E²STORMED Transition Manual
City of Zagreb

E²STORMED PROJECT
Improvement of energy efficiency in the water cycle by the use of innovative storm water management in smart Mediterranean cities
www.e2stormed.eu

Projet cofinancé par le Fonds Européen de Développement Régional (FEDER)
Project cofinanced by the European Regional Development Fund (ERDF)

Main Authors

Sara Perales Momparler	*Green Blue Management*
Alison Duffy	*Abertay university*
Adrián Morales Torres	*IIAMA - Universitat Politècnica de València*
Marin Kuspilic	*University of Zagreb*

Contributors

Ignacio Escuder Bueno	*IIAMA - Universitat Politècnica de València*
Ignacio Andrés Doménech	*IIAMA - Universitat Politècnica de València*
Ángel Pérez-Navarro Gómez	*IIE - Universitat Politècnica de València*
Elisa Peñalvo López	*IIE - Universitat Politècnica de València*
David Alfonso Solar	*IIE - Universitat Politècnica de València*
Rebecca Wade	*Abertay university*
Chris Jefferies	*Abertay university*
Neil Berwick	*Abertay university*
Ivan Halkijevic	*University of Zagreb*
Kristina Ercegovac	*City of Zagreb Office for energy, Environment and Sustainable Development*
Nikola Petkovic	*City of Zagreb Office for energy, Environment and Sustainable Development*

Date: 30th June, 2015

INDEX

Foreword

Global warming and climatic changes are an unavoidable world problem and a dangerous threat to numerous aspects of life and development on earth.

Mankind is deeply concerned, and with good reason, about climactic changes, increase of energy consumption, increased dependence on the importation of fossil fuels and their harmful effects on the environment and economy as well.

The Republic of Croatia is momentarily in a relatively unenviable energetic position. The consumption increases annually, the pressure to increase the prices of energy is increasing, as well as the importation component of energy.

A systematic energy management is the basis of sustainable development.

The realistic situation requires faster and more efficient answers at local and national levels, but also a more intense cooperation and synergy at the international level.

By decision of the Zagreb City Assembly from 30th October 2008, the City of Zagreb joined Covenant of Mayors (CoM), as one of the first European capitals that recognized the significance of this great initiative for sustainable development of urban areas of European Union.

Through systematic Energy Management Project, the City of Zagreb has fully launched the process of energy conservation, continuous monitoring of energy consumption, the implementation of energy efficiency and renewable energy measures as well as environmentally friendly fuel to all facilities belonging to or in use of the City of Zagreb.

We want to achieve direct energy and financial savings, reduce the harmful impact on the environment, implement a proactive energy policy and raise the level of responsibility and consciousness of employees and citizens of Zagreb in the process of global warming and climate change.

E2STORMED project goals coincide with the environmental protection and sustainability vision of the CoM. By choosing to participate in E^2STORMED, City of Zagreb will gain valuable opportunities to learn, improve and adapt its own energy management and environmental conservation policies.

1. INTRODUCTION

Cities around the world are facing a range of pressures including rapid urbanisation and urban sprawl, industrialisation and climate change. The ecological 'footprints' of cities are ever expanding through continued exploitation of available resources – land, water, energy, food, building materials, finance – while also producing large volumes of waste (solid, gaseous, liquid) which contaminate soils, air and water. Conventional water and energy management meanwhile, struggles to manage ever scarcer water and energy resources, to deliver services without adversely impacting the quality of life of urban populations and the environment.

The central theme of E²STORMED (www.e2stormed.eu) - saving energy through better control of stormwater - may seem a strange idea for some people. Many Mediterranean countries are not rich in energy, nor water, so combining stormwater and energy efficient practices should not be thought of as strange, just a different way of thinking - this is known a Paradigm Shift.

On the other hand, local governments frequently have fragmented sectors (urban planning, water supply, wastewater, waste, energy, etc.), with parallel planning and implementation processes that are not always aligned with strategies at regional, national and European level. In addition, innovation and research outcomes are rarely consolidated into policy and practical applications. The challenge to finding sustainable solutions - economic, environmental, social and institutional - is beyond the realm of conventional research approaches, and requires a new paradigm.

Transition Management provides an opportunity to engage multiple stakeholders and bring together diverse perspectives on a 'wicked' problem, potential solutions, and enabling new ways of working to emerge. E²STORMED project partnership allows the combination of research outputs with practical implementation at local level in six pilot urban areas: Benaguasil (Spain), Cetinje (Montenegro), Pisa (Italy), Hersonissos (Greece), Zagreb (Croatia) and Ħaż-Żabbar (Malta).

This Transition Manual presents a coherent and holistic methodology to guide the desired paradigm shift. It is intended for decision makers at the local level (in areas of urban water, energy, urban planning, etc.), water utilities and practitioners. It contains three main sections: a summary on the concept of sustainable stormwater management; an explanation of the E²STORMED Transition Management Wheel and key activities to successfully manage a paradigm shift; and the case study of City of Zagreb, illustrating how they progressed during the E²STORMED project. Hence, this Manual is intended to enlighten City of Zagreb as it continues its journey towards a more sustainable future, but also serves as an inspirational guide for other Mediterranean regions that aspire for a better future.

The authors acknowledge that the Transition Framework and the explanation contained herein are based on outputs from the EU Funded SWITCH research project. Several concepts have been re-worked to better fit E²STORMED and the pilot partners' local situation. SWITCH was predominantly concerned with the water cycle and its inputs and outputs. What is new in E²STORMED is that it links sustainable drainage and energy, thus a more energy efficient environment is gained.

2. SUSTAINABLE STORMWATER MANAGEMENT

WHY SUSTAINABLE STORMWATER MANAGEMENT?

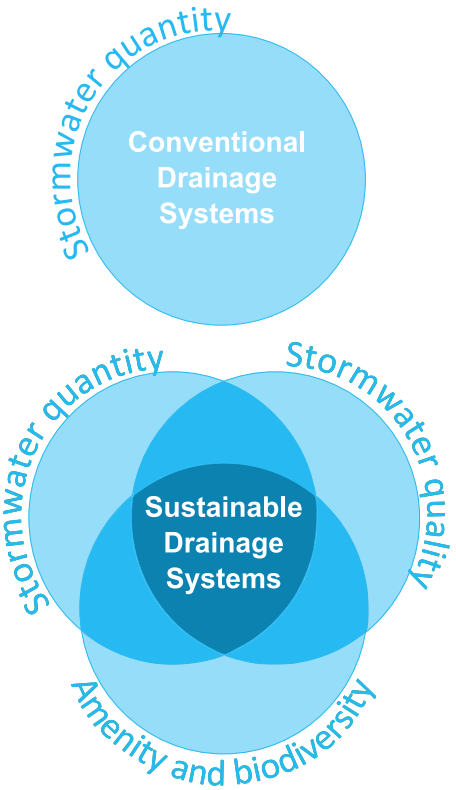
When land is developed, the natural cycle of water is altered. In general, urban development removes vegetation and increases impervious surfaces (roofs, roads). These changes produce less evapotranspiration, less infiltration and more runoff.

Conventional drainage systems (drains, pipelines, drainage channels, etc.) are the most common approach to managing stormwater in urban areas. These systems have generally been designed to remove rainfall from the urban environment as rapidly as possible. This results in the following problems (Philip, 2011):

- Combined sewer overflows: Heavy rainfall causes combined sewers to exceed capacity, resulting in overflow of untreated wastewater being released to the environment.
- Diffuse pollution: Non-point source pollutants in the form of heavy metals, oils, nutrients and pesticides are dispersed by runoff into receiving water bodies.
- Decreased base flow in rivers and streams: Increases in impervious surfaces decreases groundwater recharge.
- Downstream flooding: The rapid collection and disposal of stormwater into receiving water bodies increases the risk of downstream flooding.

Furthermore, these problems may worsen due to climate change and larger urban developments. In order to solve these problems, urban drainage should move towards more flexible and adaptive approaches.

In comparison to conventional stormwater management, a sustainable approach focuses on both managing the risks resulting from urban runoff and its contribution to environmental and landscape improvement. Sustainable Drainage Systems (SuDS) objectives are to minimize the impacts from urban developments with regards to stormwater quantity (flooding) and quality (pollution) and maximize amenity and biodiversity opportunities (Woods-Ballard *et al.*, 2007). SuDS can help to solve the problems associated with conventional drainage by contributing to flood control, pollution control and can also provide an alternative source of water for non-potable uses.



