Managing on-site activities for achieving off-site environmental effects*

Corinna Nunneri & Wilhelm Windhorst
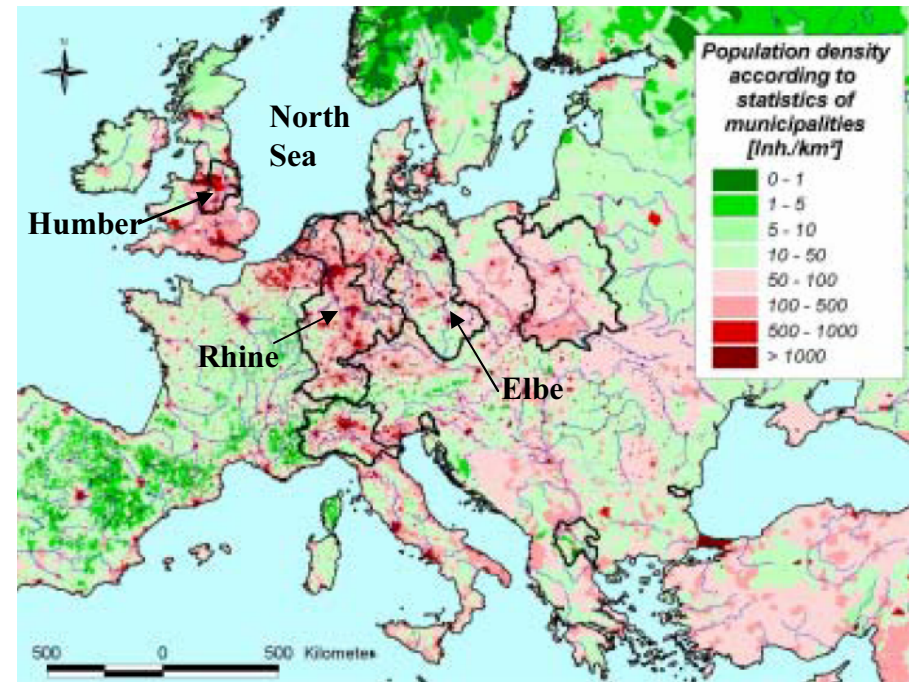
Forschungs- und Technologiezentrum Büsum
University of Kiel, Ecology Center, Division Ecosystem Research

North Sea catchment area:
707500 km^2
EUROCAT investigated catch. area:
357810 km^2

Source: Behrendt 2004

| Data by Behrendt 2004 and Cave et al. 2004	Unit	Elbe	Humber	Rhine
Basin Area	km2	148270	24240	185300
subbasins		185	6	423
length of river	km	1090	690	1320
mean disch.	m3/s	708	250	2388
tot. pop	1000 inh.	24611	13668	57256
pop. dens	inh/km2	166	564	309
urban area	%	5,9	12,3	7,9
agric. area	%	61,4	72,8	51,8
arable land	%	54,7	43,8	35,6
pasture	%	6,8	29,0	16,2
forest	%	30,5	13,7	37,2
connections to sewers	%	79,3		93,9
connections to wwtps	%	71,4	79,0	92,4

Governmental organisations

OSPAR Commission, North Sea conference,
Trilateral Waddensea Cooperation
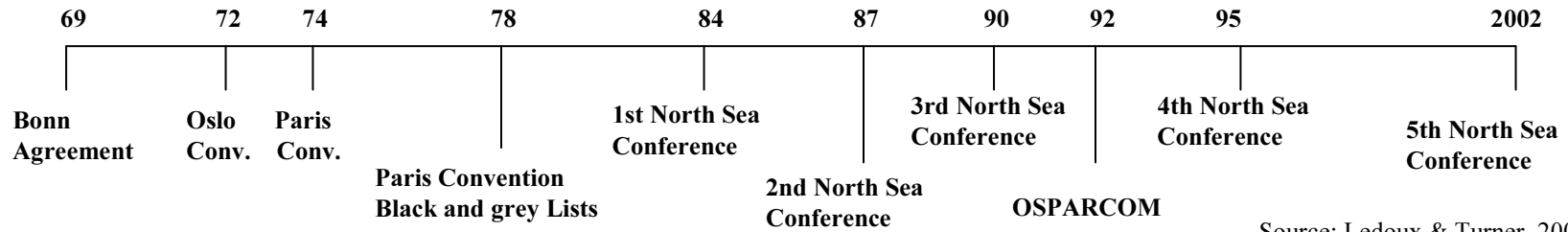
IKSE/MKOL
IKSR
IGKB

