Sun wind water earth life living environment legends for design

AR2U070 Territory (design) 5ECTS

AR0112 Civil engineering for dummies (calculations) 2ECTS

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Publish on your website:

AR1U010

how you could take environment into account in your

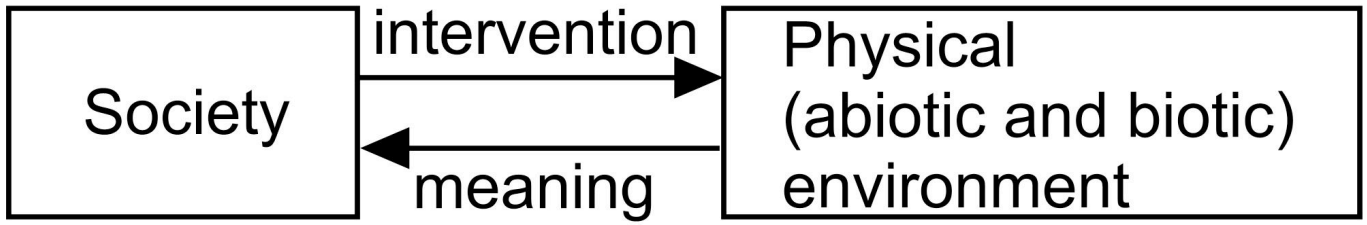
- earlier and
- future work.

AR0112

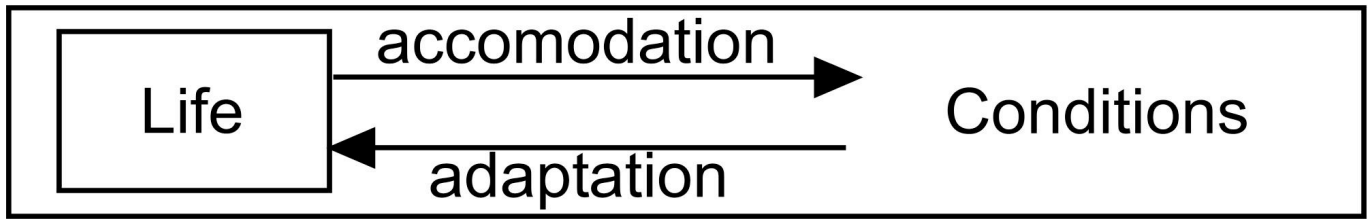
calculations and observations environment in any location and your design, check your observations.

Definitions of environment

Environment is the physical, non-living surroundings of society in reciprocal relationship.



Environment is the set of conditions for life.

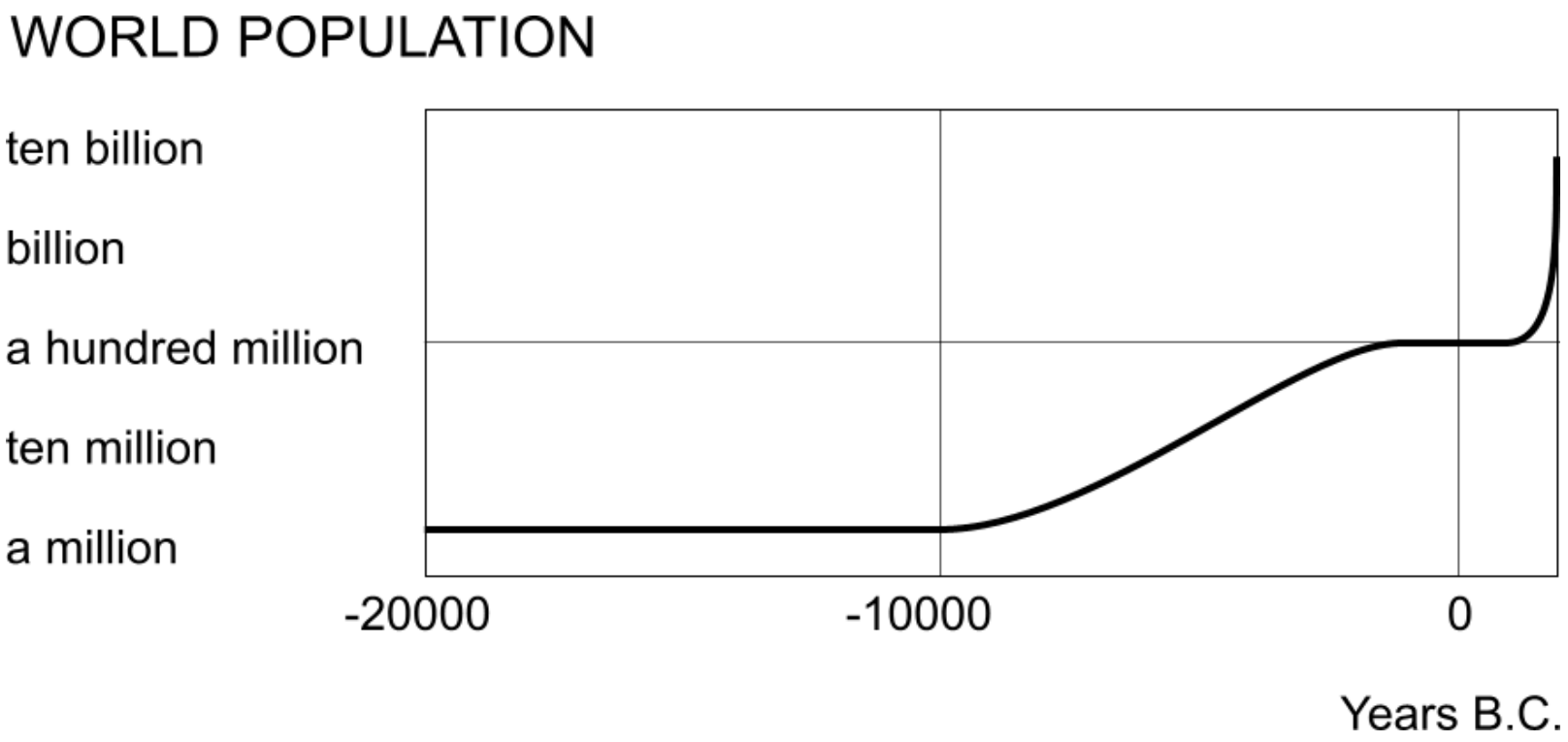


18 kinds of technical environments

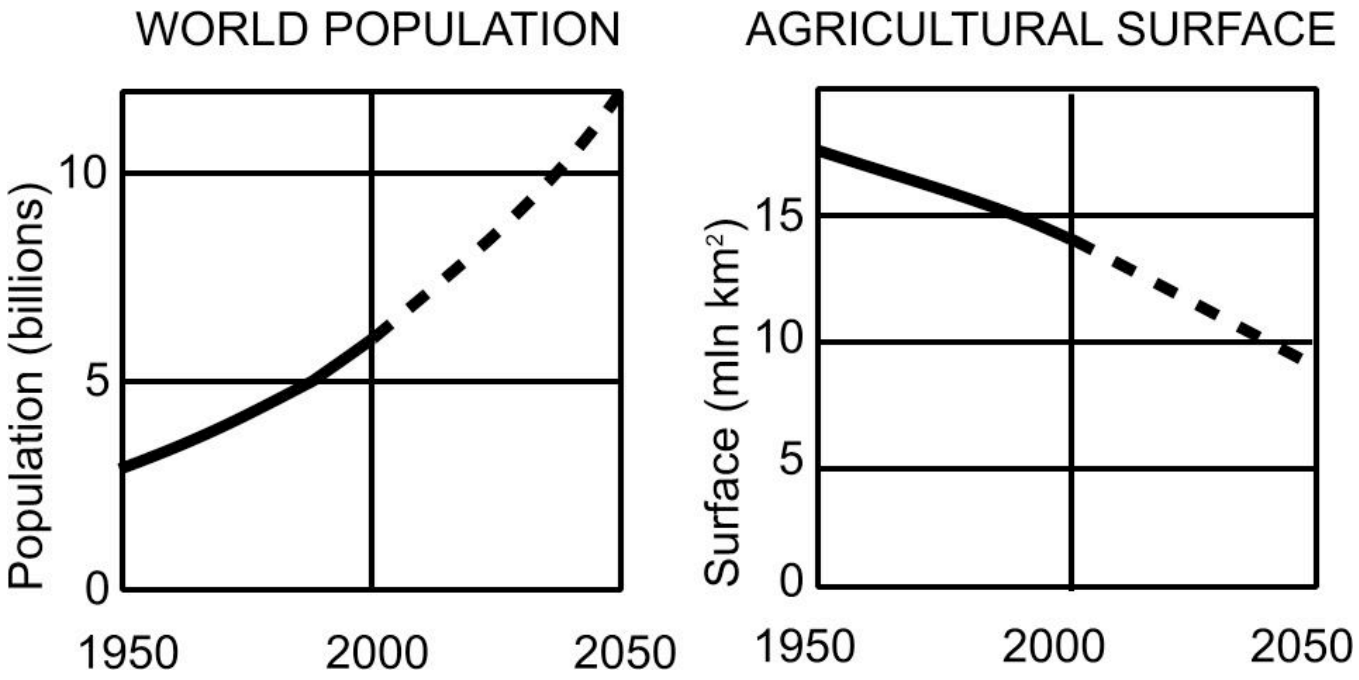
Environment is the set conditions for life

conditions	**life**
managerial	human
cultural	
economical	animal
technical	
ecological	vegetable
mass/space/time	

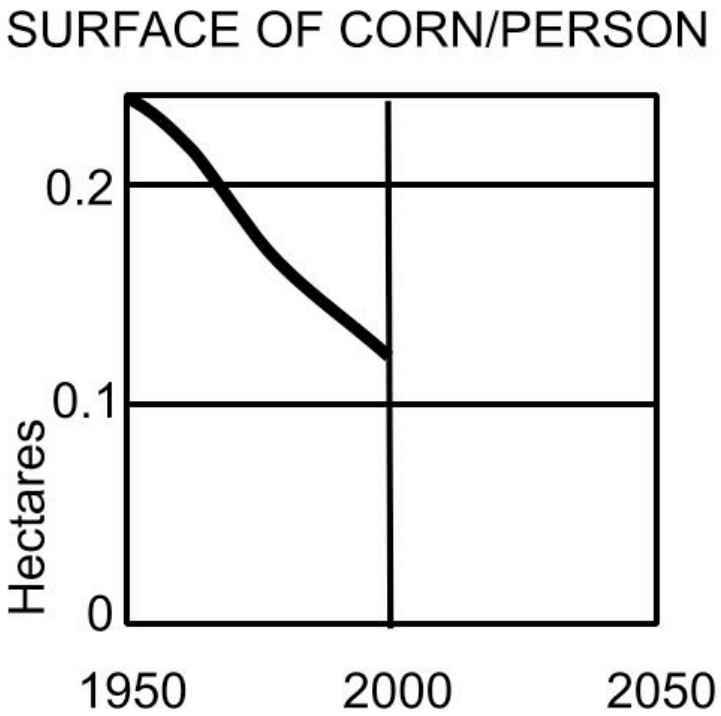
World population



Agricultural surface



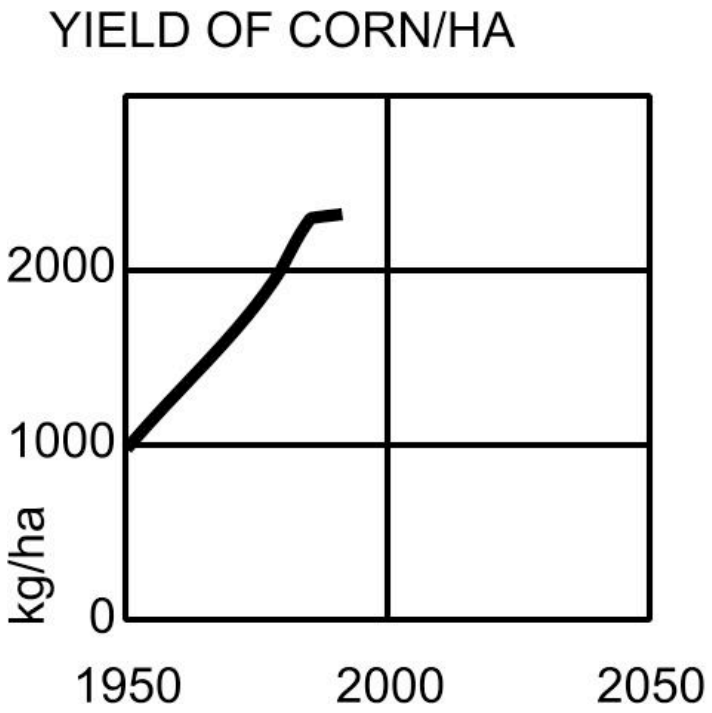
Agricultural surface/person



decrease:
60% desertification
20% erosion
20% pollution

increase:
at the cost of forest

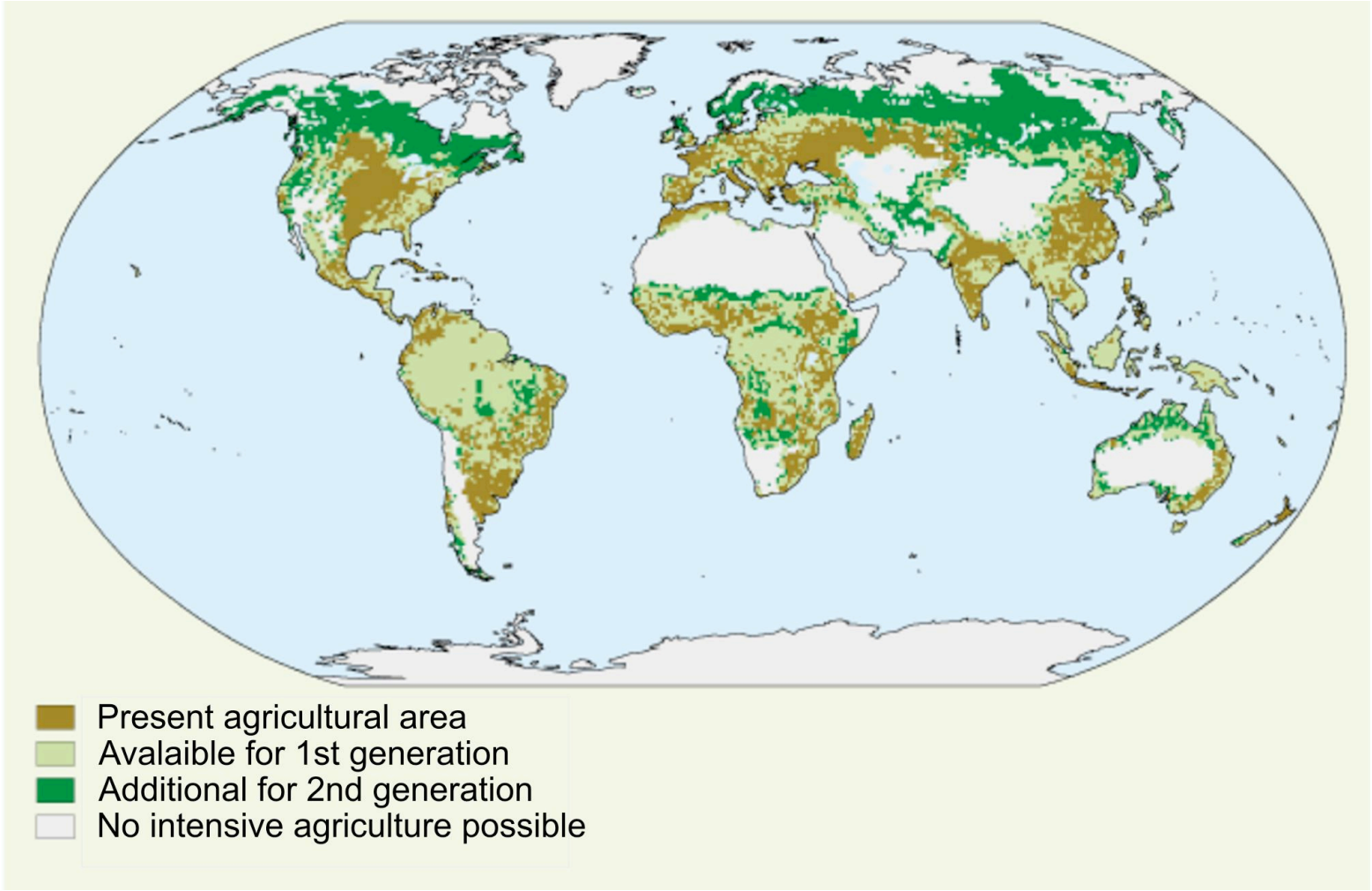
Yield per hectare



CONSEQUENCES
INCREASE OF
PRODUCTION:

erosion
desertification
pollution

Climate change



ENVIRONMENT

- Definition of environment
- Doom lecture
- Sources
- Emission
- Transmission
- Immission and exposition
- Creating standards
- Environmental policy
- Environmental data
- Critical remarks

Chains of impacts

economic activity---->	direct effect of emission ---->	indirect effect of transmission ---->	end-effect of emission and exposure
SOURCES	EMISSIONS	DISPERSED BY	OBJECTS
1. Homes	1. Inorganic	1. Air	1. Materials
2. Traffic	2. Energetic	2. Water	2. People
3. Agriculture	3. Mechanical	3. The ground	3. Other organisms
4. Businesses	4. Information	4. Food chains	4. Systems
5. Incidents	5. Potential emissions	5. Transport	5. Locations

Sources

Sources	Subdivision
1. housing, temporary-stay recreation	1.1 households
	1.2 encroachment onto public space
	1.3 public green areas
2. traffic, infrastructure	2.1 cars and other petrol-powered vehicles
	2.2 routes used for transporting dangerous substances
	2.3 railways and other electrically powered routes
	2.4 shipping
	2.5 airways
	2.6 cables and pipelines
	2.7 beam transmissions (e.g. for radio and tv)
3. Nature, agriculture, forestry, nature recreation	3.1 natural areas
	3.2 forestry
	3.3 arable farming
	3.4 glasshouse cultivation (incl. mushrooms)
	3.5 open-air horticulture and fruit growing
	3.6 animal husbandry, fisheries
4. business, day recreation	4.1 mineral exploitation
	4.2 historical manual skills
	4.3 industry
	4.4 public utility companies
	4.5 building industry
	4.6 services
5. incidental activities	

Emissions

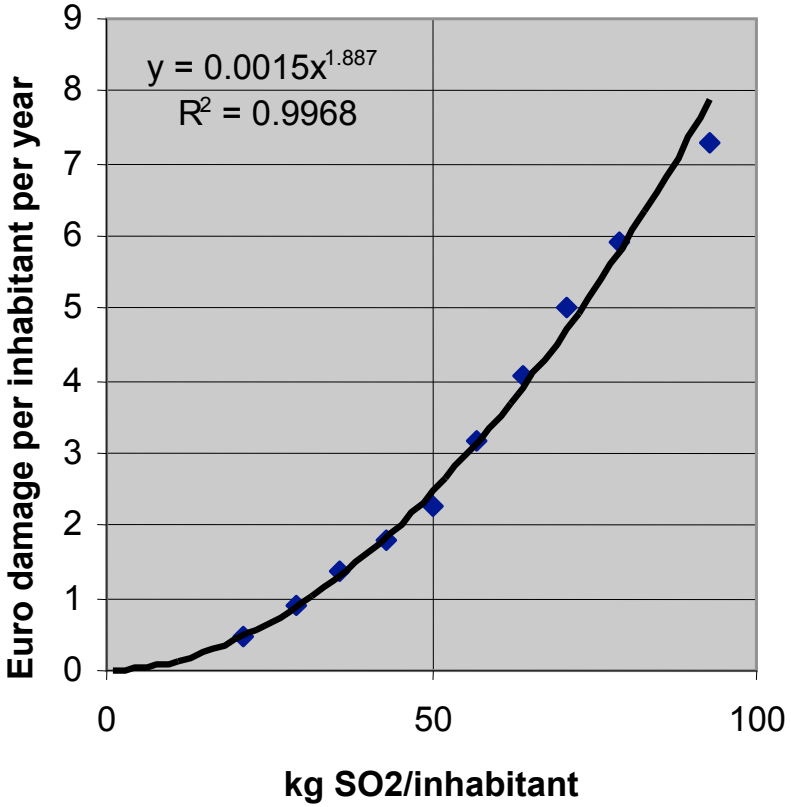
Types of emission	Subdivision	Examples
1. inorganic emissions	1.1 metallic	copper, lead, mercury
	1.2 other inorganic	CO, SO_2, NO_x
2. organic emissions	2.1 pure	methane, toluene, benzene
	2.2 halogenic	vinyl chloride
	2.3 oxygenic	alcohols, esters
	2.4 nitrogenic	amino acids
	2.5 sulphuric	thiols
	2.6 metallic	organic mercury
	2.7 other inorganic	organic phosphorus
3. mixtures	3.1 complex mixtures	BZV (biological oxygen consumption), CZV
	3.2 aerosols	fly ash, industrial waste
	3.3 solid waste	
	3.4 microbic	tetanus, botulism
4. energetic emissions	4.1 heat	cooling-water
	4.2 sound	traffic, industry
	4.3 radiation, magnetic	light, infra-red, ultra-violet, radar, ether waves
	4.4 radiation, radioactive	alpha-, beta-, gamma-
	4.5 magnetic field	high-voltage transmission lines
5. mechanical emissions	5.1 disturbance	treading on the ground, mowing, vibrations, up-
	5.2 small interruptions	ploughing, vandalism, clearing ground, building
	5.3 substantial interruptions	explosions
6. information emissions	6.1 visual	horizon pollution
	6.2 olfactory	bad smells
	6.3 others	misleading sounds
7. potential emissions	7.1 emission reduction	cloth filter, sedimentation plant, lpg (liquid propagaz) tank, (waste) storage
	7.2 risk	day–night variations
	7.3 variation in emissions	

Exposure

Damage (1974) to	Euros/inhabitant
materials	4
health	32
commercial crops and livestock	3
lost residential value	45
total estimated damage	84

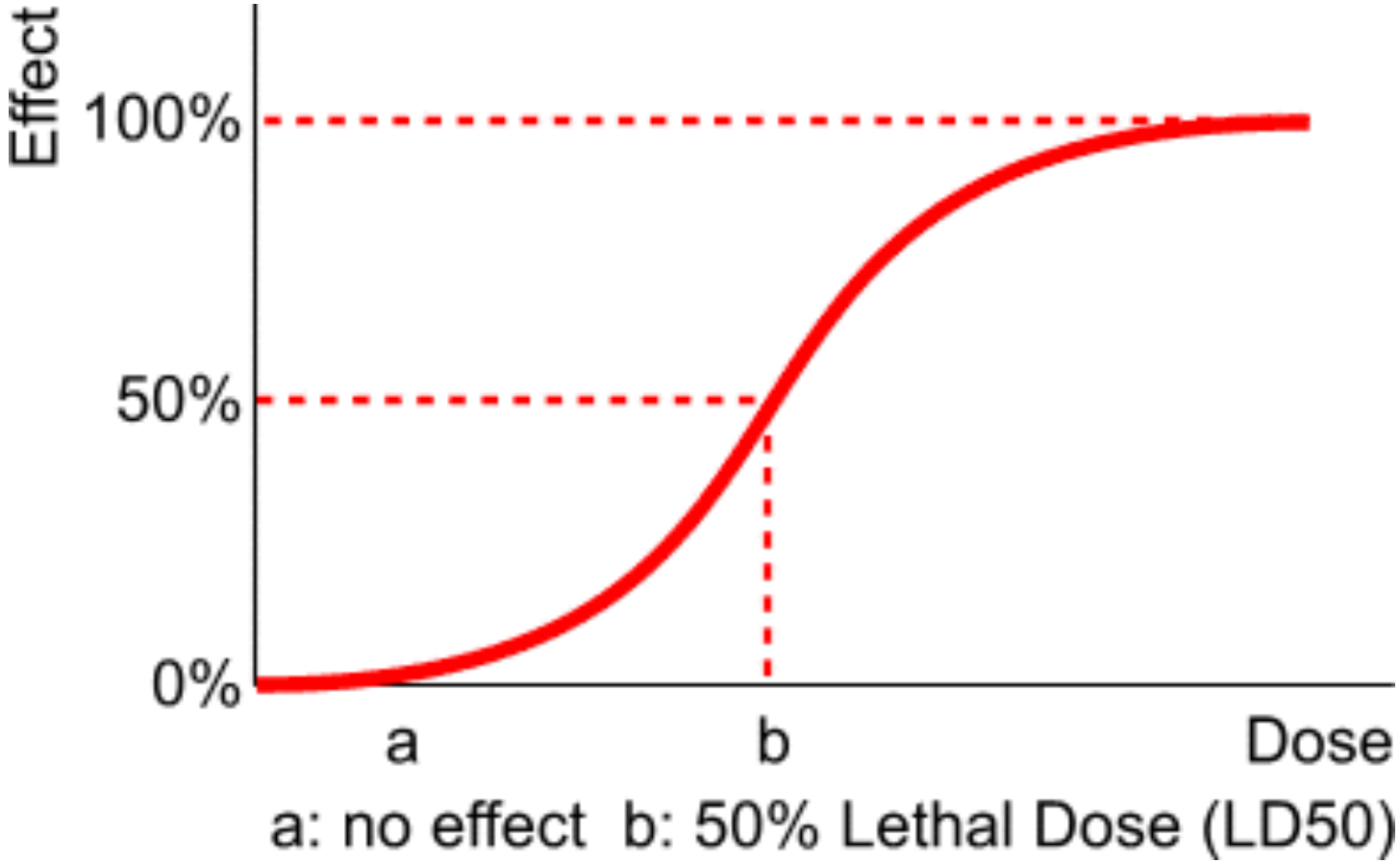
Dose-impact relation

of SO_2 on a range of metal constructions in the Netherlands (1978)



