

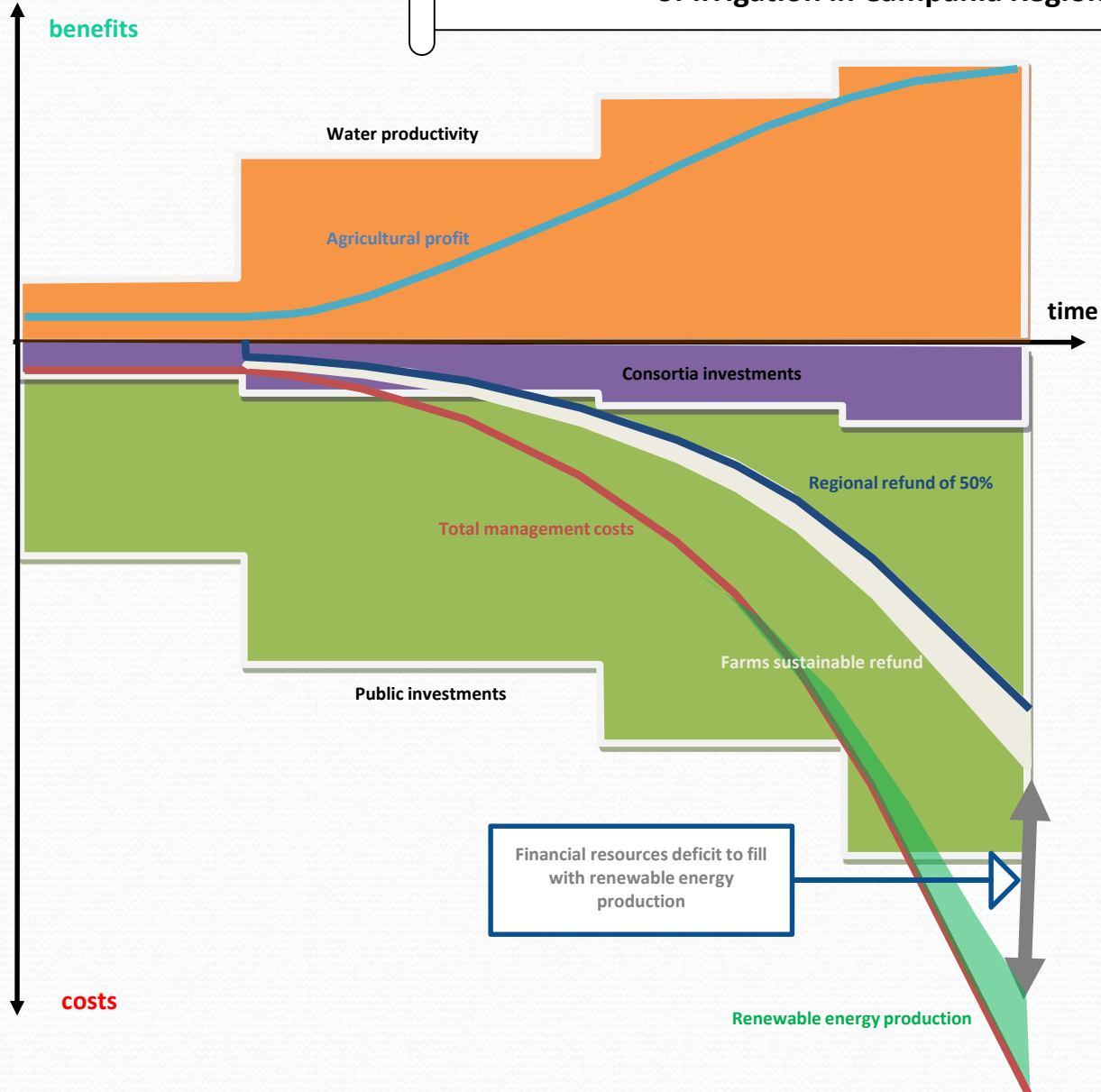
Renewable energy assisted agriculture in Campania Region - Italy

Contribution to Conference and Meeting of the
InterMediterranean Commission (IMC) of the Conference
of Peripheral Maritime Regions (CPMR) Working group on
Water and Energy – Valencia (Spain – 18.10.2016)

