

Integrated Urban Water Management (IUWM)

A First Summary and Introduction to the
Subject

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Scope and Content of the Presentation

- A general summary of ideas, methods, and technologies considered as part of IUWM
- First of a Series, more will follow with more in depth analysis of principles and technologies
- Uses extensively work carried out mostly in Azerbaijan and Latin America on the subject (*many thanks to the many authors quoted: Sanyu Lutalo, Rovshan Abbasov, Stephane Dahan, Jose Luis Gil, Matthijs Schuring, Hadji Huseynov, Abel Mejia, David Michaud, Diego Rodriguez, Pasquale Scandizo, Antonio Tarruell, Azer Velivekov and last, but not least, Michael Webster, among other*)
- Designed to be provocative and open up interest, not to come to “*final conclusions*” or “*solid recommendations*”
- Content
 - Definition, objectives, approach and steps for implementation
 - Water Sustainable Urban Design, Ecosystem-Based Approach, Water Harvesting
- Some Comments and Ideas for Future Work to finalize

AN URBAN WATER CRISIS?

- Caused by an embedded culture of waste and misuse. Urban supply has the priority, no costs
- What role has our urban environment played in the development of this culture?
 - Water, a source of disease
 - Water, a human waste transportation agent
 - Water, a source of inconvenience and flooding
 - Water, it comes from a tap, magically
 - Measures in cubic meters, what is that?
- Is there any wonder that as a society our culture has little regard for water as a precious resource?

AN URBAN WATER CRISIS?

- Can a contemporary approach to urban design change/challenge the old paradigms?
 - Need to fundamentally change the way water is managed in the urban environment to address the negative perceptions engendered by traditional approaches to urban design and urban water management.
 - Need to cease perpetuation of the traditional “out of sight, out of mind” urban water design paradigm. How?
- The approach: IUWM, Water Sensitive Urban Design (WSUD) and/or Ecosystem-Based, all new buzz-words in vogue?

Introduction

Definitions of IUWM

- IUWM is described as the practice of managing freshwater, wastewater and stormwater as components of a basin-wide management plan.
- It is also seen as a flexible, participatory and iterative process which integrates the elements of the urban water cycle with both the city's urban development and the surrounding basin's management to maximize economic, social, and environmental benefits in an equitable manner.
- It is finally a decision support tool that informs planning and policy decisions that integrate urban development, environmental sustainability and water management.

INTEGRATED URBAN WATER MANAGEMENT

- **Considers all parts of the water cycle:**
 - natural and constructed, surface and sub-surface
- **Considers all requirements for water:**
 - anthropogenic and ecological
- **Considers the local context:**
 - environmental, social, cultural and economic perspectives
- **Strives for sustainability:**
 - balancing environmental, social and economic needs in the short, medium and long term

INTEGRATION MEANS.....

- **Total water cycle view:**
 - Water supply, Stormwater, Wastewater
- **Considering whole process:**
 - Planning, Development, Operation
- **Involving all players and stakeholders**
 - Organisations and community
- **Fully integrated with Urban Planning**
 - Influences urban plans and takes into consideration urban plans for water management actions
- **Expanding to interface with other sectors**
 - Energy, transport...

Activities under IUWM seek to achieve the following:

- Improve water supply and consumption efficiency.
- Upgrade drinking water quality and wastewater management.
- Increase economic efficiency of services to sustain operations and investments for water, wastewater, and storm-water management.
- Utilize alternative water sources where feasible, including rainwater, and reclaimed and treated water.
- Engage stakeholders to reflect their needs and knowledge for water management.
- Establish and implement policies and strategies to facilitate the above activities.
- Support capacity development of personnel and institutions that are engaged in IUWM in cities/countries.

Is this too much or an appropriate mix?

Some Phrases from WPP Summary Report on IUWM

- The concept of Integrated Urban Water Management (IUWM) originates from the complexity of challenges affecting the provision of basic human services such as water supply in expanding cities worldwide
- IUWM seeks to develop efficient and flexible urban water systems by adopting a diversity of technologies to supply and secure water for urban areas
- The integration across institutions at each stage during the process of urban and water management planning represents the focus of this approach
- IUWM's view on the urban water cycle is a holistic one by which all components of the cycle (water supply, sanitation, storm water management) are integrated within the wider watershed.

UWM: the Traditional Approach

Objectives:

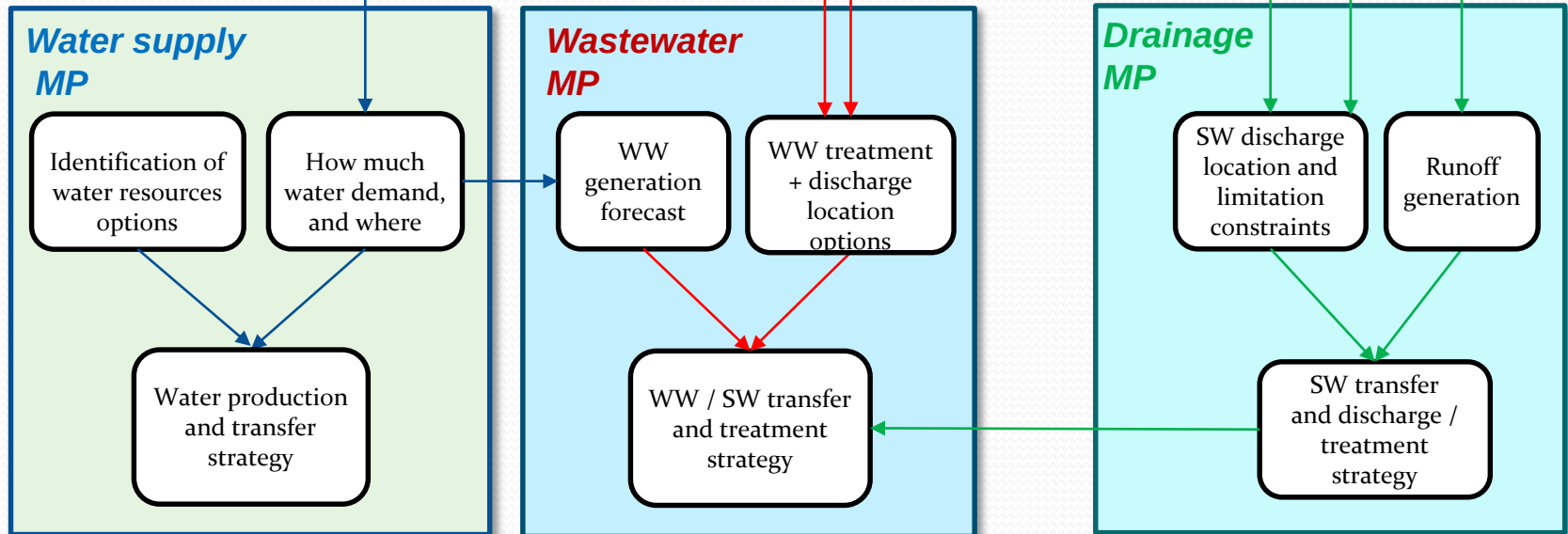
- Provision of basic municipal services objectives
- Protection of environmental, recreational and cultural values
- Increased urban attractiveness and land value

Components:

Urban development plan

Land use plan

Environmental protection plan



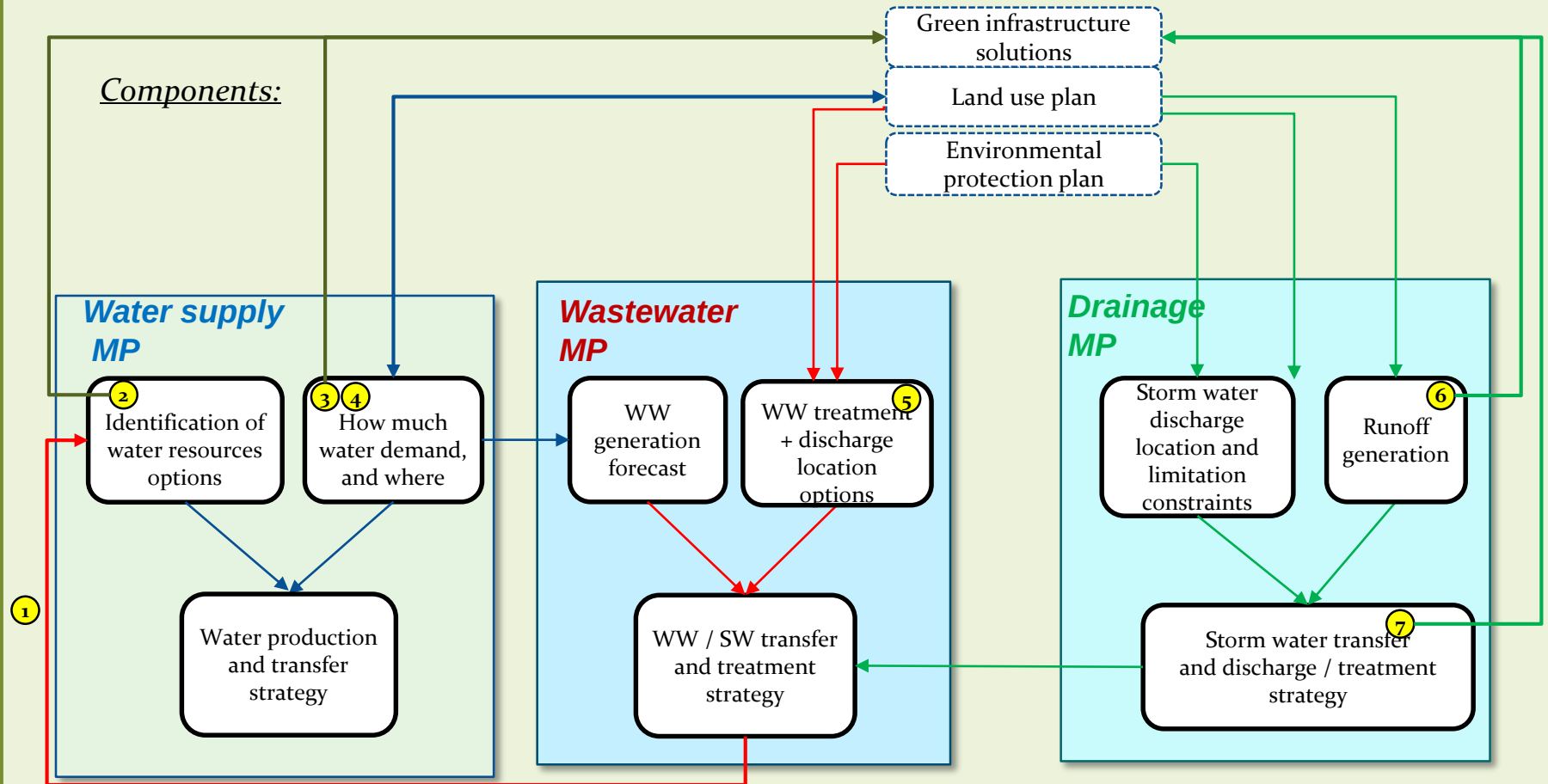
IUWM: the Proposed Approach

Objectives:

- Provision of basic municipal services objectives
- Protection of environmental, recreational and cultural values
- Increased urban attractiveness and land value

Urban development plan

Components:



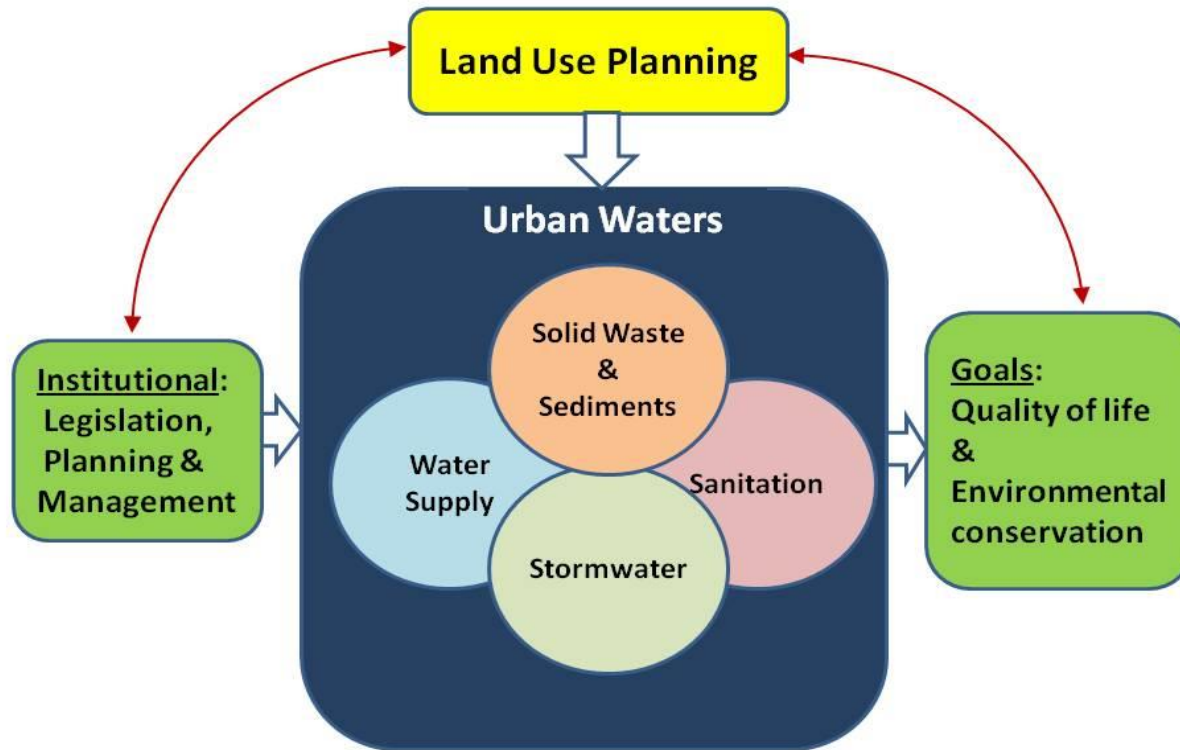
① : treated water reuse
② : stormwater capture

③ : storm / grey water reuse
④ : water demand management

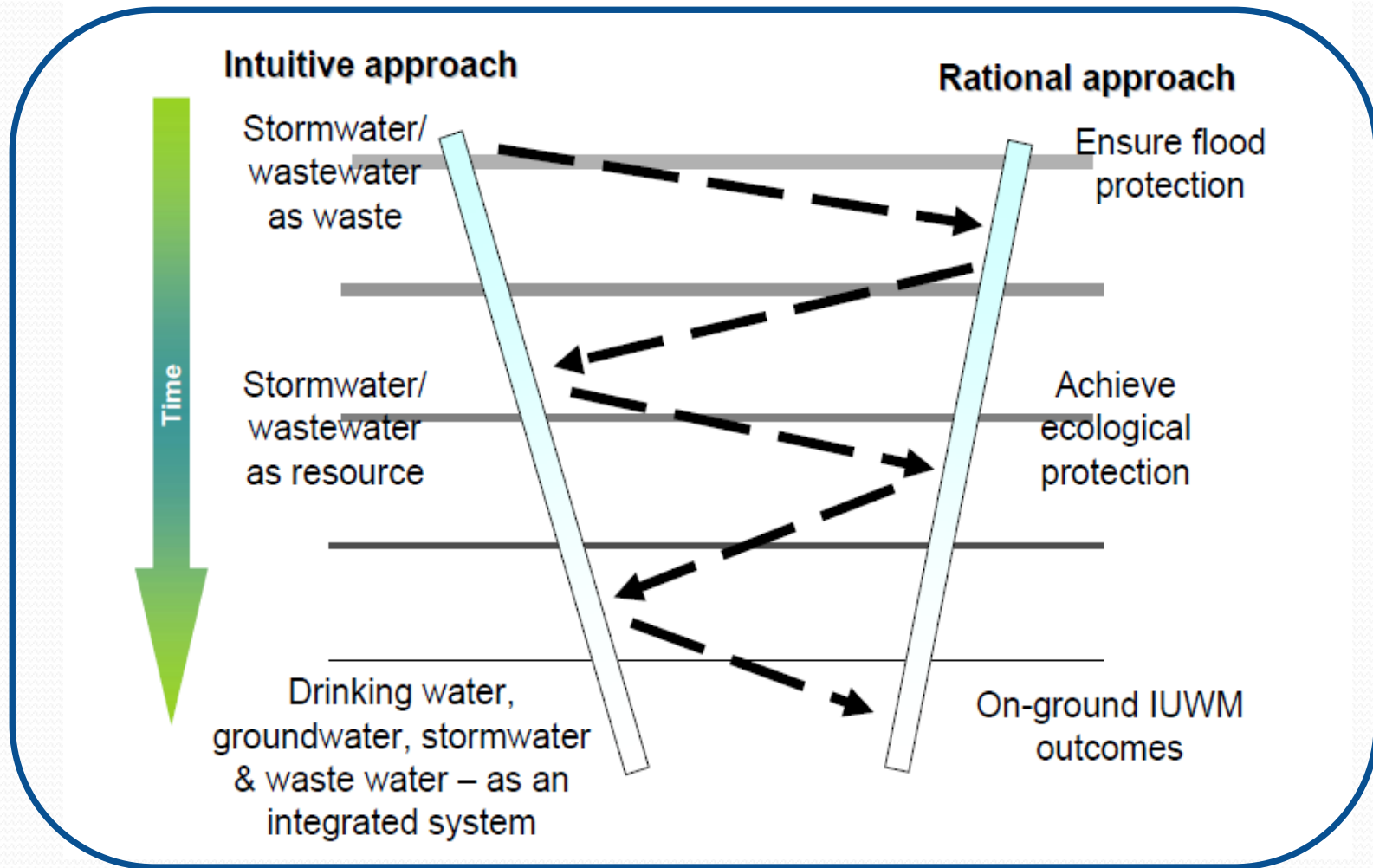
⑤ : localized WWT systems

⑥ : retrofit SUDS
⑦ : Filtration through vegetation

Another Conceptual Design



The Process of Thinking Development



Integrated Urban Water Management is ...

