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Implementation of ecohydrology by demand-driven research and innovation in the Lodz LA

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Abstract

The goal of the SWITCH project in Lodz (Poland) is to apply ecohydrology to IUWM for stormwater management, natural ecosystems health and quality of life. Following the Learning Alliance (LA) methodology, the paper will revise the undertaken activities, in order to accomplish the leading position of the Learning Alliance in facilitating the paradigm shift in Urban Water Management by implementation of demand-led research. The process of the LA establishment and development will be presented with its challenges and opportunities. The objectives and impacts of the LA meetings and communications since the launch of the project will be presented, emphasizing raising awareness to establish a multi-stakeholder IUWM platform in the city, innovate the implementation processes and communications, encourage time and effort-saving collaboration, improved governance and exchange experience with other LAs.
RTD activities will be reviewed on the background of the city needs. Examples of the implementation of some of the up-to-date demand driven research results will be presented, both in the demonstration sites, as well as their up-scaling in the city.
The paper will examine the drivers within the Learning Alliance, as well as the role of research and demo activities in contributing to and influencing linkages among the stakeholders. The grouping of stakeholders according to the roles they play in the IUWM and their inter- and intra-relations will be presented based on the stakeholder analysis. The project experiences so far will be used for ensuring the successful Visioning & Scenario Planning workshop, perceived by the SWITCH coordination team and the stakeholders as the crucial point in the genuine establishment of the LA.

Keywords: ecohydrology, stormwater, demand-led research, LA establishment progress, Visioning & Scenario-planning workshop

1) Application of the integrative concept of ecohydrology to the IUWM in Lodz

The goal of the SWITCH project in Lodz

The severe degradation of urban landscapes and aquatic ecosystems creates constraints for placing realistic objectives for environmental management (Wagner et al., 2007). Criteria for making a decision should balance a

potential increase in ecological benefits (and possibly of human well-being) and spatial, demographic and economic limitations, together with economic gains and losses (Hulse and Gregory, 2004).
Traditional approach to environmental management based on 'conservation', valid in case of rare and valuable ecosystems, is often not relevant to highly degraded urban areas. The approaches that are more often considered in the urban space include: restoration, preservation, rehabilitation and remediation (Breil, et al., 2007). They comply with reductions of pollutants emissions, improvement of habitats structure and reversing degradation, and are substantial e.g., in achieving good ecological status or potential required by the EU Water Framework Directive. Considering the high degradation of the natural processes in urban catchments, as well as the need to provide ecosystem services and quality of life to societies in cities, the management strategies should go beyond these two approaches. They have to put more consideration to the holistic management of catchment resources, by emphasizing the role of ecosystems and their properties as possible tools for management, which is postulated by ecohydrology (Zalewski et al., 1997).
The goal of the SWITCH project in Lodz (Poland) is to apply ecohydrology to IUWM for stormwater management and regeneration of natural ecosystems for health and improved quality of life in the City.
Ecohydrology enables moderation and control of the water and matter cycles and works towards: 1) increasing absorbing capacity of urban catchments for minimizing impact, and 2) reduction of the occurrence of degradation symptoms by augmenting assimilative capacity of freshwater ecosystems (Zalewski & Wagner, 2005). Complementing technological measures with ecohydrology not only accelerates improvement of environment, but also lowers costs of management and rises economic income for society (Wagner- Lotkowska at al, 2004).
Ecohydrology is a trans-disciplinary approach, which uses the understanding of the relationships between hydrological and biological processes at the catchment scale to improve water quality, biodiversity and sustainable development (Zalewski, 2006). The implementation of this approach is based on the restoration and maintenance of the water circulation patterns, nutrient cycles and energy flows at a catchment scale towards optimization of the ecosystem services for the society, and is based on three fundamental factors:

i) using synergies between catchment water cycle and dynamics of its biotic component

ii) harmonizing existing and planned hydro-technical solutions with ecological biotechnologies

iii) integrating complementary synergistic measures at all scales (Zalewski, 2006)

Socio-economic validation for the implementation of ecohydrology

The SWITCH project in Lodz through December 2010, is meant to elaborate the scientific basis for a comprehensive urban water management plan and to validate the implementation of ecohydrology as one of the essential components of urban water management in the City of Lodz. In the first year the research was carried out in the areas of:

i) A municipal river restoration for storm-water management, increase of water retentiveness and improvement of life quality (The Sokolowka River)

ii) Development of the protection zone of the City Waste Water Treatment Plant for improved environmental quality and positive socio-economic feedbacks (The Ner River)