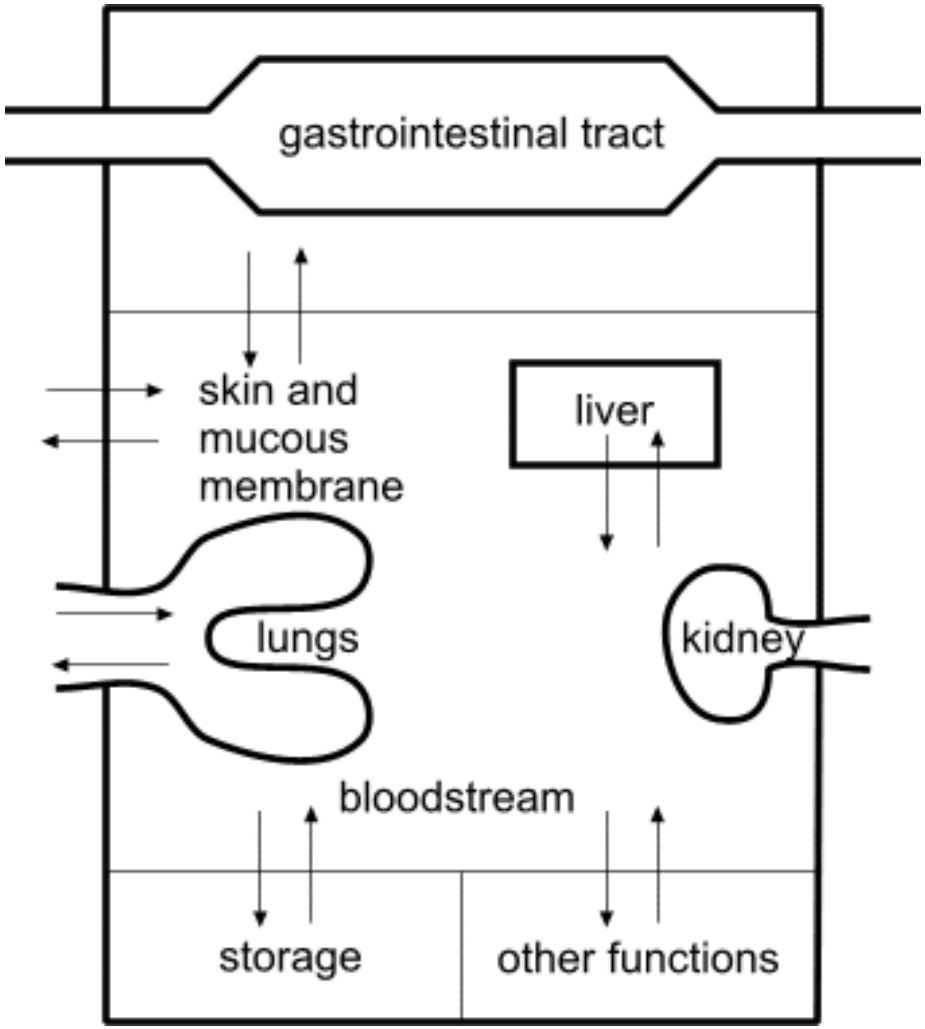
Dose-impact relation

on organisms

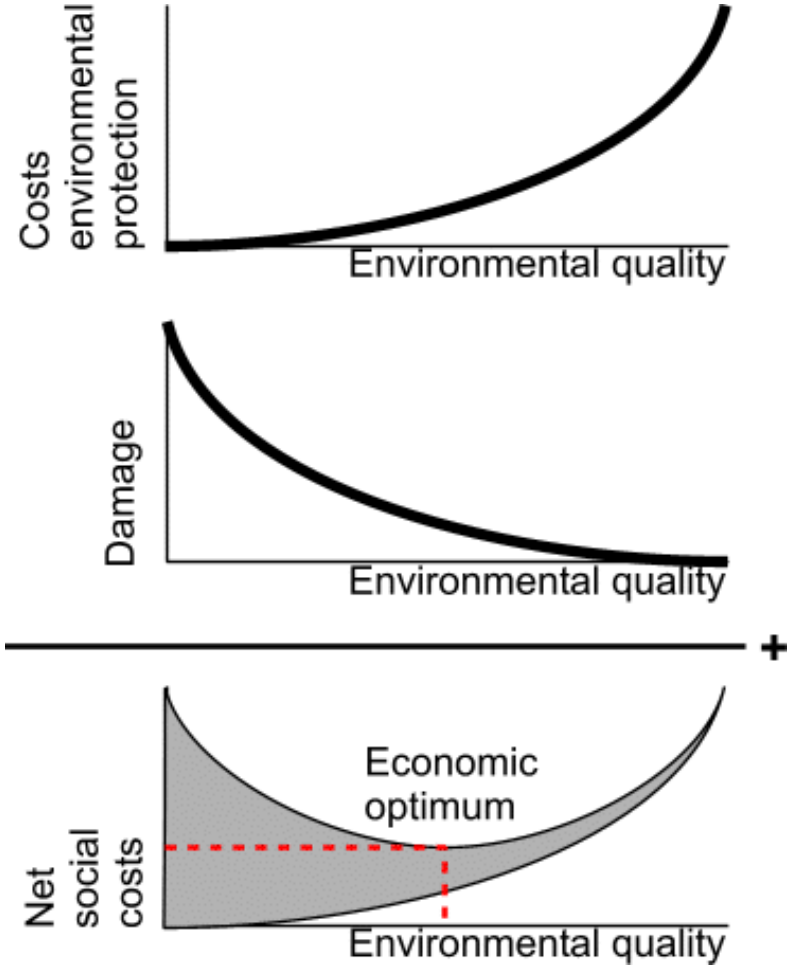


a: no effect b: 50% Lethal Dose (LD50)

Toxicology


gastrointestinal tract
skin and
mucous
membrane
liver
lungs
kidney
bloodstream
storage
other functions

Costs of damage and quality



Environmental standards

STANDARDS, applied to:			
the source ←	the emission ←	the dispersing medium ←	the object
product standards processing standards	emission standards emission ceilings	quality standards	exposure and immission standards
EXAMPLES OF NON-NUMERICAL STANDARDS (‘Policy starting-points’)			
‘Avoiding at the source’ (of the emission)	‘Combating at the source’ (of the emission) ‘Best technical means’ ‘Most practical means’	‘standstill’ principle	‘no effect’ ‘no adverse effect’
EXAMPLES OF NUMERICAL STANDARDS			
Lead content of petrol	max. 99.2 metric ton CO_2 per year in the Netherlands	average % of oxygen in the waters	EPEL value

Main strategy: from impact into

source directed standards

Remaining impact-orientated policy

Zoning
Heritages from the past
Source directed measures not in time
Being prepared on disasters
Possible shortcomings of source directed measures

Zones around activities

Recommended distances in meters from into

SBI-CODE	number	ACTIVITIES	QUIET AREAS	MIXED AREAS
01		LANDBOUW EN DIENSTVERLENING T.B.V. DE LANDBOUW	**200**	100
02		BOSBOUW EN DIENSTVERLENING T.B.V. BOSBOUW	**50**	30
05		VISSERIJ- EN VISTEELTBEDRIJVEN	**100**	50
10		TURFWINNING	**100**	50
11		AARDOLIE- EN AARDGASWINNING	**700**	500
14		WINNING VAN ZAND, GRIND, KLEI, ZOUT, E.D.	**700**	500
15		VERVAARDIGING VAN VOEDINGSMIDDELEN EN DRANKEN	**1000**	700
16		VERWERKING VAN TABAK	**200**	100
17		VERVAARDIGING VAN TEXTIEL	**300**	200
18		VERVAARDIGING VAN KLEDING; BEREIDEN EN VERVEN VAN BONT	**50**	30
19		VERVAARDIGING VAN LEER EN LEDERWAREN (EXCL. KLEDING)	**300**	200
20		HOUTINDUSTRIE EN VERVAARDIGING ARTIKELEN VAN HOUT, RIET, KURK E.D.	**200**	100
21		VERVAARDIGING VAN PAPIER, KARTON EN PAPIER- EN KARTONWAREN	**300**	200
22		UITGEVERIJEN, DRUKKERIJEN EN REPRODUKTIE VAN OPGENOMEN MEDIA	**100**	50
23		AARDOLIE-/STEENKOOLVERWERK. IND.; BEWERKING SPLIJT-/KWEEKSTOFFEN	**1500**	1500
24		VERVAARDIGING VAN CHEMISCHE PRODUKTEN	**1000**	1000

Zones around installations

Recommended distances in meters from into

Nr.	subnr.	STORAGES AND INSTALLATIONS	QUIET AREAS	MIXED AREAS
		STORAGES	**1000**	**1000**
1		butaan, propaan, LPG (in tanks):	**300**	300
2		niet reactieve gassen (incl. zuurstof), gekoeld	**50**	50
3		brandbare vloeistoffen (in tanks):	**100**	100
4		Overige gevaarlijke stoffen in tanks:	**700**	700
5		Gevaarlijke stoffen (incl. bestrijdingsmiddelen) in emballage of in gasflessen:	**500**	500
6		ontplofbare stoffen en munitie:	**1000**	1000
7		professioneel vuurwerk:	**1000**	1000
8		kunstmest, niet explosief	**50**	30
9		kuilvoer	**50**	30
10		gier / drijfmest (gesloten opslag):	**200**	100
		INSTALLATIONS	**1500**	**1500**
12		gasflessenvulinstallaties (butaan, propaan)	**100**	100
13		laadschoppen, shovels, bulldozers	**50**	30
14		laboratoria:	**30**	10
15		luchtbehandelingsinst. t.b.v. detailhandel	**10**	
16		keukeninrichtingen	**30**	10
17		koelinstallaties freon ca. 300 kW	**50**	30
18		koelinstallaties ammoniak < 400 kg	**30**	10
19		koelinstallaties ammoniak > 400 kg	**50**	50
20		total energy installaties (gasmotoren) ca. 100 kW	**50**	30

Target and intervention values

Soil

	Soil/Sediment (mg/kg dry matter)			Groundwater (mg/l solved)			
	national background concentration (AC)	target value	intervention value	target value shallow	national background concentration deep (AC)	target value deep (incl. AC)	intervention value
Table 1							
I Metalen							
antimoon	3	3	15	-	0,09	0,15	20
arseen	29	29	55	10	7	7,2	60
barium	160	160	625	50	200	200	625
cadmium	0,8	0,8	12	0,4	0,06	0,06	6
chroom	100	100	380	1	2,4	2,5	30
cobalt	9	9	240	20	0,6	0,7	100
koper	36	36	190	15	1,3	1,3	75
kwik	0,3	0,3	10	0,05	-	0,01	0,3
lood	85	85	530	15	1,6	1,7	75
molybdeen	0,5	3	200	5	0,7	3.6	300
nikkel	35	35	210	15	2,1	2,1	75
zink	140	140	720	65	24	24	800

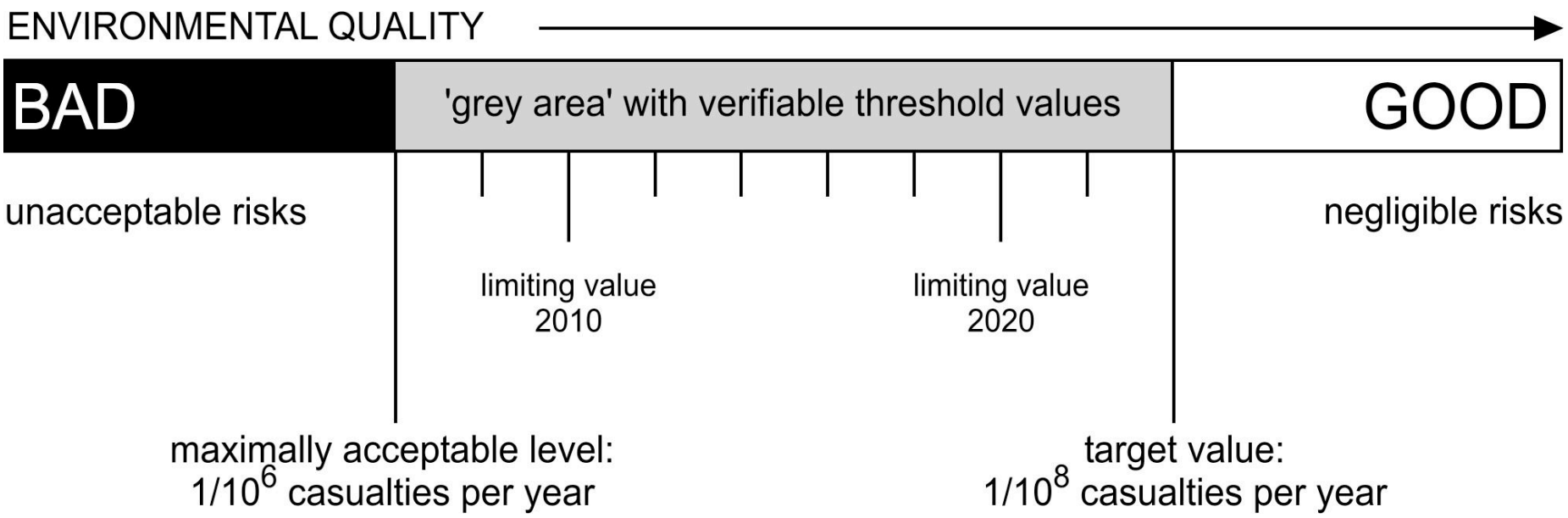
Pollutants with priority

CAS-nr	Name	International					ZEZ	NeR			MJV		Opm.	
	http://www.rivm.nl/rvs/stoffen/prio/totale_prio	KRW prio	OSPAR prio	UNEP-POP	UNECE-POP	67/548 Annex I	Zeer Ernstige Zorg	Extreem risicovol	MVP1	MVP2	Lucht	Water	Opmerking	Beleidsmatige status
16984-48-8	anorganische fluoriden										x	x		A
7440-38-2	arseen en arseenverbindingen					x	ZEZ*				x	x	2,3	B
7440-41-7	beryllium en berylliumverbindingen					x	ZEZ*		x				2,3	D
7440-43-9	cadmium en cadmiumverbindingen	pg	x			x	ZEZ*				x	x	2,3	B
	CFK's										x			C
	chlooranilinen										x			B
	chloorbenzenen										x	x		B

From impact-
into source-oriented policy

<table>
<tr><td colspan="3">impact oriented (main point seventies: soil, water, air)</td></tr>
<tr><td rowspan="4">source oriented
(since eighties)</td><td colspan="2">emission oriented (remove at source)</td></tr>
<tr><td colspan="2">volume oriented (less consumption and production)</td></tr>
<tr><td rowspan="3">structurally</td><td>energy saving (energy)</td></tr>
<tr><td>chain management (material)</td></tr>
<tr><td>quality stimulation (information)</td></tr>
</table>

Targets:
1% of maximally acceptable



National environmental policy

Core aim:

The *preservation* of carrying capacity for the benefit of ‘sustainable development’.

(A development meeting the needs of the current generation without endangering the possibility of future generations to meet their needs.)

Environmental problems

GLOBAL

Ozone layer

Climate change

CONTINENTAL

Cross-border air pollution

Ozone on low level

Acidification

Winter smog

Heavy metals

FLUVIAL

Rivers

Regional waters

Salt waters

Water bottoms

REGIONAL

Accumulation

Overfertilization

Pesticides

Heavy metals

Removal

Soil pollution

Drying out

LOCAL

Noise nuisance

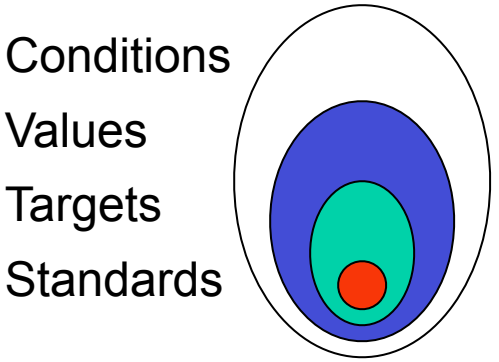
Smell nuisance

Air pollution in the city

Interior environment

Elaboration targets into standards

Global
Continental
Fluvial
Regional
Local



Sources of standards

- The 5th National Plan of Spatial Policy Min.v.VROM (2001),
- The National Plan of Nature Policy (Min.v.LNV, 2000)
- The 4th National Plan of Environmental Policy (Min.v.VROM)
- The 4th National Plan of Watermanagement Policy Min.v.V&W (1998)(stressing environment), and
- its last successor ‘Anders omgaan met water’Min.v.V&W (2000) (stressing security).

Strategic agenda

Reducing uncertainties
Choices of scenarios
Formulating

themes

signalling and recognition
policy
solution
management

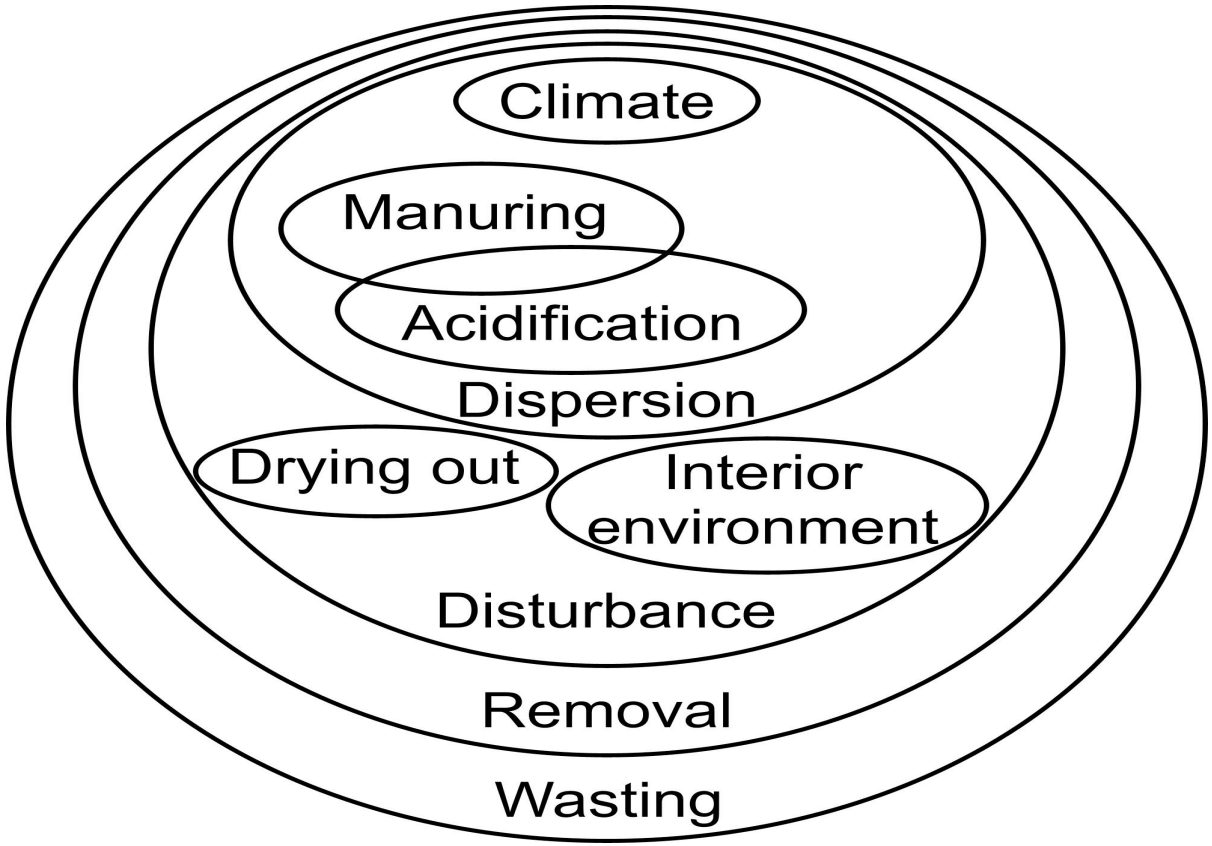
instruments

legislation, communication

cooperation

target groups

Environmental themes



Strategic agenda

Themes

- climate change
- acidification
- manuring
- dispersion
- disposal
- disturbance
- drying out
- wasting

Instruments

- rules
- responsibility
- financial regulations
- environmental care in businesses
- product norms
- information
- technology
- energy saving

Cooperation

- International
- National
- Province
- Municipality

Target groups

- agriculture
- industry
- refinaries
- energy supply
- trade, services and administration
- traffic
- consumers
- disposal services
- actors in the water chain

Impact target groups on themes

Target groups

- agriculture
- industry
- refinaries
- energy supply
- trade, services and administration
- traffic
- consumers
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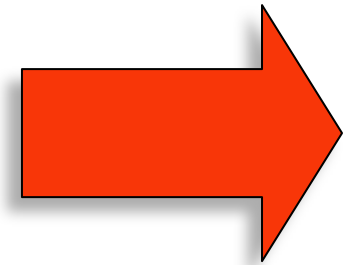
- actors in the water chain



Strategic themes

- climate change
- acidification
- overfertilization
- spread
- disposal
- disruption
- dry out
- wasting

Contributions of building

THEME	SPECIFICATION	CONTRIBUTION
Klimaatverandering	airconditioning, isolatieschuim	23% van het totale CFK-gebruik
	energie uit fossiele brandstof voor woon-werkverkeer, produktie bouwmaterialen, verwarming.	>33% van de totale CO_2-produktie
Verzuring	woon-werkverkeer, bouwmaterialen, verwarming	>16% van de totale NO_x- en SO_x-produktie
Vermesting	huishoudelijk afvalwater, emissies naar bodem- en grondwater	24% van de totale stikstof- en phosphorproduktie.
Verspreiding milieugevaarlijke stoffen	oplosmiddelen, verduurzaming, onderhoud, asbest, zware metalen emissies bij onvoldoende hergebruik.	9% van de vluchtige organische stoffen, 40000 ton zware metalen, 7000 ton pigmenten
Verwijdering afvalstoffen	bouw- en sloop-afval	20% van het totale afval
Verstoring	lawaai en stank door verkeer, bouw, produktie en winning van bouwmaterialen	2.85 mln woningen (ernstige) hinder door wegverkeer, 25% stankegehinderden in kleine steden
Verspilling	onzorgvuldig gebruik, weinig hergebruik	120 mln ton grondstoffen per jaar, waarvan 90% primair
Binnenmilieu	gezondheids-effecten bouwmaterialen, vocht, kwaliteit binnenlucht, geluid, trillingen	aantal woningen boven referentiewaarde: 90% NO_x, 80% radon, 80% luchtgeluidgeluid-isolatie, 60% respirabel stof, 15% vochtproblemen, 6% koolmonoxide, 40% van de kantoren sick buildings
Aantasting ecologisch functionerend gebied	bouw-oppervlakte met afsluiten bodem-ecologie, winning van bouwstoffen	3100 km^2 verhard oppervlak, 1000 ha/jaar winning oppervlakte-delfstoffen, waarvan 500 ha definitieve bestemmings-wijziging.