- Is it a “technology-practice” – or an emerging praxis, rather than a set of specific technologies ??
- Recognized technologies have:
 - Strengths and weaknesses ?
 - Fit within a larger context (system) ?
- Individual actions can be seen in the context of total urban water systems ?
- Assesses the collective impact of all actions ?

Practical Examples. The WPP Pilots

- An idea that started in parallel, in the anchor and in LAC
- A business development tool, but also a logical next step in the water cycle thinking and practice
- With support from WPP, the approach was tested in LAC, giving emphasis to participatory processes, in ECA, highlighting the economic perspective, and in AFR, focusing primarily on technological issues
- Different approaches, different results. Is this a problem?

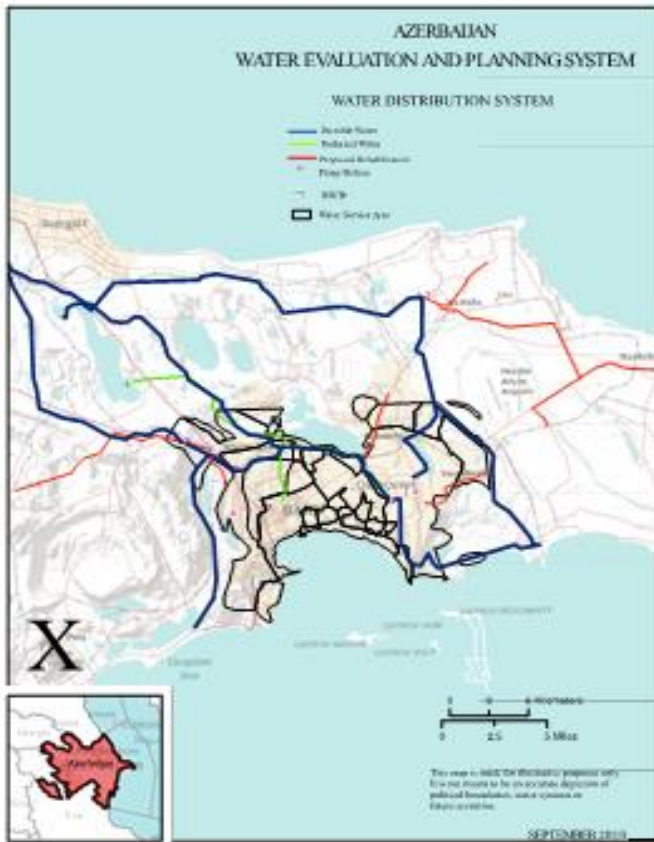
How we did in ECA (Baku): I) Preparation Phase

- Desk review: collection/analysis of Information, capture institutional memory.
- Engage country office, selection of local consultants
- Stakeholder analysis - Identification of stakeholders and preliminary analysis of political economy, contact and meet key stakeholders, informed engagement strategy.
- Rapid field appraisal of water systems.
- Define process, work plan, geographical scope and develop methodological framework.

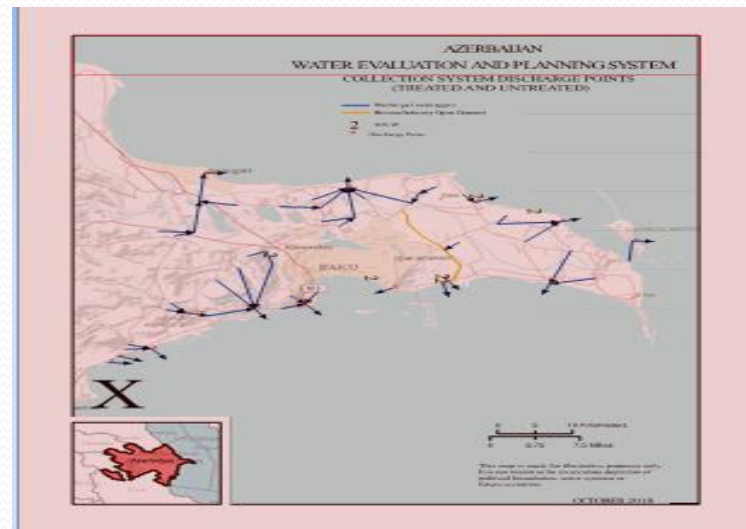
II) Diagnostic Phase

- Systematic data collection of indicators about water, urban and environmental issues in Baku- use of Rapid Assessment Tool involving survey of stakeholders, preparation of GIS based maps aggregating data in a spatial platform reflecting information on key aspects for strategic/planning purposes and a summary report providing an overview of the urban water system and issues.
- Update performance of main water infrastructure components (Comprehensive Field Report), including data such as age of infrastructure.
- Understand links of urban, environment and other sectors (agriculture, tourism, etc) with performance of water systems (cycle).
- Assessment of institutional and regulatory framework for IUWM/WRM and identification of issues.

Knowledge capture - Integrate information on GIS maps



Baku Water Distribution System



Baku Sewerage System



Baku Average Hours of Water Service

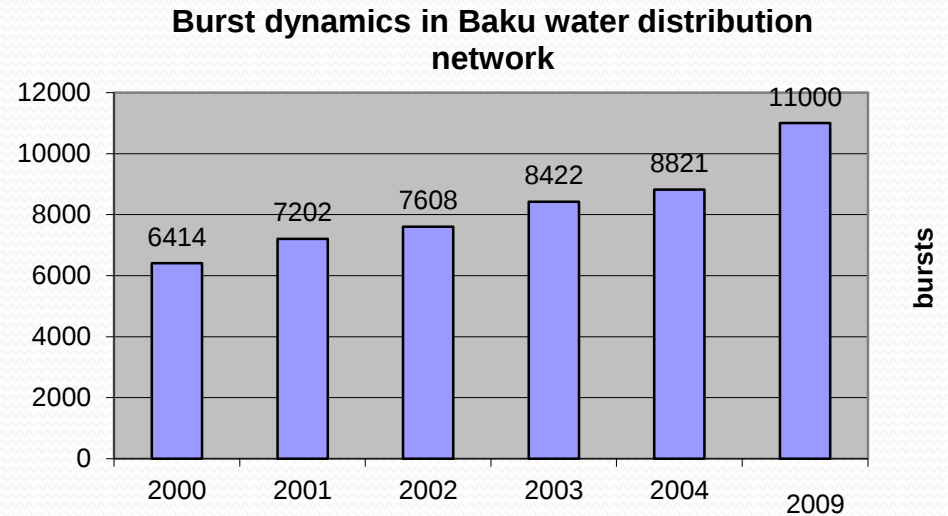
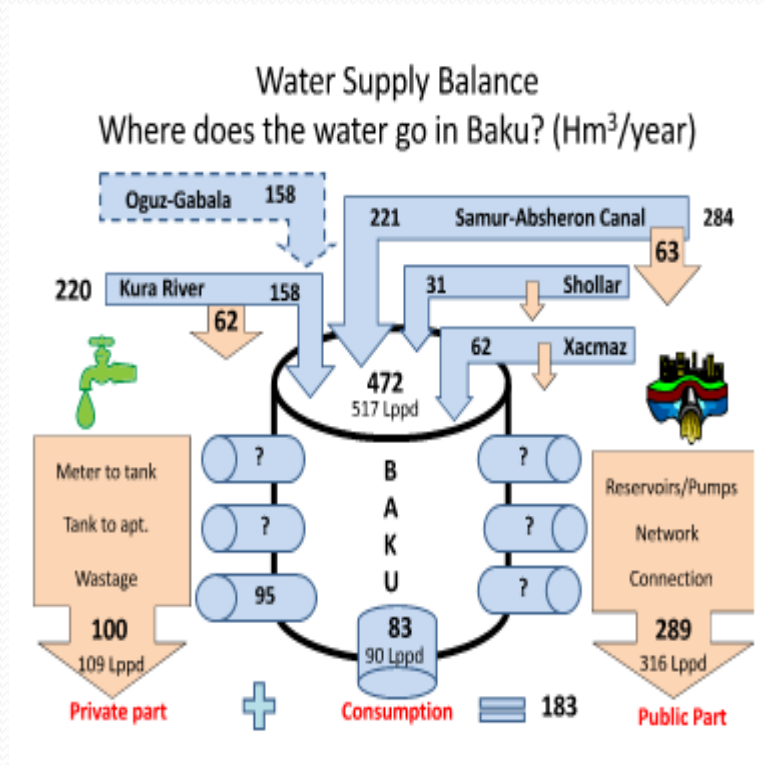
Link to Urban - Understanding Water Cycle “Local PECULIARITIES”



