WB4 Report:

On the test area of Ostuni, Apulia region, Italy

Water Research Institute –
National Research Council

(FB3)

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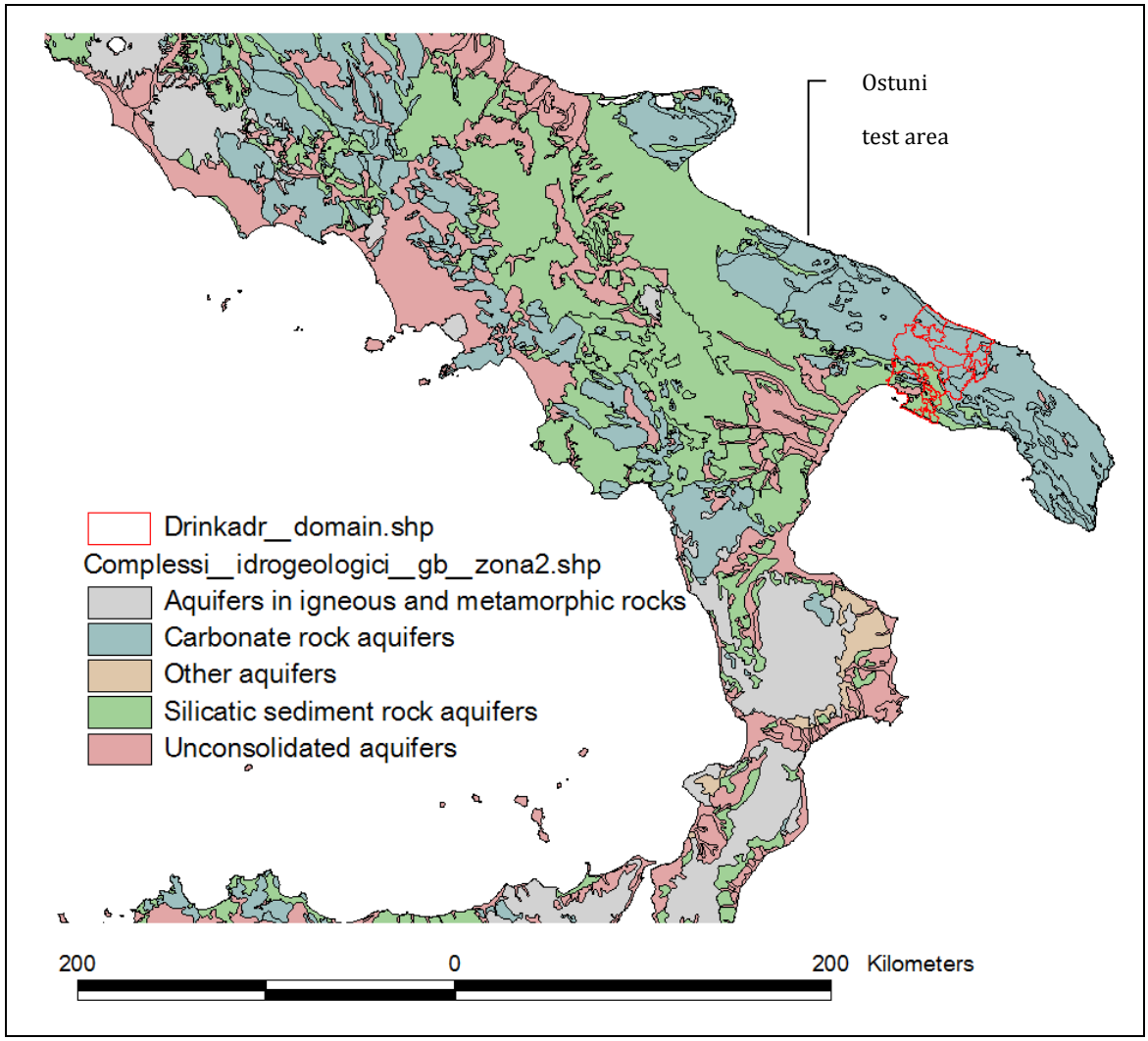
1. INTRODUCTION

The Ostuni test area includes the territories belonging to the Municipality of Ostuni and the surrounding 23 municipalities which span from the Adriatic to the Ionian coast of the Apulia region. This extended area has been selected for the WP4 as an interesting hydrogeological domain for the whole Puglia region, due to the high natural recharge rate in the inland plateau and high degree of groundwater exploitation in the lowland coastal areas.

The test area and the main geological formations within it are shown in the following figure.



