Implementation Plan to the Capital City of Prague Climate Change Adaptation Strategy for 2018 – 2019

June 2018

Implementation Plan to the Capital City of Prague Climate Change Adaptation Strategy for 2018 – 2019: A summary

The Implementation Plan develops the Capital City of Prague Climate Change Adaptation Strategy (hereinafter the Adaptation Strategy) approved by Prague Council Decision No. 1723 of July 18, 2017 aiming at enhancing a long-term resilience of the Capital City of Prague against climate change effects. The first part of the document briefly summarises international and national context and framework of climate change adaptations, the Capital City of Prague´s involvement in the Mayors Adapt Initiative, climate change effects and impacts on the city´s territory and main outputs of spatial assessment of vulnerability to climate change impacts. In the second part, pilot projects and measures aiming at five specific targets set by the Adaptation Strategy (A – D and F; item E Sustainable mobility is elaborated separately) are presented.

Measures and pilot projects included into Implementation Plan to the Capital City of Prague Climate Change Adaptation Strategy are clustered into five topic groups following the Adaptation Strategy specific targets: (i) measures for the open landscape; (ii) measures for the built-up area and the urban landscape; (iii) measures for adaptations in buildings (iv) measures in risk management and providing citizens with safety and (v) measures in communication, education and public awareness/environmental education among citizens and Prague city districts. Proposals for the individual pilot projects resulted from working group meetings and they are as follows: (a) measures and projects to complement knowledge of the area and processes there; (b) developing methodologies and guidelines; (c) proposals of the particular pilot projects. In total, the Implementation Plan includes 47 measures and pilot projects in detail described as the so-called data sheets annexed to the document.

In the final part of the document, indicators for monitoring and assessment of the Capital City of Prague Climate Change Adaptation Strategy implementation are proposed: they are set out in three categories: (i) indicators of climate extremes and changes; (ii) vulnerability indicators; (iii) adaptation indicators. Basic indicators in all the categories are developed according to the adaptation monitoring framework recommended by the Sustainable Energy and Climate Action Plan (SECAP) methodology. In addition, supplementary indicators relevant for monitoring the Capital City of Prague Climate Change Adaptation Strategy implementation are also proposed (in total, 16 basic and 10 supplementary ones).

Aim of the Strategy

Reducing vulnerability of the Capital City of Prague, the Czech Republic, to climate change effects aiming at improving the environment for its inhabitants in future

Vision of the Strategy

Enhancing a long-term resilience and reducing vulnerability of the Capital City of Prague to climate change effects by step-by-step implementation of adaptive measures, preferably applying nature-based solutions combined with grey, *i.e.* technological and soft measures, to provide the city´s inhabitants with high well-being.

Content:

1. Introduction

The Czech Republic has during the last decades been facing increasing frequency of extreme weather events related to climate change. Mean annual air temperatures have been increasing: the increase has been approx. 0.3 ^{0}C per decade and by 2030 the further increase by 1 ^{0}C is projected for the Czech Republic´s territory. In addition, frequency, intensity and duration of extremely hot periods will possibly be increasing.

Hydrological cycle and rainfall distribution in time and space have also been changing: risk of torrential rains and consequent local floods have also been increasing, as well as discharge fluctuation (droughts v. floods). It is expected that winter precipitation totals will increase: on the other hand, summer precipitation totals will be decreasing. In addition, number of days in the period without precipitation shall be significantly increasing as well as risks in an occurrence of droughts. The climate models predict an increase in extreme weather events (windstorms, tornados, *etc*.) frequency.

The Strategy on Adaptation to Climate Change in the Czech Republic approved by the Government of the Czech Republic´s decision in 2015 is elaborated by the Capital City of Prague Climate Change Adaptation Strategy approved by Prague Council´s Decision No. 1723 of July 18, 2017. At the same time, the Prague Council charged the Department of Environmental Protection, Capital City of Prague Municipal Office by developing the Implementation Plan to the Strategy for 2018 – 2019.

The Implementation Plan to the Capital City of Prague Climate Change Adaptation Strategy for 2018 – 2019 (hereinafter the Implementation Plan) aims at the relatively short time period of 2018 – 2019, allowing to complement the knowledge database on climate change impacts in Prague, to develop methodologies, guidelines, measures and pilot projects contributing to climate change mitigation and thus to raise awareness of possible climate change adaptations in Prague among citizens.

The Implementation Plan includes the particular adaptation measures and pilot projects, starting the implementation procedure, taking into account the specific conditions of the Capital City of Prague as the urban landscape characterized by high proportion of the built-up area and paved spaces, high economic, technological and transport infrastructure accumulation and uneven dispersed distribution of green spaces and vegetation elements.

The Implementation Plan in detail develops the individual steps towards implementation of the selected adaptation measures together with a proposal on their monitoring and assessment of their effectiveness and efficiency. After completing the knowledge database and assessing effectiveness and efficiency of the implemented measures, developing a further implementation plan for a longer time period starts.

The Implementation Plan was drafted in cooperation with the Global Change Research Institute of the Academy of Sciences of the Czech Republic/CzechGlobe, the Institute of Computer Science of the Academy of Sciences of the Czech Republic, Czech Hydrometeorological Institute and Prague stakeholders.

2. Climate change adaptation framework

2.1 International and national climate change adaptation framework

Preparedness and early responses to current observed and projected climate change impacts and preventing damages which can be caused by them are among priorities within the European Union environmental policy. Therefore, the European Commission developed the Adaptation Strategy (April 2013), being a long-term policy document to enhance the EU resistance against negative climate change impacts at all levels. At the EU level, the EU Strategy on Adaptation to Climate Change and the EU Biodiversity Strategy to 2020 should be mentioned. The European Environment Agency published a comprehensive report mapping the current climate change adaptations in European cities entitled *Urban adaptation to climate change in Europe 2016: Transforming cities in a changing climate*.

On October 26, 2015 the Government of the Czech Republic approved by Decision No. 861 the Strategy on Adaptation to Climate Change in the Czech Republic (hereinafter National Adaptation Strategy, NAS) as a inter-disciplinary elaborated framework for development and implementation of partial climate change adaptation strategies in the Czech Republic. The document presents scenarios of further climate development in the Czech Republic, identifies priority in economy and the environment, contextualize adaptation measures set out by various policy documents developed by the individual sectors and complement directions in the field where they have not been developed yet. The urban landscape is among the issues covered by the NAS where a review on key challenges in climate change adaptations in cities and towns as well as recommendations on suitable climate change adaptations are presented. The NAS has been elaborated by the National Action Plan on Adaptation to Climate Change in the Czech Republic approved by the Government of the Czech Republic through Decision No. 34 of January 16, 2017.

All the policy documents consider climate change as a possible risk for the society and the environment: thus, climate change adaptations are the most important way to mitigate climate change negative impacts.

2.2. The Capital City of Prague and the Mayors Adapt Initiative

The Mayors Adapt Initiative which has become a part of the Covenant of Mayors for Climate and Energy is a subsidiary tool for developing climate change adaptations in cities and towns. Developing a climate change adaptation strategy within two years after signing the initiative is a commitment for cities becoming a member. Cooperation among the individual partners aiming, *inter alia*, at education or inspiration by the other is also a part of the project. By Prague Council Decision No. 3213 of December 12, 2015 and submitting an application, the Capital City of Prague became a *Mayors Adapt Initiative* member, thus accepting a commitment to develop a climate change adaptation strategy and to monitor and assess the process and procedure of adaptation measures incl. risk assessment and elaborating biennial assessment reports. Delivering the commitment is development of the Capital City of Prague Climate Change Adaptation Strategy by the Department of Environmental Protection, Capital City of Prague Municipal Office in cooperation with the Prague Institute for Planning and

Development. The Capital City of Prague Climate Change Adaptation Strategy was approved by Prague Council Decision No. 1723 of July 18, 2017. At the same time, the Prague Council charged the Department of Environmental Protection, Capital City of Prague Municipal Office by developing the Implementation Plan to the Strategy for 2018 – 2019.

Within the Mayors Adapt Initiative the city of Munich displaying rich experience in flood prevention, extreme temperature changes and drought mitigation and growing population was proposed for Prague as a partner city. The cooperation with Munich had contributed in drafting the Capital City of Prague Climate Change Strategy and continued also in developing the Implementation Plan.

3. Climate change effects and impacts in Prague

Prague, particularly its downtown, is among the warmest areas in the Czech Republic with mean annual temperature > 10 ^{0}C; the temperature has in the long term been increasing. The step-by-step increase in temperature can also be evidenced by mean annual temperatures, having been 9.1 ^{0}C in 1911-1960, 10.4 ^{0}C in 1961-2010 respectively (an increase by 1.3 ^{0}C). The increase in mean annual temperature is showed by measurements at the Prague Clementinum Observatory & Meteostation (see Fig. 1).

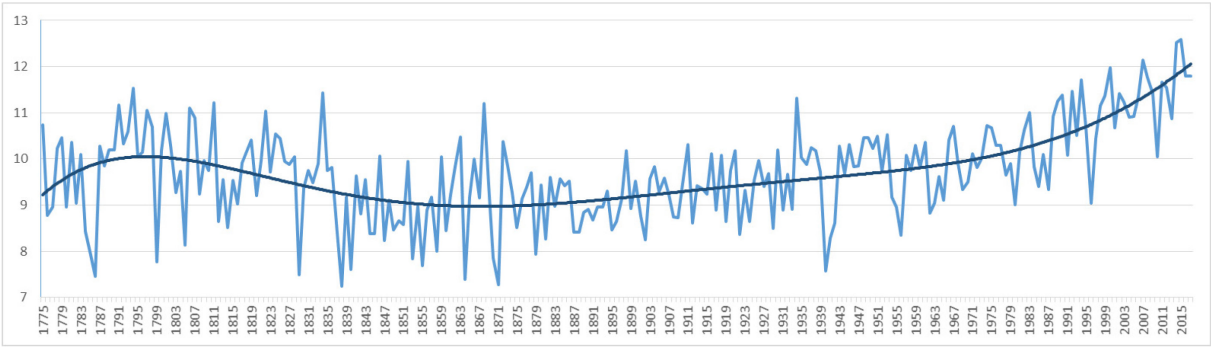

Fig. 1 Mean annual air temperatures (in ^{0}C) in 1775-2017 at the Prague Clementinum Observatory & Meteostation (Source: Czech Hydrometeorological Institute, 2018, portal.chmi.cz and infomet.cz)

In Prague, climate change displays itself particularly by increasing air temperature. It is projected that the mean annual temperature will increase by 1^0 C by 2030, while the mean annual temperature is expected to increase further by 2 – 5 ^{0}C by 2100 according to particular RCP scenario. In addition, heat wave frequency, intensity and duration will also increase as well as the tropical day (T_{max} > 30 ^{0}C) and the tropical night (T_{min} > 20 ^{0}C) number. In big cities, urban heat island effect shall be harder.

Mean annual precipitation totals shall be similar to the current ones, but their temporal and spatial distribution is projected to be changed. It is expected that winter precipitation totals will slightly increase: on the other hand, summer precipitation totals will be slightly decreasing (cf. Figure 2). In addition, number of days in the period without precipitation shall be significantly increasing as well as risks in an occurrence of droughts. Hydrological cycle and rainfall distribution in time and space have also been changing. On one hand risk of

torrential rains and consequent local floods has also been increasing, at the same time mean and minimal discharges have been decreasing on the other: watercourses can totally be dried. Generally, intense rainfall number has been increasing as well as long periods without precipitation. The climate models also predict an increase in extreme weather events (windstorms, tornados, *etc.*) frequency.

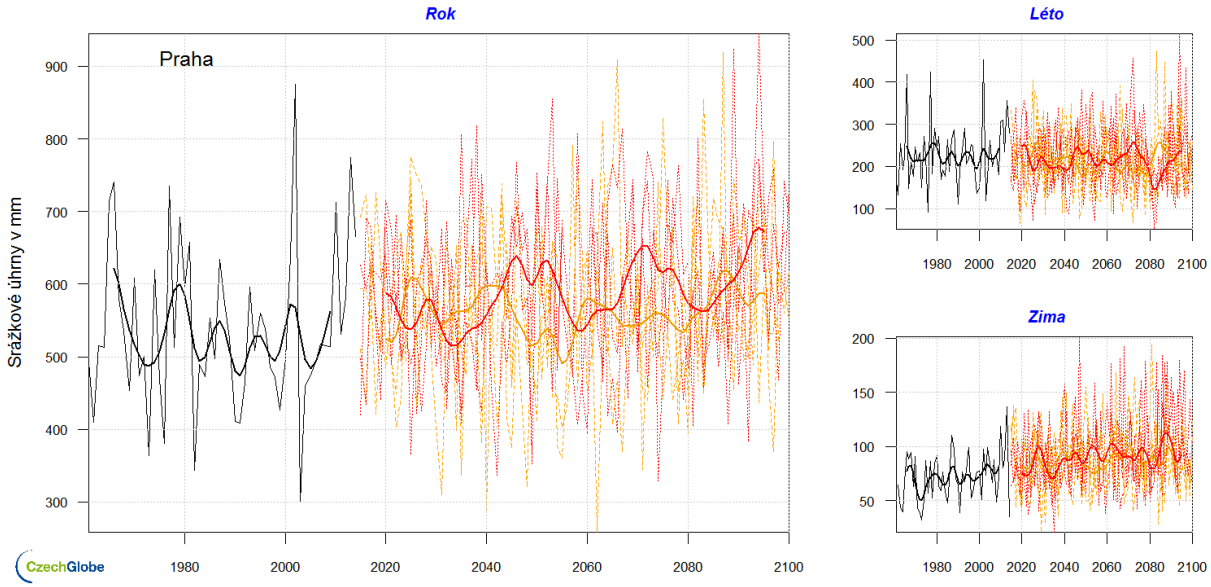

Fig. 2**:** Mean annual precipitation totals in Prague and a prognosis on their development based on EURO-CORDEX climate models (RCP 4,5 – orange colour; RCP 8,5 – red colour)(Source: www.klimatickazmena.cz)

Based on hydrometeorological data analyses and climate model outputs, observed current and projected future climate change has been displaying in the Czech Republic by:

- Increasing mean annual temperature total, more frequent fluctuations and extremes particularly in higher temperatures (*e.g.*, an increase in the tropical day and night number, heat waves);
- Changes in precipitation distribution in time and space, while keeping its mean annual totals (*e.g.,* intensive short-term torrential rainfalls, droughts);
- Higher frequency and intensity in other extreme weather events (*e.g.*, thunderstorms, hailstorms or strong winds, *etc.*).

In the urban environment of the Capital City of Prague, these events are related particularly with following impacts:

- Higher frequency in heat waves and their longer duration enhanced by the urban heat island effect;
- Flash floods in small urbanized stream basins, supported by a high proportion of parcels/plots with a quick surface rainfall water runoff;
- Drought (hydrologic, biological/agricultural, socio-economic).

4. Vulnerability to climate change impacts

In the analytical part of the Implementation Plan, the Capital City of Prague´s vulnerability to climate change impacts was assessed against temperature extremes and heat waves as well as against extreme rainfalls and insufficient rainfall/storm water infiltration applying the commonly used methodological framework taking into account three components (*cf.* Fig. 3). These are as follows: (i) exposure to climate change effects, covering two different climate RCP (Representative Concentration Pathways, namely RCP 4.5 and RCP 8.5); (ii) city´s sensitivity to climate change impacts represented by land cover data, demographic data on the human population vulnerability and their projections for 2030; and (iii) adaptation capacity (socio-economic indicators describing ability of the society to respond to a changing climate).

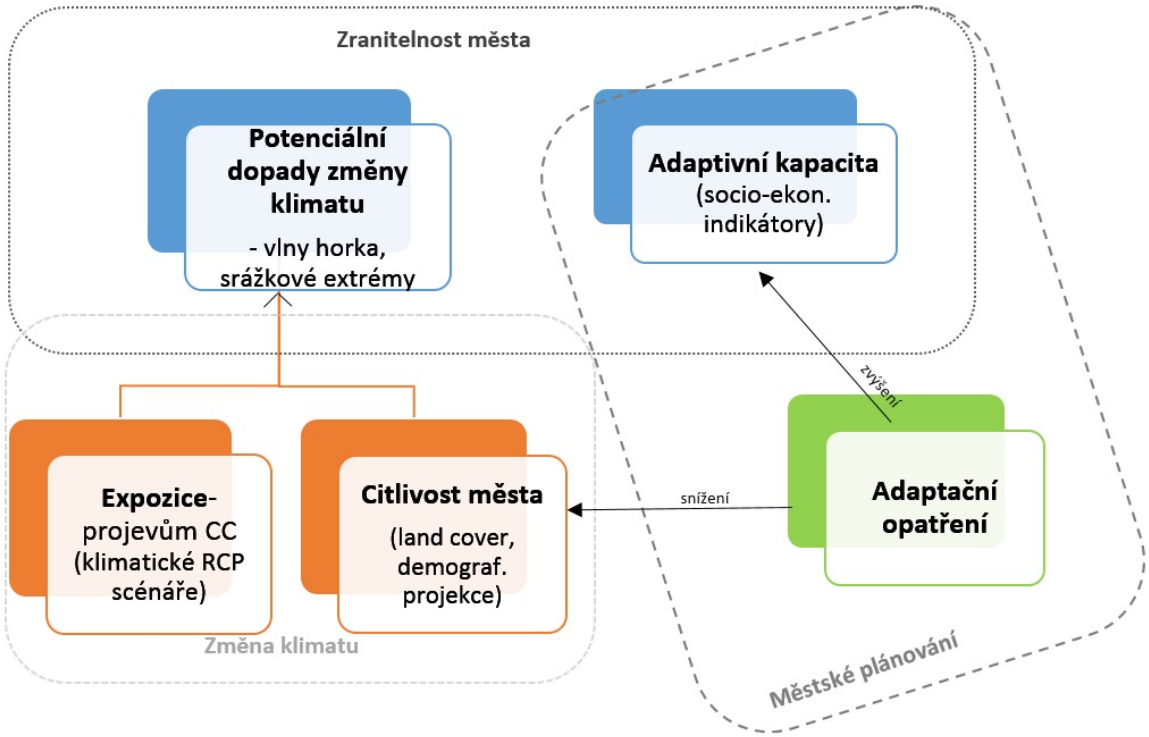

Fig. 3: Vulnerability assessment methodological framework applied for vulnerability assessment in the analytical part of the Implementation Plan

zranitelnost města – city´s vulnerability; potenciální změny klimatu – vlny horka, srážkové extrémy – possible climate change – heat waves, precipitation extremes; adaptivní kapacita (socio-econ. indikátory) – adaptive capacity (socio-economic indicators); zvýšení - increasing; snížení - decreasing; adaptační opatření – adaptation measures; městské plánování – urban planning; citlivost města (land cover, demograf. projekce) – city´s sensitivity (land cover, demographic projections); změna klimatu – climate change; expozice – projevům CC (klimatické RCP scénáře) – exposure to climate change impacts (climatic RCP scenarios).

4.1. Temperature extremes in the city – heat waves

From a point of view of vulnerability to temperature extremes (heat waves) areas in the Prague´s downtown have at present been most affected. The proportion of areas displaying the highest vulnerability can be found particularly in Prague 1, Prague 2, Prague 3, Prague 6, Prague 7 city districts as well as in some quarters on the Prague outskirts with industrial built-up areas, e.g. Libeň or Štěrboholy (*cf.* Fig. 4). For high vulnerability category, there is an increase in the area by 5% in the RCP 4.5. scenario, by 5.5% in the RCP 8.5 scenario respectively. At the same time, there is a decrease in the proportion of medium and very low vulnerability areas in both the scenarios. A slight increase has been found in low vulnerability areas.