III) Analysis Phase

- Base-line and schematic setting of **main water systems** (engineering Master-plan and economic data) and **urban development plans**.
- Development goals, time frame of analysis for urbanization, water management and environmental sustainability (long-term plans, stakeholders views, existing surveys).
- Water balance assessment - Water demand, availability of water resources, water infrastructure deficits and performance issues.
- Investment needs assessment to upgrade infrastructure performance within time frame.
- Financial analysis and assessment of resources to achieve development goals.
- Environmental Health Analysis
- Risk Analysis study.
- Institutional Analysis - Identify policy/institutional barriers.

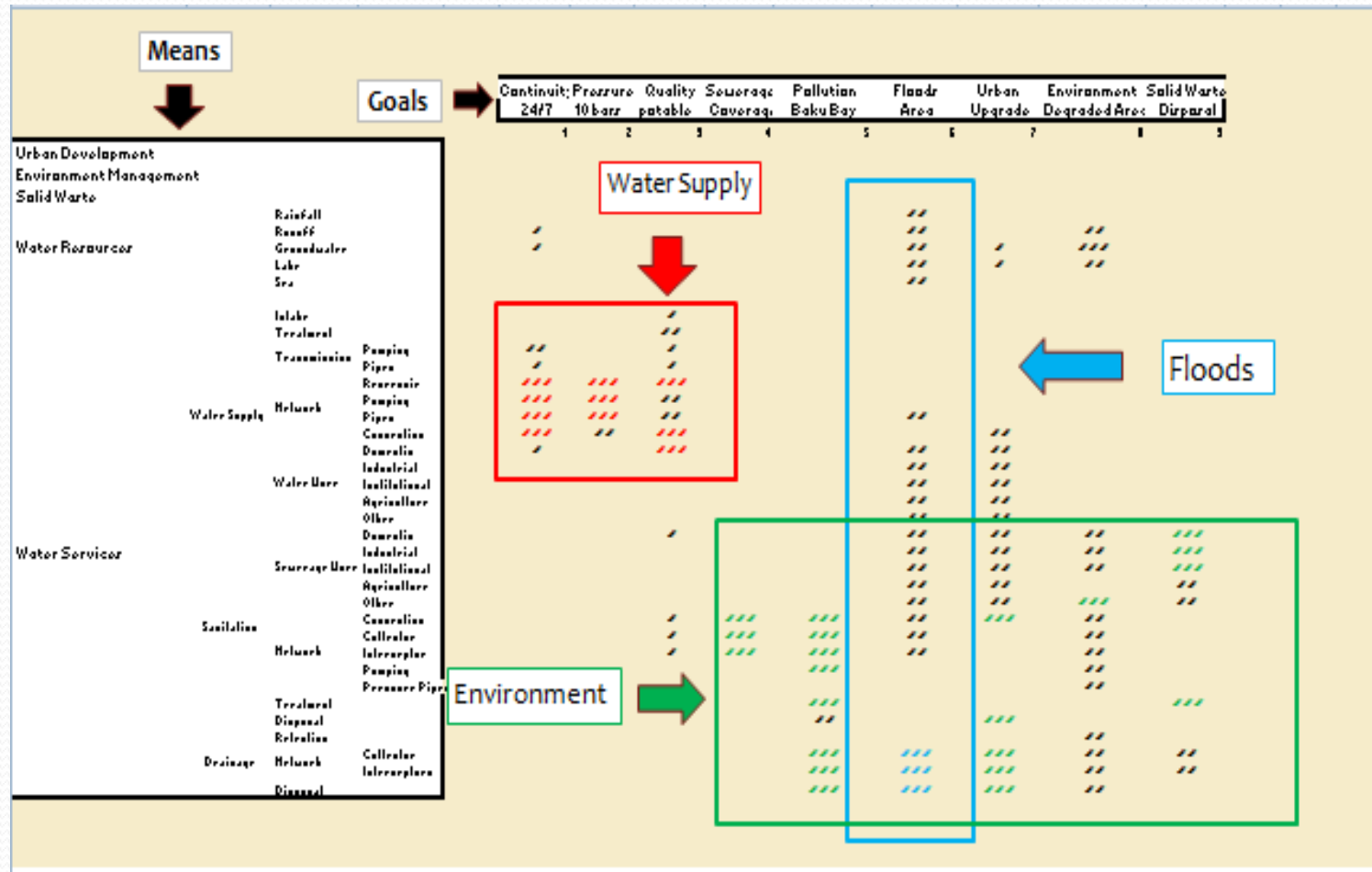
Identifying root causes behind poor performing water services



Goals and Target Scenarios

Indicator	Goal			
	2010	2015	2020	2025
1 Population with 24/7 service	60	90	100	100
2 Area with adequate pressure	30	80	100	100
3 Reliable water at tap	20	80	100	100
4 Sewerage Coverage (%)	80	95	100	100
5 Pollution of Baku Bay (BOD)	high	medium	low	none
6 Flooding (Ha)	1000	500	50	10
7 Urban Development (Renewal Ha)	10	20	50	100
8 Environment (Ha degraded)	10000	9000	8000	7000
9 Solid Waste (% in landfill)	5	50	85	100
10 Financial Sustainability (%)	50	75	100	100

