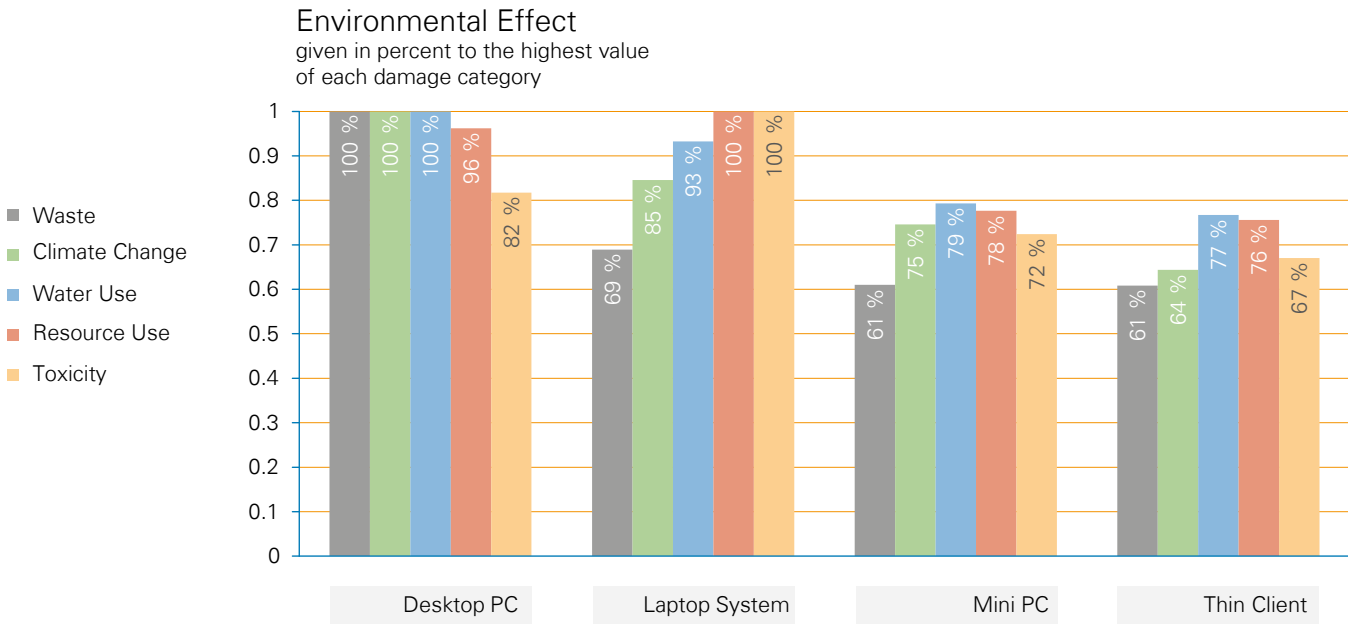
Resource use during production	
Energymix	937 MJ
Process water	384 l
Cooling water	228 l

Life Cycle Inventory (Thin Client)

This LCI presents an extract of the materials and energy flows that occur during production. Each material, sorted by material groups, accounts for more than 5% by weight of the final product.

Life Cycle Impact Assessment

The LCIAs of the analysed systems show that the use of Mini PCs or server-based Thin Clients is advantageous over the use of conventional Desktop PC or laptop systems in nearly all impact indicators. The waste prevention potential amounts to about one third compared of that of the Desktop-PC. CO2 emissions could also be reduced by up to 30%.



Waste	kg	12.23	8.43	7.46	7.44
Climate Change	kg CO_2 eq	992.63	839.62	740.28	639.09
Water Use	m^3	1.860.19	1.734.31	1.475.56	1.427.21
Resource Use	kg Fe eq	308.24	320.45	248.80	242.17
Toxicity	kg 1.4-DB eq	1.447.83	1.771.38	1.282.52	1.187.19

Sensitivity analyses and interpretation

The conducted sensitivity analyses include the variation of data concerning supply of Thin Clients per server, their technical composition and life span. Accordingly, different circuit boards are analysed. Circuit boards account for only 5% (150 g) of the total weight of Thin Clients, but for 40% of resource depletion and 50% of the toxicity values. The mass of circuit boards in Mini PCs is 50g, therefore resulting in lower impacts compared to Thin Clients. Assuming a similar size of the circuit board for both systems and a usage duration of 7 years for the server-based Thin Client, the LCIA shows more positive results for the Thin Clients.

Especially for the interpretation of an LCA of IT equipment, a time-delay needs to be factored in. The rapid change of the market and consumer demand leads to variation in weight and material composition of appliances. Simultaneously, production processes improve. Therefore, production data collected only a few months apart can result in different LCIAs.

Lifetime extensions of any good reduce waste. An extended warranty service could guarantee the functionality of devices during the use phase, which could lead to longer usage durations especially for technical appliances, vehicles or furniture. A long warranty coverage on the part of the producers also counteracts planned obsolescence and promotes repair and refurbishment. Eventually, this measure saves resources and prevents waste.

Suggested Reading

There are a lot more information and best practice examples available on the internet, via public and private institutions, science and many other agencies.

The German original guideline of this publication offers more links. This publication can be accessed via this link: https://www.bestellen.bayern.de/shoplink/stmuv_abfall_001.htm

You will find such examples by typing suitable search terms in internet browsers or ask for brochures at environmental agencies.

Good starting points are usually Environmental Agencies which provide such information or hints on their webpages.

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Note: all weblinks have been verified on 27. November 2018.

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Notes to this translation:

- The original guideline in German language was written and tailored to German municipalities. This translation contains some of the most important measures and instructions. For further information refer to the German version of the guideline.
- The letter identifier for the various measures are derived from the German keywords: e.g. 'Intensified use' relates to the German word ‚Nutzung', thus the letter identifier (N).
- Numbers have been formatted using decimal points and thousands divider commas.
- Units are all in the metric system, i.e. a ton (t) is equivalent to 1,000 kilograms.

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