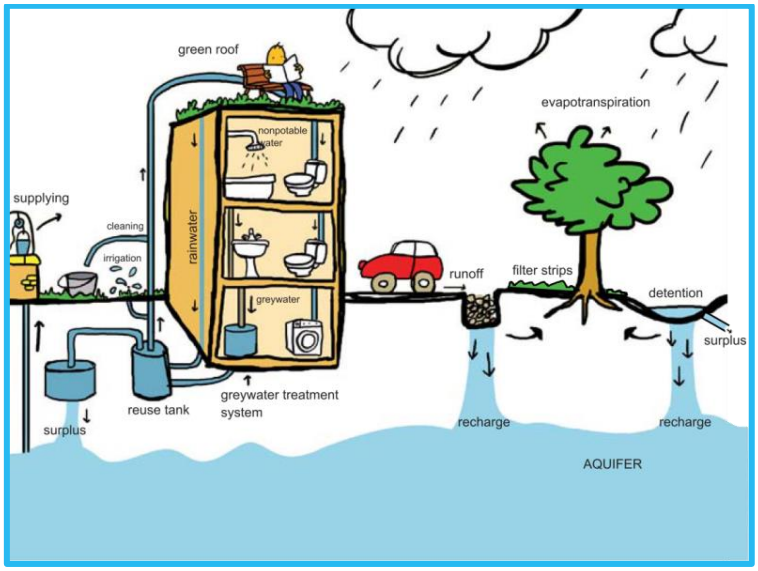
Objectives of Conventional and Sustainable Drainage Systems

	Conventional approach: Stormwater as a 'nuisance'	Sustainable approach: Stormwater as a 'resource'
Stormwater quantity	Stormwater is conveyed away from urban areas as rapidly as possible	Stormwater is attenuated and retained at source
Stormwater quality	Stormwater is treated together with human waste at centralised wastewater treatment plants or discharged untreated in receiving water bodies	Stormwater is treated as close to the source as possible using decentralised natural systems that may combine soils, vegetation and permanent water bodies
Recreation and amenity value	Not considered	Infrastructures are designed to enhance the landscape and provide recreational opportunities
Biodiversity	Not considered	Urban ecosystems are restored and protected
Potential resource	Eventually considered for reuse from wastewater treatment plants	Stormwater is harvested for non-potable water supply uses and infiltrated to aquifers

Key differences between a conventional and a sustainable approach to stormwater management. Adapted from (Philip, 2011).

SUSTAINABLE DRAINAGE SYSTEMS

Sustainable Drainage Systems (SuDS), also known as Best Management Practices (BMPs), Low Impact Developments (LIDs), Water Sensitive Urban Design (WSUD) or Green Infrastructure (GI), are designed to manage stormwater following natural hydrologic processes. The basic principle is to decentralize retention: to infiltrate and reuse at source as much rainwater as possible both in public and private spaces.



Sustainable Drainage Systems in the urban water cycle. Adapted from (Perales-Momparler and Valls-Benavides, 2013).

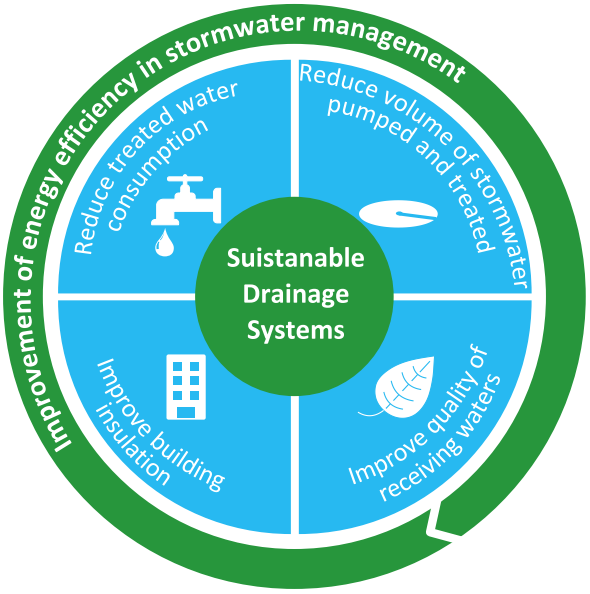
SuDS make use of common sense and simple technologies, embracing a broad range of typologies such as rain gardens, rain barrels, green roofs, swales and porous surfaces for car parking and roads (USEPA, 2014), (Woods-Ballard *et al.*, 2007). Some examples are shown in the following pictures.

Examples of Sustainable Drainage Systems.

Sustainable Drainage Systems are now broadly accepted in many countries particularly the US, Australia and northern Europe. Evidence is now available that SuDS are a viable option in Mediterranean regions as well (Perales-Momparler *et al.*, 2014). However, understanding of the concept is still developing, with implementation limited due to lack of knowledge and expertise throughout the region.

STORMWATER MANAGEMENT AND ENERGY

Water and wastewater facilities frequently represent the largest and most energy-intensive burden for water utilities, representing up to 35% of municipal energy use (NRDC, 2009). Using a sustainable approach for stormwater management can potentially reduce energy consumption in the urban water cycle, as follows:



Improvement of energy efficiency with Sustainable Drainage Systems.

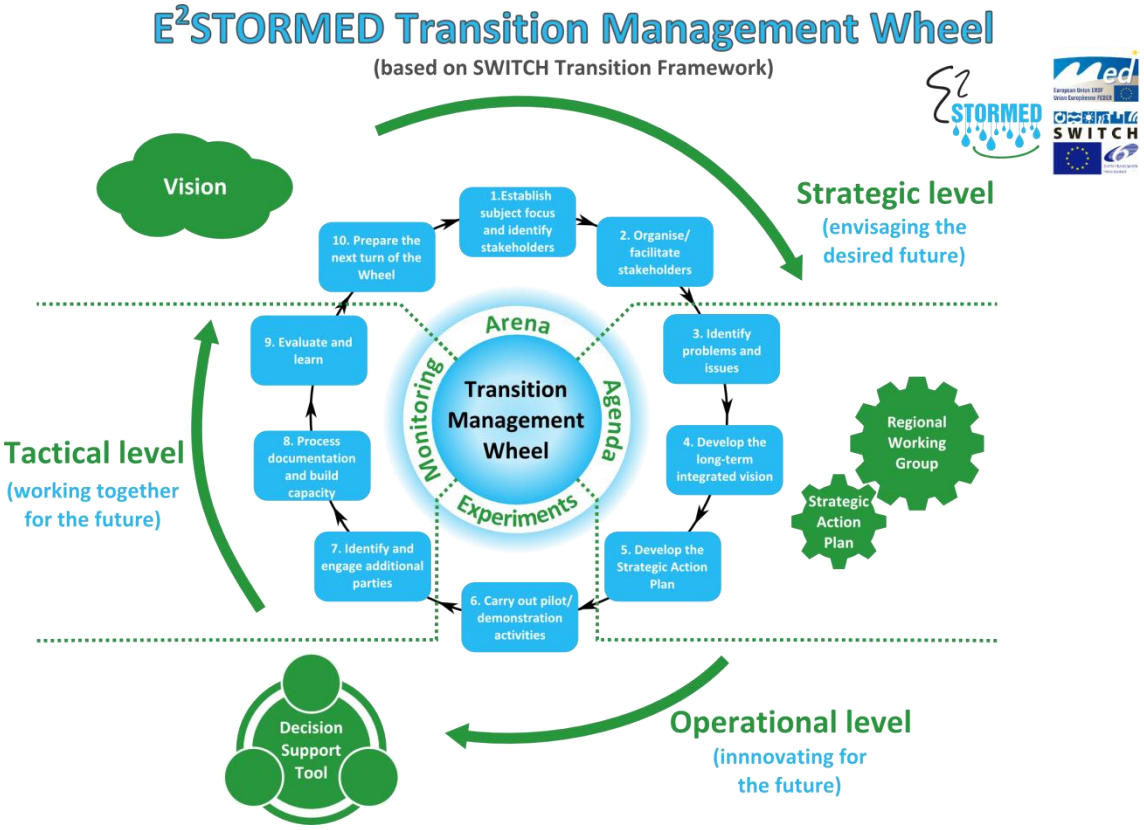
- Reducing potable water use reduces energy consumed in acquiring and treating drinking water.
- Reducing stormwater inflows to sewer systems reduces energy consumed in pumping and treating wastewater.
- Improving stormwater quality results in less treatment required before release into the environment.
- Reducing local temperatures and improving buildings' insulation (with green roofs) reduces cooling and heating demand for buildings, reducing energy needs and decreasing emissions from power plants.

Left: Wastewater treatment in Zagreb (Croatia). Right: Reverse Osmosis Plant in Ghar Lapsi (Malta).

3. TRANSITION MANAGEMENT WHEEL

A radical change is required in culture as well as institutions towards sustainable urban built environments (clean local watercourses for citizens to enjoy, pleasant greener streets, flood resilient properties and infrastructure, etc.). Transition management has emerged as a sound governance approach that can accelerate progress for implementing innovative urban water technologies and practices such as sustainable drainage systems and improve energy efficiencies in the water cycle. Transition management does not aim to control the future; it attempts to influence ongoing processes of changes in society by systematically reflecting on the future and developing shared notions for desired sustainable urban environments.

The E^{2}STORMED Transition Management Wheel as shown below, is a simple cyclical road map illustrating the pathways and tools available to manage the change from traditional types of drainage infrastructure such as stormwater sewers to more sustainable practices such as green roofs and basins, with a holistic view focussed on the local situation, in accordance with the well-known slogan “think global, act local”.



E^{2}STORMED Transition Management Wheel. Adapted from the SWITCH Transition Framework (Duffy and Jefferies, 2011).

