

# ECOLOGICAL STATE AND CHANGES IN LAKE ECOSYSTEMS IN ITALY

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## ITALIAN LAKES AREAS

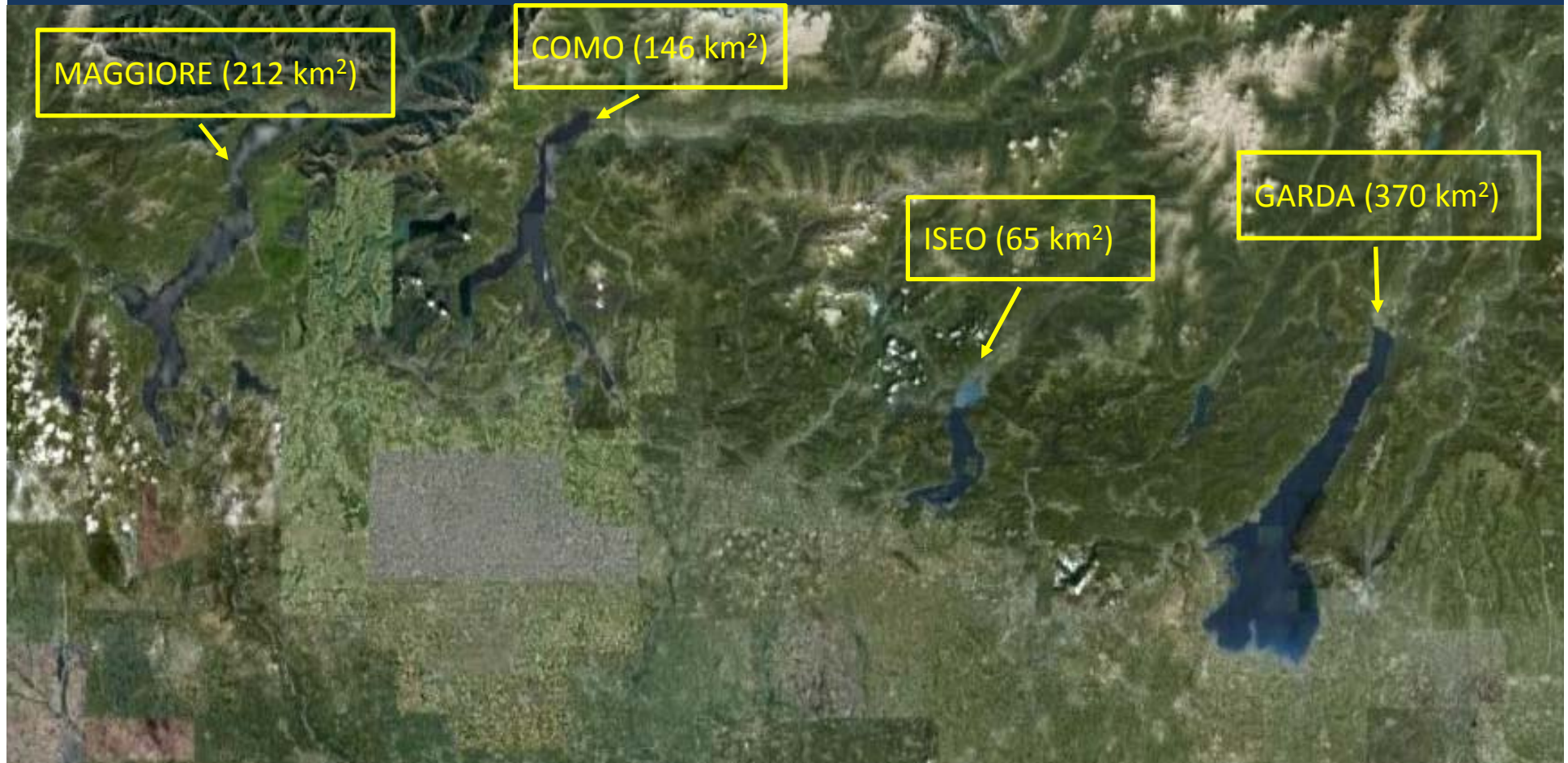
### Alpine / subalpine area (Glacial)

- Garda (370 km<sup>2</sup>)
- Maggiore (212 km<sup>2</sup>)
- Como (146 km<sup>2</sup>)
- Iseo (65 km<sup>2</sup>)

### Apennine area (Volcanic)

- Trasimeno (128 km<sup>2</sup>)
- Bolsena (114 km<sup>2</sup>)
- Bracciano (57 km<sup>2</sup>)

