

EDITORIAL

DANA: learning from the past to responsibly build

“As a result of rising temperatures, the hydrological cycle has accelerated. It has also become more erratic and unpredictable, and we are facing growing problems of either too much or too little water.” (General Secretary of WMO, Celeste Saulo)

DANA is an acronym used in Spain (literally ‘Depresion Aislada en Niveles Altos’) that refers to an isolated depression at high altitude. This phenomenon is quite frequent in the western Mediterranean area, especially in autumn and spring, when there is a significant difference between the warm sea temperature and the cold air at altitude. The greater this contrast, the more intense the effects of DANA can be, such as violent thunderstorms and concentrated precipitation in a short time. In addition to the acronym definition, the name DANA is a tribute to the meteorologist Francisco García Dana (1924-1984) head of the Forecasting Center of the then National Institute of Meteorology (Instituto Nacional de Meteorología). He was a remarkable scholar with a deep knowledge about the causes and effects of the phenomenon indicated also as cold drop (gota fría in Spanish) and cut-off low in common and technical language respectively. In recent years, global warming increased the rates and almighty destruction of DANA. Europe, together with the Arctic, are the most warmed areas in the last five years: +2.3°C degrees on average, compared to +1.3°C globally. This year the phenomenon has also been amplified by the El Niño phenomenon. The surface temperature of the oceans has also increased by 1°C in the last 30 years and the Mediterranean has warmed 20% more than the global average. Heating the water speeds up its evaporation, water vapor in turn is more retained by hot air (Clausius-Clapeyron equation). For every 1°C increase in temperature, the atmosphere increases its water-holding capacity by about 7%. As a result, extreme catastrophic calamitous events linked to hydrogeological cycles have become increasingly frequent, taking place in long periods of drought or intense flooding in areas where such phenomena are unusual. Most recently, the Comunitat Valenciana was severely affected by flooding on 29 and 30 October, with many places receiving more than 300 l/m² in a few hours. The weather station in Chiva received 491 l/m² in just eight hours - the equivalent of a year’s worth of rainfall, according to AEMET - Agencia Estatal de Meteorología. The World Weather Attribution has determined that rainfall in the Valencia region has been made 12% more intense due to climate change.

The territory of the Comunitat Valenciana has always been an area with a high hydrogeological risk due to the clay nature of the soils and the dense network of natural and artificial canals that flow into the sea. In 1795, the Valencian botanist Cavanilles writes about a great natural catastrophe that he experienced when he was young, with consequences similar to those of 2024. Cavanilles describes the morphology of affected villages and the canals of the Albufera, a lake close to the sea. This lake is currently a natural park of millenary origin. In the beginning it was a marine gulf that extended between the mouths of the Túria and Xúquer rivers that was isolated from the Mediterranean Sea and, little by little, partially filled with the sedimentary contributions of the two rivers. Cavanilles accurately narrates how in 1775 the water that increased its volume and speed devastated the same villages, hitting houses, streets and above all people.

Also, in 1957 Valencia was hit by a flood that caused the flooding of the Turia river, the destruction of about 5,800 buildings and the death of 80 people, as well as damage to commercial activities and infrastructure. Between 1957 and 1969, the government built a new infrastructure to prevent future destruction, consisting of a concrete canal with sloping walls 250 meters wide at the base and 7 meters high. The course of the Turia river was therefore diverted about 12 km from the centre and transformed into an urban park of about 9 km equipped with services for the city and at the same time water-permeable land and collection basin below street level. This infrastructure saved the historic centre of the city and the northern part of Valencia from damage during the recent flood. On the contrary, the southern part of the city, which was not equipped with adequate infrastructure for water management, was destroyed. Construction and high land consumption have also reduced the surface area capable of absorbing water to the advantage of impermeable areas, thus increasing the flow of water that has poured into the built-up areas. The area south of Valencia also has a soil that is arid and clayey in many areas which, due to its low water absorption, amplifies the amount of water that needs to be disposed of via urban networks.

The anthropic space can no longer be an antithetical and contrasting element with respect to the logic of nature, but should be shaped on them, coexist synergistically with its rules. The construction sector is responsible for about 40% of global environmental pollution, but we cannot ignore it as it is necessary for our survival. We therefore need to change our approach to conceiving the urban environment. A change that requires questioning not only our lifestyle, but also the way we conceive space, eliminating the historicized divergence between human space and natural space, the result of the Renaissance idea of the Ideal City, but allowing the interpenetration of nature in architecture. On a global scale, it is necessary to implement united and shared actions aimed at reducing environmental pollution shared among all countries, remembering that the world is only one and we are all responsible for its conservation. At the same time, it is necessary to become aware that extreme weather events are no longer exceptional but ordinary events, representing the inevitable consequence of the irreparable environmental damage that we have now produced. It is therefore necessary to start designing and building anthropogenic space in an adaptive and resilient way with respect to the effects of climate change, a dynamic space capable of transforming itself according to the sudden change in boundary conditions and capable of guaranteeing safe living conditions for humans.

The history of the floods in the Comunitat Valenciana highlights the cyclical nature of events that repeat themselves in history, for which we should be prepared by directing our efforts towards the construction and improvement of our infrastructure. There is a lack of important and urgent attention to future disasters to implement contingency plans guided by experts and professionals and strict vigilance for compliance with regulations. Many of the destroyed buildings had in fact been built in areas of high hydrogeological risk. We find common situations in all cases: river space invaded, urbanized, channelled and, in many cases, buried under roads and buildings. These riverbeds, which have been robbed of their space, are unable to retain the volume of water that reaches them in torrential form. The result is roads turned into torrents.

Urban plans should be revised considering orographic and urban changes caused by floods and floods. Mere “cleaning” and adjusting the canals alone do not prevent flooding. The adaptive capacity and resilience of at-risk locations should be increased to avoid damage from future flooding, while implementing nature-based solutions, supporting the retention, lamination functions of rivers.

With this focus, since its foundation in 2014, the journal Vitruvio has published innovative research contributions with the aim to boost the knowledge of the correlations and interrelationships between anthropic space and nature and to promote holistic strategies for sustainable developments.

Every action we take influences a global scale. We are all called to an act of responsibility and change.

We now bow before the grief of the loss of 230 victims. And it is to them and their families that we dedicate this issue. We have not stopped, and we will not stop. We will continue our action for change through the dissemination of knowledge and the promotion of research for the wellbeing of communities.

Our best wishes this year would go to those who suffer, those who have lost everything, even their loved ones

We will not allow this to happen again.

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