2. WATER RESOURCE AND WATER SUPPLY OF THE TEST AREA

The number of inhabitants in the pilot area 568,959 according to the 2008 census (see table below). The drinking water consumption supplied by the regional water company AQP is estimated in 66 Mm^3/year. This water is mostly supplied by a system of interconnected artificial reservoirs located outside the Apulia region with a minor component coming from 2 karst spring located in Campania region.

MUNICIPALITY	AREA [km^2]	Inhabitants 2008	Households (population) water use [Mm3/yr]	Touristic water use [Mm^3/yr]	Touristic/ Household
LOCOROTONDO	48	14,167	1.563	0.004	0.2%
CAROVIGNO	106	16,050	1.696	0.216	12.8%
CEGLIE MESSAPICO	131	20,706	2.229	0.012	0.6%
CISTERNINO	54	11,914	1.344	0.020	1.5%
FASANO	130	38,460	4.429	0.200	4.5%
FRANCAVILLA FONTANA	176	36,603	4.055	0.004	0.1%
LATIANO	55	15,072	1.693	0.000	0.0%
OSTUNI	223	32,428	3.578	0.469	13.1%
SAN MICHELE SALENTINO	26	6,372	0.644	0.000	0.0%
SAN VITO DEI NORMANNI	66	19,947	2.239	0.010	0.4%
VILLA CASTELLI	35	9,059	0.899	0.003	0.4%
CAROSINO	11	6,553	0.634	0.000	0.0%
CRISPIANO	111	13,502	1.429	0.001	0.1%
FAGGIANO	20	3,519	0.335	0.000	0.0%
GROTTAGLIE	104	32,835	3.551	0.011	0.3%
LEPORANO	15	7,551	0.628	0.062	9.8%
MARTINA FRANCA	297	49,525	5.155	0.059	1.1%
MONTEIASI	10	5,484	0.542	0.000	0.0%
MONTEMESOLA	16	4,190	0.409	0.000	0.0%
MONTEPARANO	4	2,354	0.229	0.000	0.0%
PULSANO	18	10,788	1.145	0.071	6.2%
ROCCAFORZATA	47	1,845	0.164	0.000	0.0%
SAN GIORGIO JONICO	23	16,014	1.710	0.002	0.1%
TARANTO	265	194,021	25.729	0.237	0.9%
TOTALS	**1992**	**568,959**	**66.031**	**1.382**	**2.1%**

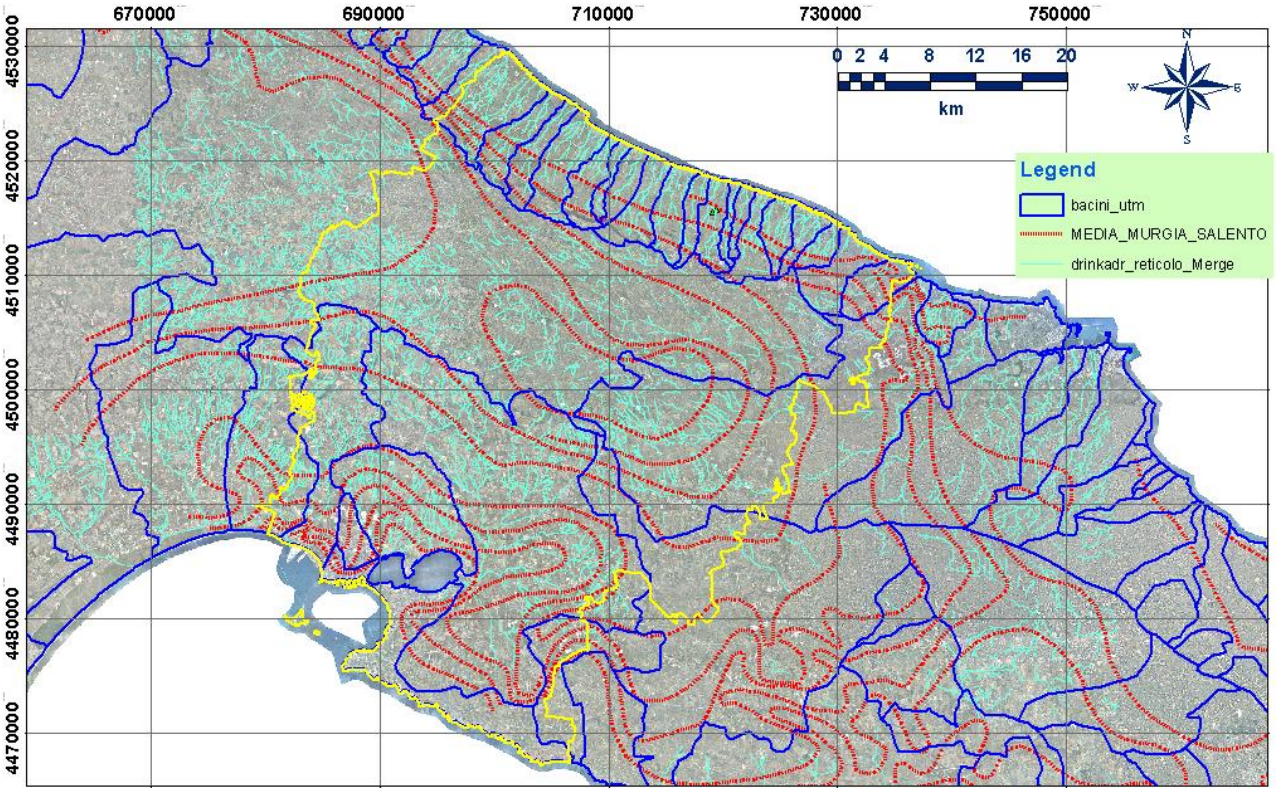
The water consumption for touristic use is 1.4 Mm^3/year and is mostly supplied by the same water system described above.

