

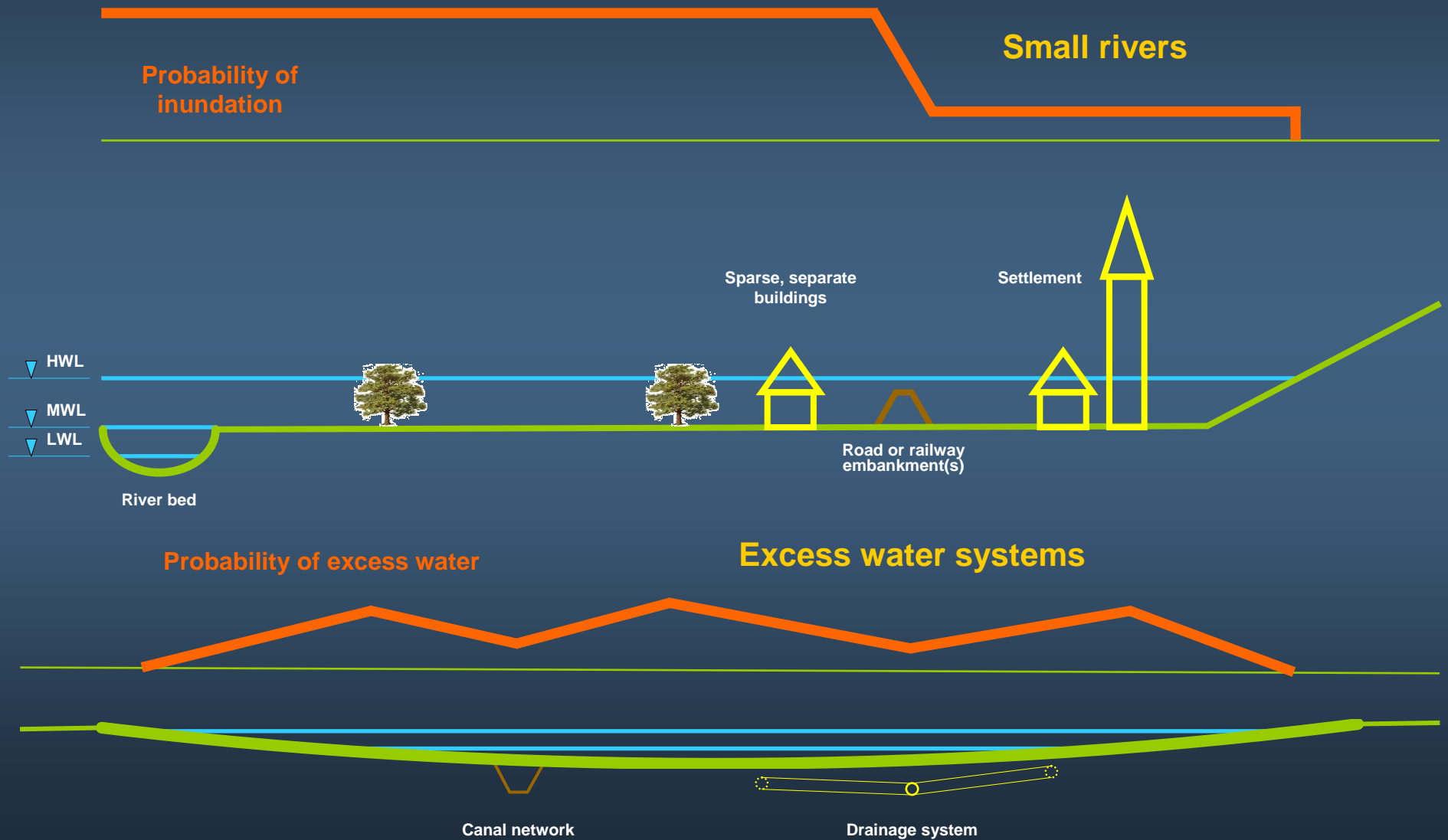
Methodology project – Flood Risk sub-project

