Sustainable Water Systems Environmental Flow Challenges and Issues

Presentation

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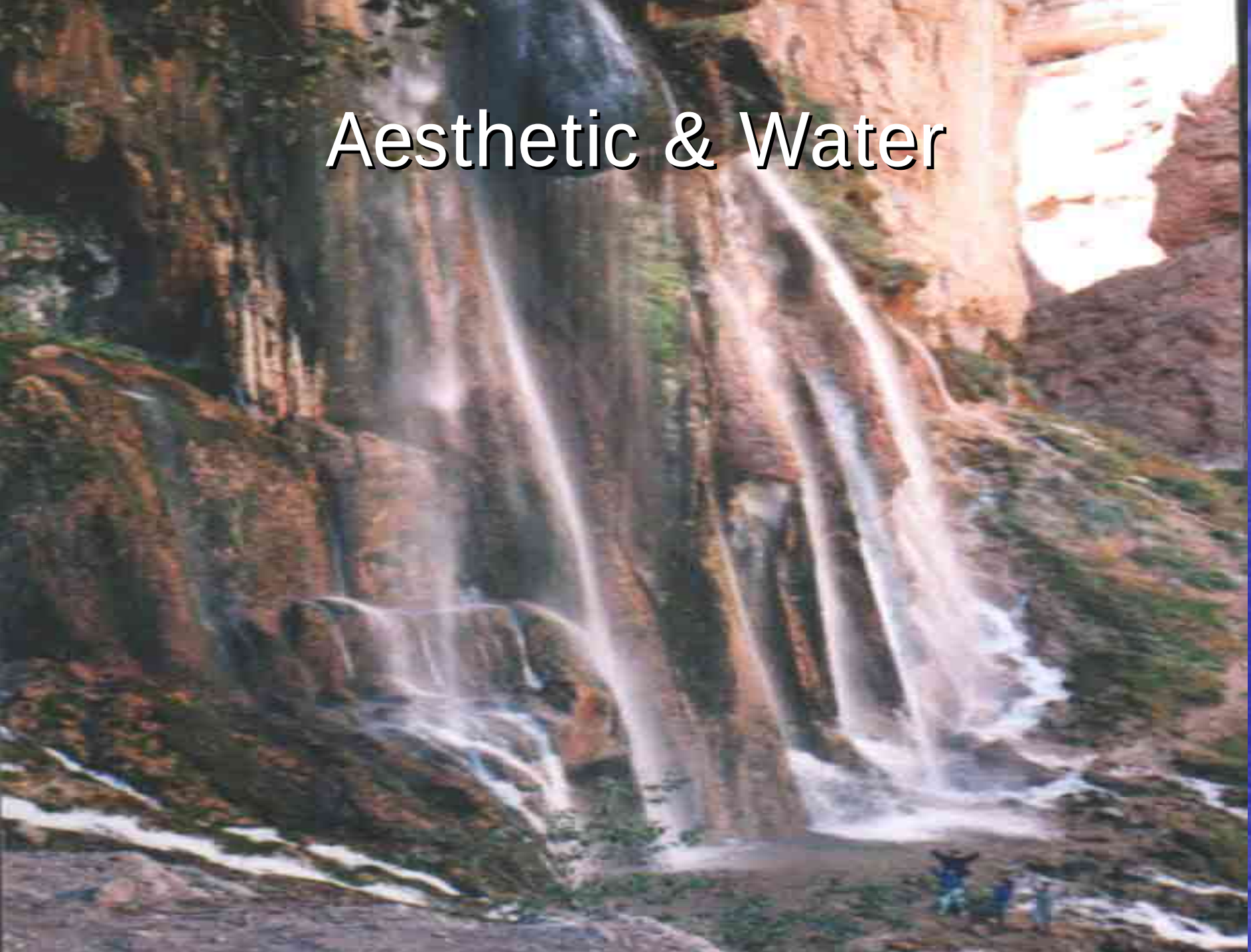
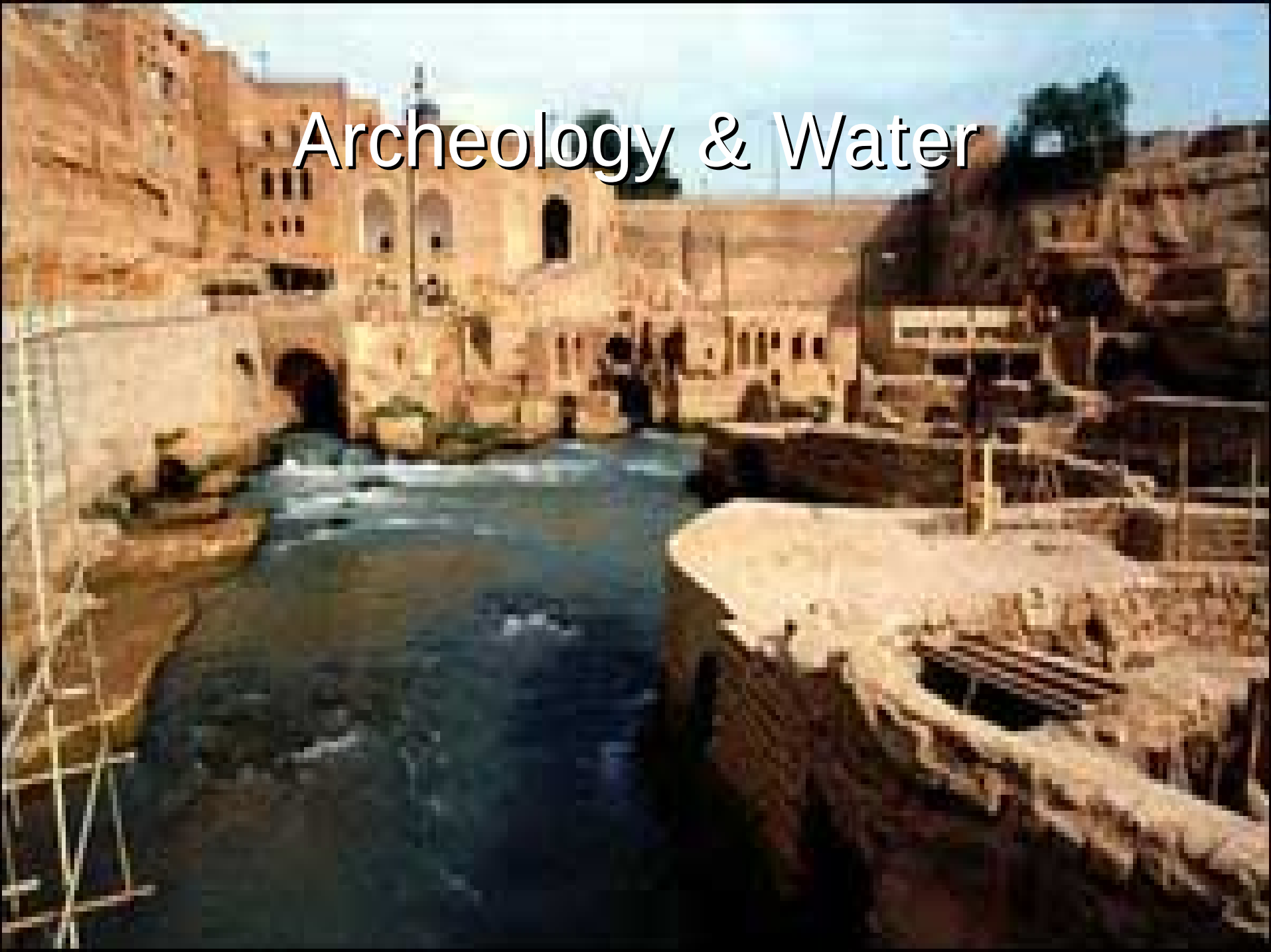
Sustainable Water System

