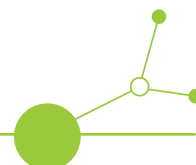


# D1.2.1 Report

Ecological goals for restoration of the  
study streams



Version 1  
MM YYYY





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# EXECUTIVE SUMMARY

The ecological perspective led by TU Dresden, Institute for Hydrobiology, assesses and evaluates the current ecological status, analyses relevant ecosystem services, and carries out deficit analysis to identify hydromorphological pressures and establish ecological goals for restoration to enhance connectivity and foster biodiversity. Defining goals for restoration is an important step towards appropriate restoration attempts and in order to evaluate the success or effect of restoration measures.



## A. Purpose and objectives

A core question of restoration ecology is the definition of success. Urban streams face a wide range of ecological challenges. Functional restoration to reach good ecological reference conditions is often not possible due to chemical contamination, strongly fluctuating hydrological condition, a lack of space for natural dynamics, a limited species pool for recolonization and many instream migration barriers. On the other hand, it is a missed opportunity for the increase of biodiversity or functional species richness to capitulate and only enhance urban streams in terms of human aesthetic norms. Within ReBioClim we work on these conflicts in urban stream restoration. The international research project identifies and analyses the current urban challenges and opportunities for river restoration from different perspectives in four different countries and extract the trade-offs between social and ecological requirements in the context of urban planning and institutional settings. This enables the project team to develop socio-ecologically integrated solutions for urban multifunctional areas that provide ecosystem services and climate adaptation, promote biodiversity and take into account urban planning.

From an ecological perspective, the following questions arise: What are the ecological possibilities for urban stream restoration? What could be a biological reference system for urban streams?

We have developed a comprehensible method for setting ecological restoration goals for urban streams. These are based on chemical, geomorphological and biological data collection and stressor analysis. This allows to prioritise urban stressors and set restoration targets. We consider spatial and administrative constraints to formulate ecological targets that are understandable, measurable and achievable.

These criteria are particularly important as ecological restoration targets are combined with urban-spatial analysis and socio-economic objectives as the basis for stakeholder co-design workshops, and are made available to communities as projects are implemented in our river sites.

## B. Methods

### 1. Literatur Research

ReBioClim aims to restore urban streams in a community based approach based on scientific metrics. To get an overview over scientific based approaches a literature research in Web of Science (WOS) was conducted to get an overview of methods to identify urban stream ecology restoration goals. The aim was to identify publications that deal with the setting of goals for a socio-ecological urban stream restoration project. The following search string was used in WOS:

*TS=((stream OR freshwater OR running water OR flowing water) AND (restorat\* OR renature\* OR enhance) AND (goals OR goal OR objective\* OR success Or target\*) AND (urban OR cit\*) NOT (marine OR ocean OR energy))*

The query resulted in 776 Results (27.02.2025) which were filtered by adjusting the timespan of publication date for the last ten years (2025-2015) to consider current mode of conduct and applying the research question: Does the study elaborate on goals for urban stream restoration? One older study (Palmer et al., 2005) was considered as it dealt with setting of standards for ecologically successful river restoration. The



majority of studies dealt with various questions on (urban) stream restoration. Only eight studies, were extracted which dealt with setting of restoration goals specifically.

Additionally, the AI Research Assistant Elicit was applied with the research question: "What is the best method to identify urban stream ecology restoration goals". The AI based search assistant scanned 126 million academic papers from the Semantic Scholar corpus and provided ten studies that described five distinct methods for identifying urban stream restoration goal. Deleting double hits and applying the set publication time frame resulted in another two studies. The literature research resulted in eleven studies, which dealt with the setting of urban stream restoration goals.

## 2. Data acquisition

In ReBioClim, a multiperspective approach on urban stream restoration was conducted for all four partner cities and streams (**Fehler! Verweisquelle konnte nicht gefunden werden.**). To gain an understanding of the ecological status of our project stream data acquisition through our local partners and web resources was necessary.

Table 1 Overview of ReBioClim partner cities and streams

| Country        | County/Region  | City               | Project Stream |
|----------------|----------------|--------------------|----------------|
| Slovakia       | Trnavský kraj  | Senica             | Teplica        |
| Germany        | Sachsen        | Dresden            | Geberbach      |
| Poland         | Wielkopolskie  | Poznań             | Piaśnica       |
| Czech Republic | Liberecký kraj | Jablonec nad Nisou | Bílá Nisa      |

### 2.1. Public Resources

As all partner countries are subject to Water Framework Directive (WFD) (2000/60/EC) the first step was to obtain open access monitoring data of stream morphology, benthic invertebrates and fishes. Furthermore, local partners were asked to obtain data on hydro morphological features such as discharge, geomorphological type, stream velocity and chemical pollution. Here is a list of identified open access web resources:

- European level:
  - WDF Results: <https://discomap.eea.europa.eu/wise-freshwaterviewer/?page=Page&views=Ecological-Status%2CLayer> (12.06.2025) Jurisdiction: European Commission and the European Environment Agency (EEA).  
ESA WorldCover: <https://doi.org/10.5281/zenodo.7254221>, (10.06.2025), Jurisdiction: European Space Agency
- National Level:
  - Czech Republic
    - > Geomorphological Type:  
<https://vuv.maps.arcgis.com/apps/webappviewer/index.html?id=6a6a8ec85cc9452bba069147ecd9ada4> (12.06.2025), Jurisdiction: CUZK



- > Hydromorphology:  
<https://hydro.chmi.cz/hpps/?id=act&key=map&sx=1691250.3976558652&sy=6575027.318561342&sz=8> (12.06.2025), Jurisdiction: Český hydrometeorologický ústav (Czech Hydrometeorological Institute)
- Germany
  - > WFD Results, geomorphological type, stream/river fact sheets:  
<https://geoportal.bafg.de/wfdmaps2017/#> (12.06.2025), Jurisdiction: Bundesanstalt für Gewässerkunde (BfG)
  - > Saxony:  
Morphological, chemical, biological data stream data, fact sheets, :  
<https://www.umwelt.sachsen.de/umwelt/infosysteme/ida/> (12.06.2025), Jurisdiction: Sächsisches Landesamt für Umwelt, Landwirtschaft und Geologie (LfULG)  
Discharge and in-stream barriers:  
[https://www.umwelt.sachsen.de/umwelt/infosysteme/mnqhq-regio/website/?whereClause=AKZ%20IN\(%2705113%27\)](https://www.umwelt.sachsen.de/umwelt/infosysteme/mnqhq-regio/website/?whereClause=AKZ%20IN(%2705113%27)) (12.06.2025), Jurisdiction: Sächsisches Landesamt für Umwelt, Landwirtschaft und Geologie (LfULG)  
Nutrient inputs into Saxon waters: <https://www.viewer.stoffbilanz.de/start/> (12.06.2025), Jurisdiction: Sächsisches Landesamt für Umwelt, Landwirtschaft und Geologie (LfULG)
- Poland
  - > Status of surface water bodies and additional data:  
<https://wody.gios.gov.pl/pjwp/publication/367> (12.06.2025), Jurisdiction: Department of Environmental Monitoring of the Chief Inspectorate for Environmental Protection (GIOS)
- Slovakia:
  - > No public resources found