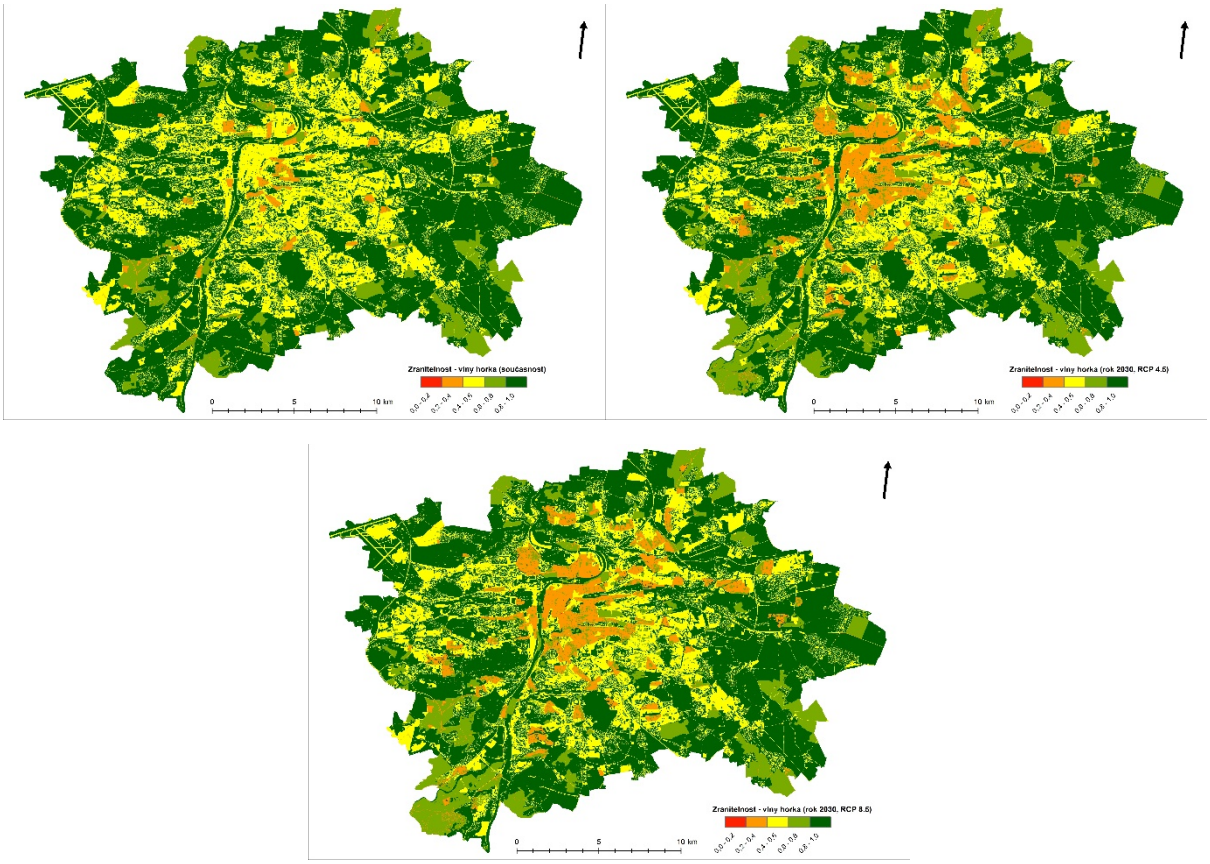

Fig. 4: Vulnerability to heat waves (the current state and the year 2030 – RCP 4.5 and 8.5. scenarios)

Within this phase, detailed simulations on air temperature spatial distribution on the Capital City of Prague´s territory during heat waves were carried out: the MUKLIMO_3 thermodynamic model was applied. The modelling outputs cover the period between August 1 16.00 o August 2 2.00 CEST (*cf.* Fig. 5). The period was selected because it illustratively shows the urban heat island spatial distribution and its impact on the Capital City f Prague citizens both in day and night. Generally, there are sharp differences in air temperature distribution on the Capital City of Prague´s territory. The maximum air temperatures are almost in all cases located in the city´s downtown with densely built-up areas (*e.g.* the Staré Město/Old Town, Josefov, Malá Strana/Lesser Town city quarters) or in areas with older

industrial built-up sites. Other important although more isolated sites, the so-called hotspots, are situated *e.g.* in Vysočany or Dejvice city quarters.

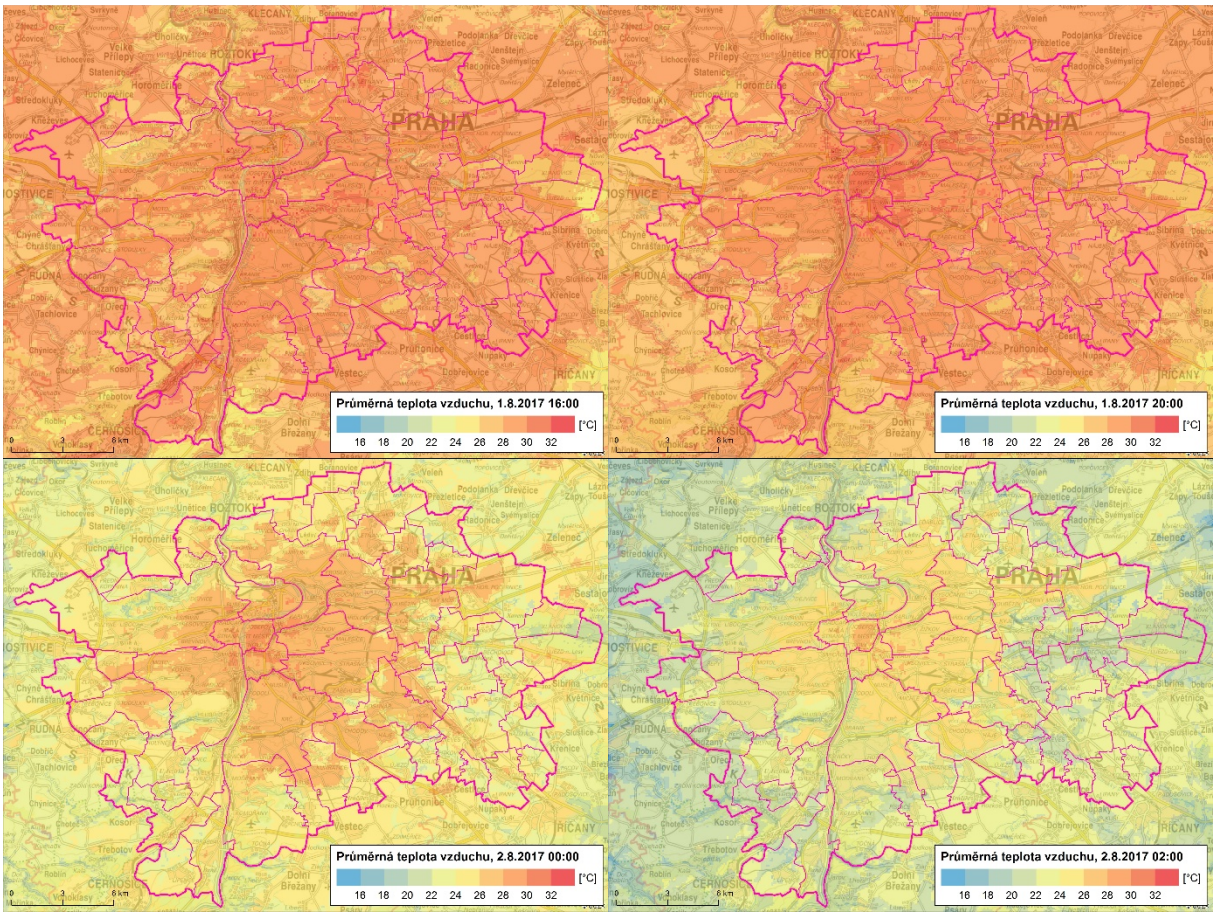

Fig. 5: Air temperature spatial distribution on the Capital City of Prague´s territory at 16:00, 20:00, 0:00 and 2.00 CEST, August 1, 2017

From a point of view of air temperature distribution, 11 land cover classes typical for the Capital City of Prague were analysed (*cf.* Fig. 6). The results clearly show that there is an overheating in areas with the LC01 (Dense and high built-up are in city downtowns), LC02 (Dispersed lower built-up areas in city downtowns) and LC10 (Densely built-up industrial areas) land cover types.

Exposure of the vulnerable population (children younger than 15 years, elder people above 65 years) to temperature extremes was assessed in relation to air temperature spatial distribution simulations developed for the Capital City of Prague´s territory. The population is most vulnerable between 16.00 and 19.00. The most affected areas include the historic downtown (Prague 1 and Prague 2 city districts) and adjacent city districts (Prague 3, Holešovice, Karlín, Žižkov, Vinohrady and Dejvice city quarters). Vysočany and Hloubětín city quarters as well as large prefabricated building housing estates, particularly Černý Most/Black Bridge, Jižní Město/South City and Bohnice, Kobylisy, Střížkov and Letňany housing estates are also exposed to high air temperature extremes.

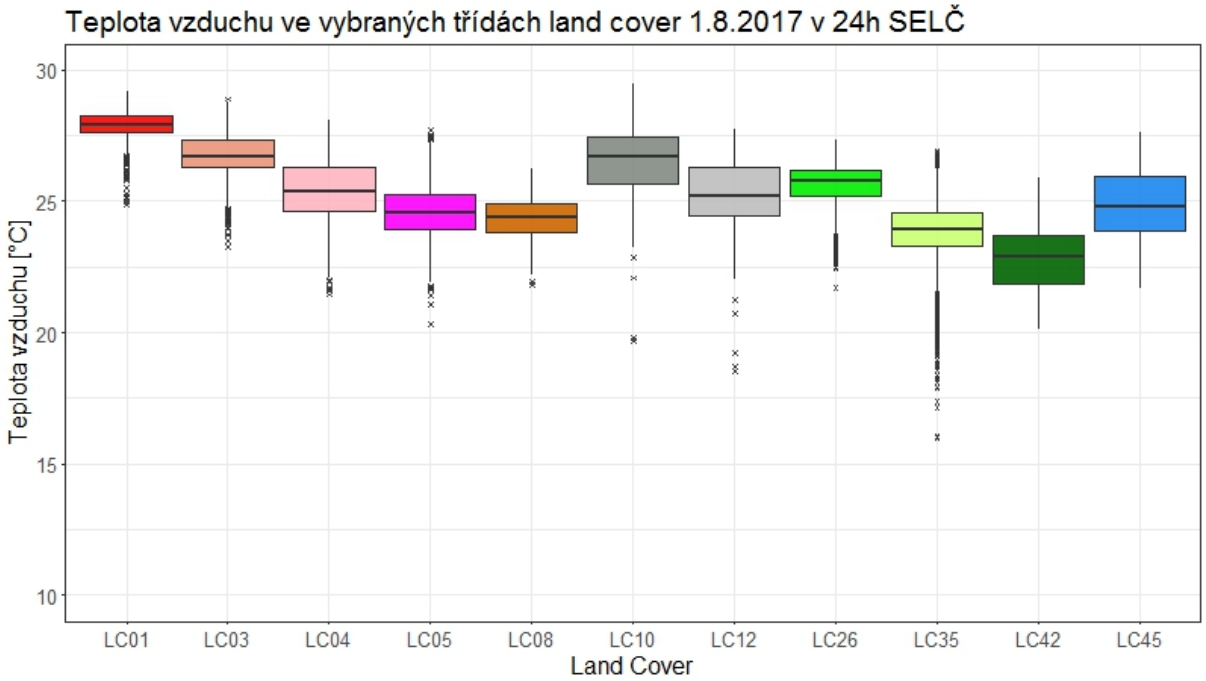

Fig 6: Examples of air temperature spatial distribution simulations in various land cover during a heat wave, August 1, 2017 at 24.00 CEST. LC01 - Dense and high built-up are in city downtowns; LC03 - Dispersed lower built-up areas in city downtowns; LC04 – Higher, densely populated built-up areas; LC05 – Higher sparsely populated built-up areas; LC08 – Dispersed low built-up areas; LC10 - Densely built-up industrial areas; LC12 – Industrial and shopping centres with halls; LC26 – Dense urban vegetation; LC35 – Permanent grass growths/grasslands; LC42 – Mixed forests; LC45 – Watercourses and water bodies

4.2. Insufficient infiltration and extreme rainfalls

At present, the highest vulnerability to extreme rainfalls and insufficient infiltration can be found in the vicinity of the Vltava and Berounka rivers confluence, *i.e.* in the City District of Prague 16, Velká Chuchle, Zbraslav and Lipence city quarters respectively. The Vltava River and Botič and Rokytka brooks Q100 zones also display high vulnerability as well as densely built-up areas in Praha 2 and Praha 3 city districts and a part of the Vysočany quarter under Klíčov, The most extensive area is covered by the vulnerability medium class – it is about 35 % of the Capital City of Prague´s total territory (*cf.* Fig. 7). In projection for the 2030 year, the vicinity of the Vltava and Berounka rivers confluence displays, similarly to the current state, the highest vulnerability. As a mosaic, the high vulnerable areas are located across the whole city´s territory, covering 4 % of the city´s total area. Low and very low vulnerability classes are located particularly in uptowns where green spaces have been less vulnerable.

Details on the elaborated analytical part are available at http://portalzp.praha.eu/jnp/cz/ochrana_klimatu/implementplan_StrategieadaptaceHMP_analytcast.html

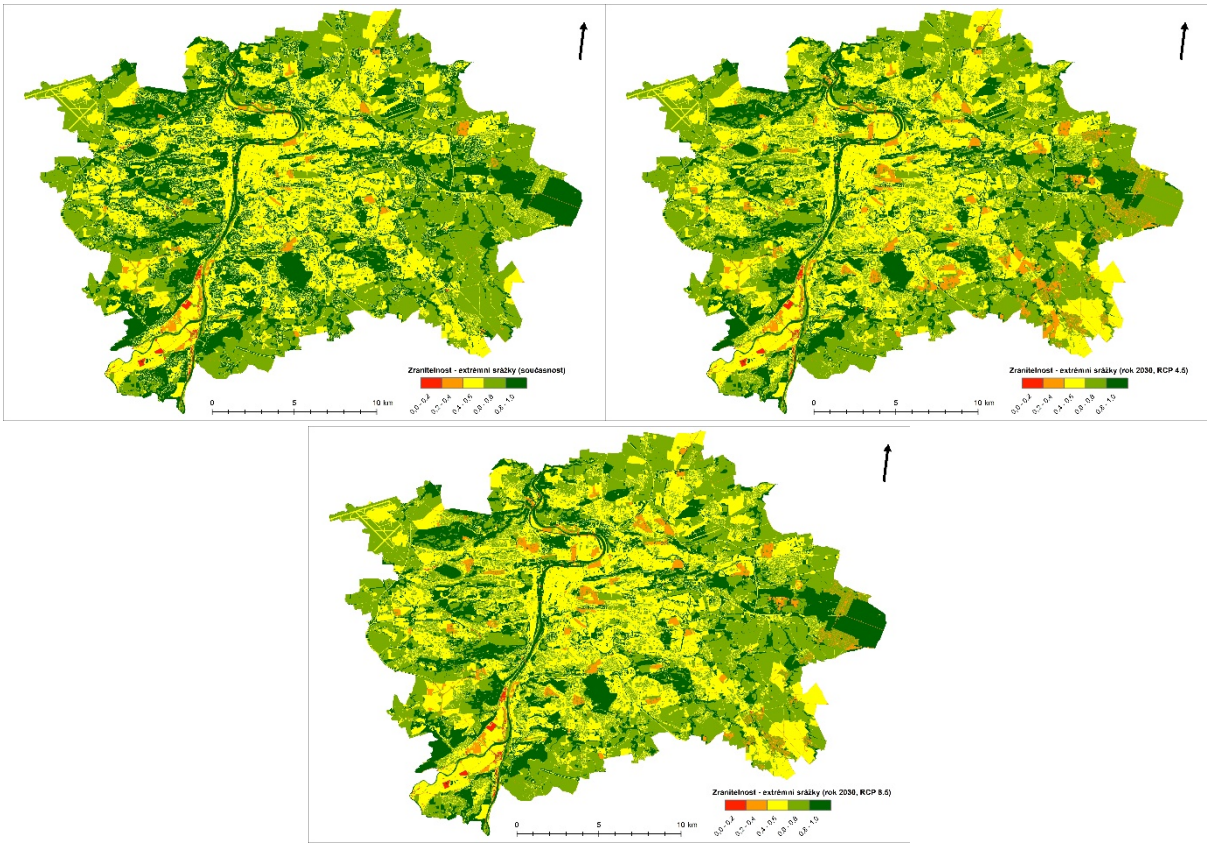

Fig. 7: Vulnerability to extreme rainfalls (the current state and the year 2030 – RCP 4.5 and 8.5. scenarios)

5. Methodology of developing the Implementation Plan to the Capital City of Prague Climate Change Adaptation Strategy for 2018 – 2019 and its measures

The Capital City of Prague Climate Change Adaptation Strategy (hereinafter the Adaptation Strategy) was approved by Prague Council Decision No. 1723 of July 18, 2017. At the same time, the Prague Council charged the Department of Environmental Protection, Capital City of Prague Municipal Office by developing the Implementation Plan to the Strategy for 2018 – 2019.

Developing the Implementation Plan for 2018 – 2019 is based on the approved Adaptation Strategy and it proposes measures and pilot projects aiming at the Adaptation Strategy main aim and its specific targets for that short-term period.

Main strategic target of the Capital City of Prague Climate Change Adaptation Strategy
Enhancing Prague´s long-term resistance to climate change impacts

A proposal on adaptation measures targets aiming at enhancing Prague´s resistance and involving the specific targets is based on the analysis of the current state and projections of climate change impacts on the Capital City of Prague´s territory by 2030 as well as on the Prague´s vulnerability assessment.

Specific targets of the Capital City of Prague Climate Change Adaptation Strategy

A: Enhance microclimatic conditions in Prague and reduce the adverse impacts of extreme temperatures, heat waves and urban heat island on Prague inhabitants;

B: Reduce extreme hydrological event impacts, *i.e.* torrential floods, floods and long-term droughts on the Capital City of Prague´s territory as well as the adjacent landscape in the Prague Metropolitan Area;

C: Reduce energy performance in Prague incl. adaptations in buildings;

D: Enhance Prague´s preparedness in risk management;

E: Enhance conditions for sustainable mobility in Prague;

F: Enhance conditions in communication, education and public awareness, support monitoring of and research on climate change impacts.

A list of the proposed measures for the Capital City of Prague Climate Change Strategy specific targets is given in Annex I. Some of the measures help at the same time to mitigate climate change impacts for two or more specific targets which will be taken into account when assessing their benefits.

The proposed Implementation Plan to the Capital City of Prague Climate Change Adaptation Strategy for 2018 – 2019 (hereinafter the Implementation Plan) aims at the relatively short-term period of 2018 – 2019, allowing

(i) to complement the knowledge database on climate change impacts in Prague;
(ii) to develop methodologies, guidelines, measures and pilot projects contributing to climate change mitigation and that can be introduced in that short-term period and;
(iii) to raise awareness of possible climate change adaptations in Prague among citizens.

The Implementation Plan includes the particular adaptation measures and pilot projects, starting the implementation procedure, taking into account the specific conditions of the Capital City of Prague as the urban landscape characterized by high proportion of the built-up area and paved spaces, high economic, technological and transport infrastructure accumulation and uneven dispersed distribution of green spaces and vegetation elements.

The Implementation Plan in detail develops the individual steps towards implementation of the selected adaptation measures together with a proposal on their monitoring and assessment of their effectiveness and efficiency. After completing the knowledge database and assessing effectiveness and efficiency of the implemented measures, developing a further implementation plan for a longer period.

As a pilot area for testing the approach to the proposed adaption measure implementation was selected the City District of Prague 6, due to its area diversity and heterogeneity and possibilities for testing various approaches to the proposed adaptation measures.

The analytical part of the Implementation Plan was drafted in cooperation with the Global Change Research Institute of the Academy of Sciences of the Czech Republic/CzechGlobe, the Institute of Computer Science of the Academy of Sciences of the Czech Republic, Czech Hydrometeorological Institute and Prague stakeholders.

A proposal on elaboration of the Implementation Plan including a detailed time schedule was submitted to the Prague Council which approved the schedule and established the Implementation Plan Steering Committee in its Decision No. 3025 on December 5, 2017.

Proposing adaptation measures within the Implementation Plan requires coordination among the relevant departments and divisions at the Capital City of Prague Municipal Office and other City´s organisations. Therefore, the Coordination Committee has also been established.

The Steering Committee appointed to the Coordination Committee representatives of the relevant departments and divisions at the Capital City of Prague Municipal Office and City´s organisations so that it is possible to handle interdisciplinary interconnection among the proposals and to agree the measures to be implemented.

Experts and other staff of the Capital City of Prague Municipal Office are involved in elaborating the proposal on the measures and pilot projects in the following working groups:

(i) Working group on urban heat island and heat wave impact mitigation;
(ii) Working group on enhancing rainfall/storm water management and reducing extreme hydrological event impacts, *i.e.* torrential floods, floods and long-term droughts;
(iii) Working group on reducing energy performance in Prague and enhancing adaptations in buildings;
(iv) Working group on adaptations in risk management and providing citizens with safety;
(v) Working group for communication, education and public awareness/environmental education and support to research on climate change.