A selection of two pilot catchments allowed tackling a comprehensive scope of water-related city-specific issues as well as validating the concept of Eco-hydrology tested in meso-scale.
The Sokolowka river restoration, by the application of ecohydrological solutions, addresses the issues of:

- reduction of storm-water sewage flow peaks by series of ponds and reservoirs, creation and restoration of river floodplain and wetlands
- increase of water retentiveness in the city landscape (mitigation of extreme flows, increase of groundwater level, support of the city vegetation) by application of phyto-technology
- increase in the quality of water, ecological stability of freshwater resources and increase in their carrying capacity by in-stream eco-hydrological regulation

- increase in life quality and aesthetic values in the catchment by restoration of the river corridor by creating impoundments, buffering eco-tone zones and landscape management
- improvement of human health by incorporation of the comprehension of the relationships between the effect of green areas and water on the occurrence of allergies and asthma cases into the city planning processes
- creation of attractive urban spaces for the development of residential areas

The Ner river project addresses:

- phyto-extraction of heavy metals with the application of willows for both water and floodplain quality improvement and production of biomass (bio-energy), including floodplain restoration with native plant communities
- application of sewage sludge for fertilization of remote bio-energetic plantations (enhancement of biomass and bio-energy production as well as utilization of sewage sludge to fertilize the plantations)

The innovation of the application of ecohydrology lies in its concept, according to which urbanization should be seen as a process that by extinction of natural structures and their replacement with artificial ones, disrupts flow of paths of energy, water and matter, within and between adjacent ecosystems, re-directing them into unsustainable, human originated tracks (Wagner et al., 2007). Such transformations pose major ecological consequences for freshwaters, which are the receivers of deregulated, extreme run-off and accelerated flow of water and matter from disrupted natural cycles (Zalewski, 2000).
These changes do not only directly affect the water quality and quantity in degraded catchments, but also handicap the resilience of the freshwater ecosystems – their ability to maintain oscillations within the steady state. Consequently, ecosystems functions and ability to provide services may be permanently amended (Krauze & Wagner, 2007), contributing to human health and well-being in cities. (Kuprys-Lipinska et al, in press). According to the concept of ecohydrology improvement of the absorbing capacity of the environment can be achieved by using the ecosystem properties as a management tool, e.g. to reduce hydro-peaking, improve water quality and retention, convert excess nutrients, pollutants and sludge into reusable bio-energy (e.g. from the biomass). Therefore the need for cost-efficient, integrated solutions, extending technical systems for urban water management with ecological measures, that may not only improve the quality of the environment, but also tower the costs of management and raise economic income for the society (Wagner-Lotkowska et al, 2004).

2) Demonstration sites progress, impact, relationship to LA and up-scale prospects

Demand- and needs-serving demonstration sites

The demonstration sites-related progress is well in accordance with the city plan, the scientists networking as well as taking part in activities involving all other stakeholders in the SWITCH project,
contribute to building awareness of the research and its implementation conducted in the demonstration sites, inform the stakeholders, most importantly the decision-makers, but also service providing companies, media and the community about measurable visible results and potential impacts, which include:

- construction of 2 new reservoirs for the reduction of stormwater peaks
- adaptation of hydrotechnical infrastructure in the new and old reservoirs to ecohydrological principles, i.e. reduction of stormwater peaks and the improvement of water quality in the Sokolowka system
- ecological restoration of a section of the Sokolowka river, and elaboration of recommendations for the replication of the method in other rivers in Lodz
- support of the development of green areas in the river catchment based on the hydrological regulation
- development of operational procedures for the Waste Water Treatment Plant (WWTP), including ecological and economic goals
- elaboration of the DSS for the WWTP sewage sludge utilization and production of biomass
- increase in green energy production
- raising environmental awareness by using the permanent on-line monitoring systems for environmental education
- creation of preliminary meta-base enabling easy access to min environment-focused information

- active involvement of the community in the enhancement of the environment to contribute to building a new city image

The relationship of the demonstration project to the LA – evidence of demand

The City of Lodz demonstration projects have already proven to be demand-driven in that they tackle the issues of stormwater retention and purification, identified by the City of Lodz Office (Municipality) as well as the citizens as highly desired already a long time ago. The activities developed in the demonstration projects of SWITCH are in agreement with the regional programme, as a natural demand- and need-driven extension. Moreover, following the results of the social research conducted in February 2006, the development of public space in the city, including open water and green recreational areas, were articulated of key importance for the citizens of Lodz. These areas are proving to develop more dynamically and be in greater demand as residential interest and investment areas.
The idea of the demonstration projects – the Sokolowka and the Ner – met with a great interest and support in the first SWITCH Lodz Learning formation phase, and the already visible impacts upon the application of the research results in the demonstration sites, have drawn interest and willingness to participate in the LA, which results in the LA extention, which coincides with the approaching Visioning & Scenario-Planning Workshop, first such in the area of water management in the city.