## 2.2. Non-public resources

Local partners were able to provide further non-public data and collect specific data for the project streams:

- Jablonec nad Nisou: Biological report for the Bílá Nisa project site (Michal Pravec, 2024)
- Poznań: Historical Chemical Data for Cybina River
- Senica: Results of WFD, In-stream barriers, overview illegal discharges
- Dresden: Monitoring results amphibian species

## 2.3. Data collection

As the data availability was inconsistent in the four project cities, further data on stream morphology and biology needed to be collected within the project. To collect consistent stream morphology data the application of one common methodology was agreed upon: Applied procedural methodology for small urban watercourses (Renner et al., 2018). The methodology was translated from German into English language and provided to local partners to map the stream structure.



To increase the knowledge on stream biology for our project streams and set the groundwork for post-restoration monitoring sampling campaigns were agreed upon. Regional partners in Sencia and Poznan agreed on sampling campaigns for benthic macroinvertebrates (mzb) according standardised WFD procedure:

- Multihabitat sampling (20 Habitats +1 optional, on a 100m stream stretch, with a 0,25\*0,25 m area)
- BACI Design (Before, After, Control, Impact)
- One sampling campaign/year (spring sample)
- Three samples in each campaign:
  - 1 at beginning of project site
  - 1 at end of project site
  - 1 Reference above project site

Two sampling campaigns were conducted by LP (TU Dresden) according the aboved mentioned procedure:

- Jablonec nad Nisou, 29.04.2025
- Dresden, 15.04 and 16.04.2025

## C. Results

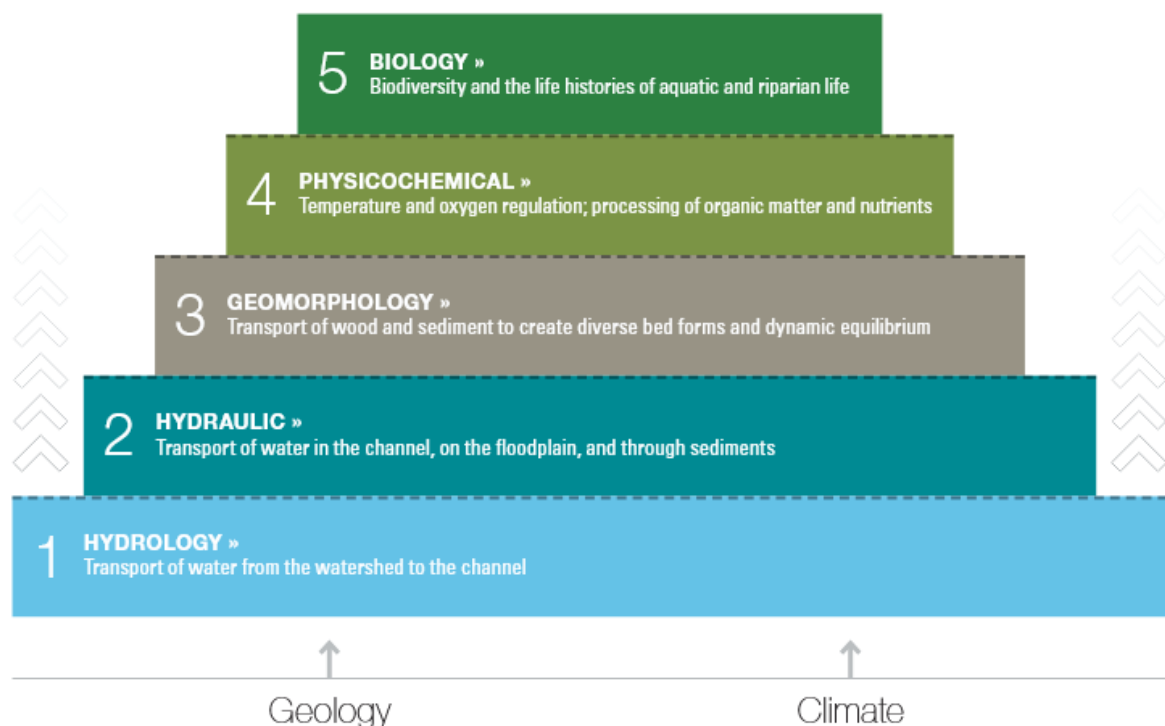
### 3. Urban Stream Restoration Goals- a Methodology

Urban stream restoration goals are best identified through frameworks that merge scientific metrics with community input while maintaining clear measurements and flexibility. Several studies propose systematic approaches to goal identification for urban stream restoration:

- (Asnake et al., 2021) emphasize the importance of clear and measurable goals in river restoration, highlighting the need for a structured approach to goal-setting.
- (Feio et al., 2015) suggest setting restoration goals based on based on invertebrate communities, riparian vegetation, instream habitat conditions and water chemistry. In their case study they found that an important limiting factor for macroinvertebrate communities' recovery may be the distance to source populations.
- (Guimarães et al., 2021) stressed the fact that restoration goals and measures should consider each specific situation. In the scenario of scarcity of open spaces, typical of cities, a balance among flood defence structures, the reestablishment of ecological functions and recreational uses is central to the success of river restoration. Something they state as not easy to achieve.
- (Hawley, 2018) suggests a framework for sustainable stream restoration in which long-term biological integrity is dependent on both natural processes and socioeconomic factors, such as accommodating safe wading access or complementing the aesthetics of the neighborhood. They suggest considering the stream function pyramid (Harman et al., 2012) as a basis for goal setting. The model (Image 1) visualizes hydrology, hydraulics, geomorphology, physicochemical parameters and biology in an pyramid shape.
  - From (Harman et al., 2012): "Hydrology is placed at the bottom of the pyramid because water contributed from the watershed strongly affects the higher-level functions. Very simply put, without surface water flow, there would not be channel formation and the subsequent aquatic



ecosystem. Biology is located at the top of the Pyramid because these functions are dependent on all the underlying functions. These functions include the biodiversity and the life histories of aquatic and riparian organisms. Biology functions can affect lower-level functions, e.g., beaver activities; however, as with the other levels, the dominant cause-and-effect relationship is upward. A healthy aquatic ecosystem must have sufficient water contributed from the watershed, the right levels of hydraulic forces, proper bed form diversity and channel stability, suitable temperature and oxygen regimes, and so on. The value of the Pyramid at this level is that it helps regulators, scientists and engineers to identify the underlying functions that must be present in order to achieve functional improvements”.



