<<EUROPE-INBO 2013>>
WATER FRAMEWORK DIRECTIVE

Ray Earle, Ireland

THE ROLE OF ECONOMICS IN THE WFD IMPLEMENTATION PROCESS

PLOVDIV, BULGRIA – 14th Nov. 2013
Hotel Imperial

WATECO - Paving the way for the 3-step approach

Second Roundtable

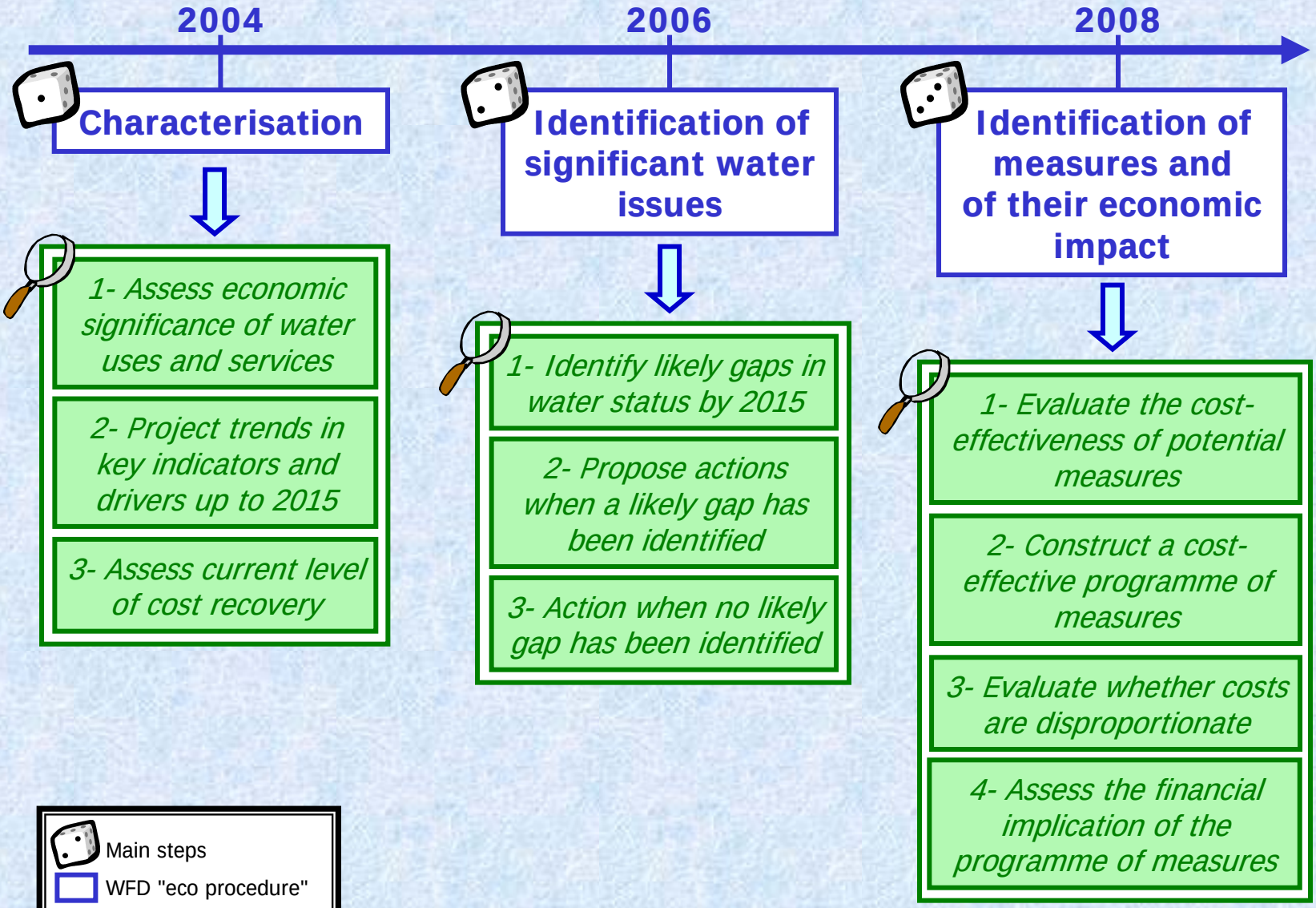
- Economic Analysis for determining the most Cost Effective Combination of Measures
- Value of Ecological Services
- Principle of Cost recovery
- Sources of Funding for PoM
- Access to EU Funding (Structural and Cohesion Funds etc.)

PRELIMINARIES REGARDING ECONOMICS AND WFD

- A double role for economics in the WFD process
  - provide information in the decision-making process
  - play as a measure for the implementation
- The higher the risk of gap, the more intensive the use of economics
  - potential non-compliance with the goal: HMWB, derogations

The WATECO Guidance:
a detailed road-map on how to integrate and properly use economics in WFD process