Environmental themes as agenda

THEME	SPECIFICATION	CONTRIBUTION
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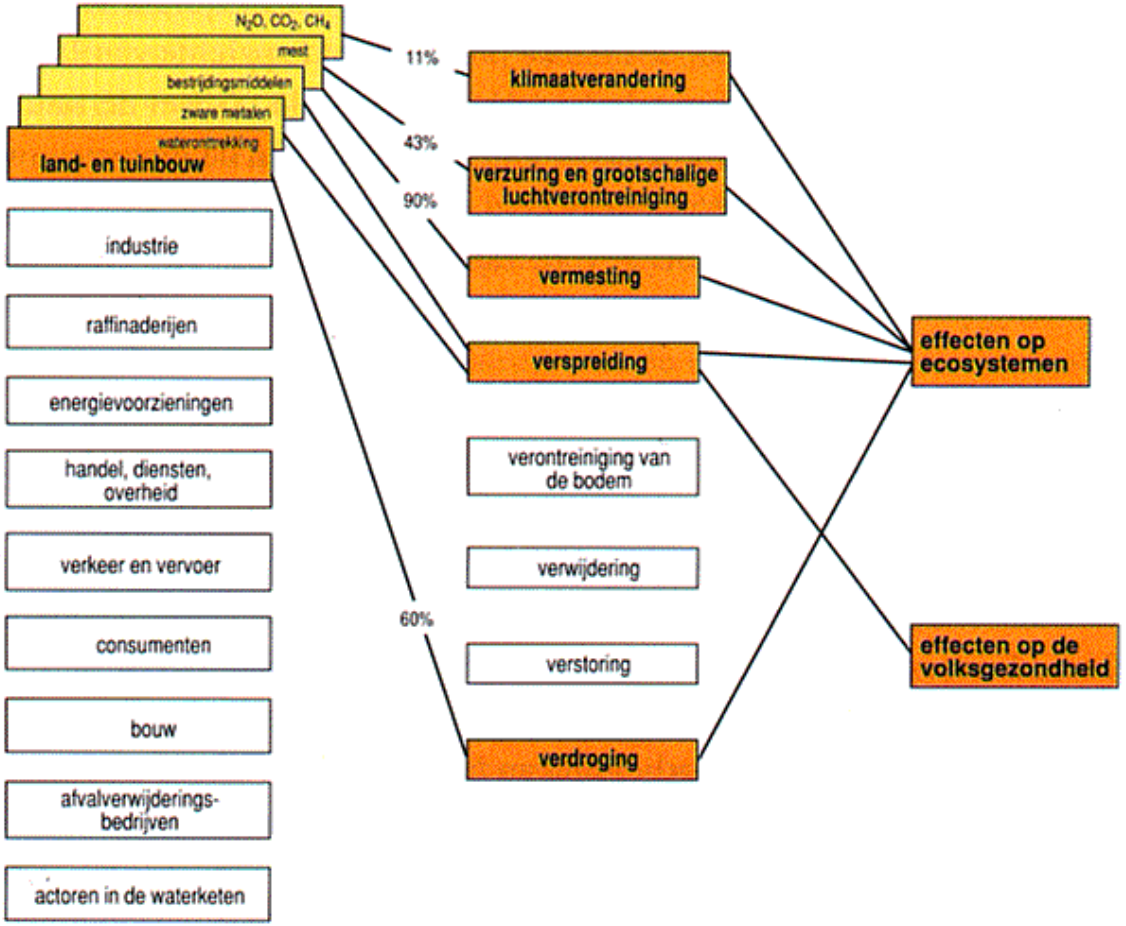
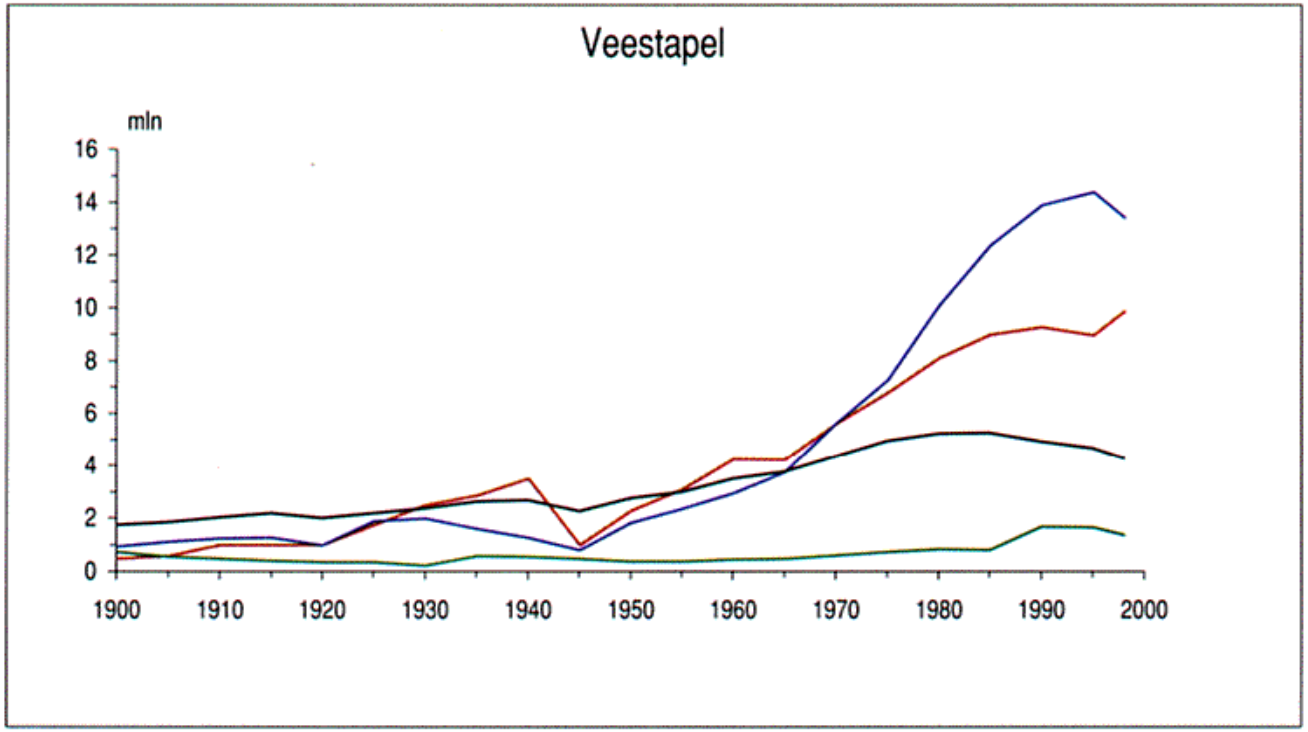
Target group agriculture

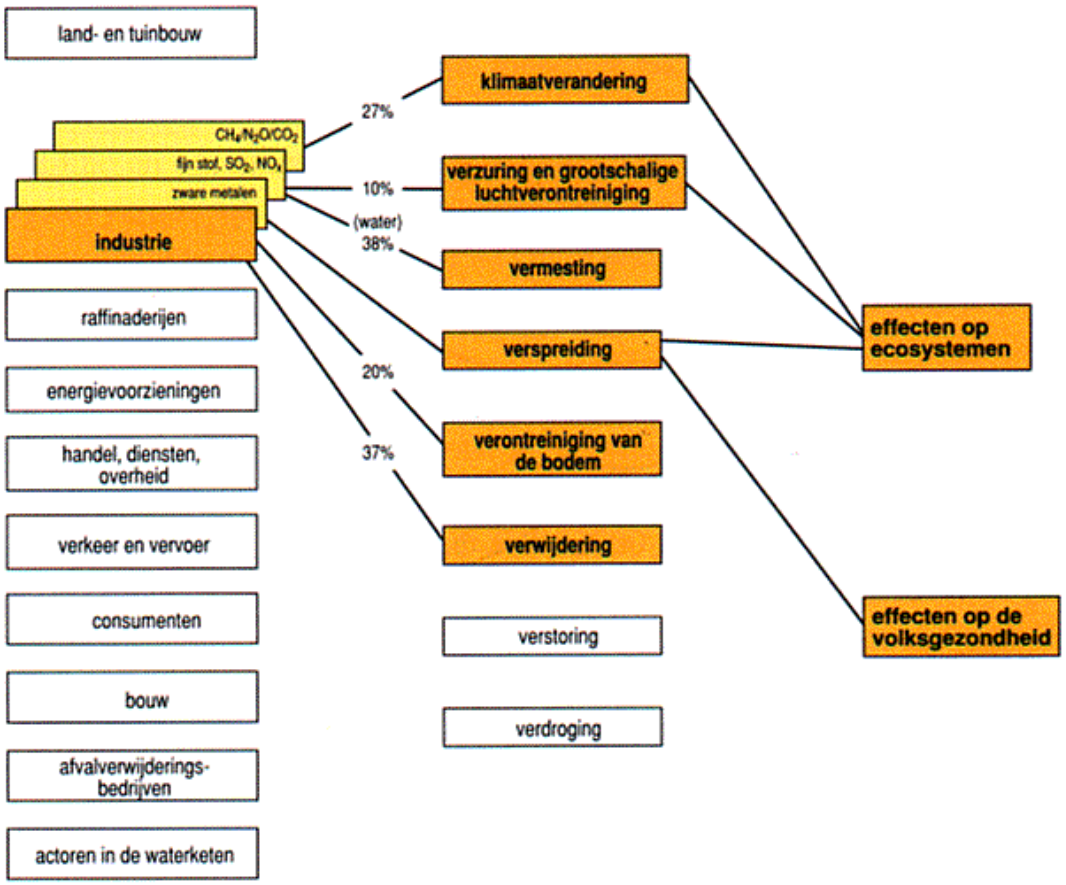


Agriculture

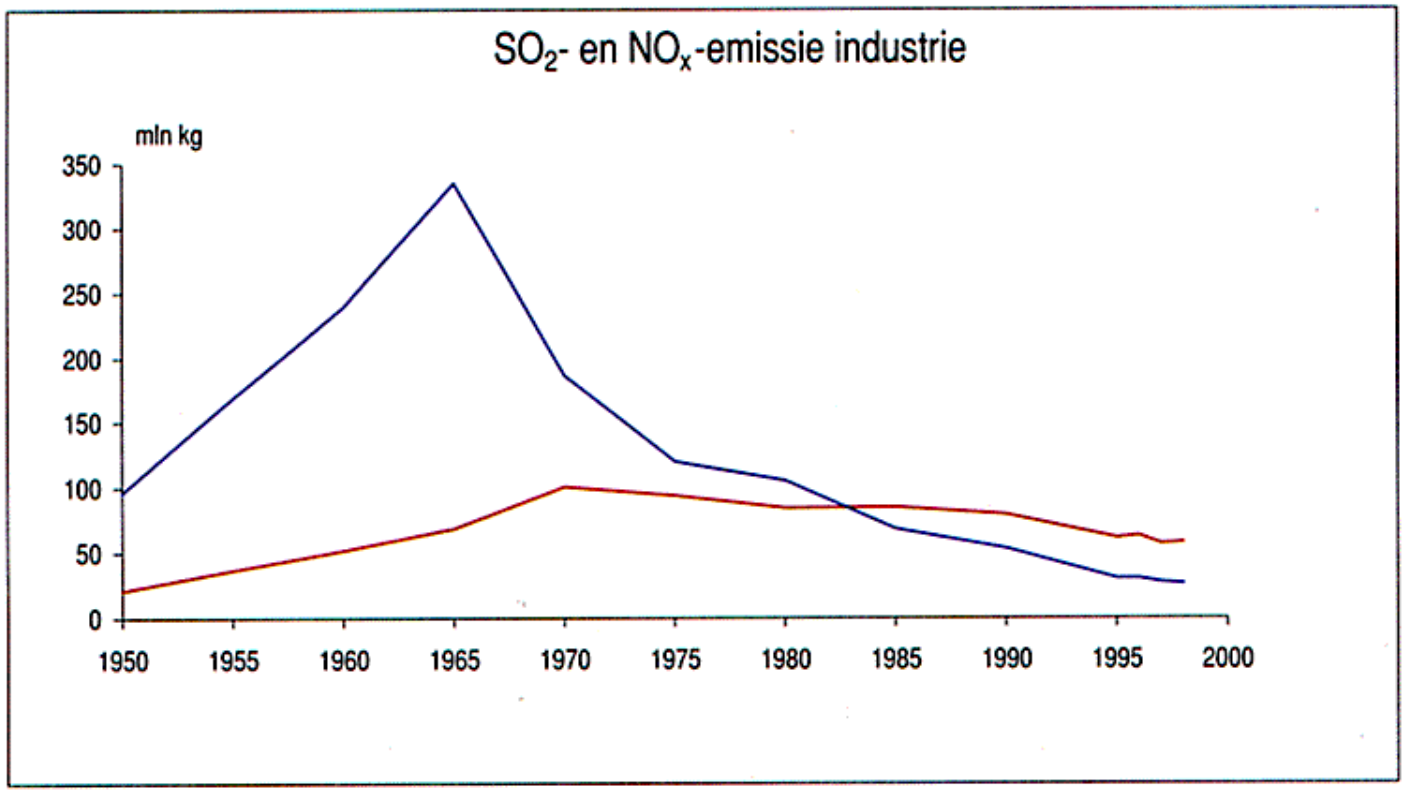


Figuur 3.2.2 De omvang van de veestapel, 1900-1998 (Bron: CBS).

Target group industry

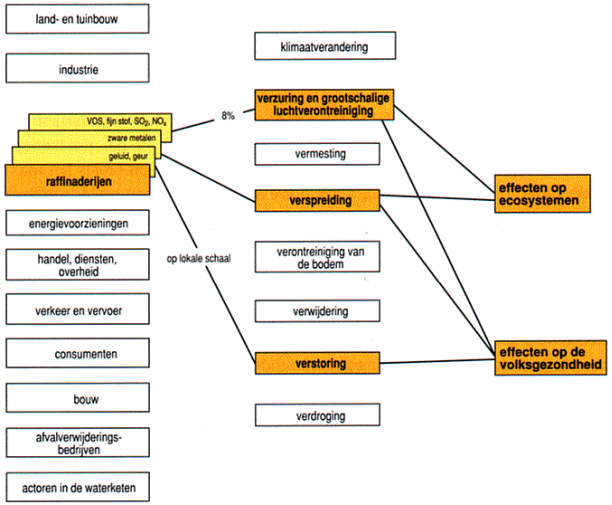


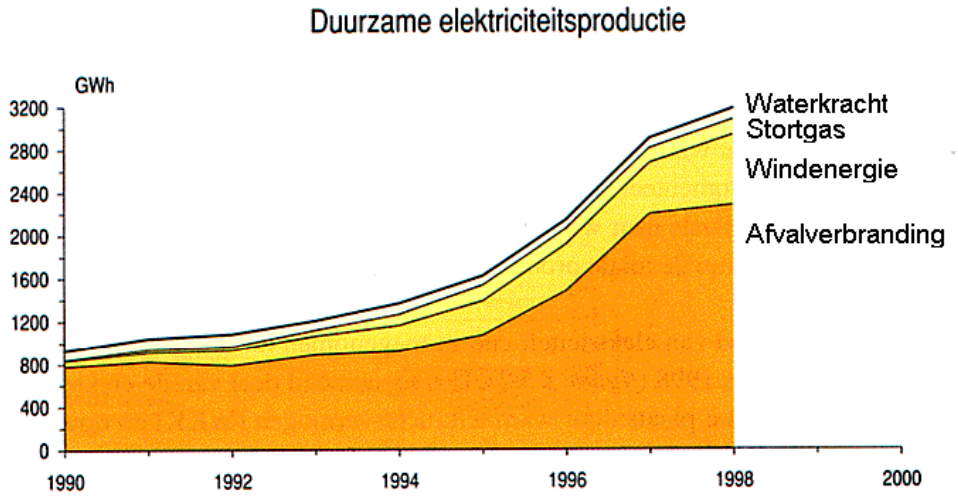
Industry



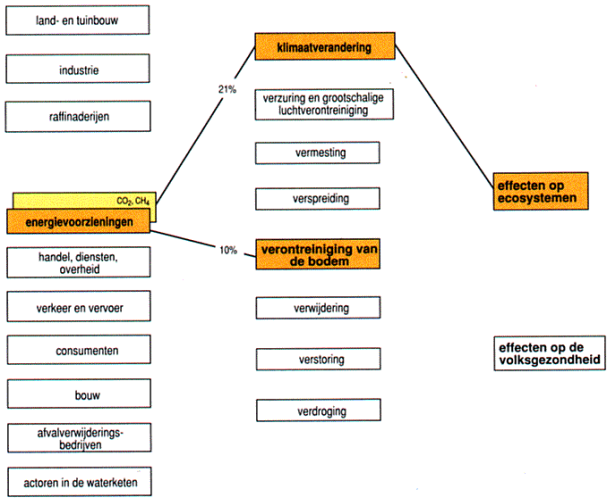
Figuur 3.3.3 Emissie van SO_2 en NO_x door de industrie, 1950-1998.

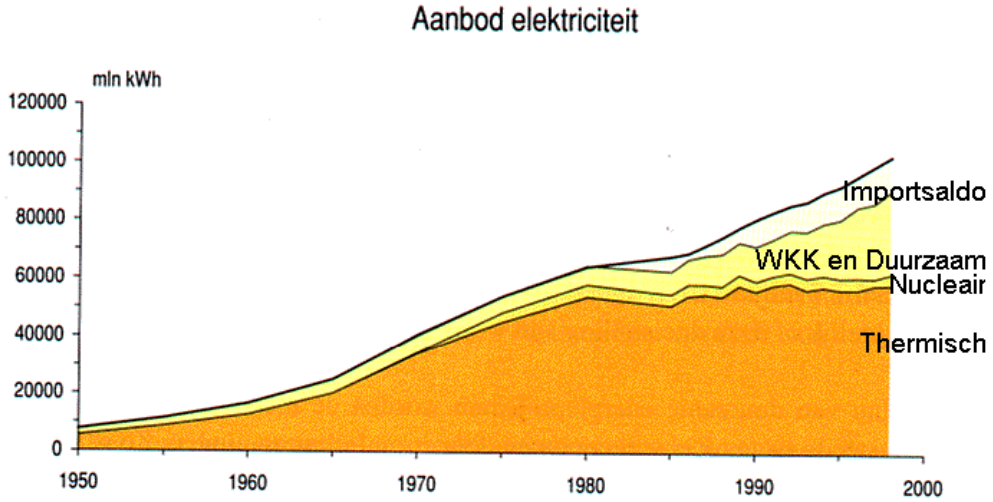
Target group refinaries



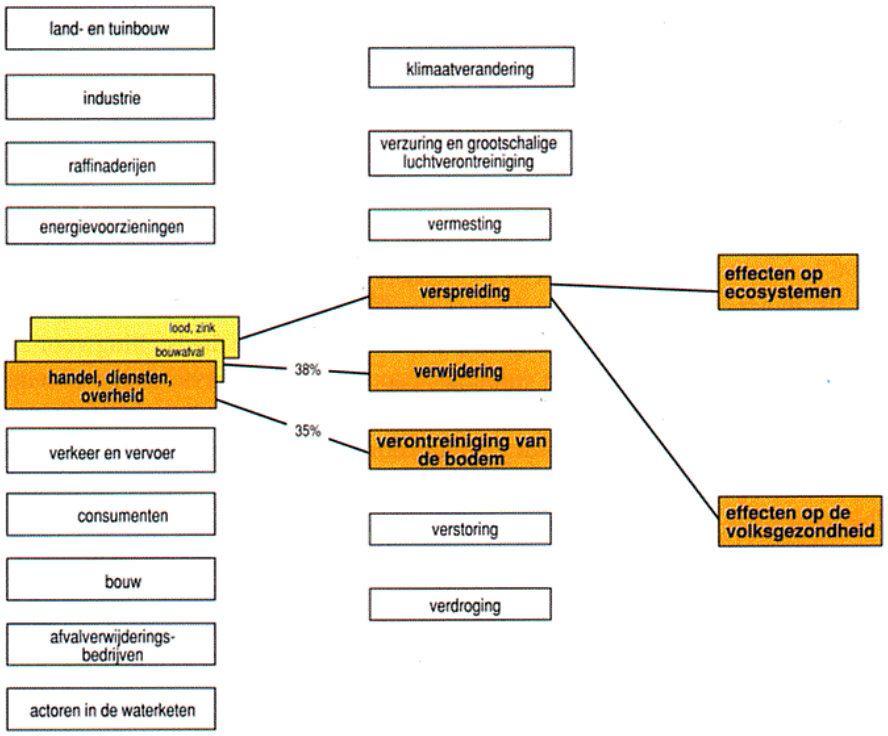


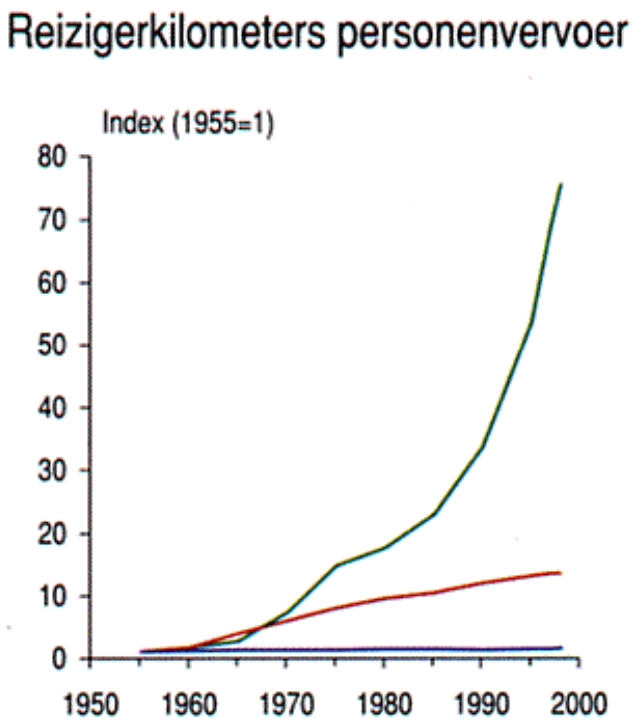
Target group energy supply



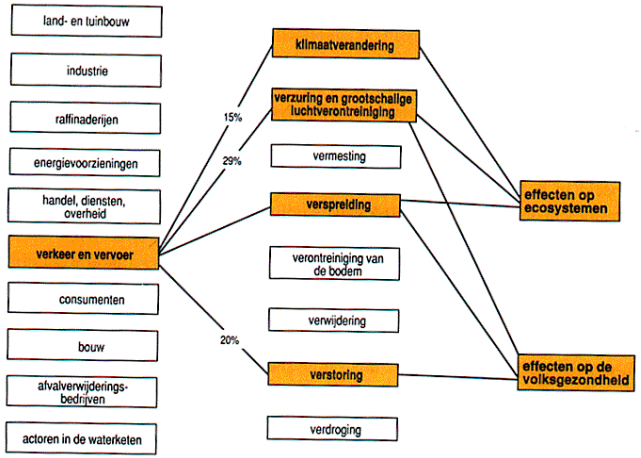


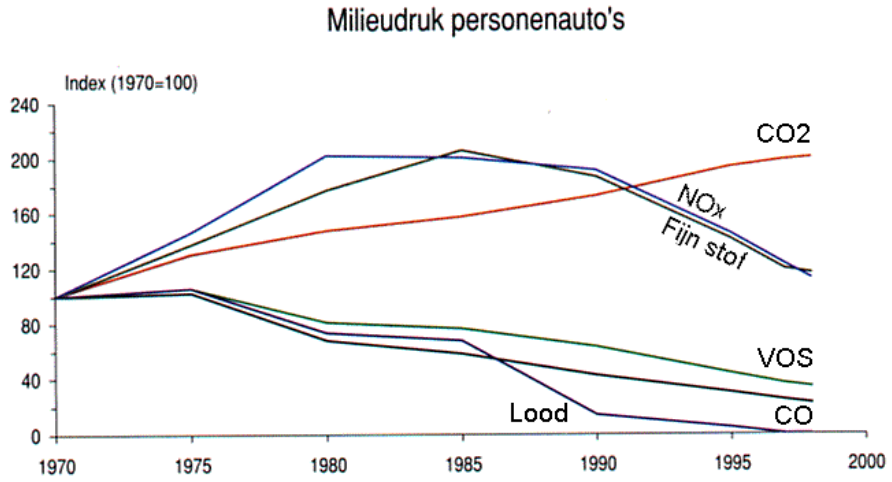
Target group trade, services and administration