*Image 1 The Stream Functions Pyramid, developed by (Harman et al., 2012), provides a framework that organizes stream functions in a pyramid form. It illustrates that stream functions are supported by lower-level functions in a hierarchical structure.*

- (Murphy et al., 2022) emphasize the importance of integrating community values and diverse knowledge
- (Smith et al., 2016) propose a more comprehensive framework called Urban Stream Renovation (USR), which integrates both ecological and societal objectives. This approach emphasizes flexibility in setting goals, aligning with future scenarios rather than strictly adhering to historical reference conditions that the authors find unlikely to reach in urban settings. The USR framework creates a feedback loop where societal benefits increase public support for further ecological actions, demonstrating a mechanism for linking short-term societal outcomes to long-term ecological objectives.

From the above summarized findings in recent publications on urban stream restoration goals, the following methodology was derived:

1. Identification of stressors in urban streams, assess specific conditions at every stream site





2. Define Scale of Restoration (small-scale, catchment scale)
3. Prioritise: Which stressors are relevant for specific site and project scale? And is there an ecological priority between stressors? What is the primary ecological issue at the site?
4. Formulate Ecological Restoration goals for each of the defined stressors according to urban limitations/urban reference

## 4. Project streams - an overview



Figure 1: ReBioClim project streams Geberbach site 1 (Prohlis) and Bílá Nisa



Figure 2: ReBioClim project streams Piaśnica (piped) and Teplica

A detailed site description was created for each waterbody based on the data described in 2.1 and 2.2 (attached files). The site descriptions contain information on stream geo-hydraulics, physico-chemicals and biology. This was intended to provide a quick overview of the water ecology parameters and assessments according to the WFD. The site descriptions can be used by the responsible partners in the cities in the further planning and implementation process.

Table 2 Overview over the four project cities and site with selected criteria

|  | Senica | Dresden | Poznań | Jablonec nad Nisou |
|--|--------|---------|--------|--------------------|
|--|--------|---------|--------|--------------------|





|                          |         |                            |                            |          |                                          |
|--------------------------|---------|----------------------------|----------------------------|----------|------------------------------------------|
| Population [inhabitants] | 19 000  | 560 000                    |                            | 530 000  | 46 000                                   |
| Area [km2]               | 50      | 328                        |                            | 262      | 32                                       |
| Project Stream           | Teplica | Geberbach Site 1 (Prohlis) | Geberbach Site 2 (Nickern) | Piaśnica | Bílá Nisa                                |
| Site length [m]          | 750     | 1090                       | 320                        | 250      | 930                                      |
| Structure index          | 3       | 2.8                        | 3.2                        | 5        | Upper section: 3.5<br>Lower section: 2.1 |

The partner cities vary in area and population size (Table 2). Dresden is the city with the largest area and number of inhabitants, followed by Poznań. Jablonec nad Nisou has the smallest city area but more than double the number of inhabitants compared to Senica, which is smaller in size. All cities are located in low mountain ranges, the streams in reference conditions would be typically rich in coarse substrates, have a rapid flow velocity, a high stream dynamic due to slope and precipitation, a high variety of substrates, riparian trees/forest in the riparian zone and a high species variety of benthic invertebrates.

Even though the cities and streams differ in catchment size and discharge, they all share the influence of urban space on their biology, physico-chemistry and geohydraulics. The streams have been confined to regulated channel (or even piped) and are disconnected from its floodplain and former meanders. In all streams there are several migration barriers that impair ecological connectivity. Furthermore all streams are degraded by chemical pollution due to agriculture, industry and urban run-off. In Geberbach the exceedances for the nutrients Ammonium, Nitrite, Nitrate, and Orthophosphate-P are especially critical. In nearly all measurements, these substances exceeded the ecologically relevant thresholds (Bundesministeriums der Justiz, 2016). In 2024, the annual mean concentrations exceeded the threshold value for Ammonium by a factor of 9, for Nitrite and for Nitrate by a factor of 3 (Landesamt für Umwelt, Landwirtschaft und Geologie (LfULG), 2025). In Bílá Nisa ecocritical concentrations of the nutrient phosphate have increased both upstream and downstream since 2022. Electrical conductivity is increased in the downstream section. Repeatedly very high values of the highly ecotoxic heavy metal zinc have been measured (Johnson et al., 2025). According to local partners just above the project site is an old industrial site, which leaks toxicants. Those can be at least partly responsible of the measured pollution levels. Furthermore, zink is part of tire wear and is washed into urban streams by stormwater runoff. Historical data (years 2013 and earlier) for Cybina show ecosystem critical levels of nutrients as nitrate and Orthophosphate-P as well as high summer peak temperatures. For Teplica there is no chemical data available, although local partners explained that chemical pollution is major problem.

The site length for stream restoration within ReBioClim varies in the range of 1090 m (Geberbach site 1) and 250 m (Piaśnica). The project stream sites were surveyed according to a mapping procedure for small urban water bodies (Martina Renner et al., 2018). Since the usual mapping methods are based on reference conditions, they place particular emphasis on urban impact and pollution. The method used is based on the perception than morphological condition are changed in urban areas and ecological reference state cannot be reached. The procedure can therefore evaluate the morphology of urban streams in a more differentiated manner. In addition to substrate, embankment and stream bed characteristics other parameters relevant to urban spaces are considered as well (f.ex. reachability of the aerea and peculiarity of the site). Piaśnica reached the worst index of 5, which translates to “completely anthropogenically affected”, the other sites were scored with index 3 “moderately anthropogenically affected”. The project site in Poznań (Piaśnica) is completely piped, which explains the worst reachable index. The Bílá Nisa in Jablonec nad Nisou had a morphologically better (index 2.1, “slightly anthropogenically affected”) lower section than upper section



(index 3.5, heavily anthropogenically affected”). The mean resulted in the index 3. In Dresden the lower section (site 1) scores also slightly better than the upper section (site 2), although both lie in the range of index 3 (Table 2). The results show, that all four streams have been morphologically altered resulting in biological degradation. These results are supported by the assessment results of WFD (Table 3) for Geberbach (Dresden) and Teplica (Senica). The results show a bad to poor ecological potential. For Piašnica and Bílá Nisa there are no monitoring results under WFD as they are not subject to reporting according (European Environment Agency (EEA), 2021). For Bílá Nisa a biological monitoring was conducted to assess the effect of restoration measures (Michal Pravec, 2024). The monitoring of benthic invertebrates showed the disruption of species composition from highly specialized sensitive mountain dwellers to more insensitive generalists.