FLOW CHART OF THE USE OF ECONOMICS



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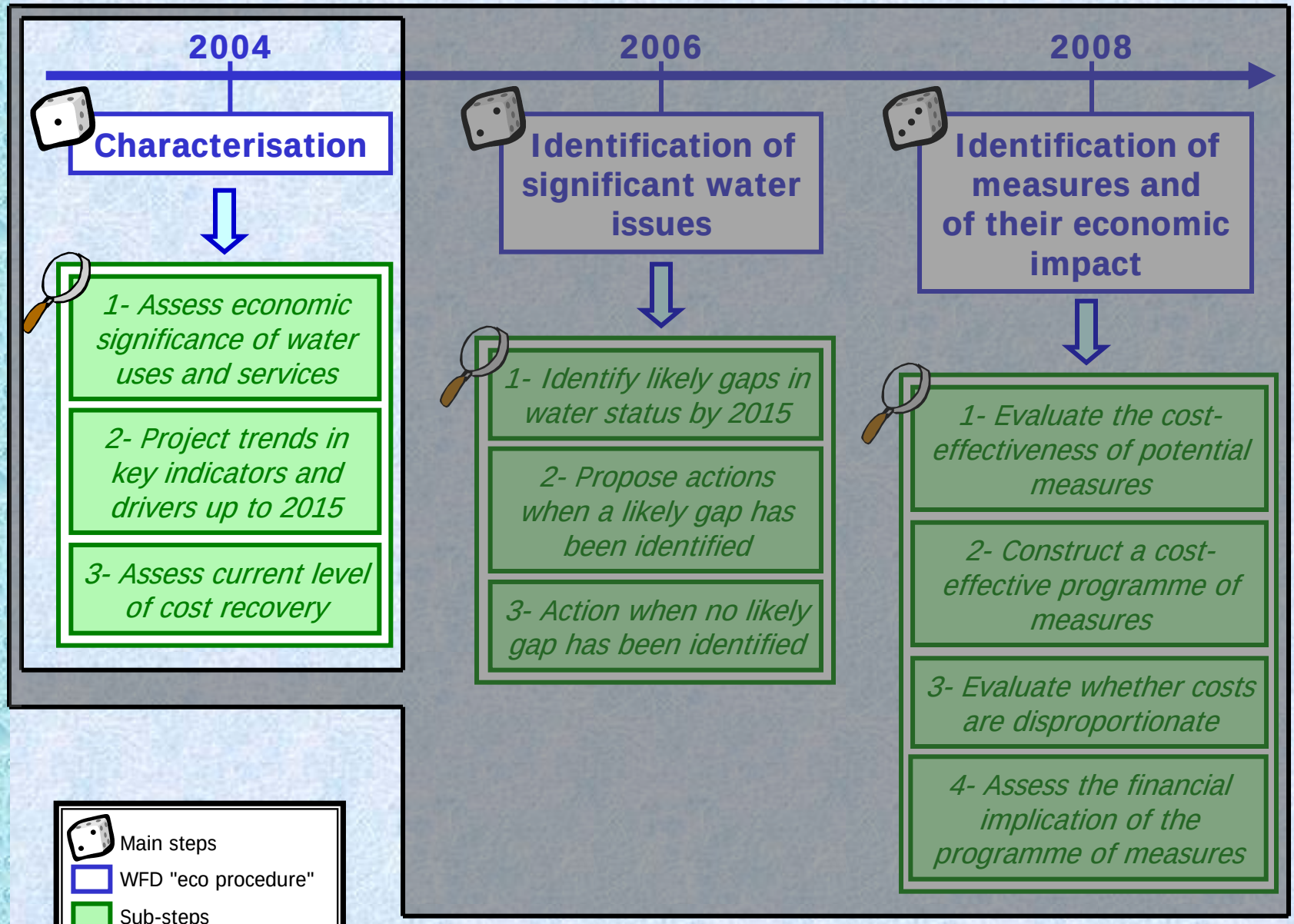
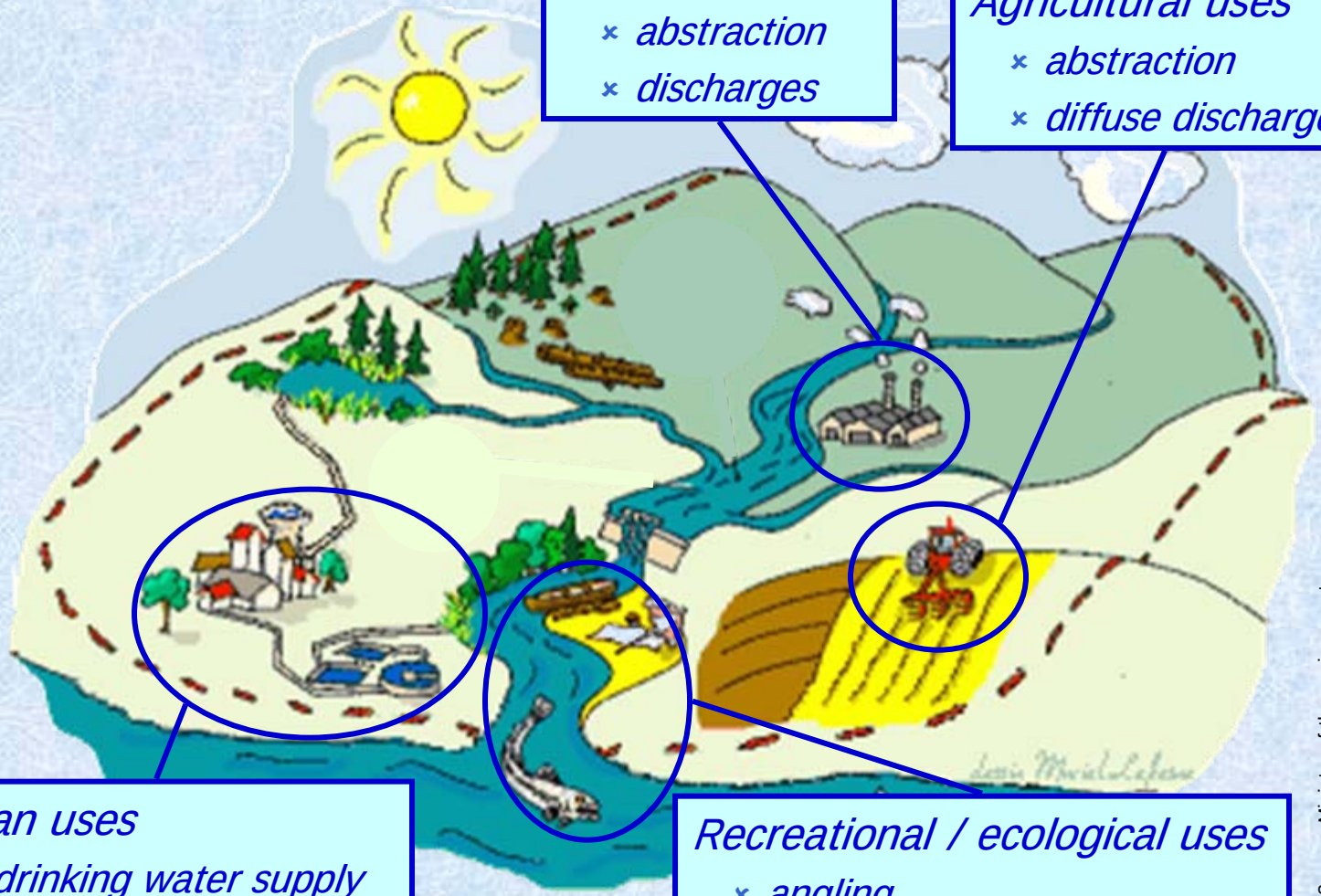


MAJOR WATER USES



Industrial uses
- abstraction
- discharges

Agricultural uses
- abstraction
- diffuse discharges

Urban uses
- drinking water supply
- wastewater treatment

Recreational / ecological uses
- angling
- bathing...

