

CLIMATE CHANGE MITIGATION AND ADAPTATION STRATEGIES: THE NEW FRONTIERS OF WATER COLLECTION, IRRIGATION AND CIRCULARITY OF USE.

Climate change is causing major impacts on natural and anthropic environment, on people's quality of life and health, on the safety and security of communities, on agriculture, economy and employment. Epochal upheavals occurring in an increasing number of areas of the world are rooted in it.

According to ISPI, the Italian Institute for International Political Studies, 80% of natural disasters are due to climate change impact. It's foreseen that by 2050 up to 143 million people will be forced to migrate due to food insecurity and famine sprang from climate change.

Nowadays, almost the totality of scholars believe that human greenhouse gas-producing activities are altering the global climate. The World Economic Forum warns about the significant economic impact on many countries, with a large number of low-income countries particularly at risk. However, not only the latter will necessarily have to adapt their future macroeconomic policies, facing the need to cope more resiliently with markets instability and economic crises related to increasingly frequent climate shocks.

Climate change directly affects the water cycle, impacting on quantity, duration, temporal and spatial distribution of rainfall, causing prolonged droughts, devastating floods and landslides. Extreme climate events are striking with intensified impact more and more frequently, so much so that they are being defined as the 'new normal' rather than 'exceptional' as it was just a decade ago.

The first half of 2023 was characterised by devastating floods in the USA and northern China and extreme and prolonged droughts affecting beside USA and China also Canada, central and Est Europe, Spain, Greece and Italy.

Climate change, mainly prolonged drought and heat waves, play a role in letting grow forest fires more intense and destructive. In the first six months of 2023, 2,100,000 ha of forests burned in Canada, 15,000 ha in Tenerife, 50,000 ha in Greece. According to ISPRA, the Italian Institute for Environmental Protection and Research, in Italy 59,000 ha

of forest went up in flames from January to July, of which 75% in Sicily and 18% in Calabria.

Climate change has as well dramatic impacts on the hydro-geological equilibrium of anthropized territory causing enormous damage to populations and economic systems. To recover such damages involves soaring public and private investments and multi-year sacrifices.

According to the European Severe Weather Database, in July 2023 more than 4,100 extreme weather events (heat waves, prolonged droughts, sudden intense rainfall, hailstorms, tornadoes and flash floods) occurred in Europe.

In Italy, in Emilia-Romagna, Marche, and Campania in the island of Ischia, in few hours long lasting water scarcity and drought turned into destructive floods and ruinous landslides, triggering over than EUR 10 billion of economic damage.

According to the Swiss Re insurance company, the worldwide bill for natural disasters (including earthquakes) is growing at a constant pace, ranging from 5% to 7% each year. In the first half of 2023, this bill was 46% higher than the average of the last 10 years, reaching the breath-taking amount of over EUR 130 billion.

Awareness must be raised on how water, a natural resource as precious as finite, the keystone element for a thriving environment and socio-economic vibrant communities, needs to be governed to guarantee the hydro-geological safety of the territory and, therefore, the development of communities. Adaptive water regulation involves new infrastructures and modernisation of governance, aiming to collect and store the resource when in excess to be then available for efficient and sustainable uses during the highly probable subsequent long spells of water scarcity.

The event "The New Frontiers of Water Harvesting, Irrigation and Reuse", ANBI proposes to organise in the "Italian Pavilion" at the Doha Expo 2023, is intended to be an opportunity for knowledge exchange, reflection and discussion on the consequences of climate change. Particularly, the intensification of drought and desertification phenomena in the socio-economic and agricultural contexts will be on focus, as well as the measures and actions that could be undertaken to reconcile the needs of all users and stakeholders. Among the portfolio of possible measures ANBI draws attention to:

- The construction of new water collection, storage and distribution infrastructures (reservoirs, artificial wetlands, ponds, canals, pipelines) and the upgrading and efficiency improvement of existing ones;
- The technological innovation in irrigation and agronomy. These involve, information technologies and telematic systems, drones, sensors, satellites, and artificial intelligence, deployed for an effective implementation of digital agriculture 4.0 with a clear focus on water resilience at a larger scale than the field. Innovation must involve in parallel also plant's genetic improvement and novel crop husbandry techniques leading to a sustainable agriculture and food production. The integration of hard and soft technologies, crop genetics and low impact crop husbandry is crucial to achieve significant water savings;
- The circularity of water resource use in agriculture.