Prospects of scaling-up the application of ecohydrology in IUWM

The experience gained with the Sokolowka river project is to become a basis for the restoration of the remaining 18 rivers in the City of Lodz. The realistic goal for up-scaling the project within the timeline of SWITCH, includes the elaboration of recommendations by researchers submitted to the City of Lodz Office's Studio of Spatial Development (Miejska Pracownia Urbanistyczna) in charge of designing the city redevelopment plan with the consideration of the redevelopment of the river valleys. The implementation of the recommendations by researchers is set as a "long-term" goal.
The experiences on both Sokolowka and Ner rivers will be disseminated through the vertical LA information exchange channels with the purpose of seeking possibilities for the replication of implementation on the national scale

4) SWITCH Lodz Learning Alliance – towards the accomplishment of the central position in facilitating the paradigm shift in Urban Water Management in the City of Lodz

The process of establishment and development of the Learning Alliance – challenges and opportunities

In the September 2006 "SWITCH-Lodz: Action Plan for the establishment of the Learning Alliance" document, it was predicted that until the end of 2007/beginning of 2007, the LA facilitator was going to be appointed and that would bring about diverse efforts to form a Learning Alliance that would interact: share, mutually learn as well as shape the vision, scenarios and strategies for the IUWM in Lodz.
Having achieved that objective, consistent and enduring undertakings to examine, build and maintain trust and motivation in the existing group, as well as to extend it, with the extension logic based on the common first and second phase of the stakeholders analysis, have led to the recognition of SWITCH as the centrally positioned platform with the potential to bring about change in the ways of interaction and collaboration to truly focus on the UWM issues. The platform is perceived as one with the potential to add excellence and economical approaches towards a truly Integrated Urban Water Management – solutions resulting from needs- and demand-driven research by scientists connected to the local and global present and predicted realia, who through frequent, open and honest interaction with all the involved actors form the UWM and crucial adjacent areas, open to adjustments where necessary for the desired common vision and goals, would point the research application directions and serve the city's sustainable water management goals.

Findings based on the first stakeholder analysis in short

The initial stakeholder analysis conducted among the participants during a workshop of "LA Development and Facilitation", and in further steps by the LA Facilitator in interviews with the stakeholders until the end of October 2007 showed willingness to collaborate, share data and experiences and make common decisions, though sometimes delayed because of the hierarchical models within the administration. The facilitator's observations regarding the possible hindrances to the establishment of the LA as well as reaching the common vision, are the perceptions of the stakeholders based on *"the can't do"* or *"they are …"* attitudes/prejudice, possibly resulting from past systems-related experiences as well as insufficient knowledge and recognition of mutual needs or a lack of understanding of the organizational mechanics driving the organizations.

In the mutual perception of the IUWM stakeholders the power-driven or corrupt relations have been almost completely absent, possibly because of the level of importance of the shared IUWM-related vision, which in the perceptions of all appears independent of politics and any strict hierarchical relations, probably because of the methodology implied by the SWITCH facilitators as well as the win-win for the benefit of the city and its community. At times the interviewees expressed uncertainty to whether they were competent or entitled to giving information regarding what could be considered "copyright" or "confident" as the "market realia". The operational level employees and representatives of the stakeholder organizations, not acting on the "political" level have no reservations sharing information or data relevant to UWM issues, sometimes technical access to them being difficult because of the past filing methods.

The emerging success of the LA platform therefore lies in the ability to encourage the "roundtable" type of interactions set in a safe environment, forwarding a belief that IUWM based on the consideration all the stakeholders' needs equally fairly is achievable and sustainable. It appears an observation as well as an achievement of a desired sub-goal.

The main present short-term goal and challenge is for the SWITCH Lodz team to design and facilitate a Visioning and Scenario-Planning workshop, scheduled for January 2008, that will engage the strategic and operational levels of the stakeholders' organizations and make a real impact in the UWM sector in Lodz.

The ever-present main scientific, educational and socio-economic goal of the SWITCH Lodz project and Learning Alliance is to share knowledge regarding the concept of ecohydrology and its implication for the IUMW in the City of Lodz with the potential to be up-scaled to other cities and regions.
The socio-economic goal involves building and up-scaling a multi-stakeholder complex problem-solving platform, which in a society transforming form hierarchical to civil, lays foundation for true governance and inclusion in a society desiring time and effort-saving collaboration.

