Catalogue of measures

Circular bioeconomy strategy for the federal state capital Stuttgart (ZirBioS)

Version 1.3 (July 2024)

STUTTGART

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MEASURE NO.:	MEASURES
1.1	**LHS MUNICIPAL LANDSCAPING, CEMETERY AND FORESTRY AUTHORITY**
	Stockholm model for planting new roadside greenery & cross-regional exchange
	STUTTGART URBAN WASTEWATER MANAGEMENT
2.1	Reduction of greenhouse gases in wastewater treatment plants: creation of a data basis
2.2	“No wet wipes in the loo" campaign. Remove the "flushable" and "dispose of in toilet" labels
2.3	Reduction of GHGs by purchasing powdered activated carbon
	HUMAN RESOURCES DEPARTMENT
3.1	Promoting circular procurement and utilising (biological) resources throughout the product life cycle
3.2	Integration of bioeconomic criteria in the development of a negative list in procurement
3.3	Adaptation of procurement regulations to include climate- and resource-friendly aspects
	STUTTGART WASTE MANAGEMENT
4.1	Reduction of organic waste in residual waste bin
4.2	Decentralised collection points for fats and oils
4.3	Valorisation of solid and liquid digestate
4.4	Climate-friendly cat litter
	BUILDING DEPARTMENT
5.1	Reduction of the CO_2 footprint in concrete / cement
	CIVIL ENGINEERING DEPARTMENT
6.1	Use of eco-asphalt and recycled asphalt
	OB/82 ECONOMIC DEVELOPMENT
7.1	Networking of production and research infrastructure for start-ups
	S/OB CLIMATE ACTION OFFICE
8.1	Continuous updating of the bioeconomy strategy and monitoring of measures
8.2	Direct measures ZirBioS: map of bioeconomic players, networking workshops, carbon sink potentials
8.3	Develop online platform pilot projects in Stuttgart
8.4	Municipal green waste pyrolysis: analysing best practice examples and transfer of implementation options to LHS
8.5	Analysing potential and setting up implementation project for carbon capture in incineration plants
8.6	Decentralised irrigation water supply
8.7	Avoidance of food waste and material utilisation
8.8	Roof and façade greening in combination with alternative substrates (C-sinks)

Table 1: Measures according to responsibility

STOCKHOLM MODEL FOR PLANTING NEW ROADSIDE GREENERY & CROSS-REGIONAL EXCHANGE

RESPONSIBLE:	MEASURE NO.	IMPLEMENTATION OF THE MEASURE	TYPE OF MATERIAL FLOW
PUBLIC OFFICE 67	1.1	☐ Short term(<2025) ☒ Medium term (2025–2030) ☐ Long term (>2030)	GREEN WASTE

DESCRIPTION & ACTION STEPS

To date, tree substrates for planting trees in cities were primarily defined by their physical properties. Few demands were placed on the chemical and biological properties of the planting substrates in tree trenches. The makeup of tree substrates means that they are often poor at storing nutrients and water, and the availability of organic matter and nutrients is low. Consequently, soil life is almost non-existent, and there is no guarantee that the trees have a sufficient supply of nutrients.

The tree trench in accordance with the Stockholm model provides a solution here. It combines the planting pit in accordance with FLL recommendations for tree planting part 2 with a trench corresponding to an infiltration system in accordance with DWA-A 138-1. The use of biochar-based substrate fulfils or exceeds all requirements for a technical substrate. The skeleton made of coarse gravel ensures the load-bearing capacity, and the organic content is increased by filling the cavities with biochar substrate. The associated benefits such as water retention capacity (sponge city), gas exchange, nutrient supply, soil life and filter properties are optimised. Furthermore, it is possible to achieve a C-sequestration of up to 1.46 tonnes of CO_2 for each tree planted. The potential of a single tree planting with certified biochar thus corresponds to the annual C-sink potential of around 120 newly planted beech trees (see C-sink portfolio, Appendix 2 of the Circular Bioeconomy Strategy). The Stockholm model has already been applied to LHS roadside greenery. The goal is to expand its application. The legal requirements and restrictions regarding surface drainage must be observed.

MILESTONE/S

- The Stockholm model is used for all new planting of roadside greenery as long as it is not in conflict with the utilisation of the soil (e.g. pipes and cables).
- Trees that are worth conserving are rehabilitated with certified biochar substrate
- Participation in supra-regional networking meetings of municipal stakeholders

GOAL/S

- All trees, wherever possible, will be planted according to the Stockholm concept by the end of 2024. The biochar used here should be EBC-certified or similar and, if possible, come from regional production.
- This stores carbon in the soil, making young trees, in particular, more resilient and creating retention areas in heavy rainfall (sponge city)

OVERALL CONTROL

Municipal Landscaping, Cemetery and Forestry Authority

STAKEHOLDERS

Climate Action Office, Climate Protection Department, Civil Engineering Office, SCS GmbH

CONTRIBUTION TO CLIMATE PROTECTION

- Reduction of GHGs
- Carbon sequestration
- Create awareness

CONTRIBUTION TO THE BIOECONOMY

- Utilisation of materials

NECESSARY MATERIAL & HUMAN RESOURCES

Additional costs incurred as a result of planting are justified by co-benefits (e.g. sponge city, young tree survival rate)

SUCCESS INDICATORS

- Number and percentage of trees in the City of Stuttgart in line with the Stockholm model
- Survival rate of young trees

SUPPORTING MEASURES

REDUCTION OF GHGS IN WASTEWATER TREATMENT PLANTS CREATION OF A DATA BASIS

RESPONSIBLE:	MEASURE NO.	IMPLEMENTATION OF THE MEASURE	TYPE OF MATERIAL FLOW
SES	2.1	☒ Short term(<2025) ☐ Medium term (2025–2030) ☐ Long term (>2030)	GHG

DESCRIPTION & ACTION STEPS	Greenhouse gases are produced in wastewater treatment plants in various areas of wastewater treatment, sludge treatment and utilisation. Sewage sludge digestion and sludge storage can be a source of methane, while the biological wastewater treatment step and sewage sludge utilisation can be a source of nitrous oxide. The actual result depends on many factors, including the time of year and operations management. The latest findings from Switzerland and series of pilot measurements at our own Möhringen wastewater treatment plant show that the annual nitrous oxide emissions are around twice as high as previously determined via the nitrogen loads. Since each SES wastewater treatment plant differs in how it carries out its wastewater treatment and even the individual streets of a wastewater treatment plant show differences (e.g. due to the age of the basin/aggregates, adapted mode of operation, etc.), it can be assumed that differences will also be found in the quantity of nitrous oxide emissions. Consequently, a scaling of measurement data from other urban wastewater management authorities or even between SES wastewater treatment plants is only of limited use. Each wastewater treatment plant requires its own series of measurements over a period of at least one year so that the data obtained can be used to draw sound conclusions about the optimum operational management for reducing nitrous oxide. Other aspects, such as the use of energy, must also be considered and weighed against the benefits of operation optimised by means of nitrous oxide. The Mühlhausen wastewater treatment plant is the largest wastewater treatment plant in Baden-Württemberg (population equivalent of 1.2 million). The aim is to equip the Mühlhausen plant with measurement technology, as it can be assumed that the greatest climate protection effect can be achieved here through optimisation.
MILESTONE/S	• Long-term measurements of nitrous oxide emissions in sludge storage, in the aeration tank, as well as secondary clarification and sludge utilisation, if applicable • Long-term methane slip measurements in the area of sludge storage and utilisation as well as in the utilisation of sewage gas • External support, data analysis and interpretation • Development and implementation of measures to reduce emissions and leakage
GOAL/S	• Creation of a data basis • Stuttgart Urban Wastewater Management
OVERALL CONTROL	Own municipal drainage company
STAKEHOLDERS	Climate Action Office, DWA, Variolytics, Fraunhofer IGB, University of Stuttgart, UTBW
CONTRIBUTION TO CLIMATE PROTECTION	• Reduction of GHGs • Create awareness
CONTRIBUTION TO THE BIOECONOMY	• Material flow avoidance • Utilisation of materials • Energy-related utilisation
NECESSARY MATERIAL & HUMAN RESOURCES	• Measurement technology, measurement methodology • Staff to deal with measurement technology and data interpretation
SUCCESS INDICATORS	• Data is acquired as a basis for discussion • Training data sets for correlation with online wastewater parameters are available
SUPPORTING MEASURES	

