

Amenity Rehabilitation or Ecosystem Rehabilitation?

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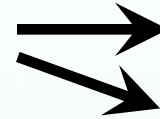
Contents

- ✓ **Changes in River Management Practices (in Korea)**
- ✓ **Models of River Rehabilitation**
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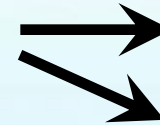
Functions of River (Water)

Engineering Function



- Water/sediment Control
- (Water Use)

Natural Function

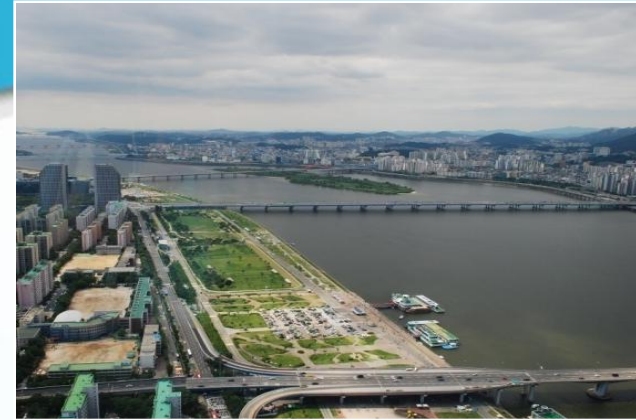


- Ecological Habitat
- Self Purification
- Aesthetic Value

Social Function



historical/cultural



Park River(d)

**Natural
River(a)**

**Disaster-
Prevention
River(b)**

River Rehabilitation

**Close-to-
Nature
River(e)**

**Occupied
River(c)**



Models of River Rehabilitation

- Amenity Rehabilitation Model
- Semi-Ecosystem Rehabilitation Model
 - *Can be sustained only by human's management* (adapted from Dr.Tsujimoto's)
- Ecosystem Rehabilitation Model
 - *Self-sustained*

Amenity Restoration Model (ARM)

- ✓ Focused mainly on rehabilitation of the aesthetic values of river
 - **Aesthetic values**: amenity, accessibility, recreation, historical/cultural values
 - **Human-oriented**
- ✓ More plausible at highly urbanized watershed and highly developed stream corridor
- ✓ Can be called “**park river**”

Ecosystem Rehabilitation Model (ERM)

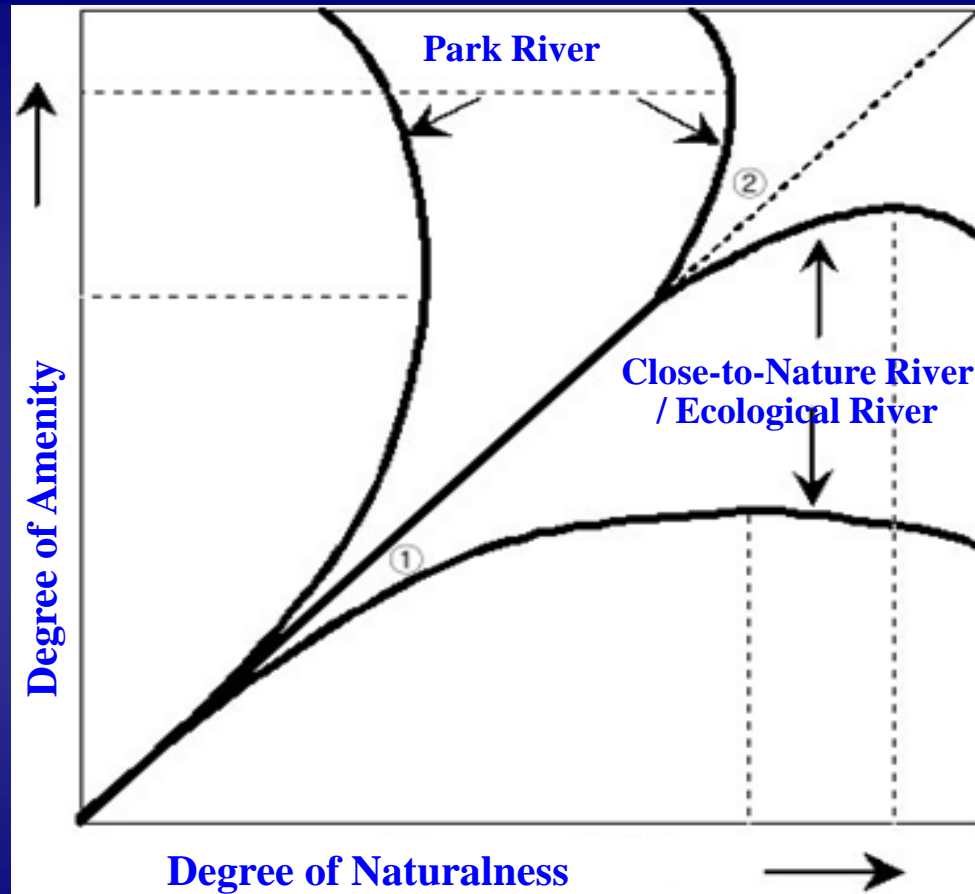
- ✓ Focused mainly on rehabilitation of the ecological system of river; **i.e. self-sustainability of physical and ecological dynamics of river**
- ✓ More plausible at sparsely urbanized watershed and less developed stream corridor
- ✓ Can be called **“ecological river”**