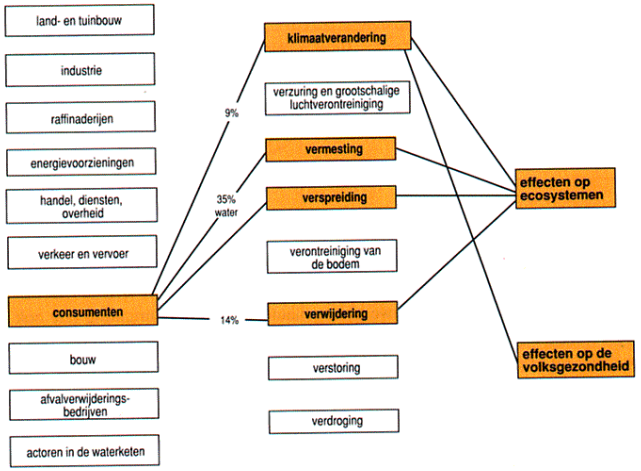


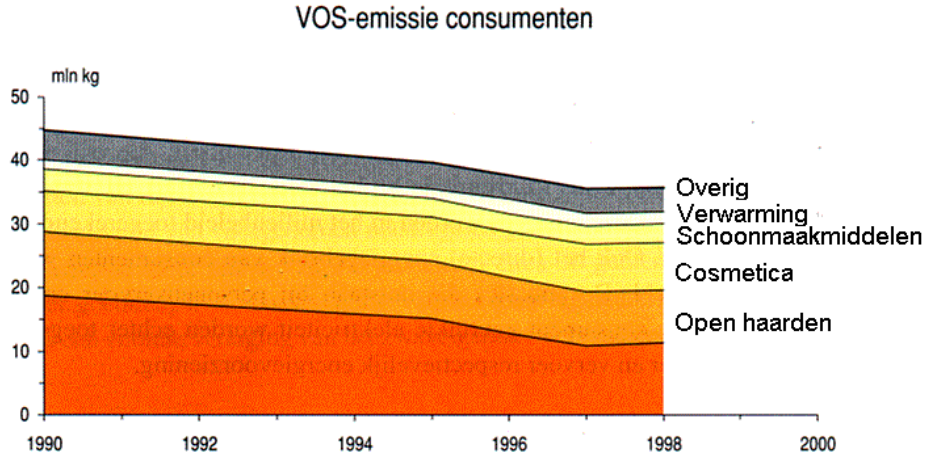
Target group traffic



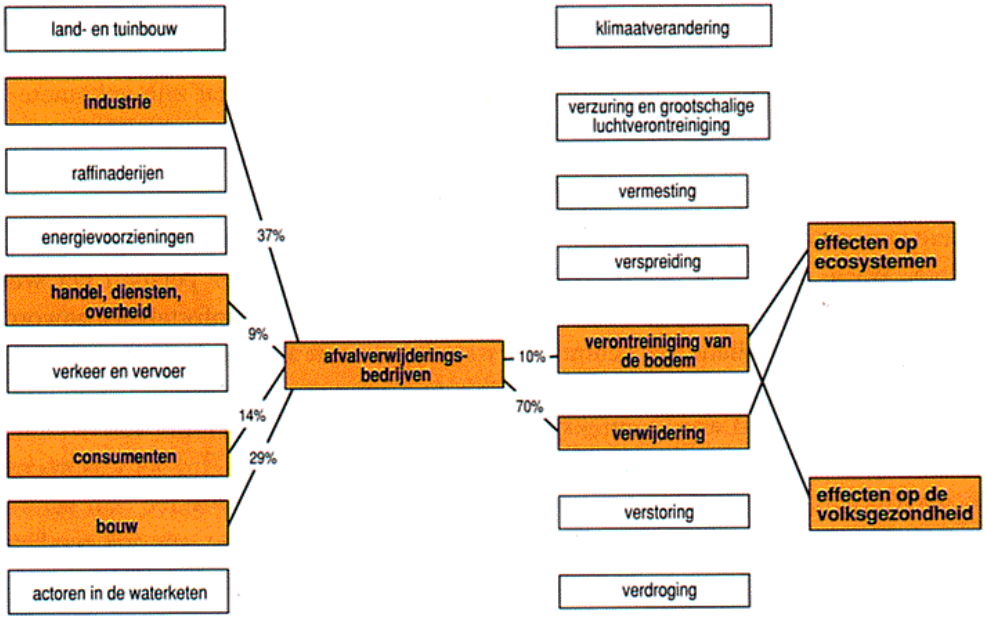


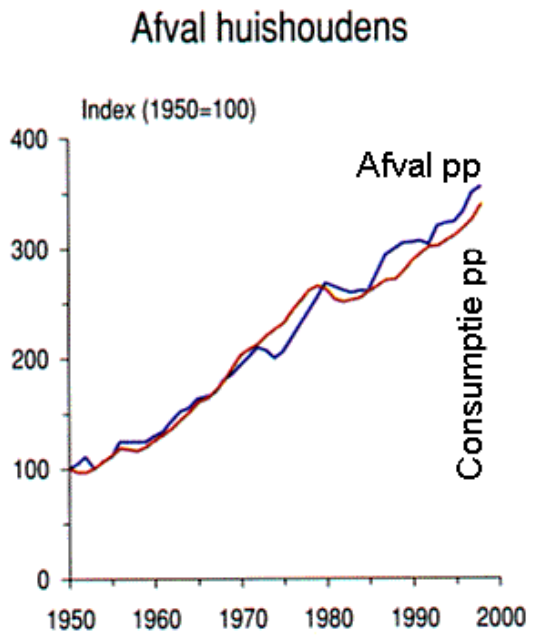
Target group consumers



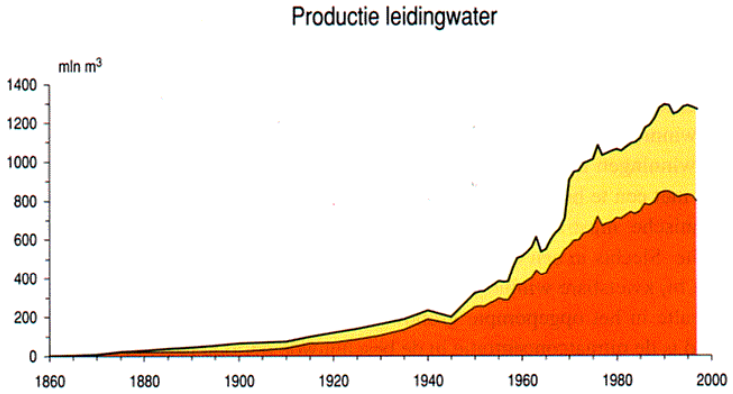


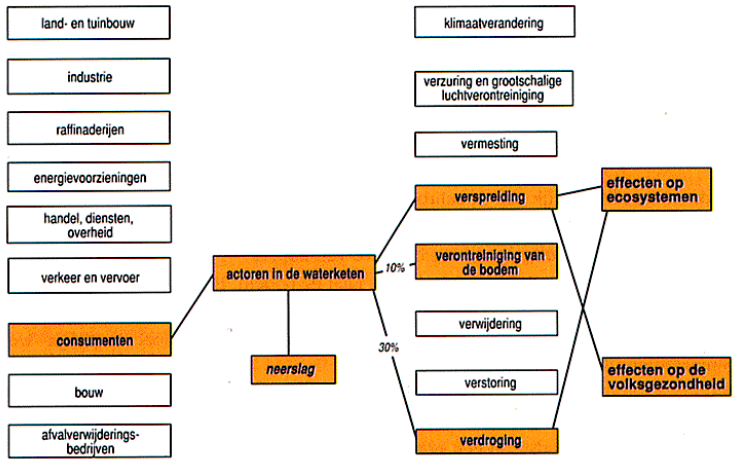
Target group disposal services

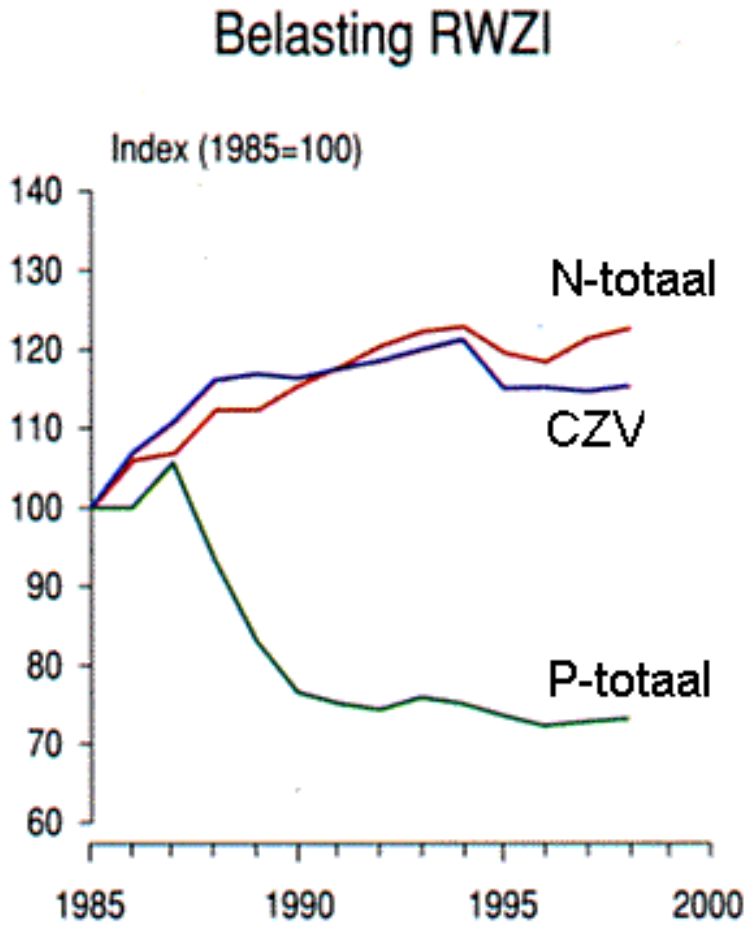




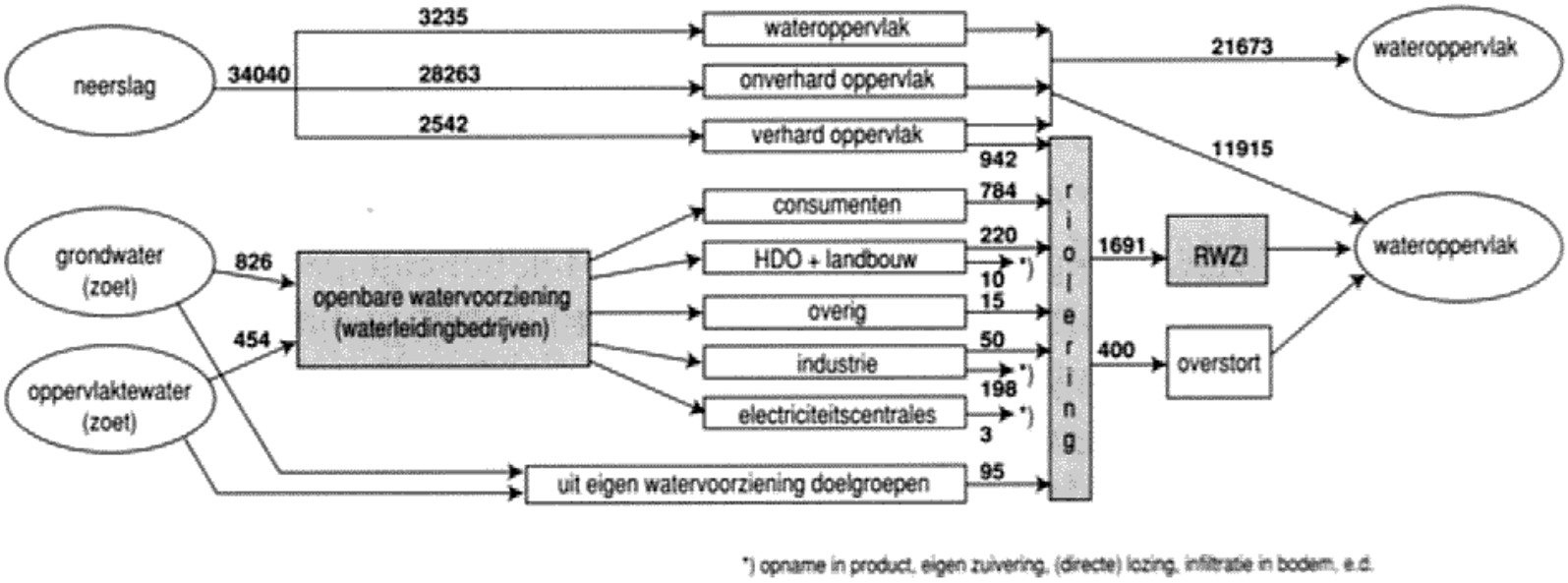
Target group actors in the water chain



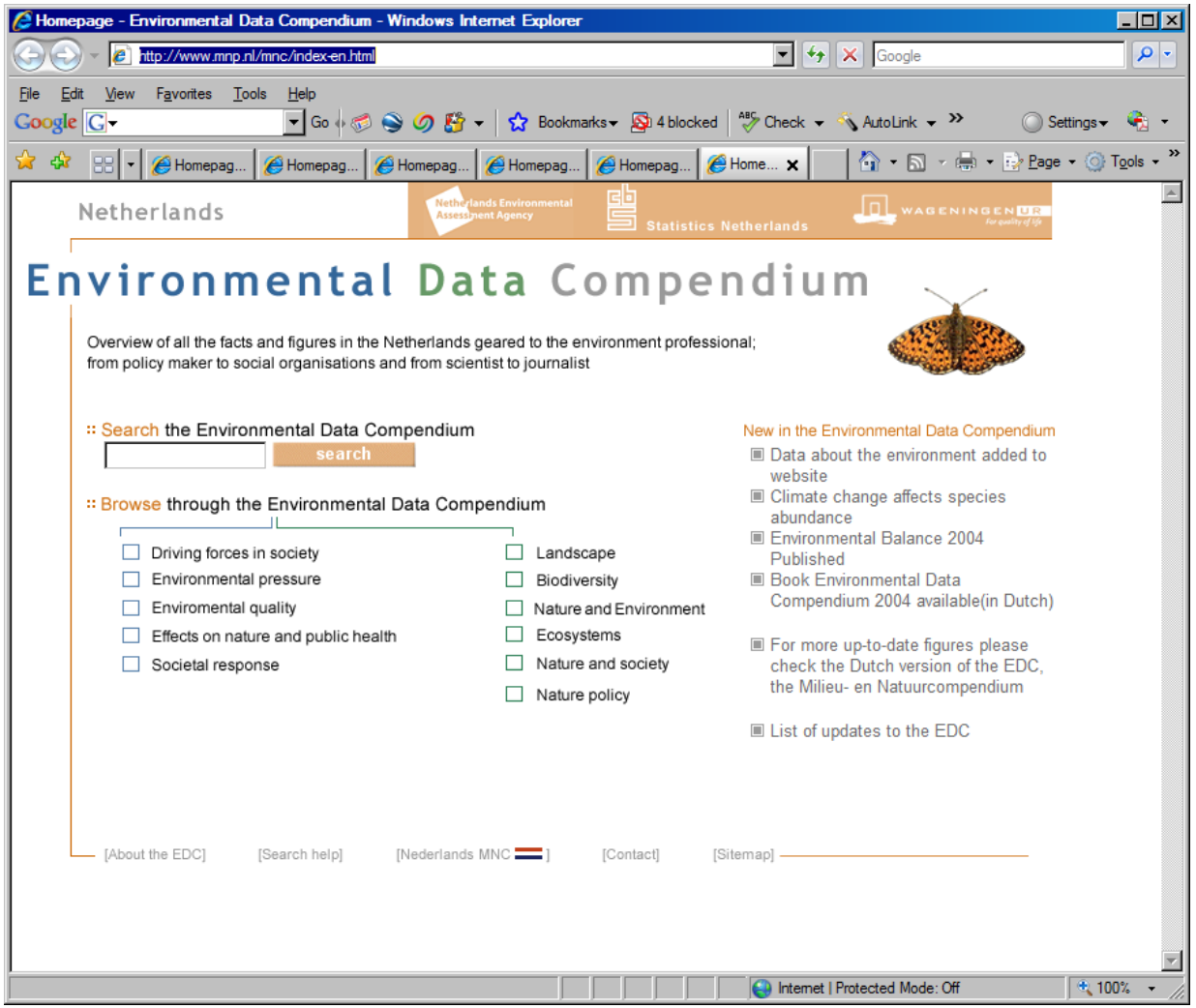




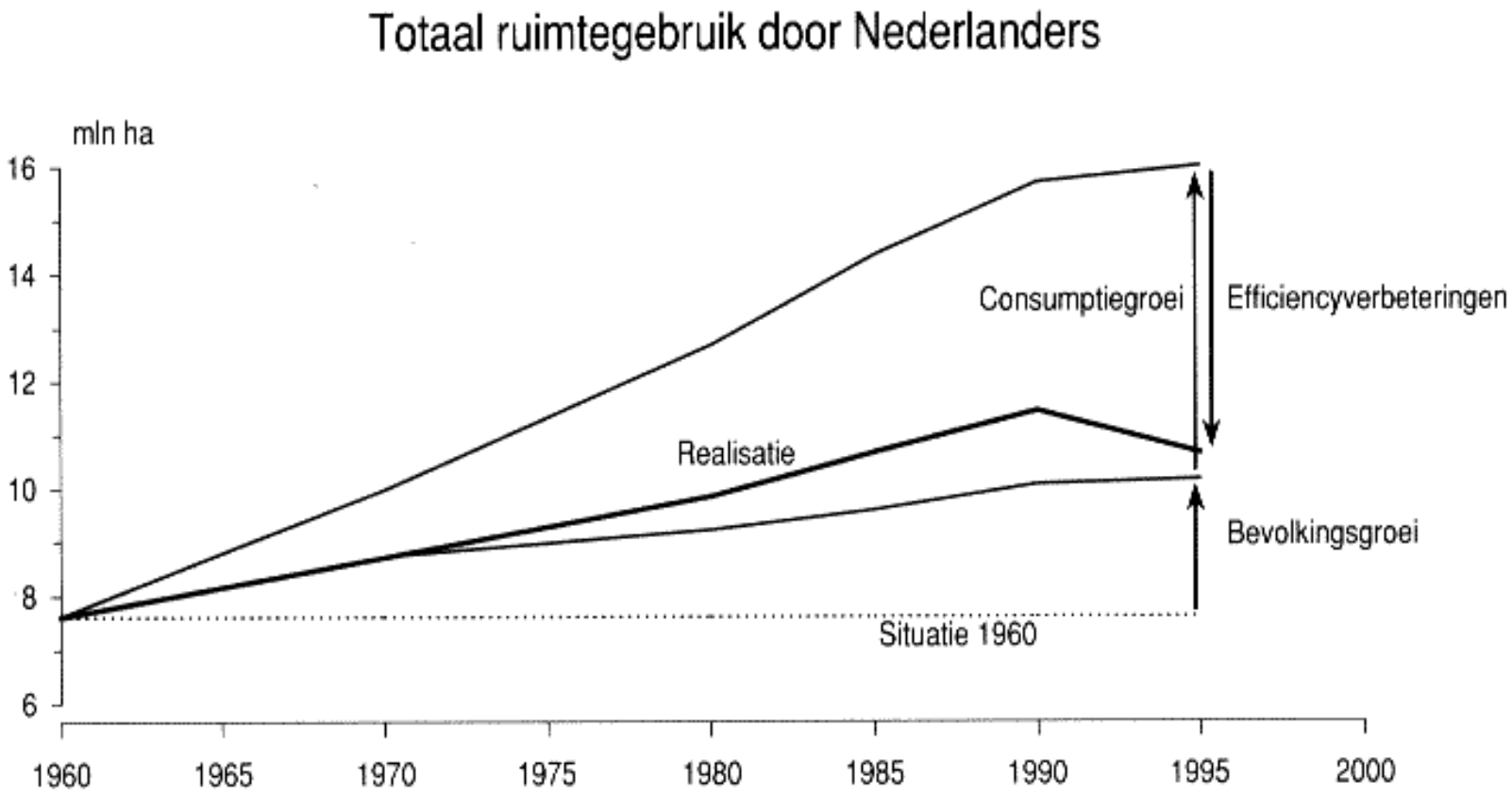
Water chain


neerslag
34040
3235
28263
2542
wateroppervlak
onverhard oppervlak
verhard oppervlak
21673
wateroppervlak
11915
grondwater (zoet)
826
oppervlaktewater (zoet)
454
openbare watervoorziening (waterleidingbedrijven)
consumenten
784
HDO + landbouw
220
10
overig
15
industrie
50
electriciteitscentrales
198
3
942
uit eigen watervoorziening doelgroepen
95
riolering
1691
RWZI
400
overstort
wateroppervlak
*)
*) opname in product, eigen zuivering, (directe) lozing, infiltratie in bodem, e.d.