“NO WET WIPES IN THE LOO" CAMPAIGN. REMOVE THE "FLUSHABLE" AND "DISPOSE OF IN TOILET" LABELS

RESPONSIBLE:	MEASURE NO.	IMPLEMENTATION OF THE MEASURE	TYPE OF MATERIAL FLOW
SES	2.2	[x] Short term(<2025) [ ] Medium term (2025–2030) [ ] Long term (>2030)	GREEN SANITARY WIPES

DESCRIPTION & ACTION STEPS	Hygiene wipes cause as yet unquantified damage to SES sewer operations and, in some instances, to the wastewater treatment facilities too. Pumping systems become clogged and the function of discharge structures is restricted by wet wipes clogging up the system. These wipes also get caught up on the vegetation on the side banks during discharge events as they float on the surface, making for an unsightly natural experience. These deposits and blockages are extremely tear-resistant and can only be removed with great effort - if at all. Dried wet wipes can only be collected by hand with a lot of effort. The aim is to reduce the amount of wet wipes in the sewers through PR work.
MILESTONE/S	• Quantify problem and impact on sewer operation by Q3 2024 (volume & pump failures) • Costs - calculate contribution to wastewater charge • Based on these findings, a target group-orientated video campaign will be carried out in line with the city of Dresden. (social media, television) • Video campaign until Q3 2024 (100,000 views, 1,000 interactions) • Creation of e.g. poster material or similar on the topic • Contacting manufacturers to communicate the correct disposal route - changing advertising or packaging labelling
GOAL/S	• Fewer maintenance cases / reduced volume of screenings • Label is removed from the packaging / population is sensitised • Self-commitment of manufacturers to remove the "flushable" label
OVERALL CONTROL	PR work undertaken by Stuttgart Urban Wastewater Management
STAKEHOLDERS	Climate Action Office, external support from graphic design office
CONTRIBUTION TO CLIMATE PROTECTION	• Reduction in total waste • Create awareness Other criteria: less maintenance work
CONTRIBUTION TO THE BIOECONOMY	• Material flow avoidance Other criteria: longer pump service life, less manpower required (in areas where occupational safety is difficult)
NECESSARY MATERIAL & HUMAN RESOURCES	
SUCCESS INDICATORS	Number of maintenance cases due to wet wipes
SUPPORTING MEASURES	

REDUCTION OF GHGS BY PURCHASING POWDERED ACTIVATED CARBON

RESPONSIBLE:	MEASURE NO.	IMPLEMENTATION OF THE MEASURE	TYPE OF MATERIAL FLOW
SES	2.3	☐ Short term(<2025) ☐ Medium term (2025–2030) ☒ Long term (>2030)	POWDERED ACTIVATED CARBON

DESCRIPTION & ACTION STEPS	The 4th treatment stage at the main wastewater treatment plant in Mühlhausen is currently being expanded. Powdered activated carbon is already being used in the secondary clarifier at a rate of approx. 700 tonnes per year. In future, far more powdered activated carbon will be required for the 4th clarification stage. The other three wastewater treatment plants in Stuttgart will probably also be equipped with a 4th clarification stage. In future tenders, care must be taken to ensure that the lower carbon footprint is used as a higher criterion than the price if the adsorption capability is the same. The use of regionally produced certified biochar is also to be examined as a potential substrate. This would close local cycles, minimise transport routes and emissions and reduce dependence on one supplier.
MILESTONE/S	• Tenders with corresponding requirements pertaining to the reduction in GHGs • Market research on alternative products to mineral powdered activated carbon • Piloting of powdered activated carbon from local pyrolysate in close cooperation with the Competence Centre Trace Elements at the University of Stuttgart
GOAL/S	• Reducing emissions when importing powdered activated carbon • Use of climate-neutral or climate-negative powdered activated carbon
OVERALL CONTROL	Stuttgart Urban Wastewater Management Authority
STAKEHOLDERS	Competence Centre Trace Elements at the University of Stuttgart
CONTRIBUTION TO CLIMATE PROTECTION	• Reduction of GHGs • Carbon sequestration • Create awareness
CONTRIBUTION TO BIOECONOMY	• Utilisation of materials
NECESSARY MATERIALS & HUMAN RESOURCES	
SUCCESS INDICATORS	Powdered activated carbon is sourced as regionally as possible
MEASURES	

PROMOTING CIRCULAR PROCUREMENT AND UTILISING (BIOLOGICAL) RESOURCES ALONG THE PRODUCT LIFE CYCLE

RESPONSIBLE:	MEASURE NO.	IMPLEMENTATION OF THE MEASURE	TYPE OF MATERIAL FLOW
10-1.2.2 ÖFS	3.1	☐ Short term(<2025) ☒ Medium term (2025–2030) ☐ Long term (>2030)	

DESCRIPTION & ACTION STEPS	The aim is to further scale circular procurement and actively implement further projects with a particular focus on the use of biogenic resources. By procuring and utilising resources in a recyclable manner, even after the first stage of use, an important contribution can be made to conserving resources or actively returning them to the cycle. Initial pilot projects are demonstrating practical implementation. For example, the closed cycle of used paper towels has already been achieved at two sites. The Stuttgart Waste Management site and the Audit Office were pilots in this project. According to current projections, over 800 kilograms of waste can be avoided within a year at the AWS and around 600 kilograms at the Audit Office or reused as a new resource for toilet paper. This corresponds to an annual CO_2 saving of over 500 kilograms of CO_2 compared to thermal recycling with energy recovery, Stuttgart City Hall has also been involved since late 2023. Another pilot project is the development of return options with an associated recycling concept for used workwear. Taking bioeconomic factors into account and recyclability is to be systematised and scaled in the future.
MILESTONE/S	• Review of all product groups for recyclable and bioeconomic criteria by the end of 2024 • Development of specific criteria for tenders and for awarding contracts • Expansion of the paper towel recycling pilot project to other centres • Implementation of other circular economy projects
GOAL/S	By consistently integrating the principles of the circular economy and bioeconomy, resources and CO_2 emissions are saved in procurement through centralised purchasing.
OVERALL CONTROL	Human Resources Department, centralised purchasing, eco-fair and social procurement
STAKEHOLDERS	Climate Action Office
CONTRIBUTION TO CLIMATE PROTECTION	• Reduction in total waste • Reduction of GHGs
CONTRIBUTION TO THE BIOECONOMY	• Utilisation of materials
NECESSARY MATERIAL & HUMAN RESOURCES	1.5 circular procurement staff posts
SUCCESS INDICATORS	• Number of centres participating in the recycling of paper towels • Weight of waste saved • Number of procurement transactions reviewed per year • Introduction of bioeconomic or circular economy criteria for X procurement processes per year • Saved CO_2 emissions
ACCOMPANYING MEASURES	