The drafts of the analytical part and the Implementation Plan were presented and discussed during the conference on elaborating the Implementation Plan to the capital City of Prague Climate Change Adaptation Strategy held in the Czech Academy of Sciences headquarters in Prague on December 12, 2017. On March 21, 2018 all the working groups jointly met in the New Town Hall in Prague to debate proposed measures and pilot projects. Consequently, the Implementation Plan draft was submitted to consultation and review by the Coordination Committee.

6. Proposed measures and pilot projects within the Implementation Plan to the Capital City of Prague Climate Change Adaptation Strategy

The Capital City of Prague Climate Change Adaptation Strategy sets the specific targets which have been including into the Implementation Plan for the short-term period of 2018 – 2019. The short-term period allows complementing the knowledge database on the area, the current climate change processes there and possibilities to mitigate their negative impacts. Within the time framework given, developing methodologies and guidelines reducing negative climate change impacts as well as launching and testing the pilot projects is proposed. Raising awareness of the current climate change and possibilities to mitigate its impacts among the Prague citizens, public administration and city district staff is another important task.

Therefore, the proposed adaptation measures included into the Implementation Plan were divided into the following areas:

(a) Measures and projects on complementing the knowledge on the area and processes;
(b) Developing methodologies and guidelines;
(c) Proposed pilot projects.

Data sheets on the proposed measures and pilot projects are presented in Annex I.

Measures aiming at the Specific Target A, *i.e.* adaptations to extreme temperatures, heat waves and urban heat island and at the Specific Target B, *i.e* adaptations in water management and mitigating hydrological event impacts, namely torrential floods, floods and long-term droughts, help to reduce climate change impacts for both the targets or for more targets at the same time. For better clarity and illustration, the measures are divided according to their scope as follows:

(i) Measures for the open landscape;
(ii) Measures for the built-up area and the urban landscape;
(iii) Measures for adaptations in buildings (the Specific Target C - Reduce energy performance in Prague and to support adaptations in buildings).

The measures for the Specific target D Enhance Prague´s preparedness in risk management are presented in the same way as they have been developing by the Department of Crisis Management, Capital City of Prague Municipal Office and other stakeholders.

The proposed measures for the Specific Target E Enhance conditions for sustainable mobility in Prague were included into the Sustainable Mobility Plan for the Capital City of Prague and its Vicinity.

The proposed measures for the Specific Target F Enhance conditions in communication, education and public awareness/environmental education, support monitoring of and research on climate change impacts summarise all measures aiming at raising awareness of possible mitigating negative climate change impacts, developing a methodology and guidelines and education of experts, public administration staff, the general public and the target groups.

(i) Measures for the open landscape

Measures for adaptations to extreme temperatures, heat waves and urban heat island (the Capital City of Prague Climate Change Adaptation Strategy Specific Target A)

and

Measures for adaptations in water management and mitigating hydrological event impacts, namely torrential floods, floods and long-term droughts (the Capital City of Prague Climate Change Adaptation Strategy Specific Target B)

(a) Measures and projects on complementing the knowledge on the area and processes:

1. Modelling temperatures, urban heat island and air quality in Prague, the URBI PRAGENSIS project (implemented by the Faculty of Mathematics and Physics, Charles University Prague, the Operational Programme Prague – Growth Pole of the Czech Republic);
2. Adaptation challenges for cities: Enhancing sustainable planning using the integrated vulnerability analysis (implemented by the Global Change Research Institute of the Academy of Sciences of the Czech Republic/CzechGlobe and the Institute of Computer Science of the Academy of Sciences of the Czech Republic);
3. Elaboration of the study on possible risk of torrential rainfall occurrence on the Capital City of Prague´s territory, submitted to the Technology Agency of the Czech Republic (to be implemented by the Academy of Sciences of the Czech Republic);
4. Analysis of adaptation measures aiming at mitigating climate change and urbanisation effects in hydrological cycle in outer Prague (implemented by the T.G. Masaryk Water Research Institute, the Operational Programme Prague – Growth Pole of the Czech Republic);
5. Strategy on providing sustainable stream basin management (implemented by the Faculty of Environmental Sciences, Czech University of Life Sciences, the Operational Programme Prague – Growth Pole of the Czech Republic);
6. Clear Water – Healthy City (implemented by the T.G. Masaryk Water Research Institute, the Operational Programme Prague – Growth Pole of the Czech Republic);
7. Mapping wells on the Capital City of Prague´s territory (implemented by the Department of Crisis Management, Capital City of Prague Municipal Office);
8. Updating the general study on allotment gardens in Prague (implemented by Department of Environmental Protection, Capital City of Prague Municipal Office/National Institute of Public Health);
9. Water recreation/leisure/tourism capacity in Prague (implemented by the T.G. Masaryk Water Research Institute, the Operational Programme Prague – Growth Pole of the Czech Republic).

(b) Developing methodologies and guidelines:

1. Developing the Prague green infrastructure policy and strategy (implemented by the Prague Institute for Planning and Development).

(c) Proposed pilot projects:

1. Dívčí hrady/Girl's Castle – a landscape park under preparation (implemented by the Department of Environmental Protection, Capital City of Prague Municipal Office);
2. Project on the Soutok/Confluence Suburb Park on the confluence of Vltava and Berounka rivers (implemented by the Prague Institute for Planning and Development);
3. The Wild Vltava River – a river nature-based restoration with enlarging the river bed and with a broad-based terrace across the Císařský ostrov/Imperial Island (implemented by the Prague Institute for Planning and Development);
4. Flood prevention measures to protect the Capital City Prague at Lipence – a broad-based terrace (documentation prepared by the T.G. Masaryk Water Research Institute);
5. Flood prevention measures to protect the Capital City Prague at Čakovice (documentation prepared by the T.G. Masaryk Water Research Institute);
6. Maniny – Flood prevention measures, decreasing the Karlín profile levelling baseline (documentation prepared by the T.G. Masaryk Water Research Institute);
7. Hloubětín – Vysočany – Rokytka restoration (implemented by the Department of Environmental Protection, Capital City of Prague Municipal Office);
8. The Litovice-Šárka Brook restoration and building the Terezka Fishpond at Liboc (implemented by the Department of Environmental Protection, Capital City of Prague Municipal Office);
9. Building a new water reservoir at Lipiny – Modřany city quarter (implemented by the Department of Environmental Protection, Capital City of Prague Municipal Office).

(ii) Measures for built-up area and the urban landscape

Measures for adaptations to extreme temperatures, heat waves and urban heat island (the Capital City of Prague Climate Change Adaptation Strategy Specific Target A)

and

Measures for adaptations in water management and mitigating hydrological event impacts, namely torrential floods, floods and long-term droughts (the Capital City of Prague Climate Change Adaptation Strategy Specific Target B)

(a) Measures and projects on complementing the knowledge on the built-up area and the urban landscape:

1. The current state analysis and a proposal on available tree species resistant to climate change impacts, preparation of tree alleys database (implemented by the Department of Environmental Protection, Capital City of Prague Municipal Office/Prague Institute for Planning and Development);
2. Modelling air temperature and ventilation dynamics in the selected built-up areas in Prague (implemented by the Department of Environmental Protection, Capital City of Prague Municipal Office/Institute of Computer Science of the Academy of Sciences of the Czech Republic);
3. Analysis of possible rainfall storage tank/reservoir restoration (implemented by the Department of Environmental Protection, Capital City of Prague Municipal Office/Capital City of Prague Forests);
4. Registering community gardens (implemented by the Department of Environmental Protection, Capital City of Prague Municipal Office/Kokoza, charitable trust);
5. Analysis on fog shower and drinking fountain distribution in Prague with respect to extreme temperature impact mitigation (implemented by the Department of Environmental Protection, Capital City of Prague Municipal Office/Prague Water Supply and Sewerage Company/Institute of Computer Science of the Academy of Sciences of the Czech Republic).

(b) Developing methodologies and guidelines:

1. Street alley current state analysis and proposal on guidelines for tree greenery planting and management (implemented by the Department of Environmental Protection, Capital City of Prague Municipal Office/Prague Institute for Planning and Development);
2. Developing a manual on rainfall/storm water management on the Capital City of Prague´s territory (implemented by the Department of Environmental Protection, Capital City of Prague Municipal Office/Faculty of Civil Engineering, Czech Technical University and Koniklec/Pasqueflower EcoCentre, charitable trust);
3. Developing a methodology on green strips along tramway tracks planting and management (implemented by the Department of Environmental Protection, Capital City of Prague Municipal Office/Prague Public Transport Company).

(c) Proposed pilot projects:

1. Planting a tree alley in Jaromír Street (implemented by the Department of Environmental Protection, Capital City of Prague Municipal Office);
2. Planting a tree alley in Blanik Street (implemented by Department of Environmental Protection, Capital City of Prague Municipal Office);
3. Restoring a park in the Petřín Watchtower Park (implemented by Department of Environmental Protection, Capital City of Prague Municipal Office);

4. The Mala Řepora Housing – a drainage (implemented by the Department of Environmental Protection, Capital City of Prague Municipal Office/City District of Prague 14).

(iii) Measures for adaptations in buildings

(The Capital City of Prague Climate Change Adaptation Strategy Specific Target C)

(b) Developing methodologies and guidelines

1. Developing methodological background documents on suitable measures in adaptations in buildings and introducing green roofs and green facades (project implemented by the Department of Environmental Protection, Capital City of Prague Municipal Office/Czech Landscape and Garden Society, registered civic association/Chance for Buildings Alliance);
2. Developing background documents for legislation on introducing green roofs and green facades (project implemented by the Department of Environmental Protection, Capital City of Prague Municipal Office/ Prague Institute for Planning and Development);
3. Energy effectiveness/efficiency in buildings, protected, conserved and managed as cultural heritage and buildings in the Capital City of Prague´s downtown (under preparation by the Department of Property Management, Capital City of Prague Municipal Office /Department of Project Management, Capital City of Prague Municipal Office);
4. Launching a compe, tition for the best adapted building with nature-based solutions in Prague (implemented by the Department of Environmental Protection, Capital City of Prague Municipal Office);

c. Proposed pilot projects:

1. Adaptation in some primary schools and kindergartens in the City District of Prague 12 incl. rainfall/storm water management (implemented by the Department of Environmental Protection, Capital City of Prague Municipal Office);
2. Project on an extensive green roof – the CUBE Building (implemented by the Department of Environmental Protection, Capital City of Prague Municipal Office and CUBE Office Centre).

(iv) Measures in risk management and providing citizens with safety

(The Capital City of Prague Climate Change Adaptation Strategy Specific Target D)

Enhance preparedness of the area in prevention to large emergencies or crises related to climate change, eventually to enhance their effective solutions. Keep spaces allowing overbank flow on watercourses. Built water retention reservoirs and polders and manage river and brook beds.

Enhance communication, education and public awareness of emergencies which can occur as a result of climate change among citizens.

Enhance general knowledge on measures to be taken to mitigate emergencies (evacuation, building flood prevention facilities, evacuation luggage content, communication from authorities on emergencies pursuant to the legislation, involvement of volunteers, providing help according to the demand).

Measures to enhance technical infrastructure resistance:

1. Enhance and develop the Capital City of Prague´s energy resistance
2. Enhance water management facility safety.

Measures to provide citizens and properties with safety

1. Enhance measures and projects increasing flood prevention and control effect of the landscape on the Capital of Prague´s territory (*cf.* Measures for the open landscape);
2. Complete flood prevention and control facilities on the Vltava River (*cf.* Measures for the open landscape);
3. Enhance implementation of measures aiming at slowing surface water runoff from the landscape and erosion prevention (*cf.* Measures for the open landscape);
4. Continue implementing flood plan digitalization;
5. Map wells that can be used as alternative water sources on the Capital City of Prague´s territory (*cf.* Measures for the open landscape);
6. Educate citizens in necessity to have their own sources and supplies.

Measures in enhancing crisis management

1. Enhance an adequate response by the public administration and citizens to emergencies or crises;
2. Update continuously the crisis documentation related to climate change;
3. Introduce software tools on elaborating the crisis documentation;
4. Regularly train the Capital City of Prague´s crisis emergency and the Integrated Rescue System bodies;
5. Provide early and effective communication to Prague citizens and visitors on possible or real emergencies or crises and on desirable responses under such conditions through the Capital City of Prague´s Security and Crisis Management Portal (bezpecnost.praha.eu);
6. Develop an early warning and notification system in the Capital City of Prague.

(v) Measures on enhancing communication, education and public awareness/environmental education among citizens and city districts

(The Capital City of Prague Climate Change Adaptation Strategy Specific Target F)

1. Developing a communication strategy to enhance awareness of climate changes and possibilities to mitigate its negative impacts (implemented by the Department of Environmental Protection, Capital City of Prague Municipal Office/Department of Communication and Marketing, Capital City of Prague Municipal Office);
2. Educational campaign on water and water resources management among Prague citizens, submitted to the Technology Agency of the Czech Republic (to be implemented by the T.G. Masaryk Water Research Institute);
3. Communication on early warning and notification when emergency or crisis appears – Providing information on life, health and property protection (implemented by the Department of Crisis Management, Capital City of Prague Municipal Office);
4. Information for citizens and city district offices on negative impacts on human health during heat waves (implemented by the Department of Environmental Protection, Capital City of Prague Municipal Office/National Institute of Public Health);
5. Developing a manual on suitable measures on rainfall/storm water management followed by training city district office staff, eventually builders, developers and the general public (implemented by the Department of Environmental Protection, Capital City of Prague Municipal Office/Czech Technical University and Koniklec/ Pasqueflower EcoCentre, charitable trust);
6. Developing a manual on suitable measures on adaptation in buildings followed by training city district office staff , eventually builders, developers and the general public (implemented by the Department of Environmental Protection, Capital City of Prague Municipal Office/Chance for Buildings Alliance);
7. Methodology on inner courtyard management, information for stakeholders and the general public (implemented by the Department of Environmental Protection, Capital City of Prague Municipal Office);
8. Methodology on enhancing allotment gardens, information for stakeholders and the general public (implemented by the Department of Environmental Protection, Capital City of Prague Municipal Office/Faculty of Environmental Sciences, Czech University of Life Sciences);
9. Methodology on enhancing community gardens, information for stakeholders and the general public (implemented by the Department of Environmental Protection, Capital City of Prague Municipal Office/Kokoza, charitable trust);
10. Developing a leaflet/brochure on tree functions and benefits and on street greenery management methods (implemented by the Department of Environmental Protection, Capital City of Prague Municipal Office/Czech Landscape and Garden Society);
11. Communication, education and public awareness/environmental education programmes and projects for children and youth (implemented by the Department of Environmental Protection, Capital City of Prague Municipal Office, pursuant to the Communication,

Education and Public Awareness Regional Strategy for the Capital City of Prague 2016 – 2020).

7. Proposed indicators for monitoring and assessment of the Capital City of Prague Climate Change Adaptation Strategy implementation

Assessing the Capital City of Prague Climate Change Adaptation Strategy implementation will be carried out by its monitoring and assessment of the selected indicators. Thus, monitoring the indicators and their assessment is a key tool for evaluating the Adaptation Strategy in short- and medium-term time framework. The general monitoring and assessing the Adaptation Strategy implementation context in relation to sustainable planning and management is shown in Fig. 8. In this chapter, the proposed indicators as well as their methodological framework are presented.

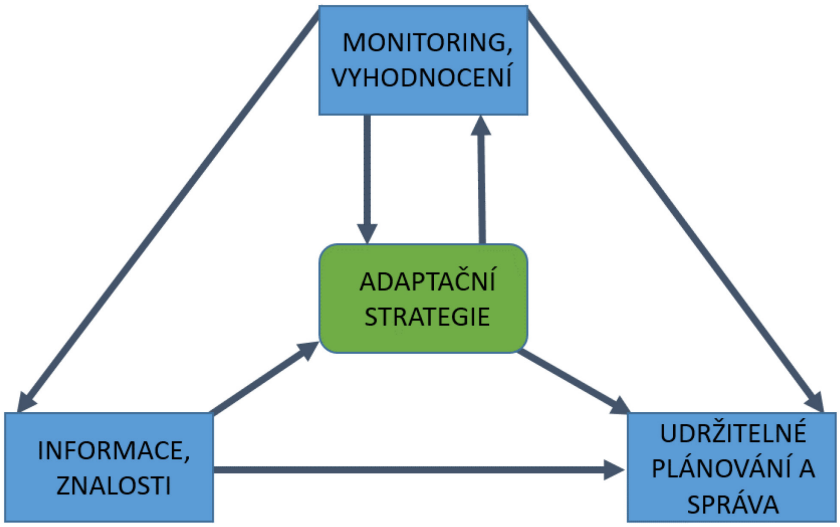

Fig. 8: Adaptation Strategy, its monitoring and assessment and relation to sustainable planning and management (SOURCE: EEA, 2016, slightly modified)
monitoring, vyhodnocení – monitoring, assessment; adaptační strategie – adaptation strategy; udržitelné plánování a správa – sustainable planning and management; informace, znalosti – information, data, knowledge

Following current activities carried out by the Capital City of Prague and other bodies (*e.g.*, Czech Hydrometeorological Institute, Czech Statistical Office, *etc.*), basic indicators are proposed for monitoring; in addition, model supplementary indicators have also been developed (examples). Data for the basic indicators have currently been gathered: therefore, they have been available for climate change adaptation monitoring and assessment, without necessity to gather new ones. The basic indicator set includes in total 16 items in three categories (A, B, C). The supplementary indicators are marked by X index in the indicator´s ID column. According to Prague Environment Reports data for their monitoring and assessment are not systematically gathered: therefore, no data sources are given for them.

The comprehensive set reflects the climate change adaptation reporting framework for the Sustainable Energy and Climate Action Plan (SECAP, www.covenantofmayors.eu) and covers three topics:

1. Indicators of climate extremes and changes;
2. Vulnerability indicators;
3. Adaptation indicators.

The indicators of climate extremes and changes are of informative character, but their monitoring is necessary to understand the global context (climate is a dynamic system and climate change adaptation monitoring requires knowledge of climate change and its extremes). The vulnerability indicators aim at monitoring social vulnerability to negative climate change impacts. The adaptation indicators´ target is to monitoring introducing and implementation of the particular adaptation measures following the Adaptation Strategy.

7.1. Indicators of climate extremes and changes (category A)

The basic climate extremes and changes are developed to reflect three main threats related to the changing climate on the Capital City of Prague´s territory – indicator on extreme temperatures, particularly heat waves (A_01); indicator on extreme rainfalls – torrential rainfalls (A_02) and indicator on lack of water and on drought (A_03). The supplementary indicators of climate extremes and changes can be deliberately based *e.g.* on the climate extreme indexes commonly (*e.g.*, https://www.ncdc.noaa.gov/extremes/cei/), but data availability necessary to monitor the extremes cannot always be easy.

Table 1: Indicators of climate extremes and changes

ID	Indicator	Definition	Measured in	Assessment	Data
A_01	Number of days/nights with extreme temperatures	Number of days/nights when the temperature is higher than the limit value (*e.g.*, number of tropical days, tropical nights, summer days)	number/year	Extreme temperature informative indication	Czech Hydrometeorological Institute
A_02	Number of extreme rainfall events	Number of rainfall events when totals are higher than the limit value set at the local level by a climatological	number/year	Extreme rainfall informative indication	Czech Hydrometeorological Institute

		map			
A_03	Number of drought days	Number of days when the model soil humidity in % of usable water capacity is < 10%	number/year	Drought informative indication	Czech Hydrometeorological Institute
A_X1	Other climate extreme indexes	There are a lot of more or less specific climate extreme indicators	*	Climate extreme informative indication	-

* - most often these are dimensionless variables (0-1) but it depends on the individual climate extreme index type

7.2. Vulnerability indicators (category B)

The basic vulnerability indicator set includes particular demographic characteristics of human population (B_01, B_02) as well as characteristics of the affected areas (B_03) and characteristics related to occurred event impacts (B_04, B_05, B_06). The proposed supplementary indicators take into account characteristics of the affected human population (B_X1) and extreme hydrometeorological/climate event economic impacts (B_X2).