European Union
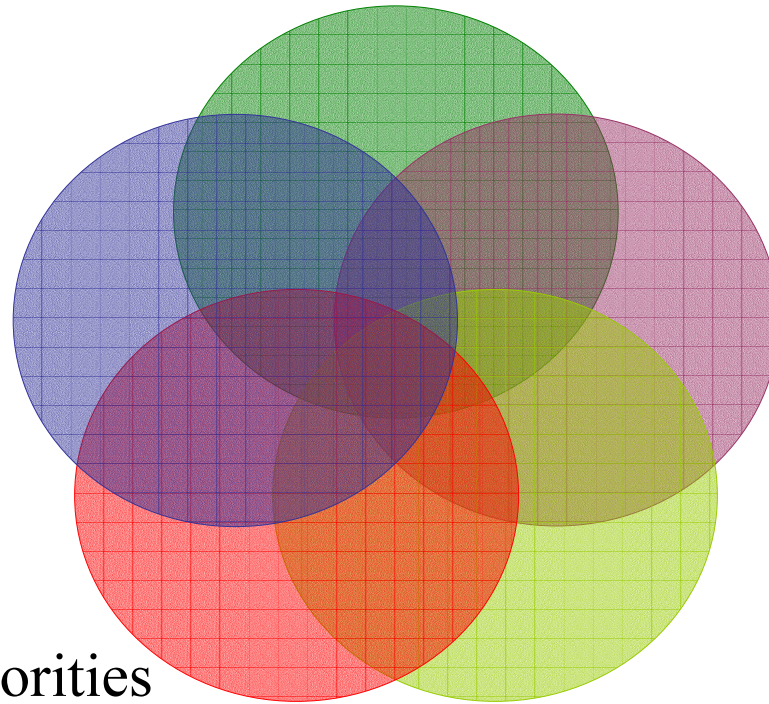
Local authorities
e.g. Regional Development Agencies,
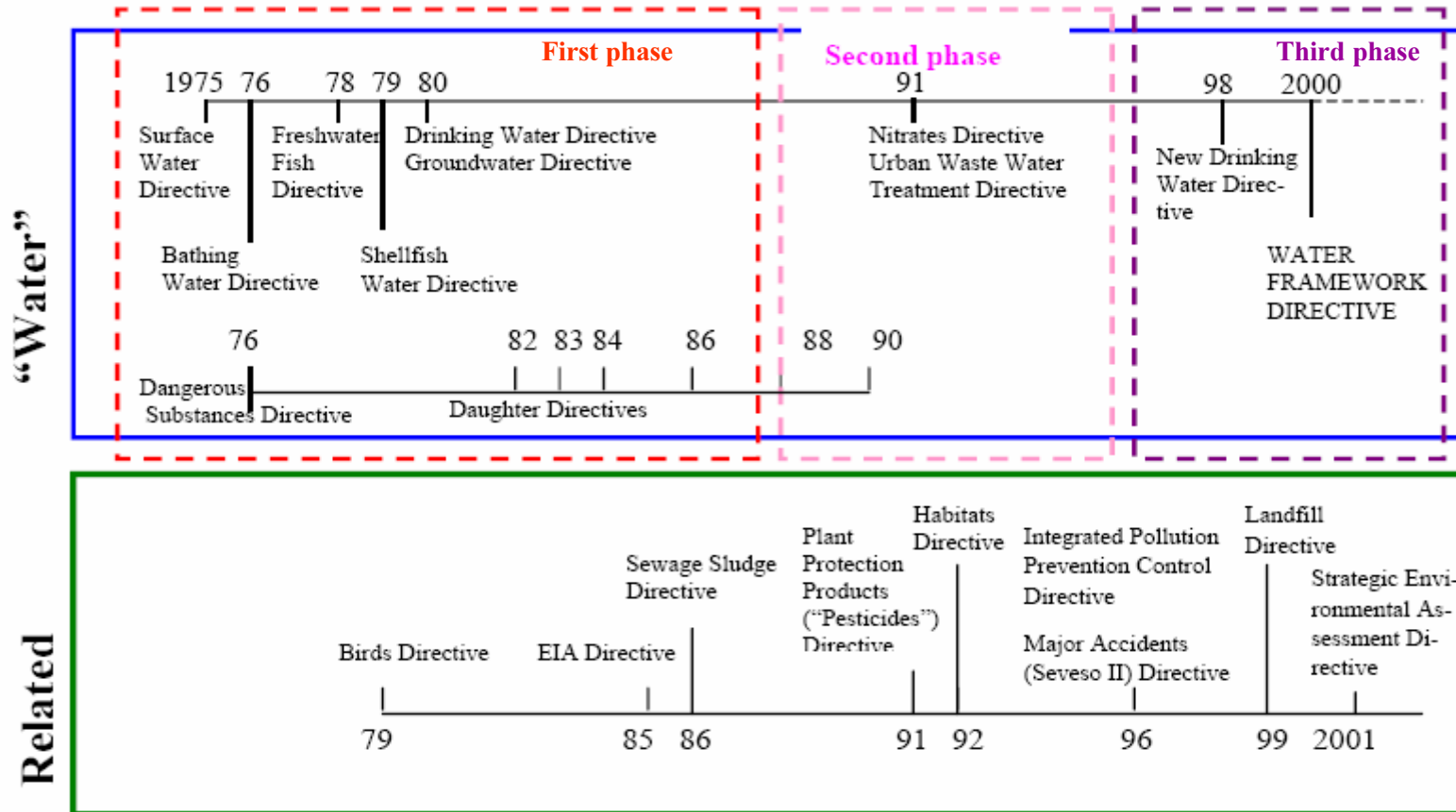Municipalities

National Ministries

International Agreements

| | | | | | | | | | |
|69|72|74|78|84|87|90|92|95|2002|

Bonn Agreement

Oslo Conv.