INTEGRATION OF BIOECONOMIC CRITERIA IN THE DEVELOPMENT OF A NEGATIVE LIST IN PROCUREMENT

RESPONSIBLE:	MEASURE NO.	IMPLEMENTATION OF THE MEASURE	TYPE OF MATERIAL FLOW
10-1.2.2 ÖFS	3.2	☒ Short term(<2025) ☐ Medium term (2025–2030) ☐ Long term (>2030)	

DESCRIPTION & ACTION STEPS	The goal is to develop a negative list containing products and/or product components that may not be procured because they are not compatible with minimum environmental or social standards. Bioeconomic criteria (e.g. alternative materials) are to be integrated too. Deviations from the list must then be justified by the procurement offices. The negative list of the city of Ludwigsburg can be used as an example.
MILESTONE/S	• Drawing up a negative list of products and product components that should no longer be procured (e.g. disposable tableware) • Develop alternatives as to what should/can be procured • Dissemination and widespread introduction within the city administration (e.g. digital information flyer)
GOAL/S	Development and internal administrative communication of a negative list based on the city of Ludwigsburg
OVERALL CONTROL	Human Resources Department, centralised purchasing, ecofair and social procurement
STAKEHOLDERS	• Climate Action Office
CONTRIBUTION TO CLIMATE PROTECTION	• Reduction in total waste • Reduction of GHGs
CONTRIBUTION TO THE BIOECONOMY	Material flow avoidance
NECESSARY MATERIAL & HUMAN RESOURCES	For circular procurement staff posts, see Measure 3.1
SUCCESS INDICATORS	The negative list has been developed and communicated by mid-2025
SUPPORTING MEASuRES	

ADAPTATION OF PROCUREMENT REGULATIONS TO INCLUDE CLIMATE- AND RESOURCE-FRIENDLY ASPECTS

RESPONSIBLE:	MEASURE NO.	IMPLEMENTATION OF THE MEASURE	TYPE OF MATERIAL FLOW
10-1.2.2 ÖFS	3.3	☐ Short term(<2025) ☒ Medium term (2025–2030) ☐ Long term (>2030)	

DESCRIPTION & ACTION STEPS	The Procurement and Contracting Regulations for Services and Supplies (BVO) of the City of Stuttgart aims to ensure a transparent, legally secure and non-discriminatory competitive tendering procedure. Besides observing the principle of economic efficiency and economy in procurement and awarding contracts, ecological (see Climate Action Programme, GRDrs 975/2019) and social criteria are also to be taken into consideration. These sustainability aspects must be checked in any decision. The BVO is updated regularly. As part of the upcoming adjustment, the focus will be placed on the longevity of products (checking whether a new procurement is necessary at all or whether a repair is an option) and on an information service for all LHS procurers. A further step will also integrate specific bioeconomy criteria (focus on bio-based materials to replace petroleum-based materials). Where possible, very clear and binding guidelines are to be formulated that prioritise a fundamental decision over individual decisions.
MILESTONE/S	• Initial adjustments: planned for late 2023 / early 2024 • Successive expansion • Prospective expansion of the BVO to include specific criteria (e.g. zero waste, circular economy, bioeconomy)
GOAL/S	• Integrate sustainable procurement more strongly into all tenders and in the process of awarding contracts (e.g. sustainability clause) • Increase the level of commitment with the help of the BVO
OVERALL CONTROL	Human Resources Department, centralised procurement, ecofair and social procurement
STAKEHOLDERS	Climate Action Office
CONTRIBUTION TO CLIMATE PROTECTION	• Reduction in total waste • Reduction of GHGs
CONTRIBUTION TO BIOECONOMY	• Utilisation of materials Further criteria: to forego petroleum-based materials, promoting the use of recycled materials
NECESSARY MATERIALS & HUMAN RESOURCES	Staff positions Circular procurement, see Measure 3.1
SUCCESS INDICATORS	Number of indicators related to the bioeconomy and circular economy in the BVO
MEASURES	

REDUCTION OF ORGANIC WASTE IN RESIDUAL WASTE BIN

RESPONSIBLE:	MEASURE NO.	IMPLEMENTATION OF THE MEASURE	TYPE OF MATERIAL FLOW
AWS	4.1	☒ Short term(<2025) ☐ Medium term (2025–2030) ☐ Long term (>2030)	BIOWASTE

DESCRIPTION & ACTION STEPS	Waste analyses from 2017 have shown that the total organic content of residual waste collected in Stuttgart amounts to 32.2% by mass in the coarse component. If packaged food is excluded here, a theoretically utilisable organic content of 27.1% remains (without pre-treatment). To further reduce this percentage of residual waste, AWS relies on continuous communication and training for households. These will be intensified in the future as soon as the biofermentation plant (BVA Zuffenhausen) is due to be commissioned (trial operation planned for 2025). Discussions are also currently underway with manufacturers of optical sensors that can detect waste during the collection process. The AWS hopes that this will enable it to specifically address and provide feedback to households that are recognisably sorting waste incorrectly (in addition to other aspects, some of which are safety-related - e.g. detection of batteries). The utilisation of the organic content in the BVA offers an opportunity to use this accompanying flow in a bioeconomic sense. Apart from energetic use, solid and liquid fermentation residues can be used as fertilisers, fibre materials (e.g. automotive industry) and substrates such as certified biochar and compost. This offers an opportunity to create negative emissions, provided that the carbon bound in the biowaste is sequestered in the long term.
MILESTONE/S	• Concept: public relations, focus on: print media, education (nurseries, schools), advertising in public spaces • Campaign to be implemented by mid-2025 • Monitoring the success of the campaign (continuous sampling) in late 2025 and late 2026
GOAL/S	• 2 years after the start of the campaign, the percentage of organic waste in the residual waste bin is to be reduced by 10%
OVERALL CONTROL	AWS
STAKEHOLDERS	
CONTRIBUTION TO CLIMATE PROTECTION	• Reduction in total waste • Reduction of GHGs • Create awareness • Further criteria: reduction in GHGs through less combustion
CONTRIBUTION TO BIOECONOMY	• Material flow avoidance • Utilisation of materials • Energetic utilisation
NECESSARY MATERIALS & HUMAN RESOURCES	
SUCCESS INDICATORS	• Number of people reached in the specific segments • Performance review: amount of biowaste in residual waste -> residual waste is analysed • Volume of biowaste is increased and utilised to a high standard in a biofermentation plant • Relief for residual waste treatment
MEASURES	Valorisation of solid and liquid fermentation residues (Measure 4.3)