*Table 3 Results of biological and chemical assessment based on WFD for the four project streams.*

| Rating under WFD             | Teplica  | Geberbach | Piašnica | Bílá Nisa |
|------------------------------|----------|-----------|----------|-----------|
| Ecological potential (total) | Poor     | Bad       | No data  | No data   |
| Biological QC: Fishes        | Good     | Bad       | No data  | No data   |
| Biological QC: mzb           | Bad      | Poor      | No data  | No data   |
| Chemical condition (total)   | Not Good | Not Good  | No data  | No data   |

The results of the survey on urban stream morphology and benthic inveterate composition show highly degraded ecosystems. They also show an increase in different habitats, substrates and benthic colonisation whenever there are sections with trees, an open stream bed and a lesser technical embankment. This becomes apparent in the downstream section of Bílá Nisa and in the middle part of Geberbach site 1.



## 5. Stressor analyses

Based on the findings of chapter 4 the main drivers and stressors were summarised and assessed based on their impact on the project streams (Table 4). For each stressor a degradation effect (state) was characterized.

*Table 4 DPSIR (Driving forces, Pressures, States, Impacts and Responses) approach to analyse relevant stressors in the ReBioClim pilot sites and to formulate restoration goals.*

| Driver                                | Pressure                        | State                                            | Impact                                                                                                           | Response/<br>Restoration Goal    |
|---------------------------------------|---------------------------------|--------------------------------------------------|------------------------------------------------------------------------------------------------------------------|----------------------------------|
| Urban development,<br>Land-use change | Technical Stormwater Management | Excessive stream bed erosion                     | - Deficient sediment balance<br>- Deepened in stream<br>- Altered habitats                                       | Promote dynamic river processes  |
| Urban development,<br>Land-use change | Technical Stormwater Management | In-stream barriers                               | - Limited migration for fishes and MZB                                                                           | Increase ecological connectivity |
| Urban development,<br>Land-use change | Technical Stormwater Management | Regulated discharge and catchment imperviousness | - Missing natural dynamic<br>- Linear flow<br>- Fast rise and fall of stormwater level                           | Establish natural discharges     |
| Urban development,<br>Land-use change | Technical Stormwater Management | Regulated discharge and catchment imperviousness | - Missing natural dynamic<br>- Linear flow<br>- Fast rise and fall of stormwater level                           | Promote dynamic river processes  |
| Urban development,<br>Land-use change | Technical Stormwater Management | Technical Embankment                             | - Reduced stream-process dynamics lead to homogeneity of substrates, flow and habitats<br>- Reduced biodiversity | Promote dynamic river processes  |
| Urban development,<br>Land-use change | Technical Stormwater Management | Technical river bed                              | Missing Interstitial leads to missing groundwater exchange, missing habitats, missing type specific organisms    | Promote dynamic river processes  |



| Driver                                          | Pressure                                             | State                                                                                        | Impact                                                                                                                                                                                                   | Response/<br>Restoration Goal           |
|-------------------------------------------------|------------------------------------------------------|----------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------|
| Urban development,<br>Land-use change           | Point source                                         | Organic/<br>chemical/<br>nutrient<br>pollution in<br>streams                                 | - Poisonous for (semi-)<br>aquatic species<br>- Low in-stream<br>biodiversity                                                                                                                            | Reach good<br>chemical water<br>quality |
| Urban development,<br>Land-use change           | Artificial<br>infrastructure and<br>human activities | Segmented<br>Ecosystems                                                                      | - Loss of biodiversity                                                                                                                                                                                   | Reconnect<br>fragmented<br>ecosystems   |
| Urban development,<br>Land-use change           | Artificial<br>infrastructure and<br>human activities | Urban Heat<br>Island (UHI) -<br>Significant higher<br>temperatures<br>than in rural<br>areas | - Negative impact to<br>human and non-human<br>health                                                                                                                                                    | Reduce urban<br>heat island<br>effects  |
| Urban development,<br>Land-use change           | Anthropogenic<br>Climate Change                      | Increasing<br>frequency of<br>extreme and<br>uncontrolled<br>flooding                        | - Danger of flooding<br>urban infrastructure<br>and residential areas                                                                                                                                    | Improve flood<br>protection             |
| Urban development,<br>Land-use change           | Anthropogenic<br>Climate Change                      | Rise in peak<br>temperatures<br>and overall mean<br>temperatures                             | - Pressure on cold-<br>water adapted fish and<br>MZB species (reduced<br>Oxygen availability)<br>- Reduces absolute and<br>functional diversity of<br>MZB, fish and other<br>(semi-)aquatic<br>organisms | Reduce heat<br>stress                   |
| Urban development,<br>Agricultural<br>practices | Non-point source<br>pollution                        | Organic/<br>chemical/<br>nutrient<br>pollution in<br>streams                                 | - Poisonous for (semi-)<br>aquatic species<br>- Low in-stream<br>biodiversity                                                                                                                            | Reach good<br>chemical water<br>quality |

