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Adaptation to the climate change with regards to the quality of settlements´ environment

Background Paper

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Introduction

At present, more than 75% of Europeans live in the large settlement areas. In Slovakia is this figure 56, 5%. Settlements are perceived as drivers of regional development as they offer a broad spectrum of functions and services like jobs, education and other services. However, the concentration of inhabitants in the large settlement areas brings a number of problems as well. On one hand, the settlement area consumes a lot of resources in form of mineral resources, water and food and on the other hand they produce waste, air pollution and sewage water. Permanent and excessive growth of settlement areas in landscape removes previously clear boarders between a city and its surrounding landscapes; nature background of the city often disappears under pressure of economic activities.

In many cities, the core centre is separated by physically separated new districts which are however functionally connected to the core city. This leads to permanently increasing demands on transport, in particular road transport, loss of biodiversity and fragmentation of natural environment. Negative trends, along with the excessive growth of cities, can be monitored within the structure of cities as well. The preference of economic and other interests causes the decrease of natural components – green spaces. Social polarisation and exclusion leads to the increased level of cultural and political conflicts, violence and criminality.

Over the last 15 years, global warming and climate change have become a reality which has been accompanied by many negative impacts. These effects could have been experienced especially throughout the large settlement areas where the consequences include adverse effects on drinking water supplies as well as extreme weather conditions such as storms, floods and excessive heat waves.

Therefore the consequences of climate change are widely acknowledged as one of the major challenges of the nearest future and are therefore representing a key policy issue.

The importance of the topic of climate change and its impacts on the settlements' environment is underlined and stressed in the leading European policies, documents, initiatives and papers.

During the Slovak Presidency of the Council of the European Union we would like to trigger discussion about the crucial role of spatial planning to secure the quality of the settlements´ environment facing the climate change negative impacts, discuss the needs for a better linkage among the settlements adaptation issues and other strategies, policies and directives on European and national level as well as underline the link between the climate change adaptation and mitigation measures in settlements. Therefore the purpose of this document is to raise discussion about the adaptation to the climate change with regards to the quality of settlements´ environment.

Setting the scene – Climate change, policies and territorial development

Overview of policies and agreements on pan-European level

The issue of climate change is widely acknowledged as one of the major challenge of the nearest future and is therefore representing a key policy issue. At the international, European, national, regional and local levels, climate change adaptation and mitigation measures form a standard part of policy formulations for territorial development.

At the European level, policy makers agreed already in 2010 on specific targets for the **Europe 2020 Strategy** to respond to these challenges, including reduction in greenhouse gas emissions by at least 20% compared to 1990 or by 30% (if the conditions are right), including increased share of energy supplied from renewable sources and a 20% rise in energy efficiency. Also the **Territorial Agenda 2020 (TA)** mentioned climate change as "the challenge and potential for territorial development", noting that the impacts of climate change and its possible negative consequences vary considerably across Europe with different impacts and different degrees of vulnerability. Furthermore the Territorial Agenda notes that these challenges necessitate the territorial coordination of policies, especially those related to climate, energy and water management, agriculture, housing, tourism and transport.

The investment support for smart, sustainable and inclusive growth is provided in the frame of the **EU Cohesion policy 2014-2020** and therefore the adaptation and mitigation measures are included as eligible expenditure.

In the 2014-2020 programming period, the **European Structural and Investment Funds**, in particular the European Regional Development Fund (ERDF), the European Social Fund (ESF) and the Cohesion Fund, are supporting 11 investment priorities also known as thematic objectives. In relation to the climate change adaptation and mitigation the following thematic objectives are the most relevant:

- Thematic objective 4. Supporting the shift towards a low-carbon economy in all sectors;
- Thematic objective 5. Promoting climate change adaptation, risk prevention and management;
- Thematic objective 6. Preserving and protecting the environment and promoting resource efficiency.

The goal of these objectives is to focus policy funding on areas that deliver the highest benefits to citizens and create synergies between the funded projects because the impacts of climate change are recognized as a threat that is already affecting and will affect the European territory in future.

In April 2013 the European Commission adopted "**An EU Strategy on Adaptation to Climate Change**" that supports action by promoting greater coordination and information-sharing by ensuring that the adaptation considerations are addressed in all relevant EU policies.

On the local level, the "Covenant of Mayors" and European Commission initiative was launched already in 2008. This initiative recognises that cities have a responsibility to contribute to the fight against climate change, as around 80% of CO2 is emitted in urban areas.