Goals lead to Sectoral Interventions



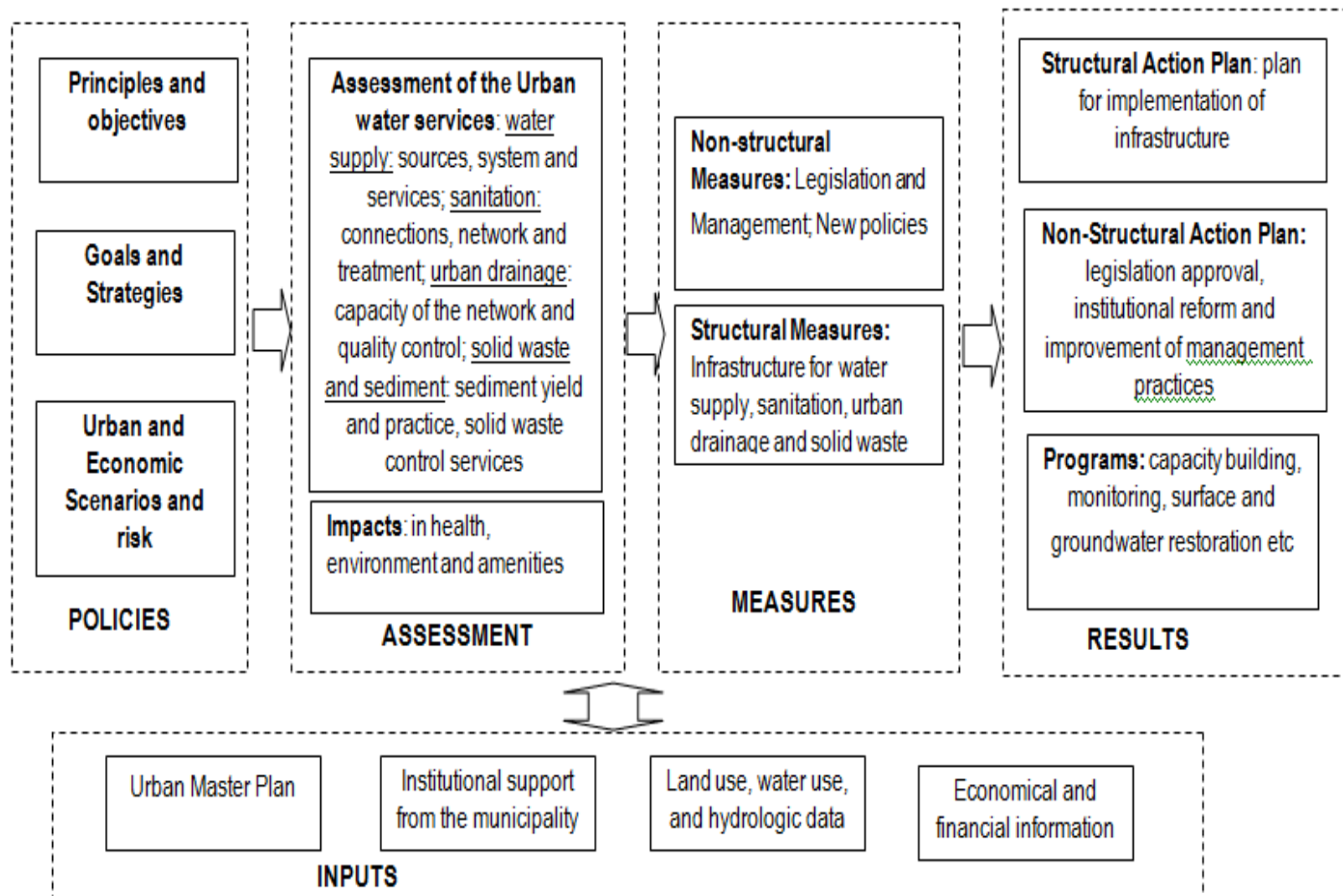
D. Prognosis Phase

- Scenarios, main assumptions, priorities and services performance targets –(use of models to project various scenarios, water/urban)
 - Scenario 1 - Business as usual
 - Scenario 2 - Efficiency improvements by 50%
 - Scenario 3 - Withdrawals reduced by 50%
 - Scenario 4 - Scenarios 2 and 3 combined
 - Other ...
- Results of projections: Supply/demand, costs and investments, strategic planning,
- Identification of policy and institutional options of different scenarios to achieve development goals.
- Draft report for discussion/consultation.

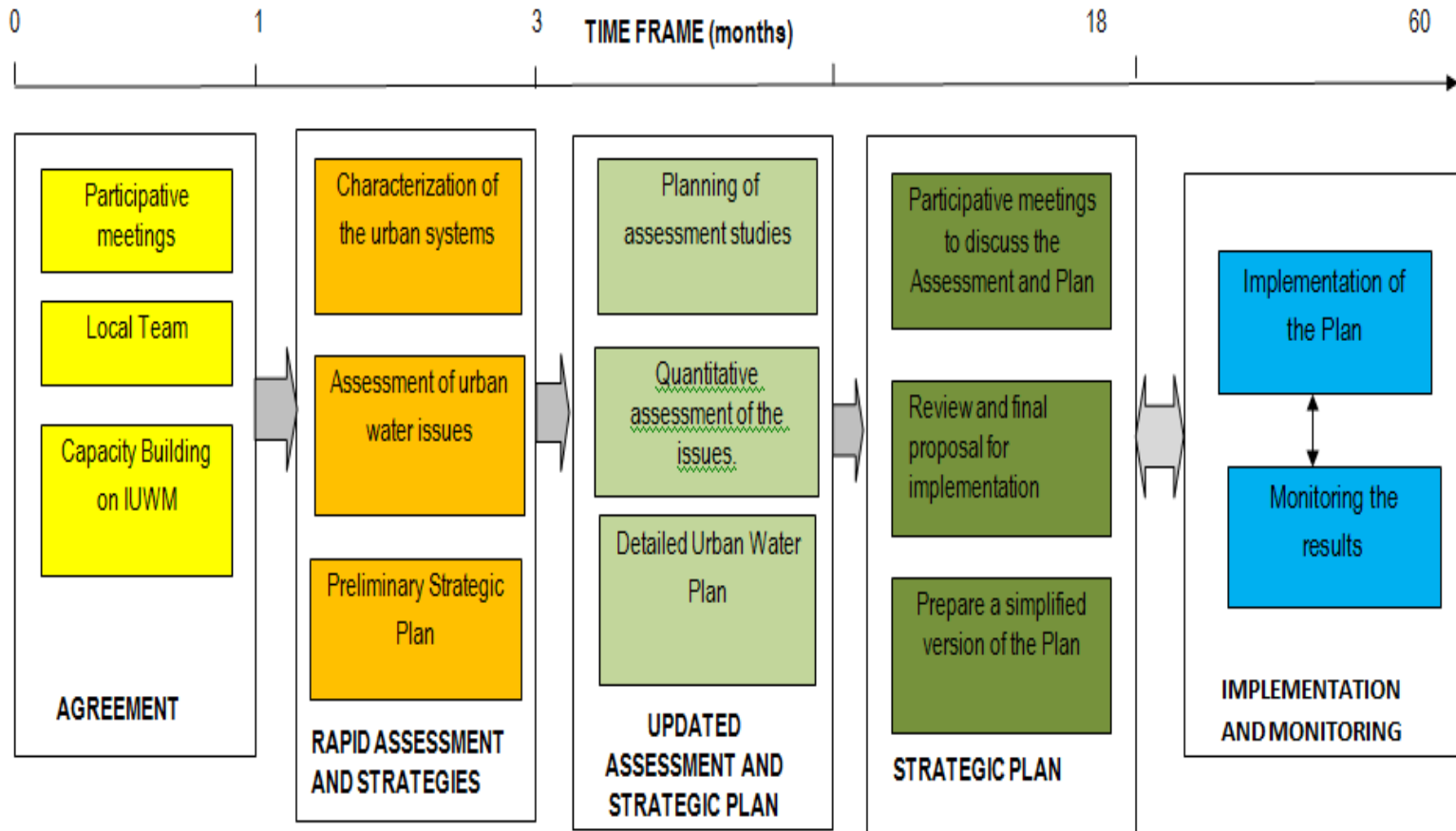
E. Proposal Phase

- Review options/strategy workshop based on draft report with stakeholders.
- Summary of main contributions and suggestions. Identify areas of consensus and needs for further analysis and clarifications.
- Internal consultations/collaboration with IFI initiatives.
- Integration with the Strategic Development Plan
- Preparation, and dissemination of final report.
- Next steps and follow up by Government.

Another Approach to Develop IUWM



Steps and Time-Frame



David Michaud, et al, 2010

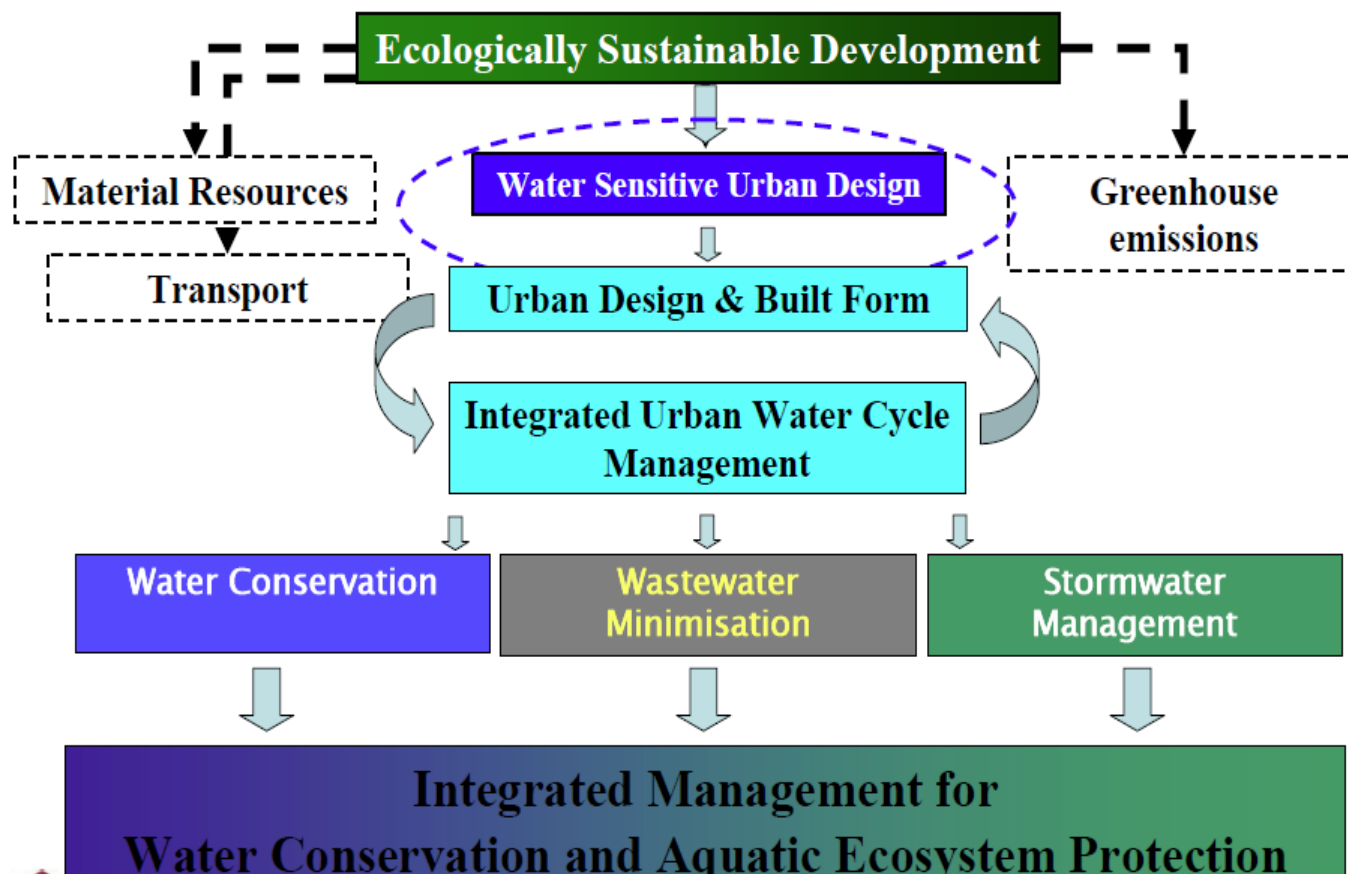
Another Term: WHAT is Water Sensitive Urban Design (WSUD)?