## N-ITALY SUB-ALPINE LAKES SYSTEM



## CENTRAL ITALY LAKES SYSTEM

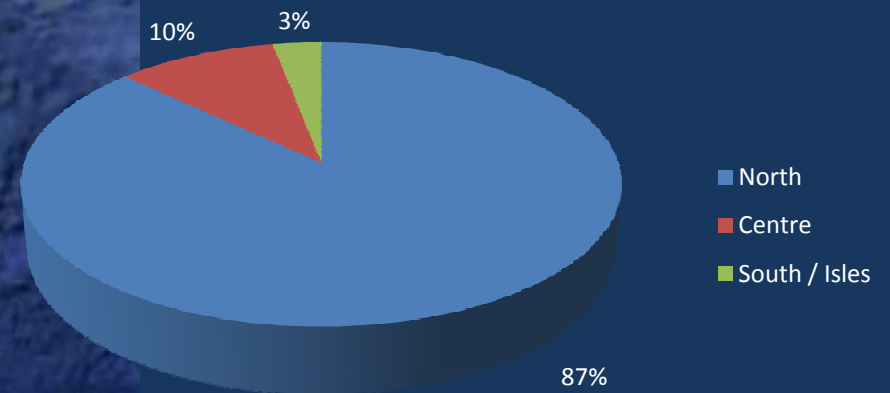


## ITALIAN LAKES: WATER AMOUNT

⇒ ~500 lakes > 0.2 km<sup>2</sup> area

⇒ 4000 lakes with smaller area in the Alps

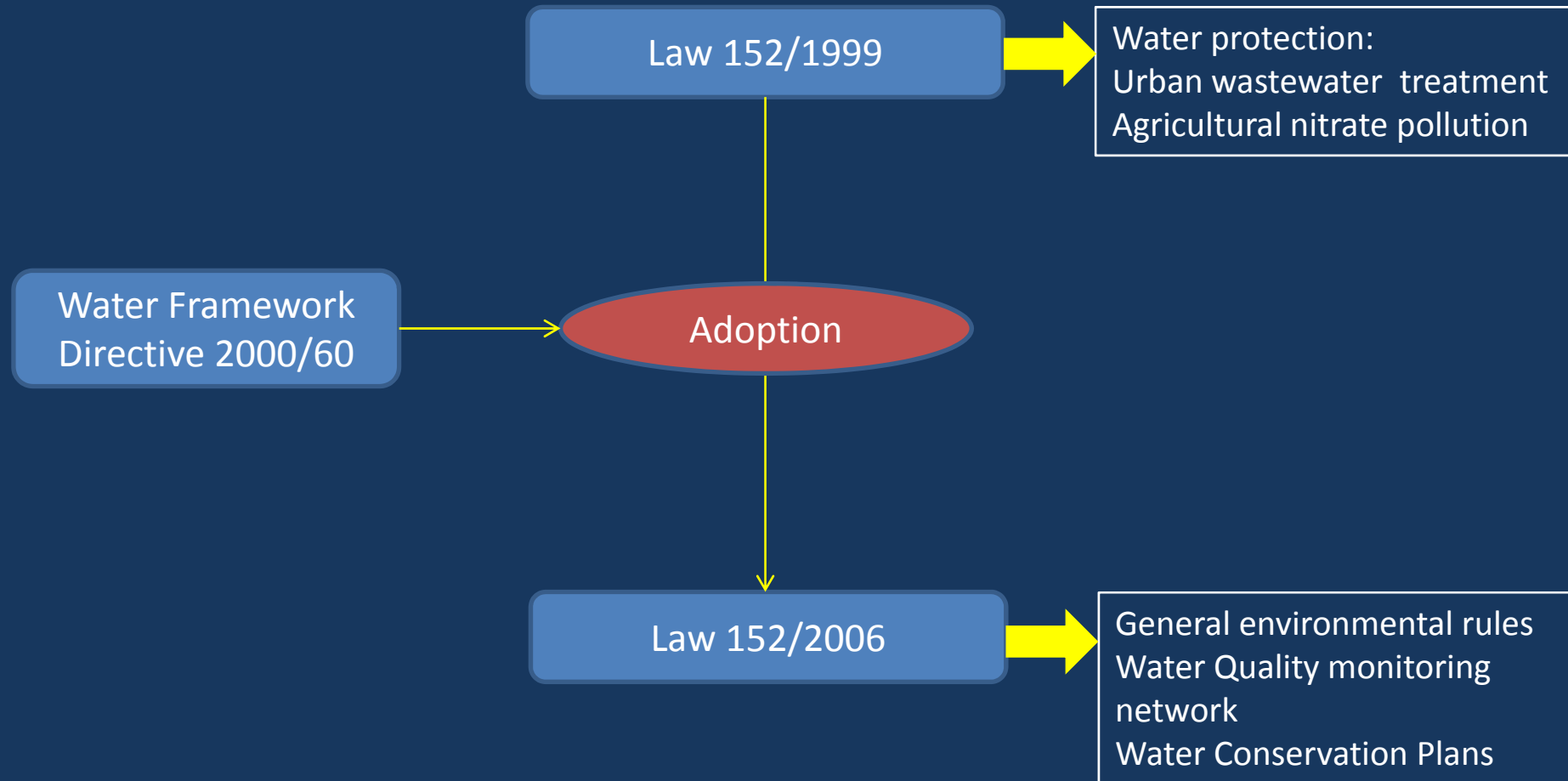
**Total water amount  
~ 150 km<sup>3</sup>**