Methodology of the Flood Risk Management Planning

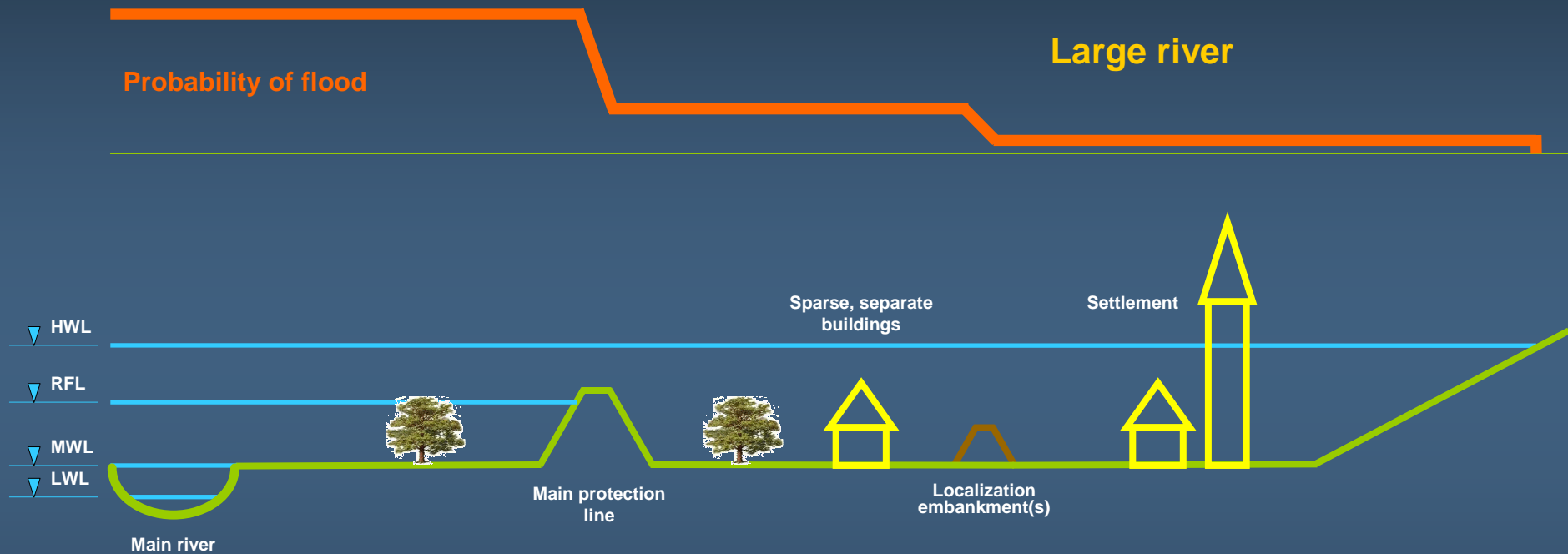
FUTAKI, Károly
Hungary (Flood Risk Consortium)

17 november 2009
Budapest

Flood Hazard Maps



Flood Hazard Maps



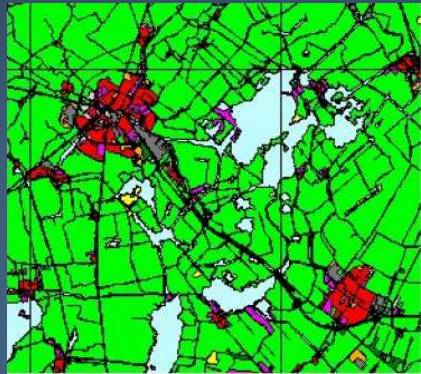
Flood Hazard Map is the input of Flood Risk Map

Flood Hazard and Flood Risk Maps

	Flood Hazard Map	Flood Risk Map
Content	<ul style="list-style-type: none"> ▪ flood extent (according to probability classes) ▪ flood depth ▪ flow velocity ▪ flood propagation 	<ul style="list-style-type: none"> ▪ Assets at risk ▪ Flood vulnerability ▪ Probable damage ▪ Probable loss (per unit time)
Purpose and use	<ul style="list-style-type: none"> ▪ Land-use planning and land management ▪ Watershed management and water mgmt planning ▪ Hazard assessment on local level ▪ Emergency planning and management ▪ Planning of technical measures ▪ Overall awareness building 	<ul style="list-style-type: none"> ▪ Basis for policy dialogue ▪ Priority setting for measures ▪ Flood Risk Management Strategy (prevention, mitigation) ▪ Emergency management ▪ Overall awareness building
Scale	<ul style="list-style-type: none"> ▪ Local level <ul style="list-style-type: none"> - 1 : 25,000 to 1 : 5,000 (various parameters) ▪ National level, whole river basin <ul style="list-style-type: none"> - 1 : 50,000 to 1 : 1,000,000 (ingeneral only flood extent) 	<ul style="list-style-type: none"> ▪ Local level <ul style="list-style-type: none"> - 1 : 25,000 to 1 : 5,000 ▪ National level, whole river basin <ul style="list-style-type: none"> - 1 : 50,000 to 1 : 1,000,000
Accuracy	<ul style="list-style-type: none"> ▪ high: cadastre level for detailed maps ▪ low: national level, whole river basin 	<ul style="list-style-type: none"> ▪ high: cadastre level ▪ low: national level, whole river basin
Target group / use	<ul style="list-style-type: none"> ▪ National, regional or local land-use planning ▪ Flood managers ▪ Emergency services ▪ Forest services (watershed management) ▪ Large public 	<ul style="list-style-type: none"> ▪ Insurance ▪ National regional or local water and land-use managers ▪ National, regional or local emergency services ▪ Large public

