WATER QUALITY MANAGEMENT
-INDIAN EXPERIENCE-

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Water is a unique solvent because it is thermally stable

Prof. Nilay Chaudhuri

The Water (Prevention & Control of Pollution) Act, 1974

PREAMBLE

'An Act to provide for the prevention and control of water pollution and the maintaining or restoring of wholesomeness of water'

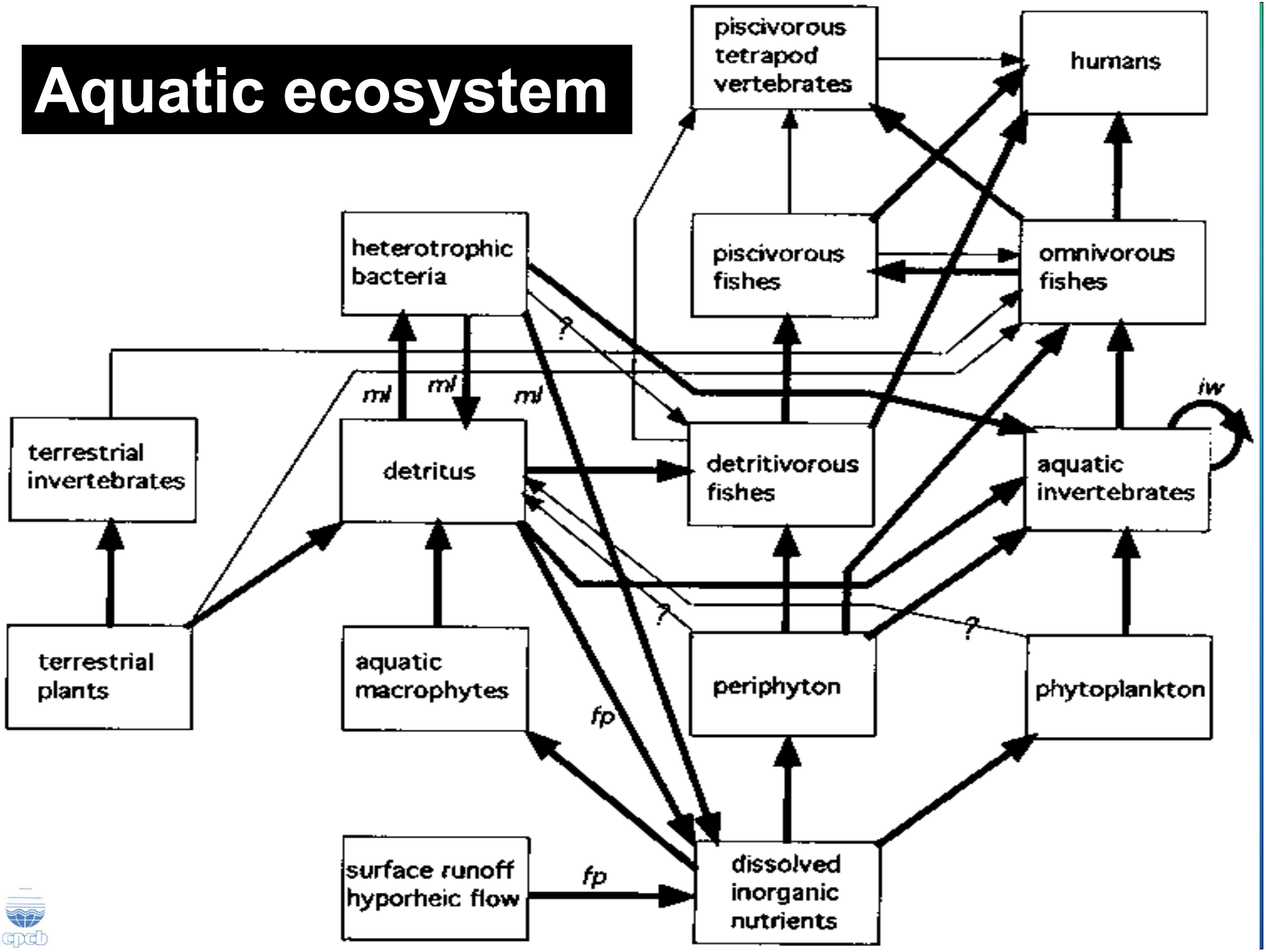
Wholesomeness of water

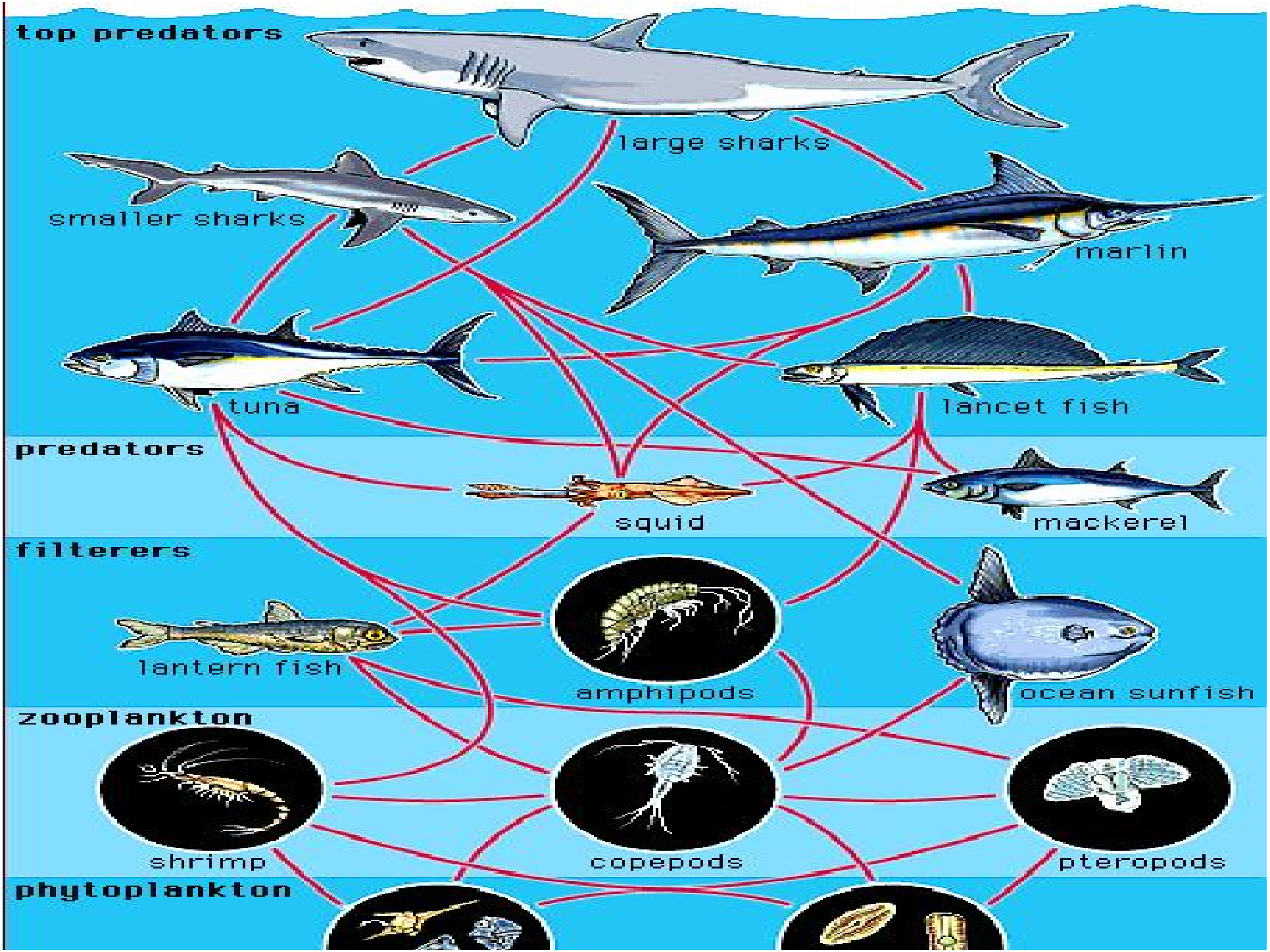
By wholesomeness of water means an aquatic ecosystem act as a dynamic biological machine that sustains a physicochemical characteristics that harbors diverse aquatic flora & fauna & various uses for human being

This biological machine also assimilates pollutants to a great extent

$$\text{Assimilative capacity} = \frac{\text{Re-aeration constant}}{\text{De-oxygenation rate}}$$

Aquatic ecosystem




top predators
large sharks
smaller sharks
marlin
tuna
lancet fish
predators
squid
mackerel
filterers
lantern fish
amphipods
ocean sunfish
zooplankton
shrimp
copepods
pteropods
phytoplankton

