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DIPARTIMENTO DI INGEGNERIA DELLE STRUTTURE, DEI TRASPORTI, DELLE ACQUE, DEL RILEVAMENTO, DEL TERRITORIO

Water Resources Management in the Emilia-Romagna region, Italy

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The Emilia-Romagna region

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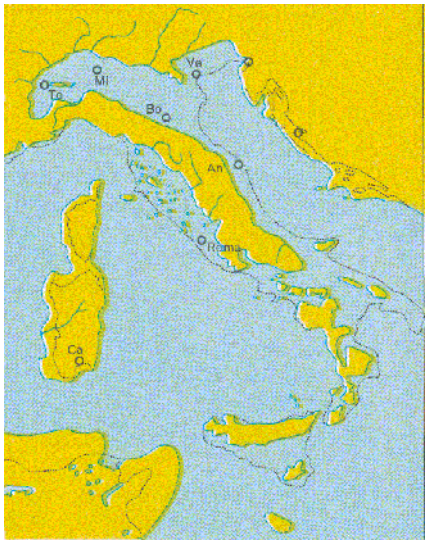
The practical need

- Optimise water resources management in the region.
- Water Framework Directive of the European Community 2000/60:
  - water quality targets on the main water bodies of the region by 2016
  - water bodies: mountain rivers, Po river, sea.
- Water needs for civil, industrial and agricultural uses.
- Water resources: Po River (significant volume, poor quality), mountain rivers (good quality, not significant volumes), groundwater resources (pollution by nitrates).
- Significant water scarcity problems during summer
- Environmenal flow requirements

Some historical background...

- Most of the Emilia-Romagna region is covered by the Padana Plain. It is extended over 45000 km^2, about 15% of Italy. It is a large agricultural area that plays a significant role in the Italian economy.

- The Padana Plain was originally a Gulf of the Adriatic Sea.



Italy during the Mesozoic Era,
about 150 millions of years ago

Some historical background...

- During the years the rivers flowing in the Padana Plain, mainly the Po River, induced a siltation of the area, while sea level decreased. The Padan Plain became a huge marsh and unhealthy area, subject to frequent floods of the Po River, that was barely confined between natural levees.

- The Greeks and especially the Etrurians first (VII century B.C.), and the Roman afterwards (II and I century B.C.) started land reclamation in the area. They built the first artificial levees of the Po river, therefore starting the Po River training.

- In order to effectively drain the area into the Po River and the Adriatic Sea, the Etrurians and the Romans built an efficient network of man made channels which still is in place today.

- With the development of agriculture, the channel network was designed for draining excess water during the raining season and conveying water for irrigation during the dry season.

Landforms in the Padana Plain...

Landforms in the Padana Plain...

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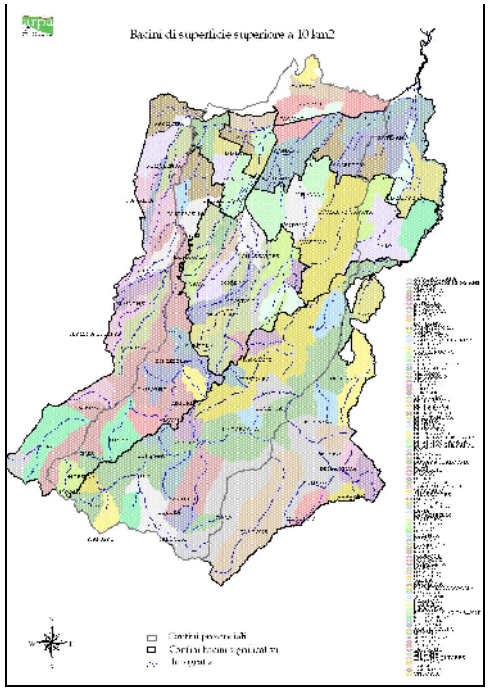
Landforms in the Padana Plain...