The standard of supply service for drinking use is very good with very few restrictions related to drought periods. Some pressure failures are observed during peak touristic season in summer.

Concerning the irrigation use, the pilot area is mostly occupied by agricultural land (olive, vine grape, fruit trees, wheat and vegetables) with irrigated crops covering about 220 km^2.

The total irrigation demand is estimated in 78 Mm^3/year (about 3,500 m^3/ha). Irrigation demand is fully based on groundwater with both private and collective pumping wells. Groundwater pumping is mostly concentrated along the coastal areas covering an ideal strep having width between 10 and 15 km from the sea. Concerning the industrial water use supplied by groundwater, the estimated annual water withdrawal is 4.2 Mm^3 mostly supplied by private wells.

The test area with the main hydrogeological features is represented in the following figure.



Main identified problems:

A fast growing trend was observed in the last decades towards irrigation farming which led to a massive exploitation of groundwater resources. As a result, the groundwater level has dramatically decreased and sea water intrusion was observed in most of the coastal zones. An increasing trend was also observed in the touristic sector in the last two decades along the coastal areas with consequent increase of water demand for drinking and gardening (e.g. golf courses).

Concerning groundwater equilibrium in the selected test area, the estimated mean annual recharge is 382 Mm^3, while mean annual groundwater exploitation is 78.1 Mm^3, corresponding to an overall groundwater exploitation around 20%. This value may be considered very unsafe for coastal aquifers for which an adequate discharge to the sea is the only way to contrast seawater intrusion.

In several coastal areas, groundwater salinity became incompatible with irrigation practice and most wells were abandoned having TDS values above 6 g/L. The observed trend in seawater intrusion is quite insensitive to the occasional very wet years (rainfall above normal values) and asks for innovative groundwater management measures as investigated in WP6.

Remediation actions to improve groundwater quantity and quality are necessary. A mathematical model will be applied in the WP6 to simulate the sea water intrusion and pollutant migration in groundwater under different scenarios by considering both global warming and anthropogenic impacts on groundwater. FB3 will investigate the best groundwater management options in order to improve water quality by reversing the sea water intrusion. The estimation of the groundwater volumes potentially recovered will be used as water supply for touristic areas.

3. TEST AREA SUMMARY TABLE

Name	OSTUNI WP4 TEST AREA
Related city	Ostuni
Geographical coordinates	40.630° N 17.740° E
Altitudinal range	0 m- 510 m
Size	1992 km^2
Morphology	Hills and carbonate plateau sloping seaward to flat coastal plains. Presence of endoreic catchment related to tectonic and karst phenomena.
Aquifer type	Karst limestone aquifer
Surface water interaction	None. With ephemeral streams perching to groundwater.
Geology	Carbonate rock with terrarossa and silicate sedimentary rocks.
Mean annual precipitation	594 mm
Mean annual temperature	15.65°C
Soil type (WRB-UTS1)	Epileptic Luvisol, Calcic Kastanodem, Rhodic Luvisol, Chromic Luvisol, Endoskeletic Phaeozem
Land uses	Agriculture 80% Forestry 13% Artificial surfaces 7% Water bodies 0%

Protection areas	Groundwater protection zones for natural recharge areas; Banned groundwater exploitation areas for salinity excess.
Water abstraction **(*) from extra-regional water resources**	Drinking*: 66.0 Mm^3/yr Touristic*: 1.4 Mm^3/yr Industrial: 4.2 Mm^3/yr Agricultural: 73.9 Mm^3/yr Total groundwater abstraction rate: 2480 l/s

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