Paris Conv.

Paris Convention Black and grey Lists

1st North Sea Conference

2nd North Sea Conference

3rd North Sea Conference

OSPARCOM

4th North Sea Conference

5th North Sea Conference

Source: Ledoux & Turner, 2003

EU-relevant legislation

"Water"

First phase — Second phase — Third phase

1975 76 78 79 80 — 91 — 98 2000

Surface Water Directive

Freshwater Fish Directive

Drinking Water Directive
Groundwater Directive

Nitrates Directive
Urban Waste Water Treatment Directive

New Drinking Water Directive

Bathing Water Directive

Shellfish Water Directive

WATER FRAMEWORK DIRECTIVE

76 — 82 83 84 86 — 88 90

Dangerous Substances Directive

Daughter Directives

Related

Birds Directive

EIA Directive

Sewage Sludge Directive

Plant Protection Products ("Pesticides") Directive

Habitats Directive

Integrated Pollution Prevention Control Directive

Major Accidents (Seveso II) Directive

Landfill Directive

Strategic Environmental Assessment Directive

79 — 85 86 — 91 92 — 96 — 99 2001

Source: Gupta et al. 2003

National legislation and reception of EU-directives

Main Stakes

Environmental conservation

Farming and agriculture

Flood/coastal protection

Industry

Tourism

Fisheries

Ports and navigation
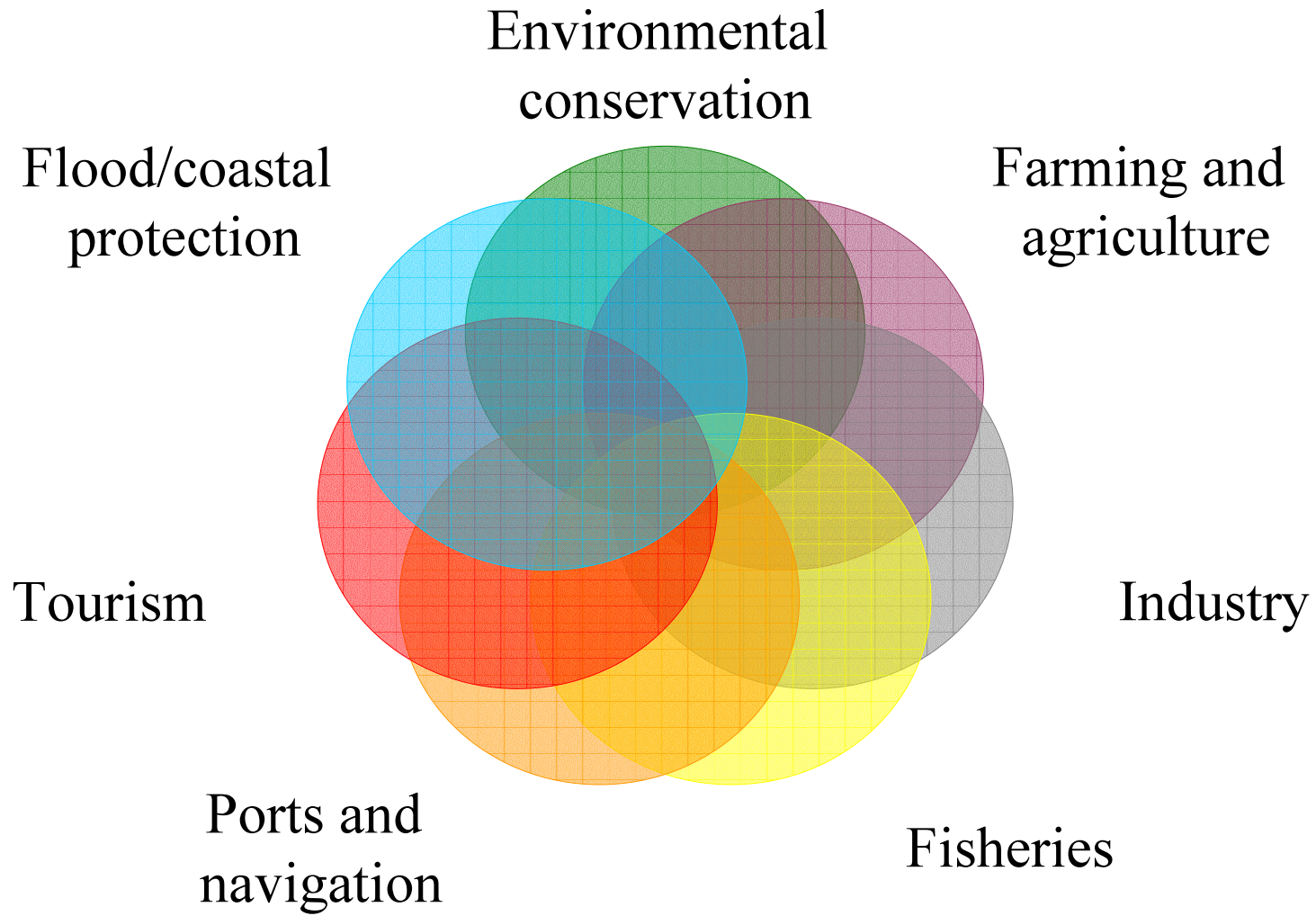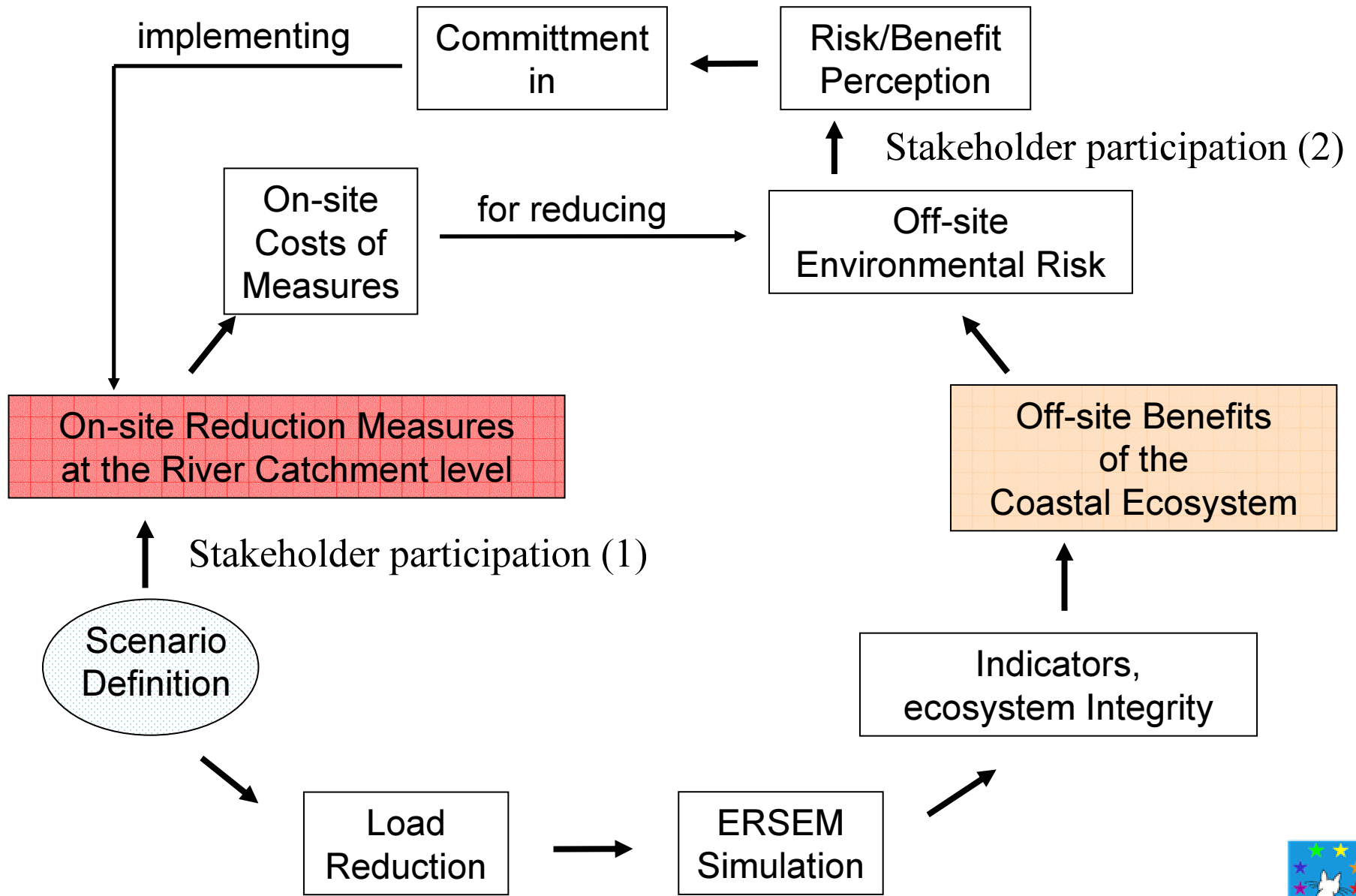
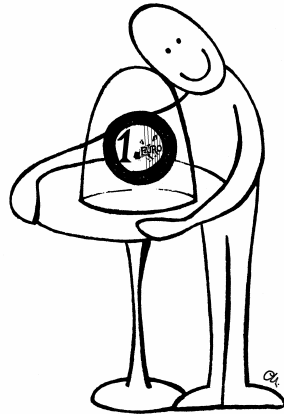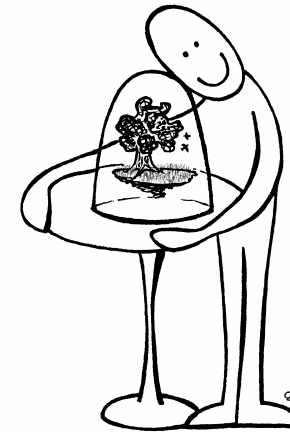| **Business As Usual** | **Policy Target** | **Deep Green** |
| **Low Reduction** | **Medium Reduction** | **High Reduction** |

Free, unfettered world markets. Priority: economic growth. People: short-term planners, no risk aversion.