## 6. Ecological Restoration Goals

*Table 5 Restoration goals and targets with proposed measures and the effects on Climate adaptation, Biodiversity and Quality of Life*

| Response/<br>Restoration<br>Goal      | Restoration<br>Target                      | Restoration<br>Measure                                                       | Description                                                                                                                     | Effect on Climate<br>Adaptation                                                                     | Effect on Biodiversity                                                                                                                                          | Effect on Quality of<br>Life                                | Indicators of<br>Restoration Success                           |
|---------------------------------------|--------------------------------------------|------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------|----------------------------------------------------------------|
| Promote<br>dynamic river<br>processes | Promote<br>natural<br>sediment<br>dynamics | Direct flow to<br>prevent or<br>enable bank<br>erosion                       | Use rocks, plants, or<br>fascines to steer the<br>water away or towards<br>the banks. Promote<br>natural sediment<br>provision. | Near-natural streams<br>are more robust against<br>climate-related changes<br>to the water balance. | Natural river banks<br>increase habitat<br>availability and<br>connectivity for fish,<br>MZB and macrophytes<br>and enable dynamic<br>river processes.          | Natural streams invite<br>to play and observe<br>nature.    | Increased diversity of<br>in-stream substrates<br>and habitats |
| Promote<br>dynamic river<br>processes | Promote<br>natural<br>sediment<br>dynamics | Enhance natural<br>provision of<br>sediment by<br>erosion or add<br>sediment | Add stream type<br>specific sediments to<br>balance out bed load<br>deficite due to altered<br>ecological connectivity.         | Near-natural streams<br>are more robust against<br>climate-related changes<br>to the water balance. | Natural stream bed<br>sediments increase<br>habitat availability and<br>connectivity for fish,<br>MZB and macrophytes<br>and enable dynamic<br>river processes. | Natural streams invite<br>to play and observe<br>nature.    | Increased diversity of<br>in-stream substrates<br>and habitats |
| Promote<br>dynamic river<br>processes | Promote<br>natural<br>sediment<br>dynamics | Natural bank<br>stabilization<br>with fascines                               | Use bundles of live<br>branches or tree roots<br>to reinforce banks and<br>encourage vegetative<br>growth.                      | Near-natural streams<br>are more robust against<br>climate-related changes<br>to the water balance. | Stream bank structures<br>made of natural<br>materials promote<br>dynamic river processes<br>and create habitats.                                               | Natural streams invite<br>to play and observe<br>nature.    | Increased diversity of<br>in-stream substrates<br>and habitats |
| Promote<br>dynamic river<br>processes | Promote<br>natural<br>sediment<br>dynamics | Sediment<br>augmentation                                                     | Add stream type<br>specific sediments to<br>balance out bed load<br>deficite due to altered<br>ecological connectivity.         | Near-natural streams<br>are more robust against<br>climate-related changes<br>to the water balance. | Natural stream bed<br>sediments increase<br>habitat availability and<br>connectivity for fish,<br>MZB and macrophytes<br>and enable dynamic<br>river processes. | Natural river beds invite<br>to play and observe<br>nature. | Increased diversity of<br>in-stream substrates<br>and habitats |

| Response/<br>Restoration<br>Goal       | Restoration<br>Target               | Restoration<br>Measure        | Description                                                                                                                                                                                                                                                                                                     | Effect on Climate<br>Adaptation                                                                                                                                                     | Effect on Biodiversity                                                                                                                                                                             | Effect on Quality of<br>Life                                                                                                          | Indicators of<br>Restoration Success                                                                                                 |
|----------------------------------------|-------------------------------------|-------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------|
| Increase<br>ecological<br>connectivity | Enable fish<br>migration            | Build fish<br>passage         | Create channels or<br>structures to allow fish<br>and MZB to bypass<br>migration barriers.                                                                                                                                                                                                                      | Near-natural streams<br>are more robust against<br>climate-related changes<br>to the water balance.                                                                                 | Bypasses allow fish and<br>MZB to move within the<br>stream. Organisms<br>migrate e.g. to<br>reproduce, find food or<br>colonise new habitats.                                                     | Natural streams invite<br>to play and observe<br>nature.                                                                              | Increase in benthic and<br>fish biodiversity                                                                                         |
| Increase<br>ecological<br>connectivity | Reconnect<br>stream sections        | Remove in-<br>stream barriers | Remove technical<br>barriers like pipes and<br>culverts OR if<br>necessary, build them<br>more ecofriendly (as<br>short as possible, filled<br>with natural substrate<br>and possibility of<br>wildlife passing along<br>the stream) to improve<br>migration of organisms<br>and increase habitat<br>diversity. | Near-natural streams<br>are more robust against<br>climate-related changes<br>to the water balance.                                                                                 | Longitudinal<br>connectivity allows<br>sediment transport,<br>which is important for<br>habitat diversity and<br>migration of organisms<br>to make use of different<br>habitats.                   | Natural streams invite<br>to play and observe<br>nature.                                                                              | Number of removed in-<br>stream barriers, Number<br>of connected stream<br>sections, Increase in<br>benthic and fish<br>biodiversity |
| Establish<br>natural<br>discharges     | Water retention<br>in riparian zone | Reconnect<br>floodplains      | Reconnect the stream<br>to existing floodplain or<br>created temporary<br>wetland (e.g. parks<br>functioning as rainwater<br>retention basin) by<br>lowering banks and<br>allow flooding.                                                                                                                       | Retention of water in<br>reconnected temporary<br>wetlands mitigates<br>floods caused by heavy<br>rain events and stores<br>water in the landscape<br>for longer drought<br>periods | Floods "clean" the river<br>bed from fine sediment<br>and enhance in-stream<br>habitat for fish and<br>macro invertebrates.<br>Deposited sinesediment<br>in the floodplain<br>fertilizes the soil. | Retention of water in<br>designated temporary<br>wetlands mitigates<br>floods and reduces<br>damages to houses and<br>infrastructure. | Increased retention area<br>[m <sup>2</sup> ]                                                                                        |