LOCAL COLLECTION POINTS FOR FATS AND OILS

RESPONSIBLE:	MEASURE NO.	IMPLEMENTATION OF THE MEASURE	TYPE OF MATERIAL FLOW
AWS	4.2	☒ Short term(<2025) ☐ Medium term (2025–2030) ☐ Long term (>2030)	FATS AND OILS

DESCRIPTION & ACTION STEPS

The cooking oils and fats in Stuttgart households are currently disposed of in the residual waste bin or the sewage system. This also includes very small quantities from the frying pan, for example, which are fed into the sewage system during the rinsing process. Industrial quantities from the catering industry are collected by private companies with the help of grease separators and, in some cases, fed in concentrated form as high-energy material into the digestion towers of the main treatment plant in Mühlhausen. An unquantified amount of the fats and oils produced in the catering sector are exported from the City of Stuttgart and used there. Companies such as "Jeder Tropfen Zählt" offer a local collection option similar to used clothing collection points. Edible oils and fats are currently collected at 121 collection points throughout southern Germany, which are later processed into biofuel. Biodiesel for up to 20 kilometres can be produced from 1.2 litres of used cooking oil. For every kg of used cooking oil collected, an average of 40,000 litres less fresh water needs to be treated. However, collection points must be accessible at all times and must therefore be located on public roads outside the AWS premises. AWS is already looking for potential, regionally based used cooking oil buyers. If this results in a sustainable and economically viable material flow, separate collection by AWS can be developed. Besides processing further into biofuels, it is also possible to utilise the collected fats and oils locally in the SES digestion towers to generate energy. A comparison of the potential as a bio-diesel or energy source requires a specific life cycle assessment, including the transport kilometres covered. AWS will monitor the progress of the projects of "Jeder Tropfen Zählt" and other companies active in this field and evaluate them, particularly with regard to the financial and environmental development of the projects.

MILESTONE/S

- Reviewing potential regional utilisation options
- Data collection completed
- Implementation campaign

GOAL/S

- Clearly visualise and quantify the material flow
- Identify and tap into potential
- Utilisation of materials

OVERALL CONTROL

AWS

STAKEHOLDERS

Climate Action Office

CONTRIBUTION TO CLIMATE PROTECTION

- Reduction in total waste
- Reduction of GHGs
- Create awareness

CONTRIBUTION TO THE BIOECONOMY

- Material flow avoidance
- Utilisation of materials
- Energetic utilisation

NECESSARY MATERIAL & HUMAN RESOURCES

SUCCESS INDICATORS

- Quantity of oil and grease collected per year in litres

SUPPORTING MEASURES

VALORISATION OF SOLID AND LIQUID DIGESTATE

RESPONSIBLE:	MEASURE NO.	IMPLEMENTATION OF THE MEASURE	TYPE OF MATERIAL FLOW
AWS	4.3	☐ Short term(<2025) ☒ Medium term (2025–2030) ☐ Long term (>2030)	DIGESTATE

DESCRIPTION & ACTION STEPS	The construction of a biofermentation plant in Zuffenhausen is currently planned (commissioning expected in 2025). Tenders for the liquid and solid fermentation residues from the new biofermentation plant are expected to go out throughout Europe. This not only generates transport emissions, but also exports a valuable raw material from the City of Stuttgart. The solid fermentation residues can be used to produce compost, for example. However, as approx. 30% of the fixed carbon content is emitted into the atmosphere during the composting stage, and the material containing lignin is difficult to compost, alternative options need to be explored. One possibility is to produce certified biochar using a pyrolysis process. The ensuing waste heat can be fed into the local heating network and the majority of the carbon contained in it is bound in high-quality substrate in the long term. Regional utilisation of the liquid fermentation residue to enhance the own plant substrate (regardless of whether compost or biochar) is preferable to a Europe-wide tender. Moreover, the aim of the measure is to establish this material flow on the market as a liquid fertiliser.
MILESTONE/S	• Identification of local players (e.g. University of Hohenheim, University of Stuttgart, B-W Environmental Engineering, AWS, private companies, fertiliser manufacturers, German Biochar e.V., Farmers' Association) • Undertaking networking meetings with industry, research and AWS to initiate applied research for enhancing substrates • Development of a target group-orientated concept for public relations work (e.g. farmers, substrate manufacturers, associations, agricultural conferences, etc.)
GOAL/S	• Initiation of targeted research and industrial implementation • Protected resource soil – enhancement • Creation of negative emissions (C sinks)
OVERALL CONTROL	Stuttgart Waste Management
STAKEHOLDERS	Climate Action Office, University of Hohenheim, University of Stuttgart, B-W Environmental Engineering, private companies, German Biochar e.V., Farmers' Association
CONTRIBUTION TO CLIMATE PROTECTION	• Reduction of GHGs • Carbon sequestration • Create awareness
CONTRIBUTION TO BIOECONOMY	• Material flow avoidance • Utilisation of materials • Energetic utilisation
NECESSARY MATERIALS & HUMAN RESOURCES	
SUCCESS INDICATORS	Quantity of liquid and solid fermentation residues that are utilised regionally as materials
MEASURES	Stockholm model (Measure 1.1), municipal green waste pyrolysis (Measure 8.4)

CAMPAIGN FOR CLIMATE-FRIENDLY CAT LITTER

RESPONSIBLE:	MEASURE NO.	IMPLEMENTATION OF THE MEASURE	TYPE OF MATERIAL FLOW
AWS	4.4	☐ Short term(<2025) ☒ Medium term (2025–2030) ☐ Long term (>2030)	CAT LITTER

DESCRIPTION & ACTION STEPS	Cat litter made from non-sustainable, mineral raw materials (bentonite, sepiolite, clay, etc.) is used by 90% of cat owners. With a cat population of 16.7 million domestic cats in Germany, this litter produces 630,000 tonnes of annual residual waste, which is thermally recycled, and 551,000 tonnes of CO_2 through production (gas-drying) and transport (origin: Turkey, Senegal, China, Canada, etc.). Cat litter from renewable raw materials (e.g. sawdust, agricultural waste) is produced locally from renewable raw materials or waste products from wood processing. The thermal utilisation of conventional mineral cat litter produces a relatively large amount of slag. Sustainable cat litter can be fully thermally recycled. In Germany, 26% of households have at least one cat. In relation to the City of Stuttgart, this results in a domestic cat population of at least roughly 91,000 animals. A household that switches from mineral cat litter to plant-based cat litter avoids around 33 kg of CO_2 per cat per year, thanks to the lower CO_2 footprint of sustainable cat litter. This equates with an annual saving of around 3,000 tonnes of CO_2 for the entire LHS.
MILESTONES/S	• Municipal information campaign (see Geneva) • Measurement of the growth of the "plant-based cat litter" category by available market data (Nielsen/Circana, GFK, etc.)
GOAL/S	• Reduction of GHGs from cat litter
OVERALL CONTROL	Stuttgart Waste Management
STAKEHOLDERS	Cats for Future (Initiative of Plant Litter Association E.V.)
CONTRIBUTION TO CLIMATE PROTECTION	• Reduction in total waste • Reduction of GHGs • Create awareness Further criteria: recycling raw materials, increasing the volume of natural fertilisers, binding CO_2 in the soil.
CONTRIBUTION TO THE BIOECONOMY	• Material flow avoidance • Utilisation of materials • Energetic utilisation Further criteria: in contrast to mineral cat litter, plant-based cat litter, when incinerated, generates climate-neutral heat and/or energy when incinerated.
NECESSARY MATERIALS & HUMAN RESOURCES	
SUCCESS INDICATORS	Continuous measurement of sales of plant-based cat litter via the scanner trade data
ASSOCIATED MEASURES	