Prof. Adv. Luigi Stefano Sorvino (Campania Region – General Director of Regional Basin Authority of the Center of Campania) – luigistefano.sorvino@adbcampaniacentrale2.it

Ph.D. Eng. Mario Sica (Campania Region – Chief of Financial Resources and Public Works Programming in Regional Basin Authority of the Center of Campania) – mario.sica@adbcampaniacentrale2.it

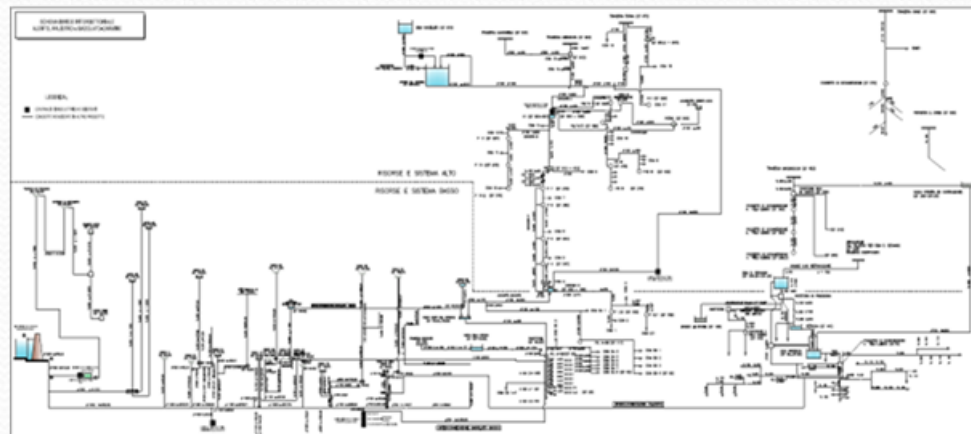
Costs-benefits analysis with conversion from gravity irrigation systems to pressure irrigation systems in Consortia of Irrigation in Campania Region



Velia Consortium of Irrigation

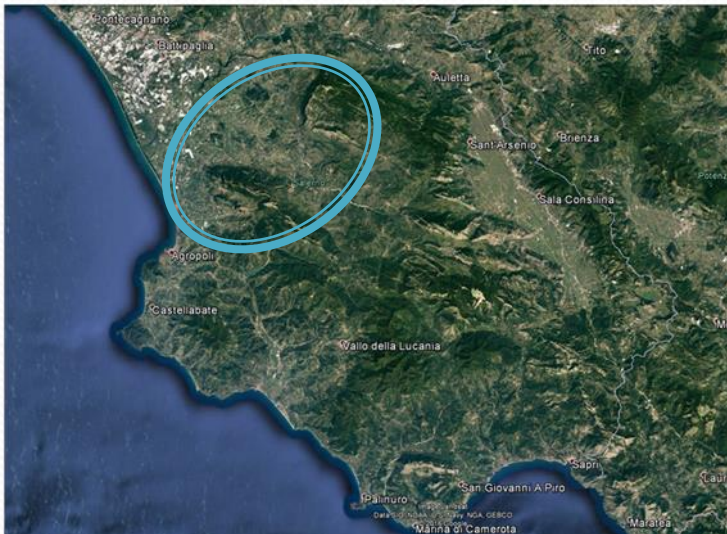


Alento River Dam and Reservoir



The complex interconnected and multipurpose system of Velia Consortium of Irrigation

Paestum Consortium of Irrigation



IMPIANTO FOTOVOLTAICO TEMPA DI LEPRE UBICAZIONE IN VIA TEMPA DI LEPRE snc GIUNGANO (SA)

DATI IDENTIFICATIVI IMPIANTO	
DATA DI ATTIVAZIONE	ANNO 2013
COD. POD	IT001E00210295
POTENZA NOMINALE ELETTRICA kW	97,3
TENSIONE DI COLLEGAMENTO kV	20
PRODUZIONE ANNUALE MEDIA kWh	120.000



IMPIANTO FOTOVOLTAICO TEMPA S. PAOLO UBICAZIONE IN VIA SCIGLIATI snc CAPACCIO (SA)

DATI IDENTIFICATIVI IMPIANTO	
DATA DI ATTIVAZIONE	ANNO 2005
COD. POD	IT001E00218812
POTENZA NOMINALE ELETTRICA kW	400
TENSIONE DI COLLEGAMENTO kV	20
PRODUZIONE ANNUALE MEDIA kWh	500.000