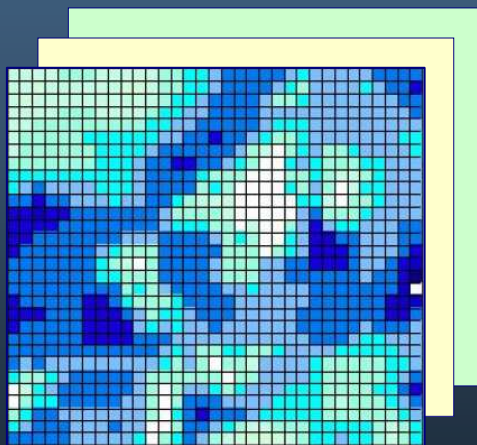
Flood Risk Maps

Exposure



Land-use

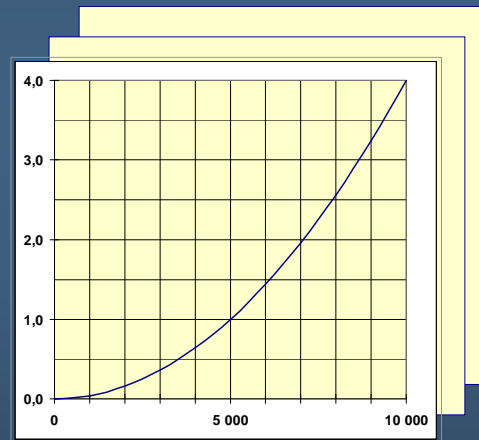
Probability of the hazard



Inundation depth



Impacts

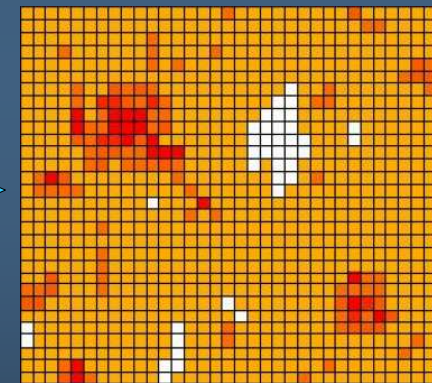


Damage functions

Flow velocity
Flood extension

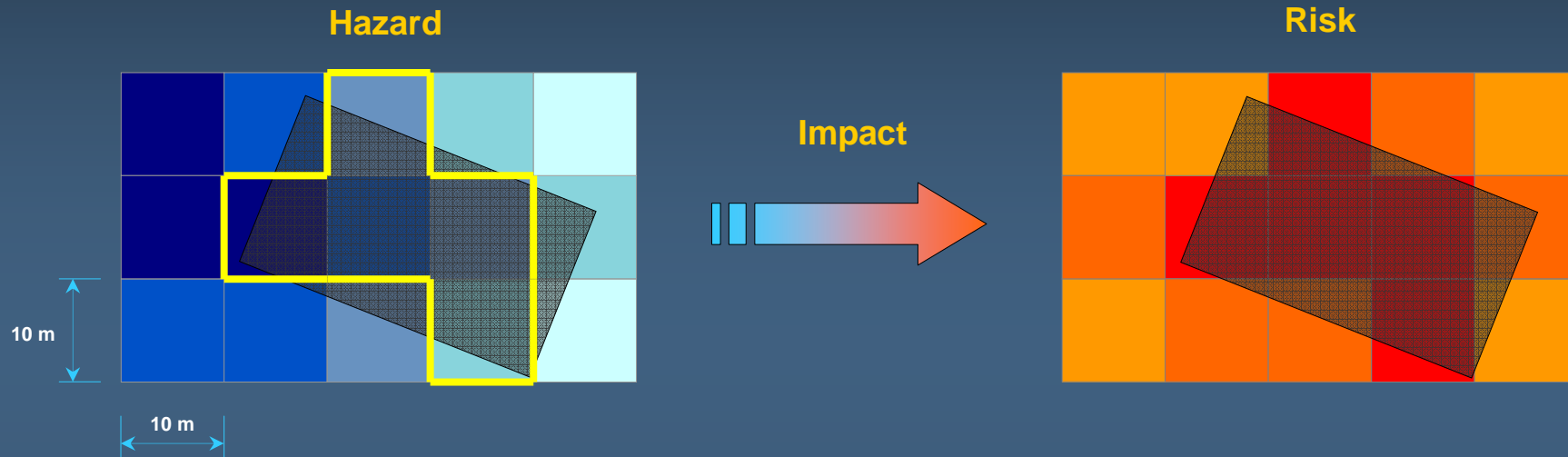


Risk



Damage

Flood Risk Maps



- both Flood Hazard and Flood Risk Maps use pixel size of 10 x 10 m (depends on currently available DTM)
- Overlapping method with cadastre level:
 - estate value is the same in each pixel
 - algorithm to calculate risk in each pixel (e.g. > 50%)

Data for FRM Planning

Flood Impacts Matrix

Direct impacts

Tangible impacts

- residential buildings
- industrial, commercial, logistic buildings
- agriculture
- infrastructure
- clean-up, disinfection costs

Intangible impacts

- deterioration of human health (physical, mental)
- souvenirs, pets
- national monuments, archeological sites
- religious sites
- sport- and leisure facilities
- values under environmental protection
- alive environmental elements (flora, fauna, habitats)