REDUCTION OF THE CO_2 FOOTPRINT IN CONCRETE/CEMENT

RESPONSIBLE:	MEASURE NO.	IMPLEMENTATION OF THE MEASURE	TYPE OF MATERIAL FLOW
HBA	5.1	☐ Short term(<2025) ☒ Medium term (2025–2030) ☐ Long term (>2030)	CONCRETE AND CEMENT

DESCRIPTION & ACTION STEPS	In Germany, around 20 million tonnes of CO_2 are caused by concrete and cement production every year. This corresponds to around 3% of Germany's total GHGs. The controlled pyrolysis of biomass produces usable energy and biochar, which can be used in building materials such as concrete with the appropriate authorisation and in the appropriate quality. The almost constant material properties are roughly comparable to those of R-concrete. Adding 1% biochar to concrete can offset the CO_2 footprint by up to 25%. It can be recycled, as climate-neutral concrete is completely recyclable. The carbon is fixed in the concrete for a long time and can be seen as an effective carbon sink. The use of biochar in concrete (whether in building construction or civil engineering) has so far been limited, but standardisation in Germany is expected in the short term.
MILESTONES/S	• Dialogue between municipalities and industry on the legal situation, standards, pilot experience etc. in Germany and, for example, Switzerland, Austria • Topic placement with regional concrete manufacturers, shell construction companies as well as structural engineers and fire protection experts • Clarification of construction and procurement law issues and assessment of the expected cost increase due to the measure • Initiation of a suitable pilot project with the use of climate concrete in LHS • Based on the experience gained from the pilot project, it will be examined whether a reduction in the footprint of concrete by e.g. 25% through the use of the biochar is realistic and feasible. A combination with the use of the existing recycled concrete quota is probably conceivable.
GOAL/S	• Initiation of a suitable project for the pilot testing of the use of biochar in concrete by 2025
OVERALL CONTROL	Building Department
STAKEHOLDERS	Climate Protection Department, Climate Action Office, external consultants and companies
CONTRIBUTION TO CLIMATE PROTECTION	• Reduction of GHGs • Carbon sequestration • Create awareness
CONTRIBUTION TO BIOECONOMY	• Utilisation of materials
NECESSARY MATERIALS & HUMAN RESOURCES	Funds for any additional costs arising from the implementation of pilot projects
SUCCESS INDICATORS	• PR work concerning the measure • Establishment of the process / materials in the market / construction sector • Identification of CO_2 savings and consideration of economic efficiency / cost development compared to conventional concrete
ASSOCIATED MEASURES	

USE OF ECO-ASPHALT AND RECYCLED ASPHALT

RESPONSIBLE:	MEASURE NO.	IMPLEMENTATION OF THE MEASURE	TYPE OF MATERIAL FLOW
CIVIL ENGINEERING DEPARTMENT	6.1	☐ Short term(<2025) ☒ Medium term (2025–2030) ☐ Long term (>2030)	ASPHALT BINDING AGENT

DESCRIPTION & ACTION STEPS	The carbon footprints of the asphalt mixtures currently used in road construction show high greenhouse gas emissions, which are primarily attributable to the production of asphalt mixtures and the extraction of raw materials. Significant CO_2 savings can be achieved through lower production temperatures, the use of recycled asphalt material and the use of bio-based binders. For example, CO_2 emissions during production and transport can be reduced by up to 70% by combining recycled asphalt and low-temperature asphalt. Recycled asphalt is obtained by dismantling old asphalt carriageways. The road surface is peeled off by a large milling machine, crushed and, after a chemical analysis, taken to the asphalt mixing plant for reuse. The percentage of recycled asphalt in new road construction can be up to 80%. Furthermore, low-temperature asphalt mainly reduces local emissions during production by reducing the amount of primary energy required (approx. 9 kWh/tonne of asphalt mix when the temperature is lowered by 30 °C). The binding agent (bitumen) obtained from crude oil can be replaced by a biological binding agent. This binding agent obtained from the shell oil of cashew nuts does not conflict with food production and enables the production of CO_2-negative types of asphalt. This results in additional logistical advantages due to procedural simplifications. The best results are achieved by combining all 3 measures. In 2023, the Civil Engineering Public Office added service items for the use of recycled materials to the service book for civil engineering, gardening and landscaping. The aim is to implement the first eco-asphalt pilots and scale up the use of low-temperature asphalt.
MILESTONE/S	• In 2024, further projects will be carried out using low-temperature asphalt. • In a road construction project in 2024, bio-asphalt with a binding agent made from nutshells are used on a test strip.
GOAL/S	• Reduction of emissions in the production of asphalt • Substitution of fossil substances such as bitumen with biological substances
OVERALL CONTROL	Civil Engineering Public Office
STAKEHOLDERS	Building Department (DLZ)
CONTRIBUTION TO CLIMATE PROTECTION	• Reduction in total waste • Reduction of GHGs • Carbon sequestration • Create awareness Further criteria: the need for primary raw materials and primary energy is significantly reduced. When using binders made from nutshells, mineral oil bitumen can be largely dispensed with.
CONTRIBUTION TO THE BIOECONOMY	• Material flow avoidance • Utilisation of materials • Energetic utilisation
NECESSARY MATERIAL & HUMAN RESOURCES	Additional maintenance funds are required for the construction of roads and paths. Co-operation with construction companies and the building materials industry is expedient.
SUCCESS INDICATORS	Areas created with recycled and eco-asphalt per year
SUPPORTING MEASURES	

NETWORKING OF PRODUCTION AND RESEARCH INFRASTRUCTURE FOR START-UPS

RESPONSIBLE:	MEASURE NO.	IMPLEMENTATION OF THE MEASURE	TYPE OF MATERIAL FLOW
OB / 82	7.1	☐ Short term(<2025) ☒ Medium term (2025–2030) ☐ Long term (>2030)	

DESCRIPTION & ACTION STEPS	Start-ups play a key role as drivers of innovation - including innovations in the bioeconomy. At the same time, there is often the challenge of not having access to sufficient production and research infrastructure, as financial and time resources are limited, especially in the start-up phase. Currently, production and research infrastructure in Stuttgart, both private and public, is often not readily available for start-ups. With regard to the efficient utilisation of existing resources, it would therefore be desirable if start-ups could be granted easy access in the future. The so-called "matching" between start-ups and potential providers is crucial to success, and legal protection is essential for both sides. The aim is for the economic development agency to draw up cooperation agreements with the relevant companies and research institutions in order to minimise the hurdles to concrete cooperation. Care must be taken to ensure that procurement and tendering guidelines and state aid law are complied with.
MILESTONE/S	• Presentation and communication of the existing assistance available for start-ups • Identification of willing providers • Identification of possible cooperation models • Drawing up of a model cooperation agreement
GOAL/S	• Create at least one match • Making three locations with existing infrastructure usable for start-ups by the end of 2025
OVERALL CONTROL	Economic development
STAKEHOLDERS	Climate Action Office, BIOPRO, UT BW
CONTRIBUTION TO CLIMATE PROTECTION	• Reduction in total waste • Reduction of GHGs • Create awareness
CONTRIBUTION TO BIOECONOMY	• Material flow avoidance • Utilisation of materials
NECESSARY MATERIALS & HUMAN RESOURCES	0.5 full-time equivalents
SUCCESS INDICATORS	• Number of matches created • Number of research institutions and companies willing to co-operate
ASSOCIATED MEASURES	