Signatories include over 6,500 EU cities and regions which voluntarily committed to cut their CO2 emissions by over 20% by 2020.

In October 2015 the "Covenant of Mayors" initiative was joined by the European Commission initiative focusing on climate change adaptation known as "Mayors adapt" under the new Covenant of Mayors for Climate & Energy. The new signatories now pledge to reduce CO2 emissions by at least 40% by 2030 and to adopt an integrated approach to tackling mitigation and adaptation to climate change[1].

Overview of policies and agreements on the international worldwide level

The year 2015 is representing a milestone in the field of mitigation and adaptation to climate change. In December 2015, the 21st Session of the Conference of the Parties convened in Paris (France) where 195 countries adopted the first-ever universal global climate deal known as the **Paris Agreement**. This universal agreement has the aim to keep a global temperature rise for this century well below 2 degrees Celsius. The governments agreed to come together every 5 years to set more ambitious targets than the ones required by science and to report on how well they are doing to implement their targets. Regarding the adaptation issues within the Paris agreement, the governments agreed to "strengthen societies' ability to deal with the impacts of climate change". The agreement will enter into force after its ratification by at least 55 countries.

In September 2015 the world leaders met at the United Nations in New York to adopt the **2030 Agenda for Sustainable Development.** The Sustainable Development Goals (SDGs) agreed upon by 193 countries comprise 17 new Sustainable Development Goals which will guide policy and funding for the next 15 years. Among these 17 Sustainable Development Goals are two directly connected to the climate change and through these the Member States express their commitment to protect the planet from degradation and take urgent action on climate change. The Sustainable Development Goal 13 aims to "take urgent action to combat climate change and its impact" while acknowledging that the United Nations Framework Convention on Climate Change is the primary international and intergovernmental forum for negotiating the global response to climate change. More specifically, the associated targets of SDG 13 focus on the integration of climate change measures into national policies, the improvement of education, awareness-raising and institutional capacity on climate change mitigation, adaptation, impact reduction and early warnings. Goal 11 – "Making cities and human settlements inclusive, safe, resilient and sustainable", the so called "urban SDG" – is one of the strongest of all SDGs. SDG 11 provides a huge opportunity to ensure a true transformation, given that the implementation of the SDGs by 2030 will take place in the kind of urban world that humanity has never experienced before.

[1] [online] http://www.covenantofmayors.eu/The-Covenant-of-Mayors-for-Climate.html

The 2030 Agenda for Sustainable Development also identifies, in its paragraph 14, climate change as "one of the greatest challenges of our time" and worries that "its adverse impacts undermine the ability of all countries to achieve sustainable development. The survival of many societies and of the biological support systems of the planet is at risk."

Connections between policies, climate change adaptation and territorial development on local regional and national level

The detailed study of the mentioned documents and policies mentioned in chapter 1 is showing, that the territorial dimension and the territorial cohesion is not recognized sufficiently in the issues of climate change. Moreover the climate change and adaptation issues are not mentioned explicitly or addressed in different EU Directives.

The EU Strategy on Adaptation to Climate Change, even mainstreaming climate change adaption into EU policies is not mentioning the territorial cohesion as important field for fostering adaptation.

The Europe 2020 Strategy is omitting importance of the socio-economic factors for adaptation, similar to the Territorial Agenda 2020 that is not addressing the adaptive capacity.

From the reason, that adaptation to climate change is a cross cutting issue, it need to be addressed and recognized at all spatial level from European, national to local in more coordinated way. The adaptation to climate change on local level will have the crucial importance to the quality of the settlements´ environment.