Strong EU leadership. Regulated economy towards sustainability. People: mid-term planners, risk averse to some degree.

Priority: environment, self-regulation. Strong sustainability. People: long-term planners, absolutely risk averse.

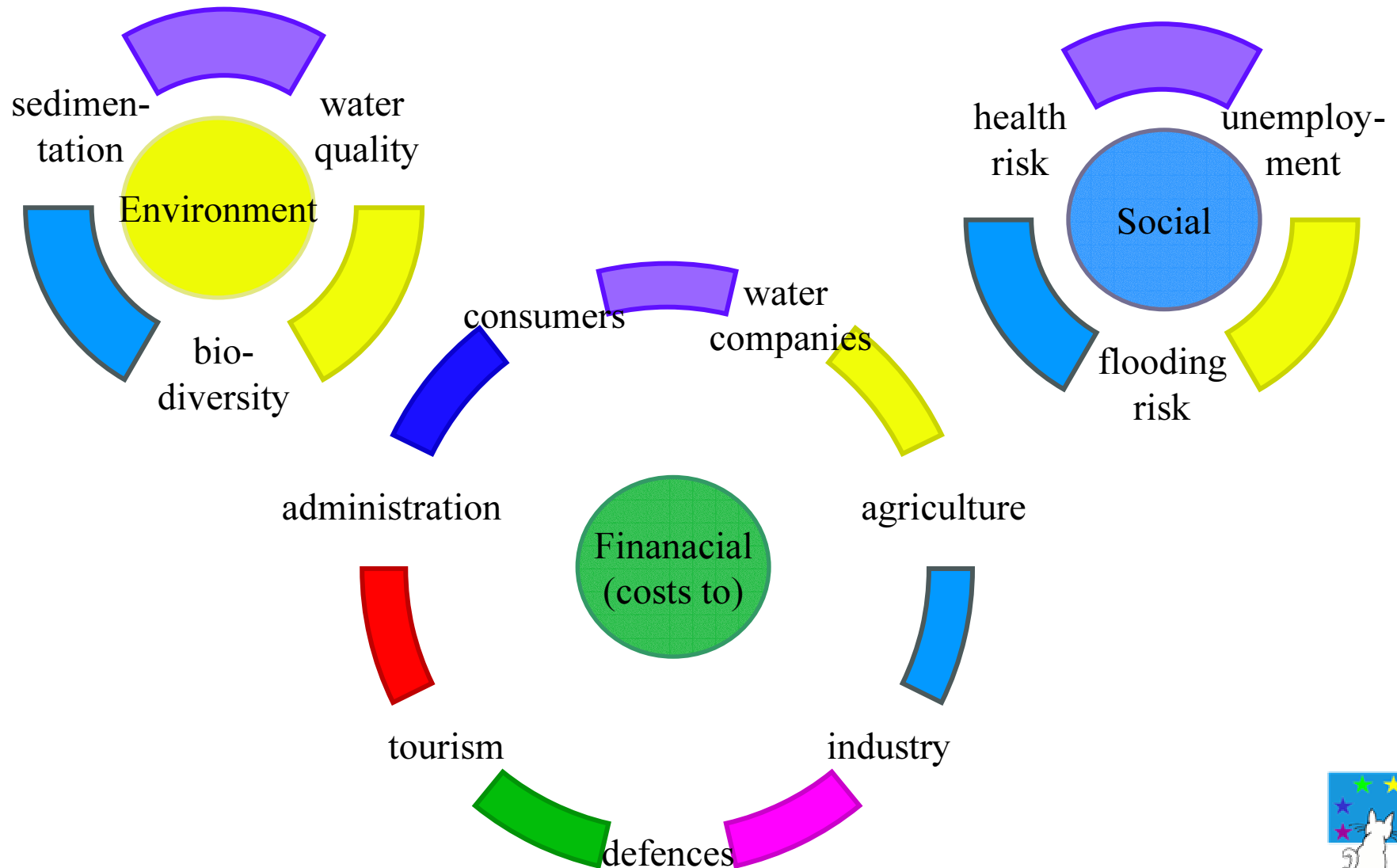# Scenarios: Measures for Reducing Nutrient Emissions

LOW-REDUCTION (BAU)		
Catchment	Description	Measures
Elbe	present trends are maintained	no additional measures
Humber		300 ha due to realignment
Rhine		no additional measures
MIDDLE-REDUCTION (PT)		
Catchment	Description	Measures
Elbe	Reduction of inputs from the catchment (point and diffuse), implementation of the Nitrate Directive and of the Urban Waste Water Directive	Farm measures, WWTP update,tile drainage reduction up to 10% of arable land
Humber		20% reduction of riverine loads (point sources + Nitrate Directive implementation), realignment area of 1321 ha
Rhine		Farm measures, WWTP update,tile drainage reduction up to 10% of arable land
HIGH-REDUCTION (DG)		
Catchment	Description	Measures
Elbe	Over-compliance with Environmental Directives and standards	Farm measures, WWTP update, tile drainage reduction up to 20% of arable land
Humber		50% red in point sources + Nitrate Directive implementation, realignment area of 7400 ha
Rhine		Farm measures, WWTP update, tile drainage reduction up to 20% of arable land