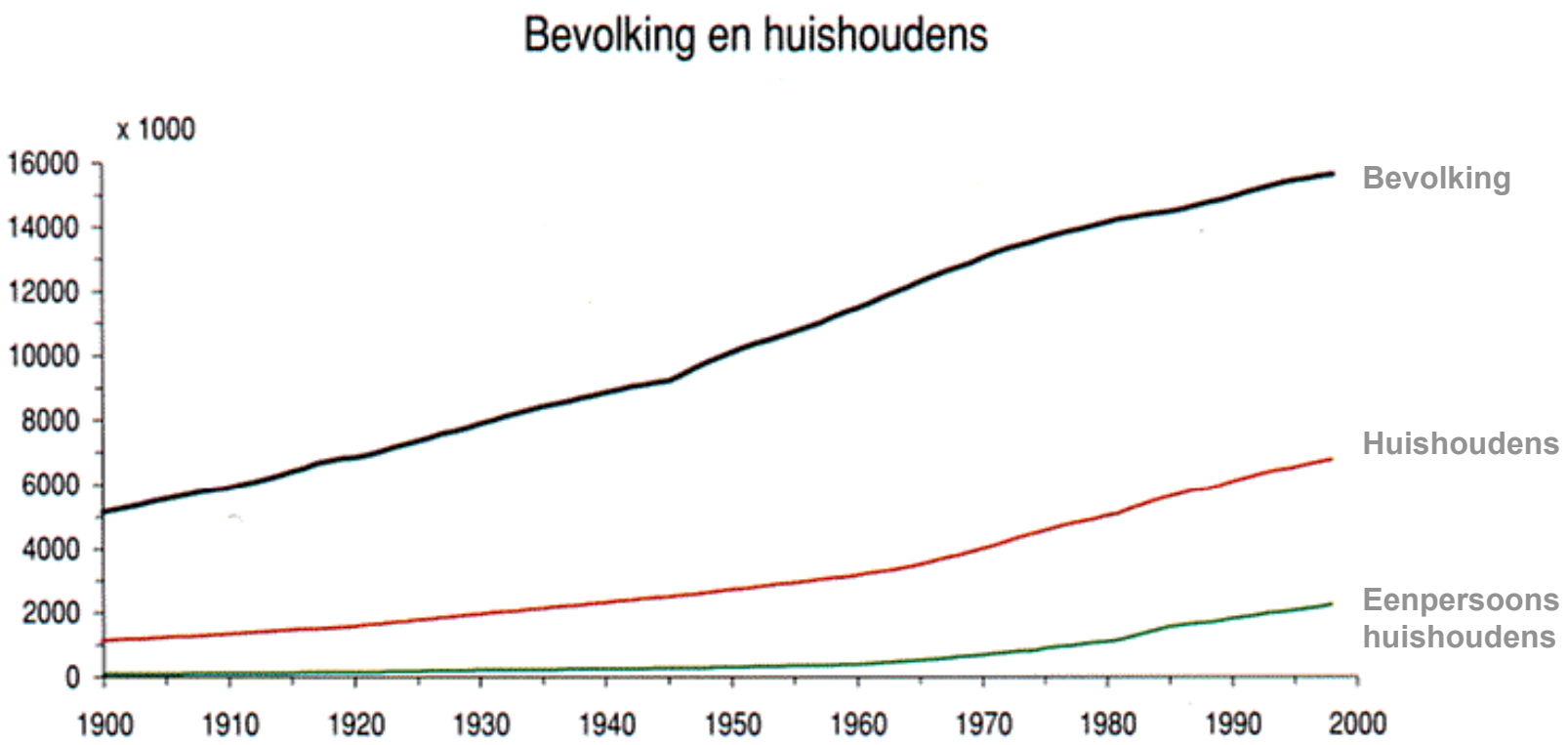
Environmental data



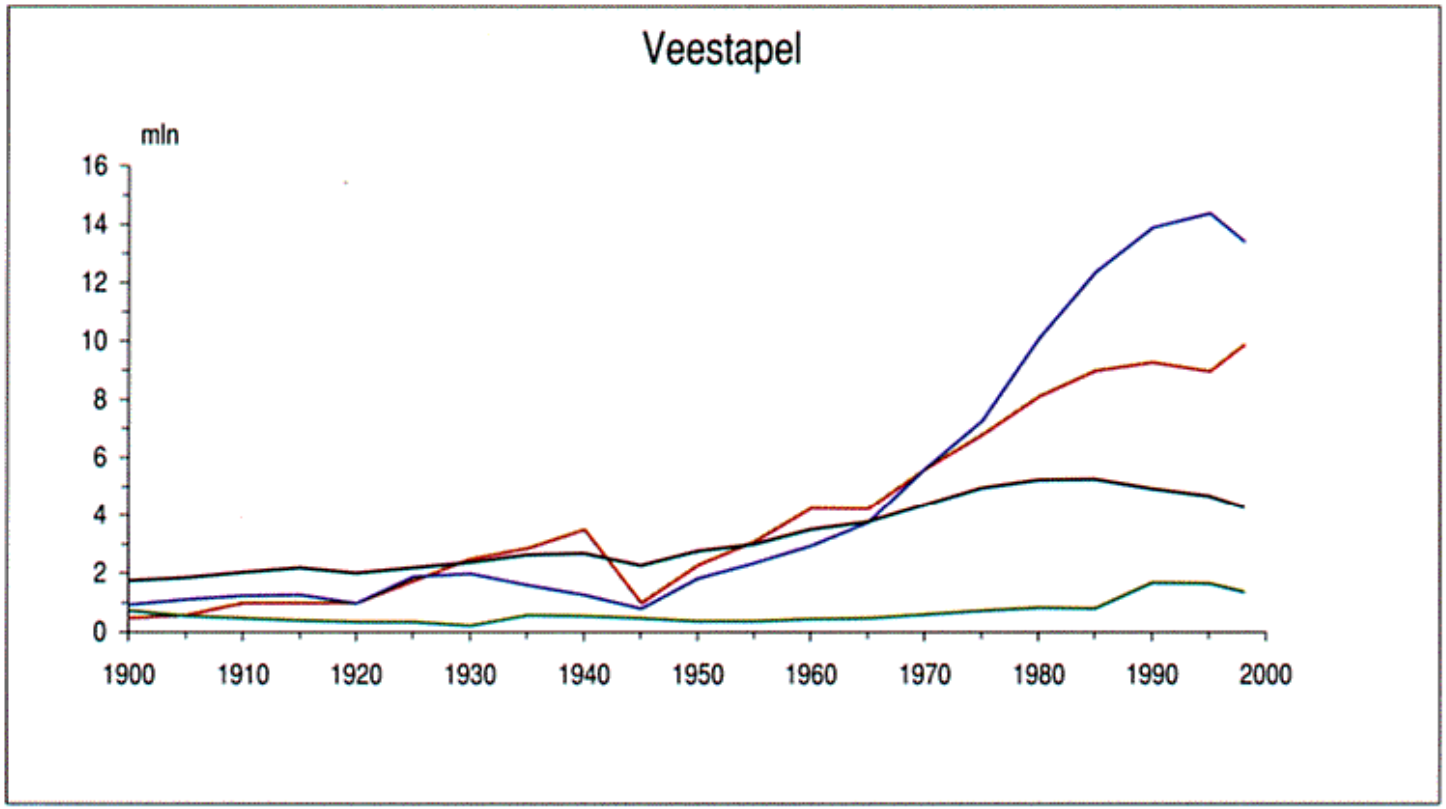
Space


Totaal ruimtegebruik door Nederlanders
mln ha
16
14
12
10
8
6
1960
1965
1970
1975
1980
1985
1990
1995
2000
Consumptiegroei
Efficiencyverbeteringen
Realisatie
Bevolkingsgroei
Situatie 1960

Population and households

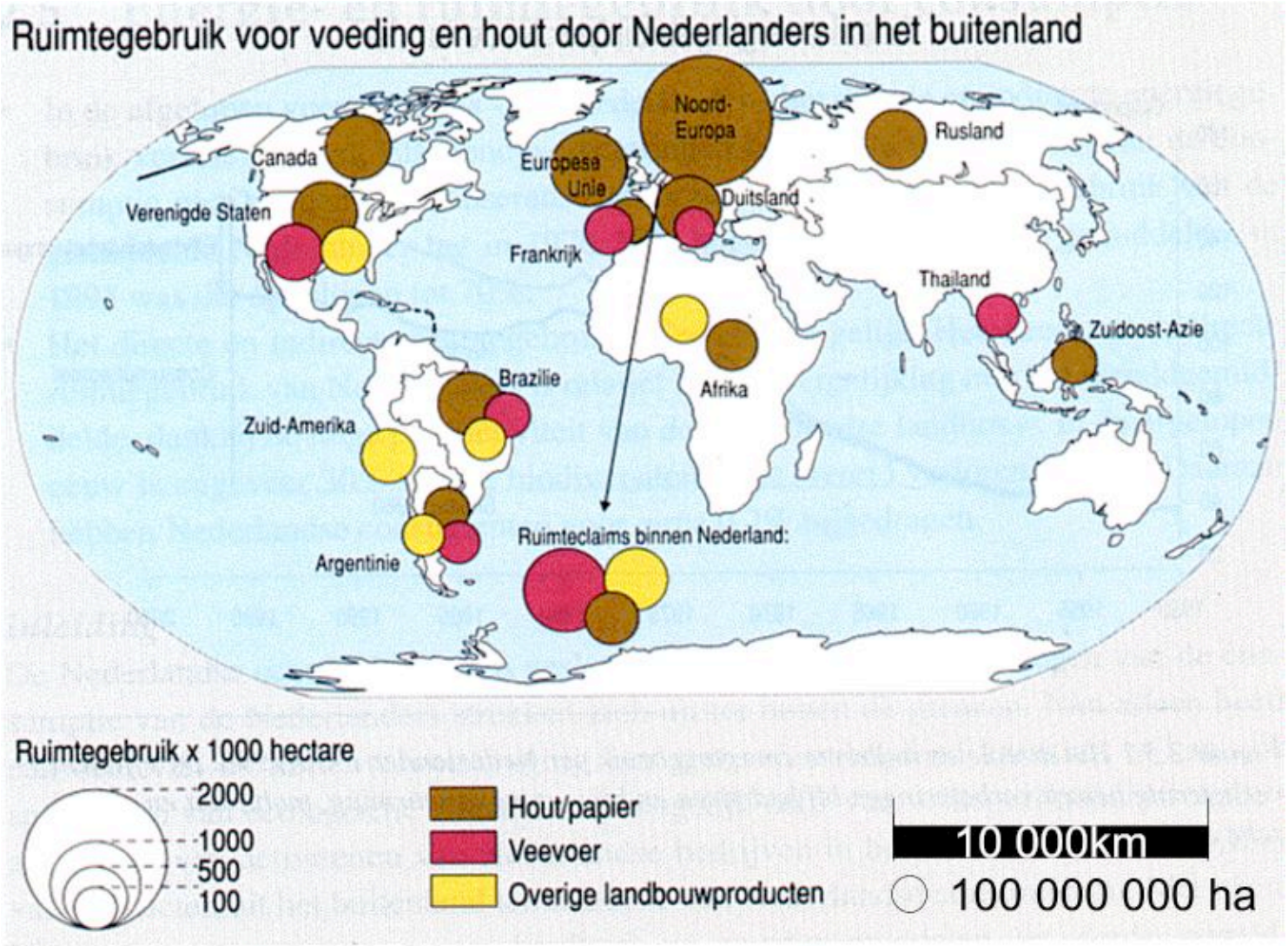


Cattle

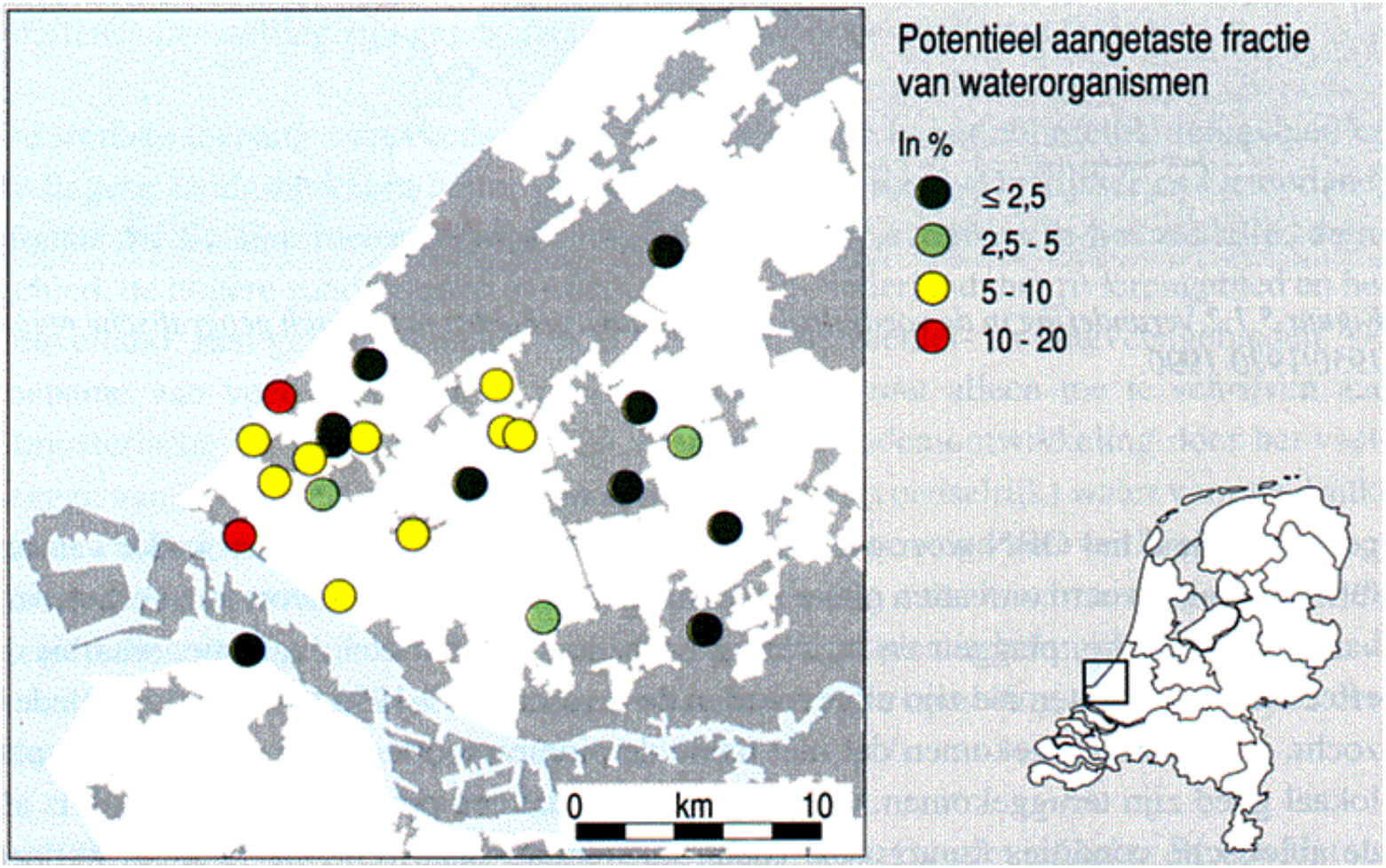


Figuur 3.2.2 De omvang van de veestapel, 1900-1998 (Bron: CBS).

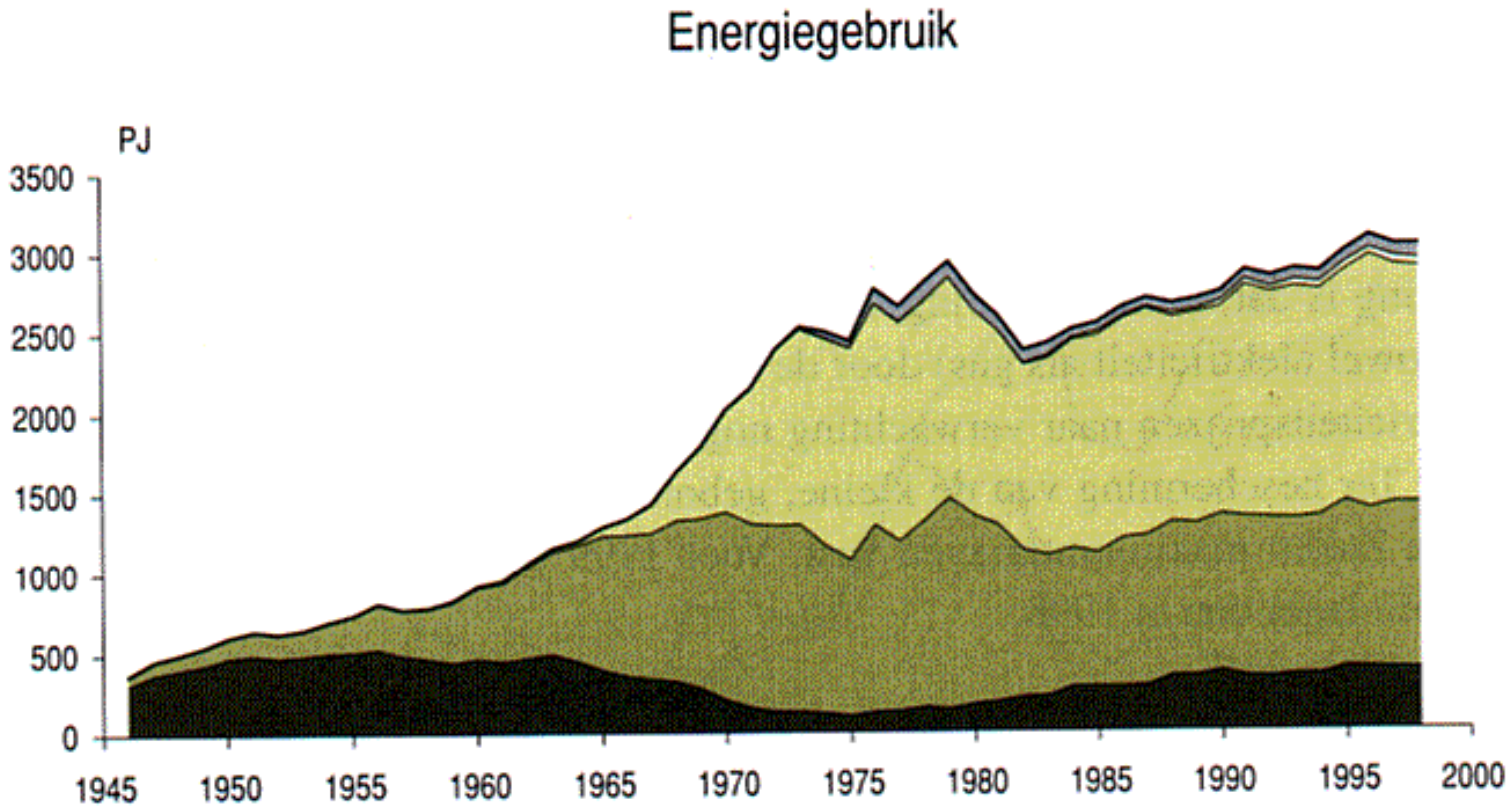
Ecological footprint



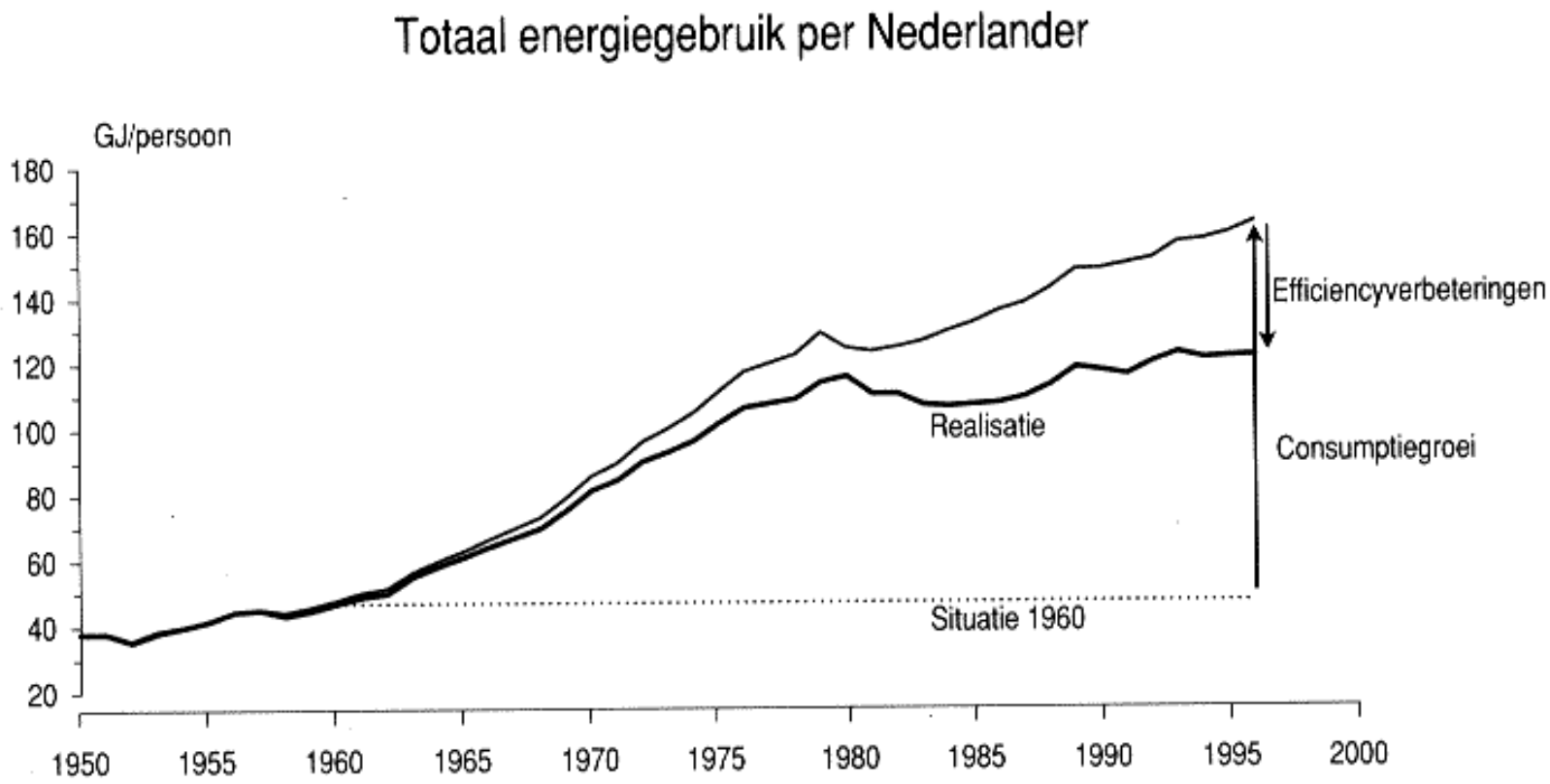
Ecology


Potentieel aangetaste fractie
van waterorganismen
In %
≤ 2,5
2,5 - 5
5 - 10
10 - 20
0
km
10