- WSUD has evolved from its early association with stormwater management to provide a broader framework for sustainable urban water management.
- “WATER SENSITIVE”
 - Sustainable solutions for managing water resources
 - Protecting aquatic ecosystems
- “URBAN DESIGN”
 - Integrating total urban water cycle management into the urban design and built form
 - Enhancing the landscape/recreation/habitat
 - Creating an “Urban Ecology”
- Integral to (or the Same Thing as) IUWM??

WHAT WSUD IS SAID TO AIM TO ACHIEVE

- Consideration of water issues and infrastructure from the earliest stages of project planning.
- Integration of urban water streams (stormwater, water supply and wastewater).
- Demand side (use reduction) and supply side (supply enhancement) measures.
- Highlight importance of synergies that can be gained by this approach.
- Incorporate the Ecosystem-Based Approach for Water Management decisions and investment planning

WSUD. A Framework

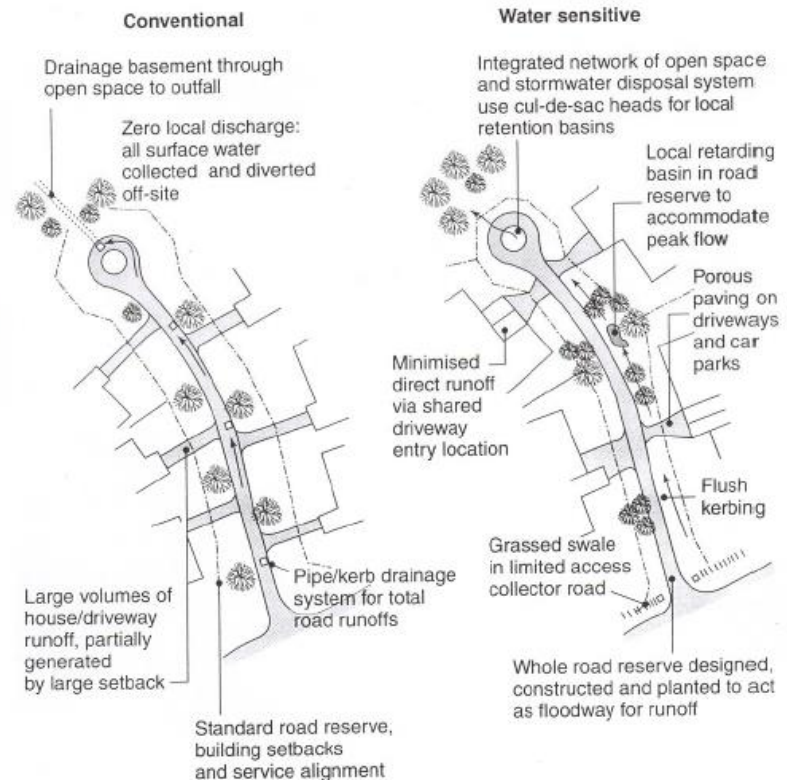


Planning and Design Tools



- Highlights various scales of planning and design tools that can be used in WSUD

- Public open space networks
- Housing layout
- Road layout
- Streetscape



INTEGRATION OF SCALE



Regional
Scale



Hoyland St
(Brisbane)



Victoria Park - Example
(Sydney)



Ascot Waters - Example
(WA)



Victoria Park
(Sydney)



Cremorne Street
(Melbourne)



Burke St Extension
(Melbourne)



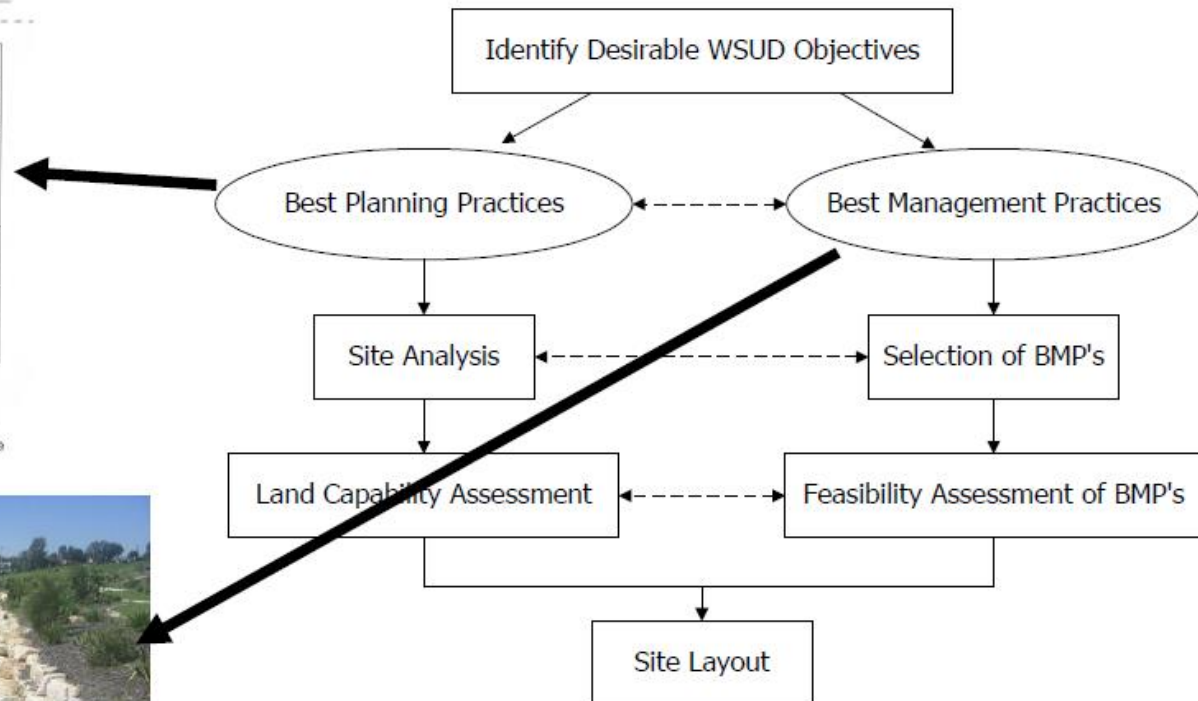
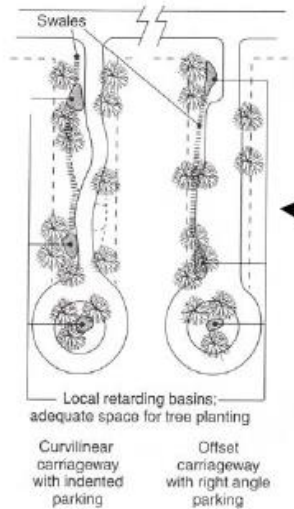
Melbourne Docklands
(Melbourne)



Baltusrol Estate
(Melbourne)

Allotment
Scale

BPP's and BMP's



Ecosystem –Based Approach. “New” Idea? More of the Same?