Table 2 Vulnerability indicators

ID	Indicators	Definition	Measured in	Assessment	Data
B_01	Human population density	Number of inhabitants of the administration unit related to an area	inhabitants /km^2	Higher human population density indicates higher vulnerability	CSO
B_02	Proportion of sensitive inhabitant groups	Proportion of inhabitants in 0 – 14 and 65+ years of age	%	Higher proportion of sensitive inhabitant groups indicates higher vulnerability	CSO

B_03	Proportion of area in flooded space	Proportion of administration unit which is flooded during the Q100 flood	%	Higher proportion indicates higher vulnerability	WRI
B_04	Number of hydrometeorological /climate crises	Number of situations caused by hydrometeorological /climate events which meet the crisis event definition according to risk management	number/ year	Higher number indicates higher vulnerability/higher climate extremes[1]	Risk management authorities
B_05	Number of evacuated persons	Number of evacuated/translocated persons due to extreme hydrometeorological /climate events	number/year	Higher number indicates higher vulnerability/higher climate extremes[1]	Risk management authorities
B_06	Number of injured persons/deaths	Number of injured persons/deaths due to extreme hydrometeological/climate events	number/year	Higher number indicates higher vulnerability/higher climate extremes[1]	Risk management authorities
B_X1	Proportion of population in threatened areas	% population of administrative unit living in areas threatened by the given extreme hydrometeorological /climate event types	%	Higher proportion of population living in threatened areas indicates higher vulnerability	-
B_X2	Damages on city´s properties	Total monetary damage on city´s properties caused by extreme hydrometeorological /climate events	CZK thousands/ year	Higher damage indicates higher vulnerability/higher climate extremes[1]	-

1 it can also be used as category A indicator

CSO – Czech Statistical Office, WRI – T.G. Masaryk Water Research Institute

7.3. Adaptation indicators (category C)

The basic adaptation indicator set include indicators reflecting nature-based adaptation measure implementation on the city´s territory (C_01, C_02, C-_03, C-04 and supplementary

measures C_X1, C_X2, C_X3) as well as indicators characterising drinking water management (C_05, C_06, C_07 and supplementary measures C_X6 and C_X7), communication, education and public awareness indicator (C_X4) and costs spent (C_X5).

Table 3 Adaptation indictors

ID	Indicator	Definition	Measured in	Assessment	Data
C_01	Proportion of green spaces	Proportion of the administration unit´s territory classified as green spaces	%	Higher proportion indicates successful Adaptation Strategy implementation	City districts, CCPMO
C_02	Proportion of permeable surfaces	Proportion of the administration unit´s territory classified as permeable surfaces	%	Higher proportion indicates successful Adaptation Strategy implementation	ÚP
C_03	Number of planted trees	Number of newly planted trees as a part of public greenery in the city	number/year	Higher proportion indicates successful Adaptation Strategy implementation	City districts, CCPMO
C_04	Tree number ratio	Difference between planted and cut trees within the administrative unit	number/year	Value above zero indicates successful Adaptation Strategy implementation	CCPMO
C_05	Nature-based watercourse restoration	Total length of restored or newly built watercourses	kilometres/year	Higher number indicates successful Adaptation Plan implementation	CCPMO

C_06	Drinking water consumption	Specific drinking water consumption in households	litres/inhabitant/day	Lower consumption can indicate successful Adaptation Strategy implementation	PWSSCCPMO
C_07	Drinking water loss in distribution facilities	Proportion of drinking water volume taken by consumers and the total volume of water supplied into distribution facilities	%	Lower proportion indicates successful Adaptation Strategy implementation	PWSSCCPMO
C_X1	Green roof and green facade area	Total area of green roofs and green facades on buildings within the administration unit	square metres	Increase in green roof and green façade area indicates successful Adaptation Strategy implementation	-
C_X2	Infiltration strip and belt area	Total infiltration strip and belt area within the administration unit	square metres	Increase in total infiltration strip and belt area indicates successful Adaptation Strategy implementation	-
C_X3	Area of restored space in brownfields	Total area of restored spaces in brownfields in the city/administration unit in a given year	hectares/year	Brownfield restoration can indicate successful Adaptation Strategy implementation	-

C_X 4	Involvement of the general public into CEPA on climate protection	Number of participants in CEPA programmes on climate protection and climate change adaptations for children and adults on the Capital City of Prague´s territory	number/year	Higher involvement of the general public in climate change adaptation issue indicates successful Adaptation Strategy implementation	-
C_X 5	Total investment into adaptation measures	The total finances invested from public sources on adaptation measures implemented on the Capital City of Prague´s territory in a given year	CZK thousands/ year	Higher investment in adaptation measures can indicate successful Adaptation strategy implementation	-
C_X 6	Rainfall/storm water accumulation and its use in buildings	Number of newly built buildings accumulating and again using rainfall/storm water, *e.g* for sanitary purposes, in a given year	number/year	Higher number indicates successful Adaptation Plan implementation	-
C_X 7	Rainfall/storm water accumulation and its use for public greenery watering	Number of public parcels where measures for rainfall/storm water accumulation and use for watering (pools, rainfall/storm water accumulation tanks or reservoirs, etc.) were newly implemented in a given year	number/year	Higher number indicates successful Adaptation Plan implementation	-

CCPMO - Capital City of Prague Municipal Office; PWSSC - Prague Water Supply and Sewerage Company; CEPA – communication, education and public awareness/environmental education

Annexes to the Implementation Plan to the Capital City of Prague Climate Change Adaptation Strategy for 2018-2019

Draft June 2018

Annex I: Data sheets on adaptation measures and pilot projects

I. Data sheets for the open landscape

a. Measures and projects on complementing the knowledge

Name of the measure/pilot project	Modelling temperatures, urban heat island and air quality in Prague	
Description of the measure/pilot project Implementation steps	Modelling temperatures, urban heat island and air quality in Prague (the URBI PRAGENSIS project implemented by the Faculty of Mathematics and Physics, Charles University Prague) aims at modelling microclimate and air pollution in Prague. It will contribute to implementing the Capital City of Prague Climate Change Strategy by allowing the targeted decision-making and proposing adaptation measures incl. assessing their effectiveness	
Implementation period		
Leading department/administrator	Faculty of Mathematics and Physics, Charles University Prague	
Departments and institutions involved	Department of Environmental Protection, Capital City of Prague Municipal Office	
Relation to Adaptation Strategy	A: Adaptation measures to mitigating increasing temperature, urban heat island and heat waves	x
	B: Adaptation measures to reducing impacts of torrential rainfall, floods and long-term drought on the Capital City of Prague´s territory	x
	C: Adaptation measures to reduce energy performance in Prague incl. adaptations in buildings	
	D: Adaptation measures in risk management and providing citizens with safety	
	F: Adaptation measures to reducing impacts of torrential rainfall, floods and long-term drought on the Capital City of Prague´s territory	
Type of the measure	Running measures/pilot project	x
	New measure/pilot project	x
Climate change impacts targeted:	1. Heat waves and urban heat island	x
	2. Extreme rainfalls and rainfall/storm water management	
	3. Floods	
	4. Droughts	

Synergies with other policy documents and projects	
Possible conflicts	
Financial costs	
Source of financing	the Operational Programme Prague – Growth Pole of the Czech Republic www.penizeproprahu.cz, info@penizeproprahu.cz
Other information	

Name of the measure/pilot project	Adaptation challenges for cities: Enhancing sustainable planning using the integrated vulnerability analysis	
Description of the measure/pilot project Implementation steps	Developing an integrated vulnerability analysis methodology, using the urban land cover classification which shall become a tool for enhancing climate change adaptation and suitable adaptation planning in cities. For the selected pilot cities (Prague, Ostrava, Brno) a detailed vulnerability analysis using climate analysis will be elaborated.	
Implementation period	2018 – 2022	
Leading department/administrator	Global Change Research Institute of the Academy of Sciences of the Czech Republic/CzechGlobe	
Departments and institutions involved	Department of Environmental Protection, Capital City of Prague Municipal Office Institute of Computer Science of the Academy of Sciences of the Czech Republic	
Relation to Adaptation Strategy	A: Adaptation measures to mitigating increasing temperature, urban heat island and heat waves	x
	B: Adaptation measures to reducing impacts of torrential rainfall, floods and long-term drought on the Capital City of Prague´s territory	x
	C: Adaptation measures to reduce energy performance in Prague incl. adaptations in buildings	
	D: Adaptation measures in risk management and providing citizens with safety	
	F: Adaptation measures to reducing impacts of torrential rainfall, floods and long-term drought on the Capital City of Prague´s territory	
Type of the measure	Running measures/pilot project	X
	New measure/pilot project	
Climate change impacts targeted:	1. Heat waves and urban heat island	X
	2. Extreme rainfalls and rainfall/storm water management	
	3. Floods	
	4. Drought	
Synergies with other policy documents and projects		
Possible conflicts		
Financial costs		
Source of financing	Approved by the Technology Agency of the Czech Republic within the Eta Programme	
Other information		

Name of the measure/pilot project	**Elaboration of the study on possible risk of torrential rainfall occurrence on the Capital City of Prague´s territory**	
Description of the measure/pilot project Implementation steps	Elaboration of the study on possible risk of torrential rainfall occurrence on the Capital City of Prague´s territory, project´s application submitted. Stochastic analysis on rainfall dynamics in Prague will allow assessing possible torrential rainfall impacts on the Prague´s territory and enhancing city´s preparedness to emergencies and crisis. The project is expected to be approved in August 2018.	
Implementation period	2018 – 2020	
Leading department/administrator	Academy of Sciences of the Czech Republic	
Departments and institutions involved	Department of Environmental Protection, Capital City of Prague Municipal Office	
Relation to Adaptation Strategy	A: Adaptation measures to mitigating increasing temperature, urban heat island and heat waves	
	B: Adaptation measures to reducing impacts of torrential rainfall, floods and long-term drought on the Capital City of Prague´s territory	x
	C: Adaptation measures to reduce energy performance in Prague incl. adaptations in buildings	
	D: Adaptation measures in risk management and providing citizens with safety	
	F: Adaptation measures to reducing impacts of torrential rainfall, floods and long-term drought on the Capital City of Prague´s territory	
Type of the measure	Running measures/pilot project	
	New measure/pilot project	x
Climate change impacts targeted:	1. Heat waves and urban heat island	
	2. Extreme rainfalls and rainfall/storm water management	x
	3. Floods	
	4. Drought	
Synergies with other policy documents and projects		
Possible conflicts		
Financial costs		
Source of financing	Submitted to the Technology Agency of the Czech Republic within the Eta Programme	
Other information		

Name of the measure/pilot project	**Analysis of adaptation measures aiming at mitigating climate change and urbanisation effects in the hydrological cycle in outer Prague**	
Description of the measure/pilot project Implementation steps	The project aims at assessing long-term effects of continuing urbanization on the hydrological cycle on the Prague outskirts in close relation to current climate change and its projected impacts. It also will assess effectiveness and efficiency of currently proposed adaptation measures and those having been implemented, possibly proposing other supplementary ones, introducing a pilot plant of the system allowing to assess immediate rainfall runoff on small watercourses and developing a utility model and a type project.	
Implementation period	January 1, 2018 – June 30, 2020	
Leading department/administrator	T.G. Masaryk Water Research Institute	
Departments and institutions involved	Department of Environmental Protection, Capital City of Prague Municipal Office	
Relation to Adaptation Strategy	A: Adaptation measures to mitigating increasing temperature, urban heat island and heat waves	
	B: Adaptation measures to reducing impacts of torrential rainfall, floods and long-term drought on the Capital City of Prague´s territory	x
	C: Adaptation measures to reduce energy performance in Prague incl. adaptations in buildings	
	D: Adaptation measures in risk management and providing citizens with safety	
	F: Adaptation measures to reducing impacts of torrential rainfall, floods and long-term drought on the Capital City of Prague´s territory	
Type of the measure	Running measures/pilot project	
	New measure/pilot project	x
Climate change impacts targeted:	1. Heat waves and urban heat island	
	2. Extreme rainfalls and rainfall/storm water management	x
	3. Floods	
	4. Drought	x
Synergies with other policy documents and projects		
Possible conflicts		
Financial costs	CZK 18.6 million (EUR 720,000.00)	
Source of financing	Project has been funded by the Operational Programme Prague – Growth Pole of the Czech Republic www.penizeproprahu.cz, info@penizeproprahu.cz	
Other information		

Name of the measure/pilot project	**Strategy on providing sustainable stream basin management**	
Description of the measure/pilot project Implementation steps	Through the SWAT Reference Centre, the strategy on providing sustainable stream basin management influencing water quality important for the Capital City of Prague´s requirements will establish a unique service for managing processes in stream basins aiming at improving water quality in watercourses and bodies and monitoring individual pollutant dynamics.	
Implementation period	2018 - 2022	
Leading department/administrator	Faculty of Environmental Sciences, Czech University of Life Sciences	
Departments and institutions involved	Department of Environmental Protection, Capital City of Prague Municipal Office	
Relation to Adaptation Strategy	A: Adaptation measures to mitigating increasing temperature, urban heat island and heat waves	
	B: Adaptation measures to reducing impacts of torrential rainfall, floods and long-term drought on the Capital City of Prague´s territory	x
	C: Adaptation measures to reduce energy performance in Prague incl. adaptations in buildings	
	D: Adaptation measures in risk management and providing citizens with safety	
	F: Adaptation measures to reducing impacts of torrential rainfall, floods and long-term drought on the Capital City of Prague´s territory	
Type of the measure	Running measures/pilot project	
	New measure/pilot project	x
Climate change impacts targeted:	1. Heat waves and urban heat island	
	2. Extreme rainfalls and rainfall/storm water management	x
	3. Floods	
	4. Drought	x
Synergies with other policy documents and projects		
Possible conflicts		
Financial costs		
Source of financing	Project has been funded by the Operational Programme Prague – Growth Pole of the Czech Republic www.penizeproprahu.cz, info@penizeproprahu.cz	
Other information		

Name of the measure/pilot project	**Clear Water – Healthy City**	
Description of the measure/pilot project Implementation steps	The Clear Water – Healthy City project aims at monitoring contaminants in underground, surface and waste waters caused by human activities. It deals with entering of pesticides into a water body and removing organic substances from sorption filters, enhancing monitoring drinking water biological quality and predicting possible occurrence of dangerous substances during accidents and floods.	
Implementation period	2018 – 2020	
Leading department/administrator	T.G. Masaryk Water Research Institute	
Departments and institutions involved	Department of Environmental Protection, Capital City of Prague Municipal Office	
Relation to Adaptation Strategy	A: Adaptation measures to mitigating increasing temperature, urban heat island and heat waves	
	B: Adaptation measures to reducing impacts of torrential rainfall, floods and long-term drought on the Capital City of Prague´s territory	x
	C: Adaptation measures to reduce energy performance in Prague incl. adaptations in buildings	
	D: Adaptation measures in risk management and providing citizens with safety	x
	F: Adaptation measures to reducing impacts of torrential rainfall, floods and long-term drought on the Capital City of Prague´s territory	
Type of the measure	Running measures/pilot project	x
	New measure/pilot project	
Climate change impacts targeted:	1. Heat waves and urban heat island	
	2. Extreme rainfalls and rainfall/storm water management	x
	3. Floods	
	4. Drought	x
Synergies with other policy documents and projects		
Possible conflicts		
Financial costs		
Source of financing	Project has been funded by the Operational Programme Prague – Growth Pole of the Czech Republic www.penizeproprahu.cz, info@penizeproprahu.cz	

Other information	

Name of the measure/pilot project	**Updating the general study on allotment gardens in Prague**	
Description of the measure/pilot project Implementation steps	Updating the general study on allotment gardens in Prague allows to map the above facilities and to enhance areas contributing to climate change impact mitigation, particularly to rainfall/storm water accumulation and reducing extreme temperature impacts. Allotment gardens can be considered as a green space/element network related to watercourses and water bodies contributing to ecosystem services and functions preservation, at the same time providing other social benefits to humans.	
Implementation period	June 2018	
Leading department/administrator	Department of Environmental Protection, Capital City of Prague Municipal Office	
Departments and institutions involved	Faculty of Environmental Sciences, Czech University of Life Sciences	
Relation to Adaptation Strategy	A: Adaptation measures to mitigating increasing temperature, urban heat island and heat waves	x
	B: Adaptation measures to reducing impacts of torrential rainfall, floods and long-term drought on the Capital City of Prague´s territory	x
	C: Adaptation measures to reduce energy performance in Prague incl. adaptations in buildings	
	D: Adaptation measures in risk management and providing citizens with safety	
	F: Adaptation measures to reducing impacts of torrential rainfall, floods and long-term drought on the Capital City of Prague´s territory	x
Type of the measure	Running measures/pilot project	x
	New measure/pilot project	
Climate change impacts targeted:	1. Heat waves and urban heat island	X
	2. Extreme rainfalls and rainfall/storm water management	X
	3. Floods	
	4. Drought	X
Synergies with other policy documents and projects		
Possible conflicts		
Financial costs	CZK <50,000.00 (EUR 1,935.00), funded from the budget of the Department of Environmental Protection, Capital City of Prague Municipal Office	
Source of financing		
Other information		

Name of the measure/pilot project	**Mapping wells on the Capital City of Prague´s territory**	
Description of the measure/pilot project Implementation steps	Project on mapping wells on the Capital City of Prague´s territory aims as reviewing location of wells and underground water sources which can be used as alternative water sources.	
Implementation period	2018 – 2019	
Leading department/administrator	Department of Crisis Management, Capital City of Prague Municipal Office	
Departments and institutions involved		
Relation to Adaptation Strategy	A: Adaptation measures to mitigating increasing temperature, urban heat island and heat waves	
	B: Adaptation measures to reducing impacts of torrential rainfall, floods and long-term drought on the Capital City of Prague´s territory	x
	C: Adaptation measures to reduce energy performance in Prague incl. adaptations in buildings	
	D: Adaptation measures in risk management and providing citizens with safety	x
	F: Adaptation measures to reducing impacts of torrential rainfall, floods and long-term drought on the Capital City of Prague´s territory	
Type of the measure	Running measures/pilot project	
	New measure/pilot project	
Climate change impacts targeted:	1. Heat waves and urban heat island	
	2. Extreme rainfalls and rainfall/storm water management	x
	3. Floods	
	4. Drought	x
Synergies with other policy documents and projects		
Possible conflicts		
Financial costs	Approved budget of the Department of Crisis Management, Capital City of Prague Municipal Office	
Source of financing		
Other information		

b. Developing methodologies and guidelines for the open landscape and the urban landscape

Name of the measure/pilot project	**Developing the Prague green infrastructure policy and strategy**
Description of the measure/pilot project Implementation steps	The green infrastructure includes both a protected area network and the non-reserved landscape outside protected areas including various greenery sites/areas in human settlements, from green roofs and greenery belts to urban parks, gardens, orchards, fields and watercourses. A systematic interlinkage among the above elements and using their ecosystem services allow Prague to better adapt itself to climate change and provide their citizens with the suitable environment for life, sport, recreation/leisure at the place they have been living, at the same time preserving, conserving, protecting and developing natural values in the urban and suburban landscape. For creating the high-quality green infrastructure within the city, it is necessary to define joint targets and goals as well as the individual steps for its long-term development and management. It will be reached by elaborating the Green Infrastructure Strategy and Policy, developing of which should be divided into some phases. Initial/kick-off and preparatory phases will produce information, communication, analytical and knowledge background for developing the documents, identify difficulties to be handle with as well as the Strategy´s main topic. Within the process, a preliminary draft will be developed after discussing the issue with key stakeholders and basic scenarios on the Prague Green Infrastructure development will be designed. The last step will be establishment of the Steering Committee to manage developing the Strategy and Policy. In further phases, the Green Strategy and Policy as well as ways how to implement measures proposed by the Strategy and defined by the Policy will be elaborated. Initial/kick-off Phase (Prague Institute for Planning and Development) • Launching the project on elaborating Green Infrastructure Strategy and Policy and developing its scheme by the Prague Institute for Planning and Development; • Starting consultations with key stakeholders in Prague; • Defining the Prague Green Infrastructure basic topics; • Producing an information document on the Green Infrastructure. Preparatory Phase • An analysis on the current state in green infrastructure and related issues in Prague; • Elaborating the Prague Green Infrastructure basic topics based on discussions with key stakeholders; • Communication and education of and awareness raising

	on the green infrastructure among both the general public and academicians; • Drafting a Strategy´s preliminary vision and proposal of scenarios on the green infrastructure development in Prague based on discussion with key stakeholders; • Elaborating a final report including outputs obtained by that time and a proposal for developing the Capital City of Prague´s Green Infrastructure Strategy and Policy • A proposal for establishing the Steering Committee to manage developing the Strategy and Policy.	
Implementation period	2018 – 2019	
Leading department/administrator	Prague Institute for Planning and Development	
Departments and institutions involved	Coordination and consultations with the Department of Environmental Protection, Capital City of Prague Municipal Office and the Capital City of Prague Forests, consultations with other subjects	
Relation to Adaptation Strategy	A: Adaptation measures to mitigating increasing temperature, urban heat island and heat waves	X
	B: Adaptation measures to reducing impacts of torrential rainfall, floods and long-term drought on the Capital City of Prague´s territory	X
	C: Adaptation measures to reduce energy performance in Prague incl. adaptations in buildings	
	D: Adaptation measures in risk management and providing citizens with safety	
	F: Adaptation measures to reducing impacts of torrential rainfall, floods and long-term drought on the Capital City of Prague´s territory	x
Type of the measure	Running measures/pilot project	
	New measure/pilot project	x
Climate change impacts targeted:	1. Heat waves and urban heat island	x
	2. Extreme rainfalls and rainfall/storm water management	x
	3. Floods	
	4. Drought	x
Synergies with other policy documents and projects	Strategic Plan for Prague (updated 2016) Greenery Management Strategy for the Capital City of Prague Prague Public Space Design Manual Prague Riverbank Policy	