Territorial dimension and exposure to the impact of climate change

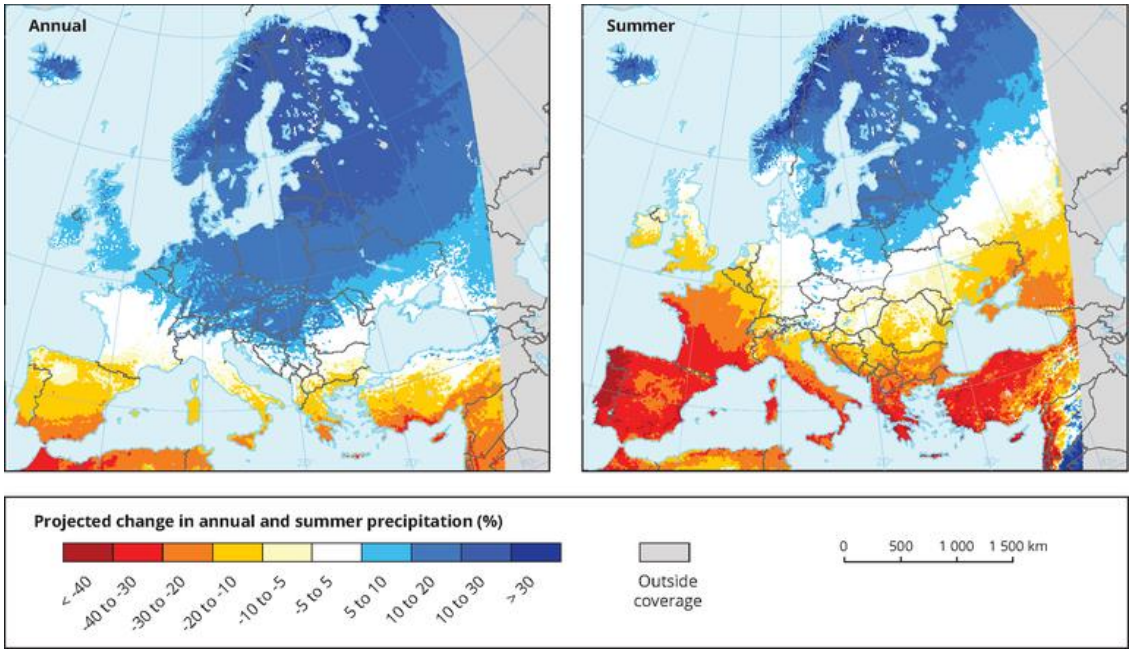
Despite the new international Paris Agreement on climate change which will hopefully lead to the decrease of greenhouse gas (GHG) emissions, climate change will continue for many decades as a result of past emissions and the inertia of the climate system.[2] It is therefore necessary to adapt to the changes that have already occurred and to prepare for plausible scenarios of future climate change.

The maps below indicate the projected changes in annual and summer precipitation (%) in the period 2071-2100 compared to the baseline period 1971-2000[3] and the projected changes in annual temperature and precipitation for 2071-2100 compared to 1971-2000[4].

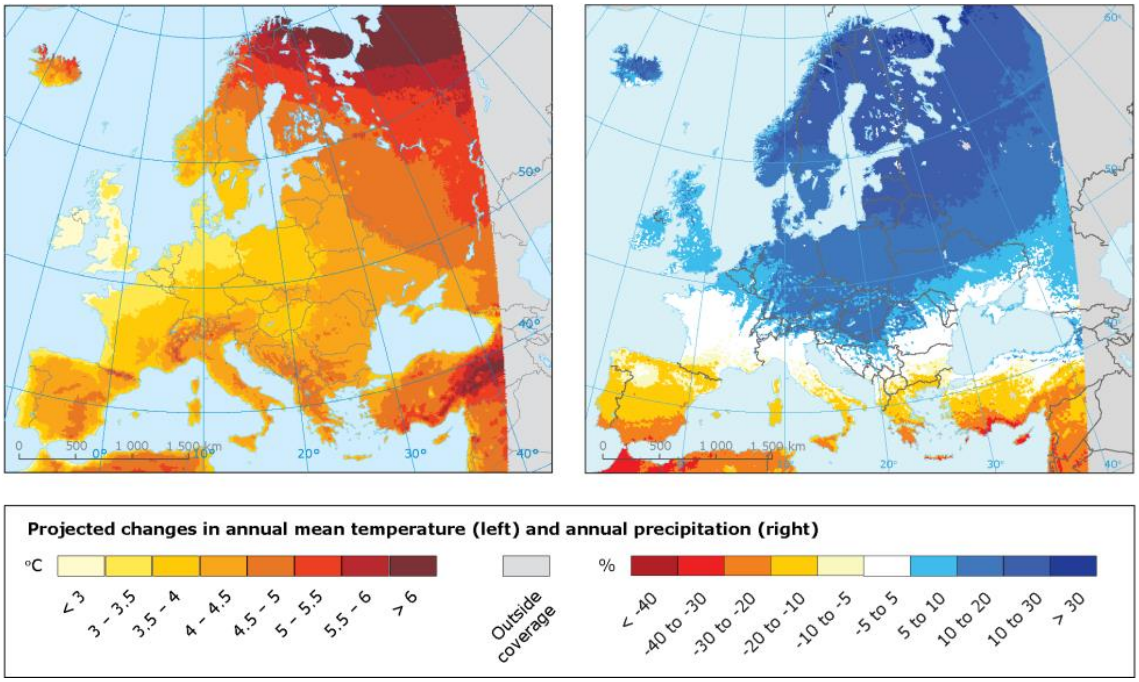
[2] [online] http://www.eea.europa.eu/soer-2015/europe/climate-change-impacts-and-adaptation#note2