Source: Ministry of the environment, Québec, Canada

ECONOMIC SIGNIFICANCE OF WATER USES AND SERVICES

Aspects closely connected

Water uses	Technical data	Economic data
Abstraction for drinking water production	- surface water: 100Mm^3/yr - groundwater: 576Mm^3/yr ...	- cost/m^3 produced depending on the type of treatment: denitrification... - cost of damages caused by abstraction...
Discharges from urban wastewat...	- 7,42M EH ...922 treatment plants - 6,24...	- cost/m^3 - cost of specific treatments: nitrogen, phosphor... ...t of damages ... ...rges...
Industry	*Abstraction* surface water: 844Mm^3/yr; groundwater: 782Mm^3/yr *Discharges* ...158 treatment plants...	- cost/m^3 depending on the origin of the water: self abstraction, public utility... - annual turnover - cost of water/unit...
Agriculture	*Abstraction* surface water: 14Mm^3/yr; groundwat... 110Mm^3/yr *Discharges* - MOX: 2,18M EH; nitrogen: 1M EH; ...phor: 0,29M...	- cost of water/surface ...ost of dama...
Recreation	- number of tourists ...number of fishermen...	- average daily expense - local income generated by these activities...

Identification of significant uses & services: cf. 2004 characterisation

EXAMPLES OF USEFUL DATA FOR THE DESCRIPTION OF THE DOMESTIC SECTOR

Water uses	Technical data	Economic data
Drinking water supply	- volume of raw water abstracted: surface / groundwater - volume of drinking water distributed - leakage rate - population connected to public water system - population with self-supply - number of drinking water supply companies ...	- cost/m^3, global and detailed (operating costs, financial costs, etc.) - cost/m^3 produced depending on the type of treatment: denitrification... - cost of damages caused by abstraction - turnover of water supply companies ...
Wastewater treatment	- population connected to sewerage system - population connected with wastewater treatment plant - number of treatment plants - population with individual wastewater treatment systems - number of wastewater treatment companies ...	- cost/m^3, global and detailed (operating costs, financial costs, etc.) - cost of specific treatments: nitrogen, phosphor... - cost of damages caused by discharges - turnover of wastewater treatment companies ...

QUESTIONS TO TACKLE WHEN COLLECTING DATA

Be pragmatic: adjust to your needs

- **Scale issues / (dis)aggregation**
  - ⇨ *e.g. when describing impacts and pressures: work at the scale of significant pressures, water uses/services*
  - ⇨ *e.g. when aiming at public participation: work at the (local) scale people feel concerned and get involved*

Always be transparent about methods you use, the degree of uncertainty, etc.

- **Uncertainty**
  - Accuracy
  - ⇨ *depends on the significance of the impact described: limited accuracy is negligible when impact has little significance*
  - ⇨ *depends on the use of the data: limited accuracy of individual data may be acceptable when data is aggregated at large scale*
  - Reliability
  - ⇨ *who produces/stores data? under what form?*
  - ⇨ *how often is it updated?*
  - ⇨ *...*

***For 2004**: apply cost-effective methods*
***For the future**: consider new organisation for data production, storage and collection*

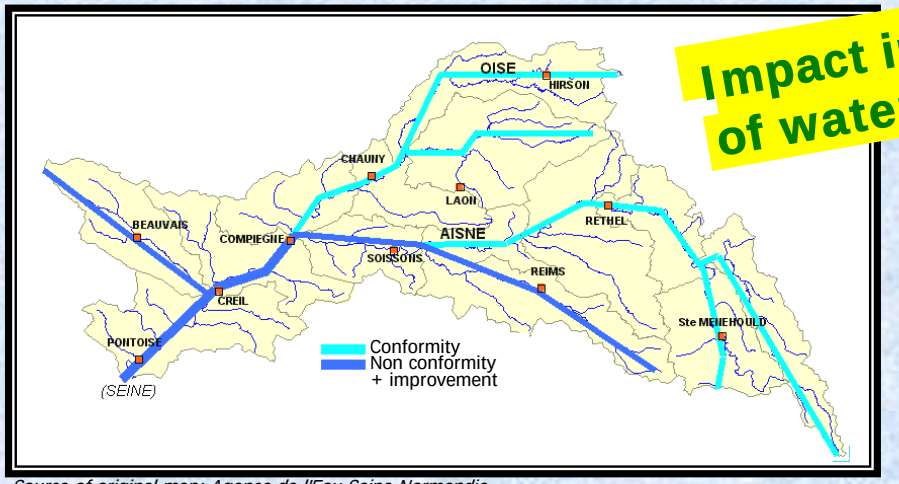
WHAT IS THE USE OF THE DATA?

- employment in various economic sectors; demographic evolution...
  - ⇨ *appraise future water demand when constructing baseline scenario*
- volume of effluents discharged; of raw water abstracted...
  - ⇨ *determine pressures and impacts of activities*
- income / inhabitant; willingness to pay for higher water quality...
  - ⇨ *estimate the ability to pay to assess whether costs of possible measures are disproportionate*
- cost of environmental damages; opportunity cost of water...
  - ⇨ *assess cost-benefit ratios when comparing / selecting the most cost-efficient measures*
  - ⇨ *determine whether costs are disproportionate or not*
- detailed structure of the price of water / m^3; cost of specific treatments for drinking water production (denitrification...)...
  - ⇨ *identify cross-subsidies and externalities when assessing the level of recovery of costs of water services*
- daily expenses by tourists; turnover of fishing industry...
  - ⇨ *assess the benefits linked to a water body*

When ultimate use of data is not obvious, explain it clearly to all actors

BASELINE SCENARIO UP TO 2015

	Trends	Impact: Present	Impact: 2015
Continuation of past trends	- demography - changes in land planning...		
Impact of water policies	- implementation of water directives - planned investments in the water sector - new technologies...		
Critical uncertainties	- new CAP - climate change...		