WATER RESOURCES
-AVAILABILITY-

GLOBAL POSITION OF WATER RESOURCE

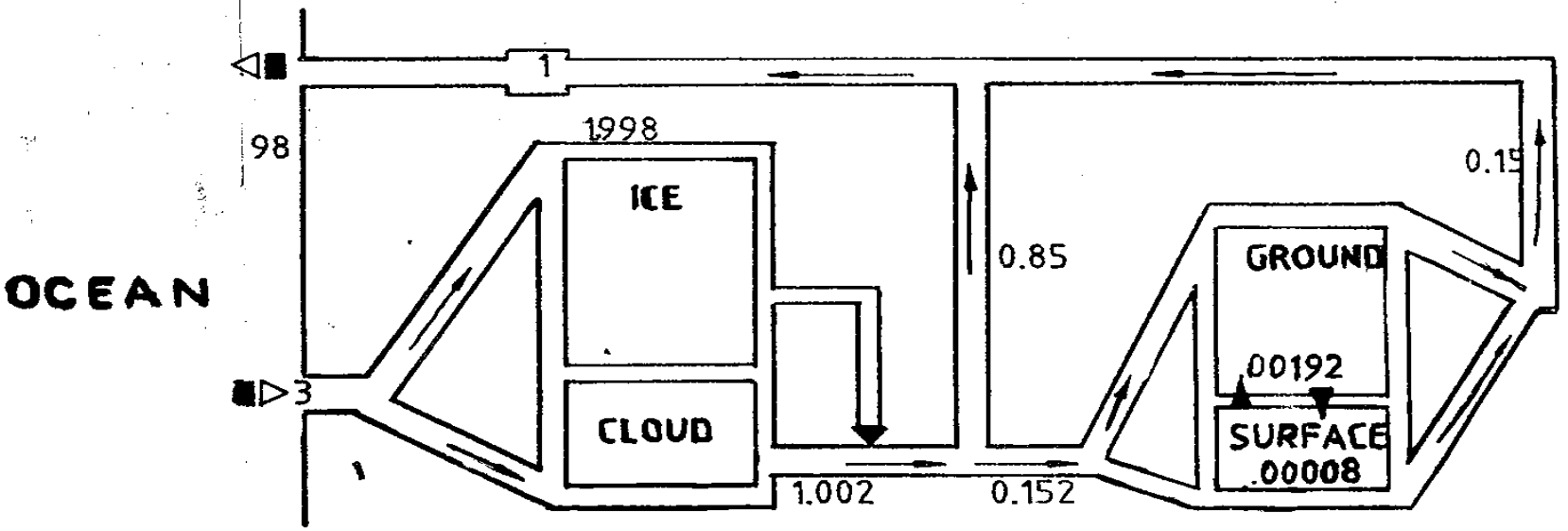


FIG: GLOBAL HYDROLOGICAL CYCLE

WATER RESOURCE OF INDIA :

Surface runoff-utilizable : 6840 km^3

Ground water-utilizable : 4200km^3

WATER REQUIREMENT(Km^3/yr) :

	1985	2000	2025
Suface water	360	500	700
Ground water	180	250	350

WATER NEED IN INDIA (KM^3)

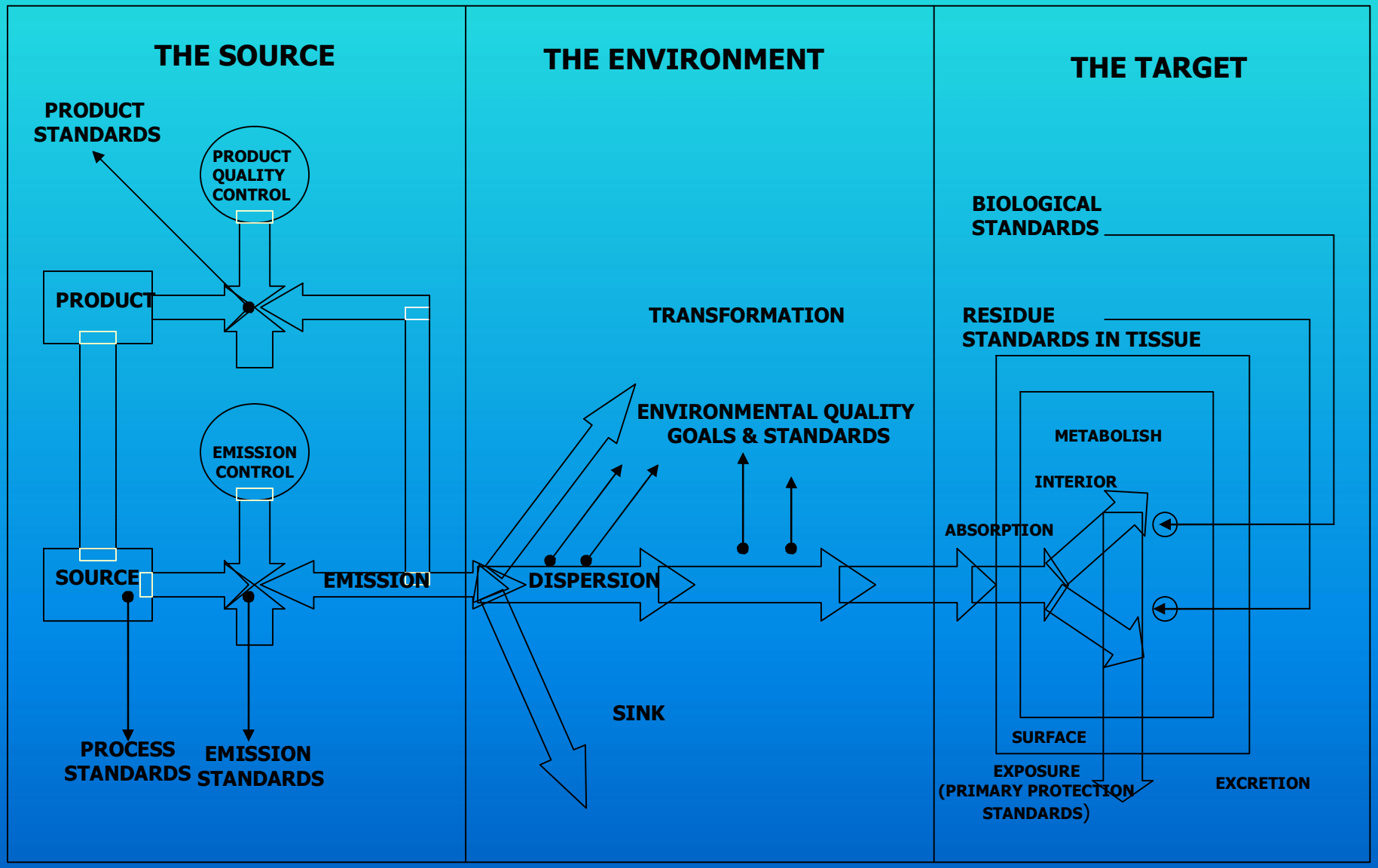
	1985		1986		1987	
	Surface water	Ground water	Surface water	Ground water	Surface water	Ground water
Irrigation	320	150	420	210	510	260
Other uses	40	30	80	40	190	90
Domestic & live stock	16.70		24.20		40.00	
Industries	10.10		30.00		120.00	
Thermal power	4.30		5.80		15.00	
Miscellaneous	39.00		60.00		105.00	
Total - water source	360	180	500	250	700	350
Total - year	540		750		1050	