IMPIANTO FOTOVOLTAICO OLIVELLA BT UBICAZIONE IN VIA CASTELLUCCIO snc Altavilla Silentina (SA)

DATI IDENTIFICATIVI IMPIANTO	
DATA DI ATTIVAZIONE	ANNO 2016
COD. POD	IT001E84334412
POTENZA NOMINALE ELETTRICA kW	30,24
TENSIONE DI COLLEGAMENTO kV	0,4
PRODUZIONE ANNUALE MEDIA kWh	45.000



IMPIANTO FOTOVOLTAICO OLIVELLA MT UBICAZIONE IN VIA CASTELLUCCIO snc Altavilla Silentina (SA)

DATI IDENTIFICATIVI IMPIANTO	
DATA DI ATTIVAZIONE	ANNO 2016
COD. POD	IT001E80225267
POTENZA NOMINALE ELETTRICA kW	30,00
TENSIONE DI COLLEGAMENTO kV	20
PRODUZIONE ANNUALE MEDIA kWh	45.000

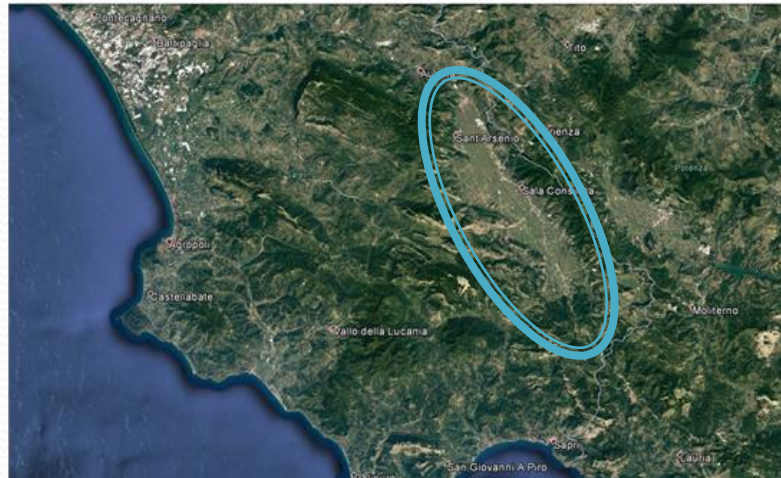


IMPIANTO FOTOVOLTAICO SEDE CONSORTILE UBICAZIONE IN VIA MAGNA GRAECIA 341 - CAPACCIO (SA)

DATI IDENTIFICATIVI IMPIANTO	
DATA DI ATTIVAZIONE	ANNO 2016
COD. POD	IT001E87331038
POTENZA NOMINALE ELETTRICA kW	15
TENSIONE DI COLLEGAMENTO kV	0,4
PRODUZIONE ANNUALE MEDIA kWh	20.000



Tanager River Integral Consortium



SITE	Municipality	Power (kWp)	Activity status
Remote control center	Padula (SA)	44,00	In esercizio
Water tank control room San Giovanni in Fonte	Sala Consilina (SA)	48,25	In esercizio
Network lift station	Buonabitacolo (SA)	12,00	In attivazione
Repository near water tank in Buonabitacolo	Buonabitacolo (SA)	22,50	In attivazione
TOTALE (kWp):		126,75	

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Water management in agriculture is a very important question in the current scenario of climate change, with increasing of the annual middle temperatures. It is necessary to work together in the fields of scientific and technical research and in the regional and administrative planning. This target is achieved with a sustainable management of water resources and with a contribution to production of renewable energy that doesn't produce greenhouse gases.

For these reasons, the combined action of the two original groups on "**Water and Energy**" of the **InterMediterranean Commission** is very commendable.

The **Regional Basin Authority of the Center of Campania** is a public organism in charge of programming and planning in Campania Region (Italy), in respect of :

- **protection from hydro-geological risks,**
- **protection of coasts from erosion,**
- **water conservancy,**
- **protection of soils from desertification.**

Campania is not yet affected by important processes of desertification. However these processes may occur in the future because of climate change and the unsustainable exploitation of water resources and intensive agriculture.

