Preliminary Version
Of
Surface Water and Groundwater Resources Government Plan

(Preliminare di Piano Stralcio per il governo della risorsa idrica superficiale e sotterranea)
Planning process for water resources has been based on Italian laws:

- L. 183/89 (soil defense)
- L. 36/94 (water use)
- D. Lgs. 152/99 (water protection from pollution risk)


The WFD has been transposed into Italian legislation with the law D.Lgs. 152/06.

On the basis of D.P.S.I.R. methodology, Basin Authority has made a preliminar individuation of determinant and pressure systems, and now is going to complete D.P.S.I.R. application.
Planning activities

GROUNDWATER

SURFACE WATER
PROCESSO DI PIANIFICAZIONE E PROGRAMMAZIONE PER IL GOVERNO DELLA RISORSA IDRICA
AUTORITÀ DI BACINO DEI Fiumi LIRI-GARIGLIANO E VOLTURNO

PLANNING PROCESS: FLOW CHART

- Studio Preliminare "Optimizzazione Risorse Idriche" Bacino Liri-Garigliano e Volturno
  - Valutazione Piano Stradale Risorse Idriche (Valore e Pris) successivamente al progetto preliminare di Piani
  - Attività specifiche
    - Autovalutazione ed adeguamento del sistema di monitoraggio idrogeologico del bacino Liri-Garigliano e Volturino
    - Progetto di realizzazione del piano di gestione idraulica del bacino
  - Valutazione e pianificazione del piano di gestione idraulica

- Preliminare di Piano Stradale per il Governo della Risorsa Idrica Superficiale e Sotterranea del Bacino Liri-Garigliano e Volturino
  - Analisi esecutiva
  - Impianti territoriali
  - Climatologia
  - Vicinanza
  - Geologia
  - Idrogeologia
  - Manutenzione LAMET
  - Aspetti geoss guarantee
  - Assetto del canale principal
  - Stato qualitativo dei corsi acquei
  - Impianti
  - Monitoraggio qualitativo e quantitativo
  - Dati di bilancio idrologico e bilancio idrico
  - Safficienze dei principali agglomerati

- Definizione Bilancio Idrico ed Idrogeologico
  - Individuazione dei punti di debolezza (idrogeologia) e punti di forza
  - Identificazione delle zone idriche e zone idrogeologiche
  - Supporto alla definizione di strategie di "sostenibilità idrica e idrogeologica"

VAURIS - Vincoli ambientali sull’utilizzo della risorsa idrica superficiale
PRIS - Protezione delle risorse idriche sotterranee

Per le specifiche attività vedere scheda allegata
PLANNING PROCESS:
FLOW CHART

PHYSICAL SYSTEM

STATUS (IMPACTS)

PRESSURES
First step of planning activities consisted in definition of physical system features for **GROUNDWATERS** and **SURFACE WATERS**.

Description of physical system required analysis of following themes:

- **geology and hydrogeology**
- **main groundwater bodies**
- **main natural and artificial surface water bodies**,  
- **hydrology and climatology** (rain, temperature, evapotranspiration, flow, etc.)
- **hydraulics (morphology, River Functional Index)**
GEOLOGICAL CROSS SECTIONS OF
FUCINO PLAIN
HYDROGEOLOGICAL CROSS SECTIONS OF FUCINO PLAIN
PRESSURES

- Potential pollutant loads
- Water requirement
- Main water exploitation points
- Main interregional water resources transfers
- Wastewater discharge points and treatment plants
- Land use map
- Urbanization map
WATER REQUIREMENT

Drinking water

Irrigation water

Breading water

Industrial water
MAIN WATER EXPLOITATION POINTS
MAIN INTERREGIONAL WATER RESOURCES TRANSFERS
WASTEWATER DISCHARGE POINTS AND TREATMENT PLANTS
LAND USE MAP
URBANIZATION MAP
- water balance
- minimum stream flow (deflusso minimo vitale)
- groundwater and surface water quality
Water balance is pointed to define a strategy for government of water resources, and to guarantee a sustainable use.

Aim of water balance is:
- to quantify hydrologic cycle components
- to quantify water exploitation
- to identify new resources
- to provide information for studies at local scale
- to plan future exploitation based on water demand

Water balance has been computed referring to:
- **natural conditions**: input and output volumes are referred to natural condition without considering resources exploitation.
- **uses**: input and output volumes are computed including resources exploitation, present and future water demand, and minimum streamflow.
SIMPLIFIED MODEL FOR HYDROLOGIC ACCOUNT

$P$  
Precipitazioni

$ET$  
Evapotraspirazione reale

$\Delta W$  
Volume immagazzinato

$V_e$  
Volume entrante

$V_u$  
Volume uscente

*Sottobacino idrografico*  
*o idro-struttura*
WATER BALANCE CALCULATING POINTS
Minimum Stream Flow for biological life (*Deflusso Minimo Vitale*) is the flow value to guarantee preservation of river ecosystem.

**Fondamental parameters:**

- natural: hydrology, hydrogeology, river ecosystem
- human: river geometry modification, pollutant loads.

There are many methods to compute DMV. Usually they are based on hydrologic and environmental variables.

*Basin Authority* used:

- *hydrological-environmental method*, computes DMV using geomorphologic and hydrologic parameters coupled with environmental factor
- *experimental method of microhabitat*, computes DMV using environmental conditions fit for water life.
DMV computed with hydrological - environmental method
WATER QUALITY

Surface water quality and environmental level map
WATER QUALITY

Groundwater quality map: chemical level
MONITORING NETWORK → Groundwater
MONITORING NETWORK → Surface water
**SPECIFIC PROGRAM FOR WATER RESOURCES MANAGEMENT**

*Basin Authority* elaborated two special program focused on water resources management:

- **Quality and quantity monitoring network for groundwater and surface water in Volturno basin**

- **Program for groundwater and surface water resources management in Fucino Plain.**
MONITORING NETWORK LAYOUT DESIGNED FOR VOLTURNO BASIN

LEGENDA

- Stazioni di monitoraggio integrative per i corpi idrici sotterranei (ST) del Bacino Voltumo - territorio Campano
- Stazioni di monitoraggio integrative per i corpi idrici superficiali (SP) del Bacino Voltumo - territorio Campano
- Codice identificativo progressivo delle stazioni di monitoraggio integrative previste dall'Autorità di Bacino

- Limiti Bacino Voltumo
- Limiti di sottobacino
FUCINO PLAIN: field investigations
ACTIVITIES FOR WFD IMPLEMENTATION

Basin Authority is involved in implementation process of WFD, and its technical staff realised report document required in art. 5. The report provides an analysis of Liri-Garigliano and Volturno basin characteristics, and undertakes an impact review of human activity on the status of waters in accordance with the requirements of art. 5.

Report contains:
- a characterization of water bodies, including a preliminary individuation of heavily modified water bodies
- a review pressures and impacts and identify sites at risk of not meeting the environmental objective of ‘good status’
- a register of Protected Areas

All informations used to realise report derive from Water Resources Government Plan elaborated by Basin Authority.
SURFACE WATER BODIES AT RISK MAP