[3] [online]http://www.eea.europa.eu/data-and-maps/figures/projected-changes-in-annual-and-4

[4] [online] http://www.eea.europa.eu/data-and-maps/figures/projected-change-in-annual-mean



Map 1: Projected changes in annual (left) and summer (right) precipitation (%) in the period 2071-2100 compared to the baseline period 1971-2000.



Map 2: Projected changes in annual temperature and precipitation for 2071-2100 compared to 1971-2000.

Climate change will affect all European regions, directly or indirectly, though the rate of affection will vary in accordance with geographical location and adaptation measures that were adopted.

In this sense it is important to underline, that these are the climatic conditions that lead to these territorial differences. The main challenges for Europe differ geographically, specific types of regions are at particular risk due to the exposure to two climatic variables (i.e. change in annual mean

temperature and relative change in annual mean precipitation in summer months), two hydro-meteorological hazards (i.e. floods and droughts) and one geophysical hazard (i.e. landslides).

However, there is still missing knowledge, uncertainty, missing vulnerability and risk assessment on the regional and local level and this fact has been identified for example in the already mentioned EU Strategy Adaptation to Climate Change as one of the gaps.

Major climate risks in Europe (Slovakia including) include increased river floods, significant reduction in water availability and extreme heat events[5]. According to a recent study, under a high-emission scenario and in the absence of adaptation actions, some climate impacts would roughly double by the end of this century. Regions having high exposure to natural hazards and climate change and low capacities to respond are most in need of action.

Heat-related deaths would reach about 200 000 per year; the cost of river flood damages would exceed EUR 10 billion/year; and every year forest fires would affect an area of about 800 000 ha. In this scenario, the number of people affected by droughts would also increase by a factor of seven to about 150 million per year and welfare loss due to sea-level rise would more than triple to EUR 42 billion/year[6].

Climate change and its adverse impacts in Slovakia

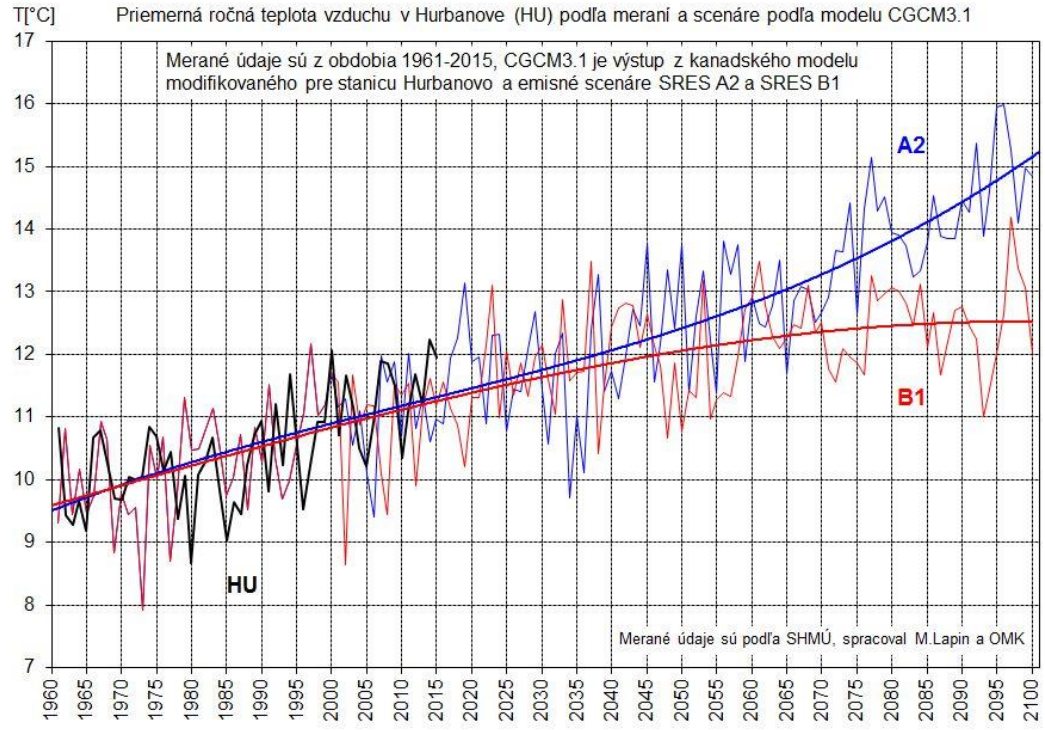
Even as the region of Central Europe was not identified among the most vulnerable European territories (like for instance the South-East Europe Region was)[7], the impact of climate change will have considerable consequences on the different sectors in Slovakia. The trends and changes already observed between 1881 and 2010 are showing especially the increase of mean annual air temperature by about 1.7 °C, decrease of annual precipitation mainly in the south of Slovakia up to 10%, decrease of all snow cover characteristics by altitude 1000 m.a.s.l., increase of potential evapotranspiration and decrease of soil humidity, where southern Slovakia gradually dries out which is visible on the characteristics of evapotranspiration, soil humidity and solar radiation. Moreover, the amount of extreme daily precipitation increased within the last 15 years considerably what caused the growth of the risk of local floods[8] (see more information in the graphs below).

