LOCAL WATER PLANNING – INTEGRATED APPROACH TOWARDS FLOOD RISKS REDUCTION

M. Kováč

Director, Department of Local Development, Association of Towns and Communities of Slovakia, Bratislava, Slovak Republic

Abstract

Some critical links and interactions between various parts of the ecosystems are overlooked with fatal impacts. Function of the landscapes in the distribution of the rainwater and role of vegetation in the dissipation of solar energy in the landscapes are overlooked. There is need for integrated approach instead of isolated public policies and public funding. Key challenges are to achieve good status of the water and stakeholders involvement. Integrated approach includes balanced management of vegetation cover, water and soil resources and physical area adaptation of landscape profile in water basins. Local Water Planning process supports such integration and adaptation. Radical reform of Common Agricultural Policy is required as it is today biggest contributor to climate change, flood risks and consumer of EU budget.

1. Introduction

In distribution of rainwater, landscape has three basic functions: 1. optimally infiltrate water to the soil profile and underlay, based on their natural physical parameters; 2. create favourable conditions for water evaporation from soil, plants, water bodies and surfaces; 3. drain only natural surplus of water from basin through the river basin network.

Deforestation, agriculture and urbanization accelerate the runoff, decrease evaporation and infiltration of rainwater, cause draining and decrease of

Corresponding author:
Martin Kováč, Association of Towns and Communities of Slovakia
Bezrucova 9 – 811 09 Bratislava, Slovak Republic

soil quality of the transformed land. The lack of water and vegetation on landscape surface leads to increased temperature of the landscape. Immense flows of solar energy are changed into sensible heat instead of the latent heat of water evaporation. Increased heat production in the landscape accelerates extreme weather events and changes in precipitation patterns. 2/3 of the rainwater comes from water evaporation in water basins. Thus if we decrease evaporation we decrease average amount of rain and change precipitation patterns in water basins. Alteration of the land (during the centuries and decades) without compensation measures for rainwater retention and soil protection leads to desertification. Droughts and floods have common denominator, which is small water cycle distorted (not least) by current methods of water and soil management with minimising functioning vegetation in the country.

There is need for territorial adaptation of the landscape profile due to loosen water storage capacity and huge soil erosion of the water basins. That is why it is necessary to adopt new culture of managing water and vegetation at all levels of the territory. Rainwater harvesting, renewal of wood and vegetation cover of the landscapes project on massive scale are necessary steps to recovery of local, regional and global climate and for radical flood risks reduction. Important part of such planning and adaptation processes is water planning in which **local water planning** plays key role. Local water planning leads to elaboration of **Local Plan of the Integrated Water Resources and Soil Management (Community plans of IWRM)**. Such plan fosters integrated approach by balancing management of water and soil resources and vegetation cover in the territory of every community, in sum in territory of whole water basin. Association of Towns and Communities of Slovakia developed the methodology and provides set of special instruments for local water planning processes and local communities including innovative early warning system (www.meteoradar.eu). The methodology fully supports

implementation of the EU Water Framework Directive, EU Flood Directive and integrated water resources and soil management.

Principles for sustainable protection of towns and villages cadastre territories against floods

A key to ensure preparation and implementation of flood defense measures is a role of local municipality and cooperation of partners and landowners in the river basin. Through implementation of simple and investment not demanding technical and biotechnical adaptation measures in urban zones, agricultural land, woodland and water units, we can improve surface of the landscape and to revitalize ability of the river basin to retain water in the landscapes via water cycle circulation. We can therefore reverse a trend of a negative water balance to a positive water balance in the landscape and to achieve equilibrium after some time. With this approach, we have to adhere to the following principles: area water protection principle; solidarity principle; partnership principle; subsidiary principle; sustainability principle and natural processes auto-regulation principle.