| Response/<br>Restoration<br>Goal      | Restoration<br>Target                                                                      | Restoration<br>Measure                                          | Description                                                                                                                                              | Effect on Climate<br>Adaptation                                                                                                                                                          | Effect on<br>Biodiversity                                                                                                                                     | Effect on Quality of<br>Life                                                                                                          | Indicators of<br>Restoration Success                                              |
|---------------------------------------|--------------------------------------------------------------------------------------------|-----------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|
| Establish<br>natural<br>discharges    | Maintaining<br>minimum<br>discharge                                                        | Reduce water<br>extraction                                      | Minimize water<br>withdrawals to maintain<br>ecological integrity.<br>Prioritize withdrawals if<br>necessary.                                            | Near-natural streams<br>are more robust against<br>climate-related changes<br>to the water balance.                                                                                      | Maintaining minimum<br>water discharge ensures<br>habitat availability for<br>fish and MZB                                                                    | Maintaining minimum<br>water discharge<br>protects groundwater<br>resources, supports<br>ecosystem health,<br>supports water quality. | Increased number of<br>days maintaining<br>minimum water<br>discharge             |
| Establish<br>natural<br>discharges    | Maintaining<br>minimum<br>discharge,<br>seasonal change<br>from high to<br>low waterlevels | Remove dams<br>or adjusted<br>operation rules                   | Change dam operation<br>rules reflecting natural<br>hydrological regime.                                                                                 | Near-natural streams<br>are more robust against<br>climate-related changes<br>to the water balance.                                                                                      | Natural hydrologic<br>regimes ensure habitat<br>availability and<br>connectivity for fish,<br>MZB and macrophytes<br>and enable dynamic<br>river processes.   | Natural streams invite<br>to play and observe<br>nature.                                                                              | Minimized number of<br>drought days                                               |
| Establish<br>natural<br>discharges    | Decrease<br>imperviousness,<br>enhance<br>infiltration                                     | Unseal<br>impervious<br>surfaces, use<br>permeable<br>pavements | Use permeable<br>pavements or remove<br>sealed surfaces<br>completely to increase<br>ground-water<br>infiltration and<br>decrease stormwater<br>run-off. | Permeable pavements<br>control stormwater<br>through infiltration to<br>the ground below. It<br>retains water supporting<br>groundwater recharge<br>and decreases<br>stormwater run-off. | Permeable surfaces<br>flatten stormwater<br>hydrographs and<br>therefore reduce the<br>risk for MZB to be<br>flushed away. They also<br>filter toxic run-off. | Permeable pavements<br>support the reduction<br>UHI effect in the city.                                                               | Increased retention area<br>[m <sup>2</sup> ]                                     |
| Promote<br>dynamic river<br>processes | Permeable<br>interstitial zone                                                             | Fine sediment<br>retention                                      | Create technical fine<br>sediment retention in<br>areas with increased<br>fine sediment loads and<br>maintain them.                                      | Near-natural streams<br>are more robust against<br>climate-related changes<br>to the water balance.                                                                                      | Retention of<br>fine sediment prevents<br>river bed from clogging<br>and enhances habitat<br>quality for fish and MZB.                                        | Natural streams invite<br>to play and observe<br>nature.                                                                              | Increased diversity of<br>MZB, Increased<br>exchange of stream and<br>groundwater |

| Response/<br>Restoration<br>Goal      | Restoration<br>Target           | Restoration<br>Measure                                                           | Description                                                                                                                                                                                                                | Effect on Climate<br>Adaptation                                                                     | Effect on<br>Biodiversity                                                                                                                                                                              | Effect on Quality of<br>Life                                                                                     | Indicators of<br>Restoration Success                           |
|---------------------------------------|---------------------------------|----------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------|
| Promote<br>dynamic river<br>processes | Create natural<br>embankment    | Add groynes,<br>baffles, dead<br>wood and<br>circulation<br>trees                | Use natural<br>embankment to<br>promote river dynamic<br>processes (targeted<br>substrate erosion and<br>sedimentation,<br>diversification of flow).                                                                       | Near-natural streams<br>are more robust against<br>climate-related changes<br>to the water balance. | Natural stream bank<br>structures and dynamic<br>river processes create<br>and enhance habitats.                                                                                                       | In stream structures<br>such as stones and dead<br>wood invite to play and<br>listen to the sounds of<br>nature. | Increased diversity of<br>in-stream substrates<br>and habitats |
| Promote<br>dynamic river<br>processes | Create natural<br>embankment    | Remove<br>concrete<br>channel,<br>installation of<br>fascines where<br>necessary | Remove technical<br>embankment to allow<br>for natural fluvial<br>processes and<br>connectivity. If<br>necessary, use bundles<br>of living branches or<br>tree roots to stabilize<br>the bank and promote<br>plant growth. | Near-natural streams<br>are more robust against<br>climate-related changes<br>to the water balance. | Natural river banks<br>increase habitat<br>availability and<br>connectivity for fish,<br>MZB and macrophytes<br>and enable dynamic<br>river processes.                                                 | Natural stream banks<br>invite to play and<br>observe nature.                                                    | Increased diversity of<br>in-stream substrates<br>and habitats |
| Promote<br>dynamic river<br>processes | Promote<br>natural river<br>bed | Remove<br>technical river<br>bed                                                 | Remove technical<br>riverbed to allow for<br>natural fluvial processes<br>and connectivity. If<br>necessary, use natural<br>materials to create<br>habitats.                                                               | Near-natural streams<br>are more robust against<br>climate-related changes<br>to the water balance. | Permeable water bed<br>structures increase<br>habitat availability and<br>connectivity for fish,<br>MZB, plants and algae.<br>Permeability of the<br>interstitial zone allows<br>groundwater exchange. | Natural stream beds<br>invite to play and<br>observe nature.                                                     | Increased diversity of<br>in-stream substrates<br>and habitats |

| Response/<br>Restoration<br>Goal  | Restoration<br>Target                    | Restoration<br>Measure                                                                                                       | Description                                                                                                                                      | Effect on Climate<br>Adaptation                                                                                                                                                                | Effect on<br>Biodiversity                                                           | Effect on Quality of<br>Life                                                                                                               | Indicators of<br>Restoration Success                                                                                                                          |
|-----------------------------------|------------------------------------------|------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Reach good chemical water quality | Prevent illegal discharge of waste water | Connection of households to existing wastewater treatment plants. Install small wastewater treatment plants in remote areas. | Improvement of wastewater disposal of a municipality by connecting households and businesses to the existing central wastewater treatment plant. | Reduced organic/ chemical/ nutrient pollution in streams minimize hazards caused by interaction of pollutants with high water temperatures and concentration effects caused by low discharges. | Reduced organic/ chemical/ nutrient pollution in streams increases habitat quality. | Good water quality invites people to play in the water, swim and fish.                                                                     | Reduced input and load of pollutants, High diversity of sensitive aquatic species, Number of connected households. Number of small wastewater treatment plant |
| Reconnect fragmented ecosystems   | Increase landscape connectivity          | Add transversal green corridor                                                                                               | Connect ecosystems by transversal corridors for wildlife movement.                                                                               | Connected green spaces enable larger scale fresh air channels, water infiltration and stormwater runoff management.                                                                            | Connect ecosystems enable wildlife movement and connect urban with suburban areas.  | Green corridors through cities invite to rest and find shade in overheated cities.                                                         | Increased number of connected ecosystem, Connected area [m <sup>2</sup> ]                                                                                     |
| Reconnect fragmented ecosystems   | Increase landscape connectivity          | Create an interconnected network of green spaces                                                                             | Create continuous ecological zones and recreational routes to enable air corridors, connect ecosystems, and spaces for rest.                     | Connected green spaces enable larger scale fresh air channels, water infiltration and stormwater runoff management.                                                                            | Connect ecosystems enable wildlife movement and connect urban with suburban areas.  | Green corridors through cities invite to rest and find shade in overheated cities.                                                         | Increased number of connected ecosystem, Connected area [m <sup>2</sup> ]                                                                                     |
| Reduce urban heat island effects  | Increase urban vegetation cover to 30%   | Turn gray to green-blue infrastructure - Urban afforestation                                                                 | Transform fallow land into forests with native plant and tree species.                                                                           | Densely vegetated areas help to cool the air, provide shade and stores rainwater.                                                                                                              | Densely vegetated areas provide habitat and promotes biodiversity.                  | Densely vegetated areas reduce UHI in the city by improving air quality and microclimate, reduce stress and allow interaction with nature. | Afforested area [m <sup>2</sup> ], reduced peak temperatures in summer and at nights                                                                          |