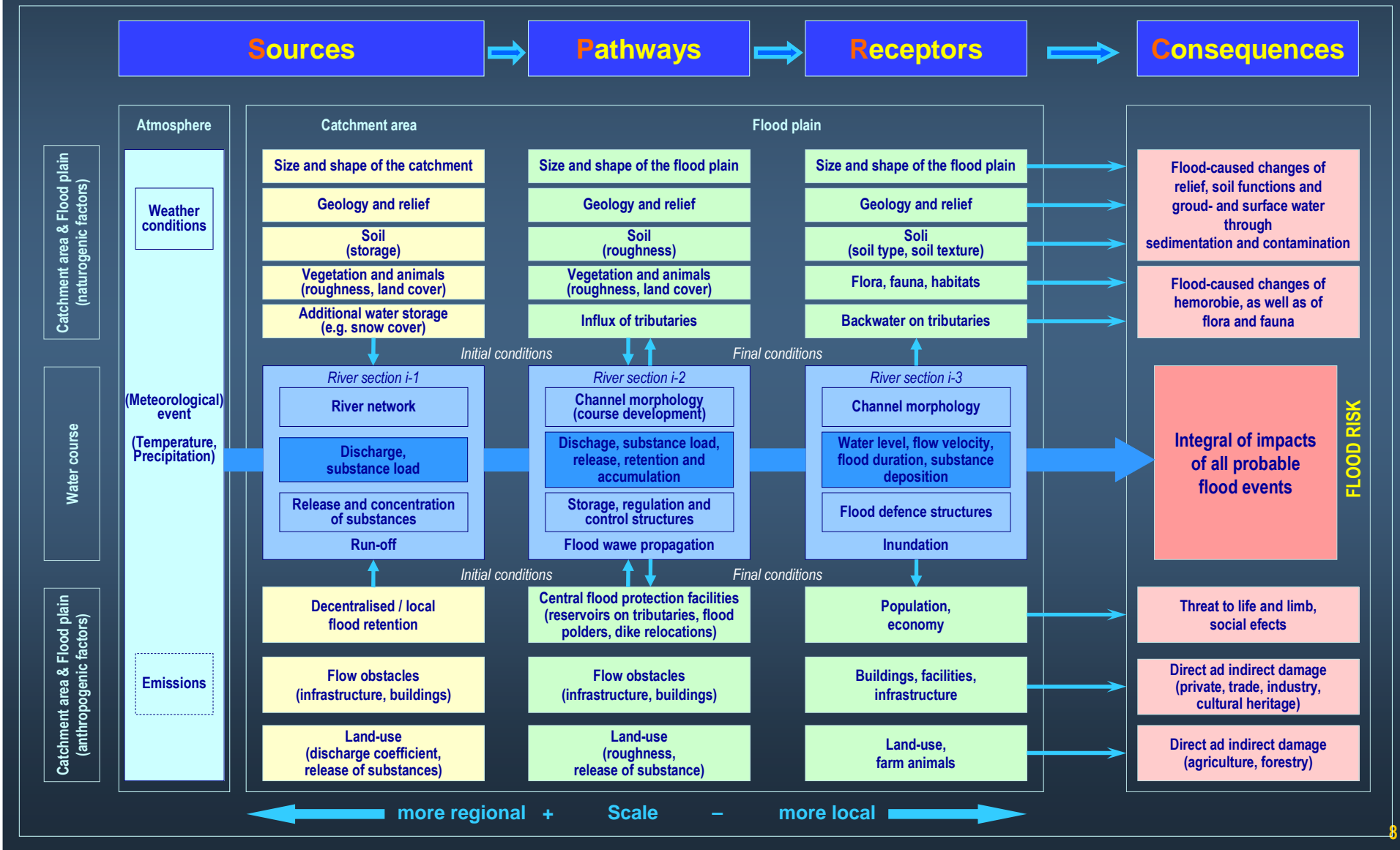
Indirect impacts

- evacuation costs
- losses of revenue
- costs of flood protection services
- environmental pollution caused by flooded objects (pollution of drinking water wells, decrease of land-values, soil erosion, etc.)