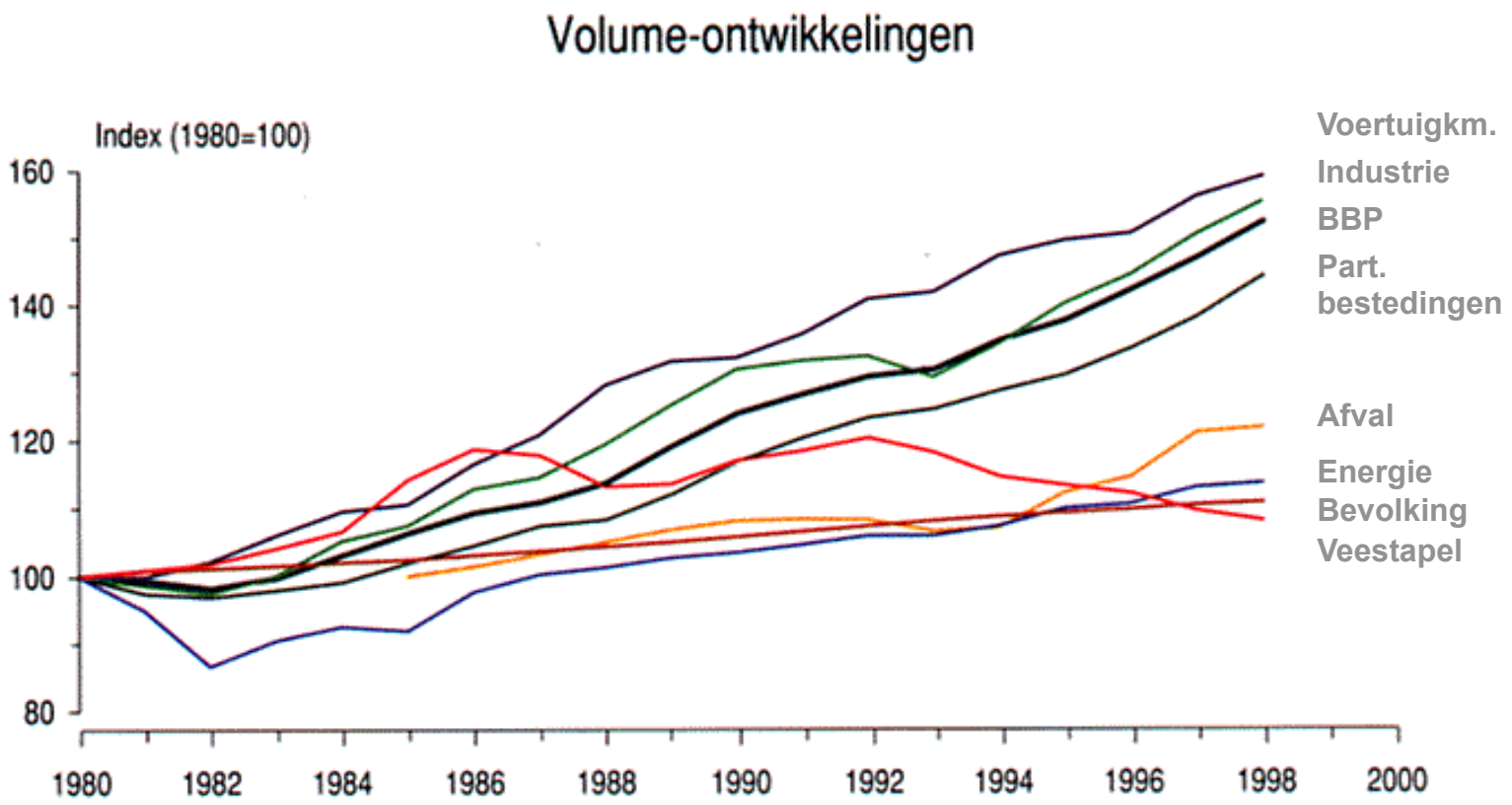
Use of energy



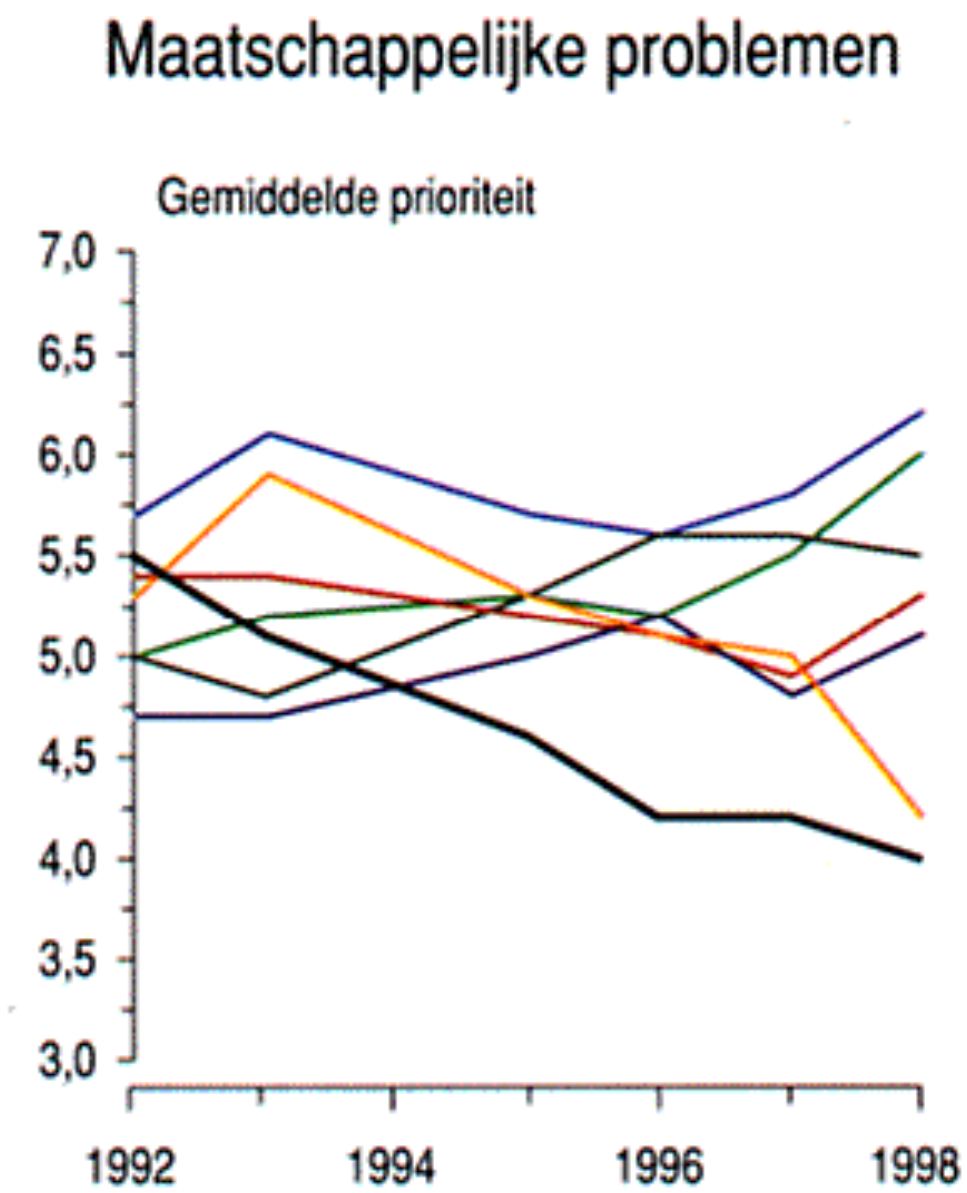
Use of energy



Economy


Volume-ontwikkelingen
Index (1980=100)
160
140
120
100
80
1980
1982
1984
1986
1988
1990
1992
1994
1996
1998
2000
Voertuigkm.
Industrie
BBP
Part. bestedingen
Afval
Energie
Bevolking
Veestapel

Culture



Criminaliteit

Openbare orde

Sociale zekerheid

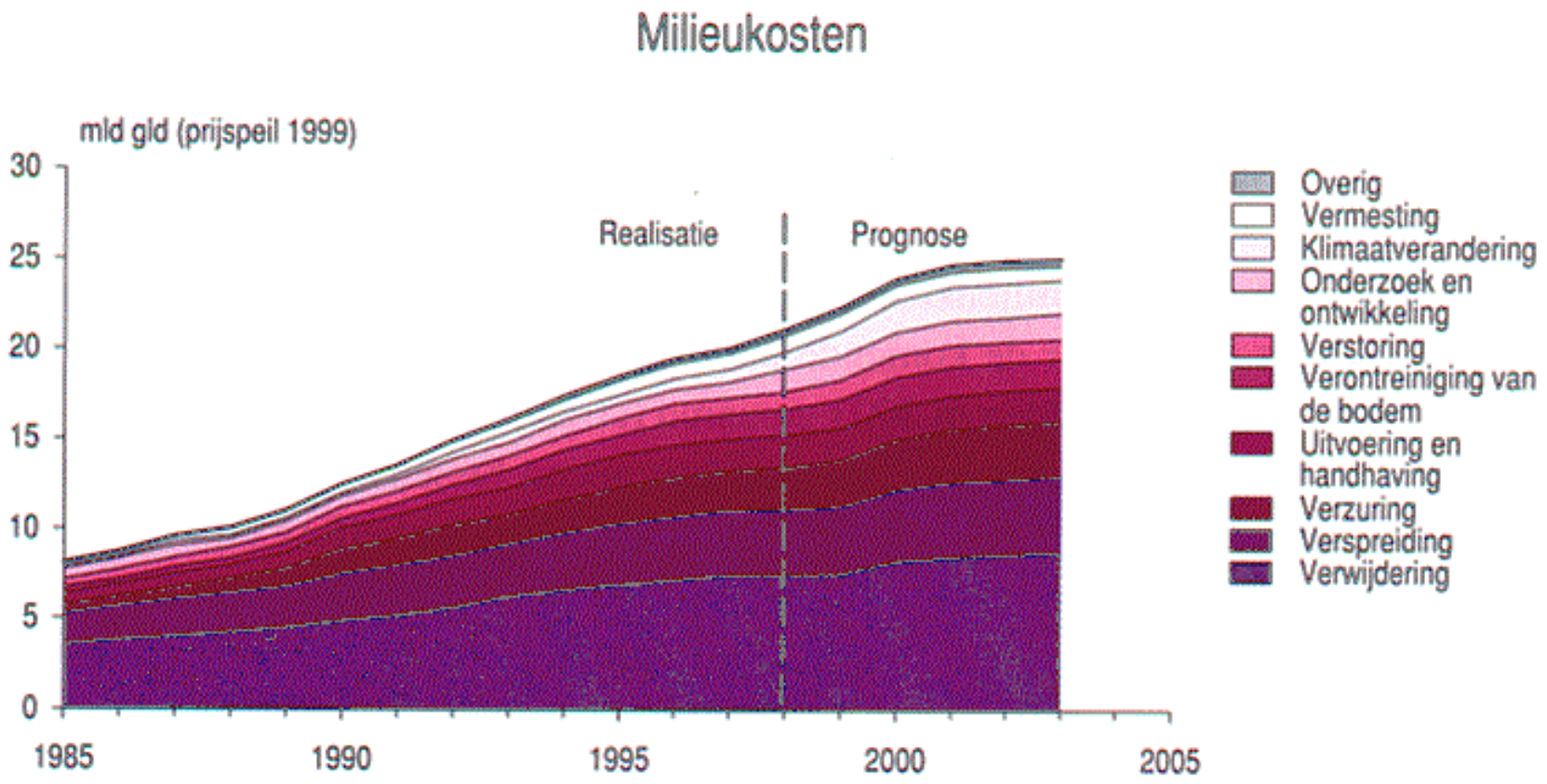
Economische groei

Vrijheid meningsuiting

Werkeloosheid

Milieu

Finance


Milieukosten
mld gld (prijspeil 1999)
30
25
20
15
10
5
0
1985
1990
1995
2000
2005
Realisatie
Prognose
Overig
Vermesting
Klimaatverandering
Onderzoek en ontwikkeling
Verstoring
Verontreiniging van de bodem
Uitvoering en handhaving
Verzuring
Verspreiding
Verwijdering

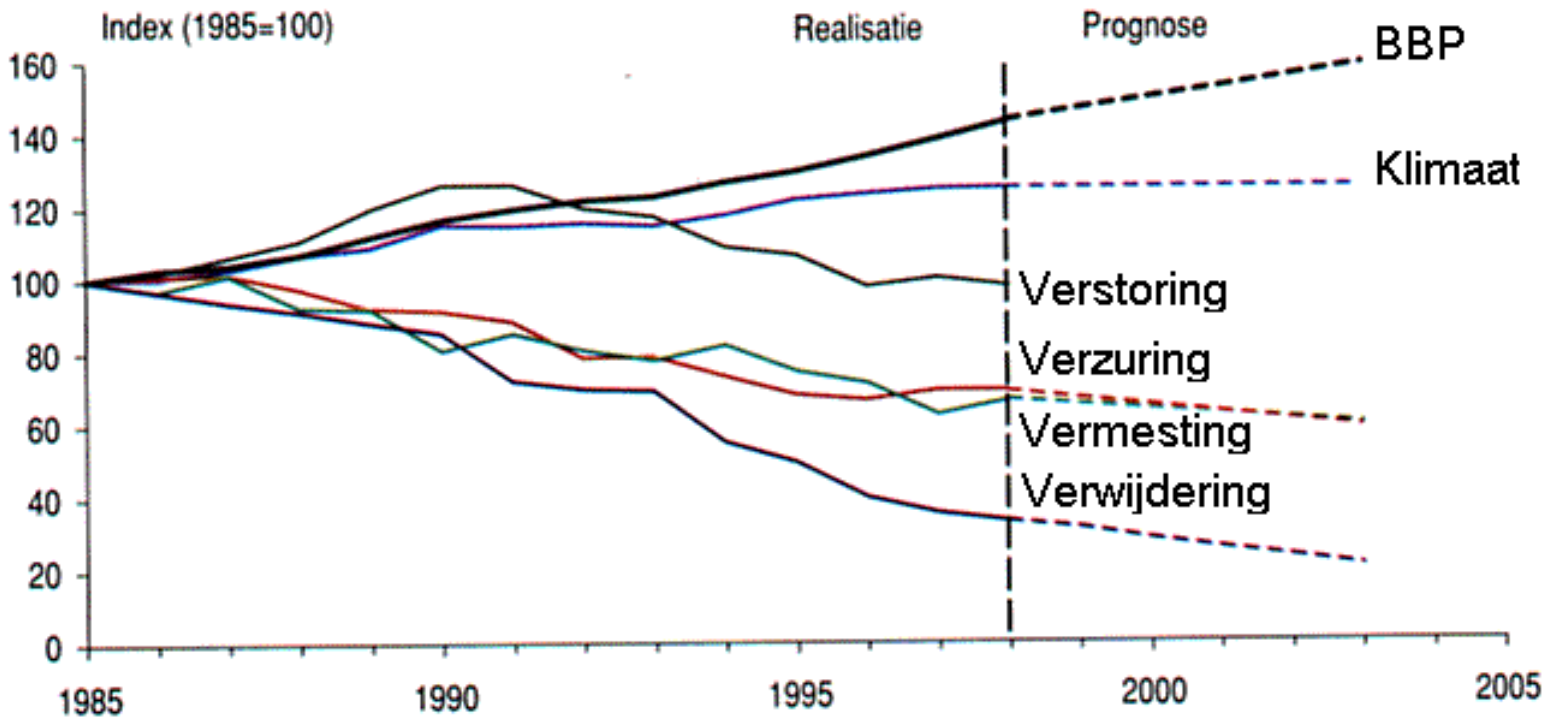
Environmental pressure

- C1. Total emissions and waste in the Netherlands
- C2. Agriculture and horticulture
- C3. Industry
- C4. Energy supply
- C5. Traffic and transport
- C6. Consumers
- C7. Construction
- C8. Actors in the water chain
- C9. Waste disposal
- C10. Trade, Services and Government (TSG)

Evironmental themes

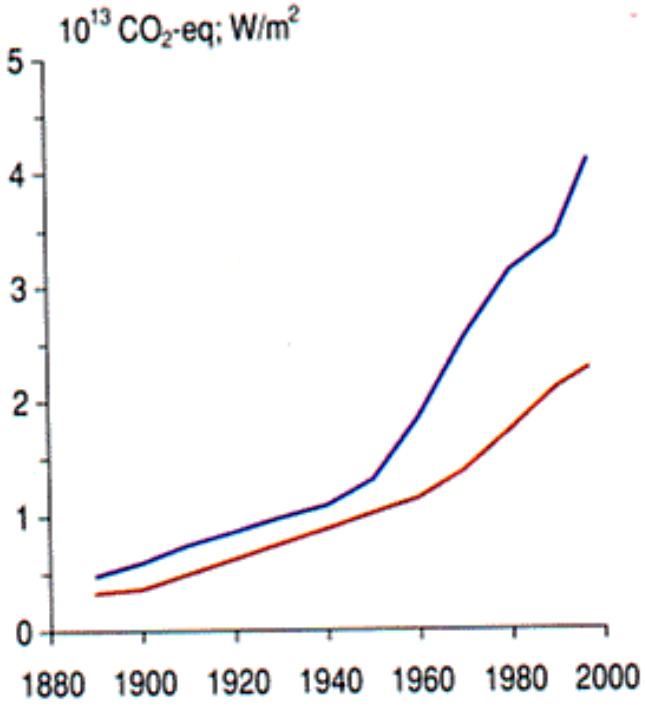
- D1. Climate change - Enhanced greenhouse effect
- D2. Climate change - Depletion of the ozone layer
- D3. Acidification and transboundary air pollution
- D4. Eutrophication
- D5. Toxic and hazardous substances
- D6. Disposal
- D7. Desiccation