	Land-use/territorial planning documentation
Possible conflicts	
Financial costs	CZK 1 million (EUR 38,690.00)
Source of financing	Capital City of Prague Municipal Office budget
Other information	

c. Pilot projects for the open landscape

Name of the measure/pilot project	**Dívčí hrady/Girl´s Castle – a landscape park under preparation**	
Description of the measure/pilot project Implementation steps	The Dívčí hrady/Girl´s Castle – a landscape park under preparation: establishing a landscape park allows cooling and enhancing air ventilation within the respective area, improving rainfall/storm water retention and allowing their use for vegetation management in the drought periods.	
Implementation period	2017 – 2020	
Leading department/administrator	Department of Environmental Protection, Capital City of Prague Municipal Office	
Departments and institutions involved		
Relation to Adaptation Strategy	A: Adaptation measures to mitigating increasing temperature, urban heat island and heat waves	
	B: Adaptation measures to reducing impacts of torrential rainfall, floods and long-term drought on the Capital City of Prague´s territory	
	C: Adaptation measures to reduce energy performance in Prague incl. adaptations in buildings	
	D: Adaptation measures in risk management and providing citizens with safety	
	F: Adaptation measures to reducing impacts of torrential rainfall, floods and long-term drought on the Capital City of Prague´s territory	
Type of the measure	Running measures/pilot project	x
	New measure/pilot project	
Climate change impacts targeted	1. Heat waves and urban heat island	x
	2. Extreme rainfalls and rainfall/storm water management	x
	3. Floods	
	4. Drought	x
Synergies with other policy documents and projects	Reducing water surface runoff, dustiness, and chemical substances (*e.g.* fertilisers, pesticides, *etc.*) levels resulting from transforming the original landscape into extensive meadows with dispersed greenery	
Possible conflicts		
Financial costs	CZK 25 million (EUR 970,000.00)	
Source of financing	Budget of the Department of Environmental Protection, Capital City of Prague Municipal Office	

Other information	

Name of the measure/pilot project	Project on the Soutok/Confluence Suburb Park on the confluence of Vltava and Berounka rivers
Description of the measure/pilot project Implementation steps	According to the background analysis, the floodplain landscape on the confluence of the Berounka and Vltava rivers is from a point of view of the extreme rainfalls and floods the most vulnerable part of the Capital City of Prague´s territory. The agricultural floodplain landscape around the confluence of the Berounka and Vltava rivers features high proportion of privately owned lands and is targeted by a lot of economic interests. The attractive landscape harbouring a freely meandering river and covering more than 1,300 hectares have no joint vision of future development and suffers from intensive fragmentation. The vision of the Soutok/Confluence Suburb Park is based on harmony among supported natural processes, economic intents and developing various activities for visitors. The project aims at setting long-term conditions for creating the diversified, clear and permeable suburban landscape with a viable flowing river which addition to recreation/leisure and agricultural functions integrates flood prevention requirements, economic and sport activities of local inhabitants and visitors. In summer 2015, representatives of the respective city districts, the town of Černošice and the Capital City of Prague undersigned the Memorandum of Cooperation on development and future use of the area. The Together on the Confluence Platform was established by local stakeholders, which together with the Prague Institute for Planning and Development reviewed building intentions, proposals and projects within the area and spatial policy development principles. At present, the platform members are establishing the Soutok/Confluence Suburb Park, registered civic association which will guarantee a joint discussion on land-use, become a partner for elaborating the Soutok/Confluence Suburb Park land-use/territorial study, management plan and landscape masterplan and it also is suggested that it prospectively participate in participatory and coordinated management within the respective area. Based on area´s surveys targets and activities necessary for establishing the Soutok/Confluence Park have been set out. Goal 1 Park Management Institutionalization 1.1. Developing a proposal on a park management body; 1.2. Support Together on the Confluence Platform; 1.3. Establishing the Soutok/Confluence Suburban Park, registered civic association; 1.4. Registration of the Soutok/Confluence Suburban Park, registered civic association; 1.5. Developing the Soutok/Confluence Suburban Park Management Plan; 1.6. Provide the Soutok/Confluence Suburban Park with

	legally binding nature. Goal 2 Developing land-use/territorial planning documentation 2.1. Complete surveys within the area; 2.2. Develop a study on the Berounka River bed restoration and on new water body; 2.3. Develop a land-use/territorial study on the Soutok/Confluence Suburban Park; 2.4. Develop the Soutok/Confluence Park landscape masterplan. Goal 3 Immediate improving the area´s current state 3.1. Provide coordination on projects within the area; 3.2. Implement rapid building measures within the area.	
Implementation period	2018 – 2019	
Leading department/administrator	Prague Institute for Planning and Development Department of Environmental Protection, Capital City of Prague Municipal Office	
Departments and institutions involved	The Capital City of Prague, Radotín, Zbraslav, Velká Chuchle, Lipence and Prague 12 city districts, the town of Černošice, Capital City of Prague Municipal Office (Department of Environmental Protection, Department of Strategic Investments, Prague Institute for Planning and Development), Capital City of Prague Forests, Nature Conservation Agency of the Czech Republic, Vltava River Basin Management Authority, land parcel/plots owners and managers, local economic subjects, citizens and civic society organisations	
Relation to Adaptation Strategy	A: Adaptation measures to mitigating increasing temperature, urban heat island and heat waves	x
	B: Adaptation measures to reducing impacts of torrential rainfall, floods and long-term drought on the Capital City of Prague´s territory	x
	C: Adaptation measures to reduce energy performance in Prague incl. adaptations in buildings	
	D: Adaptation measures in risk management and providing citizens with safety	
	F: Adaptation measures to reducing impacts of torrential rainfall, floods and long-term drought on the Capital City of Prague´s territory	x
Type of the measure	Running measures/pilot project	x
	New measure/pilot project	

Climate change impacts targeted	1. Heat waves and urban heat island	x
	2. Extreme rainfalls and rainfall/storm water management	x
	3. Floods	x
	4. Drought	x
Synergies with other policy documents and projects	Memorandum of Cooperation on development, future use and management of the area on the Berounka and Vltava rivers confluence in Prague R1 Strategic Plan for Prague Implementation Plan Prague Riverbank Policy Císařský ostrov/Imperial Island Strategy and its Action Plan Troja Basin Suburban Plan	
Possible conflicts	Berounka River navigability Location of the Lipence Fair within the flooded area Mass gravel sand extraction within the area Agreement with a major landowner	
Financial costs	CZK 9.4 million (363,640.00 CZK) have been allocated	
Source of financing	The Confluence Project budget line in the Capital City of Prague budget	
Other information		

Name of the measure/pilot project	**The Wild Vltava River – a river nature-based restoration with enlarging the river bed and with a broad-based terrace across the Císařský ostrov/Imperial Island**
Description of the measure/pilot project Implementation steps	The Wild Vltava River project aims at a river nature-based restoration of the Vltava river along the Císařský ostrov/Imperial Island, thus significantly enhancing flow rate during floods, improving floodplain landscape values, natural river process restoration and enlarging possibilities for various recreation/leisure and educational activities. The Wild Vltava is a pilot and priority project set out by the Overall Landscaping Strategy for the Císařský ostrov/Imperial Island (hereinafter Strategy) and its Action Plan approved by the Prague Council on August 29, 2017, Document No. R.25854. The project was also included into the R1 Strategic Plan for Prague Implementation Plan. The Strategy´s main goal is to compensate the Císařský ostrov/Imperial Island landscape values in relation to building a Central Water Treatment Plant new water line. Within the Action Plan which is a tool to implement the Strategy, initial measures and investment projects are proposed and intents which have to be coordinated in the area are defined. The plan also includes measures for project management and elaboration of guidelines on integrated projects. The Wild Vltava project is a part of the 1st round of investment projects include into the Action Plan immediately linked to building the new water line. It aims at a river nature-based restoration of the Vltava river along the Císařský ostrov/Imperial Island with enlarging the river bed and establishing gravel islets and a broad-based terrace with permanent flow across the Císařský ostrov/Imperial Island. Goals • Enhancing flow rate within the Vltava River flow profile during floods; • Restoring hydromorphological conditions on the Vltava River in the Troja Basin; • Restoring and developing natural processes and ecological interactions, enhancing biological diversity including targeted wild plant and animal species habitats; • Restoring floodplain landscape values; • Raising new possibilities for recreation/leisure and sports for local people; • Raising possibilities for communication, education and public awareness; • Providing the Troja weir with permeability for wildlife migration; • Enhancing the Troja Basin population own

	identification with the site. The Císařský ostrov/Imperial island Strategy and its Action Plan Completed Study Water management feasibility study and study on landscaping including hydrotechnological assessment through a physical-mathematical 2D model Other phases Project documentation, implementation and management	
Implementation period	A study and model assessment phases 2018-2021 Partial outputs in 2019	
Leading department/administrator	A study phase: Prague Institute for Planning and Development	
Departments and institutions involved	The Capital City of Prague, Prague 6, Prague 7 and Troja city districts, Capital City of Prague Municipal Office (Department of Environmental Protection, Department of Strategic Investments), Prague Water Management Company, Capital City of Prague Forests, Nature Conservation Agency of the Czech Republic, Vltava River Basin Management Authority, land parcel/plots owners and managers, local economic subjects, citizens and civic society organisations	
Relation to Adaptation Strategy	A: Adaptation measures to mitigating increasing temperature, urban heat island and heat waves	x
	B: Adaptation measures to reducing impacts of torrential rainfall, floods and long-term drought on the Capital City of Prague´s territory	x
	C: Adaptation measures to reduce energy performance in Prague incl. adaptations in buildings	
	D: Adaptation measures in risk management and providing citizens with safety	
	F: Adaptation measures to reducing impacts of torrential rainfall, floods and long-term drought on the Capital City of Prague´s territory	x
Type of the measure	Running measures/pilot project	x
	New measure/pilot project	
Climate change impacts targeted:	1. Heat waves and urban heat island	x
	2. Extreme rainfalls and rainfall/storm water management	x

	3. Floods	x
	4. Drought	x
Synergies with other policy documents and projects	R1 Strategic Plan for Prague Implementation Plan Prague Riverbank Policy Císařský ostrov/Imperial Island Strategy and its Action Plan Soutok/Confluence Suburban Park Memorandum of Cooperation on development, future use and management of the Troja Basin in the Císařský ostrov/Imperial Island vicinity	
Possible conflicts	Property rights	
Financial costs	CZK 3.5 million (EUR 135,400.00)	
Source of financing	Transfer of funds from the Department of Strategic Investments, Capital City of Prague Municipal Office (Císařský ostrov/Imperial Island Chapter) to the Prague Institute for Planning and Development	
Other information		

Name of the measure/pilot project	**Flood prevention measures to protect the Capital City Prague at Lipence – a broad-based terrace**	
Description of the measure/pilot project Implementation steps	Almost every year, increased flow rate on the Berounka River cuts off the Dolní Černošice area from road connection and car traffic to the Capital City of Prague. Flood prevention measures will be implemented by making flow free through the current broad-based terrace where a dike can be erected on the head and the Černošice road will be passed by an inundation bridge. The feasibility study has been carried out.	
Implementation period	2021 – 2022	
Leading department/administrator	Water Management Development and Building, plc	
Departments and institutions involved	Department of Environmental Protection, Capital City of Prague Municipal Office	
Relation to Adaptation Strategy	A: Adaptation measures to mitigating increasing temperature, urban heat island and heat waves	
	B: Adaptation measures to reducing impacts of torrential rainfall, floods and long-term drought on the Capital City of Prague´s territory	x
	C: Adaptation measures to reduce energy performance in Prague incl. adaptations in buildings	
	D: Adaptation measures in risk management and providing citizens with safety	
	F: Adaptation measures to reducing impacts of torrential rainfall, floods and long-term drought on the Capital City of Prague´s territory	x
Type of the measure	Running measures/pilot project	
	New measure/pilot project	x
Climate change impacts targeted:	1. Heat waves and urban heat island	
	2. Extreme rainfalls and rainfall/storm water management	x
	3. Floods	x
	4. Drought	x
Synergies with other policy documents and projects		
Possible conflicts		
Financial costs	Not available	
Source of financing	Water Management Development and Building, plc	

Other information	

Name of the measure/pilot project	**Flood prevention measures to protect the Capital City Prague at Čakovice**	
Description of the measure/pilot project Implementation steps	The flood prevention measures include nature-based flood prevention shaping of the Mratín Brook bed on the Prague District of Čakovice´s territory. Discussion on land-use/territorial development documentation.	
Implementation period	2020 – 2021	
Leading department/administrator	Water Management Development and Building, plc	
Departments and institutions involved	Department of Environmental Protection, Capital City of Prague Municipal Office	
Relation to Adaptation Strategy	A: Adaptation measures to mitigating increasing temperature, urban heat island and heat waves	
	B: Adaptation measures to reducing impacts of torrential rainfall, floods and long-term drought on the Capital City of Prague´s territory	x
	C: Adaptation measures to reduce energy performance in Prague incl. adaptations in buildings	
	D: Adaptation measures in risk management and providing citizens with safety	
	F: Adaptation measures to reducing impacts of torrential rainfall, floods and long-term drought on the Capital City of Prague´s territory	x
Type of the measure	Running measures/pilot project	
	New measure/pilot project	x
Climate change impacts targeted:	1. Heat waves and urban heat island	
	2. Extreme rainfalls and rainfall/storm water management	x
	3. Floods	x
	4. Drought	x
Synergies with other policy documents and projects		
Possible conflicts		
Financial costs	Not available	
Source of financing	Water Management Development and Building, plc	
Other information		

Name of the measure/pilot project	**Maniny – Flood prevention measures, decreasing the Karlín profile levelling baseline**	
Description of the measure/pilot project Implementation steps	The facility aims at reducing the terrain level and decreasing the Vltava river water level during floods by building a lower runoff river diversion or branch. Following the terrain measures, the Rohan Island located between the current flood prevention dike and the Vltava River bed will become an area of quiet, integrating recreation/leisure possibilities and the TSES (the Territorial System of Ecological Stability, a national multilevel ecological network) biocentre (= core area). The first two phases which can be implemented before making water flow free under the Libeň Bridge, will reduce the terrain level in a part of the future river bed and create pools as well as a park. The whole building has got final zoning permission, the first two phases have got also final water management permissions.	
Implementation period	2018 – 2023 (a whole building)	
Leading department/administrator	Water Management Development and Building, plc	
Departments and institutions involved	Department of Environmental Protection, Capital City of Prague Municipal Office	
Relation to Adaptation Strategy	A: Adaptation measures to mitigating increasing temperature, urban heat island and heat waves	
	B: Adaptation measures to reducing impacts of torrential rainfall, floods and long-term drought on the Capital City of Prague´s territory	x
	C: Adaptation measures to reduce energy performance in Prague incl. adaptations in buildings	
	D: Adaptation measures in risk management and providing citizens with safety	x
	F: Adaptation measures to reducing impacts of torrential rainfall, floods and long-term drought on the Capital City of Prague´s territory	x
Type of the measure	Running measures/pilot project	
	New measure/pilot project	x
Climate change impacts targeted:	1. Heat waves and urban heat island	
	2. Extreme rainfalls and rainfall/storm water management	x
	3. Floods	x
	4. Drought	x
Synergies with other	The investment was approved by the Government of the Czech	

policy documents and projects	Republic´s decision No. 1082 as of December 21, 2015, as a part of the Flood Risk Management Plans in the Czech Republic, being one of the six newly proposed particular measures for the Lower Vltava River Basin.
Possible conflicts	
Financial costs	Not available
Source of financing	Water Management Development and Building, plc
Other information	

Name of the measure/pilot project	The Litovice-Šárka Brook restoration and building the Terezka Fishpond at Liboc	
Description of the measure/pilot project Implementation steps	In late 2017, further important activity has begun at the site, *i.e.* building a new Prague fishpond called Terezka which will be fed by water ftom the Světluška/Firefly Brood and the Ve hvězdě Fishpond. The area will also include the Litovice-Šárka Brook restoration. Brook´s banks and bed become more natural and remnants of the original concrete fortress walls will be removed. Where it is necessary to make the brook bed more solid, heavy stones will be used. Close to the brook, two smaller water bodies for amphibians will be created. The fishpond will be surrounded by gravel roads and all parcels/plots owned by the Capital City of Prague will be regularly mown. In further phases, other stretches of the Litovice-Šárka Brook will be made more natural. The building activities have begun.	
Implementation period	January 2018 – October 2018	
Leading department/administrator	Department of Environmental Protection, Capital City of Prague Municipal Office	
Departments and institutions involved	Department of Environmental Protection, Capital City of Prague Municipal Office OCP MHMP	
Relation to Adaptation Strategy	A: Adaptation measures to mitigating increasing temperature, urban heat island and heat waves	
	B: Adaptation measures to reducing impacts of torrential rainfall, floods and long-term drought on the Capital City of Prague´s territory	x
	C: Adaptation measures to reduce energy performance in Prague incl. adaptations in buildings	
	D: Adaptation measures in risk management and providing citizens with safety	x
	F: Adaptation measures to reducing impacts of torrential rainfall, floods and long-term drought on the Capital City of Prague´s territory	x
Type of the measure	Running measures/pilot project	
	New measure/pilot project	x
Climate change impacts targeted:	1. Heat waves and urban heat island	
	2. Extreme rainfalls and rainfall/storm water management	x
	3. Floods	x
	4. Drought	x

Synergies with other policy documents and projects	Prague Water Body Restoration
Possible conflicts	Access to the site
Financial costs	CZK 15 million (EUR 580,270.00)
Source of financing	Department of Environmental Protection, Capital City of Prague Municipal Office
Other information	

Name of the measure/pilot project	**Building a new water reservoir at Lipiny – Modřany city quarter**	
Description of the measure/pilot project Implementation steps	Building a new water body in the Libuše Brook Valley at sites where a flow was put into pipeline in the past. The new Lipiny Fishpond built during implementation of the Libuše Brook Restoration at Lipiny project implementation will cover 3,060 square meters and will be fed by water from the Libuše Brook. Together with building the new water body, adjacent vicinity will be enhanced.	
Implementation period	July 2017- August 2018	
Leading department/administrator	Department of Environmental Protection, Capital City of Prague Municipal Office	
Departments and institutions involved	Department of Environmental Protection, Capital City of Prague Municipal Office	
Relation to Adaptation Strategy	A: Adaptation measures to mitigating increasing temperature, urban heat island and heat waves	
	B: Adaptation measures to reducing impacts of torrential rainfall, floods and long-term drought on the Capital City of Prague´s territory	x
	C: Adaptation measures to reduce energy performance in Prague incl. adaptations in buildings	
	D: Adaptation measures in risk management and providing citizens with safety	x
	F: Adaptation measures to reducing impacts of torrential rainfall, floods and long-term drought on the Capital City of Prague´s territory	x
Type of the measure	Running measures/pilot project	x
	New measure/pilot project	
Climate change impacts targeted:	1. Heat waves and urban heat island	x
	2. Extreme rainfalls and rainfall/storm water management	x
	3. Floods	x
	4. Drought	x
Synergies with other policy documents and projects	Prague Water Body Restoration	
Possible conflicts		
Financial costs	CZK 7 million (EUR 270,800.00)	
Source of financing	Department of Environmental Protection, Capital City of Prague Municipal Office	