Transitioning is a cyclical process; the desired change will not happen overnight and it is expected that multiple cycles will have to be completed, repeating the above group of activities again and again. Completion of each cycle is referred herein as one “turn” of the

Wheel. Not all transition activities need to be undertaken in one cycle to consider that one "turn" has occurred.

The Wheel consists of ten activities that take place at three management levels:

- **Strategic Level (envisaging the desired future)**: The focus is on the long-term aspirations and goals towards sustainable urban built environments, requiring strategic thinkers open to innovation and not afraid of change.
- **Tactical Level (working together for the future)**: The focus is on development of strategies, networks, coalitions that bring attention to sustainability objectives and gain societal support to achieve short/mid-term goals, overcoming socio-institutional barriers to innovation/change.
- **Operational Level (innovating for the future)**: The focus is on short-term actions, experimenting with innovations that have the potential to materialize the vision.

Different types of actors are involved in each level, requiring a range of diverse skills and competencies. All are important; hence the levels do not represent any hierarchy.

For a clearer understanding of the process at first sight, the ten activities are grouped into four clusters in the inner circle (Arena, Agenda, Experiments and Monitoring), while the icons in the outer circle highlight the core Wheel activities, which can be customized for each city depending on their local situation.

In the context of E²STORMED, "steering" the Wheel is initiated by each Municipality through the organization of a Regional Working Group focused on issues of Energy Efficiency (RWGEE) in the Urban Water Cycle, engaging people who can influence, guide and structure governance activities, and who are able to sustain and develop the process over time. The starting point for each pilot urban area was different as it was subject to historical, cultural and political backgrounds. E²STORMED helped guide partners through the process to develop their weaker strengths during the project which will prepare them for continuing beyond the project and into the next round of transition (or "turn" of the Wheel).

3.1 ESTABLISH SUBJECT FOCUS AND IDENTIFY STAKEHOLDERS

The term stakeholders refers to individuals, groups or organisations, who have an interest in, influence over, or may be affected by the issues in question and the desire to address the issues. The involvement of all stakeholders ensures that the particular needs, goals, limitations, etc. are considered, defended and negotiated.

In the frame of E²STORMED, each pilot partner is in charge of identifying and engaging relevant stakeholders. As with any group activity, momentum for a new enterprise is often provided by one or two key

individuals, with backing from their superiors and/or organisation/s. To set up a RWGEE a coordinator to champion the alliance and a team of enthusiastic co-workers is required.

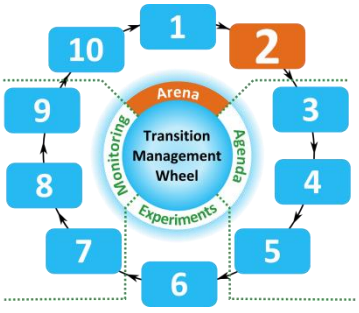
Saving energy through better management of stormwater at the local level is the subject focus of E^{2}STORMED; hence, each RWGEE should include a good mix of relevant key stakeholders that make decisions or can effect changes in policy and practice in urban water practices, energy supply, urban planning, service-providers and other stakeholders who can directly influence decisions in related sectors at all levels (industry, regulatory bodies, universities, volunteers, etc.).

Some RWGEE groups may also include, at the appropriate time: water and energy user groups; local champions working to address environment issues; training and research organisations; financial organisations and the press/media, which provides a means by which the RWGEE can reach the public.

The RWGEEE size depends on each city and the stakeholders involved in each case; as guidance, an appropriate size may be between 8 and 15 members.

Whether the RWGEE is sustained after the end of E^{2}STORMED is an important question. Municipalities and the rest of the stakeholders will have to find ways for the activities to be funded, and agree on how costs and benefits are going to be shared.

3.2 ORGANISE/FACILITATE STAKEHOLDERS



To kick off the RWGEE, the coordinator and co-workers should identify the different stakeholder interests in water and energy management, and make initial contact with them. Stakeholders should understand why their participation is relevant also for their own organisation.

It is important at the early stage that local buy-in and ownership of the process is. Caution should be taken to avoid 'hijacking' of the process by an elite group resulting in the establishment of a cartel. The RWGEE should be all inclusive if it is to be successful.

Meetings should take place on a regular basis so that momentum is not lost. It is recommended that stakeholders are informed in advance of issues to be discussed during each meeting to allow for them to properly prepare it.

The main tasks for the RWGEE during E²STORMED were (but not restricted to):

- Compiling local (Mediterranean based) data for development of the Decision Support Tool (DST).
- Evaluating and commenting on the application of the DST in the Pilot City and the E²STORMED Transition Manual.

RWGEE meeting in Cetinje (Montenegro).

- Developing a Strategic Action Plan.
- Learning and disseminating results and conclusions from E²STORMED within their organisations and to external stakeholders about using SuDS to deliver energy efficiency gains that mitigate and adapt to climate change impacts.

Additional/complementary activities can include: bilateral meetings focused on developing trust and gaining understanding; workshops and training sessions on energy efficient stormwater management; organizing joint activities (i.e. school art competitions); etc.

3.3 IDENTIFY PROBLEMS AND ISSUES

RWGEEs provide a means to jointly solve difficult problems. Based on local knowledge, studies and analysis, stakeholders can identify stormwater and energy issues, at technical and management levels, including governance and regulatory aspects.

Each stakeholder will have their own issues and potential solutions and there will be reasons (e.g. responsibilities, mandates, potential benefits) for each to want to seek resolution to the problem(s). It is only through the process of working together that an understanding of each other's long-term ambitions and aspirations can be appreciated and shared solutions negotiated.

TIP: This activity offers a good point in time to assess RWGEE composition and decide whether to invite additional stakeholders or if an existing stakeholder's contribution is no longer required.


What causes high energy consumption for stormwater management in Pisa? The topography that requires pumping stations on the left, or the high density urban area on the right?

3.4 Develop the long-term integrated vision

A vision is a concise description of the desired future state. RWGEE members are a diverse group of stakeholders with different visions of what future urban water services and the environment should be. What are RWGEE long-term aspirations? The aim is to develop a consensus amongst the group and a commitment to work towards achieving a shared vision.

This activity might start from scratch or build upon an existing vision for the urban area that is set by EU, national or local legislation. The vision for a city must be exciting to inspire organisations and the public, using a mixture of descriptive narrative and numerical targets if appropriate (inspiration can also be gained by reviewing other cities' visions). Consistency with visions at different spatial and temporal scales is required so as to secure political support and increase the probability of funding for strategies and plans aimed at achieving the vision. It is recommended that wording includes "sustainable drainage" and "energy efficiency", key objectives of the project.

Hersonissos long-term integrated vision

"A vital urban environment and tourist destination where water resources are managed in a sustainable manner, thus rainwater is collected and reused to cover irrigation needs while localised flooding is essentially reduced, and, in which there is space and provision for new developments through the implementation of energy efficient solutions, such as SUDS. In a city like this professionals, stakeholders and citizens, are welcome to be informed, educated and involved in decision making regarding sustainable water management and conservation planning.'

Long-term integrated vision for Hersonissos (Greece).

3.5 Develop the Strategic Action Plan

A strategy is a medium to long-term planning framework within which specific activities are described and plans implemented. Over time, an effective strategy should lead to the realisation of a vision.

This activity could start by brainstorming and listing practical options and opportunities that could become components of an overall strategy, then assessing the social, technical, political, economic and environmental viability and acceptability of each item. Grouping strategy components to relevant parts of the vision will help to identify whether anything is missing to achieve the vision. Although relative costs, benefits, merits and trade-offs of the strategies need to be considered, it is important not to get drawn into too much detail.

Strategic Action Plan development session in Benaguasil

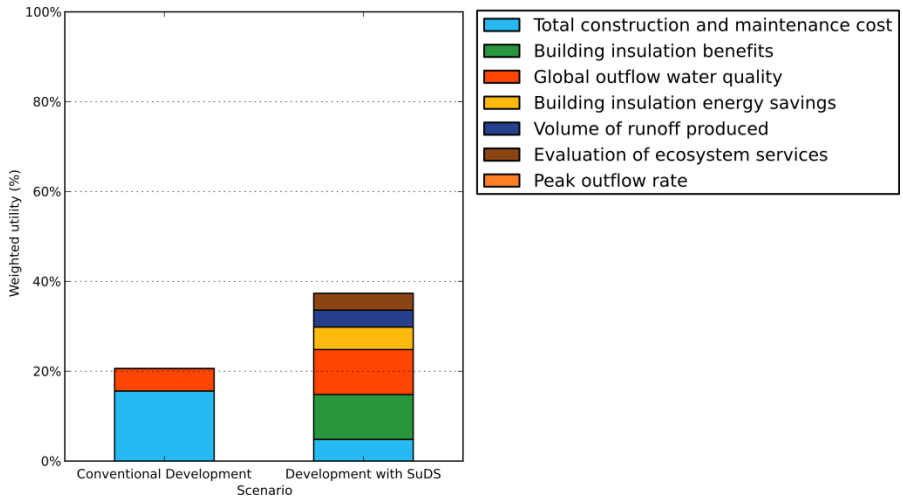
Based on a literature review, the academic partners of E^{2}STORMED have compiled a set of actions that pilot partners can use as a starting point for the preparation of Strategic Action Plans. They include communication, legal and technical actions that could be used to improve energy efficiency in stormwater management at the local level. Caution should be used when assessing strategy components for a particular urban area, as there is not "one size fits all" Plan.