Aesthetic & Water




Archeology & Water

Persian Poetry & Water Values

آب زنید راه را هین که نگار می‌رسد
مژده دهید باغ را بوی بهار می‌رسد

راه دهید یار را آن مه ده چهار را
کز رخ نوربخش او نور نثار می‌رسد

چاک شدست آسمان غلغله ایست در جهان
عنبر و مشک می‌دمد سنجق یار می‌رسد

رونق باغ می‌رسد چشم و چراغ می‌رسد
غم به کناره می‌رود مه به کنار می‌رسد

تیر روانه می‌رود سوی نشانه می‌رود
ما چه نشسته‌ایم پس شه ز شکار می‌رسد

باغ سلام می‌کند سرو قیام می‌کند
سبزه پیاده می‌رود غنچه سوار می‌رسد

خلوتیان آسمان تا چه شراب می‌خورند
روح خراب و مست شد عقل خمار می‌رسد

چون برسی به کوی ما خامشی است خوی ما
زان که ز گفت و گوی ما گرد و غبار می

Persian Poetry & Water for Life

من در اين تاريكي
ريشه ها را ديدم
و براي بته نورس مرگ ، آب را
معني كردم

Why Need Environmental Flow? Noticeable examples

- The dead Sea and its Basin are suffering degradation process induced mainly by anthropogenic unsustainable development actions
- Last 30 years, level of lake dropped 20 m , surface area has shrunk by 30 %
- Reason: major water diversion projects of Jordan River and Side Wadis
- Reduced fresh water input from pre-1985 annual average of 1570 MCM to less than 560 MCM per year of bad quality water
- Drop of lake level, 32 sinkholes opened up, groundwater lowering, 60 m in last 20 years, ground water quality, 90% of industrial and domestic wastewater are dumping their discharge
- Salt concentration prior to 1958 averaged 500 mg/l, in April 1959 reaches 2050 and in June 1960, 2473 mg/l
- Needs 1250 MCM/year to be in safe side
- 700 fish species are endangered in the world

Usual water uses
Instream & Offstream Uses

- -Municipal use
- -Agricultural use
- -Industrial use
- -Husbandry (animal) use
- -Hydropower
- -Flow Augmentation during low flow periods
- -Recreation & water sport
- -Habitat, Ecosystem, and Environment

Instream Flow Uses

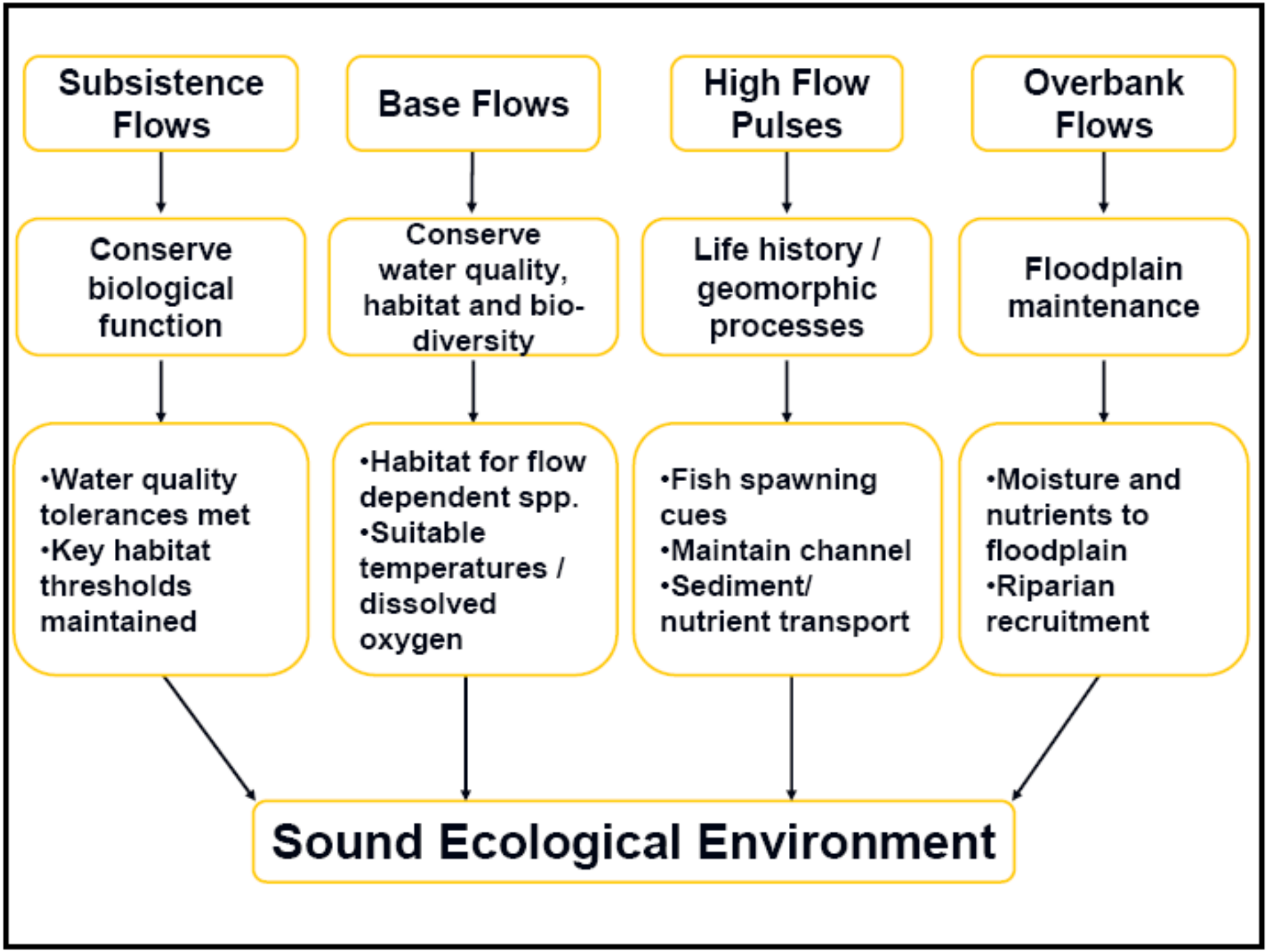
- Navigation & Transportation
- Production of hydroelectric
- Waste disposal
- Maintaining fish & wildlife habitat
- River Corridor
- Recreation