[5] IPCC (2014), Climate Change 2014: Impacts, Adaptation, and Vulnerability, Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA.

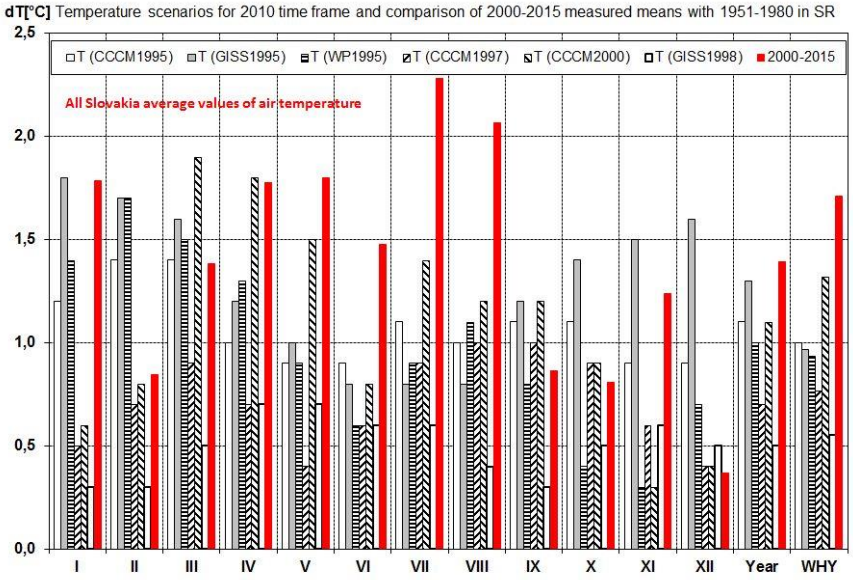
[6] Ciscar JC, et all (2014). Climate Impacts in Europe. Results from the JRC PESETA II Project. JRC Scientific and Political Reports, EUR 26586EN.

[7] ESPON Territorial observation No.7, [online],https://www.espon.eu/main/Menu_Publications/Menu_TerritorialObservations/

[8] [online], http://climate-adapt.eea.europa.eu/repository/11273729.pdf



Graph 1: Average annual temperature for South of Slovakia based on model CGCM3.1[9].



Graph 2: Temperature scenarios and comparison of 2000-2015[10].

[9] [online] http://www.milanlapin.estranky.sk/fotoalbum/klimaticke-scenare/

[10] [online] http://www.milanlapin.estranky.sk/fotoalbum/klimaticke-scenare/

Settlements and impacts of climate change

As mentioned before, climate change will affect all European regions, directly or indirectly, although the extent will vary according to the location of the area and the adaptation measures it adopts. Consequences of climate change will be especially apparent in large settlements in the form of high summer temperatures, periods of drought and floods. Moreover, land use and changes to these usages, uncontrolled urban growth, sealed surfaces and development on open spaces can increase the risk of extremely high temperatures and floods, and contribute to soil desiccation and shortage of drinking water supplies.