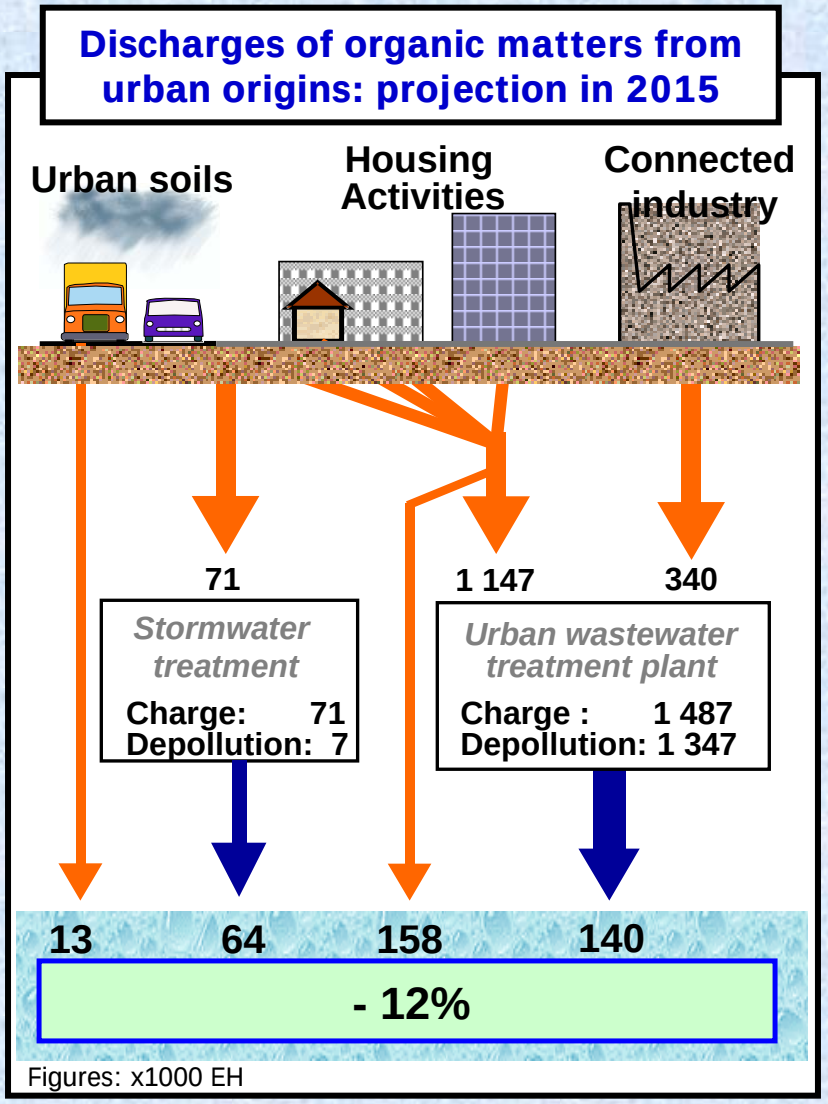
Impact in terms of water status

Source of original map: Agence de l'Eau Seine-Normandie

EXAMPLE OF PROJECTION OF CERTAIN CHANGES IN WATER POLICY VARIABLES: *APPLICATION TO URBAN DISCHARGES*

Hypothesis: full implementation of urban wastewater directive *(91/271/EEC)*

- **Actions**
  - 306 000 more inhabitants connected to pipes
  - rehabilitation of pipes
  - creation, extension, improvement of 270 existing treatment plants (2,175M EH)
  - improvement of stormwater collection
- **Impacts**
  - better collection rate
    ⇨ *more effluents to treat*
  - increased treatment performances
    ⇨ *higher depollution rate*



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EXAMPLE OF PROJECTION OF CERTAIN CHANGES IN WATER POLICY VARIABLES: *APPLICATION TO URBAN DISCHARGES*

Hypothesis:
full implementation of urban wastewater directive
(91/271/EEC)

- **Estimation of costs**

Actions	Cost
306 000 more inhabitants connected to pipes	610 M€
rehabilitation of pipes	75 M€
creation, extension, improvement of 270 existing treatment plants	323 M€
improvement of stormwater collection	110 M€
Total estimated costs	*1 113 M€*

- **Impacts**
  - 69 M€/yr if actions are phased between 2000 and 2015
  - 185 M€/yr if directive deadline (2005) is implemented
  - 101 M€/yr if implementation is "postponed" until 2010

Figures to be compared with actual investment: 46 M€ in 2000

CURRENT COST RECOVERY

Estimate all costs of water services:

- financial costs: operating, maintenance and capital costs
- environmental costs: damages caused by the water service
- resource costs: opportunity costs

E.g. 1m³ in the household sector: 2,63€/m³

Only internalised ones

Financial costs

	Ratio	Amount (€)
Operating cost		
Wages	*35%*	0,74
Electricity	*10%*	0,21
Outsourcing	*21%*	0,45
Misdemeanours	*8%*	0,17
Sub-total	*74%*	*1,57*
Capital costs		
Investment	*16%*	0,34
Depreciation	*10%*	0,21
Sub-total	*26%*	*0,55*
TOTAL	***100%***	**2,12**