Semi-Ecosystem Rehabilitation Model

- ✓ Focused mainly on rehabilitation of the ecological system of river; **but it can be sustained only with human's continuous support (management)**
- ✓ It can be called **“close-to-nature river” (Naturnaher Wasser)**



Compatibility of Models (to each other)



Cases of ARM

- The Han River in Seoul (first developed in 1986)



(A bird eye view)



-The Yangjae-cheon in Seoul (developed in late 1990s)



The Cheonggye-cheon (developed in 2005)



Sumida River, Japan (from Numata, 2009)



Before (70's-80's)



(Source: Tokyo Metropolitan Government)

Yangtze River, China

(from Numata, 2009)



Before (1990's)



(Source: Wuhan Water Authority)

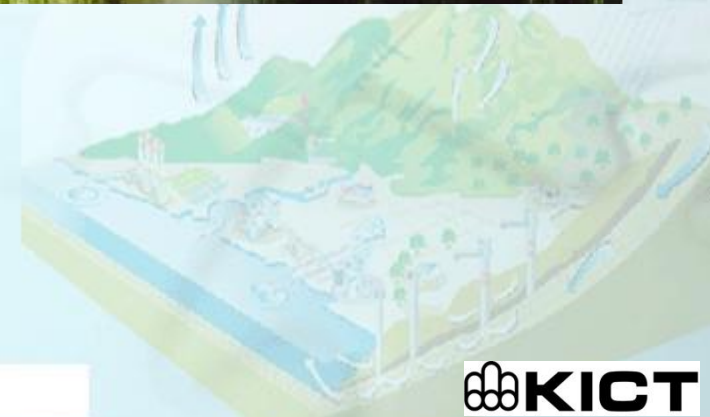
-The Limat River in Zurich (from C. Goeldi, 2009)



Cases of Semi-ERM (A demo-project at Yangjae-cheon, Kwacheon)