Sources: Cave et al., 2003 (Humber); Lise et al., 2003, 2004 (Rhine and Elbe)
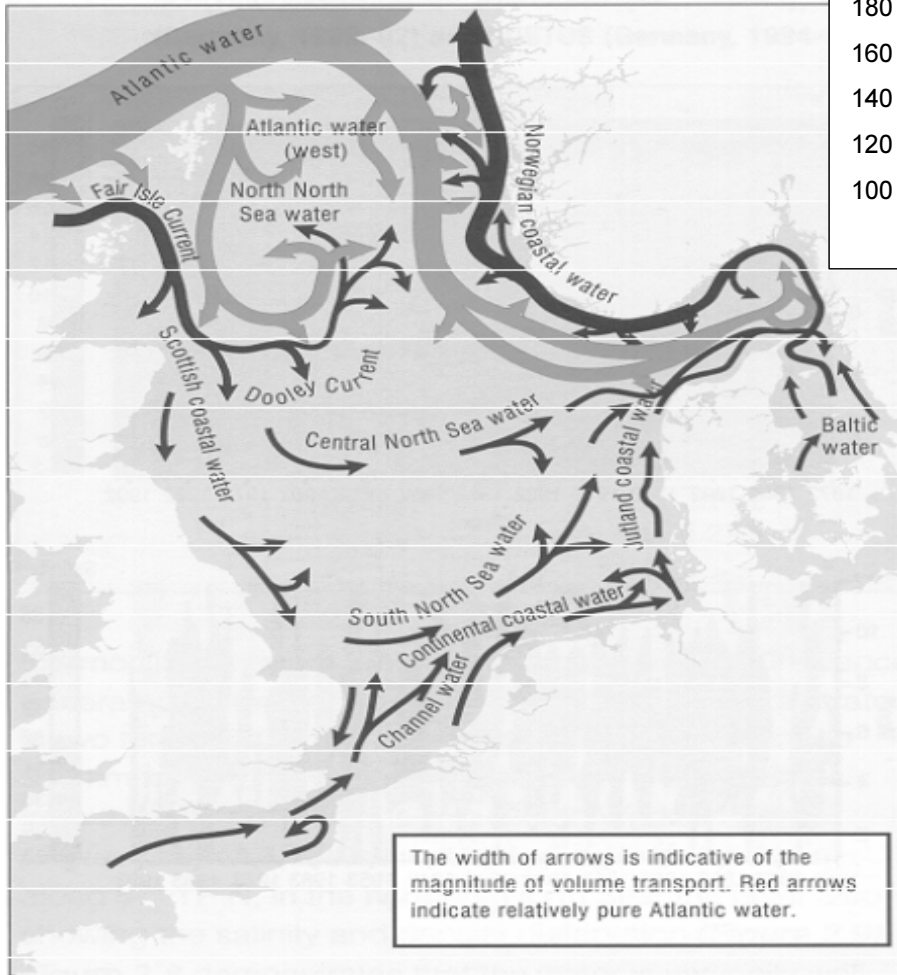
Effects of measures (Humber)

sedimen-
tation

water
quality

Environment

bio-
diversity

consumers

water
companies

health
risk

unemploy-
ment

Social

flooding
risk

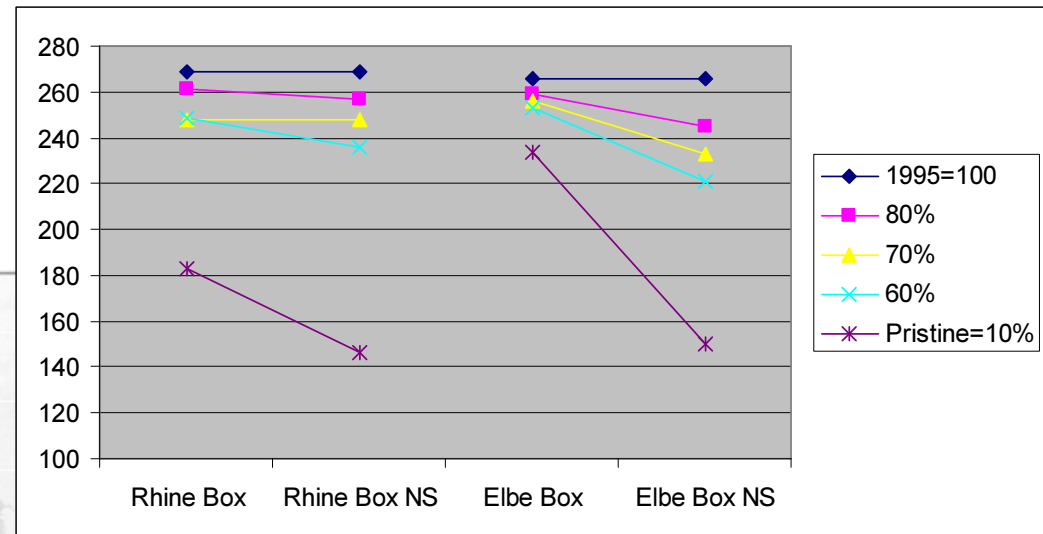administration

Finanacial
(costs to)