3.6 Carry out Pilot/Demonstration Activities

This activity provides a 'protected' space for experimenting with activities that are aligned with the vision so that they can mature and become embedded into the existing culture. Pilot/demonstrations activities (also referred to as transition experiments) come in all shapes and sizes and by their very nature, open doors to new options.

E^{2}STORMED transition experiments consisted of application of the Decision Support Tool (DST) to local sites. The DST compares and evaluates different

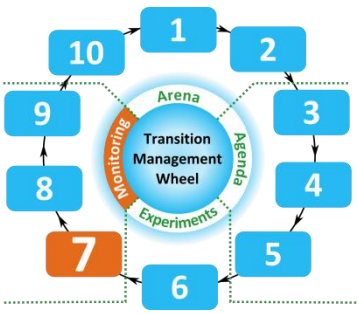
scenarios of conventional drainage solutions and SuDS in both, developed and undeveloped parts of each pilot urban area. To assist the process of informed decision making, different options are compared in terms of CO_2 emissions, energy consumption and financial savings (amongst other parameters) using a multi-criteria analysis. Application of the DST was undertaken by specialists, with the RWGEE providing local datasets, multi-criteria weightings and constructive recommendations on how to improve the DST so that it is a useful tool. This activity increased RWGEE knowledge on SuDS and their relation to energy efficiency by providing examples of different end uses and how they compared with conventional systems.



Multicriteria analysis results comparing two options for drainage (conventional/SuDS) for a new development in Zagreb (Croatia).

A unique demonstration activity amongst the E²STORMED partners has taken place in Benaguasil. This demonstration has been constructed and was monitored within the timeframe of the project: a green roof retrofitted at the Benaguasil Social Centre that was monitored over 20 months. This type of experiment is important as it proves the value of innovative methodologies by providing exemplars to practitioners and the public and as the saying goes: "seeing is believing".

3.7 IDENTIFY AND ENGAGE ADDITIONAL PARTIES



The RWGEE should realise the benefits of involving other parties (community, civil society groups, business, media), and decide who and at what stage of the process they should be invited to join. They can be involved in multiples ways such as participation in meetings, special conferences, guided tours to SuDS sites, etc.

Involving the Media is crucial as they can get the message out to a wider audience. Media can raise awareness of issues and sustainable solutions available by communicating technical, institutional and economic issues using non-technical language.

Group of schoolchildren visiting the green roof in Benaguasil (Spain).

In addition, frontrunners who are innovative individuals (not necessarily from institutions) could be invited as they are generally powerful actors with strategic capabilities in the business sector, the policy domain, academia or society.

It is also beneficial to identify possible synergies and alignments with other agendas (i.e. the green agenda) as this can increase the likelihood of success through taking advantage of joint funding opportunities.

3.8 Process documentation and build capacity

Process documentation captures and tracks what happens during a process of change and how it happened. Good process documentation enables stakeholders to reflect and analyse why changes happened and to organise and disseminate the findings. Meeting minutes, photographs, voice recordings, videos, etc. are some of the ways that information can be captured, and this should be processed and stored in a way that changes can be tracked.

In terms of capacity building, training sessions and workshops which empower middle management / operatives / community, etc. will encourage a change in mind-set and ensure engagement with new technologies / techniques.

RWGEE meetings are a good platform to conduct training activities (e.g. inform members about the performance of built sustainable drainage infrastructures in Mediterranean cities such those in Benaguasil).

3.9 Evaluate and Learn

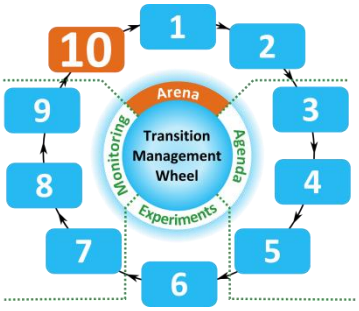
The starting point for each pilot partner at the beginning of E^{2}STORMED was different and dependant on its own background, with transition strengths already developed in some of the activities. During the project, progress was represented by colour coding transition management activities in accordance with strengths developed as the project advanced. Dark green signifies that an activity is completed;

light green signifies that the activity is underway whilst blue signifies that the activity is still to be considered.

1. Establish subject focus and identify stakeholders
2. Organise/facilitate stakeholders
3. Identify problems and issues
4. Develop the long-term integrated vision
5. Develop the Strategic Action Plan
6. Carry out pilot/demonstration activities
7. Identify and engage additional parties
8. Process documentation and build capacity
9. Evaluate and Learn
10. Prepare the next turn of the Wheel

Evaluation of transition strengths in Zagreb (Croatia).

3.10 Prepare the next turn of the Wheel



The transition management cycle is almost complete by this stage, but the journey towards the desired future is far from over. In the image of the Transition Management Diagram, the Wheel has turned once during E^{2}STORMED.

Sustainability should be thought of as a journey of discovery rather than a fixed goal that can be worked towards. The quest for sustainable outcomes will generate new knowledge areas as well as identifying gaps where knowledge does not exist. The next round of transitioning will begin after E^{2}STORMED has finished where n gaps will have been identified and the vision readjusted if required. New visions may be required, and new actors may need to be found who are ready to become the champions of the future.

Throughout the process, the RWGEE is seeking more sustainable solutions and this can only be achieved by turning the Wheel again….and again….and again!

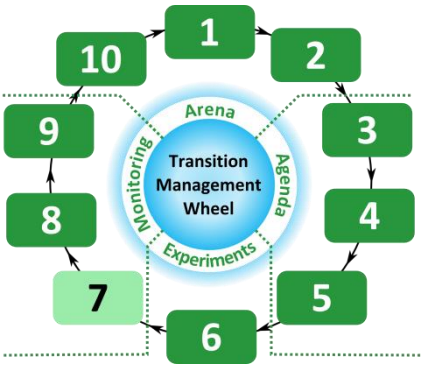
4. TRANSITION IN E²STORMED URBAN AREAS

This chapter presents a summary of the transition activities undertaken by the six E²STORMED pilot partners, in order to move towards a more sustainable future for managing its resources.

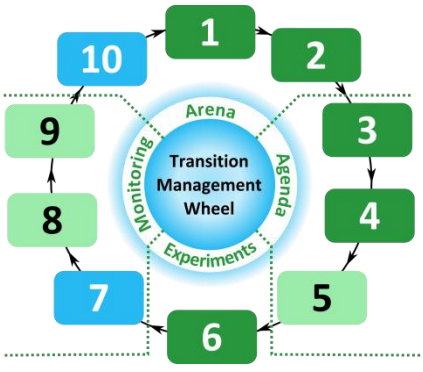
Strengths developed by each pilot partner are depicted using the following colour code: dark green signifies that an activity had been completed; light green signifies that the activity is underway whilst blue signifies that the activity is still to be considered. For clarity, only numbers are used to refer to each activity; these correlate to the following activities:

1. Establish subject focus and identify stakeholders
2. Organise/facilitate stakeholders
3. Identify problems and issues
4. Develop the long-term integrated vision
5. Develop the Strategic Action Plan
6. Carry out pilot/demonstration activities
7. Identify and engage additional parties
8. Process documentation and build capacity
9. Evaluate and Learn
10. Prepare the next turn of the Wheel

Municipality of Benaguasil (Spain)



The most remarkable achievement in Benaguasil during this Turn of the Transition Wheel has been the formation and work undertaken by the Regional Working Group, formed by the main regional actors involved in stormwater management. In addition, E²STORMED project has boosted understanding and dissemination of the benefits that SuDS bring, contributing to enhanced urban environments from the energetic, environmental and social points of view.



Municipality of Pisa (Italy)

Pisa Regional Working Groups on Energy Efficiency (RWGEE) has created an opportunity to bring together the main regional actors related to energy, water and urban development, public as well as private. Transition management has been gradually introduced and explained in all meetings, together with an update on project progress and activities. During the meetings the main problems of storm water management in the

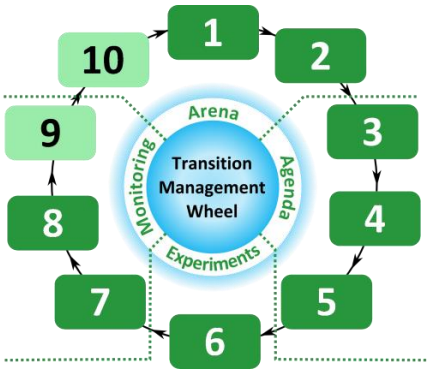
city of Pisa were identified and a vision for the future of the city has been shared. These are the most relevant results including, a proposed Strategic Action Plan. Through the Italian Municipalities Association (ANCI) the experience developed by the Municipality of Pisa within E2stormed project will be spread at national level.