Theme-indicators

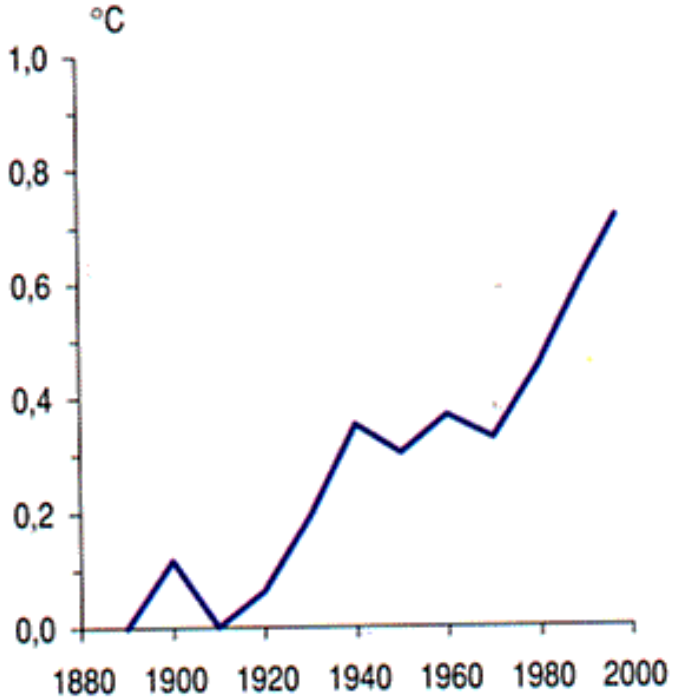


D1 Climate

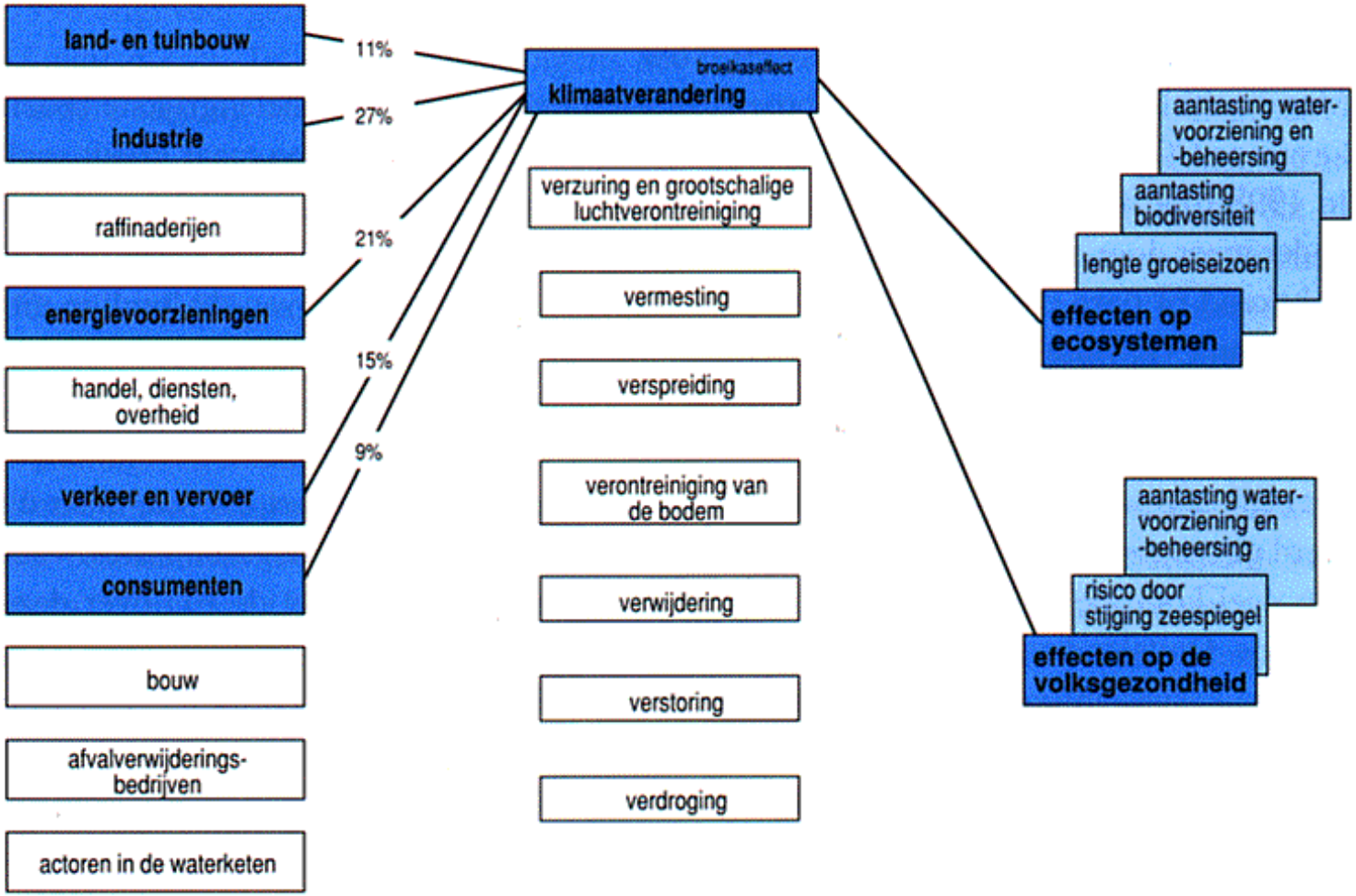
Mondiale emissie broeikasgassen



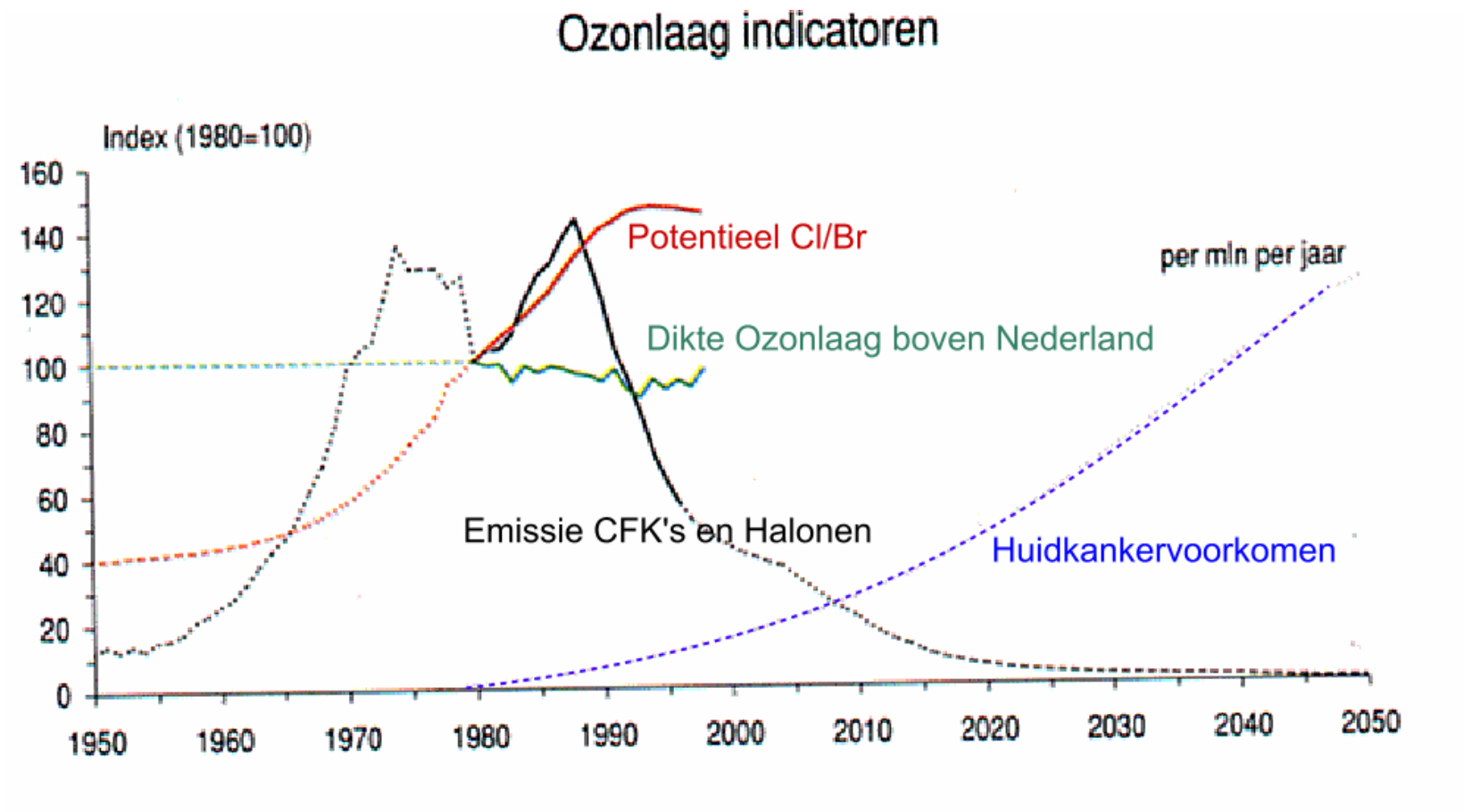
Toename temperatuur t.o.v. 1890



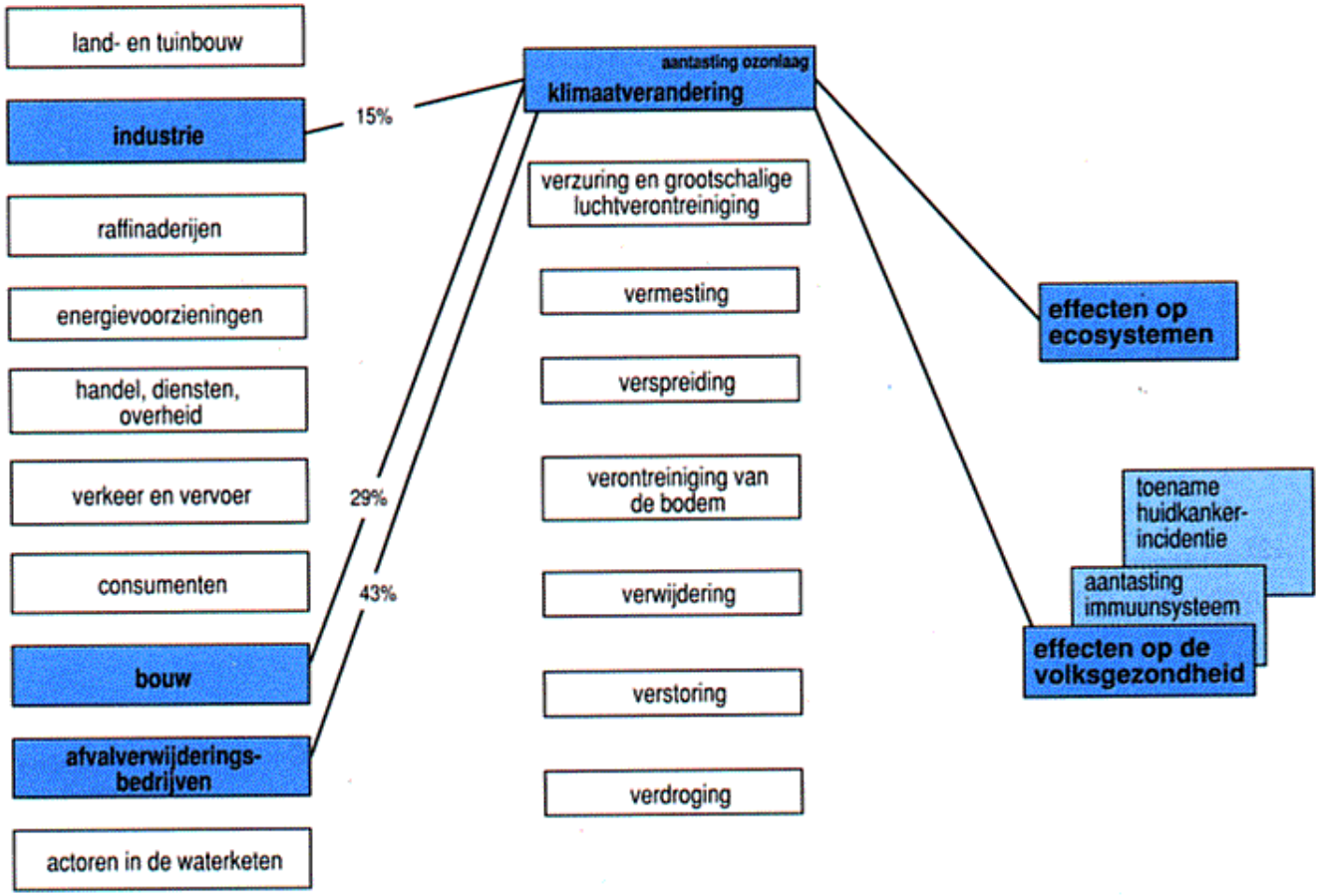
Climate target groups and impacts



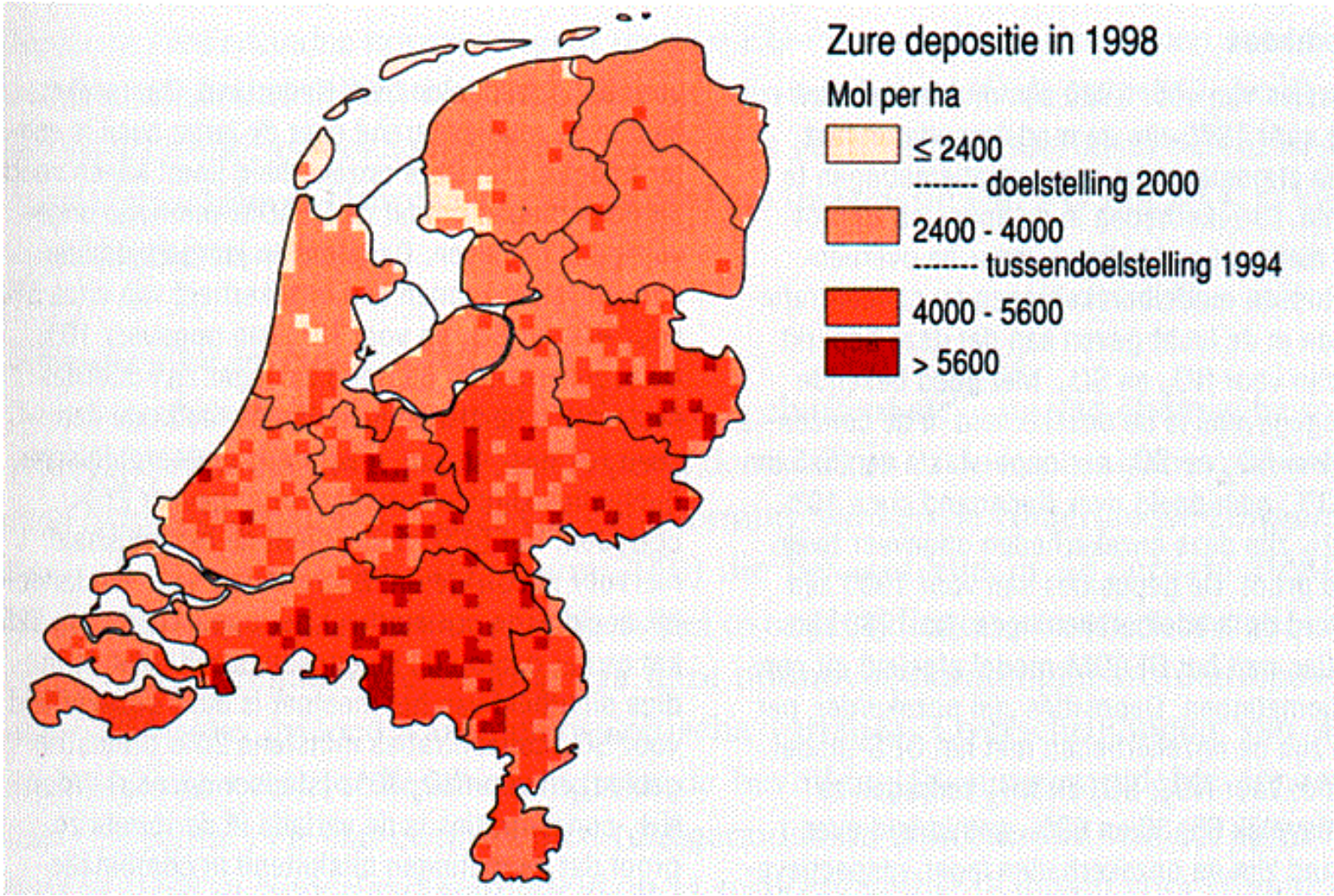
D2 Depletion of the ozone layer



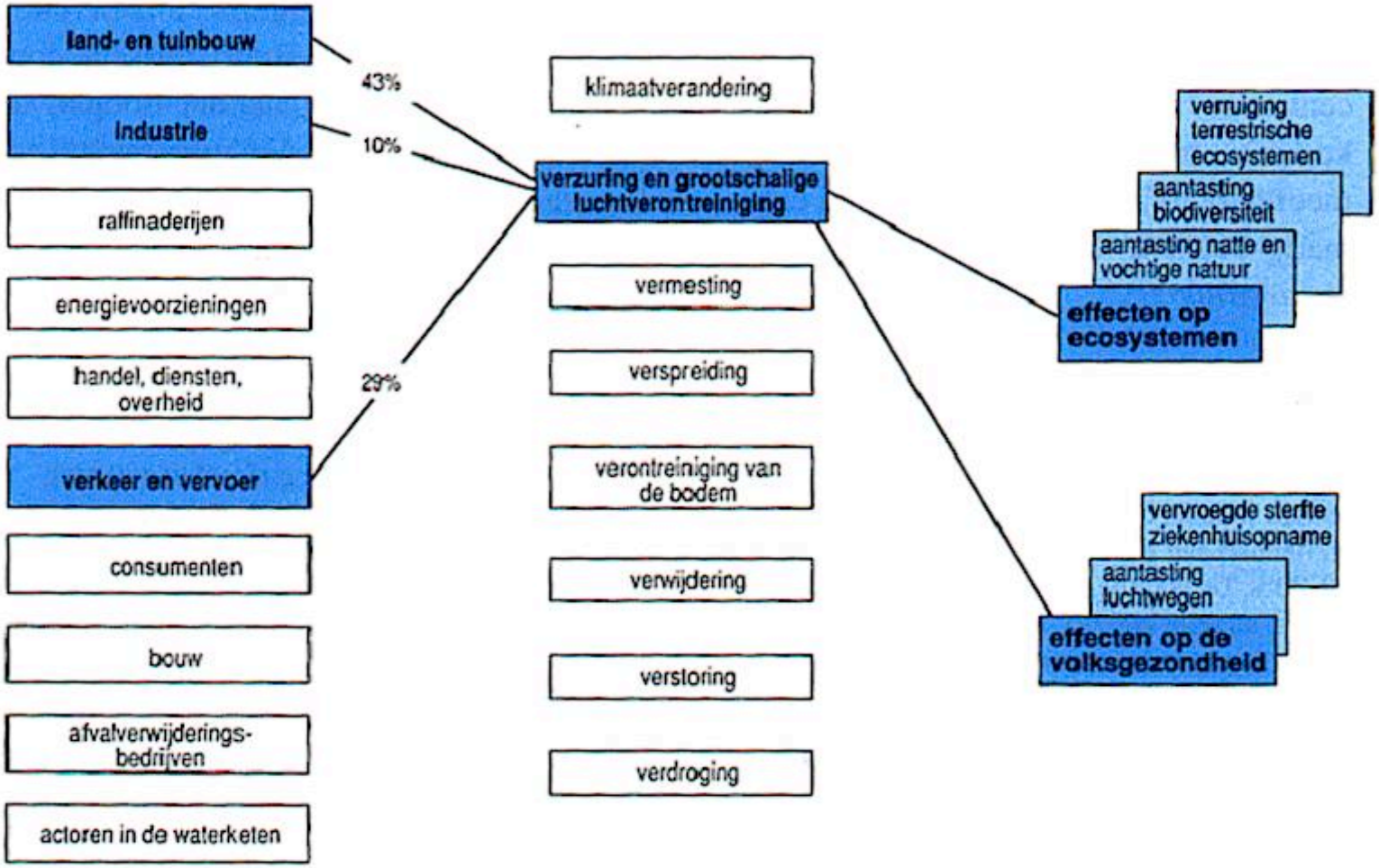
Ozone layer
target groups and impacts



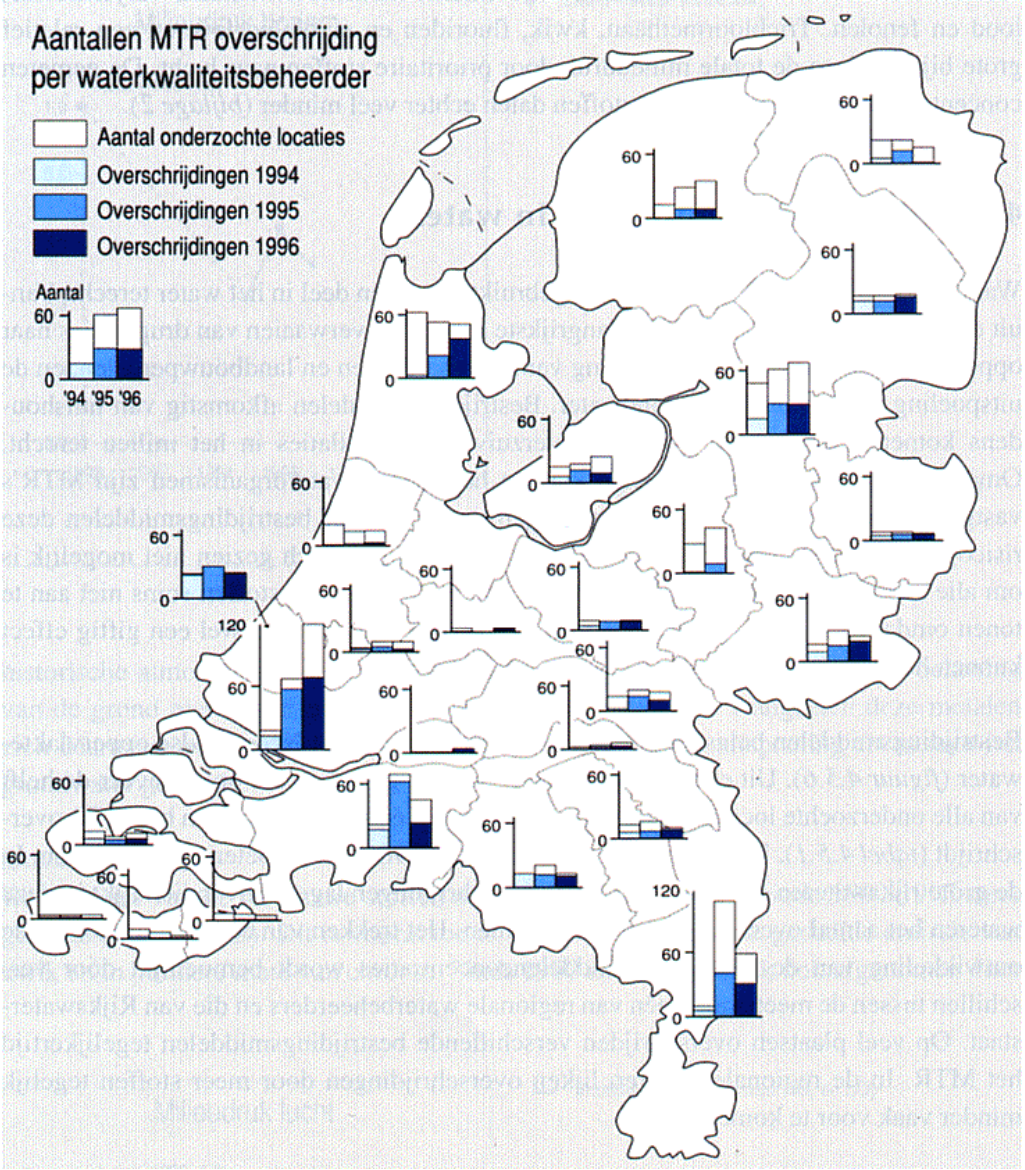
D3 Acidification



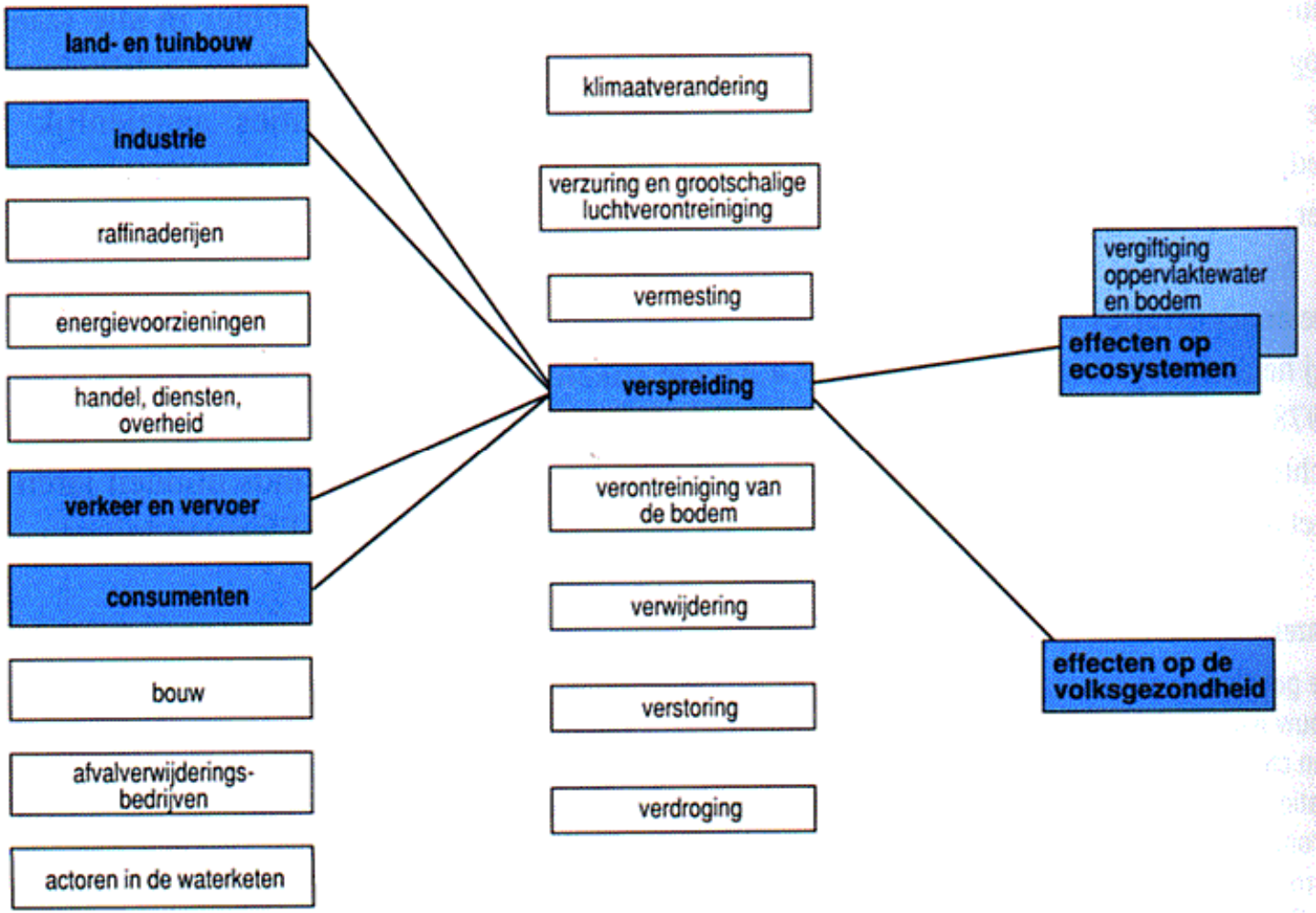
Acidification
target groups and impacts



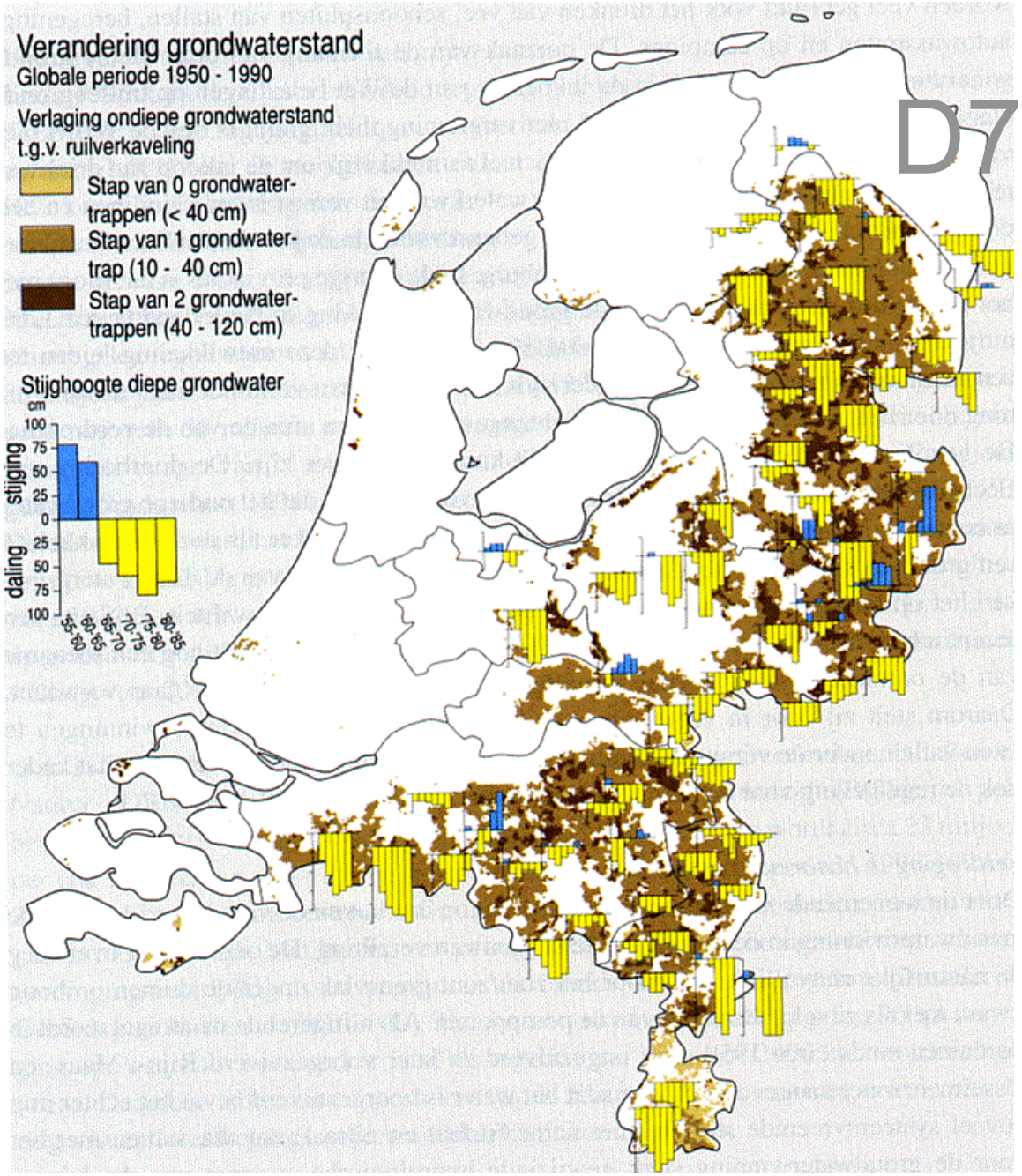
D5. Toxic and hazardous substances



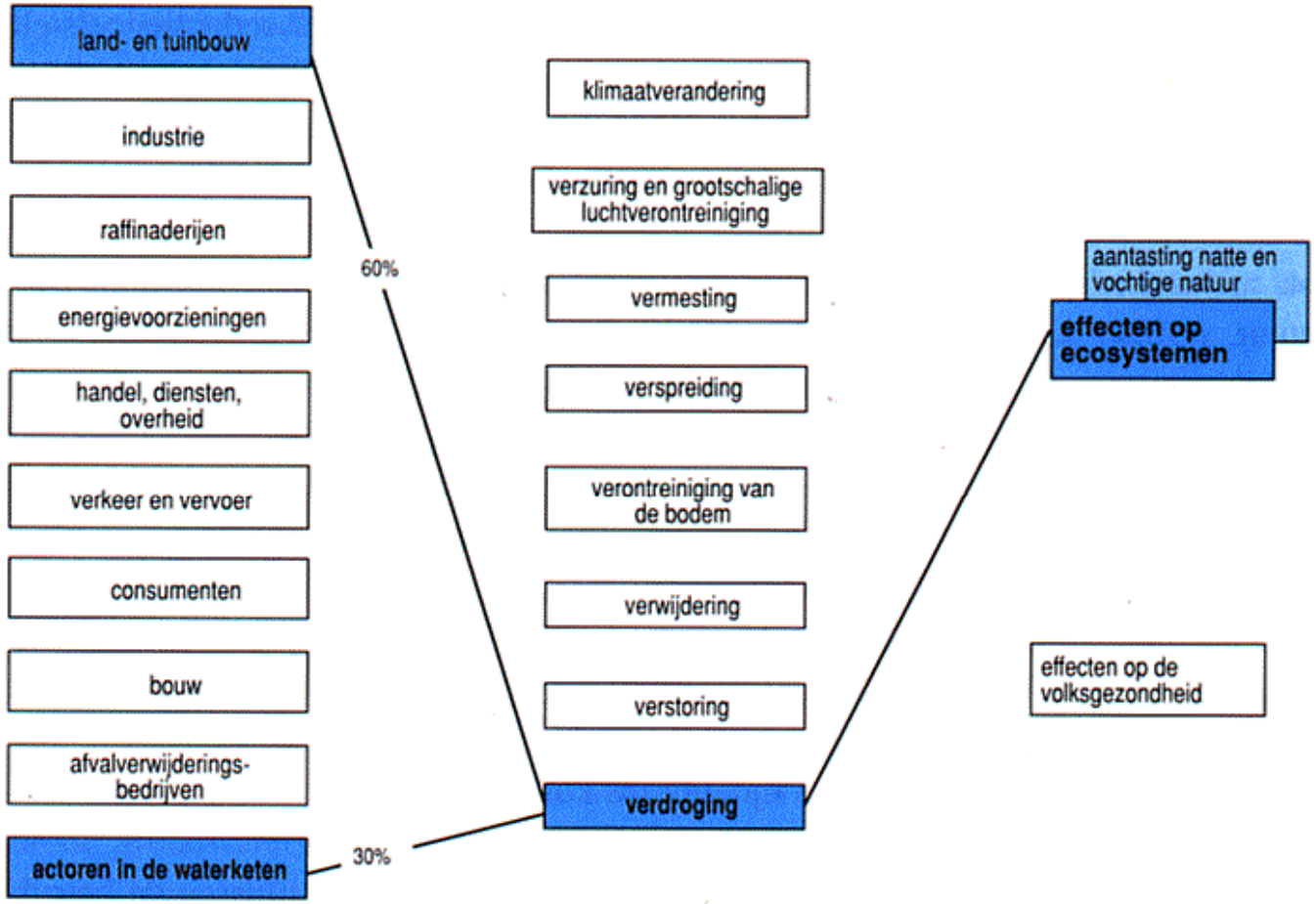
D5. Toxic substances target groups and impacts