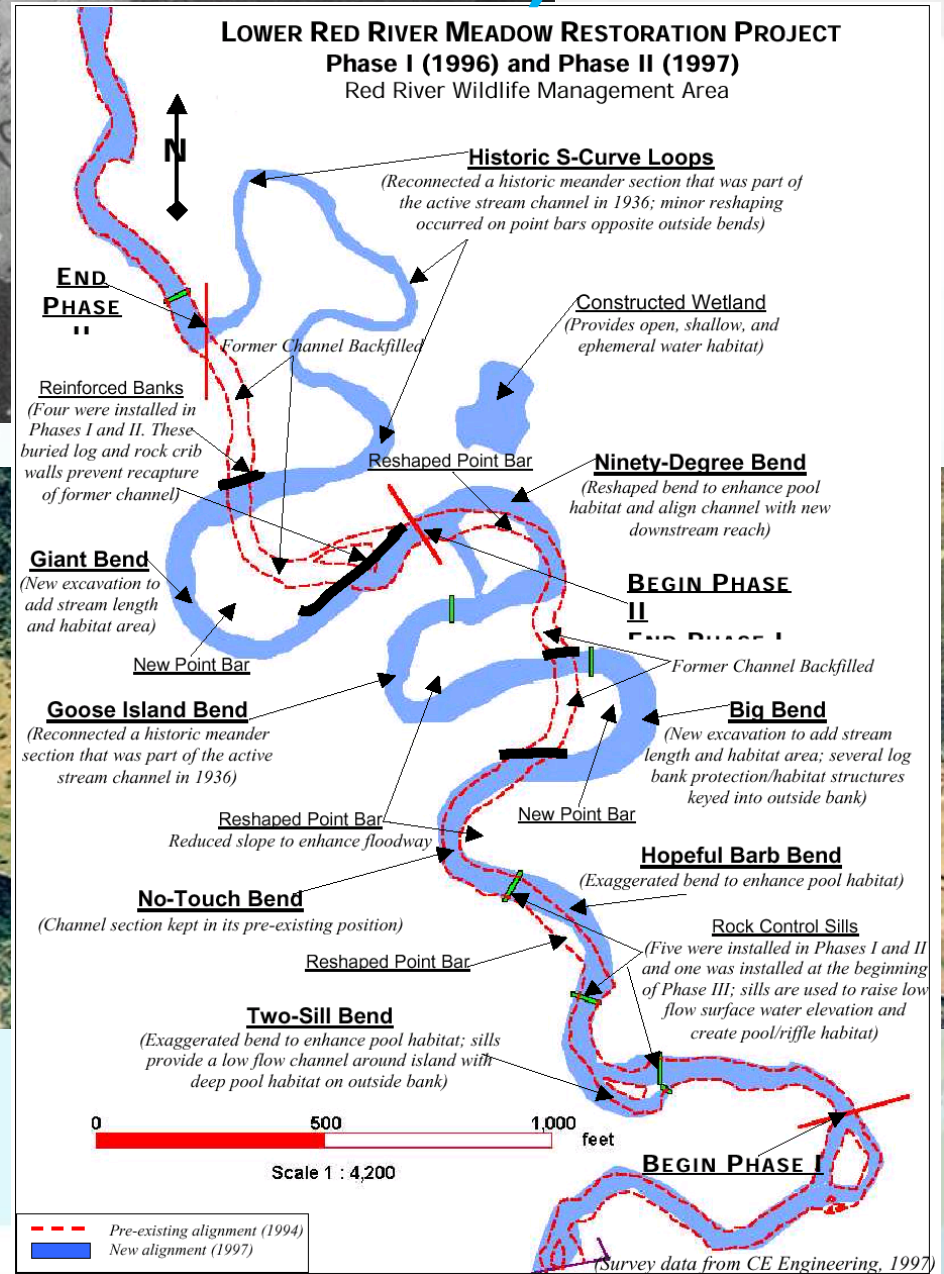


Alterbach (in Austria)



Cases of ERM (Red River in USA)