The Italian Land Reclamation and Irrigation Consortia (ConSORZI di Bonifica e di Irrigazione) are deeply engaged and proactive promoting and implementing the aforementioned adaptive measures. Since their establishment, in the early decades of the last century, these collective management bodies have demonstrated their willingness and capability to provide quick and effective answers to any challenges and transformations they had to face. The Italian ConSORZI di Bonifica play a relevant role, protecting and improving biodiversity, safeguarding natural resources while providing and maintaining a suitable and safe environment for any productive and social activity. ANBI associated Consortia are committed to progress restlessly towards sustainable forms of socio-economic growth.

The event is therefore an opportunity to present, share and promote the climate change adaptation and mitigation measures planned or undertaken to counteract water scarcity and progressive desertification. An Italian experience, which sees the ConSORZI di Bonifica e Irrigazione on the frontline playing an important role. ANBI is calling for the following actions:

- ✓ **Proposal for an extraordinary 2023-2030 plan, jointly prepared by ANBI and Coldiretti, aiming to create a new widespread network of sustainable and multifunctional water basins to collect rainwater.** The plan counts on a portfolio of about 390 projects already prepared by the land reclamation consortia, 123 of them already are executive and therefore can be started immediately. The plan aims to collect and store rainwater keeping water on the territory so that it can be

used when needed. The network of multifunctional water storage basins will also prevent the rapid fresh water discharge into the sea, that currently made up of about 89% of the 300 billion cubic metres of annual rainfall. The reservoirs, to be built with a minimal impact on the landscape and well integrated in the territories, will ensure adequate water availability not only for irrigation uses but also for drinking, civil, industrial and energy purposes. Besides, they will help controlling flood heads, buffering and channelling flood waters. The plan will give answer also to the necessity to have a distributed network of fire-fighting water reservoir. The proposal needs to be financed with an adequate multi-year fund.

- ✓ **Expansion of the area equipped with collective irrigation systems (currently 3.5 million hectares) and water resources use efficiency improvement through innovative irrigation strategies and technologies.** On shelf technologies, such as digitisation, monitoring and automated and remote-controlled management of adduction and distribution networks will be deployed, and advanced “climate services” will be broadly applied to support an efficient use of water resources by irrigation decision-making. ANBI developed the GocciaVerde third-party certification standard, in order to certify the sustainable use of water resources in agri-food chain production processes. IRRIFRAME is an irrigation management support platform, providing farmers with all the information needed to achieve a correct and efficient use of irrigation water at field level. Both are proving Land Reclamation and Irrigation Consortia’s capacity and willingness to develop, implementing and operate innovation for the sake of the territories, environment, citizens and agri-food companies.
- ✓ **Enable the use of reclaimed water in agriculture.** In Italy, about 9 billion cubic metres per year of reclaimed water are discharged, after being treated to a good and safe quality by efficient wastewater treatment plants. This significant volume of water could be destined to irrigation purposes. To boost water reuse in agriculture, ANBI is calling for incontrovertible and public guarantees about residual risks after the treatment chain, to protect the quality, hygiene and healthiness of agricultural production. At present, a regulatory framework is being defined that is adequate for the delicacy of the matter, and risk management plans are being drawn up with respect to the effectiveness of current purification treatments. Difficulties arise when heavy metals and emergent pollutants of concern are to be taken into account (microplastics, radioactive elements, antibiotics, xenobiotic molecules, etc.).