agriculture

tourism

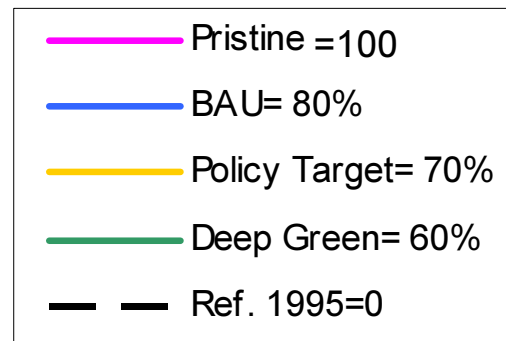industry

defences

Data source: Ledoux et al. 2003

Net primary production (g C m^{-2} a^{-1})

North Sea circulation patterns

Legend:
- 1995=100
- 80%
- 70%
- 60%
- Pristine=10%

Chart x-axis: Rhine Box | Rhine Box NS | Elbe Box | Elbe Box NS

Chart y-axis: 100, 120, 140, 160, 180, 200, 220, 240, 260, 280

Map labels: Atlantic water, Atlantic water (west), Fair Isle Current, North North Sea water, Norwegian coastal water, Scottish coastal water, Dooley Current, Central North Sea water, Jutland coastal water, Baltic water, South North Sea water, Continental coastal water, Channel water