Environmental costs

Fee	Amount (€)
Abstraction	0,03
Discharge	0,48
TOTAL	**0,51**

Resource costs

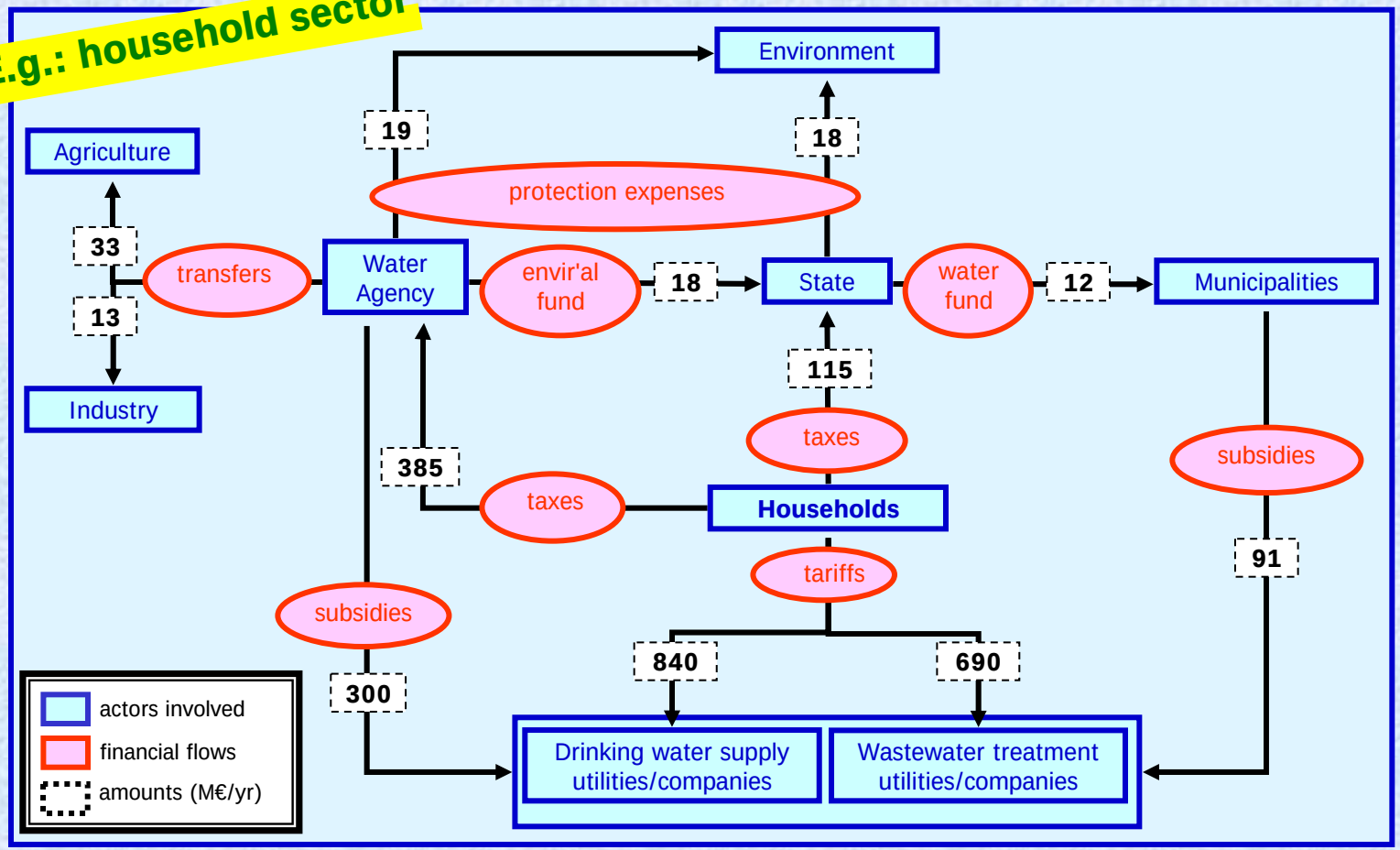
	Amount (€)
	0
TOTAL	**0**

Not covered

CURRENT COST RECOVERY

Identify financial flows in main sectors

- households
- agriculture
- industry



RECOVERY RATE OF THE ECONOMIC COSTS

$$\text{Cost Recovery Rate} = \frac{\text{Total revenues - subsidies}}{\text{Total costs}} \times 100$$

Source: WATECO Guidance

Elements	Figure (M€)	Comments
Total revenues	1915	Service paid + internalised environmental costs through fees paid to water agency
Subsidies	> 391	Supplementary subsidies may be awarded in rural municipalities. Not fully included here.
Total costs	> 1921	Financial costs are estimated Environmental costs are only partially accounted and estimated. Resource costs are not included

Cost Recovery Rate :