- increases of water resources
- secondary tangible losses

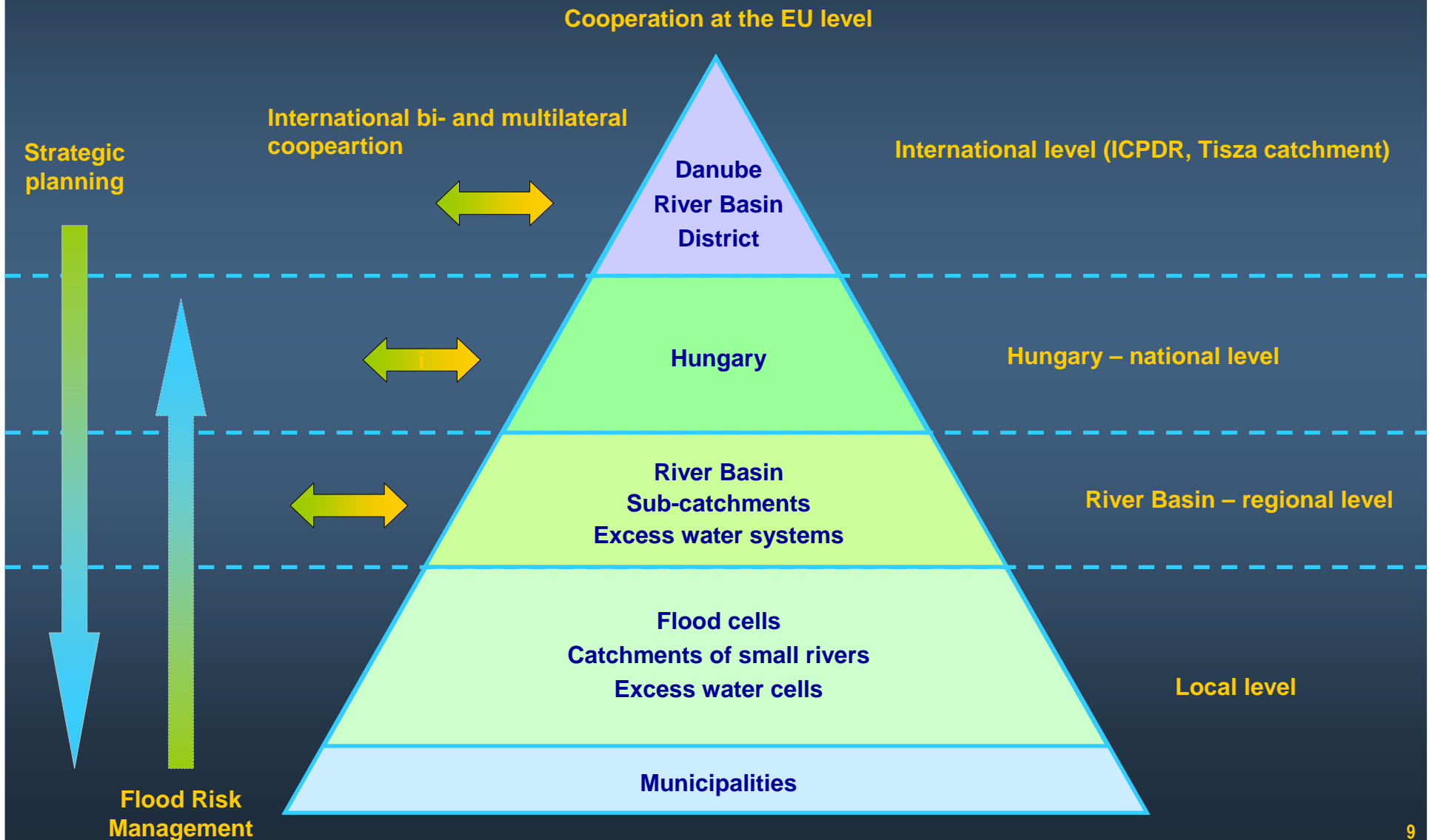
- discomfort caused by evacuation, repatriation
- loss of confidence
- effects on inert environmental elements (surface- and groundwater, soil)