But the efficient use of water in irrigation, if not well planned, especially if not adequately supported by an appropriate policy of economic and social development, it is likely to become the cause and not the solution to desertification.

In Campania an important contribution to the combined need for a sustainable energy and water management with the maximization of agricultural profit happens thanks to "**Consortia of Irrigation**", that have invested in renewable energy production, for some time now.

Let's see why.

The need to produce energy from renewable sources came contextually to conversion from gravity irrigation systems to pressure irrigation systems, thanks largely to public financing (practically “no cost” for Consortia). It is a passage that allows to increase the **water productivity** (that is the amount of biomass produced per unit of water used). The pressure irrigation systems allowed to transform the agricultural production from extensive to intensive, with realization of greenhouses and a continuous water's annual request, instead of a certain period of the year. In fact, the agricultural entrepreneur isn't interested to saving water, but - with the same water quantity - he is interested in higher production and earnings.

The pressure distribution of irrigation waters allows a considerable saving of consumption, but at the same time, it causes a greater use and therefore wear of lifting pumps and a greater consumption of electricity. It reaches the increase of unit cost of the consumed water. So, if on the one hand farmers consume less water, on the other they spend more for the unit water consumption.

Strengthening the efficiency of water distribution for Consortia in Campania became cause of financial, environmental and survival problems for the Consortia themselves. So Consortia of Irrigation begun to invest in the production of electricity from renewable sources, which in Italy is encouraged by public funding.

In Campania, most of agricultural economy cannot be sustained alone. Thanks to Consortia of Irrigation, horticultural production and “fourth gamma” (products ready to be eaten like washed vegetables) becomes economically sustainable by farmers. However Consortia of Irrigation can't impose a very high unit cost of water. For this reason, the Campania Region shall reimburse 50% of the energy costs incurred by the Consortium for its users.

But it isn't enough. Some Consortia are experiencing serious financial deficit and are currently garrisoned by Campania Region. Other Consortia, like those that we will see, have started some power generation projects from renewable sources to compensate the expenses and moderate water supply costs (Picture 1).

Later, for brevity, we'll illustrate some cases in Campania, in particular those Consortia that collaborate more closely with Basin Authorities.

The **Velia Consortium of Irrigation** uses the most complex system of energy production and distribution of multiuse water in Campania. It manages seven dams, six hydroelectric power installations with 5,095 kW of installed capacity, 13 photovoltaic systems with 466 kW of installed power, to cope - even if partially - the costs to conduct 540 km of pipelines, 16 storage basins, 5 pump installations, 3 potable water treatment systems. It is an excellence of hydraulic technology in Campania, founded on a complex interconnected and multipurpose system (Picture 2).

The **Paestum Consortium of Irrigation** has 4 photovoltaic installations on ground and 1 photovoltaic system on the roof of the offices, for a total of 572.54 kW of nominal power and an annual energy production of 730,000 kWh, compared with a consumption annual electricity of 23 million kWh. In the medium-term programs, the Consortium plans to acquire a private “wind farm” under construction of 14 MW, but it’s looking for public funds (Picture 3).

The **Tanager River Integral Consortium** has installed four photovoltaic systems on the roof of service buildings with a total nominal power of 126.75 kW (Picture 4).

What are prospects in the 2014-2020 regional programming?

The discussion on the energy’s production from renewable sources is lively in Campania Region. The Region established a working group for updating and elaboration of Regional Environmental Energy Plan.

In the filed of renewable energies the Basin Authority believes in the renewed potentialities of hydropower production, with the modernization of existing installations and the diffused and rational development of "mini and micro-hydro". Reconditioning and new regional hydropower production require a preliminary confrontation with the Basin Authority, which protects the environmental aspects, the water balance and the rivers minimum vital flow.

The Campania Region, which co-finances 50% of the Consortia electricity expenses, must focus on promoting and encouraging the production of energy from renewable sources to reduce co-financing.