| Response/<br>Restoration<br>Goal       | Restoration<br>Target                     | Restoration<br>Measure                                                      | Description                                                                                                                                                                                                                                              | Effect on Climate<br>Adaptation                                                                                                                               | Effect on<br>Biodiversity                                                                                                                                                                                      | Effect on Quality of<br>Life                                                                                                                                                                                                           | Indicators of<br>Restoration Success                                       |
|----------------------------------------|-------------------------------------------|-----------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------|
| Reduce urban<br>heat island<br>effects | Decrease<br>imperviousness                | Turn grey to<br>green-blue<br>infrastructure -<br>Use permeable<br>pavement | Use permeable<br>pavements or remove<br>sealed surfaces<br>completely to increase<br>ground-water<br>infiltration.                                                                                                                                       | Permeable pavements<br>retain water, support<br>groundwater recharge<br>and support blue-green<br>infrastructure.                                             | permeable pavements<br>support the connectivity<br>of densely vegetated,<br>therefore promote<br>biodiversity.                                                                                                 | Permeable pavements<br>support the reduction<br>UHI effect in the city.                                                                                                                                                                | Increased unpaved area<br>[m <sup>2</sup> ]                                |
| Improve flood<br>protection            | Watercourse<br>development                | Increase space<br>for river and<br>floodplain                               | Widening of the stream<br>corridor to reduce<br>uncontrolled flooding<br>and downstream<br>flooding risk.                                                                                                                                                | Increased natural<br>retention area mitigates<br>floods caused by heavy<br>rain events and stores<br>water in the landscape<br>for longer drought<br>periods. | Near-natural streams<br>are more robust against<br>climate-related changes<br>to the water balance.<br>Enlarged stream<br>corridors facilitate<br>movement of species<br>and increase habitat<br>availability. | Retention of water in<br>the floodplain reduces<br>flood peaks and reduces<br>damages to houses and<br>infrastructure.                                                                                                                 | Increased retention area<br>[km <sup>2</sup> ]                             |
| Improve flood<br>protection            | Manage of<br>natural flooding<br>/ runoff | Manage<br>rainwater                                                         | Measures to retain<br>water, e.g., through<br>communal retention<br>facilities, facilities to<br>improve infiltration<br>(including rainwater<br>infiltration systems),<br>other rainwater<br>utilization facilities in<br>public areas (green<br>roofs) | Serves to adapt to<br>climate change induced<br>increase of heavy<br>rainfall.<br>Promotes natural water<br>retention in the area.                            | Green roofs and other<br>vegetated areas<br>promote biodiversity of<br>urban insects and bird.                                                                                                                 | Retention of water in<br>the floodplain reduces<br>flood peaks and reduces<br>damages to houses and<br>infrastructure. Green<br>roofs have positive<br>psychosocial benefits<br>and allow interaction<br>with natural green<br>spaces. | Number of installations,<br>increased green roof<br>area [m <sup>2</sup> ] |

| Response/<br>Restoration<br>Goal | Restoration<br>Target                  | Restoration<br>Measure                | Description                                                                                                                                                                                                           | Effect on Climate<br>Adaptation                                                                                                                               | Effect on<br>Biodiversity                                                                                                                                                                                      | Effect on Quality of<br>Life                                                                                           | Indicators of<br>Restoration Success           |
|----------------------------------|----------------------------------------|---------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------|------------------------------------------------|
| Improve flood<br>protection      | Watercourse<br>development             | Reconnect<br>floodplains              | Support the stream's<br>ability to flood adjacent<br>lands by lowering the<br>banks or lift stream bed<br>by adding sediment.                                                                                         | Increased natural<br>retention area mitigates<br>floods caused by heavy<br>rain events and stores<br>water in the landscape<br>for longer drought<br>periods. | Near-natural streams<br>are more robust against<br>climate-related<br>changes to the water<br>balance. Enlarged<br>stream corridors<br>facilitate movement of<br>species and increase<br>habitat availability. | Retention of water in<br>the floodplain reduces<br>flood peaks and reduces<br>damages to houses and<br>infrastructure. | Increased retention area<br>[km <sup>2</sup> ] |
| Improve flood<br>protection      | Manage natural<br>flooding /<br>runoff | Reduce surface<br>sealing             | Measures promote<br>natural water retention<br>in the area by unsealing<br>surfaces and reducing<br>new sealing,<br>particularly in areas<br>with increased<br>precipitation or runoff.                               | Serves to adapt to<br>climate change induced<br>increase of heavy<br>rainfall.<br>Promotes natural water<br>retention in the area.                            |                                                                                                                                                                                                                | Retention of water in<br>the floodplain reduces<br>flood peaks and reduces<br>damages to houses and<br>infrastructure. | Increase of unsealed<br>area [m <sup>2</sup> ] |
| Improve flood<br>protection      | Watercourse<br>development             | Restore and<br>reconnect side<br>arms | Re-establishing the<br>connection between a<br>stream's main channel<br>and its natural<br>floodplain features to<br>increase water<br>retention capacity and<br>reduce damage to<br>buildings and<br>infrastructure. | Increased natural<br>retention area mitigates<br>floods caused by heavy<br>rain events and stores<br>water in the landscape<br>for longer drought<br>periods. | Near-natural streams<br>are more robust against<br>climate-related<br>changes to the water<br>balance. Enlarged<br>stream corridors<br>facilitate movement of<br>species and increase<br>habitat availability. | Retention of water in<br>the floodplain reduces<br>flood peaks and reduces<br>damages to houses and<br>infrastructure. | Increased retention area<br>[m <sup>2</sup> ]  |