1930



Space Allocations for Each Model

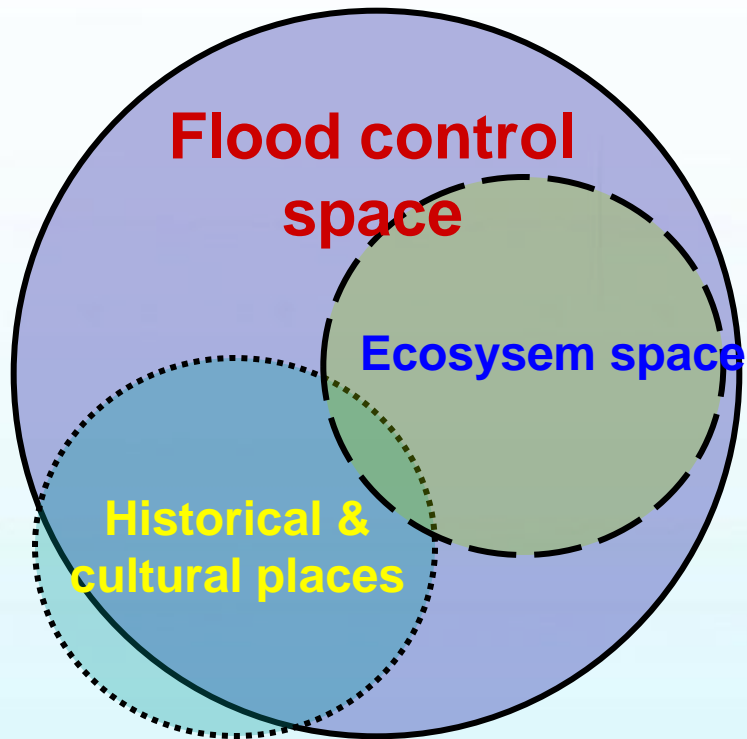
✓ ARM

- **Flood control space** mostly contains spaces for ecological habitat and historical/cultural spaces

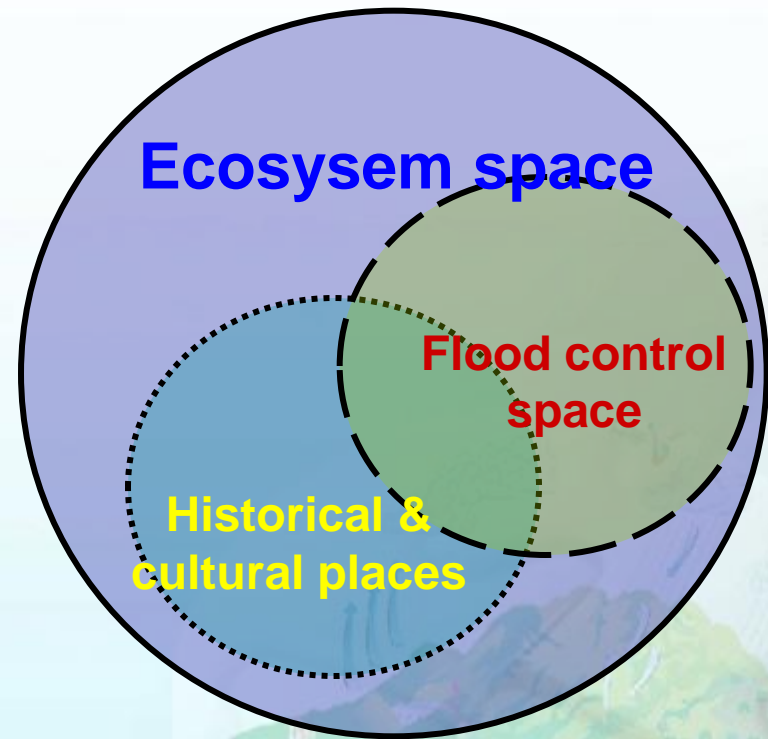
✓ ERM

- **Ecosystem space** needs not be limited within flood control space.
- It can be larger than flood control space and interconnected with neighboring terrestrial habitats.

Spaces for ARM and ERM



Amenity Restoration Model (ARM) (modified from Dr. Shin's)



Ecological Restoration Model (ERM)

Sustainability of Each Model

- **ARM**

- Mostly related much to the **safety of** people, protection of properties and maintenance cost.

- **ERM**

- Indicates the **ecological sustainability**, which means the ecological system once restored sustains in the future without degradation

Reference Models for Each Model

- **ARM**

- Hard to delineate the 'original' stream because of a long time-span, and moreover, urbanization and channelization
- Naturally focused on landscape architecture and sometimes the restoration of historical places

- **ERM**

- Time-span is usually short and reference model is relatively easily obtained from the maps, pictures and data of the stream at reference time

Limitations of ERM in Urban Rivers

- Physical restriction of restoring the stream corridor which were already **permanently changed** with buildings and streets
- Extreme variations of stream flow with and without rainfalls (**urbanization effect**)
- **Water quality problem**: a serious constraint on stream restoration in urban stream
- **High land price** near urban streams → Realization of “**room for river**” is mostly impossible
- **Citizens' level of eyes: ARM rather than ERM**

ARM, ERM – Which one people prefer?