The impacts of the LA meetings so far (media, interviews with engaged stakeholders)

Following the Learning Alliance (LA) methodology, in order to accomplish the leading position of the SWITCH LA in facilitating the paradigm shift in Urban Water Management by implementation of demand- and need-led research, the following activities which encouraged information and knowledge exchange and development, sharing and documenting among the stakeholders have taken place:

LA meetings, trainings and workshops
Training activities (by activity, location, timeframe)

1. On 18-19 January 2007 in the Office of the City of Lodz and in the European Regional Centre For Ecohydrology under the auspices of UNESCO a working meeting of the Lodz SWITCH Learning Alliance group regarding „Stormwater management and the GIS tools for decision support systems tools in urban water management" was held. There were two experts collaborating with the University of Lodz within the SWITCH project - Prof. Mike Revitt and Dr. Marc Soutter.

2. On 28-31 March 2007 the City of Lodz Office and ERCE - the European Regional Centre For Ecohydrology under the auspices of UNESCO in Lodz hosted the meeting of the Lodz SWITCH Learning Alliance group regarding "Learning Alliance Development and Facilitation". The meeting was accompanied by the workshop in

communication for LA coordinators from four Demonstration Cities engaged in the SWITCH project - Birmingham, Hamburg, Lodz and Tel Aviv.

3. On 1-5 July 2007 a training workshop 'Process documentation for learning alliances and action research' was held in Lodz. The meeting was organised by the IRC International Water and Sanitation Centre, ERCE - the European Regional Centre for Ecohydrology under the auspices of UNESCO, and the EMPOWERS Partnership.

4. Training workshops 'Use natural systems in Demo-cities' will hold in Lodz. Training
will provide a forum for exchanging information and stimulate discussions focusing on the application of ecohydrology and phytotechnology in cities:

- 2008 - Plan to use natural systems and processes for Urban Water Management
- 2008 - School-education of natural systems in cities based on "educational path" on the Sokolowka River
- 2009 - Restoration of the natural river bed
- 2009 - The sewage sludge management and biomass production in the willow plantation in the protective zone of the Wastewater Treatment Plant
- 2009 - The mathematical model of stormwater runoff in the Sokolowka River catchment
- 2010 - Optimization of urban landscape toward human -well being

Internet communication – establishment of a blog internet site http://switchlodz.wordpress.com , the ongoing e-mail correspondence and newsletters

Face-to-face and phone interviews with stakeholders for the sake of the stakeholders analysis gathering of information as well as common review of the SWITCH progress and the LA development – building trust and relational environment for the 'true' establishment of LA as a multi-stakeholder platform

Small groups thematic meetings – presentations on mutual progress, group discussions

Side events including "Water in Lodz – the City of the Future" Art Competition and participants' meeting at ERCE for primary and secondary schoolchildren (19.10.2007)

Dissemination activities & events within the LA and extended with diverse means and environments to build awareness of SWITCH as being key project in the development of the IUWM and the city's integrated revitalization, with the growing focus on dissemination of the demonstration research results for all the stakeholders' awareness and sharing with the goal of truly connecting scientists to all other stakeholders (decision-makers, service providers, community, media)

The dissemination/publication activities have so far included the following:

Published papers/chapters in scientific journals:

- Wagner, I., Bocian J. & Zalewski M. 2007. The ecohydrological dimension of small urban river management for stormwater and pollution loads mitigation: Lodz, Poland [In:] Wagner, I. , Marshalek, J. and Breil, P. (eds). 2007. Aquatic Habitats in Sustainable Urban Water Management: Science, Policy and Practice. Taylor and Francis/Balkema: Leiden;
- Zalewski, M. & Wagner, I. 2007. Ecohydrology of urban aquatic ecosystems for healthy cities [In:] Wagner, I. , Marshalek, J. and Breil, P. (eds). 2007. Aquatic Habitats in Sustainable Urban Water Management: Science, Policy and Practice. Taylor and Francis/Balkema: Leiden;
- Wagner, I., Izydorczyk, K., Drobniewska, A., Fratczak, W., Zalewski, M.. 2007. Inclusion of ecohydrology concept as integral component of systemic in urban water resources management. The city of Lodz case study, Poland. SWITCH Scientific Meeting Proceedings. Birmingham, UK, January 2007
- Zalewski M & Wagner I. 2006 "Ecohydrology in Urban Water Habitat restoration" in EH & HB Journal.