The ESPON Territorial observation No.7 recognises urban areas with high population density among the European regions that are most vulnerable to natural hazards and climate change impacts[11]. On the other hand, cities and human settlements are crucial to Europe's economy as centres of major economic assets and innovative activities while possessing a high damage potential.

The settlements´ environment differs even today from the surrounding landscape in a number of characteristics (temperature, humidity, air and soil quality). Logically, it is expected that due to climate change these adverse trends will continue and grow. The most important problems related to climate change in cities will include:

- Growth of temperature and heat waves (in case of heat waves the heat in cities will be worsened by heat islands);
- Significant decrease of relative air humidity;
- Decrease of precipitation – long periods of drought and aridisation (gradual desiccation, in particular due to increasing potential evapotranspiration and decreasing soil humidity);
- Storm precipitation and heavy rains – possibility of local floods;
- Windstorms and tornados;
- Changes in natural ecosystems and loss of biodiversity of unprecedented extent;
- Landslides caused by intensive precipitation.

As mentioned before, the summer heat waves are considered a specific and the most apparent problem for the human health. During the 2003 heat wave around 70,000 people died in 12 EU countries due to heat[12]. The EuroHeat project stresses that a combined effect of air pollution and increased summer temperature can occur when people are exposed to the high concentration of particulate matter PM10 and the ground-level ozone. This problem is ever more serious, especially

[11] ESPON Territorial observation No.7, [online], https://www.espon.eu/main/Menu_Publications/Menu_TerritorialObservations/
[12] Robine, J.M., Cheung, S.L., Le Roy, S., Van Oyen, H., Griffiths, C., Michel, J.P., and Herrmann, F.R. (2008) 'Death toll exceeded 70 000 in Europe during the summer of 2003', Comptes Rendu Biologies 331:171–8, in EEA (2010) State and Outlook 2010 (Thematic Assessment: Urban Environment), European Environment Agency, p.13.

taking into account the existing problems with dust, air pollution, social exclusion which means that the poorer segments of the population are the most threatened[13].

Adaptation to the adverse impact of climate change in settlements

Adapting to climate change means taking into account new threats and opportunities in the daily activities. Adaptation aims to manage climate risk to an acceptable level, taking advantage of any positive opportunities that may arise. The extent of the adaptation needed will depend on the success of mitigation measures.

In theory, it should be possible to see the success of mitigation measures through reductions in GHG emissions. However, any reduction will only be noticed in the long term, rather than immediately. When planning adaptation measures, it is also necessary to take into account these long-term impacts.

Although mitigation and adaptation measures have to be developed at all levels – local, national and international – adaptation measures are the most important at the local level. Adaptation strategies should be focused on:

- coping with potential losses and risks;
- preventing consequences arising from the identified risks, or from reducing these risks;
- sharing responsibility for losses and risks;
- using the potential opportunities of climate change[14].

Adaptation responses to the identified risks and threats can be clustered in following broad categories[15]:

- technological solutions — grey measures;
- ecosystem-based adaptation options — green measures;
- behavioural, managerial and policy approaches — soft measures.

Some example of adaptation options on local level to cope with the impacts of climate change represented by the growth of temperature and heat waves are as follows:

- To enable better air circulation throughout the day and night through urban design and the interrelationships between vegetation and buildings;
- To increase the share of vegetation, especially in the built-up areas of urban centres (planting trees along streets and in car parks, creating green dividing strips, using alternative types of vegetation such as green roofs, and climbing and vertical vegetation);
- The cooling and shading of buildings and open spaces;

13 Robine, J.M., Cheung, S.L., Le Roy, S., Van Oyen, H., Griffiths, C., Michel, J.P., and Herrmann, F.R. (2008) 'Death toll exceeded 70 000 in Europe during the summer of 2003', Comptes Rendu Biologies 331:171–8, in EEA (2010) State and Outlook 2010 (Thematic Assessment: Urban Environment), European Environment Agency, p.13.

14 NORDREGIO (2009) Climate Change Emergencies and European Municipalities: Guidelines for Adaptation and Response [online], www.nordregio.se/munires/Guidelines_%20brochure.pdf

15 EEA (2010a) The European Environment: State and Outlook 2010 (Thematic Assessment: Adapting to Climate Change), European Environment Agency, [online], www.eea.europa.eu/soer

- The use of the building material and reflexive colours.