Concept of Flood Risk System

Water courses



Levels of planning



Strategic planning

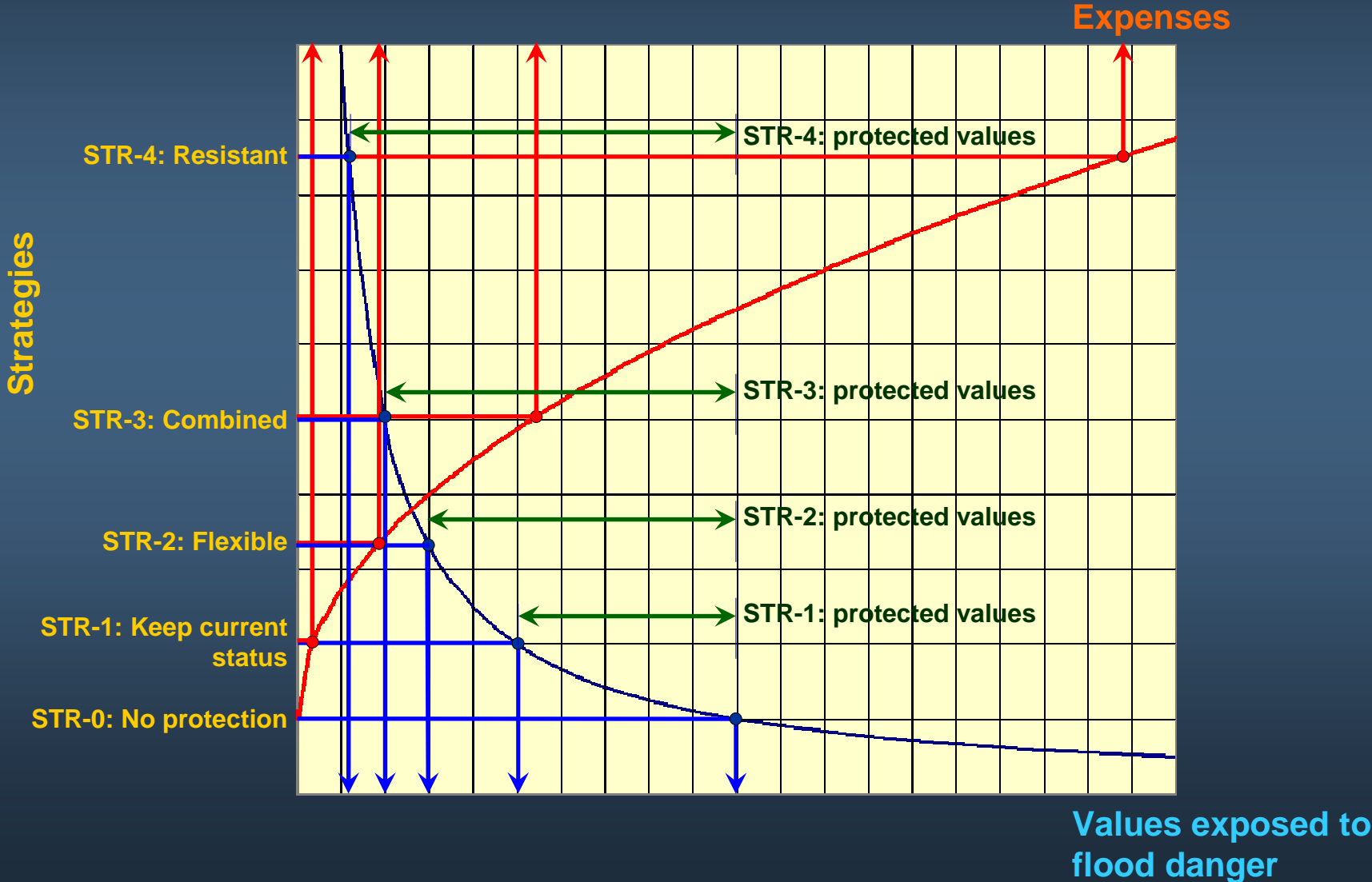
Scenarios:

- consequences of FRM take effect in long run (uncertain future)
- long-term scenarios – to 2050 or 2100 (future development trends):
 - climate
 - demography
 - economy
 - land-use

Strategy:

- collection of FRM Strategic Measures
- versions are grouped around guiding principles (e.g.):
 - flexible
 - resistant
 - combined
- selection with
 - Multi-Criteria Analysis (MCA)
 - Benefit-Cost Analysis (BCA)
 - combined MCA & BCA

Theoretical comparison of strategies



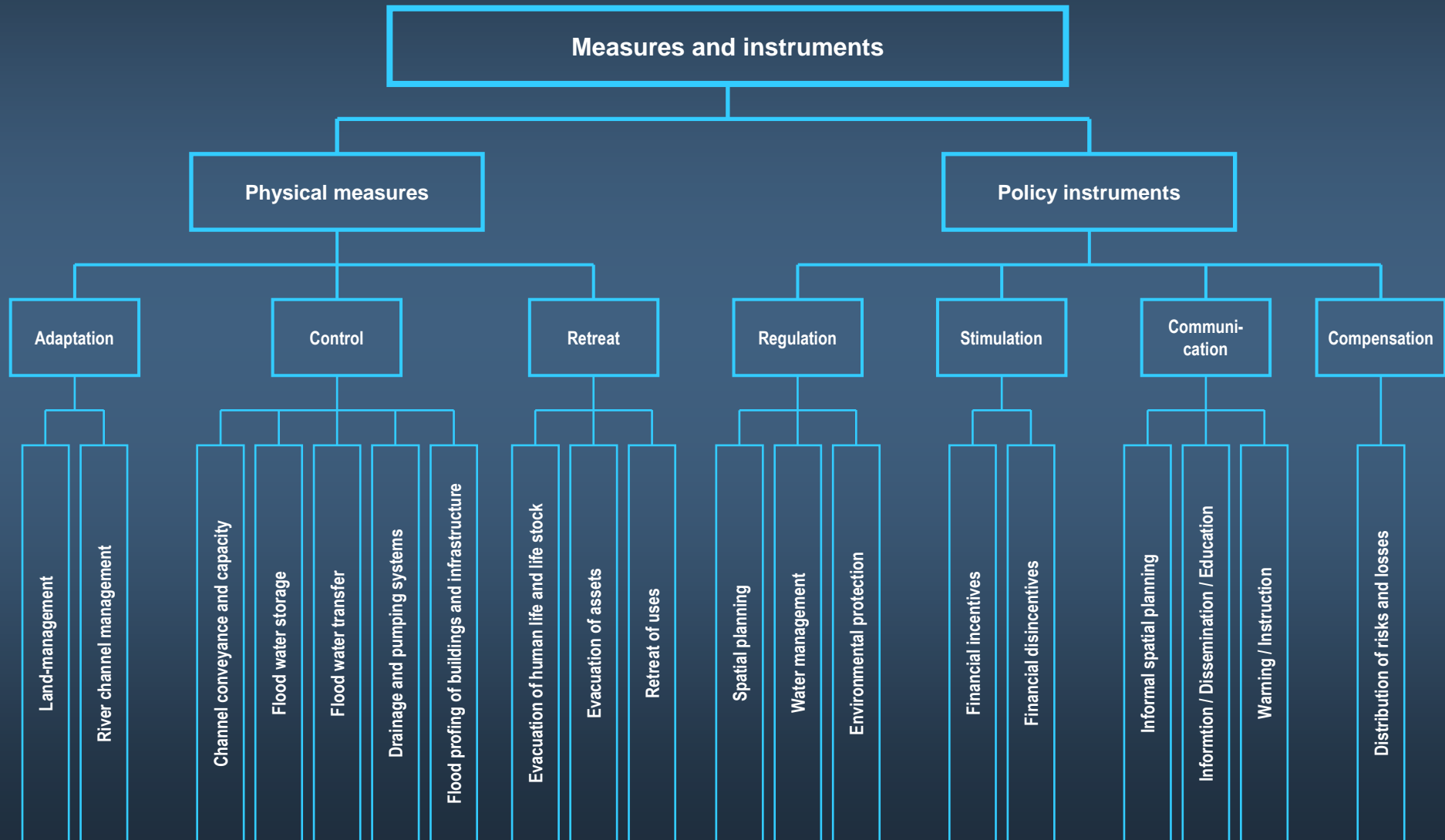
Strategy selection

Scenarios:	A	B	C	D	Evaluation
Strategies:	Selected evaluation indicators ($X_{i,n}$)				
STR-0	X_{0_A}	X_{0_B}	X_{0_C}	X_{0_D}	X_0
STR-1	X_{1_A}	X_{1_B}	X_{1_C}	X_{1_D}	X_1
STR-2	X_{2_A}	X_{2_B}	X_{2_C}	X_{2_D}	X_2 (min!)
STR-3	X_{3_A}	X_{3_B}	X_{3_C}	X_{3_D}	X_3
STR-4	X_{4_A}	X_{4_B}	X_{4_C}	X_{4_D}	X_4

Criteria to assess strategies are based on impacts:

- on people (e.g.: population or real estates affected)
- on economy (e.g.: cost-effectiveness of measures)
- on environment (e.g. environmental objectives)

Type of FRM measures



National FRM principles

Definition of FRM principles:

- approval of time schedule for Strategy and FRM planning
- ensuring financial background
- approval of political principles (for river basin strategies) :
 - equal security or
 - equal risk
 - degree of participation of the state risk management
 - basic risk management (valid for everybody)
 - self-care (self-insurance)
 - relief principles in case of disaster
 - etc.

FRM planning process

Strategic planning in each river basin:

- definition of FRM objectives (harmonized with environmental objectives)
- development of Strategic Plans (measures)
- public participation in planning activity (at river basin level)
- selection of best FRM strategy for river basin (MCA & BCA)

Development of local FRM plans based upon Strategic Plans for river basin:

- definition local FRM objectives (harmonized with river basin level objectives)
- development of FRM plans at local level
- public involvement (at local level)
- selection of best FRM plan for flood cells

Implementation of FRM plans