The Province of Reggio Emilia

Extension: about 2200 km^2
Inhabitants: about 600.000
Main mountain rivers: Secchia River and Enza River



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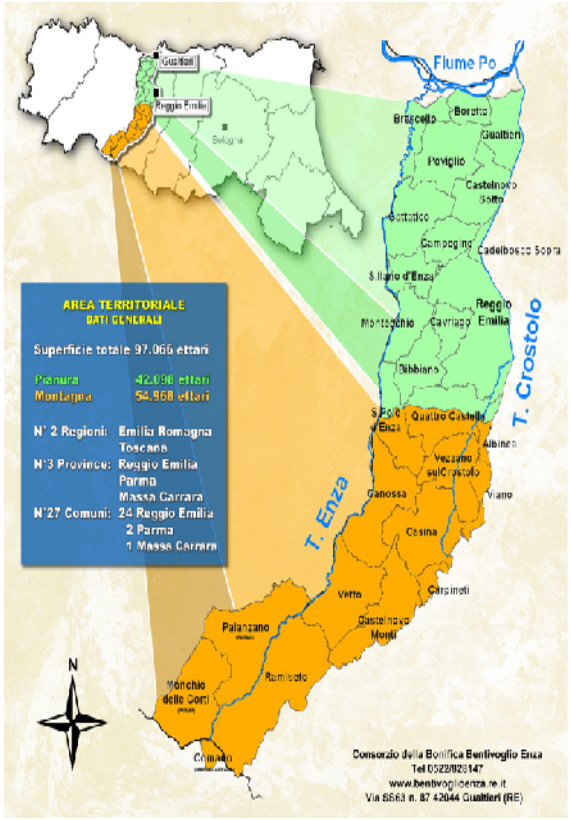
Consortiums for land reclamation



The plain areas are irrigated by the Po River

The mountain areas are irrigated by the mountain rivers

Water Quality

Water quality in the main rivers accordingly to the indexes:

- **Ecologic state index: SECA**
- **Environmental state index: SACA**

CORPO IDRICO	STAZIONE	TIPO STAZ.	SECA 2001-2002	SACA 2001-2002	SECA 2003	SACA 2003	SECA 2004	SACA 2004	SECA 2005	SACA 2005
F. PO	Loc. Boretto	AS	Classe 3	Sufficiente	Classe 4	Scadente	Classe 3	Sufficiente	Classe 3	Sufficiente
T. ENZA	Traversa Cerezzola	AS	Classe 2	Buono	Classe 2	Buono	Classe 2	Buono	Classe 2	Buono
T. ENZA	Coenzo	AS	Classe 3	Sufficiente	Classe 3	Sufficiente	Classe 4	Scadente	Classe 3	Sufficiente
T. CROSTOLO	Briglia valle Rio Campola	AS	Classe 2	Buono	Classe 3	Sufficiente	Classe 3	Sufficiente	Classe 2	Buono
C. TASSONE	S. Vittoria - Gualtieri	AI	Classe 5	Pessimo	Classe 4	Scadente	Classe 4	Scadente	Classe 4	Scadente
T. CROSTOLO	Ponte Baccanello	AS	Classe 4	Scadente	Classe 5	Pessimo	Classe 4	Scadente	Classe 5	Pessimo
F. SECCHIA	Traversa di Castellarano	AS	Classe 3	Sufficiente	Classe 2	Buono	Classe 3	Sufficiente	Classe 3	Sufficiente
T. TRESINARO	Briglia Montecatini – Rubiera	AI	Classe 4	Scadente	Classe 4	Scadente	Classe 4	Scadente	Classe 4	Scadente