< 79 %

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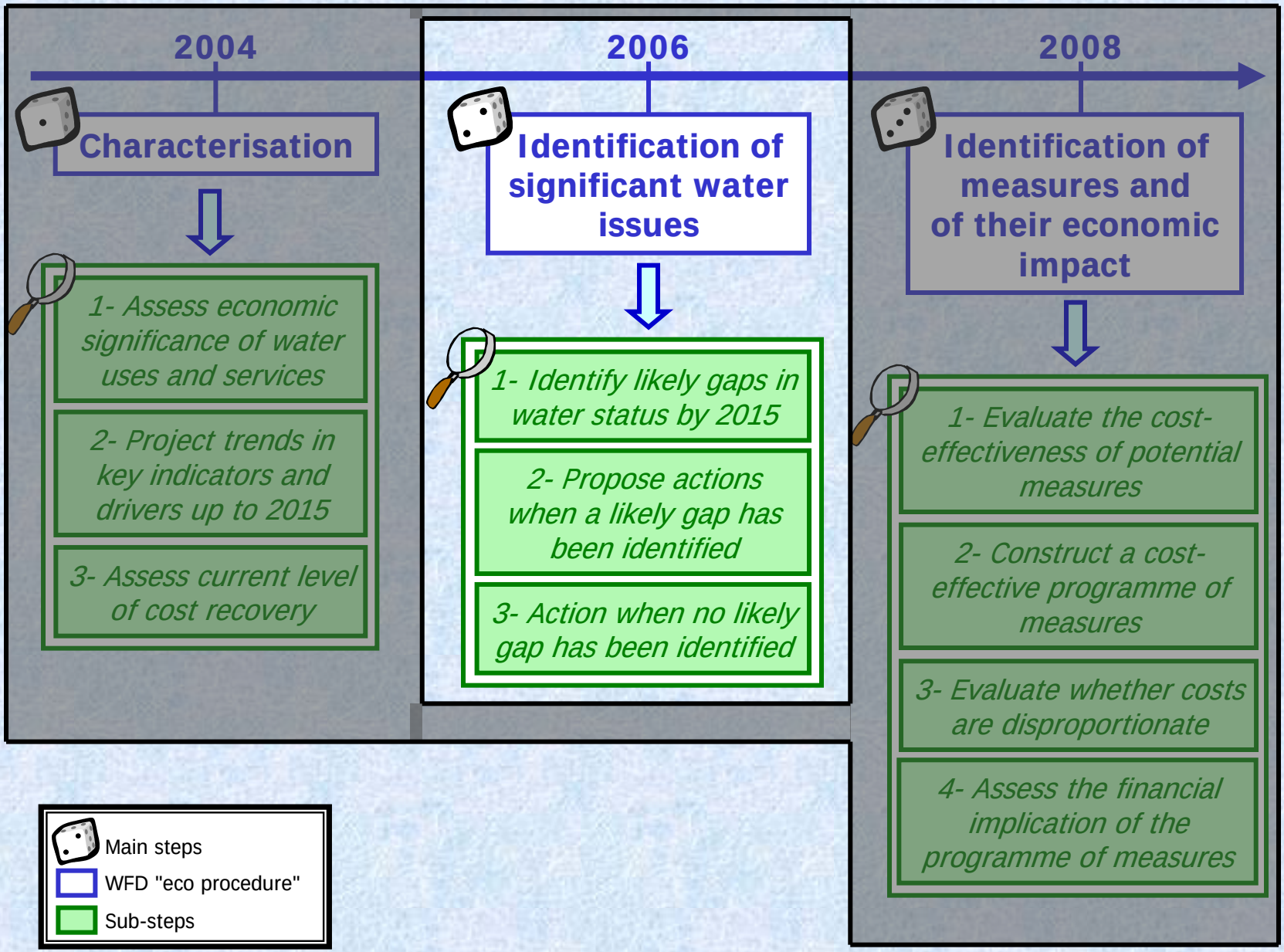
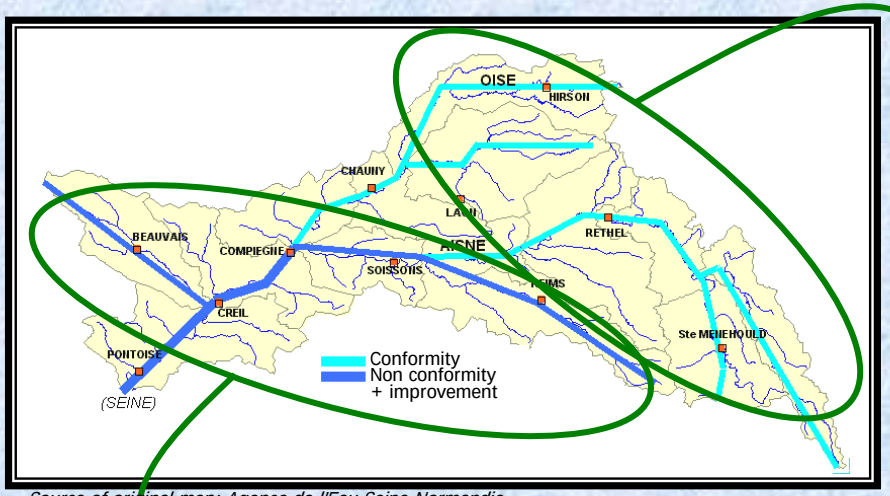


IDENTIFICATION OF POTENTIAL GAPS IN STATUS



Source of original map: Agence de l'Eau Seine-Normandie

No likely gap in 2015

- identification of water bodies concerned
- pre-estimation of the cost of the measures
- pre-identification of the impact on socio-economic groups

Likely gaps in 2015

- identification of water bodies concerned
- identification of the main drivers of pressures
  - e.g.1: salted effluents from former mines discharging in an aquifer
  - e.g.2: dam for flood protection in an estuarine...
- pre-identification of supplementary measures
  - e.g.1: removal of salt tips, pumping wells...
  - e.g.2: removal of dam and mitigation measures: higher dikes, new water resources...

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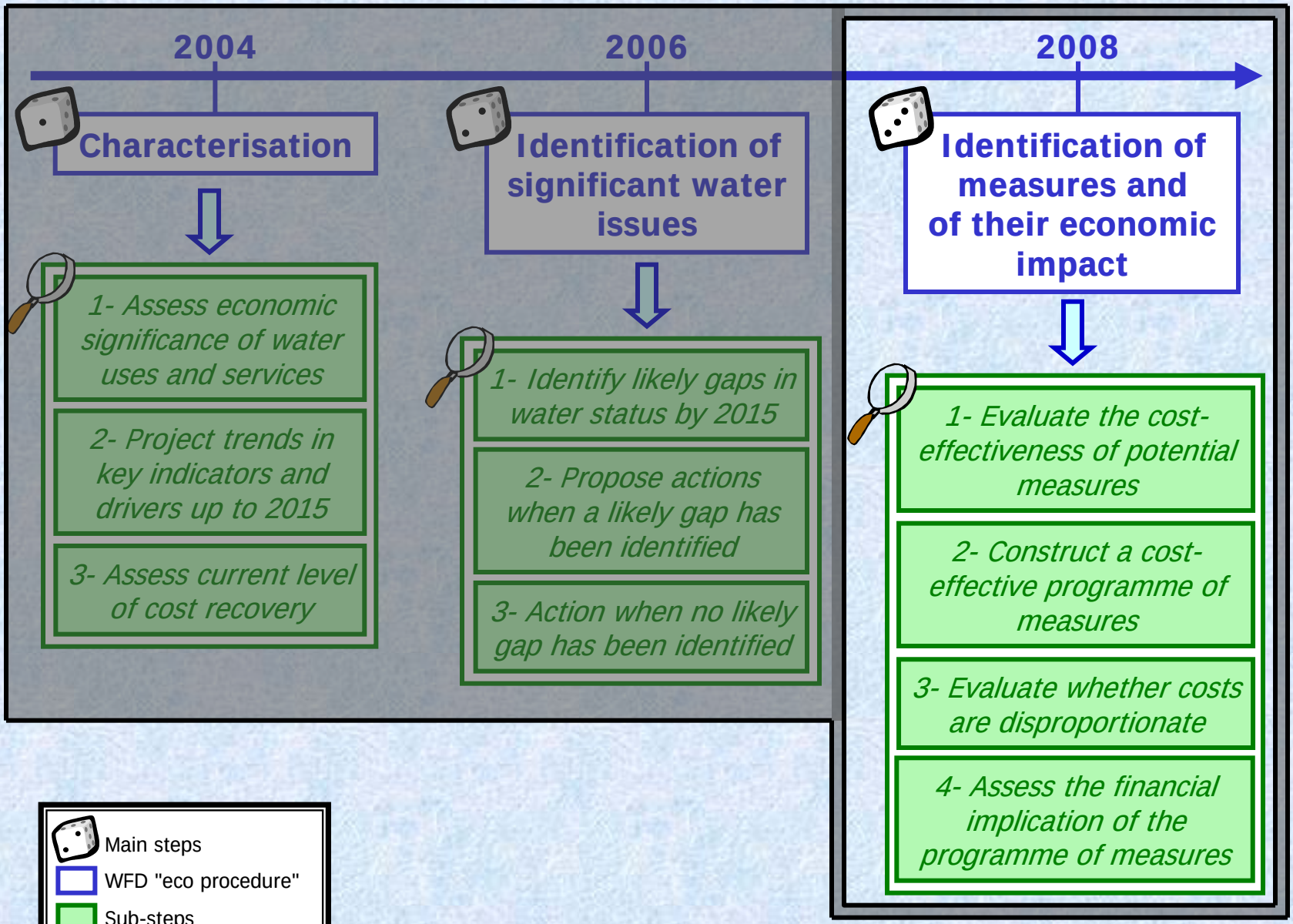