Local Government Association (Malta)

In Malta the transition process in relation to the E²STORMED project was very interesting and engaging both for Local Government Association (LCA) as a partner and for the main stakeholders. Malta is new to SuDS, therefore, one cannot simply implement SuDS straight away. Their transition is aimed at a gradual transition from the solution used today to the implementation of SuDS. Issues and problems were identified and these helped in the development of a long-term strategy which complements the government's vision for sustainable drainage management in Malta. All main stakeholders agreed that the way forward is by using SuDS and by means of this project LCA also had the opportunity to hold lectures for students attending the University of Malta in order to introduce them to SuDS. The next step is the actual implementation of a pilot project so as to assess the impact of SuDS in Malta and this will be done with the cooperation of the Ministry of Energy and Health.

Municipality of Hersonissos (Greece)

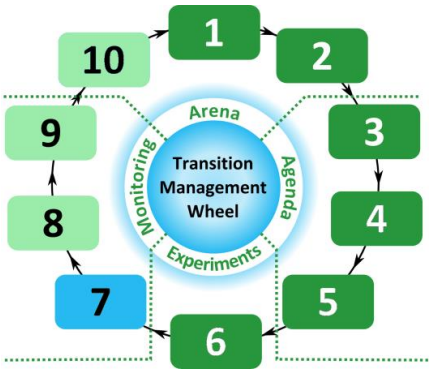
The E²STORMED experience in Hersonissos has been particularly interesting. It has proved to be a valuable tool towards improving stormwater management in the region. With the assistance of local stakeholders, who were identified at the very early stages of the project, problems and issues were mapped and scenarios tested. The transition process has been driven and informed at the same time by the vision developed in the early stages of the project, to develop a vital urban environment with sustainability, energy efficiency, and improved stormwater management, while actively involving local stakeholders and the public. This vision has contributed towards developing a concrete Strategic Action Plan and enriching the CoM with future sustainable stormwater management activities, including dissemination of project outcomes to the local society and especially to young students. Overall, the transition process in the Municipality of Hersonissos can be characterised as an important tool, and the experiences gained by its use could be utilised in future applications.



Old Royal Capital Cetinje (Montenegro)

Cetinje is one of the cities with the highest rainfall in Europe. Project E²STORMED brought to Old Royal Capital Cetinje a new philosophy regarding stormwater and its connection with energy efficiency. Old Royal Capital Cetinje has learned that the large quantities of stormwater should be considered as a valuable resource that can benefit it in many ways, and especially to contribute to significant savings in electricity consumption. With SuDS solutions Old Royal Capital Cetinje will be able to have at the same time flood protection, energy savings and new interesting landscapes. Reusing a large quantity of stormwater will provide the opportunity for Old Royal Capital Cetinje to have a potable water during the whole year without the usual restrictions.

City of Zagreb (Croatia)



City of Zagreb has undertaken most of the transition activities in the transitioning wheel. Subject focus was identified (improvement of stormwater management practices) and most of the relevant stakeholders have attended RGWEE meetings. During the meetings problems and issues were identified and members of the RGWEE agreed on a vision. A Strategic Action Plan was also developed, with regards to the Sustainable energy action plan of the City of Zagreb. Pilot activities have been conducted using the DST software on two areas within the city.

Future transitioning activities (in the next "turn of the wheel") should involve additional parties, especially ones able to influence the national and local legislature regarding stormwater management.

5. TRANSITION IN CITY OF ZAGREB

As one of six E²STORMED pilot partners, the City of Zagreb has attempted to undertake all transition activities in order to move towards a more sustainable future for managing its resources. This has involved the application of innovative methodologies such as the DST whilst also valuing and preserving local traditions. Transition management activities were undertaken from January 2013 until June 2015.

Population: 790.017 **Area**: 642 km² **Climate**: Mild continental

Temperature: Summers are hot and dry with average temperatures of 20°C, while winters are cold with average temperatures of 1°C.

Rainfall: 1060 mm/year with average monthly rainfall of 112,7 mm in July and 60,5 mm in January.

Zagreb is the capital and largest city in the Republic of Croatia. It is located in the northwest of the country, along the Sava River on the southern slopes of Mount Medvednica. Zagreb lies at an elevation of approximately 122 m above sea level. The wider metropolitan area has more than one million inhabitants.

Zagreb is a city with a rich history dating from the Roman times. Transport connections, concentration of industry, scientific and research institutions and industry underlie its leading economic position. Zagreb is the seat of central government, administrative bodies and most government ministries. Many of Croatia's largest companies, media and scientific institutions have their headquarters in the city. Zagreb is the most important transport hub in Croatia where Western Europe, the Mediterranean and South eastern Europe meet, making it the centre of road, rail and air networks. It is a city known for

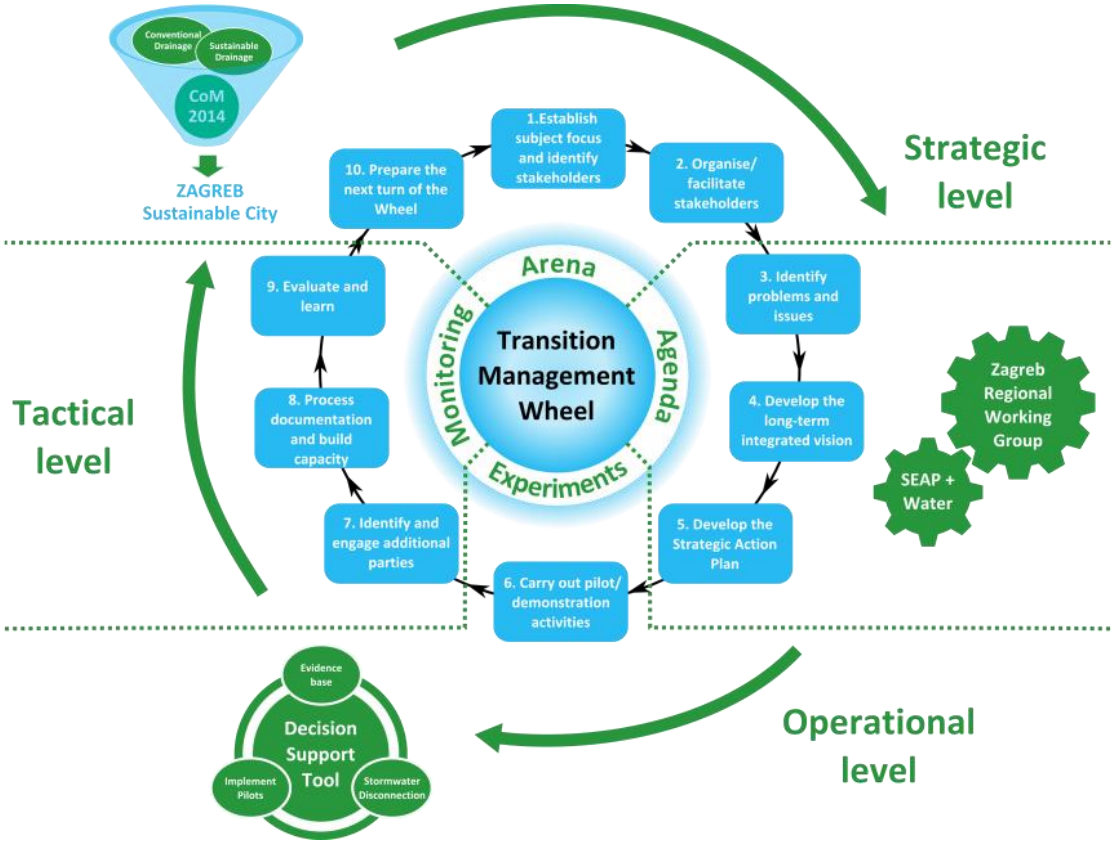
its diverse economy, museums, high quality of living, sporting and entertainment events. Its main areas of economy are industry and the service sector.

Water supply in the Zagreb area covers the entire city, as well as the gravitating parts of Zagreb County with total area of over 800 km^2. It consists of six water intakes with a total of 30 water wells. The total nominal capacity of wells is 5.500 l/s of which the City of Zagreb uses about 4.950 l/s. Maximum water production of the system is more than 430.000 m^3 per day. Some wells are located within the construction area of Zagreb, in residential areas or in close proximity to industrial zones and other potential pollutants. In these wells unacceptable levels of pollution have been identified and they are excluded from the regular water supply system.

The public water supply network provides water access to approximately 897.000 residents. The average annual consumption of drinking water is around 70,3 m^3 per capita. The households water consumption accounts for 75,58%, and other users with 24,42%.

Zagreb City sewage system consists of two independent sewage systems, each of which is located on one side of the Sava River. Both were built as a combined sewerage system. The area covered by the public sewage system is 235 km^2 and approximately 750.000 inhabitants are connected to sewage system. Gravitational transport of wastewater is not possible in the lower parts of the city, so the sewage system includes multiple wastewater pumps. Wastewater is treated at a central wastewater treatment plant (CWWTP) and effluent is discharged into the Sava River. WWTP is located on the left bank of the Sava. At CWWTP wastewater is treated with primary and biological treatment processes. The capacity of the CWWTP is 1,2 million population equivalent.