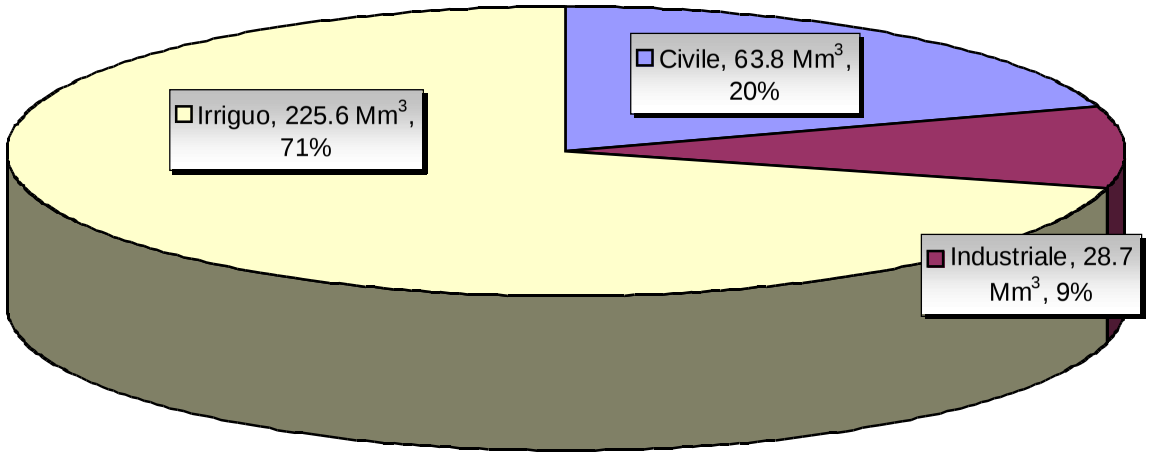
Water availability in the main rivers

- Daily hydrological simulation for the period 1991-2001.
- Estimation of mean water resources availability during the dry season:.

River	April (m^3/s)	May (m^3/s)	June (m^3/s)	July (m^3/s)	August (m^3/s)	September (m^3/s)
Enza @ Cerezzola	5.01	3.37	3.21	1.23	0.80	3.11
Crostolo @ Puianello	0.30	0.20	0.12	0.00	0.00	0.00
Secchia @ Castellarano	10.39	7.36	6.38	3.93	2.77	5.43

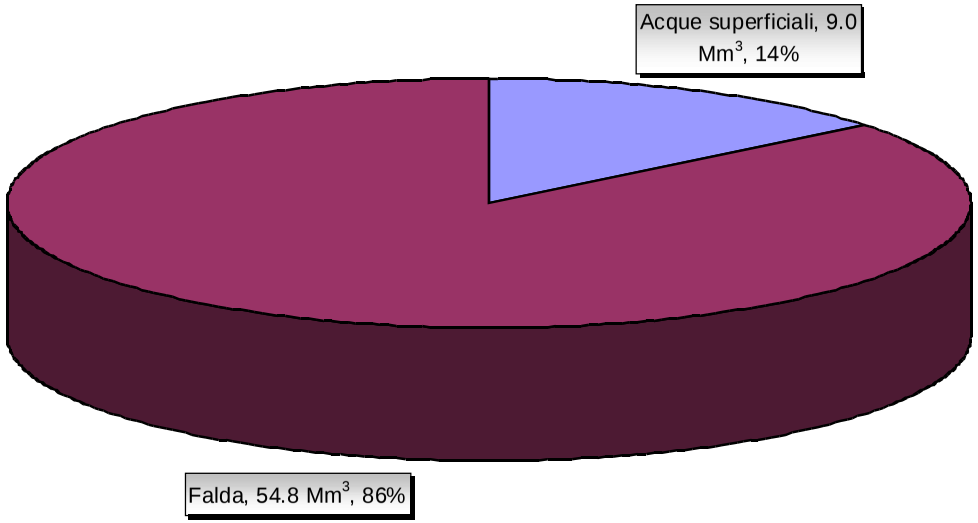
Macro bilanci idrici (da PTA)

Prelievi idrici alla fonte attuali (relativi all'anno 2000)