BASIC MEASURES

Measures required for the implementation of directives

E.g. drinking water directive (98/83): nitrates < 50mg/l; pesticides < 10µg/l

Which measure could best achieve compliance with these norms at the lowest cost?

Measure	Effectiveness	Costs	Comments
Preventive Co-operative agreement with farmers: change in cultivation methods vs. compensation	Full compliance with norms due to the improvement of the quality of raw (ground)water	0,29€/m^3	Action at source enhances likeliness of using this resource in the long term and facilitates compliance with potential future stricter norms
Curative New treatment facilities: filtration, denitrification	Full compliance with norms due to higher effectiveness of new facilities (once they will be in operation)	0,21€/m^3 (nitrates) 0,06€/m^3 (pesticides)	Treatment facilities may not suffice if nitrates concentrations in groundwater keep increasing

Associated benefits of preventive measures may also be considered: improvement of raw water quality, potential better protection v. floods, farmers' awareness…

SUPPLEMENTARY MEASURES

Measures required to fill the gap in water quality between the result of business-as-usual evolution and GES

E.g. given existing uses and their likely evolution, it is necessary to increase the water flow of a river (+50l/sec.) to reach GES

What possible measures for improving the water flow?

M1. Reduce water demand

A- Water Saving Programme (WSP) in the agriculture sector:

- reduce the demand
- implement more efficient technologies
- ...

B- Water saving programme (WSP) in the urban sector

M2. Increase the efficiency of the water distribution networks

A- In urban areas

B- In rural areas

M3. Import water from another basin

SELECTION OF SUPPLEMENTARY MEASURES: COST-EFFECTIVENESS ANALYSIS

Which measures could ensure the greatest increase in water flow at the lowest cost?

Goal: +50l/second to achieve GES

Measures	Maximum water saving (m^3)	Annual Equivalent Cost (€)	AEC/m^3	Maximum flow increase (l/sec.)	AEC/l/sec.
Water imports	unlimited		0,224	unlimited	7 560
Efficiency in water networks	695 258	58 072	0,260	1,11	5 232
Installation of meters	88 989	25 376	0,280	2,8	8 993
Saving campaigns for consumers	103 820	17 744	0,170	3,3	5 390
Saving programme for households	136 330	20 805	0,150	4,3	4 813
Saving programme for firms	48 589	5 201	0,110	1,5	3 376
Saving programme for institutions	27 822	5 300	0,190	0,9	5 896
Water recycling	350 000	92 855	0,260	11,1	8 367

Ranking may change depending on the indicator
⇨choose it carefully

Source of the original table: "*Scoping and testing key elements of the economic analysis for the WFD*", Ministry of the Environment, Government of Navarra, Spain, 2002

ASSESS THE DISPROPORTION OF COSTS

Description of the case	
Type of water body	aquifer close to former salt mines
Pressure	discharge of salted water from salt tips
Measure 1	construction of lines of pumping wells downstream the highly polluted areas
Measure 2	construction of lines of pumping wells downstream the highly polluted areas + in the centre of the pollution plume

how costly?
⇨ cost-benefit analysis for each measure

Estimated costs (M€)	
Construction of the wells	9
Operation of the wells	8,9
Connection of wells (11km)	2,5

Estimated benefits (M€)	
For direct users	
Agriculture : avoided damages to equipment, soil and crops due to salinisation	3,1
Public water supply : no further treatment	13,8

compare measures

	Total cost (M€)	Cost/surface restored (k€/ha)	Cost / household (€/year)
Measure 1	32	6,7	39,2
Measure 2	44,3	9,2	54,3

Cost-benefit analysis includes financial and environmental costs; direct/indirect; present/future

ASSESS THE DISPROPORTION OF COSTS

Are costs disproportionate regarding benefits, willingness to pay and affordability?

	Total cost (M€)	Cost/surface restored (k€/ha)	Cost / household (€/year)
Measure 1	32	6,7	39,2
Measure 2	44,3	9,2	54,3

Potentially disproportionate compared to ability to pay: 36€/year/household

⇨ *more accurate assessment of costs and of future benefits*

If costs are judged disproportionate…

… Does phasing of the implementation allows to reach the goal under acceptable conditions?

⇨ ***seek a time derogation***

… Do costs remain disproportionate despite phasing of the implementation?