## MAJOR CAUSES OF WATER QUALITY ALTERATION

- ⇒ ACIDIFICATION: especially for Alpine high-altitude lakes (52% affected). Can alter directly and indirectly the water communities structure
- ⇒ EUTROPHICATION: great lakes in the Pre-Alpine area. Caused by runoff and leaching from intensive farms in N-Italy
- ⇒ TOXIFICATION: given by industrial wastewaters especially in N-Italy

## NORMATIVE FRAMEWORK



## SOURCES OF INFORMATION

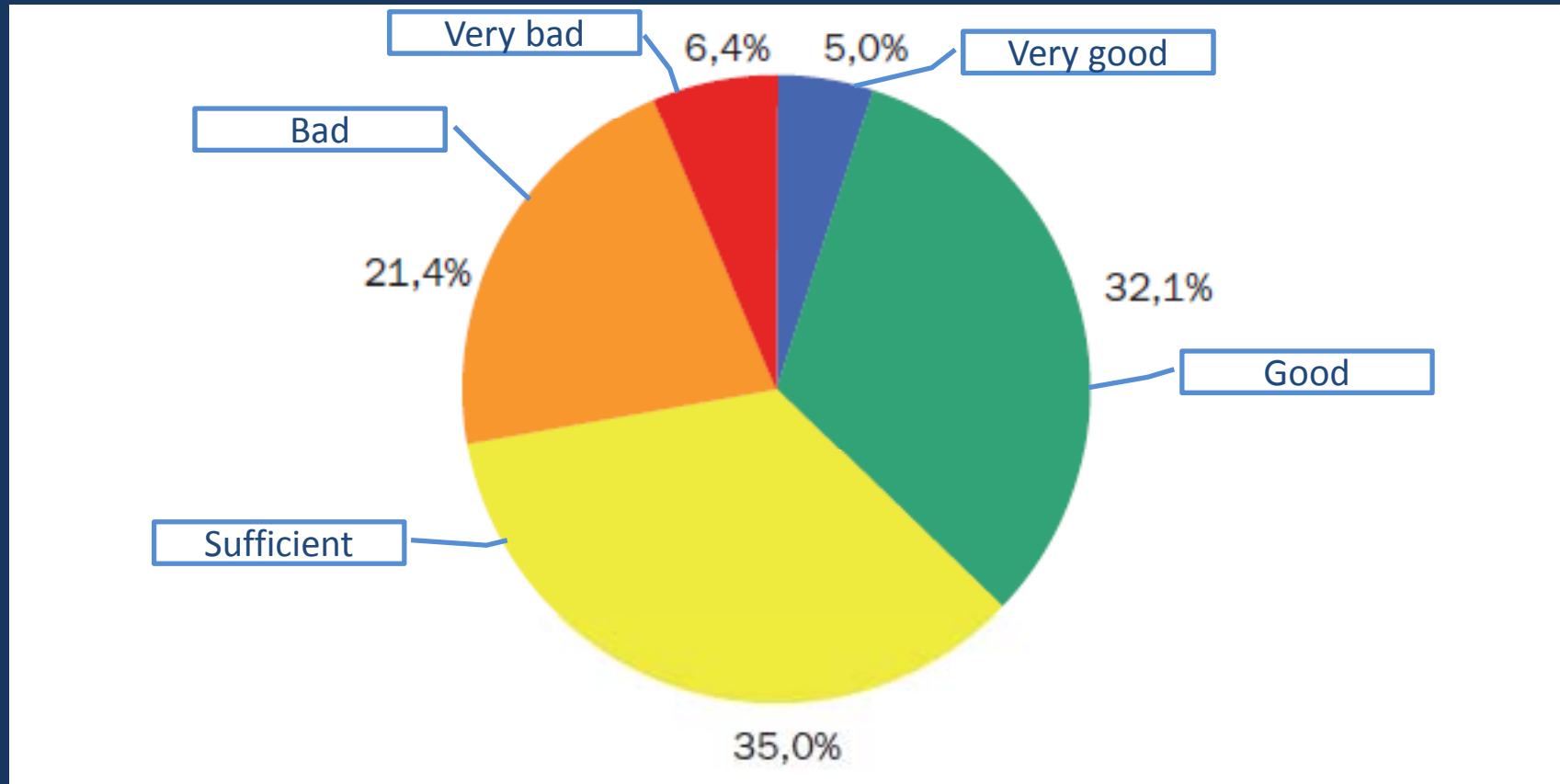
- Italian Ministry of Environment
- ISPRA (National Agency for Environmental Protection and Research) →  
Environmental Data Yearbook
- ARPA (Regional Agencies for Environmental Protection)
- National Council of Research – ISE (Verbania)
- ISTAT (National Institute of Statistics)



