

# Frost risks in the Mantaro river basin

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Frost events are frequent in the Mantaro River Basin (34550,08 km<sup>2</sup>), located on the eastern slope of the central Peruvian Andes. After droughts, they are the atmospheric phenomena that concern the locals the most, particularly because of their effects on agriculture, their main economic activity.

Due to its strategic location and its constant supply of resources (water, energy and farm products) to Lima (capital city of Peru), the Mantaro River Basin was chosen, along with two other basins, for an Integrated Local Assessment with a Climate Change perspective, the first such effort in our country.

As a part of the study of the current and future vulnerability to climate change in the Mantaro River Basin, we analysed the main characteristics of frosts (intensity, duration, frost-free periods, areal distribution) and historical trends, using daily minimum temperature (T<sub>min</sub>), from fifteen meteorological stations throughout the basin for 1960-2002; with emphasis on the rainy season (September to April), when socioeconomic impacts on the basin due to frost are worst.

Results indicate a high relationship between those characteristics and altitude (non-linear correlation coefficients between 0,91 and 0,94 were calculated for T<sub>min</sub> from September to April in the basin). For the rainy season, the probability of frost occurrences (T<sub>min</sub><5°C) was very high (80%-100%) for altitudes higher than 3800 masl (this is in the northern and western side of the basin); for the Mantaro Valley, with altitudes that range between 3100 and 3300 masl, the probability was low (20%-40%) and in lower zones, located in the eastern and south-eastern part of the basin, the probability decreased to an interval of 20% to 0%. We also present basin-wide maps of probability of frost occurrences for other intensities (T<sub>min</sub><0°C, -2°C, -4°C), extrapolated by a fifth grade polynomial equation in function of the altitude, as well as maps of frost risks, which take into consideration other basin characteristics such as soil types, land-use distribution and morphology. On the other hand, trends analysis show that the frequency of frost days (with t<sub>min</sub> <5°C) have been increasing in the rainy season (September to April), with an average rate of 8 days/decade. However, there is no a clear tendency in frost intensities for the same period.