Other information	

II. Data sheets on adaptation measures and pilot projects for built-up area and the urban landscape

Measures and projects on complementing the knowledge

Name of the measure/pilot project	**The current state analysis and a proposal on available tree species resistant to climate change impacts, preparation of tree alleys database**	
Description of the measure/pilot project Implementation steps	The current state analysis and a proposal on available tree species resistant to climate change which are able to mitigate extreme temperatures in Prague, starting to develop the unified Prague tree alley database. Shading and cooling spaces in streets and thus mitigating extreme temperature impacts is one of ecosystem services provided by street greenery. Moreover, suitable tree species should be selected being able to resist to increased temperatures and suitable habitats for them can be identified. Developing the unified Prague tree alley database will support other project aiming at elaborating a unified evidence data store and proposal on tree alley management.	
Implementation period	2018- 2019	
Leading department/administrator	Department of Environmental Protection, Capital City of Prague Municipal Office	
Departments and institutions involved	Other expert/technical bodies	
Relation to Adaptation Strategy	A: Adaptation measures to mitigating increasing temperature, urban heat island and heat waves	x
	B: Adaptation measures to reducing impacts of torrential rainfall, floods and long-term drought on the Capital City of Prague´s territory	x
	C: Adaptation measures to reduce energy performance in Prague incl. adaptations in buildings	
	D: Adaptation measures in risk management and providing citizens with safety	
	F: Adaptation measures to reducing impacts of torrential rainfall, floods and long-term drought on the Capital City of Prague´s territory	x
Type of the measure	Running measures/pilot project	
	New measure/pilot project	x
Climate change impacts targeted:	1. Heat waves and urban heat island	x
	2. Extreme rainfalls and rainfall/storm water management	x

	3. Floods	x
	4. Drought	x
Synergies with other policy documents and projects		
Possible conflicts	< CZK 500,000.00 (EUR 19, 345.00)	
Financial costs	New Department of Environmental Protection, Capital City of Prague Municipal Office budget	
Source of financing		
Other information		

Name of the measure/pilot project	**Modelling air temperature and ventilation dynamics in the selected built-up areas in Prague**	
Description of the measure/pilot project Implementation steps	The project on microclimatic features (temperatures and air ventilation) modelling in the selected built-up areas allows to optimize application and location of nature-based solutions helping to mitigate climate change negative impacts, *e.g.* extreme temperatures and urban heat island. Furthermore, it allows to enhance rainfall/storm water management, mitigate torrential rainfalls and to increase moisture sources usable by vegetation in the drought period.	
Implementation period	2018 – 2019	
Leading department/administrator	Department of Environmental Protection, Capital City of Prague Municipal Office	
Departments and institutions involved	Institute of Computer Science of the Academy of Sciences of the Czech Republic Prague; Institute for Planning and Development and other expert/technical bodies	
Relation to Adaptation Strategy	A: Adaptation measures to mitigating increasing temperature, urban heat island and heat waves	x
	B: Adaptation measures to reducing impacts of torrential rainfall, floods and long-term drought on the Capital City of Prague´s territory	x
	C: Adaptation measures to reduce energy performance in Prague incl. adaptations in buildings	
	D: Adaptation measures in risk management and providing citizens with safety	
	F: Adaptation measures to reducing impacts of torrential rainfall, floods0 and long-term drought on the Capital City of Prague´s territory	x
Type of the measure	Running measures/pilot project	
	New measure/pilot project	x
Climate change impacts targeted:	1. Heat waves and urban heat island	x
	2. Extreme rainfalls and rainfall/storm water management	x
	3. Floods	x
	4. Drought	x
Synergies with other policy documents and projects		
Possible conflicts		
Financial costs	<CZK 500,00.00 (EUR 19, 345.00)	

Source of financing	New Department of Environmental Protection, Capital City of Prague Municipal Office budget
Other information	

Name of the measure/pilot project	**Analysis of possible rainfall storage tank/reservoir restoration**	
Description of the measure/pilot project Implementation steps	Analysis of possible rainfall storage tanks/reservoir restoration through nature-based solutions allows to their better integration in the urban environment, at the same time maintain their original functions. It aims at identify suitable rainfall storage tanks/reservoirs to be restored for carrying out pilot projects and to assess new equipment functionality.	
Implementation period		
Leading department/administrator	Department of Environmental Protection, Capital City of Prague Municipal Office	
Departments and institutions involved	Capital City of Prague Forests and other institutions	
Relation to Adaptation Strategy	A: Adaptation measures to mitigating increasing temperature, urban heat island and heat waves	
	B: Adaptation measures to reducing impacts of torrential rainfall, floods and long-term drought on the Capital City of Prague´s territory	x
	C: Adaptation measures to reduce energy performance in Prague incl. adaptations in buildings	
	D: Adaptation measures in risk management and providing citizens with safety	
	F: Adaptation measures to reducing impacts of torrential rainfall, floods and long-term drought on the Capital City of Prague´s territory	
Type of the measure	Running measures/pilot project	
	New measure/pilot project	x
Climate change impacts targeted:	1. Heat waves and urban heat island	
	2. Extreme rainfalls and rainfall/storm water management	x
	3. Floods	
	4. Drought	x
Synergies with other policy documents and projects		
Possible conflicts		
Financial costs	<CZK 500,000.00 (EUR 19, 345.00), implemented also by some private investors	
Source of financing	New Department of Environmental Protection, Capital City of Prague Municipal Office budget	

Other information	

Name of the measure/pilot project	**Registering community gardens**	
Description of the measure/pilot project Implementation steps	Registering community gardens allows to map and enhance area contributing to climate change impact mitigation, particularly to enlarging green spaces in the city, rainfall/storm water accumulation and retention and reducing extreme temperature impacts. They also contribute to ecosystem services and functions preservation, at the same time providing other social benefits to humans.	
Implementation period	June 2018	
Leading department/administrator	Department of Environmental Protection, Capital City of Prague Municipal Office	
Departments and institutions involved	Kokoza, charitable trust	
Relation to Adaptation Strategy	A: Adaptation measures to mitigating increasing temperature, urban heat island and heat waves	x
	B: Adaptation measures to reducing impacts of torrential rainfall, floods and long-term drought on the Capital City of Prague´s territory	x
	C: Adaptation measures to reduce energy performance in Prague incl. adaptations in buildings	
	D: Adaptation measures in risk management and providing citizens with safety	
	F: Adaptation measures to reducing impacts of torrential rainfall, floods and long-term drought on the Capital City of Prague´s territory	x
Type of the measure	Running measures/pilot project	
	New measure/pilot project	
Climate change impacts targeted:	1. Heat waves and urban heat island	x
	2. Extreme rainfalls and rainfall/storm water management	x
	3. Floods	
	4. Drought	x
Synergies with other policy documents and projects		
Possible conflicts		
Financial costs		
Source of financing		
Other information		

Name of the measure/pilot project	**Analysis on fog shower and drinking fountain distribution in Prague with respect to extreme temperature impact mitigation**	
Description of the measure/pilot project Implementation steps	Effective fog shower and drinking fountain distribution on public spaces supply Prague citizens and visitors with liquids and cooling as prevention to being too warm during extremely high temperature and heat waves. Therefore, it is necessary: • Review the background information on the topic; • Analyse fog shower and drinking fountain distribution in Prague; • Carry out a feasibility study also from a point of view of managing the infrastructure.	
Implementation period	2018 – 2019	
Leading department/administrator	Department of Environmental Protection, Capital City of Prague Municipal Office	
Departments and institutions involved	Consultation and coordination with the Prague Institute for Planning and Development	
Relation to Adaptation Strategy	A: Adaptation measures to mitigating increasing temperature, urban heat island and heat waves	x
	B: Adaptation measures to reducing impacts of torrential rainfall, floods and long-term drought on the Capital City of Prague´s territory	
	C: Adaptation measures to reduce energy performance in Prague incl. adaptations in buildings	
	D: Adaptation measures in risk management and providing citizens with safety	
	F: Adaptation measures to reducing impacts of torrential rainfall, floods and long-term drought on the Capital City of Prague´s territory	x
Type of the measure	Running measures/pilot project	
	New measure/pilot project	
Climate change impacts targeted:	1. Heat waves and urban heat island	x
	2. Extreme rainfalls and rainfall/storm water management	
	3. Floods	
	4. Drought	
Synergies with other		

policy documents and projects	
Possible conflicts	
Financial costs	
Source of financing	New Capital City of Prague Municipal Office budget
Other information	

b. Developing methodologies and guidelines

Name of the measure/pilot project	Street alley current state analysis and proposal on guidelines for tree greenery planting and management	
Description of the measure/pilot project Implementation steps	Street tree alleys are one of the most important urban elements contributing to reducing temperature during warm days and heat waves, providing hikers and buildings with shade and generally enhancing both microclimate and public space quality in the city. Nevertheless, trees in Prague streets have been facing a lot of difficulties related particularly to their living conditions and alley tree planting and management. The fact that street tree management and tree alley restoration have not been streamlined in Prague is a basic difficulty there. Street trees can provide shade and cooling only if they are in good physical condition and vital and have place enough for root and crown development on the street. Thus, following steps should substantially contribute to reach the above goal: • Establishing a multi-stakeholder working group on tree alleys and urban greenery in Prague composed of representatives of alley managers, experts and designers having been experienced in projects dealing with tree alleys in the urban environment and new technology/innovation applications; • Initiating unified and streamlined coordination on general street restoration; • Developing guidelines for street tree planting and management. Enhancing human source and financial capacity for implementation of projects on street tree alley planting and management within the Department of Environmental Protection, Capital City of Prague Municipal Office.	
Implementation period	2018 – 2019	
Leading department/administrator	Department of Environmental Protection, Capital City of Prague Municipal Office; Prague Institute for Planning and Development	
Departments and institutions involved	Department of Informatics, Capital City of Prague Municipal Office; Prague Technological Road Administration; Capital City of Prague Forests; Department of Strategic Investments, Capital City of Prague Municipal Office; city districts	
Relation to Adaptation Strategy	A: Adaptation measures to mitigating increasing temperature, urban heat island and heat waves	x

	B: Adaptation measures to reducing impacts of torrential rainfall, floods and long-term drought on the Capital City of Prague´s territory	x
	C: Adaptation measures to reduce energy performance in Prague incl. adaptations in buildings	
	D: Adaptation measures in risk management and providing citizens with safety	
	F: Adaptation measures to reducing impacts of torrential rainfall, floods and long-term drought on the Capital City of Prague´s territory	x
Type of the measure	Running measures/pilot project	
	New measure/pilot project	x
Climate change impacts targeted:	1. Heat waves and urban heat island	x
	2. Extreme rainfalls and rainfall/storm water management	x
	3. Floods	
	4. Drought	x
Synergies with other policy documents and projects	Strategic Plan for Prague (updated 2016) Updated Greenery Management Strategy for the Capital City of Prague	
Possible conflicts	Shared responsibility for Prague tree alley management among the Prague Technological Road Communication, city districts and the Capital City of Prague Municipal Office	
Financial costs	To be set out according to the particular step schedule and content	
Source of financing	New Capital City of Prague Municipal Office budget	
Other information		

Name of the measure/pilot project	**Developing a manual on rainfall/storm water management on the Capital City of Prague´s territory for city district offices, Department of Building staff, city district self-governing bodies and developers involved**	
Description of the measure/pilot project Implementation steps	Rainfall/storm water accumulation can enhance non-potable/service/industrial water availability (watering, sanitary, street sprinkling) during drought periods. Rainfall/storm water streamlined into a unified sewage and sewer network overloads water treatment plants and during intensive raining, water from the unified sewage and sewer network can reach watercourses and contaminate them. Therefore, rainfall/storm water accumulation at a site where rain falls on the surface by nature-based solutions, *e.g.* by building water retention facilities, dry polders, runoff infiltration canals, rainfall gardens, *etc.*, is the most suitable way to handle the issue. The practical measures should be proposed individually, according to features and patterns in the particular area. Developing a manual shall be linked to training, organising a workshop and field trip/study visits for city district office staff and other bodies involved.	
Implementation period	2018 – 2019	
Leading department/administrator	Department of Environmental Protection, Capital City of Prague Municipal Office	
Departments and institutions involved	Faculty of Civil Engineering, Czech Technical University and Koniklec/Pasqueflower EcoCentre, charitable trust and other expert/technical bodies	
Relation to Adaptation Strategy	A: Adaptation measures to mitigating increasing temperature, urban heat island and heat waves	x
	B: Adaptation measures to reducing impacts of torrential rainfall, floods and long-term drought on the Capital City of Prague´s territory	x
	C: Adaptation measures to reduce energy performance in Prague incl. adaptations in buildings	
	D: Adaptation measures in risk management and providing citizens with safety	
	F: Adaptation measures to reducing impacts of torrential rainfall, floods and long-term drought on the Capital City of Prague´s territory	x
Type of the measure	Running measures/pilot project	
	New measure/pilot project	x
Climate change impacts targeted	1. Heat waves and urban heat island	x
	2. Extreme rainfalls and rainfall/storm water management	x
	3. Floods	x
	4. Drought	x
Possible conflicts		

Financial costs	<CZK 500,000.00 (EUR 19, 345.00)
Source of financing	New Capital City of Prague Municipal Office budget
Other information	

Name of the measure/pilot project	**Developing a methodology on introducing and step-by-step replacement of paved water impermeable surface with water permeable and semi-permeable surfaces**	
Description of the measure/pilot project Implementation steps	Developing a manual on possible selection of materials and technologies for water permeable and semi-permeable surfaces aims at raising awareness among city district office staff and other experts involved and introducing it into practice.	
Implementation period	2018 – 2019	
Leading department/administrator	Department of Environmental Protection, Capital City of Prague Municipal Office	
Departments and institutions involved	Department of Environmental Protection, Capital City of Prague Municipal Office; Faculty of Civil Engineering, Czech Technical University and other expert/technical bodies	
Relation to Adaptation Strategy	A: Adaptation measures to mitigating increasing temperature, urban heat island and heat waves	x
	B: Adaptation measures to reducing impacts of torrential rainfall, floods and long-term drought on the Capital City of Prague´s territory	x
	C: Adaptation measures to reduce energy performance in Prague incl. adaptat0ions in buildings	
	D: Adaptation measures in risk management and providing citizens with safety	
	F: Adaptation measures to reducing impacts of torrential rainfall, floods and long-term drought on the Capital City of Prague´s territory	x
Type of the measure	Running measures/pilot project	
	New measure/pilot project	x
Climate change impacts targeted	1. Heat waves and urban heat island	x
	2. Extreme rainfalls and rainfall/storm water management	x
	3. Floods	x
	4. Drought	x
Possible conflicts		
Financial costs	<CZK 500,000.00 (EUR 19, 345.00)	
Source of financing	New Capital City of Prague Municipal Office budget	
Other information		

Name of the measure/pilot project	**Developing a methodology on green strips along tramway tracks planting and management**	
Description of the measure/pilot project Implementation steps	Developing a methodology on green strip along tramway tracks planting and management aims at assessing possibilities for effective tramway strip planting and appropriate management guidelines. It also focuses on raising awareness among city district office staff and other experts involved and introducing it into practice.	
Implementation period	2018 – 2019	
Leading department/administrator	Department of Environmental Protection, Capital City of Prague Municipal Office	
Departments and institutions involved	Department of Environmental Protection, Capital City of Prague Municipal Office; Prague Public Transport Company; National Institute of Public Health; Faculty of Civil Engineering, Czech Technical University and other expert/technical bodies	
Relation to Adaptation Strategy	A: Adaptation measures to mitigating increasing temperature, urban heat island and heat waves	x
	B: Adaptation measures to reducing impacts of torrential rainfall, floods and long-term drought on the Capital City of Prague´s territory	x
	C: Adaptation measures to reduce energy performance in Prague incl. adaptations in buildings	
	D: Adaptation measures in risk management and providing citizens with safety	
	F: Adaptation measures to reducing impacts of torrential rainfall, floods and long-term drought on the Capital City of Prague´s territory	x
Type of the measure	Running measures/pilot project	
	New measure/pilot project	x
Climate change impacts targeted	1. Heat waves and urban heat island	x
	2. Extreme rainfalls and rainfall/storm water management	x
	3. Floods	x
	4. Drought	x
Possible conflicts		
Financial costs	<CZK 500,000.00 (EUR 19, 345.00)	
Source of financing	New Capital City of Prague Municipal Office budget	
Other information		

c. Proposed pilot projects

Name of the measure/pilot project	**Planting a tree alley in Jaromír Street**	
Description of the measure/pilot project Implementation steps	Restoring a tree alley in Jaromír Street shall be carried out within the framework of the overall street restoration. Within the process, a technology using cells providing space enough for root growth will be applied. The implementation would provide suitable space enough for tree root growth in the strongly unfavourable urban environment in the city´s downtown. Modular prefabricated equipment under the road allows creating large volumes of slightly compressed soils for appropriate root development (better penetration for water and soil air). The structured cells stabilize for surface cover background layer and protect it against damage caused by roots. At the same time they are highly effective rainfall/storm water storage. Schedule: project documentation – negotiations with the respective Public Administration authorities dealing with project documentation and technological infrastructure network managers – implementation – passing the facilities to technological infrastructure network managers- providing appropriate management to the facilities.	
Implementation period	2020 – 2021	
Leading department/administrator	Prague Public Transport Company; Prague Technological Road Administration; PRE Prague Energy Company; Department of Environmental Protection, Capital City of Prague Municipal Office	
Departments and institutions involved	Prague Institute for Planning and Development; Prague Public Transport Company; Prague Technological Road Administration; infrastructure network managers; Department of Environmental Protection, Capital City of Prague Municipal Office	
Relation to Adaptation Strategy	A: Adaptation measures to mitigating increasing temperature, urban heat island and heat waves	x
	B: Adaptation measures to reducing impacts of torrential rainfall, floods and long-term drought on the Capital City of Prague´s territory	x
	C: Adaptation measures to reduce energy performance in Prague incl. adaptations in buildings	
	D: Adaptation measures in risk management and providing citizens with safety	
	F: Adaptation measures to reducing impacts of	

	torrential rainfall, floods and long-term drought on the Capital City of Prague´s territory	
Type of the measure	Running measures/pilot project	x
	New measure/pilot project	
Climate change impacts targeted	1. Heat waves and urban heat island	x
	2. Extreme rainfalls and rainfall/storm water management	x
	3. Floods	
	4. Drought	x
Possible conflicts	Necessity to replace technological infrastructure network elements to restore a tree alley in a continuous strip using cells providing space enough for root growth Some investors at the same street – a close coordination among them needed	
Financial costs	To be set out	
Source of financing	New Capital City of Prague Municipal Office budget	
Other information		

Name of the measure/pilot project	Restoring a park in the Petřín Watchtower Park	
Description of the measure/pilot project Implementation steps	Restoring a park in the Petřín Watchtower Park will result in enhancing rainfall/storm water retention by building drainage infiltration boxes located under restored park roads and paths, vegetation space restoration, providing cooling and improving the hydrological cycle within the respective area and allowing the use of rainfall/storm water by vegetation in drought period.	
Implementation period	2018	
Leading department/administrator	Department of Environmental Protection, Capital City of Prague Municipal Office	
Departments and institutions involved	Department of Environmental Protection, Capital City of Prague Municipal Office	
Relation to Adaptation Strategy	A: Adaptation measures to mitigating increasing temperature, urban heat island and heat waves	
	B: Adaptation measures to reducing impacts of torrential rainfall, floods and long-term drought on the Capital City of Prague´s territory	
	C: Adaptation measures to reduce energy performance in Prague incl. adaptations in buildings	
	D: Adaptation measures in risk management and providing citizens with safety	
	F: Adaptation measures to reducing impacts of torrential rainfall, floods and long-term drought on the Capital City of Prague´s territory	
Type of the measure	Running measures/pilot project	
	New measure/pilot project	
Climate change impacts targeted	1. Heat waves and urban heat island	x
	2. Extreme rainfalls and rainfall/storm water management	x
	3. Floods	x
	4. Drought	x
Possible conflicts		
Financial costs	CZK 25 million (EUR 970,000.00)	
Source of financing	New Capital City of Prague Municipal Office budget	
Other information		

Name of the measure/pilot project	The Malá Řepora Housing – a drainage	
Description of the measure/pilot project Implementation steps	The measure includes building a semi-natural drainage network for a new housing estate having been under construction as well as building a water retention reservoir and dry ponds. The first phase of the project has been implemented.	
Implementation period	2017 – 2019	
Leading department/administrator	Department of Environmental Protection, Capital City of Prague Municipal Office	
Departments and institutions involved	Central group pls Department of Environmental Protection, Capital City of Prague Municipal Office	
Relation to Adaptation Strategy	A: Adaptation measures to mitigating increasing temperature, urban heat island and heat waves	
	B: Adaptation measures to reducing impacts of torrential rainfall, floods and long-term drought on the Capital City of Prague´s territory	x
	C: Adaptation measures to reduce energy performance in Prague incl. adaptations in buildings	
	D: Adaptation measures in risk management and providing citizens with safety	x
	F: Adaptation measures to reducing impacts of torrential rainfall, floods and long-term drought on the Capital City of Prague´s territory	
Type of the measure	Running measures/pilot project	
	New measure/pilot project	x
Climate change impacts targeted	1. Heat waves and urban heat island	
	2. Extreme rainfalls and rainfall/storm water management	x
	3. Floods	
	4. Drought	x
Possible conflicts		
Financial costs	CZK 10 million (EUR 386,850.00)	
Source of financing	Department of Environmental Protection, Capital City of	