## FRESHWATERS QUALITY INDICATORS

INDICATOR / INDEX	UPDATE	CONTENT
Macro-descriptors	Yearly	75° percentile of: % Oxygen, BOD5, COD, ammonium, nitrate, total P, <i>Escherichia coli</i>
Pollution level from macro-descriptors (LIM)	Yearly	Sum of macro-descriptors 75° percentiles, in 5 quality classes
Extended Biotic Index (BIE)	Yearly	Structure of the benthic macro-invertebrates communities
Ecological State of Water Flows (SECA)	Yearly	Integration of LIM and BIE
Ecological State of Lakes (SEL)	Yearly	Integration of water transparency, chlorophyll, Oxygen saturation, total P
Water compliance for fish life	Yearly	Integration of chemical / physical parameters
Chemical State of Groundwaters (SCAS)	Yearly	Integration of chemical / physical parameters

## SEL CLASSES % DISTRIBUTION (2009)



- ⇒ Data from 140 stations in 12 Italian regions
- ⇒ 72% of records in the classes sufficient-to-very good (+7 with respect to 2008)
- ⇒ Difficult to compare cause of changes in monitoring procedures in 2009

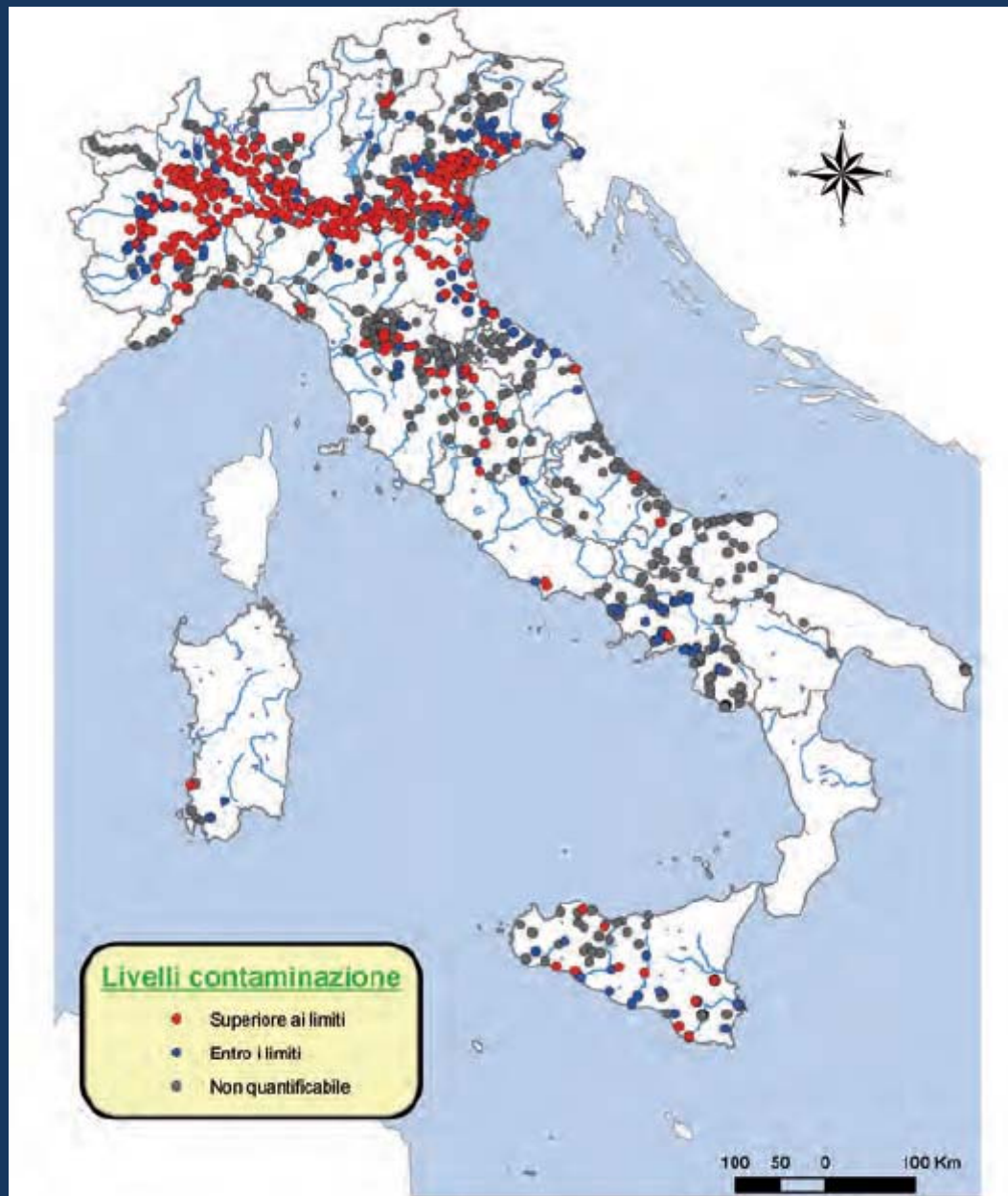
## SEL CLASSES (2009)