Precipitation is approximately 40% more during warmer months due to prolonged summer and autumn rainfall patterns. Constructed levees along the banks of the Sava River as well as nineteen retention facilities located in the Nature Park of Mount Medvednica and in urban areas greatly reduce the risk of urban flooding. However, certain areas of the City are still prone to flooding events caused by high levels of Sava River and intensive rainfall events.



The following section illustrates how the City of Zagreb managed the transition towards a more sustainable future during E²STORMED. The key objective of E²STORMED was to achieve energy efficiency in urban water management through the use of sustainable drainage systems. Progress with each transition management activity has been evaluated to help not only Zagreb but other Mediterranean areas understand the transitioning process and how it is possible to influence and accelerate change towards a desired sustainable outcome.

5.1 ESTABLISH SUBJECT FOCUS AND IDENTIFY STAKEHOLDERS

The City of Zagreb has joined the E²STORMED project in January 2013, after being invited to participate in it by the project's coordinator, Polytechnic University of Valencia (UPV). Promptly after, the Regional Working Group on Energy Efficiency (RGWEE) has been established and held its first meeting.

Croatian Waters, a national agency for water management, as well as several municipal departments have been identified as relevant stakeholders of the project and their representatives been invited to participate in the first meeting, held in June 2013. At this time participants (Annex 1) have been informed about the E²STORMED project

and its goals. Great interest has been shown by the participants in energy saving and environmental protection aspects of the E^{2}STORMED program.

5.2 ORGANIZE/FACILITATE STAKEHOLDERS

The Zagreb RWGEE meetings have been facilitated by the City of Zagreb Office for energy, Environment and Sustainable Development.

By March 2014 Zagreb RWGEE was a well-functioning working platform with most key stakeholders relating to stormwater and energy represented from national down to local Government levels including educational facilities.

The first meeting outlined the E^{2}STORMED project and the need to improve energy efficiency in the urban water cycle which could be addressed using SuDS. Potential pilot locations were identified. The importance of a well-functioning RWGEE was also stressed and their input to developing the transition manual. Stormwater management issues in Zagreb were identified during the second meeting and the use of the DST to facilitate decision making for implementation of SuDS in pilot areas. During the third meeting results of the Pilot project, completed with the DST software, have been demonstrated to the participants. Discussion took place about the current legislation and the possibility of implementation of SuDS infrastructure within the existing legal framework.

During the fourth meeting a discussion regarding current legislative issues was continued and specific actions have been determined for the Strategic action plan, which was agreed upon on the fifth meeting.

Key outcomes from each meeting are shown below:

Meeting Nº	Date	Main outcome of the meeting
1	27-06-2013	E2STORMED project scope (SuDS and DST) and activities outlined. Importance of RWGEE established including input to the transition manual. Potential pilot areas identified.
2	30-10-2013	Key problems and potential solutions identified. DST presented. Pilot areas discussed.
3	19-09-2014	Pilot project results presented. Discussion held regarding SuDS infrastructure and current legislation. Vision statement discussed
4	03-03-2015	Agreement on the vision statement, Strategic Action Plan proposed
5	25-05-2015	Discussion and approval of the Strategic Action Plan
6	30-06-2015	Final dissemination

5.3 IDENTIFY PROBLEMS AND ISSUES

The main issue surrounding stormwater and high energy consumption in the City of Zagreb is pumping combined sewerage up to the CWWTP and treatment of stormwater which if disconnected from the network would reduce these costs. The main issue surrounding stormwater management in the City of Zagreb is sewer system overloading due to intense urbanisation. Key stormwater problems identified by the RWGEE are:

- Stormwater from roofs, roads and other impervious surfaces is drained in the combined sewer system increasing the wastewater treatment costs and risks of urban flooding

- Combined sewer overflows to Sava River, resulting in Sava quality deterioration and possible flooding downstream from Zagreb
- Decreased ground water levels due to the construction of dams upstream, tributaries training works and gravel excavation from Sava
- Poor drainage design, aging sewer network and inefficient maintenance of the combined sewer system due to increasing costs.

5.4 DEVELOP THE LONG-TERM INTEGRATED VISION

The City of Zagreb already has a vision for energy which is linked to the Covenant of Mayors (CoM) Municipal Programme which was signed on the 30th October 2009. Zagreb is also a member of the Croatian Club of CoM which strengthens the Croatian network of sustainable cities. Key to the vision is the City's aspiration to meet four basic goals by 2020, two of which could relate to the implementation of SuDS: reduce greenhouse gas emissions by 20%; increase energy efficiency by 20%. A Sustainable Energy Efficiency Action Plan (SEAP) has been developed and there is potential to include stormwater management measures for adoption by the city if the evidence base is provided for delivering energy savings related to CO_2 emissions.

Following RWGEE meetings 1 and 2 and Hersonissos open day workshop outputs, several stormwater issues were identified and these are discussed in more detail in section 4.5. The

vision is a statement or declaration of the right future for all stakeholders as it acts as a framework for action.

At the **Strategic Level**, focus is on the long-term aspiration or goal of becoming a sustainable city by increasing energy efficiency in line with the CoM. Implementation of SuDS can assist with this agenda. This will be achieved through integrating conventional practices and suitable emerging sustainable drainage techniques to deliver energy efficiency gains thus reducing CO_2 emissions.

For the substantial changes it is necessary to make a political and strategic decisions that would encourage long-term activities primarily by changing the approach to urban planning through the adjustment of legislation. This Paradigm Shift should envisage a planning and financing of SuDS, a maintenance and training of utilities together with the education of the professional staff and the public. Eventually regulations for urban nonpoint source pollution with the inclusion of SuDS solutions should be considered.

At the strategic level Zagreb components for the Zagreb collective vision should include the integration of sustainable urban water management strategies which deliver energy efficiencies into the SEAP and submitting this amendment to CoM for approval by their technical committee.

City of Zagreb vision:

City of Zagreb, a member of the Covenant of Mayors, as one of the first European capitals that recognized the significance of this great initiative for sustainable development of urban areas of European Union, strives towards more efficient energy management in the fight against global warming. By signing the Covenant, City of Zagreb is committed to the implementation of numerous energy efficiency measures which will reduce CO_2 emissions in their cities by 20 % until the year 2020, how obliges a European energy policy Proposal from 2007.

As an important component of a path towards a sustainable future, City of Zagreb also strives towards better stormwater management. Environmentally safe, energy efficient stormwater management solutions with the ability to protect the aquifer and preserve groundwater quality are required to ensure an ecologically friendly and safe surrounding able to provide a high quality of living. Ongoing participation and cooperation of all stakeholders, government and administrative bodies, technical experts and citizens, is necessary to design an efficient and socially and environmentally beneficial system.

5.5 Develop the Strategic Action Plan

The current legislative framework is not precisely defined regarding storm water management and relevant issues are only marginally represented. Also the possibility of the energy efficiency through effective storm water management is not included in the Municipal SEAP. Developing a strategic action plan in this context should strike a balance between individual and collective agendas and account the legal and technical actions for sustainable drainage and energy efficiency improvement in stormwater management.

To achieve the collective vision Zagreb RWGEE should develop strategies with short-term goals which will provide the following evidence base for implementing SuDS pilots:

- Develop a sustainable energy action plan regarding public water supply and sewage or to add this sector into an existing action plan.
- Reduction in storm water pumping and treatment costs.
- Reduction in the amount of potable water used by providing rain water harvesting measures for non-potable uses such irrigation / toilet flushing / gardening /car washing.
- Reduction in CSO spills to watercourse.
- Disconnection from the sewer network will not cause flooding to surrounding neighbourhoods.
- A different approach to urban planning reduces the intensity of rainfall runoff, brings closer natural hydrologic functions and keep a balance between runoff, infiltration, interception, enriching underground and evapotranspiration.
- How to influence change and update regulations at the city level to allow storm water disconnection using outcomes from the strategies outlined above.
- Identify funding sources to implement SuDS pilot activities.

This importance of this activity is further emphasised in the E^{2}STORMED transition management framework outer layer which depicts the main activities which Zagreb RWGEE should focus on at the **Tactical Level.** This will initially involve providing the evidence base for the feasibility of disconnecting stormwater from the sewer network for approval and inclusion into regulations at the City level. Once sustainable urban drainage practices have been embraced and adopted by the city they should be submitted as an amendment to the SEAP for approval by the Covenant of Mayors and their technical committee.

5.6 CARRY OUT PILOT/DEMONSTRATION ACTIVITIES

Transition experiments in the context of E²STORMED included the analysis of outputs delivered by the DST for two stormwater management scenarios: developing drainage plans for a retrofit and a new development situation. Conventional stormwater system was then compared with an appropriate SUDS solution for each location.

The importance of this activity is further emphasised in the E²STORMED transition management framework outer layer which depicts the main activities which Zagreb RWGEE should focus on at the **Operational Level.** Focus should be on short-term actions using DST outputs to provide the economic and functional evidence base for disconnecting stormwater and implementing pilot SUDS projects.