	Prague Municipal Office
Other information	

Name of the measure/pilot project	**Prague Fairground Habitat – enhancing water quality**	
Description of the measure/pilot project Implementation steps	Bathing habitat primarily does not serve to enhance water quality, but it should improve conditions for recreation/leisure and microclimate during heat waves. Water treatment for bathing is provided by a habitat treatment zone in the bathing place, but this is a water treatment technology in the closed cycle.	
Implementation period		
Leading department/administrator	Prague Fairground	
Departments and institutions involved	Department of Environmental Protection, Capital City of Prague Municipal Office	
Relation to Adaptation Strategy	A: Adaptation measures to mitigating increasing temperature, urban heat island and heat waves	x
	B: Adaptation measures to reducing impacts of torrential rainfall, floods and long-term drought on the Capital City of Prague´s territory	x
	C: Adaptation measures to reduce energy performance in Prague incl. adaptations in buildings	
	D: Adaptation measures in risk management and providing citizens with safety	
	F: Adaptation measures to reducing impacts of torrential rainfall, floods and long-term drought on the Capital City of Prague´s territory	
Type of the measure	Running measures/pilot project	
	New measure/pilot project	x
Climate change impacts targeted	1. Heat waves and urban heat island	x
	2. Extreme rainfalls and rainfall/storm water management	x
	3. Floods	
	4. Drought	x
Possible conflicts		
Financial costs	Prague Fairground budget approved	
Source of financing	Prague Fairground budget	
Other information		

II. Data sheets on adaptation measures and pilot projects for buildings
b. Developing methodologies and guidelines

Name of the measure/pilot project	**Developing methodological background documents on suitable measures in adaptations in buildings and introducing green roofs and green facades**	
Description of the measure/pilot project Implementation steps	A manual on suitable adaptation measures in the public space including training courses, workshops and field trips/study visits for city district office staff, possibly for builders, developers and the public will be divided into proposing adaptation measures in buildings based on the respective area character, built-up area types and building features. Green roofs and green facades are one of the tools to mitigate the extreme temperature impacts and to retain rainfall/storm water at a site where rain falls on the surface. The rainfall/storm water accumulated can mitigate torrential rainfall impacts or be used for watering vegetation during drought periods. The manual will aim at raising awareness of climate change adaptation possibilities in buildings and of climate change impact mitigation in Prague among experts and the general public.	
Implementation period	2018 – 2020	
Leading department/administrator	Department of Environmental Protection, Capital City of Prague Municipal Office	
Departments and institutions involved	Czech Landscape and Garden Society, registered civic association/Chance for Buildings Alliance	
Relation to Adaptation Strategy	A: Adaptation measures to mitigating increasing temperature, urban heat island and heat waves	x
	B: Adaptation measures to reducing impacts of torrential rainfall, floods and long-term drought on the Capital City of Prague´s territory	x
	C: Adaptation measures to reduce energy performance in Prague incl. adaptations in buildings	x
	D: Adaptation measures in risk management and providing citizens with safety	
	F: Adaptation measures to reducing impacts of torrential rainfall, floods and long-term drought on the Capital City of Prague´s territory	x
Type of the measure	Running measures/pilot project	
	New measure/pilot project	
Climate change impacts targeted	1. Heat waves and urban heat island	x

	2. Extreme rainfalls and rainfall/storm water management	x
	3. Floods	
	4. Drought	x
Possible conflicts		
Financial costs	<CZK 500,000.00 (EUR 19,345.00)	
Source of financing	New Capital City of Prague Municipal Office budget	
Other information		

Name of the measure/pilot project	**Developing background documents for legislation on introducing green roofs and green facades**	
Description of the measure/pilot project Implementation steps	The projects aims at identifying legislation requirements for introducing green roofs and green facades in order to integrate them into the Prague building regulations. It also deals with raising awareness of possibilities and advantages of green roofs and of climate change impact mitigation in Prague among experts and the general public.	
Implementation period	2018 – 2020	
Leading department/administrator	Department of Environmental Protection, Capital City of Prague Municipal Office	
Departments and institutions involved	Prague Institute for Planning and Development; Czech Landscape and Garden Society, registered civic association/Chance for Buildings Alliance and other expert/technical bodies	
Relation to Adaptation Strategy	A: Adaptation measures to mitigating increasing temperature, urban heat island and heat waves	x
	B: Adaptation measures to reducing impacts of torrential rainfall, floods and long-term drought on the Capital City of Prague´s territory	x
	C: Adaptation measures to reduce energy performance in Prague incl. adaptations in buildings	x
	D: Adaptation measures in risk management and providing citizens with safety	
	F: Adaptation measures to reducing impacts of torrential rainfall, floods and long-term drought on the Capital City of Prague´s territory	x
Type of the measure	Running measures/pilot project	
	New measure/pilot project	
Climate change impacts targeted	1. Heat waves and urban heat island	x
	2. Extreme rainfalls and rainfall/storm water management	x
	3. Floods	

	4. Drought	x
Possible conflicts		
Financial costs	<CZK 500,000.00 (EUR 19,345.00)	
Source of financing	New Capital City of Prague Municipal Office budget	
Other information		

Name of the measure/pilot project	**Launching a competition for the best adapted building with nature-based solutions in Prague**	
Description of the measure/pilot project Implementation steps	Green roofs and green facades are one of tools to mitigate the extreme temperature impacts and to retain rainfall/storm water at a site where rain falls on the surface through nature-based solutions, *e.g.* infiltration canals, rainfall gardens, gravel grassland, polders, man-made wetlands, *etc.* The rainfall/storm water accumulated can mitigate torrential rainfall impacts or be used for watering vegetation during drought periods. In 2018, the grant is scheduled to be open for the first time as a testing one.	
Implementation period	2018	
Leading department/administrator	Department of Environmental Protection, Capital City of Prague Municipal Office	
Departments and institutions involved	Prague Institute for Planning and Development and other bodies	
Relation to Adaptation Strategy	A: Adaptation measures to mitigating increasing temperature, urban heat island and heat waves	x
	B: Adaptation measures to reducing impacts of torrential rainfall, floods and long-term drought on the Capital City of Prague´s territory	x
	C: Adaptation measures to reduce energy performance in Prague incl. adaptations in buildings	x
	D: Adaptation measures in risk management and providing citizens with safety	
	F: Adaptation measures to reducing impacts of torrential rainfall, floods and long-term drought on the Capital City of Prague´s territory	x
Type of the measure	Running measures/pilot project	x
	New measure/pilot project	
Climate change impacts targeted	1. Heat waves and urban heat island	x
	2. Extreme rainfalls and rainfall/storm water management	x
	3. Floods	
	4. Drought	x
Possible conflicts		

Financial costs	<CZK 500,000.00 (EUR 19,345.00)
Source of financing	Department of Environmental Protection, Capital City of Prague Municipal Office current budget
Other information	

b. Proposed pilot projects

Name of the measure/pilot project	**Adaptation in some primary schools and kindergartens in the City District of Prague 12 incl. rainfall/storm water management**
Description of the measure/pilot project Implementation steps	Division of Sustainable Energy, Department of Environmental Protection at the Capital City of Prague Municipal Office proposes to implement a pilot project on vertical greenery on some of the selected primary school or kindergarten buildings which are owned by the Capital City of Prague and which currently do not meet requirements on energy management pursuant to Act No. 406/2000 Gazette. The project´s main aim is to implement measures resulting in decrease in energy consumption (indoor climate control, sun shading and thermal insulation of the building including building a vertical garden on the facade or a green roof, *etc.*) following the Implementation Plan to the Capital City of Prague Climate Change Adaptation Strategy. The adaptation measure would be mostly financed by the Operational Programme Prague – Growth Pole of the Czech Republic and co-financed by the Capital City of Prague Municipal Office, its Department of Project Management respectively. At present, following suitable buildings have been selected: the Písnice Primary School, Montessori Kindergarten, Pastelka/Coloured Pencil Kindergarten and Urbánkova Kindergarten. None of them have been restored and principals/headmasters of the schools have preliminarily agreed to participate in the project. After implementation of the selected measures, the building will serve as a model displaying possibilities to carry out climate change adaptation measures in buildings also in other Capital City of Prague´s properties or building built by other bodies. The requested scope of the feasibility study for building measures within climate change adaptation measures The study will be carried out for four schools, namely the Písnice Primary School, Písnice Str. No. 760/11, Prague 12 – Kamýk, Montessori Kindergarten, Urbánek St. No. 3347/2, Prague 12 – Modřany, Pastelka/Coloured Pencil Kindergarten, Platón Str. No. 3288/28, Prague 12 – Modřany, and Urbánkova Kindergarten, Urbánek Str. No. 3374, Prague 12 – Modřany. The selected building should provide experience and lessons learnt which can be applied in other similar buildings, namely kindergartens and primary & high schools. Optimal, economically acceptable measures (not the so-called SMART, because of their costs) will be applied. At the same time, guidelines for school education authorities and

	principals/headmasters which will carefully guide applicants through the building adaptation procedure. The scope of the feasibility study only to select the most suitable building The study of feasibility to implement adaptation resulting in decrease in energy consumption in the building, at the same time maintaining inner layout and dimensions to be use as at present. Measures to be applied can be *e.g.*: • Indoor climate control within the building; • Sun shading the building; • Thermal insulation of the building; • Green roof; • Model vertical greenery; • Rainfall/storm water management including infiltration and accumulation facilities; • Analysis of possible co-operation with the school (Children´s Parliament, *etc.*). The feasibility study will also cover mapping the school´s closest vicinity and it will be the so-called pre-project study for analysing whether the programme´s requirements have been met. The adaptation measure shall be mostly funded by the Operational Programme Prague – Growth Pole of the Czech Republic, without the building and technological survey.	
Implementation period	June 2018, consequently the adaptation itself shall begin	
Leading department/administrator	Department of Environmental Protection, Capital City of Prague Municipal Office	
Departments and institutions involved	Department of Environmental Protection, Capital City of Prague Municipal Office	
Relation to Adaptation Strategy	A: Adaptation measures to mitigating increasing temperature, urban heat island and heat waves	x
	B: Adaptation measures to reducing impacts of torrential rainfall, floods and long-term drought on the Capital City of Prague´s territory	
	C: Adaptation measures to reduce energy performance in Prague incl. adaptations in buildings	x
	D: Adaptation measures in risk management and providing citizens with safety	
	F: Adaptation measures to reducing impacts of torrential	x

	rainfall, floods and long-term drought on the Capital City of Prague´s territory	
Type of the measure	Running measures/pilot project	x
	New measure/pilot project	
Climate change impacts targeted	1. Heat waves and urban heat island	X
	2. Extreme rainfalls and rainfall/storm water management	X
	3. Floods	
	4. Drought	x
Possible conflicts		
Financial costs		
Source of financing	Department of Environmental Protection, Capital City of Prague Municipal Office	
Other information		

Name of the measure/pilot project	**Project on an extensive green roof on the CUBE Building**	
Description of the measure/pilot project Implementation steps	A pilot project on designing a green roof on the CUBE Building. The roof´s total area is approx. 600 square metres, vegetation multilayer height being 14 centimetres, burden when saturated by water approx. 190 kilograms per square meter. The roof will display close to nature character, vegetation will be developing naturally and under regular management.	
Implementation period	2018 – 2020	
Leading department/administrator	Department of Environmental Protection, Capital City of Prague Municipal Office; Cube Office Centre	
Departments and institutions involved		
Relation to Adaptation Strategy	A: Adaptation measures to mitigating increasing temperature, urban heat island and heat waves	x
	B: Adaptation measures to reducing impacts of torrential rainfall, floods and long-term drought on the Capital City of Prague´s territory	x
	C: Adaptation measures to reduce energy performance in Prague incl. adaptations in buildings	x
	D: Adaptation measures in risk management and providing citizens with safety	
	F: Adaptation measures to reducing impacts of torrential rainfall, floods and long-term drought on the Capital City of Prague´s territory	x
Type of the measure	Running measures/pilot project	
	New measure/pilot project	
Climate change impacts targeted	1. Heat waves and urban heat island	x
	2. Extreme rainfalls and rainfall/storm water management	x
	3. Floods	
	4. Drought	x

Possible conflicts	
Financial costs	
Source of financing	CUBE Office Centre Building owner´s budget
Other information	

V. Data sheets on communication with, education of and awareness among citizens and city districts

Name of the measure/pilot project	**Developing a communication strategy to enhance awareness of climate changes and possibilities to mitigate its negative impacts information on**	
Description of the measure/pilot project Implementation steps	Due to long-term sceptically perceived climate change and recent systematic downplaying the issue, communication with, education of and awareness among the general public is an important task in the Czech Republic. Developing a communication, education and public awareness (CEPA) strategy and support to educational programmes and projections on climate change adaptation aiming at CEPA, providing information on climate change mitigation and adaptation for experts involved, city district office staff and the general public is a precondition for success. For enhancing Prague citizens´ awareness, a comprehensive CEPA strategy on climate change presenting possibilities for climate change mitigation and adaptation will be developed: it will be dealing not only with climate change itself and projected impacts on the city and its inhabitants, but also with possible solutions: from the Adaptation strategy aims and targets up to particular measures and pilot projects having been implemented yet highlighting economic patterns (*e.g.*, higher present investment resulting in reducing future damages). The CEPA strategy will aim at enhancing awareness among the general public and experts and make the serious topic popular. The tools will include CEPA campaigns, exhibitions and fairs, social networks and web pages´ usage, various popular materials (leaflets, booklets, *etc.*), the latter to be distributed in actions organised by the Capital City of Prague Municipal Office, as well as various public workshops and round tables specifically dealing with various climate change aspects and issues.	
Implementation period	2018 – 2020	
Leading department/administrator	Department of Environmental Protection, Capital City of Prague Municipal Office	
Departments and institutions involved	Department of Communication and Marketing, Capital City of Prague Municipal Office Prague Institute for Planning and Development and other bodies	
Relation to Adaptation Strategy	A: Adaptation measures to mitigating increasing temperature, urban heat island and heat waves	x

	B: Adaptation measures to reducing impacts of torrential rainfall, floods and long-term drought on the Capital City of Prague´s territory	x
	C: Adaptation measures to reduce energy performance in Prague incl. adaptations in buildings	x
	D: Adaptation measures in risk management and providing citizens with safety	
	F: Adaptation measures to reducing impacts of torrential rainfall, floods and long-term drought on the Capital City of Prague´s territory	x
Type of the measure	Running measures/pilot project	
	New measure/pilot project	
Climate change impacts targeted	1. Heat waves and urban heat island	x
	2. Extreme rainfalls and rainfall/storm water management	x
	3. Floods	
	4. Drought	x
Possible conflicts		
Financial costs	<CZK 500,000.00 (EUR 19,345.00)	
Source of financing	New Capital City of Prague Municipal Office budget	
Other information		

Name of the measure/pilot project	**Educational campaign on water and water resources management among Prague citizens**	
Description of the measure/pilot project Implementation steps	In the Capital City of Prague, educational campaign will aim at the general public through large-size posters in underground carriages presenting issues related to water and drought as well as travelling exhibition launched in the Capital City of Prague Town Hall. Together with other audiovisual (television spots) and software tools (educational application for primary school pupils), it will contribute to the Capital City of Prague Climate Change Adaptation Strategy implementation by its holistic coverage, trying to support a water management perception by the public in its complexity and as a whole.	
Implementation period		
Leading department/administrator	T.G. Masaryk Water Research Institute	
Departments and institutions involved	Department of Environmental Protection, Capital City of Prague Municipal Office	
Relation to Adaptation Strategy	A: Adaptation measures to mitigating increasing temperature, urban heat island and heat waves	
	B: Adaptation measures to reducing impacts of torrential rainfall, floods and long-term drought on the Capital City of Prague´s territory	x
	C: Adaptation measures to reduce energy performance in Prague incl. adaptations in buildings	
	D: Adaptation measures in risk management and providing citizens with safety	
	F: Adaptation measures to reducing impacts of torrential rainfall, floods and long-term drought on the Capital City of Prague´s territory	
Type of the measure	Running measures/pilot project	
	New measure/pilot project	x
Climate change impacts targeted	1. Heat waves and urban heat island	
	2. Extreme rainfalls and rainfall/storm water management	x
	3. Floods	
	4. Drought	x
Possible conflicts		
Financial costs		

Source of financing	an application submitted to the Technology Agency of the Czech Republic (Éta Programme)
Other information	

Name of the measure/pilot project	**Communication on early warning and notification when emergency or crisis appears**	
Description of the measure/pilot project Implementation steps	The project aims at enhancing general knowledge of measures to be taken to mitigate emergencies (evacuation, building flood prevention facilities, evacuation luggage content, communication from authorities on emergencies pursuant to the legislation, involvement of volunteers, providing help according to the demand) among citizens and at educate inhabitants on necessity to have own supplies.	
Implementation period	2018 – 2020	
Leading department/administrator	Department of the Director of the Capital City of Prague Municipal Office, Capital City of Prague Municipal Office	
Departments and institutions involved	Department of Environmental Protection, Capital City of Prague Municipal Office and other bodies	
Relation to Adaptation Strategy	A: Adaptation measures to mitigating increasing temperature, urban heat island and heat waves	x
	B: Adaptation measures to reducing impacts of torrential rainfall, floods and long-term drought on the Capital City of Prague´s territory	x
	C: Adaptation measures to reduce energy performance in Prague incl. adaptations in buildings	
	D: Adaptation measures in risk management and providing citizens with safety	x
	F: Adaptation measures to reducing impacts of torrential rainfall, floods and long-term drought on the Capital City of Prague´s territory	x
Type of the measure	Running measures/pilot project	
	New measure/pilot project	
Climate change impacts targeted	1. Heat waves and urban heat island	x
	2. Extreme rainfalls and rainfall/storm water management	x
	3. Floods	x
	4. Drought	x
Possible conflicts		

Financial costs	
Source of financing	Department of the Director of the Capital City of Prague Municipal Office, Capital City of Prague Municipal Office, Capital City of Prague Municipal Office current budget
Other information	

Name of the measure/pilot project	**Information for citizens and city district offices on negative impacts on human health during heat waves**	
Description of the measure/pilot project Implementation steps	The project aims at providing information on possible protective measures against extreme temperature and urban heat island negative impacts, particularly for sensitive target inhabitant groups, *e.g.* elderly citizens, people suffering from cardiovascular and respiratory diseases and babies/small children.	
Implementation period	2018 – 2020	
Leading department/administrator	Department of Environmental Protection, Capital City of Prague Municipal Office	
Departments and institutions involved	Department of the Director of the Capital City of Prague Municipal Office, Capital City of Prague Municipal Office; National Institute of Public Health and other bodies	
Relation to Adaptation Strategy	A: Adaptation measures to mitigating increasing temperature, urban heat island and heat waves	x
	B: Adaptation measures to reducing impacts of torrential rainfall, floods and long-term drought on the Capital City of Prague´s territory	
	C: Adaptation measures to reduce energy performance in Prague incl. adaptations in buildings	
	D: Adaptation measures in risk management and providing citizens with safety	x
	F: Adaptation measures to reducing impacts of torrential rainfall, floods and long-term drought on the Capital City of Prague´s territory	x
Type of the measure	Running measures/pilot project	
	New measure/pilot project	x
Climate change impacts targeted	1. Heat waves and urban heat island	x
	2. Extreme rainfalls and rainfall/storm water management	
	3. Floods	

	4. Drought	x
Possible conflicts		
Financial costs	<CZK 200,000.00 (EUR 7,740.00)	
Source of financing	New Capital City of Prague Municipal Office budget	
Other information		

Name of the measure/pilot project	**Methodology on inner courtyard management, information for stakeholders and the general public**	
Description of the measure/pilot project Implementation steps	Developing methodology/guidelines on inner courtyard management for the stakeholders involved allows establishing further green spaces, particularly in the city´s densely built-up downtown. In addition to raise awareness of benefits provided by green spaces in the urban environment, the methodology/guidelines will present a basic outline of possible changes in inner courtyards through nature-based solutions into spaces contributing to climate change mitigation in the city and playing other social roles.	
Implementation period	2018 – 2020	
Leading department/administrator	Department of Environmental Protection, Capital City of Prague Municipal Office	
Departments and institutions involved	Czech Landscape and Garden Society; National Institute of Public Health and other bodies	
Relation to Adaptation Strategy	A: Adaptation measures to mitigating increasing temperature, urban heat island and heat waves	x
	B: Adaptation measures to reducing impacts of torrential rainfall, floods and long-term drought on the Capital City of Prague´s territory	x
	C: Adaptation measures to reduce energy performance in Prague incl. adaptations in buildings	
	D: Adaptation measures in risk management and providing citizens with safety	
	F: Adaptation measures to reducing impacts of torrential rainfall, floods and long-term drought on the Capital City of Prague´s territory	x
Type of the measure	Running measures/pilot project	
	New measure/pilot project	x
Climate change impacts targeted	1. Heat waves and urban heat island	x
	2. Extreme rainfalls and rainfall/storm water	

	management	
	3. Floods	
	4. Drought	x
Possible conflicts		
Financial costs	<CZK 200,000.00 (EUR 7,740.00)	
Source of financing	New Capital City of Prague Municipal Office budget	
Other information		