Before rehabilitation (1996)

**Under re-construction for
recreational use in Spring 2009**



**After rehabilitation (1998)
Now in September 2009**

ARM vs. ERM - People like which one?



Before rehabilitation (1998)

After rehabilitation (2000)



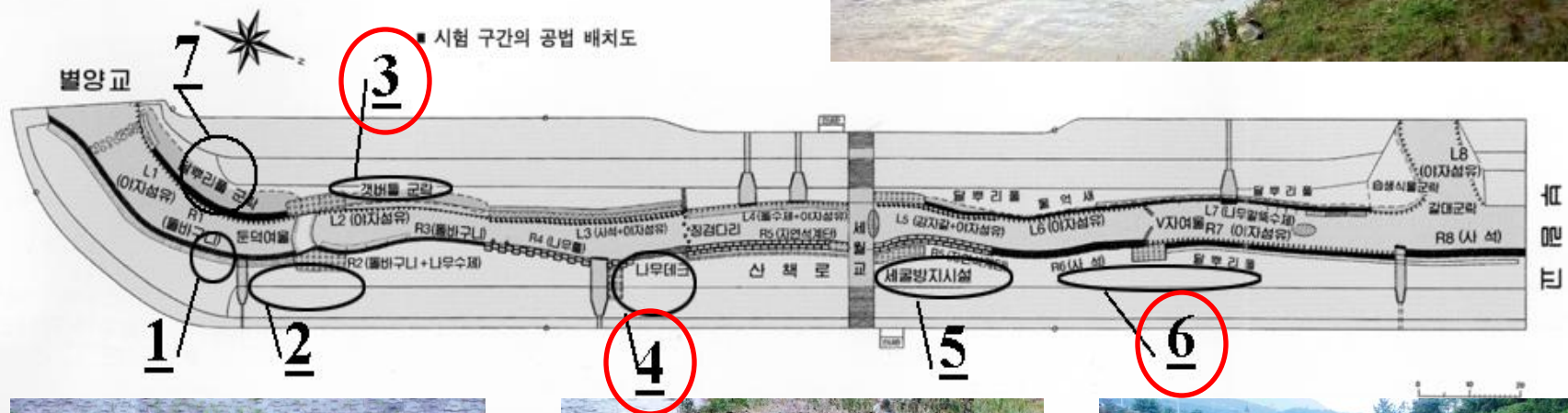
**Now in September 2009
Under reconstruction in Spring 2009**

Problems of ARM in Urban Rivers

- **Susceptible to flood damage** due to various amenity-enhancing works (landscape architecture)
- **Overuse and misuse of material**
– another environmental damage
- **Misleading of the concept of river restoration**
(Ecological restoration is such!?)



Ex 1: Flood damage (340mm for 24 hrs exceeding design rainfall of 385mm) (Yangjae-cheon; August, 1998)



Vulnerable during construction



Scours at immediate downstream of a weir (Changwon-cheon; July, 2009)

Neglect of nature's dynamics



Under construction (July 2009)



Washout during July flood

An artificial island at Deokpung-cheon



Overuse and misuse of material

- Ex 1: Use of quarried stones for low-flow revetment
- Ex 2: Use of large boulders at sandy river



Ex 3: Overuse of pebbles for low-flow revetment

(from Dr. Kim, Haeju)



Conclusions

- ✓ River management practices: changed by the priority of stream functions considered
- ✓ Two types of river rehabilitation model: ARM and ERM, with semi-ERM delineated
- ✓ River space allocation, concept of sustainability and time-span of reference model are different from each model



Conclusions

- ✓ Two models are not usually compatible in most cases; **Semi-ERM may be of a compromise**
- ✓ **Limitations of ERM** to be implemented in urban river: physical restriction, extreme variation in flow, poor water quality, high land price
- ✓ **Problems of ARM** to be implemented in urban river: susceptible to floods, overuse and misuse of material, and misleading of the concept of river restoration
- ✓ People's preference to each model differ from different eras and regions – “**level of eyes**”

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