The width of arrows is indicative of the magnitude of volume transport. Red arrows indicate relatively pure Atlantic water.
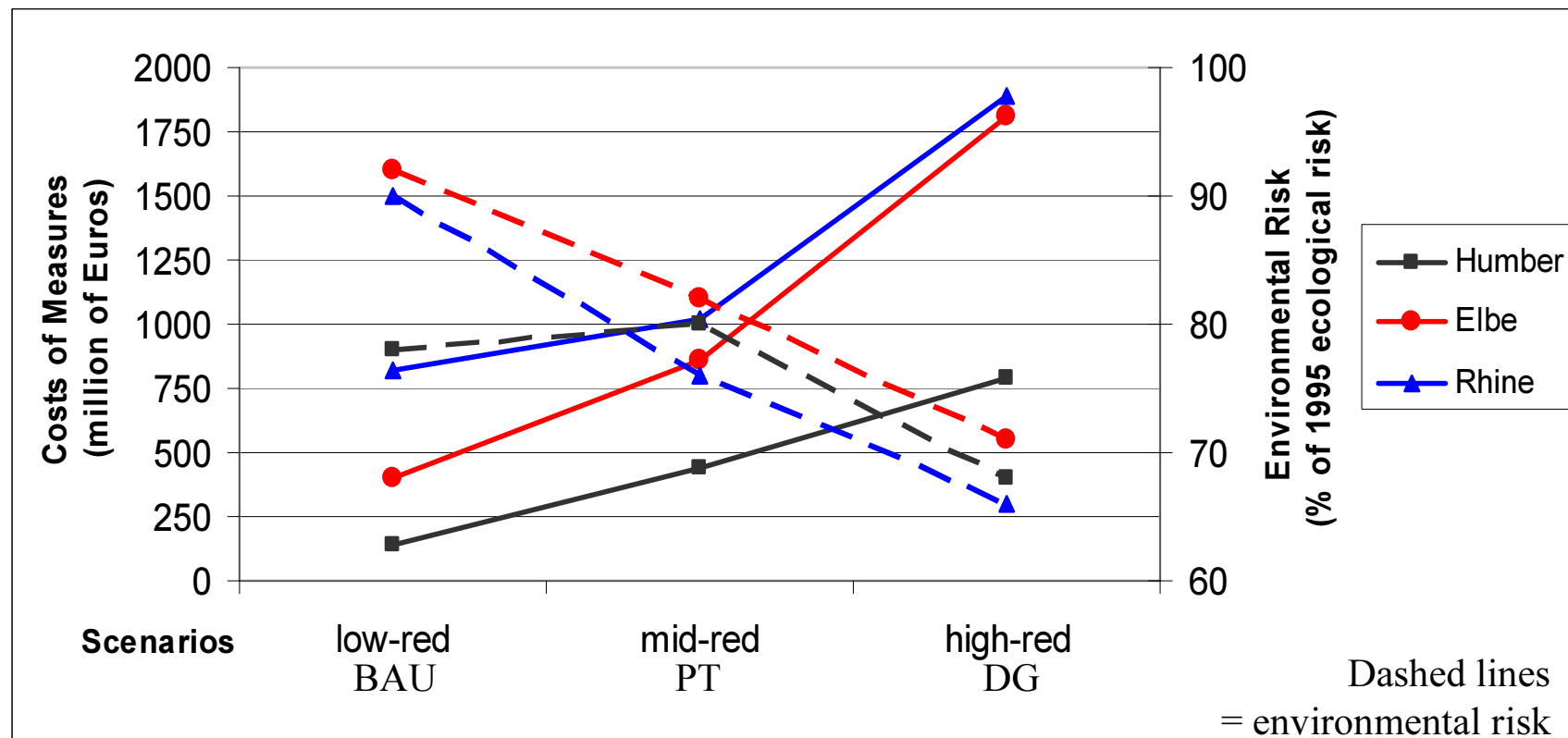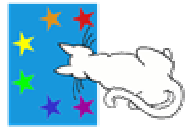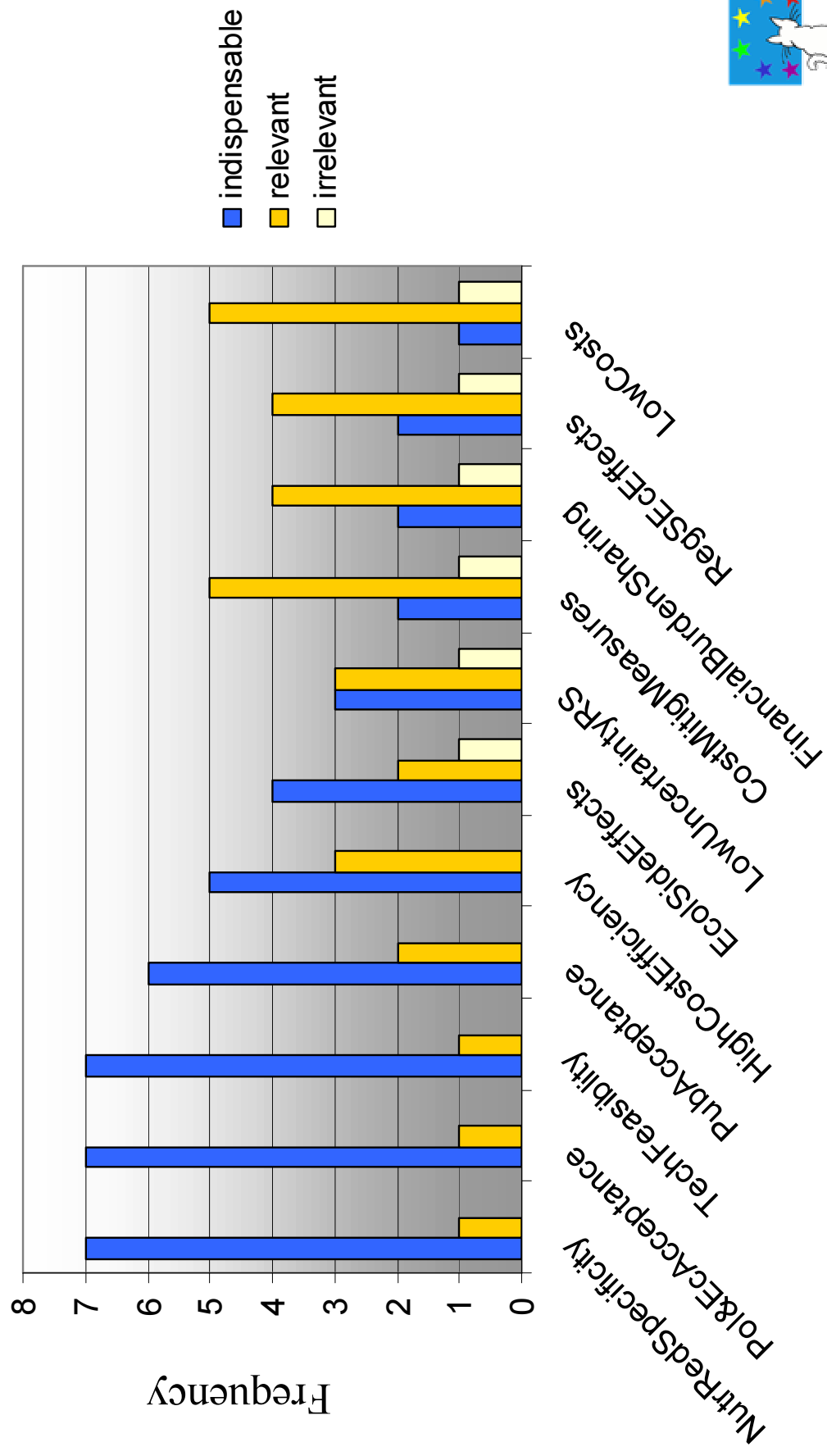
Costs* of measure implementation and environmental risk reduction

* Data from Cave et al., 2003; Coombes et al., 2004; Lise et al. 2003

Ranking of Criteria for Measure Evaluation (Elbe)

Outlook

Advantages of the presented methodology:
- Determine the ‚role' and impact of each river system upon the whole North Sea basin
- Represent regional equilibria
- Offer a way to reduction based on the choice of ‚acceptable' ecological risk
- Determine the values of ecological indicators related to acceptable risk (monitoring campaigns)

Further research topics are:
- Validation, revision and improvement of the aggregation procedure (from single indicators to environmental Risk)
- Potential for further applications (stakeholder communication?)

Main contributing scientists:

Hermann Lenhart

Kerry Turner, Rachel Cave, Laure Ledoux and Diane Burgess

Jürgen Hofmann and Horst Behrendt

Wietze Lise, Joeeta Gupta and Ron Jannsen

Franciscus Colijn and Andreas Kannen