Press release

A brief insight on the weather impact over transportation infrastructures

(Athens, November 2019) Transportation infrastructures, e.g. roads, bridges, tunnels, are designed to withstand local weather and climate. Typically, local weather patterns are formulated using historical climate records. Given a set of past observations, experts make appropriate preparations to mitigate expected weather conditions. However, extreme weather events become more frequent by the years[1]. The more subtle and pervasive changes in long-term temperature and precipitation regimes are causing additional problems. Weather conditions will interrupt the use of transportation infrastructures, increase maintenance and repair costs, and alter the deterioration process of the materials used in its construction.

Flash flood events, as a result of intense precipitation, may cause severe disruptions to the transport sector. This case is particularly acute on the road network in urban areas owing to the high proportion of impermeable surfaces that prevent the infiltration of water into the soil. Heavy rain causes overland flow that can result in drains exceeding their capacity, and increasing the likelihood they become blocked by debris before flood warnings can be widely disseminated. The relationship between adverse weather, traffic flow and congestion is acknowledged but poorly understood[2], making the decision-making process even more challenging. Adding the wind effects, the situation can become more dire.

Wind-driven rain is a natural phenomenon; the rain phase is given a horizontal velocity by the wind phase, and then falls obliquely. Usually, it is followed by a windstorm, which may result in material erosion and vibrations of cables in cable-stayed bridges[3]. Typical outcomes may include water penetration and frost damage, surface soiling, structural cracking (due to thermal/moisture gradients), mold growth, salt damage and discolorations. The most crucial mitigation strategy is prevention, for all the above. A close monitoring of small scale areas and detailed analysis of the microclimate changes can provide significant information to the experts, allowing for an early stage and low-cost intervention.

PANOPTIS project will utilize a new software module and a database that can be used in real-time, to assess potential impacts/hazards at a very local level, within the monitoring infrastructure regions. The climate conditions will be provided by autonomous (off-grid) micro-climate stations that incorporate sensors for Air Temperature, Air Humidity, Wind Speed, Wind Direction, Solar Radiation and Rain Gauge. Authorities will have multiple sources of information available so that weather conditions and their effects can be addressed in the best possible way.

Additional information can be found in PANOPTIS site, just follow the link: http://www.panoptis.eu/

[1] European Academies' Science Advisory Council, Leopoldina - Nationale Akademie der Wissenschaften. "New data confirm increased frequency of extreme weather events: European national science academies urge further action on climate change adaptation." ScienceDaily. ScienceDaily, 21 March 2018.

[2] Pregnolato, M., Ford, A., Wilkinson, S. M., & Dawson, R. J. (2017). The impact of flooding on road transport: A depth-disruption function. Transportation Research Part D: Transport and Environment, 55, 67–81.

[3] Liu, M., Huang, S. H., Yan, B. W., & Li, Q. S. (2018). Modelling of turbulent dispersion for numerical simulation of wind-driven rain on bridges. Environmental Fluid Mechanics, 18(6), 1463–1489.

This project has received funding from the European Union's Horizon 2020 Research and Innovation Programme under grant agreement no769129.

This document reflects only the views of the author(s). Neither the Innovation and Networks Executive Agency (INEA) nor the European Commission is, in any way, responsible for any use that may be made of the information it contains.