Instream Values

- Fishery
- Recreation
- Habitat
- Cultural
- aesthetic

Objectives and Goals

- Considering interests of neglected parties, especially nature itself and demands of local communities
- Preserving native species of flora & fauna
- Protect features of scientific and or cultural interests
- Protect natural flow variability, NFV is one of the most important components of any healthy stream and instream policy
- Variability and predictability of flow and of ecosystem characteristics such as resilience and resistance is very important.


Subsistence Flows
Base Flows
High Flow Pulses
Overbank Flows
Conserve biological function
Conserve water quality, habitat and bio-diversity
Life history / geomorphic processes
Floodplain maintenance
•Water quality tolerances met
•Key habitat thresholds maintained
•Habitat for flow dependent spp.
•Suitable temperatures / dissolved oxygen
•Fish spawning cues
•Maintain channel
•Sediment/ nutrient transport
•Moisture and nutrients to floodplain
•Riparian recruitment
Sound Ecological Environment

Earth Summit

In 1992–Earth summit in Rio de Janeiro- the concept of Basic Water Needs reaffirmed and expand to include ecological water needs:

In developing and using water resources, priority has to be given to the satisfaction of basic needs and the safeguarding of ecosystems.

Water Allocation

With increasing competition for the world's freshwater resources there is growing demand for tools and methodologies that can help managers and policy makers make better decisions concerning how water should be allocated between competing demands.

For many urban, industrial and agricultural uses these tools are relatively robust and increasingly sophisticated.

Natural Aquatic Ecosystems

But tools for assessing the water requirements of natural aquatic ecosystems are relatively new and, in particular for arid and semi-arid regions and large tropical rivers, are still in the development stage.

Instream flow

- Environmental flow
- Minimum flow requirement
- Natural flow variability
- Flatlining
- Minimum flow and levels
- Habitat conservation
- Sustainable ecosystem
- water for neglected parties
- Managed Flood

What IS Environmental Flow?

An environmental flow is the water regime provided within a river, wetland or coastal zone to maintain ecosystems and their benefits where there are competing water uses and where flows are regulated.

To maintain specified valued features of the river ecosystems

The goal of environmental flows is to provide a flow regime that is adequate in terms of quantity, quality and timing for sustaining the health of the rivers and its corridor and other aquatic ecosystems

River Ecosystem

- All components of landscape linked to river & river life forms,
- It include: source area, channel from source to sea, riparian areas, water in the channel & its physical and chemical natures, associated groundwater in channel and bank areas, wetlands, floodplains, estuary, and near shore environment

Definition

- The essential concept of flows in a river that are necessary for the specific purpose of sustaining river ecosystems and the varied goods and services provided by them.