ENVIRONMENTAL SETTING

- Proposal for Design Uses.
- Zoning of the Water Body.
- Adoption of Use-Specific Environmental Objectives.
- Establishment of Water Quality Criteria.



SEWER SYSTEM DESIGN

- Data Gathering.
- Discharges and Pollutant Loads Estimation.
- Sewerage Modeling.
- Treatment Plant Study.
- Water Quality Modeling
- Cost Study
- Environmental Impact Assessment

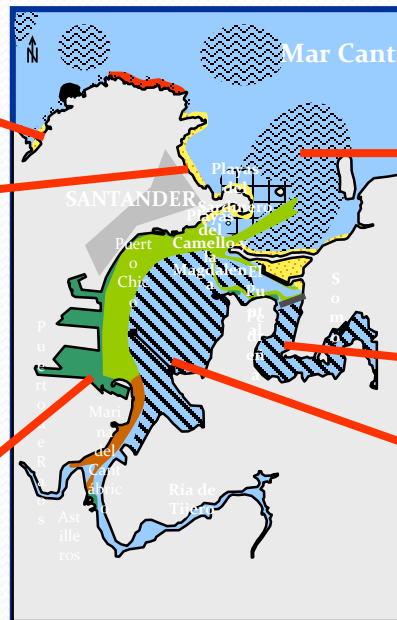
Water Quality Modelling



MONITORING PROGRAM

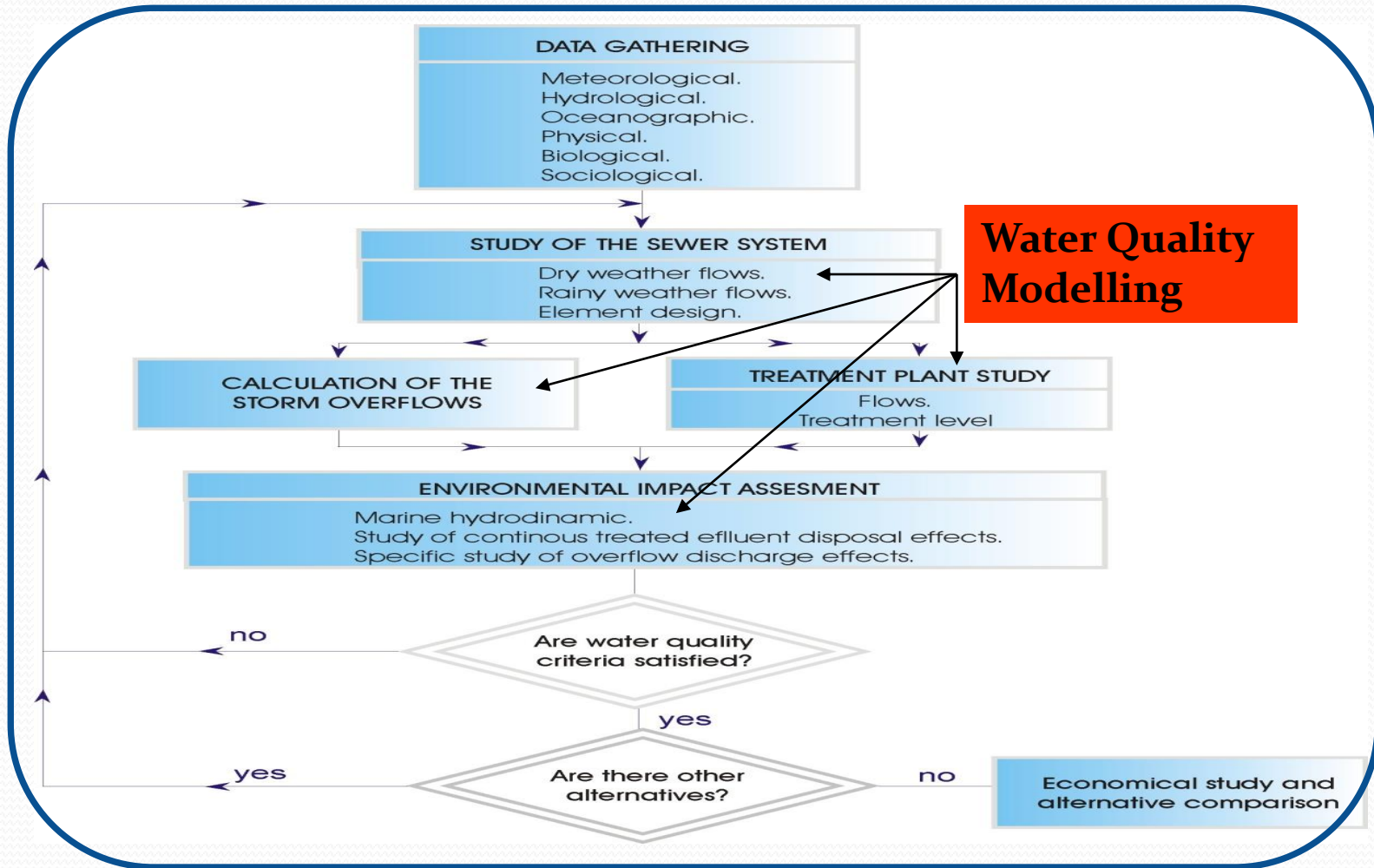
- Objectives Definition.
- Development of the Monitoring Strategy.
- Data Acquisition and Analysis.
- Decision Making.

LAND USE / ZONING and QUALITY OBJECTIVES



- Zona de interés portuario
- Zona de interés para la industria y la navegación
- Puertos y Astilleros
- Áreas de pesquerías tradicionales
- Zona producción moluscos
- Recursos vegetales (algas)
- Zona de producción de rizos
- Zona de baño
- Otros usos recreativos
- Zona de protección
- pesquera
- Conservación de ecosistemas

ENVIRONMENTAL DESIGN SCHEME



EBA Elements for Setting Management Objectives

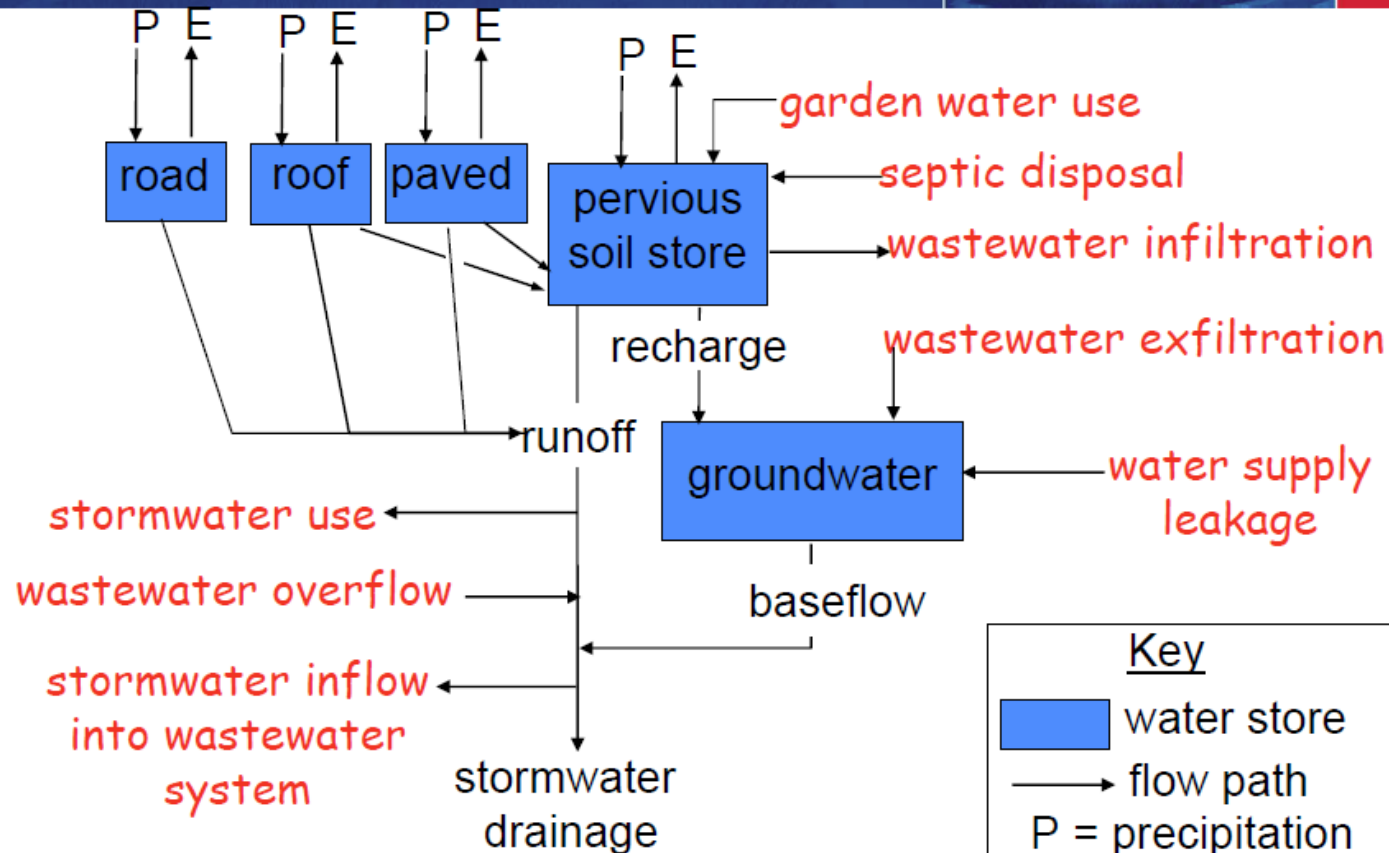
- Risk-based Approach
 - Based on best practice management.
 - Guidelines on what is currently possible.
- Potable water conservation
- Wastewater minimisation
- Stormwater discharge attenuation
- Stormwater, treated wastewater quality and discharge sites
- Discharges quality objectives based on modelling of receiving water responses guided by “reference” conditions and urban planning / land uses