Published popular papers:

- Barbara Gortat (Municipal Office of the City of Lodz, LA), "Necessary reanimation – Sokolowka river comes back", Chronicle of the City of Lodz, 4/2006 (in polish "Reanimacja konieczna – powrót rzeki Sokołówki", Kronika Miasta Łodzi, 4/2006);
- Anita Zając-Waack (Municipal Office of the City of Lodz, LA), "The rivers of Lodz and their restoration", Special issue of "The Municipal Review", No 5/2007 (in polish: "Łódzkie rzeki i ich renaturyzacja", Przegląd Komunalny, No 5/2007);
  on-line version: http://www.komunalny.pl/cik/index.php?r=artykuly&id=7370

Published informative brochures:

- Informative brochure about SWITCH activities in Lodz (2006)
- Production of the informative brochure "Sokolowka River Valley – Local Development Project" - SWITCH in Lodz (in English; to be translated into Polish);
- "Gazeta Wyborcza" Process Documentation Training brochure

Media:

Media coverage releases – newspaper articles:

- "Lodz makes itself a river", Gazeta Wyborcza (national daily newspaper), 11.05.2007, (in polish: "Lodz zrobi sobie rzeke"), Interview with prof. Maciej Zalewski and dr Iwona Wagner, University of Lodz, European Regional Centre for Ecohydrology, red. Joanna Grabowska);
  On-line version: http://wiadomosci.gazeta.pl/wiadomosci/1,55670,4121623.html
- Flooding in Lodz, Gazeta Wyborcza, 30.05.2007 (in polish: "Powodz w Lodzi", Interview with prof. Marek Zawilski, Technical University of Lodz);
  online version: http://miasta.gazeta.pl/lodz/1,79413,4186960.html
- The article about SWITCH workshop in Gazeta Wyborcza, 02.07.2007
- The article summarizing the SWITCH workshop (Lodz, 1-5 July 2007), Gazeta Wyborcza 05.07.2007

Media coverage releases – films and TV broadcasts:

- "The green light for the Ner River" – director: Jerzy Bezkowski, production: Association Film – Nature – Culture with our participation.
  The film was broadcasted in the regional TVP3 Łódź on 17 Julie 2007 and during the Sławomir Barwiński Photos Exhibition on October 2007 in the towns located in the Ner River Catchment (Konstantynów Łodzki, Swinice Warckie, Dąbie, Grabów, Lutomiersk, Poddębice, Warkowice).

Other (workshops, conferences, etc.):

- Presentation of the results of the research, LA and demonstration activities in the International Symposium: "New directions in Urban Water Management", 12-14 September 2007, UNESCO Headquarters, Paris (France); oral presentation;
- Presentation of the SWITCH Project/Lodz in the Inter Academy Panel Conference, Lodz, Poland, 28-29 September 2006;
- Presentation of the SWITCH Project/Lodz in the international integrated revitalization conference "Vision Ksiezy Mlyn 2007-2013", Lodz, Poland, September 2006;
- Presentation of the SWITCH Project/Lodz in the World Water Forum, March 2006, Mexico-City, Mexico UNEP/UNESO session

5) Learning and sharing with other SWITCH cities

Thanks to regular interaction opportunities through the Googlegroup, e-mails, conference calls, trainings and workshops, the Lodz SWITCH team appreciate being able to share experience with our counterparts in other SWITCH cities, especially Accra and Birmingham as well as being in ongoing contact and receiving ongoing support from the SWITCH coordinators and facilitators.

Integrating scientists and facilitators in a Scientific Meeting comes as an highly appreciated idea – building a multi-stakeholder platform outside of the team first requires building the same formula-based platform within the project to be able to present it as an example to the LAs.

6) Conclusions

Summary of the progress so far

The progress in the implementation of the SWITCH Lodz project so far has been made in agreement with the predicted action plan, the application of research to demo sites, the establishment of the Learning Alliance have proven to be successful and appreciated among all the city's stakeholders.

SWITCH Lodz planned activities

The following in short are planned as the next phases of the SWITCH Lodz progress:

- 2008 – Visioning and Scenario-Planning workshop
- 2008 - 'Use natural systems in Demo-cities' training workshop, meant to provide a forum for exchanging information and to stimulate discussions focusing on the application of ecohydrology and phytotechnology in cities
- 2008 - Planning to use natural systems and processes for Urban Water Management
- 2008 - Education on natural systems in cities based on "educational path" on the Sokolowka river
- 2008 – "Towards The Restoration Economy Lodz 2013 Exhibition" conference SWITCH presentation
- 2009 - Restoration of the natural river bed
- 2009 - The sewage sludge management and biomass production in the willow plantation in the protective zone of the Wastewater Treatment Plant
- 2009 - The mathematical model of stormwater runoff in the Sokolowka River catchment
- 2010 - Optimization of urban landscape towards human well-being

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