Principles of integrated water resources management in municipalities and their river basins

Integrated water resources management (IWRM) is a complex process of water resources use and protection that respects soil and water cycle in the landscape. In addition, IWRM can be used to assess impacts of water abstraction from ecosystems. IWRM should promote sustainable - new water culture for local communities and governments. Following nine principles enable to ensure better, cost effective and more systematic sustainable water resources management in the long-term. They are based on detailed analysis of individual public policies in the area of protection and use of soil and water resources; analyses of the tasks and roles of local municipalities and landowners, new water paradigm

approach, theoretical-expert knowledge of ecosystem and economic causalities of water cycle in the landscape.

Towards rainwater protection and its active utilization in landscapes

1. Principle of spatial protection of water resources in landscape and prior implementation of spatial flood prevention measures in river basins

2. Principle of respecting importance of rain water as well as the role of landscape in rain water distribution

3. Principle of cooperation and merging land and building owners and co-owners in order to protect and use rain water and to protect soil against erosion

Planning processes and reassessment of land changes

4. Principle of assessment of an impact of planned construction, investment and economic activities on water cycle in the landscape

5. Principle of reassessment of present land adjustments which influence water balance and water regime of the landscape during future implementation of integrated water resources management

Economical sustainability principles

6. Principle of sound waste water treatment and economic analysis of the most cost effective system of drinking water supply, waste water treatment and sewage system

7. Principle of water efficiency and water recycling

8. Principle of establishment and implementation of real water pricing

Filling the gap of water policy on local level

9. Principle of preparation and approval of municipalities integrated water resources management plans as a local part of river basin management planning process.

2. Data

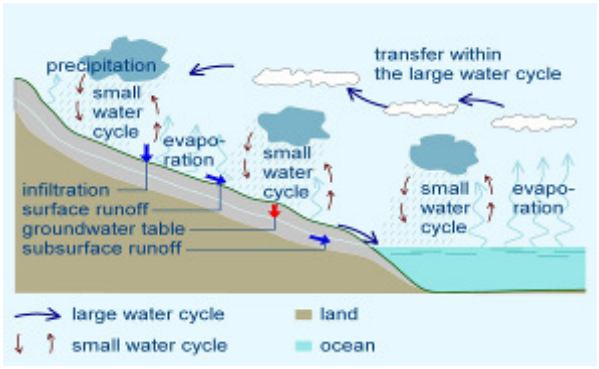

Figure 1: In circulation of the water in continents is more important small water cycle where circulates more water than in large water cycle.

Figure 2: Dry land: Most solar energy is changed into sensible heat. Wet land: most solar energy is consumed in phase change

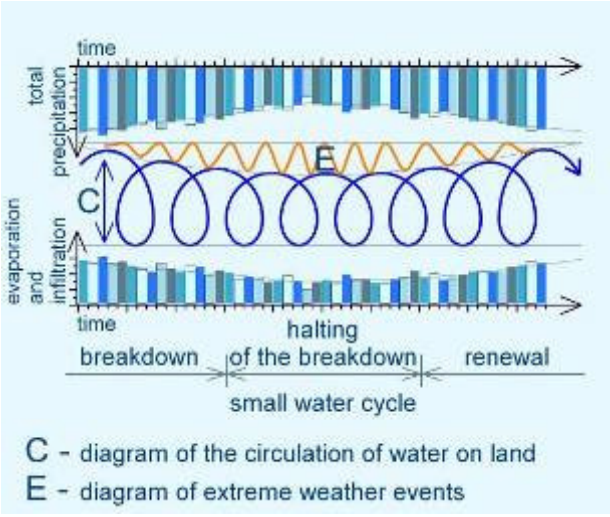

Figure 3: Description of today development, possible halting and renewal of small water cycle.