Case Study 1 (Retrofit scenario) Borovje

Borovje is a neighbourhood located in the southeast of the city, with a total area of 115.000 m². Land use includes residential buildings, green areas, parks with playgrounds surrounded by residential buildings, parking areas, primary school and urban gardens. Borovje is served by a combined sewer system.

Two stormwater drainage scenarios have been analyzed using the DST software. Both scenarios represent upgrades of the existing drainage system which should yield benefits such as a reduction of stormwater runoff peaks and reduction of volume of water entering the sewage system. One scenario consists of an upgrade to the existing system using conventional infrastructure, while the other upgrade is designed with the SuDS infrastructure, such as bioretention areas, water butts and soakaways.

Both scenarios have been compared using the DST software. According to the analysis, upgrade of the existing system with the use of SuDS infrastructure proved to be a more beneficial one. Apart from offering a greater reduction of stormwater enetering the existing system and providing greater energy efficiency, it also yields greater social and ecological benefits.

Case Study 2 (New development) Podbrezje

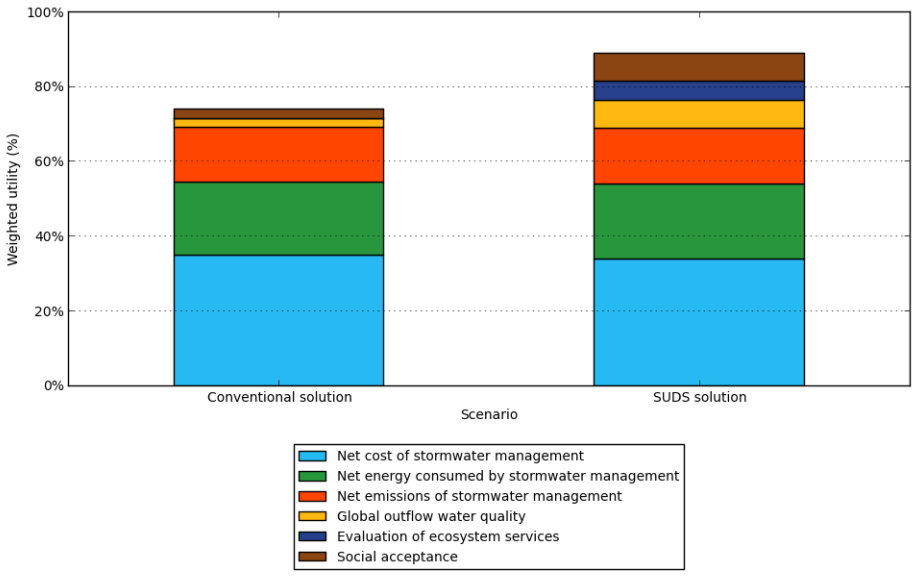
Current land use at Podbrezje is agricultural with a total area of 194.000 m². Planned land use includes eleven high density residential buildings (up to nine storeys), a business tower (with thirty five storeys), two kindergartens, one school, swimming pools, a sports hall, a cultural centre and shopping facilities.

Two stormwater drainage systems have been designed for the new development area, one consisting of conventional infrastructure and the second consisting of SuDS infrastructure. Comparison of both scenarios was conducted with the DST software.

As a conventional solution, a conventional separate drainage network is proposed with pipes, curbs and gutters. This network would collect and store stormwater in a structural detention facility which will reduce runoff peaks and mitigate overloading the existing sewage network during severe rainfall events.

In the SuDS scenario, stormwater will be collected using grass covered filter drains which will gather the excess rainfall from the green areas and transport it towards conventional pipes and into an existing combined sewage pipe. Bioretention areas placed on the existing parking lots can additionally help in stormwater management by increasing the permeability of the area.

According to the analysis conducted with the DST software, SuDS scenario proves to be a more socially and ecologically beneficial solution, as shown in the graph below.



Comparison of the two options for drainage (conventional/SuDS) for the new development site

5.7 IDENTIFY AND ENGAGE ADDITIONAL PARTIES

Most of the relevant local municipal bodies have been involved in the process by participating in the RGWEE.

Public awareness of the project is being raised by organizing media covered events such as "Energy Week" where the E2STORMED project is presented. Additional parties, such as public figures, NGOs and especially parties able to influence or facilitate a change in legislature regarding stormwater management shoud be involved in the next "turn of the wheel".

5.8 PROCESS DOCUMENTATION AND BUILD CAPACITY

The minutes delivered following each meeting tracked the process of change allowing RWGEE members to monitor progress with transitioning activities. This transition case study and evaluation of each activity is also a process document. These documents allow the RWGEE to reflect and debate progress and help deliver smarter outcomes.

In Zagreb, there are already many capacity building activities regarding energy efficiency amongst the stakeholders and the public (e.g. Zagreb Energy Week). However, overall citizen awareness is low in relation to energy and the urban water cycle. Additionally, the City Office for Energy, Environment and Sustainable Development has presented and discussed the project in international conferences regarding energy efficiency and sustainability of urban areas (EU projects for energy Feasible Sustainable Development of cities, Sustainability is in our Hands – networking).

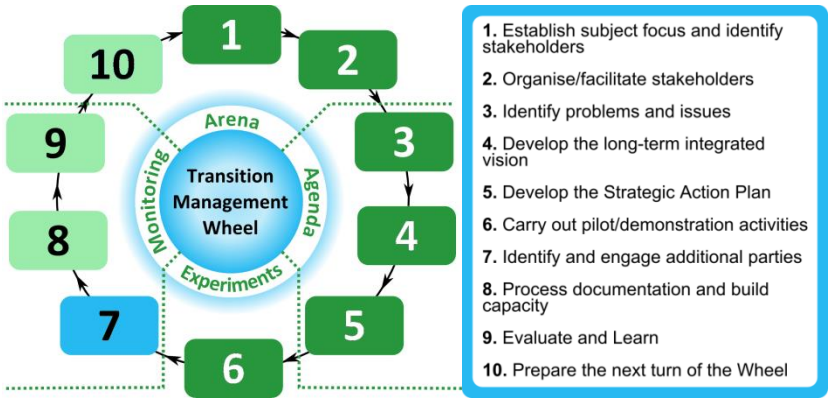
In July 2014, a representative from the City Office for Energy, Environment and Sustainable Development and the SuDS expert from Zagreb University attended a special SuDS visit organised by the Academic partner in Scotland (Abertay University). The visit covered a range of SuDS – ponds, swales, basins, filter drains and green roofs which had been implemented in residential areas (new development and regeneration projects), highways and public buildings including the Scottish Parliament. The visit supported capacity development for these members of the RWGEE by helping them understand the SuDS quality – quantity – amenity concept and see first-hand how they have the potential to deliver energy efficiencies.

5.9 Evaluate and Learn

The discussion around what strengthens Zagreb in this project is related with capacity building and efforts to engage with the public and other stakeholders in energy efficiency issues.

Progress and outcomes have been documented at the end of the project and the results are shown in the Annex 3.

During the transitioning process, most difficulties were encountered in the activities which were aimed towards the engagement of the public and attempts to find parties able to influence regulations and legislation regarding stormwater management. Additionally, members of the RGWEE were mostly concerned that the implementation of SuDS infrastructure could cause pollution of the aquifer, so measures need to be undertaken to address this concern.



Evaluation of transition strengths in Zagreb

5.10 Prepare for the next turn of the Wheel

This presents end of project conclusion for transitioning progress based on Activity 9 (Evaluate and Learn) with any gaps identified, new knowledge available etc. which resulted in a review of the vision for continuing the transition trajectory.

Future transitioning activities in the City of Zagreb (in the next "turn of the wheel") should involve additional parties, especially ones able to influence the national and local legislature regarding stormwater management. RGWEE members concerns regarding the possible pollution of the aquifer caused by the implementation of SuDS infrastructure is an important issue which needs to be addressed as well.

6. REFERENCES AND FURTHER INFORMATION

Batchelor, C. and Butterworth, J. (2008a). *Learning Alliance Briefing Note 9: Visioning (draft)*. [Online] SWITCH project. Available at: http://www.switchurbanwater.eu/outputs/pdfs/WP6-2_BRN_9_Visioning_draft.pdf [Accessed 10 Nov 2014].

Batchelor, C. and Butterworth, J. (2008b). *Learning Alliance Briefing Note 12: Strategy Development (draft)*. [Online] SWITCH project. Available at: http://www.switchurbanwater.eu/outputs/pdfs/WP6-2_BRN_12_Strategy_Development.pdf [Accessed 10 Nov 2014].

Brown, R.R., Farrelly, M.A. and Loorbach, D.A. (2013). 'Actors working the institutions in sustainability transitions: The case of Melbourne's stormwater management', *Global Environmental Change*, vol. 23, no. 4, pp. 701-718.

Duffy, A. and Jefferies, C. (2011). *Research Report: Developing a Framework to guide Urban Water Systems Transitions.* [Online] SWITCH Deliverable D1.1.1. (http://www.switchurbanwater.eu/outputs/pdfs/W1-3_GEN_MAN_D1.3.3_SWITCH_Transition_Framework.pdf) [Accessed 13 May 2014].