| Response/<br>Restoration<br>Goal  | Restoration<br>Target                                     | Restoration<br>Measure   | Description                                                                                                                         | Effect on Climate<br>Adaptation                                                                                                                                            | Effect on<br>Biodiversity                                                                                                                                                                                 | Effect on Quality of<br>Life                                                                         | Indicators of<br>Restoration Success                                              |
|-----------------------------------|-----------------------------------------------------------|--------------------------|-------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|
| Reduce heat stress                | Create shade, reduce peak water temperatures below <20° C | Less frequent mowing     | Reduce maintenance frequency to support the growth of natural plants and trees.                                                     | Native riparian plants along stream banks provide shade and reduced air temperatures. In addition, they stabilize soils.                                                   | Diverse native riparian vegetation creates a stream environment for temperature sensitive species. Furthermore, they provide food and habitats for insects, birds and mammals. They filter toxic runoffs. | Riparian plants invite to play, harvest edible plants and find shade in overheated cities.           | Summer peak temperatures <20C, Increased tree/shrub cover by 50 %                 |
| Reduce heat stress                | Create shade, reduce peak water temperatures below <20° C | Plant riparian trees     | Plant riparian trees to increase shade on waterbody to over 50%.                                                                    | Native riparian trees along stream banks provide shade and therefore reduce peak water and air temperatures. In addition, they stabilize the stream banks against erosion. | Native riparian trees create a stream environment for temperature sensitive species. Furthermore, they provide food and habitats for insects, birds and mammals. Riparian trees filter toxic runoffs.     | Riparian trees invite to play, harvest edible plants and find shade in overheated cities.            | Summer peak temperatures <20C, Increased tree cover by 50 %                       |
| Reach good chemical water quality | Enhance self-cleaning potential of the stream             | Add in-stream structures | Add in-stream structures such as dead wood or stones for more heterogeneous flow to increase self-cleaning potential of the stream. | Near-natural streams are more robust against climate-related changes to the water balance.                                                                                 | In-Stream structures increase habitats and oxygen supply for microbial self-cleaning processes.                                                                                                           | In stream structures such as stones and dead wood invite to play and listen to the sounds of nature. | Reduced input and load of pollutants, High diversity of sensitive aquatic species |

| Response/<br>Restoration<br>Goal        | Restoration<br>Target                                                                 | Restoration<br>Measure                                                                        | Description                                                                                                        | Effect on Climate<br>Adaptation                                                                                                                                                                                           | Effect on<br>Biodiversity                                                                                                                         | Effect on Quality of<br>Life                                                                                  | Indicators of<br>Restoration Success                                                       |
|-----------------------------------------|---------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------|
| Reach good<br>chemical water<br>quality | Reduce<br>stormwater<br>run-off,<br>enhance<br>infiltration                           | Build<br>permeable<br>pavements                                                               | Use permeable<br>pavements to filter<br>stormwater run-off from<br>roads to filter urban<br>runoff and pollutants. | Permeable pavements<br>control stormwater as it<br>allows infiltration of<br>water through the<br>surface to the ground<br>below. It retains water<br>and decreases<br>stormwater run-off.                                | Permeable surfaces<br>reduce pollutant<br>concentrations by<br>filtering stormwater.                                                              | Good water quality<br>invites people to play in<br>the water, swim and<br>fish.                               | Reduced input and load<br>of pollutants, High<br>diversity of sensitive<br>aquatic species |
| Reach good<br>chemical water<br>quality | Reduce diffuse<br>input of<br>pesticides and<br>nutrients                             | Inform about<br>and promote<br>biological<br>practices for<br>agriculture in<br>the catchment | Measures to maintain<br>and implement “good<br>professional practice” in<br>agricultural land<br>management.       | Reduced organic/<br>chemical/ nutrient<br>pollution in streams<br>minimize hazards<br>caused by interaction of<br>pollutants with high<br>water temperatures and<br>concentration effects<br>caused by low<br>discharges. | Reduced organic/<br>chemical/ nutrient<br>pollution in streams<br>increases habitat<br>quality.                                                   | Good water quality<br>invites people to play in<br>the water, swim and<br>fish.                               | Reduced input and load<br>of pollutants, High<br>diversity of sensitive<br>aquatic species |
| Reach good<br>chemical water<br>quality | Reduce<br>stormwater<br>run-off,<br>enhance<br>retention of<br>chemical<br>pollutants | Plant riparian<br>buffer strips                                                               | Plant riparian buffer<br>strips of at least 5<br>meters to filter urban<br>runoff and pollutants.                  | Riparian buffer strips<br>effectively retain<br>chemical loads<br>mobilized due to<br>climate related extreme<br>events.                                                                                                  | Riparian buffer strips<br>allow natural<br>interactions between<br>riparian and aquatic<br>zone by creating<br>habitats and provision<br>of food. | Riparian buffer strips<br>invite to play, harvest<br>edible plants and find<br>shade in overheated<br>cities. | Reduced input and load<br>of pollutants, High<br>diversity of sensitive<br>aquatic species |



## D. Implementation process

The aim of ReBioClim is to restore urban streams in a community based approach based on scientific metrics. The above summarised restoration goals are implemented in different ways in the course of the project. In a first step the ecological restoration goals were used as a content basis for the Co-Design workshops led by TU Delft (attachment restoration toolkit). Each goal was visualized and processes as a toolkit for the participants to elaborate on specific measures and visions for the project streams.

The site descriptions (attachment files) will be handed over to local partners to be used in the further planning and implementation process. As they provide a good overview over the project stream they can also be translated in local languages and handed over to stakeholder and the interested public.

## E. Conclusion

The collection of stream characteristics, biological monitoring results, physico-chemical data and local recourses proved to be a long but rewarding process. It became clear that data availability in the four ReBioClim project cities is very different. From almost unlimited open access on public infrastructure in Dresden, to a good basis of non-public recourses in Jablonec nad Nisou, to unavailable data recourses in Senica due to restriction to non existence of data in Poznan. These challenges were met by own surveys and further monitoring of biological data within the project. The available data shows four highly influenced urban streams with great a great potential for multi-purpose complex transformation of the riverbed and banks into an attractive, aesthetic, modern and closer to nature form.



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