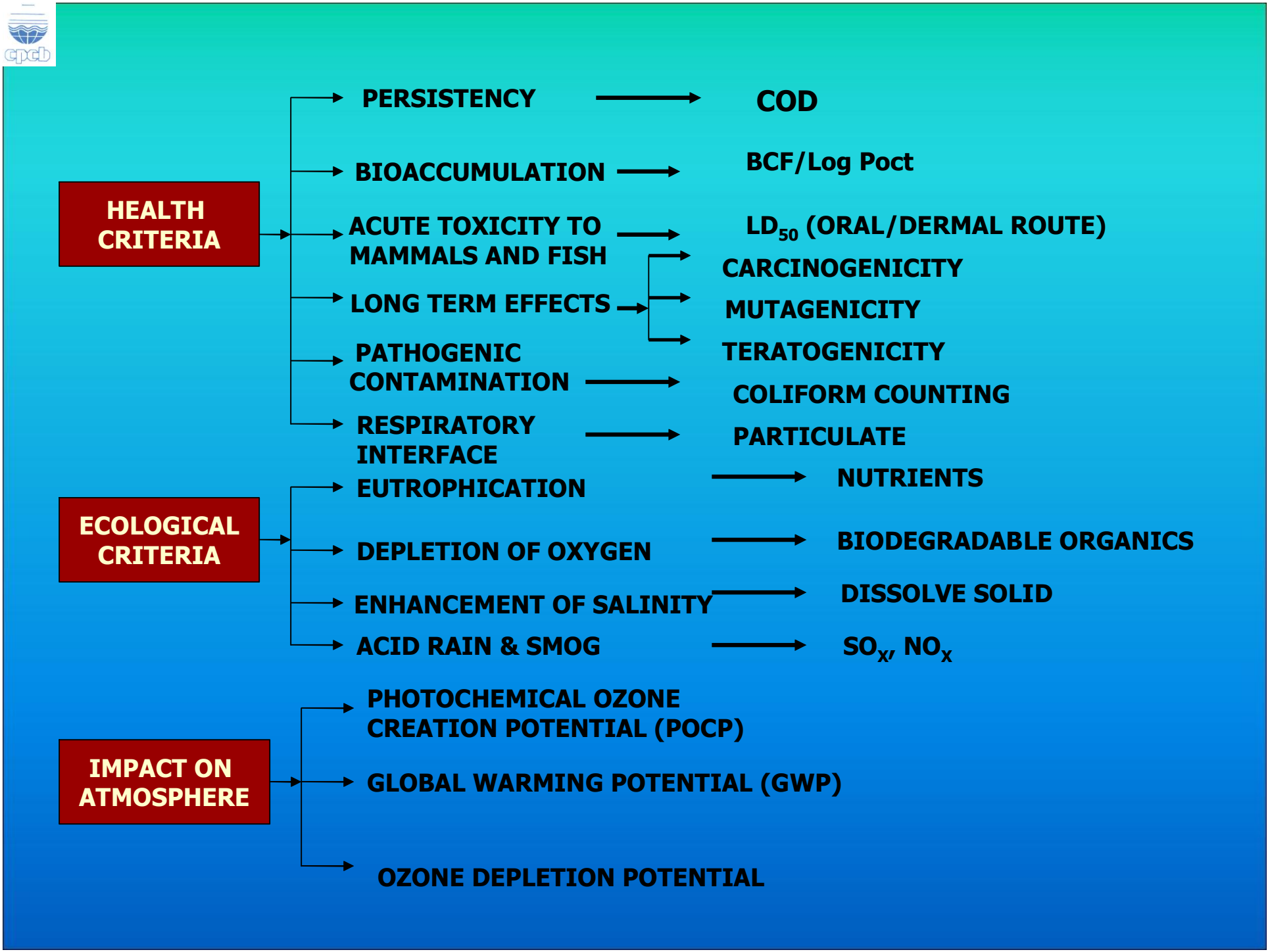
POLICY OF CENTRAL BOARD

- Control of pollution at source to the maximum extent possible giving due regard to techno-economic feasibility and social expectation.
- Optimal utilisation of assimilative capacities of natural water bodies in order to minimise investment in pollution control at source.
- Maximisation of reuse / recycle of domestic and industrial wastewaters on land for agricultural use and for industrial purposes.
- Minimisation of pollution control requirements by judicious location of industries and relocation of industries wherever necessary
- Introduction of discipline in water abstraction and wastewater discharge and a sense of water conservation and
- River flow regulation