Regione/Provincia autonoma	Classe					TOTALE
	1	2	3	4	5	
Valle d'Aosta	6	10	2	0	2	20
Lombardia	0	8	15	17	2	42
Trentino-Alto Adige	1	8	7	1	0	17
<i>Bolzano-Bozen</i>	1	7	1	0	0	9
<i>Trento</i>	0	1	6	1	0	8
Veneto	0	5	6	2	0	13
Emilia-Romagna	0	2	2	0	0	4
Toscana	0	0	5	4	1	10
Marche	0	3	0	0	0	3
Lazio	0	7	2	0	0	9
Abruzzo	0	0	6	0	0	6
Molise	0	0	0	2	4	6
Puglia	0	2	4	4	0	10
<b>TOTALE</b>	<b>7</b>	<b>45</b>	<b>49</b>	<b>30</b>	<b>9</b>	<b>140</b>

Number of stations per regions and SEL classes

## Water compliance to fish life in lakes

Anno	Totale aree designate	Aree classificate			
		Conforme		Non conforme	
	km <sup>2</sup>	km <sup>2</sup>	%	km <sup>2</sup>	%
2000	654	148	33,1	299	66,9
2001	552	387	97	12	3
2002	597	597	100	0	0
2003	596	596	100	0	0
2004	496	496	100	0	0
2005	660	660	100	0	0
2006	661	661	100	0	0
2007	664	664	100	0	0
2008	676	676	100	0	0
2009	594	594	100	0	0



## POLLUTION LEVEL OF PESTICIDES IN FRESHWATERS

➔ The majority of above-threshold values is located in Northern Italy (2008)

## WATER QUALITY PROTECTION FRAMEWORK



The Italian territory is divided into 8 hydrographic Districts

Each District has an Authority ('Autorità di Bacino')

Each Authority is in charge to design and update the District Management Plan

The Management Plan has two main tools

**Water Protection Plan (PTA)**: monitoring and measures for the qualitative and quantitative water conservation at regional level

**Hydrogeological Arrangement Plan (PAI)**: measures for managing flood risks and protection of the rivers environment

## WATER MANAGEMENT PLANS

Up to 2010:

- 14 Water Protection Plans (PTAs) approved
- 4 Water Protection Plans (PTAs) adopted
- The monitoring system is uneven applied across regions
- The overall water quality of lakes is as a whole acceptable
- The lakes water status is more or less steady
- Much work less to do...

**THANKS FOR YOUR ATTENTION!**

*Quel ramo del lago di Como, che volge a mezzogiorno, tra due catene non interrotte di monti, tutto a seni e a golfi, a seconda dello sporgere e del rientrare di quelli, vien quasi a un tratto, tra un promontorio a destra e un'ampia costiera dall'altra parte...*  
**A. MANZONI (I Promessi Sposi)**