Name of the measure/pilot project	**Methodology on enhancing allotment gardens, information for the involved stakeholders (implemented by the Faculty of Environmental Sciences, Czech University of Life Sciences)**	
Description of the measure/pilot project Implementation steps	Methodology on enhancing allotment gardens aims at stakeholders and the general public and allows establishing new green spaces within the city. In addition to raise awareness of benefits provided by green spaces in the urban environment, the methodology/guidelines will support creating other allotment gardens through nature-based solutions into spaces contributing to climate change mitigation in the city.	
Implementation period	2018 – 2020	
Leading department/administrator	Department of Environmental Protection, Capital City of Prague Municipal Office	
Departments and institutions involved	Faculty of Environmental Sciences, Czech University of Life Sciences and other bodies	
Relation to Adaptation Strategy	A: Adaptation measures to mitigating increasing temperature, urban heat island and heat waves	x
	B: Adaptation measures to reducing impacts of torrential rainfall, floods and long-term drought on the Capital City of Prague´s territory	x
	C: Adaptation measures to reduce energy performance in Prague incl. adaptations in buildings	
	D: Adaptation measures in risk management and providing citizens with safety	
	F: Adaptation measures to reducing impacts of torrential rainfall, floods and long-term drought on the Capital City of Prague´s territory	x
Type of the measure	Running measures/pilot project	
	New measure/pilot project	x
Climate change impacts targeted	1. Heat waves and urban heat island	x
	2. Extreme rainfalls and rainfall/storm water management	

	3. Floods	
	4. Drought	x
Possible conflicts		
Financial costs	<CZK 200,000.00 (EUR 7,740.00)	
Source of financing	New Capital City of Prague Municipal Office budget	
Other information		

Name of the measure/pilot project	**Methodology on enhancing allotment gardens, information for the stakeholders involved**	
Description of the measure/pilot project Implementation steps	Developing methodology/guidelines on enhancing allotment gardens for the stakeholders involved allows establishing further green spaces, particularly in the city´s densely built-up downtown. In addition to raise awareness of benefits provided by green spaces in the urban environment, the methodology/guidelines will present a basic outline of possibilities to establish allotment gardens contributing to climate change mitigation in the city and playing other social roles.	
Implementation period	2018 – 2020	
Leading department/administrator	Department of Environmental Protection, Capital City of Prague Municipal Office	
Departments and institutions involved	Kokoza, charitable trust; Czech Landscape and Garden Society; National Institute of Public Health and other bodies	
Relation to Adaptation Strategy	A: Adaptation measures to mitigating increasing temperature, urban heat island and heat waves	x
	B: Adaptation measures to reducing impacts of torrential rainfall, floods and long-term drought on the Capital City of Prague´s territory	x
	C: Adaptation measures to reduce energy performance in Prague incl. adaptations in buildings	
	D: Adaptation measures in risk management and providing citizens with safety	
	F: Adaptation measures to reducing impacts of torrential rainfall, floods and long-term drought on the Capital City of Prague´s territory	x
Type of the measure	Running measures/pilot project	
	New measure/pilot project	x
Climate change impacts targeted	1. Heat waves and urban heat island	x
	2. Extreme rainfalls and rainfall/storm water	

	management	
	3. Floods	
	4. Drought	x
Possible conflicts		
Financial costs	<CZK 200,000.00 (EUR 7,740.00)	
Source of financing	New Capital City of Prague Municipal Office budget	
Other information		

Name of the measure/pilot project	**Developing a leaflet/brochure on tree functions and benefits and on street greenery management methods**	
Description of the measure/pilot project Implementation steps	Developing a leaflet/brochure on favourable benefits provided by trees, particularly in mitigating climate change negative effects, *e.g.* by cooling, providing shading, rainfall and particulate matter accumulation, *etc.* The leaflet/brochure also aims at raising awareness among the general public and the target groups on planting and managing trees in the urban environment.	
Implementation period	2018 – 2020	
Leading department/administrator	Department of Environmental Protection, Capital City of Prague Municipal Office	
Departments and institutions involved	Czech Landscape and Garden Society; National Institute of Public Health and other bodies	
Relation to Adaptation Strategy	A: Adaptation measures to mitigating increasing temperature, urban heat island and heat waves	x
	B: Adaptation measures to reducing impacts of torrential rainfall, floods and long-term drought on the Capital City of Prague´s territory	
	C: Adaptation measures to reduce energy performance in Prague incl. adaptations in buildings	
	D: Adaptation measures in risk management and providing citizens with safety	x
	F: Adaptation measures to reducing impacts of torrential rainfall, floods and long-term drought on the Capital City of Prague´s territory	x
Type of the measure	Running measures/pilot project	
	New measure/pilot project	x
Climate change impacts targeted	1. Heat waves and urban heat island	x
	2. Extreme rainfalls and rainfall/storm water management	
	3. Floods	
	4. Drought	x

Possible conflicts	
Financial costs	<CZK 200,000.00 (EUR 7,740.00)
Source of financing	New Capital City of Prague Municipal Office budget
Other information	

Name of the measure/pilot project	**Communication, education and public awareness/environmental education programmes and projects for children and youth (implemented by the Department of Environmental Protection, Capital City of Prague Municipal Office, pursuant to the Communication, Education and Public Awareness Regional Strategy for the Capital City of Prague 2016 – 2020)**	
Description of the measure/pilot project Implementation steps	The project aims at enhancing educational programmes for children and youth, kindergartens and primary schools pursuant to the Communication, Education and Public Awareness (CEPA) Regional Strategy for the Capital City of Prague 2016 – 2020. The next step shall be elaborating the specific CEPA plans in climate change issues for city districts having been involved in co-operation with NGOs.	
Implementation period	2018 – 2020	
Leading department/administrator	Department of Environmental Protection, Capital City of Prague Municipal Office	
Departments and institutions involved	Department of Environmental Protection, Capital City of Prague Municipal Office and other bodies	
Relation to Adaptation Strategy	A: Adaptation measures to mitigating increasing temperature, urban heat island and heat waves	x
	B: Adaptation measures to reducing impacts of torrential rainfall, floods and long-term drought on the Capital City of Prague´s territory	
	C: Adaptation measures to reduce energy performance in Prague incl. adaptations in buildings	
	D: Adaptation measures in risk management and providing citizens with safety	x
	F: Adaptation measures to reducing impacts of torrential rainfall, floods and long-term drought on the Capital City of Prague´s territory	x
Type of the measure	Running measures/pilot project	
	New measure/pilot project	x
Climate change impacts targeted	1. Heat waves and urban heat island	x

	2. Extreme rainfalls and rainfall/storm water management	
	3. Floods	
	4. Drought	x
Possible conflicts		
Financial costs	<CZK 200,000.00 (EUR 7,740.00)	
Source of financing	New Capital City of Prague Municipal Office budget	
Other information		

Annex II: Economic evaluation of the selected measures and financial tools to their implementation

Cost-benefit analysis of the selected adaptation measures

Cost-benefit analysis (CBA) is an economic tool on assessing social acceptability of the individual investment types. By analysing total costs and benefits, the CBA sets out impacts of investments on well-being taking into account social costs and benefits. During CBA, some indicators, *e.g.* the Economic Net Present Value (ENPV), the Economic Rate of Return (ERR) and the Benefit/Cost (B/C) ratio are usually calculated (ENPV - the sum that results when the discounted total social value of the expected costs of an investment are deducted from the discounted total social value of the expected benefits; ERR – an index of the socio-economic profitability of a project;, B/C ratio – a ratio between discounted economic benefits and costs).

The CBA requires values on the joint scale or nominator, usually monetary values. The approach allows direct comparison between costs and benefits related to the project. The basic generalised formula for the CBA is the following equation:

$$NPV = \sum_{t=0}^{N} \frac{B_t - C_t}{(1+\delta)^t}$$

where NPV is net present value; B is benefits at the time t; C is costs at the time t and δ is discount rate. The social discount rate expresses economic preference of goods and services at the present time compared with the future. In environmental projects, the discount rate is usually calculated at 2 – 5%.

Costs include investment costs related to implementing climate change adaptation measures. Initial investments cover capital costs for all long-term property/assets *(e.g.*, land parcels/plots, buildings, machinery, equipment, *etc.)* and intangible asset *(e.g.,* technological support, construction supervision, public relations, *etc.*). The information used follows the technological feasibility study data. The cost calculation should be in line with supposed physical implementations and implementation of the time schedule over the years. If necessary, the initial investments should include costs for environmental/climate change impact mitigations during building and should be defined in the EIA (Environmental Impact Assessment) or other assessment procedures.

Operational costs include all the costs on operations and maintenance. Cost prognosis can be based on historical unit costs, taken into account the operation and maintenance quality standards. Although the real structure is specific for each project, the typical operation and maintenance costs includes the employee´s costs for the employer; materials needed for property/asset maintenance and repair; resource, fuel, energy and other consumable consumption; services purchased from a third-party retailer; rent of buildings or shelters; rent of machinery; general management; insurance costs; quality control; waste disposal costs and emission charges including possible environmental taxes.

The CBA usually includes demand analysis. Projects on environmental benefit analysis provide a broader range of ecosystem services beneficial for a lot of users, also from a point of view of the non-use value. It is important to define and quantify who benefits from the respective measure, as seen from a point of view of regions/areas/sites, human populations and various economic activities.

Benefits from ecosystem services

Implementing climate change adaptation measures providing the human society with benefits. Main categories and the individual methods for assessing the benefits are presented in Table 1

Typical benefits from implementing climate change adaptations in cities (EU 2015)

Benefit	Assessment methods
Enhanced state of health	Stated preferences
	Revealed preferences (health-based valuation, hedonic pricing)
	Sickness rate costs
Productive land use	Market price
Increased recreational value	Travel cost method
	Replacement costs
Maintaining biodiversity including habitats	Stated preference (conditional valuation)
	Replacement costs
Risk of damage to buildings reduction	Avoiding damages
	Insurance damages
Increasing residential real estate value	Hedonic pricing
	Stated preference

Urban ecosystem services are produced by a variable set of habitats, including green spaces, *e.g.* parks, urban forests, cemeteries, non-built parcels/plots, gardens and courtyards, schools, dumps and blue spaces including brooks, reservoirs, artificial broad-based terraces, fishponds and other wetlands for rainfall/storm water retention. Together, the habitat/ecosystem types are called the green, blue infrastructure respectively.

The main ecosystem services provided by the urban environment include particularly:

1. Pollution and air quality regulation;
2. Carbon sequestration;
3. Water runoff regulation;
4. Climate regulation/cooling;
5. Aesthetical, recreation and other cultural services and
6. Positive health effects.

Pollution and air quality regulation

Trees and other greenery in cities and towns remove pollutants produced there, particularly PM_{10}, SO_2, NO_2, O_3 and other substances. The greenery capacity to capture pollutants is estimated to be 42 – 102 kilogram/hectare/year in relation to the pollutant and study types. Monetary value estimation of the ecosystem service is usually calculated as costs for controlling pollutant entering into the environment.

Carbon sequestration

Carbon sequestration in urban ecosystems is a function of urban greenery photosynthetic procedures. Annual carbon sequestration rate ranges in 2 – 5 tonnes/hectare/year. Monetary carbon value can be estimated *e.g.* by societal costs of carbon (SCC).

Water runoff regulation

Urban greenery evaporates water, thus contributing to water runoff and microclimate cooling regulation. Based on literature review, the water captured volume ranges in 197 – 850 cubic metres/hectare/year. The monetary value is estimated by various methods, *e.g.* according to costs for building retention facilities or to costs for preventing floods caused by torrential rainfalls.

Climate regulation/cooling

By shading, air temperature regulation and wind regulation, urban greenery can contribute to energy savings of approx. 14 – 20 MWh/hectare/year providing significant savings in heating and air-conditioning.

Aesthetical, recreation and other cultural services

Cultural services provided by urban greenery are usually measured by a survey among urban human population. Its willingness to pay for aesthetical or recreation services is examined. At the same, *e.g.* residential real estate values in cities and towns can be used, being a function of greenery presence and quality. For the CBA, values gathered from literature were calculated according to currency exchange ratio and the CPI (Consumer Price Index) to CZK from the 2016 OECD database. All values were converted to a square meter of the climate change adaptation measures implemented.

Table 2 Economic values of average ecosystem service benefits in the urban environment (Elmquist *et al.* 2015): EUR = x25.85 CZK

Ecosystem service	CZK/m^2/year
1. Pollution and air quality regulation	1.60
2. Carbon sequestration (annual flow)	0.98
Carbon storage (stock value)	7.74
3. Rainfall/storm water reduction	2.28
4. Energy savings/ temperature regulation	3.50
5. Recreation and other amenity services	15.66
6. Positive health effects	46.72
Total (excl. health effects and carbon storage)	24.02

A case study on Cost-Benefit Analysis

A case study on park restoration was based on implementing the K Satalicím – Aborka Park plan (see Figure 1).

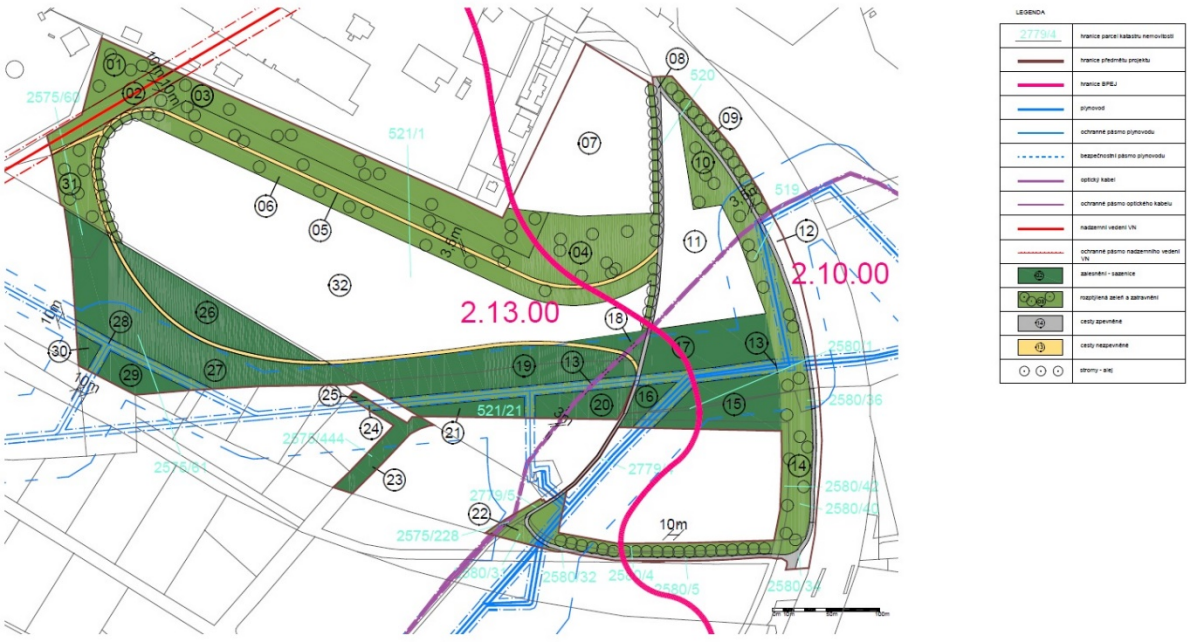

Figure 1 A design of the K Satalicím – Arborka case study area

Restoration of the park include planting 32 trees and introduction of dispersed greenery (shrubs) and grassing over, while the dispersed greenery consists of 140 shrubs. The total restored area will cover 12 hectares.

From appoint of view of the costs, the park restoration requires non-repeated costs to prepare terrain and to plant greenery. The costs also cover those for material (trees, shrubs, grass seed mixes). Cost structure respects he recommended average unit costs for public greenery planting (Institute of Spatial Development 2017).

The following costs were considered (Table 3):

Table 3 Costs of public greenery park restoration (according to Institute of Spatial Development 2017). EUR = 25.85 CZK

	Costs	Unit
Preparatory activities		
Removing ruderal growths (rubber vegetation)	29	CZK/m^2
Removing last year´s grass (non-managed dry grass growth)	19	CZK/m^2
Removing unsuitable woody plant <100 centimetres in diameter of the trunk, height > 1 meter, without stumps (thinning)	259	CZK/m^2
Terrain shaping (soil translocation, shaping, levelling, spreading topsoil)	113	CZK/m^2
Preparing the soil for planting	52	CZK/m^2
Removing shrubs and trees < 100 mm, by burning	56	CZK/m^2
Preparatory activities in total		
Planting trees and shrubs (2017)		
Planting a balled tree of 250 – 350 centimetres in height, with a developed crown	3082	CZK/piece
Material – price for trees		
Field maple (*Acer campestre*)	2500	CZK/piece
Common oak (*Quercus robur*)	2500	CZK/piece
Small-leaved lime (*Tilia cordata*)	1650	CZK/piece
Total tree planting		
Planting a shrub up to height of 50 centimetres, not balled	58	CZK/piece
Material - shrubs	90	CZK/piece
Total		
Establishing a lawn	30	CZK/m^2
Material - mixture	111	CZK/kg
Lawn total		
Maintenance activities		
Lawn management	20	CZK/m^2 of mowing
Pruning trees	50	CZK/piece
Lopping shrubs	50	CZK/piece

Furthermore, annual costs also include those for maintenance of the park, *e.g.* costs for lawn management.

Net present value of the park´s restoration

The Net Present Value (NPV) of the park´s restoration in the parameters given, including terrain shaping, planting and grassing over, is considered for 30 years with discount rates being 2, 4 and 6 %.

If the initial investment of approx. CZK 11.5 million (EUR 445,000.00, in relation to managed area and volume of activities carried out) is considered, first benefits provided by the restored park are compared with the required annual management cost estimated at approx. CZK 2.5 million (EUR 96,710.00). Ecosystem services values are taken into account without the total carbon value and health effects. Thus, the considered benefits include annual flow value of pollution and air quality regulation, carbon sequestration, rainfall/storm water reduction, energy savings and temperature regulation and recreation and other cultural services.

The total benefits amount to CZK 2.8 million (EUR 10,832.00), *i.e.* CZK 240,200 (EUR 9.292.00)/hectare of the park. For all the discount rates, benefits are slightly higher than costs and the NPV positive values (Table 4). The highest flow of total benefits is reached at the lowest discount rate of 2% (Figure 2). The NPV, *i.e.* the flow of total benefits reduced by invested costs, is CZK 101 – 161.5 million (EUR 3.9 – 6.2 million) in the further 30 years, in relation to the discount rate considered (Figure 3).

Table 4 Comparison of NPV values for various discount rates (EUR = 25.85 CZK)

Discount rate	NPV (difference of benefits and costs) in CZK million
2%	10.7
4%	8.35
6%	6.7

Economic Rate of Return

The park´s restoration includes large costs, *e.g.* for preparatory activities, planting and planting material. From the point of view, Economic Rate of Return, *i.e.* time when the NPV reaches zero and invested costs are balanced benefits available. Therefore, non-repeated costs necessary for the park´s restoration, being estimated at CZK 11.5 million (EUR 445,000.00), are included into the analysis. While during the first year of the park´s restoration and planting greenery, there are the significant negative NPV values related to costs for restoration itself, already during the second year NPV values are sharply positive (+ CZK 6.9 million/EUR 267,000.00) and within the third year, the total flow of benefits is higher than the invested costs.

Thus, the project´s economic rate of return is higher than the invested costs by the order of magnitude.

Summary and conclusions

Ecosystem-based climate change adaptations provide a huge range of benefits. Ecosystem services, *e.g.* climate change regulation, air quality regulation, recreational and aesthetic benefits or water retention significantly enhance human well-being in the urban environment. Based on a model cost-benefit analysis on an urban park restoration it is presented that from a point of the benefits for the society nature-based solutions are usually effective. For analysis of further measures, other analysis and studies should be carried out to quantify social benefits caused by a broader climate change adaptation range. For such studies, data on costs and benefits and on the total extent of adaptation measures including an entire documentation are necessary.