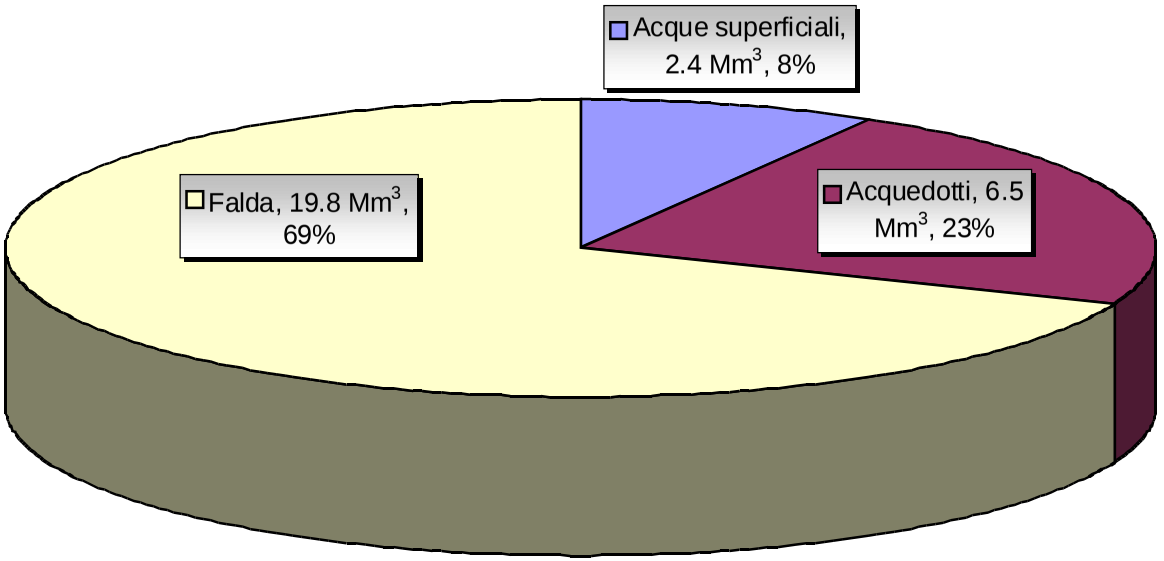
Macro bilanci idrici (da PTA)

Prelievi idrici alla fonte per il settore civile
(relativi all'anno 2000)



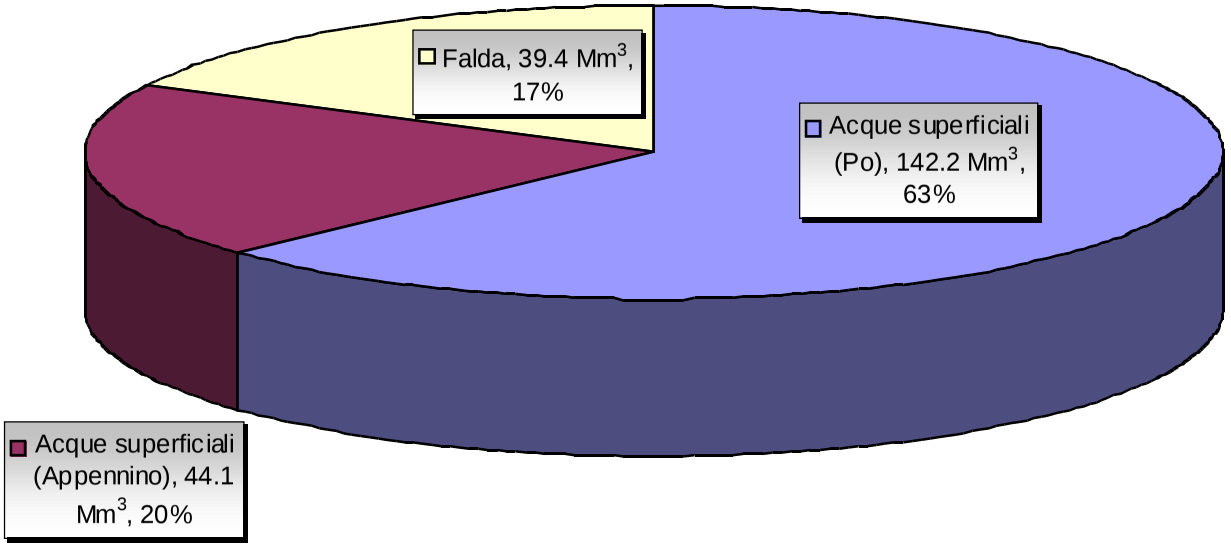
Macro bilanci idrici (da PTA)

Prelievi idrici alla fonte per il settore industriale
(relativi all'anno 2000)



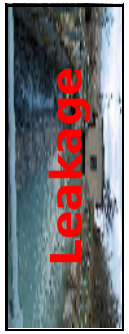
Macro bilanci idrici (da PTA)

Prelievi idrici alla fonte per il settore irriguo
(relativi all'anno 2000)



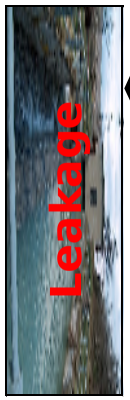
Water balance model – Current situation

Computed depending on crop spatial distribution, water requirement of each crop, coefficients to account for:
-different climate
-permeability
-water availability
-irrigation technique



Water balance model

For each day in the period June 1st – Sept 5th compares the water demand at the river with the actual river flow, for the period 1991-2001. It takes into account rainfall, floods and other casual agents limiting water availability.