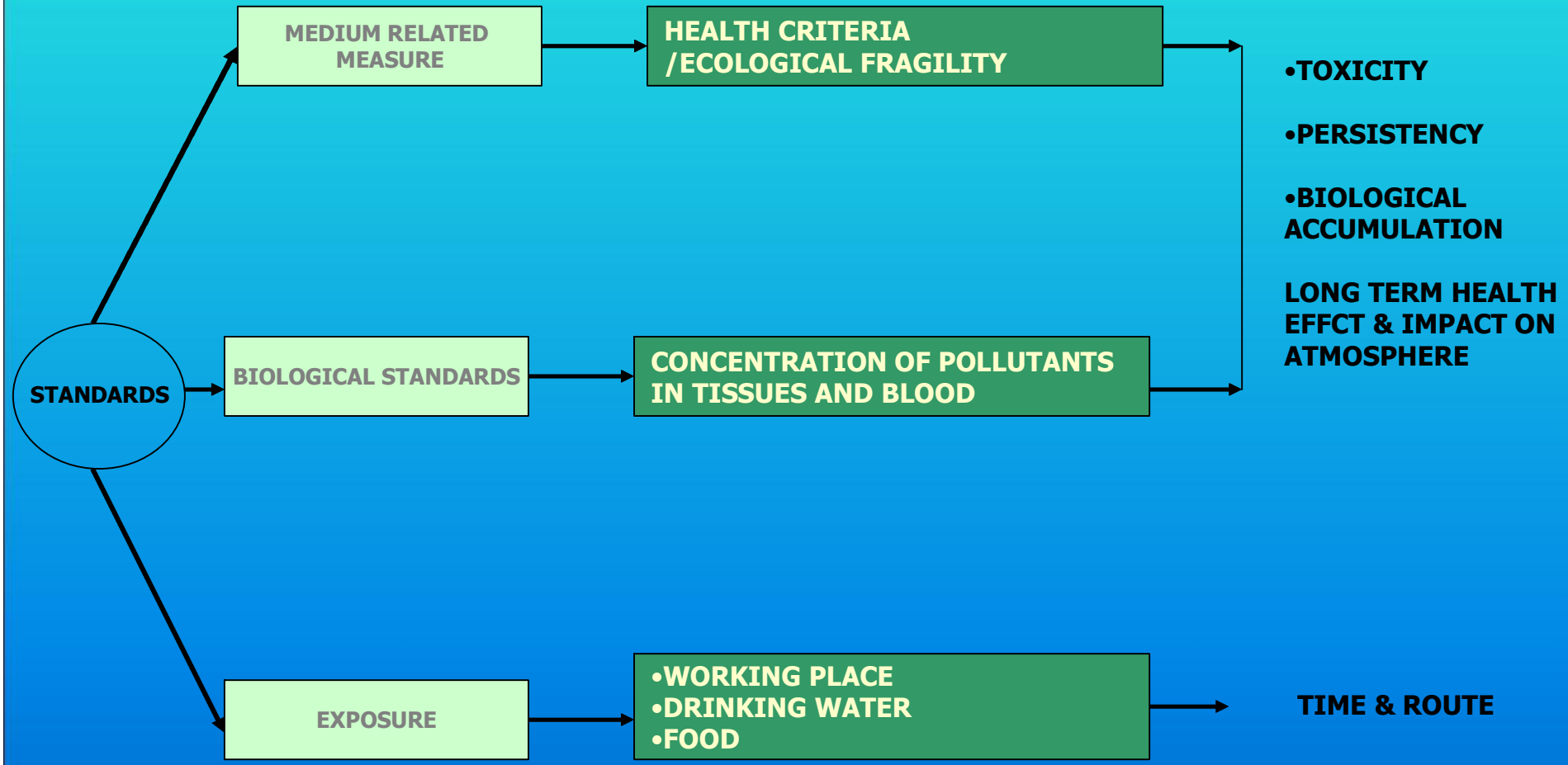
CONTROL OF POLLUTION AT SOURCE

THE POLLUTANT PATHWAY SHOWING POSSIBLE POINTS AT WHICH STANDARDS MAY BE SET (HOLDGATE, 1979)