CONTINUOUS UPDATING OF THE BIOECONOMY STRATEGY AND MONITORING OF MEASURES

RESPONSIBLE:	MEASURE NO.	IMPLEMENTATION OF THE MEASURE	TYPE OF MATERIAL FLOW
S / OB CLIMATE	8.1	☒ Short term(<2025) ☐ Medium term (2025–2030) ☐ Long term (>2030)	

DESCRIPTION & ACTION STEPS	The bioeconomy strategy comprises 22 measures in 9 departments and municipal enterprises. As it is the first time that Stuttgart has tackled this complex topic across all departments, this strategy can only be an initial step and must be continuously developed. The rapidly developing technological approaches to bioeconomy, in particular, will make further measures possible and economically viable in a few years' time. A central coordination centre is to be set up to ensure the ongoing development of the field of action and the coordinated implementation of this complex project. This is to assume the following tasks: • Coordination of the implementation of measures and working groups • Monitoring the implementation of measures including success indicators • Preparation of an annual progress report for the municipal council and the general public • In particular, support for highly relevant medium to long-term measures (e.g. carbon capture in incineration plants) • New survey of material flows every 2 years at the latest and new potential analysis based on this • Monitoring the research landscape (e.g. carbon capture in combustion processes, CCU, pyrolysis, climate concrete, irrigation water supply) to identify new bioenomic technologies, passing on the information to the specialist departments and examining the implementation in the city administration • Development and continuation of supra-regional networking with municipalities and regions to identify examples of best practice • Supporting the specialist departments in planning and implementing measures • Support for an internal LHS process to account for negative emissions and urban C sinks As Stuttgart is the first major German city to develop a bioeconomy strategy, it can be assumed that the strategy will serve as a blueprint for other municipalities. A centralised office is also useful for processing these enquiries.
MILESTONE/S	• The first report on the implementation status of the bioeconomy strategy was submitted to the municipal council and the public (2025) • The first update of the material flow analysis was carried out (2026)
GOAL/S	• From 2025, the administration will inform the municipal council in an annual report and the general public on the implementation status of the bioeconomy strategy. • New measures will be initiated on a regular basis
OVERALL CONTROL	Climate Action Office
STAKEHOLDERS	All participating offices and in-house operations
CONTRIBUTION TO CLIMATE PROTECTION	• Reduction of total waste, drop in GHGs, carbon sequestration
CONTRIBUTION TO THE BIOECONOMY	• Material flow avoidance, material utilisation, energetic utilisation
MATERIAL REQUIRED & HUMAN RESOURCES	Continuation of bioeconomy coordination centre, 1.0 full-time equivalents
SUCCESS INDICATORS	• Continual increase in the degree of measures that are or have been implemented • Continual increase in target fulfilment for the performance indicators across all measures
SUPPORTING MEASURES	8.2 (direct measures), 8.3 (online platform)

DIRECT MEASURES ZIRBIOS: MAP OF BIOECONOMIC PLAYERS, NETWORKING WORKSHOPS, CARBON SINK POTENTIAL

RESPONSIBLE:	MEASURE NO.	IMPLEMENTATION OF THE MEASURE	TYPE OF MATERIAL FLOW
S / OB CLIMATE ACTION OFFICE	8.2	[x] Short term(<2025) [ ] Medium term (2025–2030) [ ] Long term (>2030)	

DESCRIPTION & ACTION STEPS	The bioeconomy aims to close biogenic cycles with knowledge-based (new) approaches. However, this way of doing business can only be designed for and with the relevant stakeholders who identify with the relevant context. Naming relevant stakeholders and their geographical location (e.g. in the form of an interactive map) serves as a basis for bringing those groups of people together. Many start-ups, SMEs as well as public authorities and in-house companies deal with biogenic (residual) materials on a daily basis, but would not initially identify themselves as bioeconomy players. The respective stakeholders are informed through expert discussions and workshops which, on the one hand, benefits the growing bioeconomy scene and, on the other hand, can open up access to new funding pots and networks for young companies in particular. Another direct measure pursues the goal of identifying urban carbon sinks (e.g. urban biomass, climate concrete, climate asphalt, Stockholm model) and quantifying their potential for the first time. This carbon sink portfolio can serve as a basis for discussion on topics such as negative emissions.
MILESTONE/S	• The stakeholder map has been developed. The identified stakeholders are integrated into existing interactive maps of Stuttgart (e.g. jetztklimachen.de) • The stakeholders are fed into a supra-regional bioeconomy platform • Organisation of a workshop for the administrative offices and in-house operations in Stuttgart • Workshop in the field of start-ups & SMEs • The first pilot project on urban carbon sinks was initiated (e.g. climate concrete, façade greening, Stockholm model) • A process to account for negative emissions and urban C sinks has been started
GOAL/S	• Companies that supply or process raw materials identify themselves with the term bioeconomy • There are not countless small initiatives on websites with few visitors, but rather a single and intuitive platform for networking bioeconomy stakeholders • Urban carbon sinks are established and centrally controlled.
OVERALL CONTROL	Climate Action Office
STAKEHOLDERS	Urban BioeconomyLab, BioBall, BioeconomyREVIER, University of Geisenheim, Ministry for the Environment, Climate and Energy Management Ba-Wü, UT BW, Start-ups, all participating administrative offices and municipal companies
CONTRIBUTION TO CLIMATE PROTECTION	• Carbon sequestration • Create awareness
CONTRIBUTION TO BIOECONOMY	• Material flow avoidance • Utilisation of materials • Energetic utilisation • Further criteria: creating a data basis, networking
NECESSARY MATERIALS & HUMAN RESOURCES	Continuation of bioeconomy coordination centre for regular updates, see Measure 8.1
SUCCESS INDICATORS	Number of networked players Number of pilot projects launched Amount of sequestered carbon
ASSOCIATED MEASURES	8.1 (Further description of bioeconomy)

ONLINE PLATFORM FOR BIOECONOMY PROJECTS IN STUTTGART

RESPONSIBLE:	MEASURE NO.	IMPLEMENTATION OF THE MEASURE	TYPE OF MATERIAL FLOW
S / OB CLIMATE ACTION OFFICE	8.3	[x] Short term(<2025) [ ] Medium term (2025–2030) [ ] Long term (>2030)	