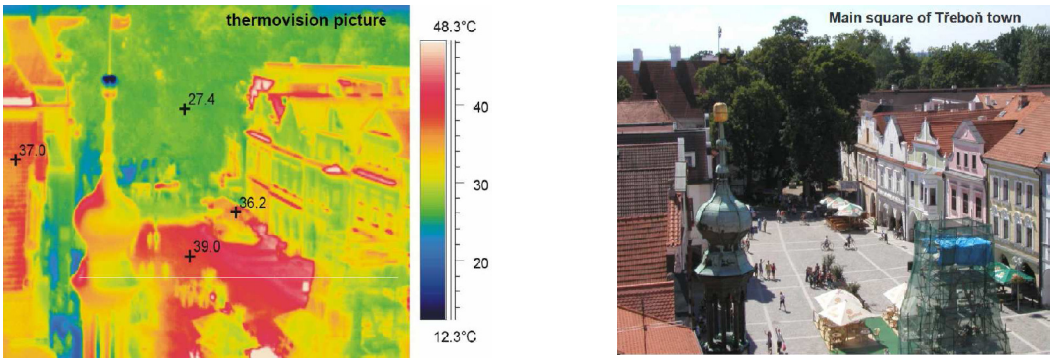

Figure 4: Infrared monitoring is an effective tool for problems identification and planning adaptation measures

3. Methodology

A part of the elaboration such **Community plan of IWRM** is evaluation of the surface water runoff of various parts of the landscapes (using *Ven Te Chow (ed.) (1964) Handbook of Applied Hydrology*) in three steps:

- Segmentation of the community territory (cadastre) for micro-water basins of common or similar surface runoff characteristics
- Calculation of surface runoff of particular micro-water basins
- Proposal of adaptation measures on the base of calculation and local characteristics

Output of the evaluation is identified potential (in cubic meters per hectare) for creation of micro-retention spaces for rainwater and other measures that need to be implemented in the landscape profile as part of the adaptation to climate change and flood risks reduction measures. Such plan is an effective document that proposes set of local measures that can be implemented via standard management tools as tax policy, territorial planning, nature protection, land adjustment, agricultural policy, forestry policy, water policy, etc.

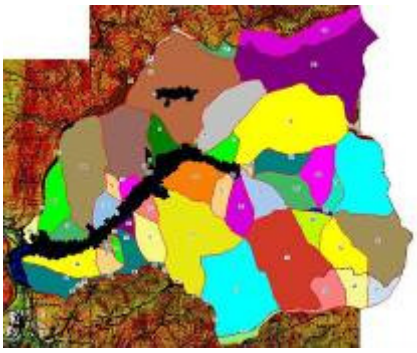

Figure 5: Example of surface runoff analysis – Oscadnica community, Slovakia

Community plans of IWRM should be prepared in cooperation and consensus with all stakeholders. They should respect principles of IWRM and public interest in the area of water protection and use on the territory of local community. Local level, level of the local municipality is the most appropriate level to put principles of integrated water resources management into practice.

4. Conclusions

To achieve real flood risk reduction we need to:

- Analyse surface runoff, propose and implement adequate adaptation measures (rainwater retention and soil protection) in landscape of all type for average 100mm precipitation event
- Minimise (close to 0) rainwater drainage from towns and urban zones
- Maximise (up to 100%) application of no till farming methods
- Establish and practise local water planning

Key impacts of integrated approach are: decreasing speed of sea level rise; halting the speed of desertification processes; improvement of precipitation patterns in the water basins; increase of biodiversity, vegetation cover and water resources in the landscapes; reduction of flood risks; reduction of landslides; soil erosion and river bad erosion reduction.

There is opportunity for flood risks reduction from 10% up to 80% depending on the complexity and scale of landscape adaptation.
Community plans of IWRM are after its elaboration powerful communication and management tools for communication and co-operation with farmers, foresters, property owners and users, water courses administrators, landowners, neighboring local governments, state administration and institutions.

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- Innovative early warning system- http://www.meteoradar.eu/English/index.html
- http://www.ourclimate.eu Cemagref, INRA.