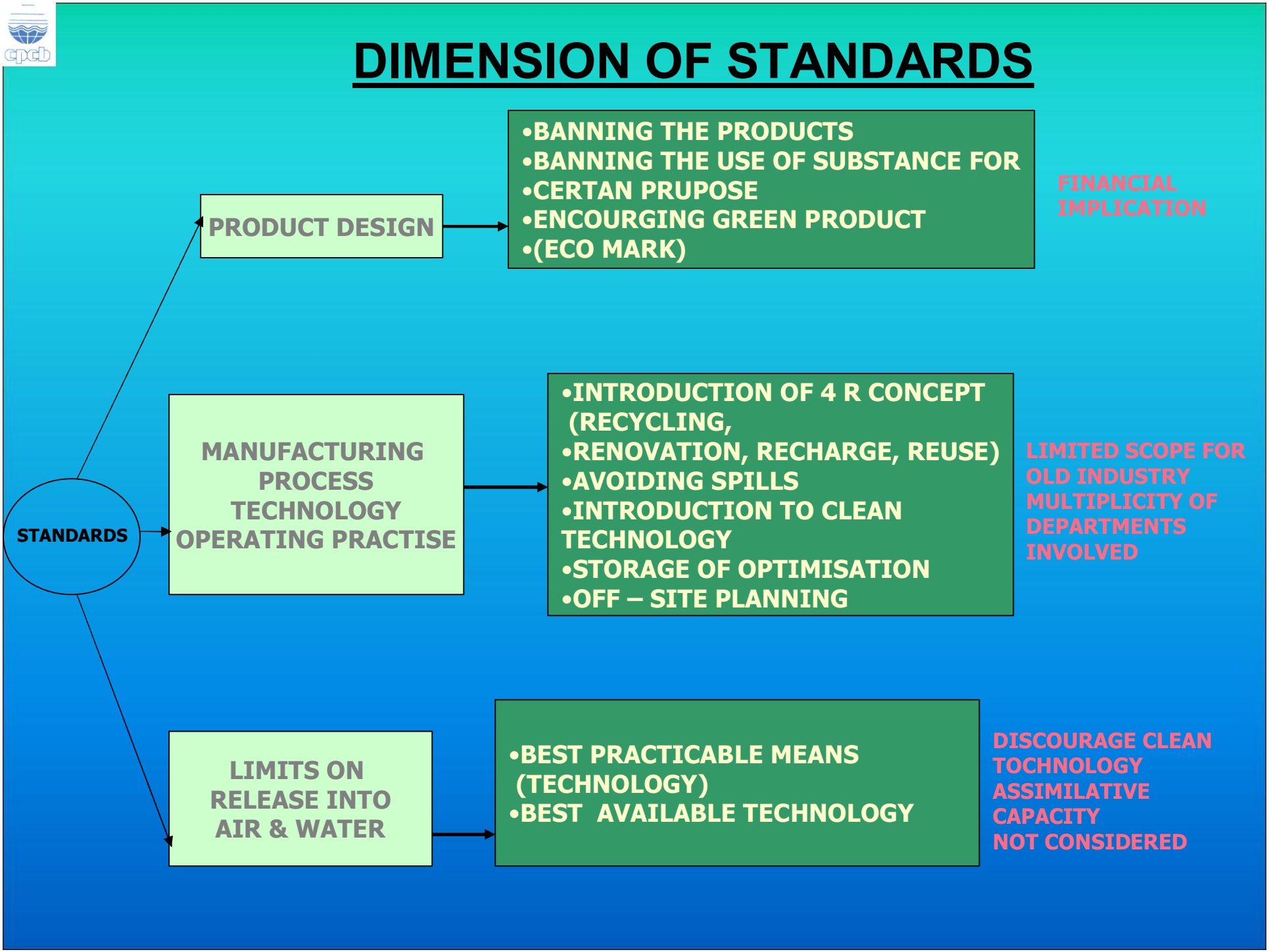



HEALTH CRITERIA
PERSISTENCY
COD
BIOACCUMULATION
BCF/Log Poct
ACUTE TOXICITY TO MAMMALS AND FISH
LD50 (ORAL/DERMAL ROUTE)
LONG TERM EFFECTS
CARCINOGENICITY
MUTAGENICITY
TERATOGENICITY
PATHOGENIC CONTAMINATION
COLIFORM COUNTING
RESPIRATORY INTERFACE
PARTICULATE
ECOLOGICAL CRITERIA
EUTROPHICATION
NUTRIENTS
DEPLETION OF OXYGEN
BIODEGRADABLE ORGANICS
ENHANCEMENT OF SALINITY
DISSOLVE SOLID
ACID RAIN & SMOG
SOx, NOx
IMPACT ON ATMOSPHERE
PHOTOCHEMICAL OZONE CREATION POTENTIAL (POCP)
GLOBAL WARMING POTENTIAL (GWP)
OZONE DEPLETION POTENTIAL

CRITERIA


STANDARDS
MEDIUM RELATED MEASURE
BIOLOGICAL STANDARDS
EXPOSURE
HEALTH CRITERIA /ECOLOGICAL FRAGILITY
CONCENTRATION OF POLLUTANTS IN TISSUES AND BLOOD
•WORKING PLACE
•DRINKING WATER
•FOOD
•TOXICITY
•PERSISTENCY
•BIOLOGICAL ACCUMULATION
LONG TERM HEALTH EFFCT & IMPACT ON ATMOSPHERE
TIME & ROUTE

DIMENSION OF STANDARDS



PHILOSOPHY OF MINAS

Universally two MODELS are considered to EVOLVE STANDARD

MODEL – I Location Specificity

- **Water quality criteria of ambient water specified**
- **Quality of discharge does not alter the ambient water quality criteria**

The model is abandoned as it is difficult to administer, in location where more Than one polluters are discharging their Effluent in the event of altered quality Of Waters it becomes difficult to identify the Violator

MODEL II Industry Specificity

- **Techno Economic Feasibility**

The Advantage is that within a specific group of industries the extent of pollution Control measures are alike. In addition, these Standards serve to Preserve the Environmental Quality in non polluted area without modification.