DESCRIPTION & ACTION STEPS	There are many projects and campaigns within the individual administrative offices and in-house operations that deal with sub-topics of the bioeconomy. In order to network individual players and make these projects accessible to both a wider circle of employees and the general public, they need to know about each other. A digital presentation of interesting projects on an existing, centralised online platform serves as the first step in this networking and the basis for coordinated and efficient cooperation. The respective project presentation will take place in close coordination with the participating offices and in-house operations. The online presence is constantly being expanded and updated in line with the dynamic field of activity.
MILESTONE/S	• Brief descriptions of relevant projects were collected by summer 2024 • The projects are presented on the online platform jetzklimachen.de until autumn 2024
GOAL/S	• From autumn 2024, there will be a central contact point for interested parties where essential activities of the bioeconomy in Stuttgart are on display
OVERALL CONTROL	Climate Action Office
STAKEHOLDERS	All participating administrative offices and in-house operations
CONTRIBUTION TO CLIMATE PROTECTION	• Create awareness
CONTRIBUTION TO THE BIOECONOMY	• Material flow avoidance • Utilisation of materials • Energetic utilisation Further criteria: collection of projects and initiatives as a basis for discussion
MATERIAL REQUIRED & HUMAN RESOURCES	Continuation of bioeconomy coordination centre for regular updates, see Measure 8.1
SUCCESS INDICATORS	Number of projects presented online
SUPPORTING MEASURES	8.1 (Further description of bioeconomy)

MUNICIPAL GREEN WASTE PYROLYSIS: ANALYSIS OF BEST PRACTICE EXAMPLES AND TRANSFER OF IMPLEMENTATION OPTIONS TO STUTTGART

RESPONSIBLE:	MEASURE NO.	IMPLEMENTATION OF THE MEASURE	TYPE OF MATERIAL FLOW
S / OB CLIMATE ACTION OFFICE	8.4	[x] Short term(<2025) [ ] Medium term (2025–2030) [ ] Long term (>2030)	GREEN WASTE

DESCRIPTION & ACTION STEPS

In Stuttgart, municipal green waste is mainly used to generate energy and is partly composted. Both processes emit GHGs. The pyrolysis of municipal green waste offers an opportunity to utilise the green waste as both a material and a source of energy. The waste heat released in the pyrolysis process can be used to generate energy (e.g. fed into the local heating network), while the biochar produced represents an option for carbon sequestration. The fixed carbon in biochar is stable for several hundred years in certified production and cannot be mineralised (negative emission). The possibility of a tour of the green waste pyrolysis plant in Darmstadt was discussed in the course of a bioeconomy workshop organised by the administrative offices and in-house operations of Stuttgart. This is scheduled to take place in spring 2024. Transfer options for Stuttgart will then be developed. The biochar produced can be used, for example, for Stuttgart's urban trees (see Measure 1.1 Stockholm model). It should be noted that the use of green waste for pyrolysis is always in competition with other utilisation options. When considering whether and what quantities of green waste are suitable for local pyrolysis, it is important to consider, among other things, how much CO_2 can be stored in the long term and what quantities of climate-neutral energy can be generated in contrast to comparable technologies, especially wood-fired systems.

MILESTONE/S

- Trip to Darmstadt to visit a green waste pyrolysis plant in spring 2024
- Workshop on the development of transmission options for the City of Stuttgart with specialists from the Stuttgart region
- A feasibility study for a green waste pyrolysis plant will be commissioned

GOAL/S

- Supra-regional exchange with best-practice examples
- Discuss transfer options for Stuttgart

OVERALL CONTROL

Climate Action Office

STAKEHOLDERS

Dr Veser, Garden, Cemetery and Forestry Office, Stuttgart Waste Management, companies, Climate Protection Department, research institutes, UT BW, SCS

CONTRIBUTION TO CLIMATE PROTECTION

- Reduction of GHGs
- Carbon sequestration

CONTRIBUTION TO BIOECONOMY

- Create awareness
- Utilisation of materials
- Energetic utilisation

NECESSARY MATERIALS & HUMAN RESOURCES

Continuation of bioeconomy coordination centre for regular updates, see measure 8.1
Budget for feasibility study

SUCCESS INDICATORS

- Quantity of CO_2 eq. removed from the CO_2 cycle and stored in the long term are stored (negative CO_2 eq. emissions)
- CO_2 eq. avoidance costs

ASSOCIATED MEASURES

1.1 (Stockholm model), 4.3 (valorisation of fermentation residues), 8.8 (green roofs and façades)

ANALYSIS OF POTENTIAL AND SETTING UP IMPLEMENTATION PROJECT FOR CARBON CAPTURE IN INCINERATION PLANTS

RESPONSIBLE:	MEASURE NO.	IMPLEMENTATION OF THE MEASURE	TYPE OF MATERIAL FLOW
S / OB CLIMATE ACTION OFFICE	8.5	☐ Short term(<2025) ☐ Medium term (2025–2030) ☒ Long term (>2030)	GHG

DESCRIPTION & ACTION STEPS	CO_2 is not only a greenhouse gas, the carbon it contains is also an important raw material for industry. The incineration of biomass in wood combustion plants or biogas in CHPs releases climate-relevant carbon dioxide and nitrogen oxide into the atmosphere. A comprehensive, deep and rapid reduction in emissions is essential for achieving the Paris Climate Targets (IPCC 2023, Smith et. al 2023). In addition, the future removal of CO_2 from the atmosphere is a supplementary, but as yet insufficient component. Based on current knowledge, it is very likely to be more favourable to minimise additional emissions of climate-relevant gases instead of capturing them from the atmosphere on a large scale in the future using a lot of energy (CCS; Carbon Capture and Storage or CCU; Carbon Capture and Utilisation). The aim of this measure is therefore to explore technologies that can capture unavoidable CO_2 before it is released into the atmosphere. This is particularly useful at CO_2 point sources such as waste incineration plants. This process can, for example, produce valuable raw materials such as C1 hydrocarbons for bioplastics, biofuels, organic soil improvers or carbon black from CO_2. These new raw materials can replace natural gas or oil-based products and do not contribute to any additional greenhouse effect in the atmosphere, at least for the lifetime of the resulting product. However, CCU should not be seen as a real CO_2 sink, as it is not permanent. The technical separation of CO_2 from the air (DAC, Direct Air Capture) or from combustion exhaust gases is currently associated with high technical, energy and financial costs. Only when electricity is produced entirely from renewable sources should DAC be considered.
MILESTONE/S	• Tour of the Biogas-Fond GmbH Nördlingen demonstration plant and comparable plants • Examine possibilities for application and separation potential in Stuttgart (e.g. feasibility study) • Pilot projects in CHP plants, wood combustion plants and industrial plants in Stuttgart
GOAL/S	• Unavoidable CO_2 emissions from incineration plants should not be included in the atmosphere • Carbon capture from emissions and use for non-petroleum-based fuels Alternative products
OVERALL CONTROL	Climate Action Office
STAKEHOLDERS	Biogas-Fond GmbH, Environmental Engineering B-W, Fraunhofer IGB, SES, Climate Protection Department, WRS, Innovation Hub CCUBIO
CONTRIBUTION TO CLIMATE PROTECTION	• Carbon sequestration
CONTRIBUTION TO THE BIOECONOMY	• Material flow avoidance • Utilisation of materials • Energetic utilisation
MATERIAL REQUIRED & HUMAN RESOURCES	Continuation of bioeconomy coordination centre for regular updates, see measure 8.1 Travel expenses
SUCCESS INDICATORS	Continual reduction in CO_2 released into the atmosphere at CO_2 point sources
SUPPORTING MEASURES	

DECENTRALISED IRRIGATION WATER SUPPLY

RESPONSIBLE:	MEASURE NO.	IMPLEMENTATION OF THE MEASURE	TYPE OF MATERIAL FLOW
S / OB CLIMATE ACTION OFFICE	8.6	[x] Short term(<2025) [ ] Medium term (2025–2030) [ ] Long term (>2030)	OPERATING AND IRRIGATION WATER