Water deficit:
Enza: 57.4 Mm^3
Secchia: 6.5 Mm^3

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Strategies for optimal water resources management

Small and distributed water storages with limited environmental impact. Typically we plan to use small basins located in theriparian areas that were excavated for gravel mining.

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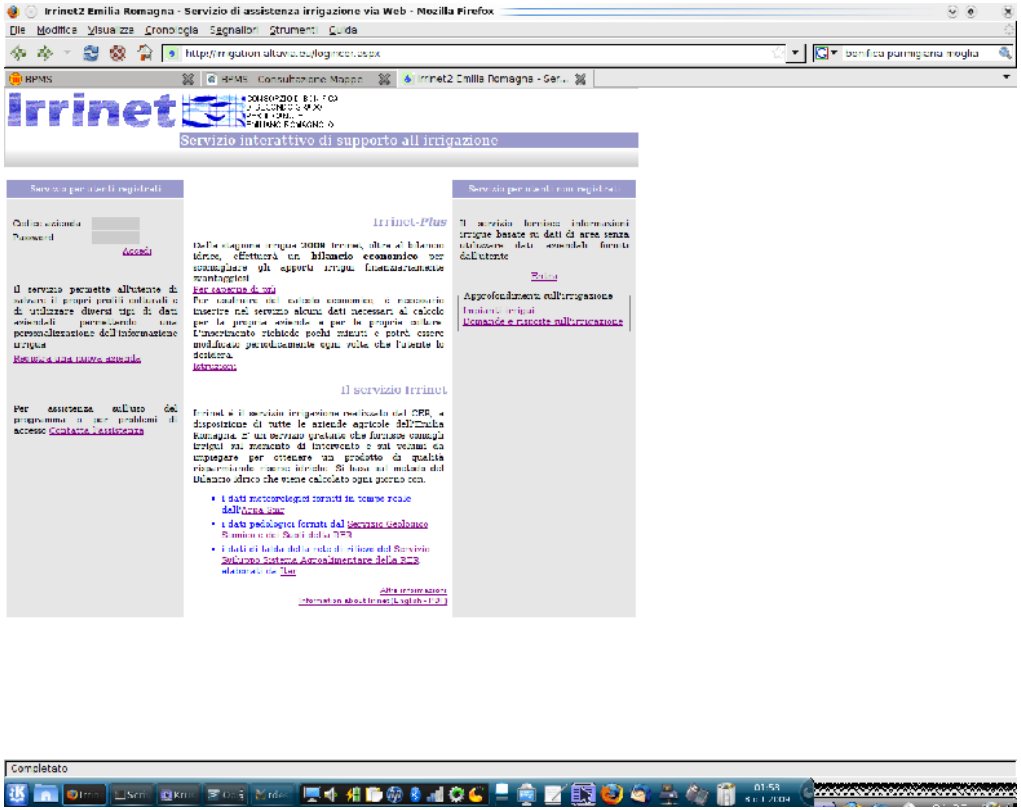
Strategies for optimal water resources management

- To reduce leakage in the channel distribution network for agriculture. Current efficiency: about 50%.
- To change irrigation practices, from surface irrigation (flood irrigation, the most used irrigation technique in the world) to sprinkler irrigation

Strategies for optimal water resources management



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Strategies for optimal water resources management

- Reduce water consumption for civil use (water saving taps....)
- Massive structural interventions (large size water storages).

Rendering of the Vetto Dam. The first project was developed in 1867.
Problems:

- Bed load transport – expected life of the dam.
- Reduction in size of the basin during the summer period – No touristic use.
- 1 village to be relocated.

The current situation in Reggio Emilia

- The idea of a huge dam is currently not considered.
- However, the realisation of many small reservoirs is not feasible.
- Nitrate pollution in groundwater.
- Currently the idea is to realise a few small reservoirs, while optimising irrigation techniques.
- There is an attempt for a concerted action to identify a mountain sub-basin where a small dam could be built (10 millions of cubic metres).

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Thanks!

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