DISADVANTAGE: The discharge does not relate to actual Environmental situation of the specific Site.

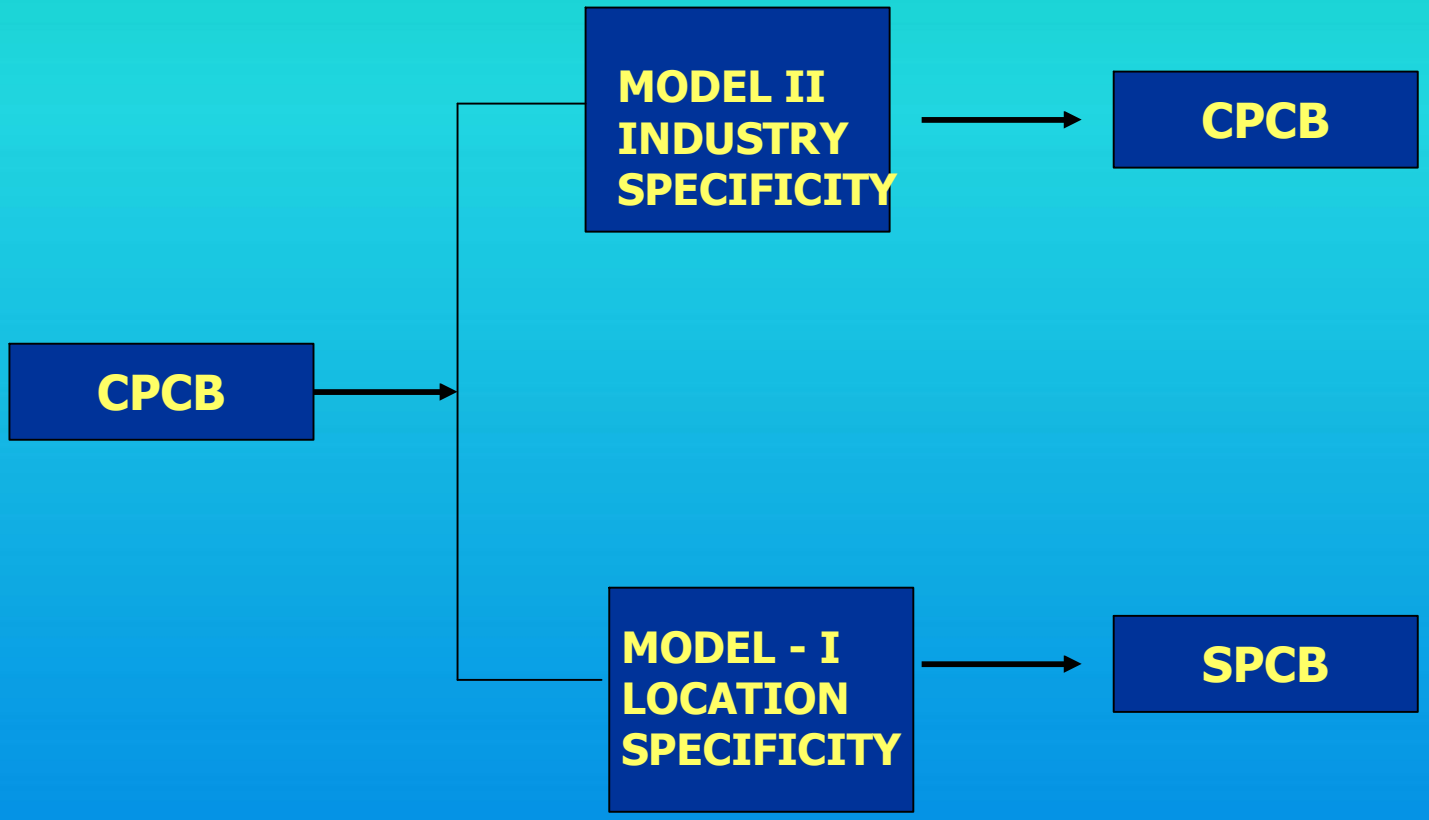
MINIMAL REQUIREMENT OF MINAS

AIM OF WASTE WATER MINI: OF

- **PATHOGENS**
- **TOXIC SUBSTANCES**
- **COLLOIDAL & DISSOLVED ORGANIC SOLIDS**
- **MENERAL OILS**
- **ADJUSTMENT OF pH**