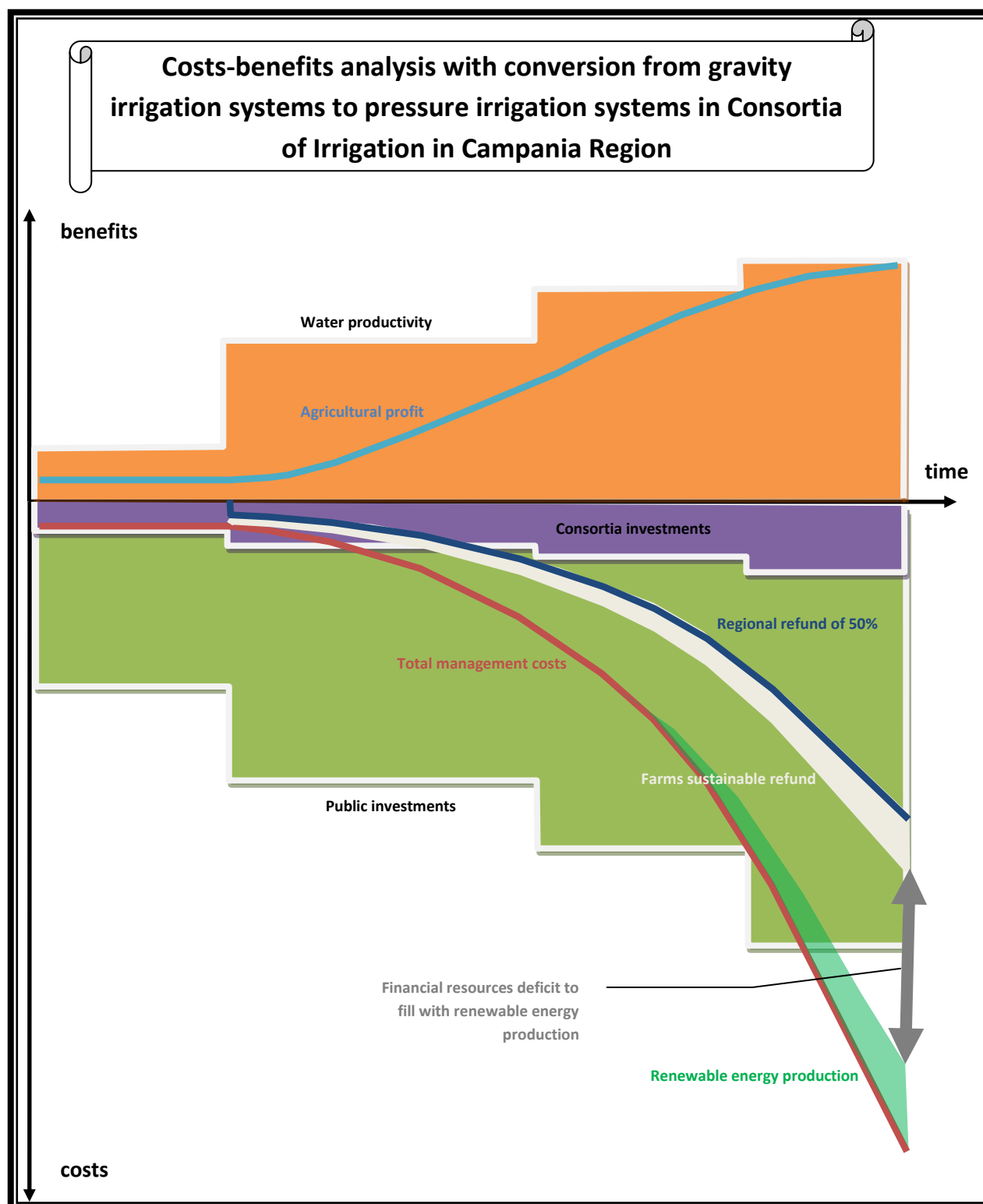
The latest technology allow to make small little impact hydroelectric plants, with interesting results and increasing environmental and public utilities.

Another form of hydroelectric generation, in which we can invest, is represented by micro-turbines inserted into the distribution pipelines.

The mini/micro-hydro plants, with small and medium photovoltaic and eolic installations, are also attractive because of they require connections to the electrical network at low voltage, more accessible and widespread in the territory.

Promoting the production of energy from renewable sources for Consortia of Irrigation would not only preserve the expenses of Consortia and Campania Region, but would also give a small contribution to the objective "20 20 20" that the European Union has set, by the year 2020, that is a 20% reduction of greenhouse gas emissions, a 20% saving in energy consume and a 20% of increase in the consumption of renewable sources.