⇨ ***seek a less stringent objective***

COST-EFFECTIVENESS OF POTENTIAL MEASURES

E.g. goal: improve the quality of water

Assess the cost-effectiveness of individual measures

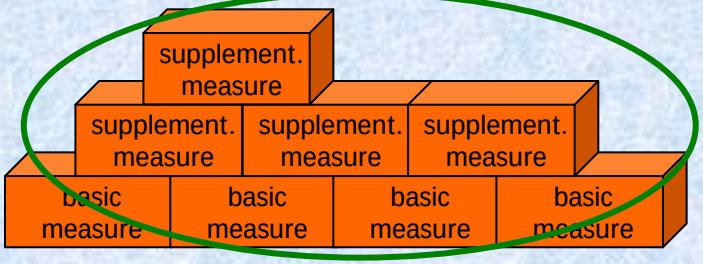
- direct / indirect costs and benefits
- economic and non-economic impacts...

- *M1- Restoration of wetlands*
  - *⇨ 1ha treats 21,7kg BOD5/day*
  - *⇨ restoration/maintenance costs?*
- *M2- Wastewater treatment plant*
  - *⇨ depollution cost of 1kg BOD5~0,45€*
- *M3-...*

Compare (sets of) measures targeting the same goal

- *Set 1- Improve water flow by reducing water demand, importing water...*
- *Set 2- Restore wetlands, promote individual treatment systems...*
  - *⇨ benefits generated by wetlands vs. wastewater treatment plant: 9700€/ha*
- *Set 3- ...*

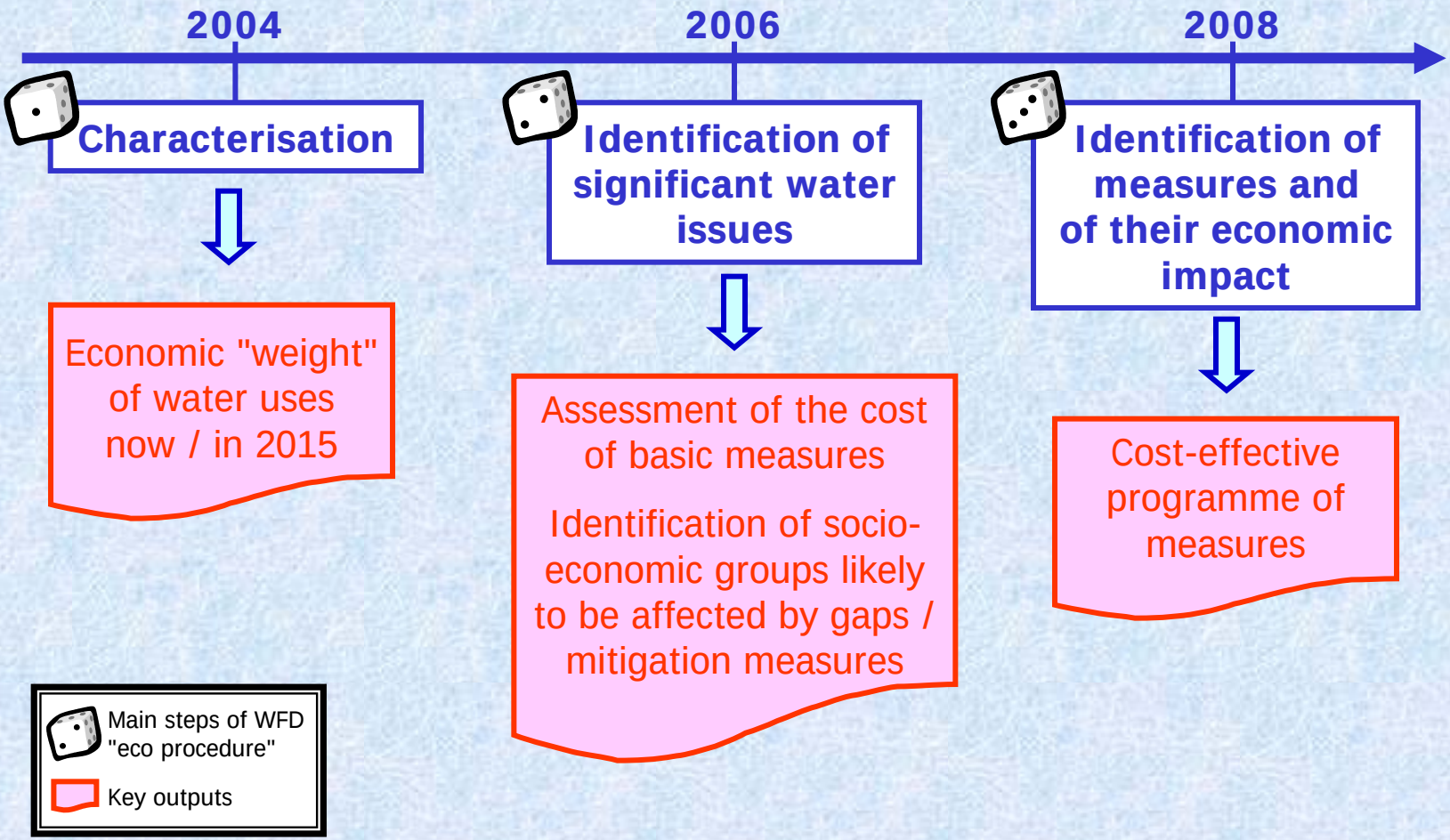
Combine the selected best measures to construct the programme of measures



FINANCIAL IMPLICATIONS OF THE PROGRAMME OF MEASURES

- What are the socio-economic implications?
  - ⇨ *impact on cost recovery*
- What are the financial implications for water users?
  - ⇨ *impact on water prices may lead to re-assess cost-effectiveness of selected measures*
  - *E.g. pricing policies*
- Are accompanying measures needed for the implementation of the plan?
  - ⇨ *institutional adjustments*
  - ⇨ *legal changes…*

MAIN OUTPUTS FROM WFD "ECO PROCEDURE"



GO FURTHER

- How to cope with uncertainty?

HOW TO COPE WITH UNCERTAINTY?

In the short term

- *use available data with all necessary care: extrapolation, experts' saying, aggregation...*
- *produce lacking data when essential*
- *identify clearly the key data gaps and costs to fill them in / the uncertainty to prevent from misunderstanding/ ease future updating*

In the mid-term

- *organise/plan the permanent collection / production of data*
- *update initial data and results as soon as possible*

In the long-term

- *organise capacity-building*
- *integrate data production in the continuous process of updating the management plan*