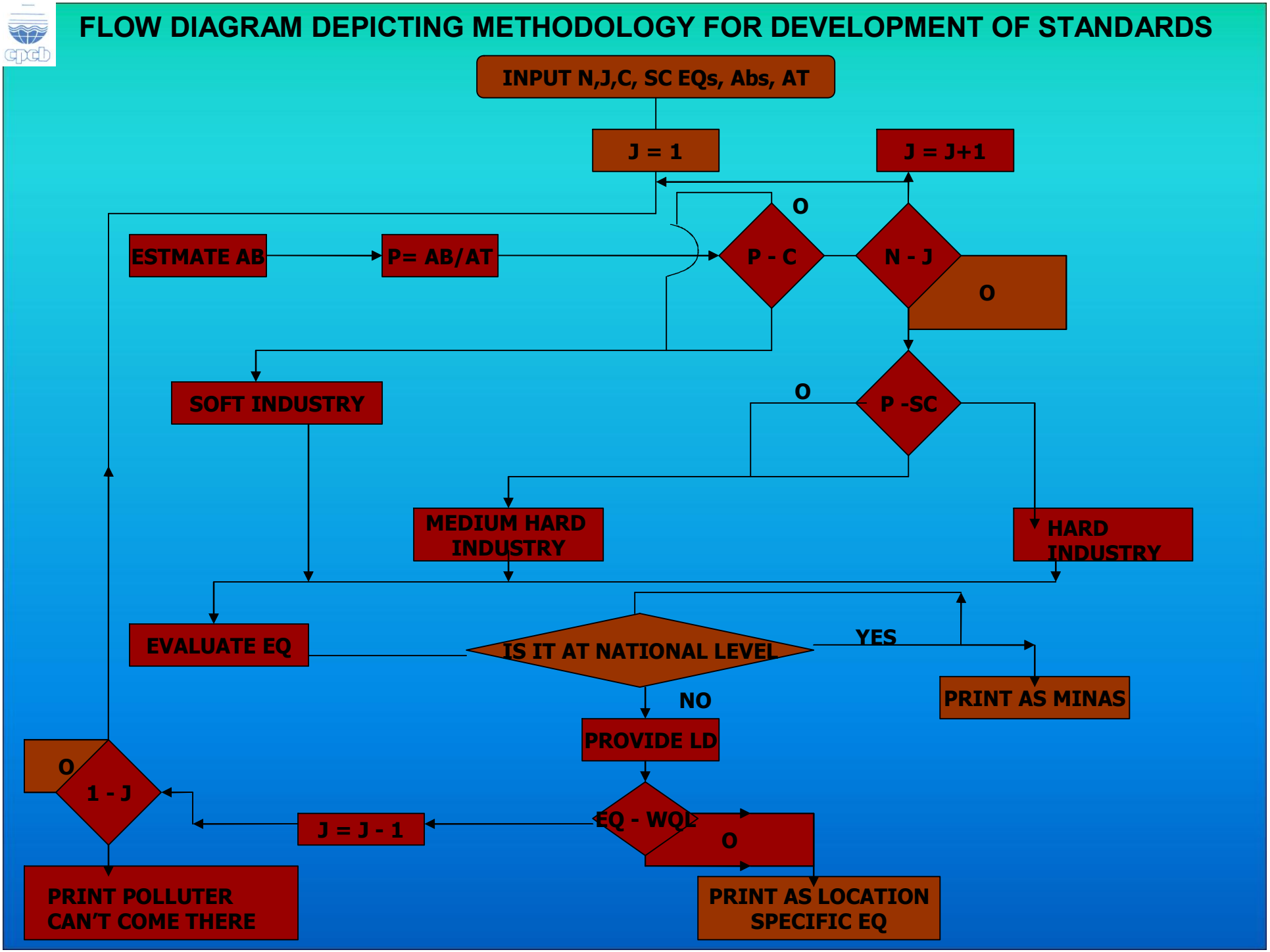
Each Pollutant removal need unit operation. Combination of Unit operation defines cost factor termed as ANNUAL BURDEN which differs industry to industry. Annual Burden to annual Turn over ratio is determining factors of MINAS.

MINAS thus evolved need to be turned at location (not relax, but stringent) by SPCB. To make MINAS Location specific



At National level, Industry Specific Standard is evolved with minimal requirement with due regard to economic feasibility termed as MINIMAL NATIONAL STANDARD (MINAS)

FLOW DIAGRAM DEPICTING METHODOLOGY FOR DEVELOPMENT OF STANDARDS



ANNUAL BURDEN TO ANNUAL TURN OVER RATIO

S No	Name of the Industry	Best Practicable Means	AB/AT RATIO (in Percentage)
1	DISTILLERY	Anaerobic digestion followed by activated sludge	10.09
2	MALTRY	Secondary Treatment	0.15
3	BREWERY	Secondary Treatment	0.91
4	SUGAR	Secondary Treatment (Anaerobic Lalgoon)	0.05-0.07
5	CAUSTIC SODA (MERCURY CELL)	a) Ion Exchange b) Sodium Sulfide c) Amalgamation with iron filling	0.10 0.27-0.49 0.28
6	OIL REFINERY (1000 TONNES)	Tertiary Treatment	0.025
7	MANMADE FIBRE (SEMI SYNTHETIC)	With Zn recovery System	0.77-0.99
8	INORGANIC CHEMICALS	Chemical Precipitation	Expected to be low
9	PHARMACEUTICALS INDUSTRY 1. BULK DRUG 2. FERMENTATION 3. FORMULATION	 Secondary Biological Treatment	 0.28-0.44 0.8 0.08
10	SMALL PULP & PAPER	Secondary Treatment	0.64-1.27
11	PETROCHEMICAL	Secondary Treatment along with ISBL treatment	0.3-0.7

MINIMISATION OF MAXIMUM EVIL

→ (MINIMAX)

LOCATION SPECIFICITY

VS

MAXIMISATION OF MINIMUM EXPECTATION

→ (MAXMINI)

INDUSTRY SPECIFICITY

STEPS IN STANDARD DEVELOPMENT