Some examples of adaptation options on local level to cope with the impacts of climate change represented landslides and soil erosion are following:

- To support the implementation of agricultural practices that help to reduce soil erosion such as ploughing along level lines, revitalising balks, tufts and terraces, and planting vegetation on field paths.;
- To support landscape management in surrounding areas that reduces erosion such as longer rotation periods, banning of clear felling, afforestation and building polders.

The adaptation options to cope with the decrease of precipitation on local level – long periods of drought and storm precipitation and heavy rains and the possibility of local floods – are described in the next chapter.

Climate change and rainwater management in settlements

Under natural conditions, water operates in a cycle of precipitation, infiltration, surface runoff and evaporation. Because 10-90% of settlement surfaces are completely sealed, water cycles are severely affected and the water cycle is disturbed and cannot run its course. The rainwater cannot infiltrate the ground due to paved surfaces and is rapidly collected and discharged to the public draining systems leaving no time for evaporation.

As mentioned before, the adverse impact of climate change will lead to the decrease in precipitation, worsening water quality caused by increasing temperatures, long periods of drought but especially the storm precipitation and heavy rains. Due to the fact that the increase in air temperature influences evaporation and transpiration rates, changes in water retention capacity of soils and vegetation is to be expected as well. This has a knock-on effect on rainwater as the natural attenuation and infiltration of runoff becomes unbalanced that will possibly lead to local floods.

To a large extent, current conventional rainwater management systems are neither sustainable nor adaptable to changing climates or developing conditions[16].

The new approach is aiming to reduce rainwater runoff by treating the rainwater as close to the source as possible, ideally on-site which is called sustainable rainwater management and is aiming to reduce runoff by using technologies for rainwater collection (e.g. for utilization or storage) and for increasing of rainwater infiltration and evaporation.

[16] [online] http://www.switchurbanwater.eu/outputs/pdfs/WP2_BRN_Sustainable_stormwater_management.pdf

Picture 1: Open rainwater canals and bioretention pond in settlement (author: Zuzana Hudekova)

For urbanised environment the following sustainable rainwater adaptation measures shall be applied:

- Set up **systems that collect rainwater from roofs and surfaces and distribute it to retention or infiltration through different options** (bioretention, open stormwater canals, detention ponds, infiltration zones and trenches etc.). This would help to reduce the desiccation of the urban landscape and to drain rainwater. Moreover by applying the concept of the rainwater harvesting the collected rainwater can be used for further water supply when treated or for the irrigation;

Picture 2: Infiltration zone in residential area (author: Zuzana Hudekova)

- **Use of water permeable pavement**. This includes pavers, asphalt, or concrete that allows water to pass through into a specially-designed sub grade gravel bed or other porous medium. Permeable pavement systems retain water in the sub grade, where it can infiltrate into the ground, evaporate, or be drained from the system;

Picture 3: Permeable pavement in parking lots (author: Zuzana Hudekova)

- **Construction of the green roofs**. Green roofs have a great effect as they are temporarily storing the rain water and in the same time increasing the evapotranspiration by the green roof plants. Evapotranspiration could be increased as well by using other sorts of vegetation such as climbing species, vertical gardens and so on;

Picture 4: Green roofs can promote the biodiversity as well (author: Zuzana Hudekova)

- **Increase in the share of vegetation**, especially in the built-up areas of urban centres (planting trees along the streets and in car parks, creating green dividing strips, using alternative types of vegetation etc.);

Picture 5: Trees in the historical Main square of Bratislava, planted in 2016 (author: Zuzana Hudekova)

- Implementation of measures **to protect the existing local wetlands, creation of the artificial wetlands as well as implementation of natural forest management in the surrounding landscapes** of a municipality. For example, the measures in the forest areas could include longer rotation periods, banning of clear felling, afforestation and building of polders;

Picture 6: Protecting natural areas and wetlands in settlements (author: Zuzana Hudekova)

- **Protection of vegetation on the banks of waterways**. Along with increasing of the capacity of water course to improve the water quality, this type of vegetation provides protection against sedimentation and overgrowth due to shielding of the riverbed. The vegetation also reduces the heating of water, and provides shielding and protection against erosion;

Picture 7: Protecting vegetation on the banks of waterways in settlements (author: Zuzana Hudekova)

The above mentioned adaptation options in the field of the sustainable urban rainwater management were successfully used in the sectorial standards and guidance described in the next chapter.