The Regional Authority of the Central Basin of Campania is ready – for hydroelectric energy planning – to give its technical and expert input to identify locations with best energy efficiency and with minimum environmental impact.

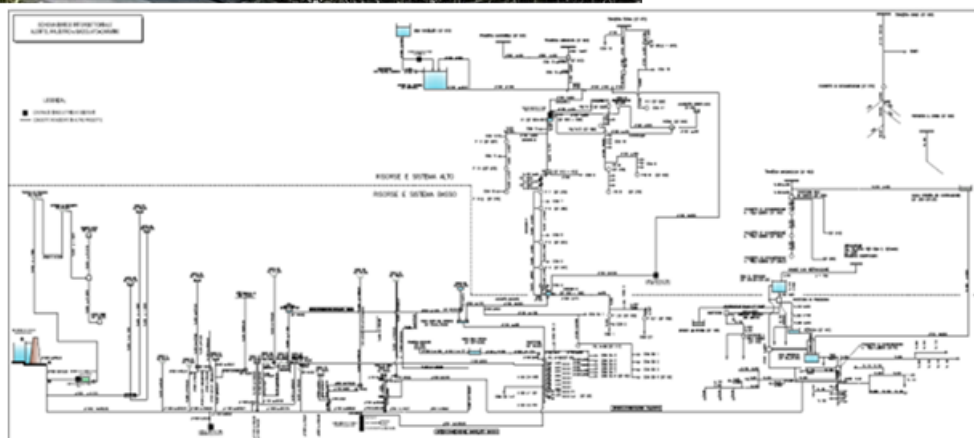


Picture 1

**Velia Consortium of
 Irrigation**

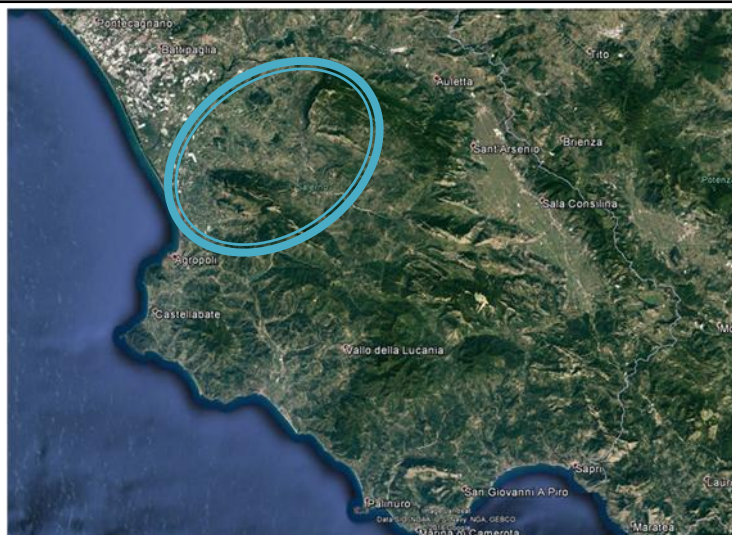


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The complex interconnected and multipurpose system of Velia Consortium of Irrigation

Picture 2



Paestum Consortium of Irrigation

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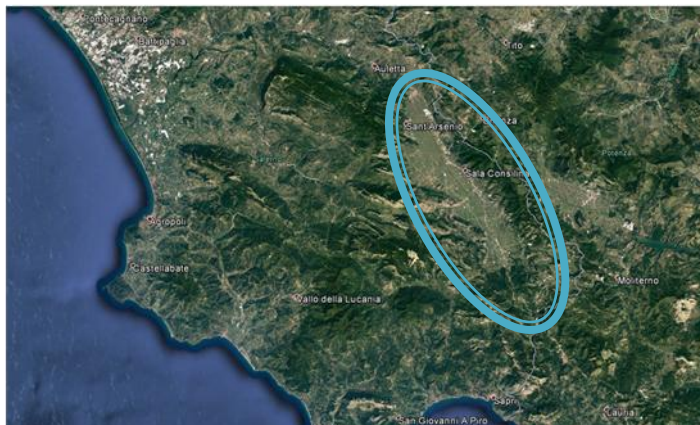
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Picture 3

**Tanager River Integral
Consortium**



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Picture 4