FRM planning process

On the basis of local FRM plans:

- development of municipal FRM measures
- public involvement (at municipal level)

Using local / municipal FRM plans, measures may be arbitrarily grouped by:

- regions
- counties
- micro regions
- RBMP planning units
- projects
- etc.

The FRM plans are not restricted only to flood-prone areas:

- measures may be applied in upper part of the catchment
- planning proces should follow the river flow direction (downstream)

Public participation

- Sensibility of the society is significant
- Results for each step of planning process should be available in suitable form for stakeholders
- Results of public participation process should be taken into account while finalising the FRM Plans



Relationship between WFD and FRD

Effects of FRMP measures with relation to environmental objectives are:

- identical with the RBMP measures, support environmental objectives (water retention, flood plain vegetation, etc.) - positive effects for both FRM and RBM
- in conform (emergency reservoirs, water governance facilities, etc) - need to comply with ecological requirements
- conflicting (construction of dikes, channel capacity enhancement, water transfer, etc.)

Derogations (designate water body as heavily modified):

- changes to the hydromorphological characteristics would have significant adverse effects on:
 - the wider environment
 - navigation, incl. port facilities and recreation
 - activities for the purposes of which water is stored, such as drinking-water supply, power generation or irrigation
 - water regulation, flood protection, land drainage
- the beneficial objectives served by the artificial or modified characteristics of the water body cannot, for reasons of technical feasibility or disproportionate costs, reasonably be achieved by other means, which are a significantly better environmental option

Sustainability is the guiding principle:

- all possible measures should be taken to prevent from further degradation of status
- mutual planning approach and close cooperation between FR and RB managers

Q & A