Environmental Flow Definition

- Water left in or released into a river system, often for managing some aspect of its conditions
  - Endangered species protection
  - Healthy ecosystem
  - Sediment transport
  - Commercial fisheries yield
  - Freshwater inflows to bays and estuaries
  - Waste assimilation

Definition

- Minimum flow is defined as the “...limit at which further withdrawals would be significantly harmful to the water resources or ecology of the area
- The minimum level is defined as the”... limit at which further withdrawals would be significantly harmful to the wildlife of the area

Definition

- The minimum flow is normally specified as an instantaneous flow rather than a daily average, meaning that the flow should never drop below the minimum at any time
- Instream flow recommendation may also include artificial floods or flushing flow, which are e.g., designed to remove fine material from the stream bed.

Two Questions?

- Can the EFR concept safeguard essential downstream functions and values?
- How can the integration of riverine, coastal processes and management be optimized?

Environmental Flow Methodology

There is **no single best method, approach or framework** to determine the environmental flow. Each method, approach or framework will thus be suitable only for a set of particular circumstances. There are a number of existing methods for determining an environmental flow :

- hydrological (Historical Discharge)
- hydraulic rating
- habitat simulation
- holistic methodologies
- Combined methods
- Function Approach

Integration

- Water quality aspects
- Social & economic river function
- Morphological changes in the river
- River flow impacts on deltas, coastal, estuarine, and marine environment.
- Complexity of integration generate large database and unsuitable for decision makers

Issues & challenges

- Definition & goals controversies
- Institutional (funding, staffing, training, inter-agency roles, management direction, policy direction)
- Legal
- Public involvement
- Science (integration(hydrology, hydraulics, biology, geomorphology, water quality, connectivity); validation; compliance; economics & social values); training)
- General (urgency, increasing conflicts, growth & other population trends, unanticipated challenges, water transfer & market)

Issues & challenge
Definition & Goal

- Definition controversies
- Continuous terminology changes leading to confusion and loss of faith in the procedure
- Inconsistent vision and approaches
- Clear & specific goals
- Lack of Balancing certainty and flexibility in headwater to sea with complex array of objectives

Issues & challenges
Institutional, Legal, & Public Involvement

- Lack of strategic environmental assessment in policy, plan and programs in integrated water resources management in national level
- Lack of policy makers belief in EFR
- Implementation issue
- Legislation & EFR and its effectiveness
- Lack of effective stakeholders involvement & information sharing

Issues & challenges
Science

- Lack of adequate expertise and technical support backed by legal, institutional arrangement and political thrust that is needed for strategic development to raise the awareness and build knowledge and understanding of environmental flows
- Considering recreation is a new drive

Issues & challenges
Science

- Lack of knowledge of morphological changes in the river and lack of historical data for geomorphic studies)
- An entire continuum of river types with different behaviors
- Lateral connectivity between rivers and floodplains needs more emphasis on the technical overview
- Impact of future changes on physical processes
- Groundwater & surface water interaction

Issues & challenges
Science

- River flow impacts on deltas, coastal, estuarine, and marine environment.
- Complexity of integration generate large database and unsuitable for decision makers

Issues & challenges
Science

- No currently available model can simulate all instream flow functions
- use of a Proper model in arid and semi-arid regions
- Sensitivity of habitat models to hydrological models
- Lack of a mechanism to combine hydrology, water quality, hydrodynamic models across spatial scales

Issues & challenges
Science

- Selecting suitable and measurable ecological indicators (responsive to flow, for monitoring & validation, adaptive management, achieving sound ecological environment)
- Insufficient monitoring & verification & testing of methods
- Peer review

Issues & challenges
General

- Conflicts among instream and offstream uses
- Climate change impacts
- Droughts effects
- Nutrient loads, toxic chemicals, and emerging contaminants (water quality is site specific & dynamic)
- Sedimentation effects
- Salinity effects
- Water stresses basins

Issues & challenges
General

- Single vs. multiple dams effects
- Socioeconomic concerns for culturally vulnerable indigenous groups
- Inter-basin water transfer
- International watersheds or river basins
- Urgency
- increasing conflicts (water use & associated conflicts, water marketing)
- growth & other population trends
- unanticipated challenges
- water transfer & market

What to do

- Public awareness
- Instream flow is essential for ecosystem livelihood
- Proper legislations
- Considering environmental flow in dam reservoir and aquifers
- Implement strategic environmental assessment of river systems in national levels
- Comprehensive auditing of EIA
- River carrying capacity studies and research
- Considering water for historical, archeological, cultural and religious sites

What to do

- Educate decision makers
- Public education
- Farmer education
- Research on optimum and suitable method
- Atlas of environmental flow for river systems