Territorial planning and the issues of climate change adaptation in Slovakia

The Ministry of Transport, Construction and Regional Development acknowledged the climate change adaptation issues and incorporated this topic in the sectorial standards and guidance in the field of the spatial planning (e.g. Standards of minimal services in municipalities, a methodological guidance for spatial planning needs (2010); Principles and guidelines in the spatial planning (2013); Ecoindex -index of maximal impermeableness (2014)").

In Slovakia the "**Standards of minimal services in municipalities, a methodological guidance for spatial planning needs"** (Standards) were updated in 2009-2010. The previous version of Standards (from 2002) was used as a starting point and the successful standards from other countries were taken into account. Ensuring the quality of life for the inhabitants at present and in the future (especially from the point of view of climate change) and the protection of biodiversity in the settlement areas were taken into consideration as well.

In the updated Standards, the green spaces are expressed in quantitative form (e.g. m^2/inhabitant), and also qualitative form e.g. share of woody plant cover, percentage of vegetation surfaces, impermeableness index (see an example in the table below).

Open spaces		STANDARD FOR SIZE CATEGORY OF MUNICIPALITIES IN THOUSANDS OF INHABITANTS						
category	Indicator	▾ 5	5 ▸ 10	10 ▸ 20	20 ▸ 30	30 ▸ 50	50 ▸ 100	▴ 100
Parks, public gardens and green spaces	Minimum park area	5 000 m^2, and minimal width 25m	5 000 m^2, and minimal width 25m	5 000 m^2, and minimal width 25m	5 000 m^2, and minimal width 25m	5 000 m^2, and minimal width 25m	5 000 m^2, and minimal width 25m	5 000 m^2, and minimal width 25m
	[m^2/inhabitant]	8-14	8-14	8-14	8-14	8-14	8-14	8-14
	[% of vegetation surfaces]	80%	80%	80%	80%	80%	80%	80%
	[% of coverage by woody plants]	60%	60%	60%	60%	60%	60%	60%
Local level	[m^2/inhabitant]	8-14	8-14	5-7	5-7	5-7	5-7	5-7
	accessibility	300 m	300 m	300 m	300 m	300 m	300 m	300 m
City level	[m^2/inhabitant]	unlimited	unlimited	5-7	5-7	5-7	5-7	5-7
	accessibility	unlimited	unlimited	1.2 km	1.2 km	1.2 km	1.2 km	1.2 km

Table A: Green spaces in different kinds of settlements expressed in quantitative form and qualitative form

The issues of climate change were elaborated in a more detailed way in the methodological document "**Principles and guidelines in the spatial planning (2013)**". In this methodological document contains a chapter dedicated to climate change and its adverse negative impacts on the different sectors related to the planning of the settlement´s structure were included. Moreover, all above mentioned sustainable rainwater adaptation measures were included in the chapter dedicated to open spaces and greenery.

In relation to the threats of heavy rains, the new index, a so called „**Eco-index - index of maximal impermeableness (2014)**", was introduced. This index could be used in the spatial planning and is describing in more detail the level of maximal impermeableness for particular surfaces according to their function because it is widely recognized that the rainwater permeability is especially important in the settlements.

Conclusions

The detailed study of relevant documents, policies and papers in the field of climate change adaptation is showing the urgent need for a better integrated territorial approach from European to local level. This integrated approach shall incorporate the link between the management of natural hazard risks and climate change adaptation and mitigation measures/options. These two needs have to be seen in relation to the socio-economic development.

Due to the fact that the adaptation to climate change is a cross cutting issue, it needs to be addressed and recognized at all spatial levels from European through national to local in a more coordinate way.

The assessment of the implications of the Paris Agreement already started on the European level[17]. The role of the "new" Covenant of Mayors for climate and energy shall be explored because, in general, there is a gap among the local and national level in the field of adaptation to climate change.

The adaptation to climate change on local level will have the crucial importance to the quality of the settlements´ environment. The spatial planning will play an important role in the possibilities to influence the adaptation process.

[17] [online] https://ec.europa.eu/transparency/regdoc/rep/1/2016/EN/1-2016-110-EN-F1-1.PDF