DESCRIPTION & ACTION STEPS

It can be assumed that the green spaces and roadside greenery in Stuttgart will be increasingly affected by periods of drought. In future, mainly rainwater or service water will be used for watering the green areas to avoid wasting drinking water. At the same time, the body of groundwater must be protected and built up. The provision and application of irrigation water is currently the responsibility of different departments. There are central water distribution points at the Mühlhausen, Plieningen and Möhringen wastewater treatment plants, and the water is picked up by trucks from Stuttgart's Landscaping, Cemetery and Forestry Department. The aim is to develop a decentralised irrigation water concept for Stuttgart. For example, the construction of large cisterns offers an opportunity to collect rainwater, buffer heavy rainfall events and provide decentralised irrigation water. Besides the sensible storage and use of rainwater, the distances travelled by the irrigation carriages and the ensuing emissions can be minimised. Furthermore, innovative approaches to decentralised irrigation water supply are to be investigated. Depending on the nature of the catchment area (e.g. industrial sites, proximity to roads), restrictions may apply with regard to utilisation as irrigation water from the point of view of soil and groundwater protection.

MILESTONE/S

- Networking meeting with Stuttgart's Urban Wastewater Management, Climate Protection Department (Lower Water Authority + Urban Climatology), Landscaping, Cemetery and Forestry Office, Fraunhofer IGB to collect ideas
- Tour of the ECO Water Solution system technology
- Determine the scalability of the individual options
- Implement construction measures and pilots

GOAL/S

Wherever possible, only service water is used for watering municipal areas (e.g. roadside greenery, parks) without negatively impacting water bodies, the sewage treatment plant or the sewage system.

OVERALL CONTROL

Climate Action Office

STAKEHOLDERS

Stuttgart Urban Wastewater Management, Landscaping, Cemetery and Forestry Office, Climate Protection Department,
ReWaterCity, Fraunhofer IGB

CONTRIBUTION TO CLIMATE PROTECTION

- Reduction of GHGs
- Create awareness

CONTRIBUTION TO BIOECONOMY

- Utilisation of materials

NECESSARY MATERIALS & HUMAN RESOURCES

Continuation of bioeconomy coordination centre for regular updates,
see measure 1.1

SUCCESS INDICATORS

- Networking is established
- Construction measures and pilot projects have started

ASSOCIATED MEASURES

AVOIDANCE OF FOOD WASTE AND MATERIAL UTILISATION

RESPONSIBLE:	MEASURE NO.	IMPLEMENTATION OF THE MEASURE	TYPE OF MATERIAL FLOW
S / OB CLIMATE ACTION OFFICE	8.7	[x] Short term(<2025) [ ] Medium term (2025–2030) [ ] Long term (>2030)	FOOD WASTE

DESCRIPTION & ACTION STEPS

According to the Federal Statistical Office, around 11 million tonnes of edible food are disposed of every year in Germany alone. In Stuttgart this works out to be 82,900 tonnes. Around 59% of this is generated in private households and 17% in out-of-home catering.
Stuttgart would like to encourage organisations and private individuals to become active themselves and save edible food from the bin by providing concrete assistance. This includes the development of guidelines for a public "food distribution point", events for food waste networking (e.g. youth education) and waste measurements in local authority facilities.
The latter can be achieved by participating in food waste fair weeks and raising awareness in municipal company restaurants, among other things. To this end, an analysis of the four categories of storage, preparation, serving and plate returns should make transparent where the majority of food waste occurs. This enables the most precise measures possible to be derived.In future, what cannot be avoided will be processed in bioeconomic processes. This means that material use (e.g. basic chemicals or fibre materials) can take precedence over energetic use.

MILESTONE/S

- Creation of a guideline for public food fair distributors to promote the civil society involvement (integration of strategic social planning) in the neighbourhoods to avoid food waste
- Food waste fair weeks in one of the two municipal canteens (repeated survey after 9-12 months)

GOAL/S

- Long-term awareness among staff and guests in municipal canteens and the general public

OVERALL CONTROL

Climate Protection Office

STAKEHOLDERS

Municipal canteens, Stuttgart Education Partnership Department, Strategic Social Planning

CONTRIBUTION TO CLIMATE PROTECTION

- Reduction of GHGs
- Carbon sequestration
- Create awareness

CONTRIBUTION TO THE BIOECONOMY

- Material flow avoidance
- Utilisation of materials
- Energetic utilisation

MATERIAL REQUIRED & HUMAN RESOURCES

SUCCESS INDICATORS

- Avoided amount of food waste in tonnes
- Number of "food distribution points" integrated into neighbourhood life in the City of Stuttgart

SUPPORTING MEASURES

ROOF AND FAÇADE GREENING IN COMBINATION WITH ALTERNATIVE SUBSTRATES (C-SINKS)

RESPONSIBLE:	MEASURE NO.	IMPLEMENTATION OF THE MEASURE	TYPE OF MATERIAL FLOW
S / OB CLIMATE ACTION OFFICE	8.8	☐ Short term(<2025) ☒ Medium term (2025–2030) ☐ Long term (>2030)	BIOMASS

DESCRIPTION & ACTION STEPS	Green roofs and façades offer a great deal of potential for urban climate adaptation. Due to Stuttgart's basin location, in particular, climate adaptation to hotter summers and heavy rainfall events, for example, is of great importance (see Stuttgart Climate Change Adaptation Concept 2024). Green roofs and façades have a positive effect on air pollution control, heat protection, rainwater management, biodiversity (e.g. birds and insects) and a general improvement in the urban microclimate and quality of life. Roof and façade greening is common practice in everyday planning and construction. Stuttgart already leads the German city comparison with 4.1 m^2 of green roof per inhabitant. One previously untapped potential of green roofs and façades is the ability to remove carbon from the atmosphere and build up urban biomass. Currently, volcanic rock substrates are still frequently used, which have a high CO_2 footprint. Consequently, it makes sense to use alternative plant substrates with similar or better properties, such as certified biochar. This would allow 0.8 tonnes of CO_2 per m^3 of biochar used to be sequestered in Stuttgart. The certified biochar should be made from local, organic residues wherever possible.
MILESTONE/S	• Use of certified biochar for roof and façade greening in tenders where feasible • Prioritisation of alternative plant substrates over volcanic substrates • Piloting of certified biochar as a roof and façade substrate • Public relations work on the use of certified biochar as a substrate
GOAL/S	• Expansion of the use of certified biochar for green roofs and façades where feasible • From 2030, 100% of all new substrates used must be based on certified biochar
OVERALL CONTROL	S / OB Climate Action Office
STAKEHOLDERS	Building Department, Climate Action Office, Landscaping, Cemetery and Forestry Office, Climate Protection Department, City Planning Office
CONTRIBUTION TO CLIMATE PROTECTION	• Reduction of GHGs • Carbon sequestration • Create awareness
CONTRIBUTION TO BIOECONOMY	• Utilisation of materials
NECESSARY MATERIALS & HUMAN RESOURCES	Funds for possible additional costs arising from the implementation of pilot projects
SUCCESS INDICATORS	see goals
MEASURES	Measure 1.1 (Stockholm model)

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