Duffy, A., Jefferies, C. and Fisher, J. (2010). *SWITCH Policy Briefing notes 4: Managing the Transition of Urban Water Systems*, [Online]. Available: http://www.switchurbanwater.eu/outputs/pdfs/WP1-3_GEN_PBN_Managing_the_transition_of_urban_water_systems.pdf [25 Nov 2014].

Jefferies, C. and Duffy, A. (2011). *SWITCH Transition Manual*. [Online] SWITCH Project. University of Abertay. Available at: http://www.switchurbanwater.eu/outputs/pdfs/W1-3_GEN_MAN_D1.3.4_SWITCH_Transition_Manual.pdf.

Loorbach, D.A. (2007). *Transition Management: New mode of Governance for sustainable development.* [Online]. Available at: http://repub.eur.nl/pub/10200 [Accessed 13 May 2014].

Morris, M. and Silva-Wells, C. (2012). *Learning Alliances: Key Documents. SWITCH project*, [Online]. Available: http://www.switchurbanwater.eu/la_guidance.php [10 Nov 2014].

NRDC (2009). *Water Efficiency Saves Energy: Reducing Warming Pollution Through Water Use Strategies. Natural Resources Defense Council*. [Online]. Available at: http://www.nrdc.org/water/files/energywater.pdf.

Perales-Momparler, S., Hernández-Crespo, C., Vallés-Morán, F., Martín, M., Andrés-Doménech, I., Andreu-Álvarez, J. and Jefferies, C. (2014). ''SuDS Efficiency during the Start-Up Period under Mediterranean Climatic Conditions'', *CLEAN Soil Air Water*, vol. 42, no. 2, pp. 178-186.

Perales-Momparler, S. and Valls-Benavides, G. (2013). 'Sustainable Drainage Systems (SuDS)', *Paisea. Waterscapes*.

Philip, R. (2011). *Module 4. Stormwater- Exploring the options. SWITCH Training Kit. Integrated urban water management in the city of the future*. [Online] SWITCH Project. ICLEI European Secretariat GmbH. Available at: http://www.switchtraining.eu/modules/module-4/#c68.

USEPA (2014). *Green infrastructure. United States Environmental Protection Agency*. [Online]. Available at: http://water.epa.gov/infrastructure/greeninfrastructure/.

Woods-Ballard, P., Kellagher, R., Martin, P., Jefferies, C., Bray, R. and Shaffer, P. (2007). *The Suds Manual*. [Online] Construction Industry Research and Information Association (http://www.ciria.org/SERVICE/Home/core/orders/product.aspx?catid=2&prodid=155) [Accessed 18 Jun 2013].

ANNEX 1. INSTITUTIONS PARTICIPATING IN RWGEE

Type of Stakeholder	Stakeholders invited to the RWGEE	Participation in Meetings*					
		1	2	3	4	5	6
National Bodies	Croatian Waters	Y	Y	N	N	N	N
Regional public authority							
Local public authority	City Office for Energy, Environment and Sustainable Development	Y	Y	Y	Y	Y	Y
	City Office for Planning, Town Building, Construction, Utilities and Transport	Y	Y	Y	Y	Y	N
	City Office for Agriculture and Forestry	Y	N	N	N	N	N
	Water Supply and Drainage Department	Y	Y	Y	Y	Y	Y
	Zagreb Wastewater Ltd.	-	Y	N	N	N	N
Academia	Faculty of Civil Engineering, University of Zagreb	Y	Y	Y	Y	Y	Y
Non-profit / government related organizations							
Economic and professional associations/entities	Croatian Chamber of Architects	-	-	-	-	-	Y
Private sector							
Civil society / community groups							
The Media							
Nº of Institutions invited to each meeting		**6**	**7**	**7**	**7**	**7**	**8**
Nº of Institutions participating in each meeting		**6**	**6**	**4**	**4**	**4**	**4**

Y: The institution was invited to the meeting and attended.
N: The institution was invited to the meeting but did not attend.
-: The institution was not invited to the meeting.

ANNEX 2. RWGEE MEETINGS' ATTENDEES

Stakeholders invited to the RWGEE	Members	Nº Attendees per Meeting					
		1	2	3	4	5	6
Croatian Waters	Josip Juric, Srecko Milic, Igor Ignac	2	1				
City Office for Energy, Environment and Sustainable Development	Nikola Petkovic, Kristina Ercegovac Drago Vasilj, Melita Boric, Tihana Ledecki, Sandra Hamin, Maja Tominic, Maja Sunjic , Ivan Boric, Nina Cikes, Davor Vilic, Marko Kucan	6	3	6	7	7	8
City Office for Planning, Town Building, Construction, Utilities and Transport	Slavica Kramar-Bozikovic	1	1	1	1	1	
City Office for Agriculture and Forestry	Biserka Petosic	1					
Water Supply and Drainage Department	Ranko Gregorin, Josip Juric	1	1	1	1	1	1
Zagreb Wastewater Ltd.	Ante Pavic	-	1				
University of Zagreb	Zivko Vukovic, Ivan Halkijevic, Marin Kuspilic	1	1	1	1	1	3
Croatian Chamber of Architects	Dušanka Šimunović						1
Nº of Attendees per Meeting		**12**	**8**	**9**	**10**	**10**	**13**

-: The institution was not invited to the meeting.

ANNEX 3. EVALUATION TABLE

Activities, desirable outcomes, indicators and metrics				Metric
1.Establish subject focus and identify stakeholders				**Activity 1***
Outcome:	Identification of a well-functioning RWGEE with key stakeholders in the area of focus involved			
	Indicator:	Whether the key stakeholders in the area of focus have been properly identified		
		Metrics	Yes/No/Work In Progress (WIP)	Yes
2.Organise/facilitate stakeholders				**Activity 2***
Outcome:	Positive involvement of key stakeholders			
	Indicator:	Percentage of invited stakeholders attending/participating in each meeting**		
		Metrics	Num. Participants/Num. Invitedx100 (%)	75%
3.Identify problems and issues				**Activity 3***
Outcome:	Positive involvement of key stakeholders			
	Indicator:	Whether the urban water related problems have been identified and stakeholders have provided supporting data		
		Metrics	Yes/No/WIP	Yes
4.Develop the long term integrated vision				**Activity 4***
Outcome:	A concise integrated vision that includes RWGEE aspirations is formalised			
	Indicator:	Whether the concise statement is in place		
		Metrics	Yes/No/WIP	Yes
5.Develop the strategic action plan				**Activity 5***
Outcome:	A strategic action plan is completed in consensus with the RWGEE			
	Indicator:	Whether the strategic action plan is completed		
		Metrics	Yes/No/WIP	Yes
6. Carry out pilot/demonstration activities				**Activity 6***
Outcome:	E^2STORMED Decision Support Tool (DST) has been applied to local sites			
	Indicator:	Whether the DST has been applied to local sites		
		Metrics	Yes/No/WIP	Yes
7.Identify and engage additional parties				**Activity 7***
Outcome:	Positive involvement of additional parties			
	Indicator:	Percentage of invited additional parties attending/participating in the proposed activities		
		Metrics	Num. Attendees/Num. Invitedx100 (%)	In preparation
8.Process documentation and build capacity				**Activity 8***
Outcome:	A procedure is in place and being used to capture and track changes in the transition process			
	Indicator:	Whether the procedure is in place and being used		
		Metrics	Yes/No/WIP	Yes
Outcome:	Capacity building is taking place			
	Indicator:	Number of people trained/assistants to workshops/etc.		
		Metrics	Number	WIP
9.Evaluate and learn				**Activity 9***
Outcome:	Evaluation at various stages in the project takes place and guides the activities that follow			
	Indicator:	Number of evaluations undertaken		
		Metrics	Number	1
10.Prepare the next turn of the Wheel				**Activity 10***
Outcome:	Gaps have been identified and there is will to continuing turning the Wheel			
	Indicator:	Whether gaps have been identified and there is will to continuing turning the Wheel		
		Metrics	Yes/No/WIP	No

** Dark green signifies that an activity had been completed; light green signifies that the activity is underway whilst blue signifies that the activity is still to be considered.*

***Those stakeholders which have justified their absence but provide information and show interest in meeting outcomes can be considered to have participated in it.*

E²STORMED PROJECT
Improvement of energy efficiency in the water cycle by the use of innovative storm water management in smart Mediterranean cities
www.e2stormed.eu

PROJECT PARTNERS

UNIVERSITAT POLITÈCNICA DE VALÈNCIA (E)

GRANA AND MAIRA VALLEYS MOUNTAIN COMMUNITY (I)

MUNICIPALITY OF BENAGUASIL (E)

MUNICIPALITY OF PISA (I)

LOCAL COUNCILS' ASSOCIATION (MLT)

MUNICIPALITY OF HERSONISSOS (GRE)

UNIVERSITY OF ABERTAY DUNDEE (UK)

OLD ROYAL CAPITAL CETINJE (MNE)

CITY OF ZAGREB (CRO)

Projet cofinancé par le Fonds Européen de Développement Régional (FEDER)
Project cofinanced by the European Regional Development Fund (ERDF)