Urban Water Harvesting and Reuse (a “sexy” tool)

Considers all elements of the urban water cycle from a reuse perspective

- Roofwater
- Stormwater
- Greywater
- Blackwater
- *Potable water even gets a mention!*

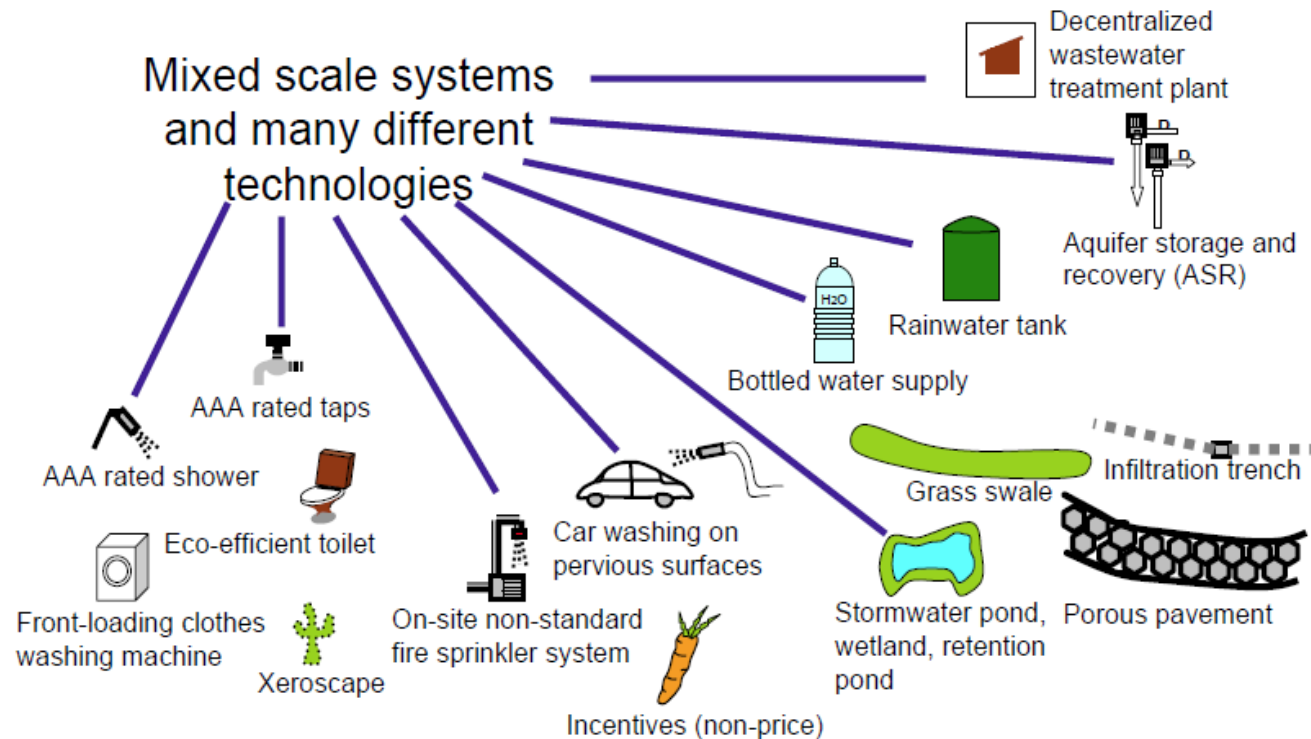
Rainfall-runoff within total cycle



Key

-  water store
-  flow path
- P = precipitation
- E = evapotranspiration

Other many Tools to Improved Urban Water Management



Is this IUWM??

Source: CSIRO Urban Water

After all these Ideas, are there Opportunities in IUWM?

- Enormous opportunities for innovation
 - Demand & supply side
 - Structural and non-structural
 - Tailored to local objectives and conditions
- Only limited by ability to harness:
 - Prepared to do things differently
 - Balance innovation with risk/precautionary principle
- The next step is to incorporate risk analysis for all elements of the water cycle to the decision

Selecting the Approach

- Individual tools, each case is different
- Integrated, integrated, integrated
- Site specific objectives solutions
- Matching water demands with available resources
- Fitting into the urban landscape
- Coherent with urban plans and objectives
- Social and governance considerations
- Economics (direct & indirect costs)
- Operation and maintenance

Changing Scales

- No longer “whole-of-city” scale
 - Allotment scale
 - Local neighbourhood to suburban scale
 - Regional scale
 - Beyond the urban area....
- Combinations of scales within an integrated urban water management system

Knowledge Building is Needed

- Performance and cost of water management measures
- Social acceptance/expectations with respect to urban water practices and designs
- Natural resources in a region
- Water governance issues and research
- Core knowledge and skills of professions dealing with water in a region
- Technical assessment tools available to support water management decisions
- Ongoing coordinated R&D program to support innovation

Some Ideas / Comments (1)

- Overall benefit of adopting the IUWM approach is its capacity to simultaneously consider the interdependent issues concerning water supply in a growing urban areas under the multiple challenges of urban and industrial development, preservation of the environment and climate change – while taking into account both traditional and alternative water resources (*Scandizzo and Abbasov, 2012*).
- What we mean by IUWM and how to achieve it, is far from closed and work should continue
- The focus will be different in different regions and cities
- SWUD and Ecosystem-Approach are two complementary tools for efficiency, or more of the same?

Some Ideas / Comments (2)

- IUWM should be seen as a framework for urban water studies and formulation of integrated solutions to be applied in the rapid growing cities
- Traditional approaches to urban water investments are rather fragmented and frequently unsustainable since they generally do not take into consideration the multiple dimensions and cross cutting issues of urban water management
- Integrated Urban Water Management is the development of urban waters – water supply, sanitation, urban drainage and solid waste – with efficient and rational use of the resources, taking into account the entire basin and its management, including urban land use management, in order to minimize water contamination, to guarantee environmental conservation and to reduce water related diseases

IUWM is a valid Tool for Planning and Decision-Making

- IUWM can be equally or more effective than traditional approaches in providing solutions for the existing challenges that affect the provision of water services in cities;
- Optimal sequencing of traditional infrastructure and alternative approaches such as: (1) innovative technologies planned around new urban clusters; (2) decentralised infrastructure and; (3) diversification of water sources, can increase the efficiency of securing and sustaining water resources for expanding cities;
- Understanding the economic costs of IUWM will help decision-makers and planners chose the best and more efficient solution for cities;
- Flexible and adaptive institutional frameworks need to be in place in order to sustain and secure the implementation of IUWM;
- Stakeholder participation is essential to guarantee their involvement and sustainability of IUWM.

At least there is Consensus on IUWM Principles

- IUWM needs to be tailored to the specific and dynamic challenges of each urban area
- IUWM has to incorporate in its scope the different interactions amongst users in the watershed
- IUWM involves a set of participatory approaches and instruments
- IUWM is not a one-time action, but an iterative, long-term process
- IUWM is as much about institutions and processes as it is about infrastructure and investments
- IUWM must be informed by sound science and technical analysis
- IUWM requires moving away from segmented, linear thinking towards a more interdependent and integrated urban planning
- IUWM seeks to address today's challenges without losing sight of tomorrow's needs.

Source: Based on World Bank 2010a.

Ready for Comments and Questions, ...

Thank you!