D7. Desiccation



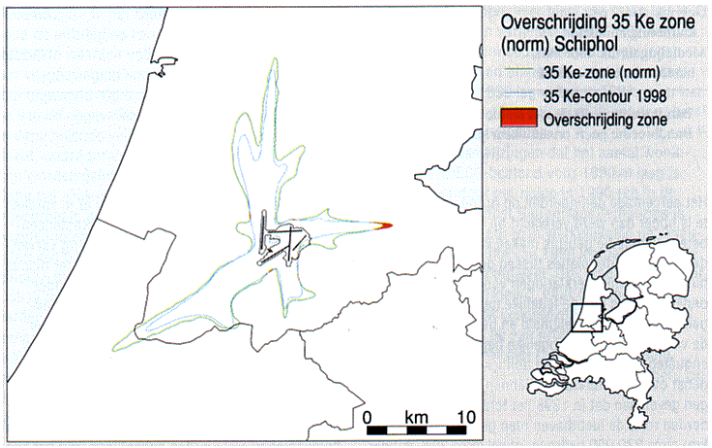
D7. Desiccation target groups and impacts

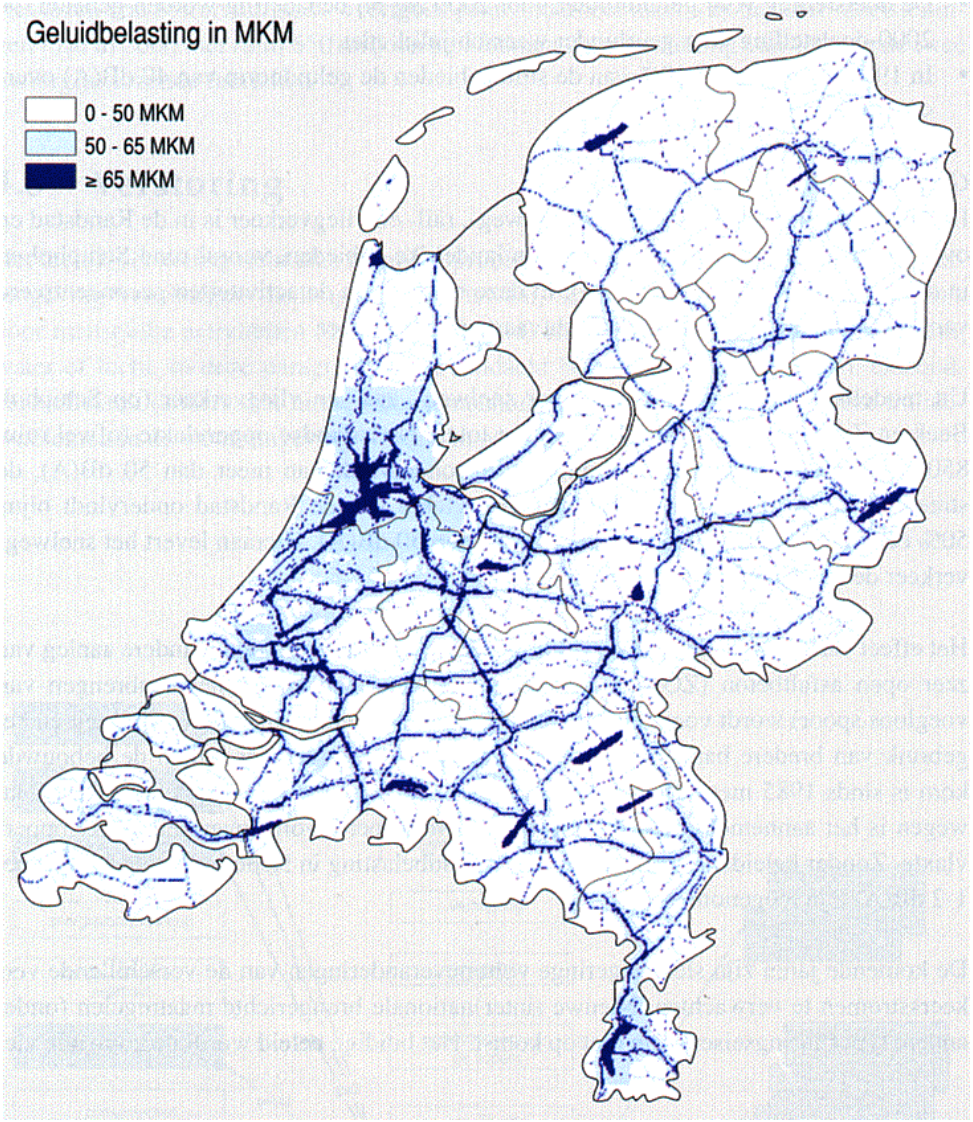


Evironmental quality

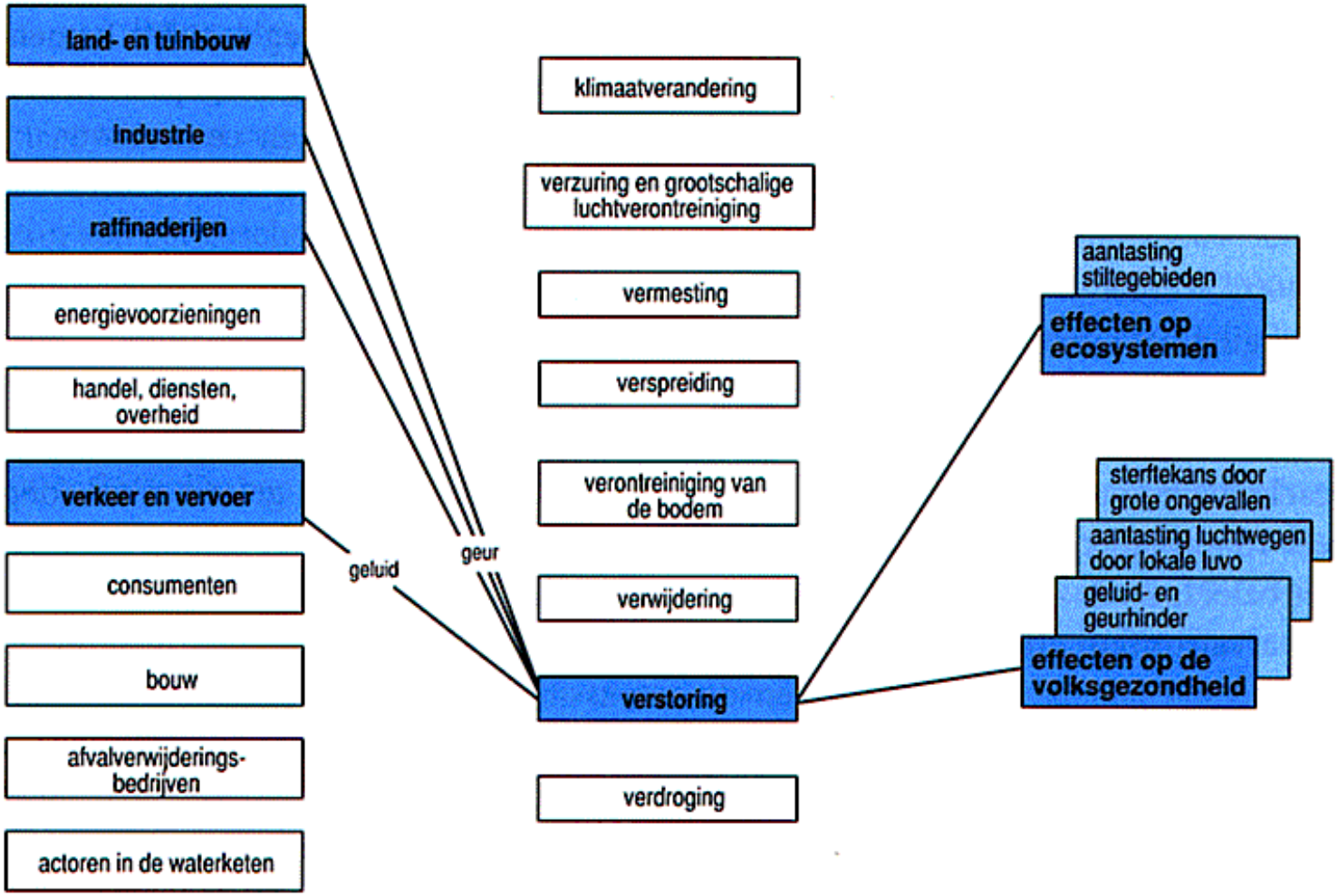
- E1. Air quality
- E2. Surface water quality
- E3. Soil quality
- E4. Groundwater quality
- E5. The human living environment

Disturbance



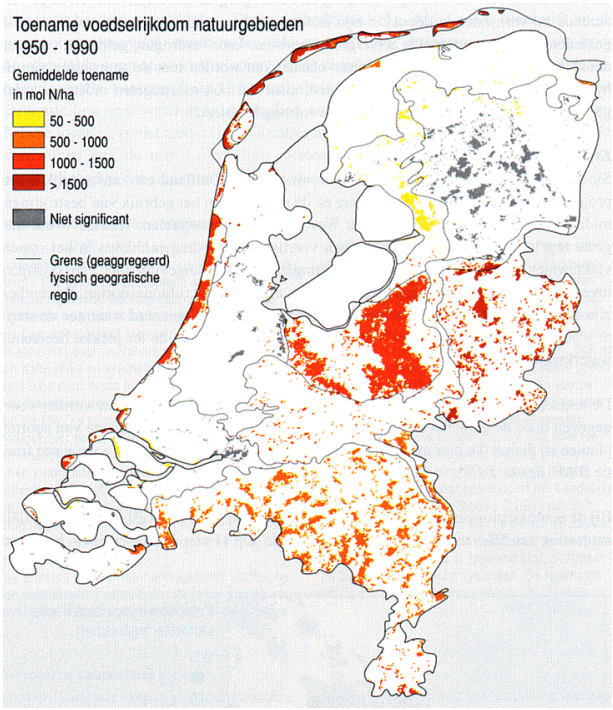


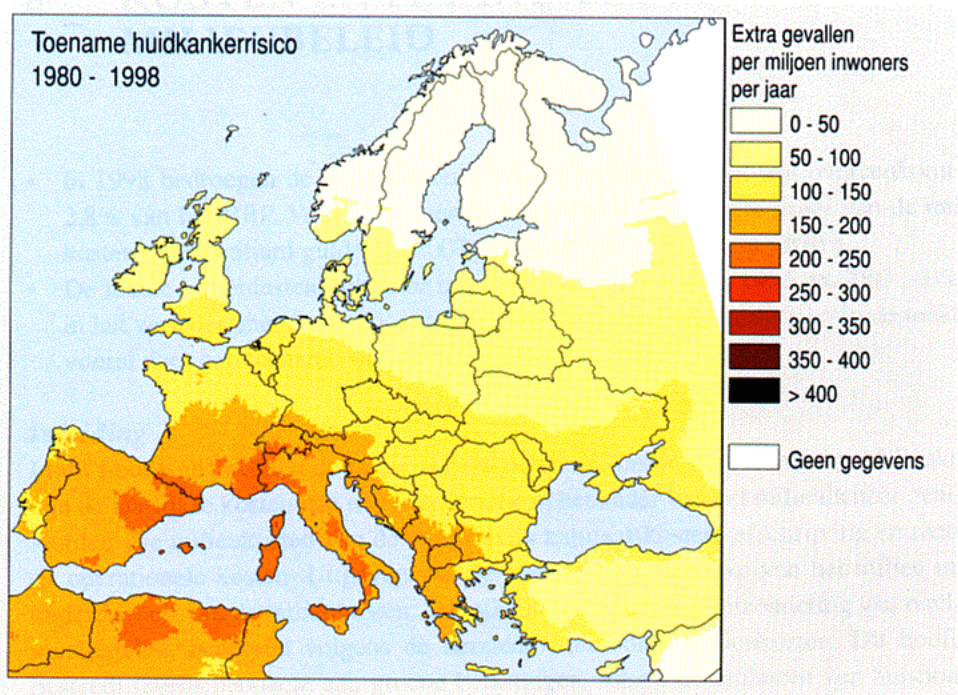
Noise and risk targetgroups and impacts



Impacts

Biodiversity and health

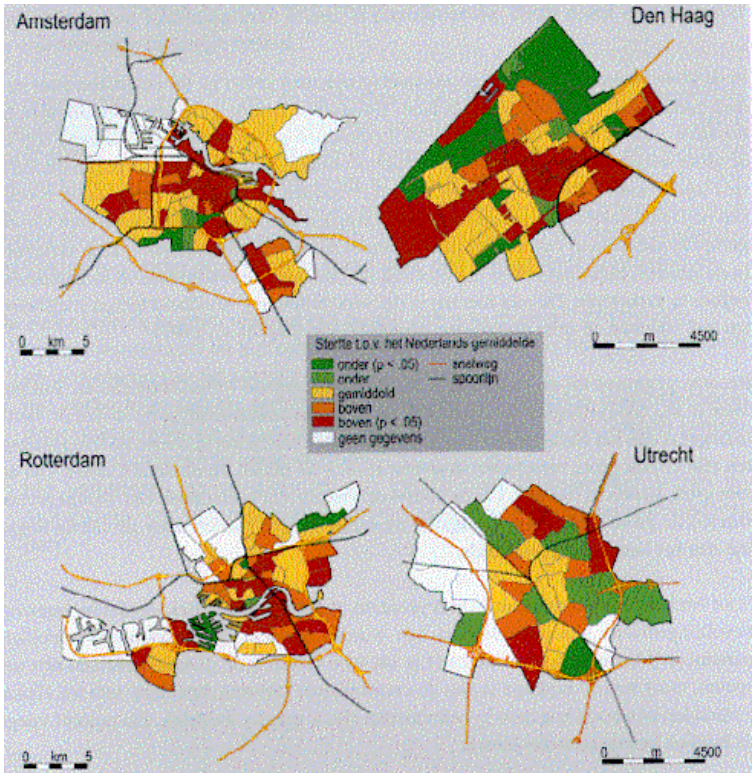


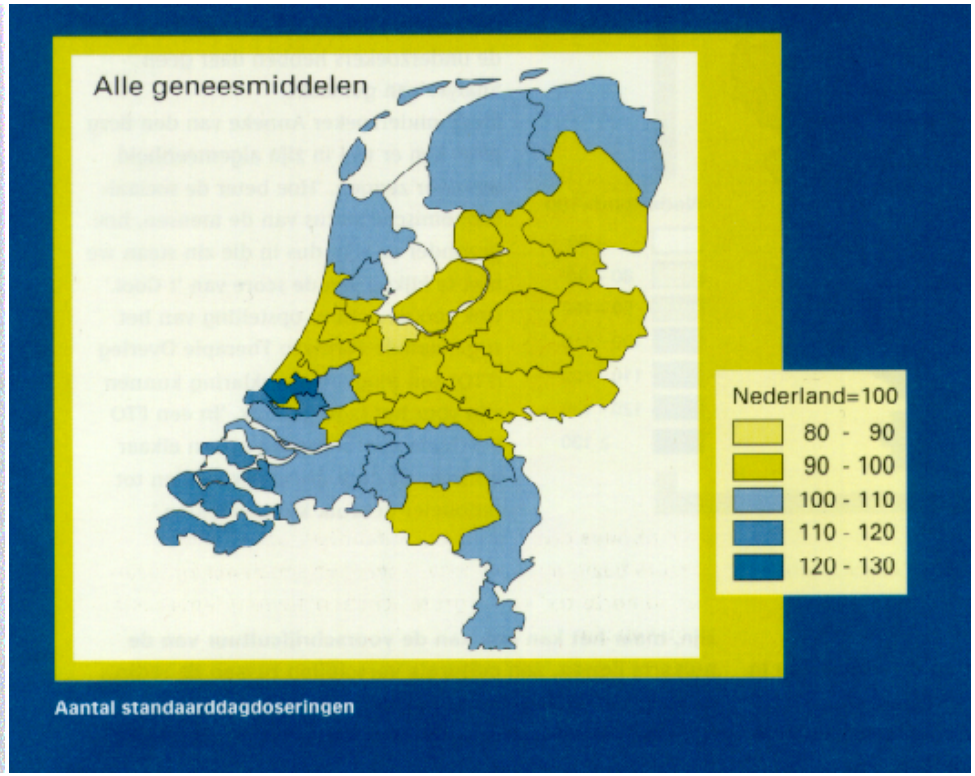


HEALTH

- Mortality and use of medicine
- Risk perception
- Stress
- Avoiding risk is risky
- side effects not demonstrable
- Diversity as hidden supposition

Mortality and use of medicines





A distorted public risk perception

- Risk is popularly defined by chance x impact.
- Exceptional occurrences are magnified by television and newspapers.
- They bomb us by statistical exceptions,
  - distorting our perception of chance and magnifying impact,
  - increasing fear and stress.

Insurance companies sell fear.

- We pay more for safety than for living:
  - Insurance, police, army, water management, traffic and building safety, preventing fire, terrorism, burglary and catching a cold.
- We fear we can not pay all and we double our work until we die from the impacts of stress.
  - The life time we spend on worry is lost well-being, lost health and life time.
  - Our fear for exceptional possibilities raises new diseases of the mind and we fear them as well.

Exaggerated hygiene drove life out and nature in exile.

- Our biological resistance fades by inescapable stress,
  - the number of immunity deficiency diseases increases.
- We do not get injuries enough to become vaccinated by nature itself.
  - Always avoiding to catch a cold results in high susceptibility for flu any time we leave a building or a car.
  - We like dangerous holydays to flee from our unnatural and boring safety, but we do not know real danger anymore and fall ill by foreign food.

Avoiding risks could be risky

- The public shame of few physicians involved intimidates the profession as a whole.
  - Avoiding risks physicians prescribe too many medicines, order too many specialists' examinations and diagnostic devices,
  - increasing the costs of medical care,
  - increasing slowly appearing side effects.
- Statistical analysis cannot clarify many rare side effects by lack of equal cases.
  - It only registers 95% short term benefits of potentially harmful medicines and treatments.
  - How many diseases are iatrogeneous? 50%?

There is something rotten in
the state of Medicine

King Average

rules a kingdom of exceptions
human species comprises

Living with life

- Our life is safer then ever, but we do not dare to live with life: the risk to die.
- Life became strange to us and death as well, we fear the unfamiliar because it could be unhygienic.

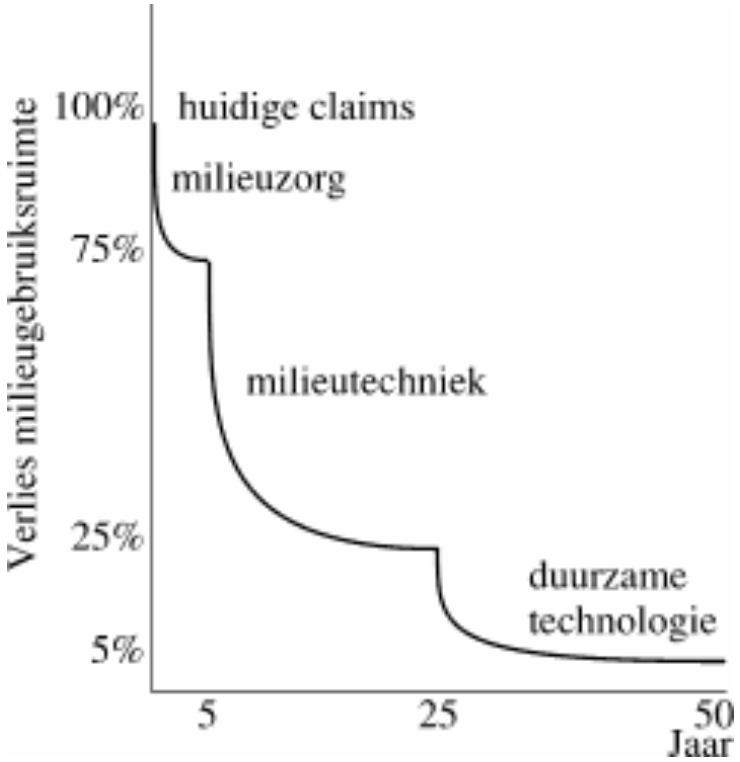
Curing fear by hope

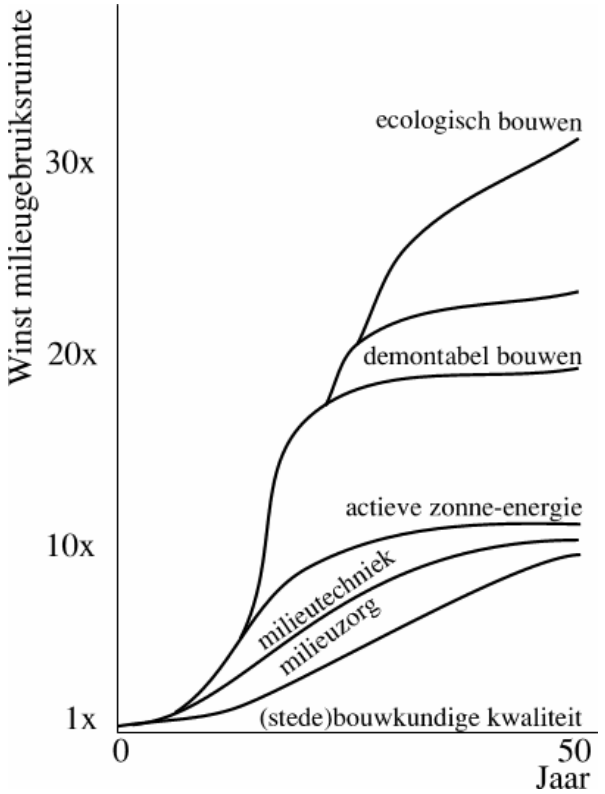
- The intellectual challenge of this century is to handle diversity instead of generalising it by statistical reduction.
- Generalising research has diminishing returns, context sensitive problems remain.
- Context sensitive design is a more promising, diversity generating study.
- Natural evolution and ecological succession is its model.

Ehrlich and Speth

D =	B	x W	x M
1/2 =	2	x5	/20

Critical remarks





Propositions

A. Er zijn geen andere ecologische problemen dan de aantasting van mondiale biodiversiteit of menselijke gezondheid.

B. Uitputting van grondstoffen (waaronder fossiele brandstoffen) is geen ecologisch, maar een industriëel probleem. Wat uitgeput raakt is kwaliteit.

C. Er is ook op de zeer lange termijn genoeg energie.

D. Bouwen heeft ecologisch meer positieve dan negatieve effecten.

E. De milieudruk per eenheid van welvaart moet tot 5% van het huidige niveau dalen.

F. Er wordt in de bouw nooit meer dan 80% gehaald zolang de positieve effecten niet geoptimaliseerd worden.

G. Eenzijdige nadruk op besparing blokkeert het ontwerpend denken over oplossingen.