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Shifts in climate suitability for wine production as a result of climate change

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Following the results of the analysis on climate evolution in the Cotnari pilot site (Romania), where climatic change brought between 1961-2010 climate suitability for the red wine production (<https://link.springer.com/article/10.1007%2Fs00704-017-2033-9>), ADVICLIM researches reveal similar evolutions at the fine scale, favorable to the quality of wines in all the other pilot sites of the project. This time the assessment of the impact of climate change on suitability for the wine production is based on the analysis of the Huglin index values for the 1951-1990 and 1991-2013. Huglin index is a viticulture index revealing climate suitability for certain wine grape varieties growing and implicitly certain types of wine production (Huglin, 1978). Its values varies between less than 1500 and much than 3000, framing into 6 classes characterizing different climate suitabilities (Table).

Climate class	Abreviation	Values
Very cool	HI-3	≤ 1500
Cool	HI-2	> 1500 ≤ 1800
Temperate	HI-1	> 1800 ≤ 2100
Temperate-warm	HI+1	> 2100 ≤ 2400
Warm	HI+2	> 2400 ≤ 3000
Very warm	HI+3	> 3000

The ADVICLIM researches found an increase of 216.15 units of the HI at the pilot sites level, with a minimum of +165.3 units in the Cotnari pilot site (Romania) and a maximum of 286.4 units in the Saint Emilion pilot site (France). With the exception of the Plumpton pilot site, where the HI although increased by 135 points maintains in the *very cool class* (not recommended for cultivation), in all other pilot sites, climate change has led during 1991-2013 period to a shifts to a higher class of climate suitability for the wine production: in Spain, at Ausejo, a transition from *temperate* to *temperate warm* class suitable for the Grenache, Mourvedre and Carignan Mediterranean varieties; the occurrence of climate suitability for the wine production at higher altitudes such as Carbonera (850 m asl); in Saint Emillion, a transition from *temperate* to *temperate-warm*, suitable also for the Mediterranean wine grape varieties *Grenache, Mourvedre, Carignan*; in Coteaux du Layon and Saumur Champigny a transition from the *cool* to *temperate* class, suitable for *Cabernet Sauvignon* and *Syrah* red varieties; in Rudesheim, a transition from the *very cool* class, not recommended for cultivation, to *cool* class, suitable also for *Pinot noir, Merlot* or *Cabernet franc*; and lastly, in the Cotnari pilot site, a transition from the *cool* to *temperate* class, suitable for *Cabernet Sauvignon* and *Syrah*.

While given its relevance for viticulture, the Huglin's regional scale values are generally known, the ADVICLIM has focused his attention on the analysis at fine scale of the spatial distribution of the Huglin index into the project pilot sites. The data obtained reveals major spatial shifts in climate suitability for the wine production between 1950 and 2013: in Ausejo, where 98.25% of the area was characterized between 1951-1990 by the HI *temperate* class, 100% of the surface is at present characterized by the *temperate-warm* class; Carbonera passed from 34% of *very cool* to 35% of *temperate* and a difference of 64% *cool* during the both time periods; in Saint Emilion, the *temperate* class which in the past characterized 100% of the

area is currently only 6.78%, the difference of 93.2% being characterized by *temperate-warm* class; in the Coteaux de Layon and Saumur Champigny pilot sites, about 45% of the surface is currently characterized by the *temperate* class, while before climate warming start its entire surface was characterized by the *cool* class. Regarding the Rudesheim pilot site, the *very cool* class which represented in the past 67.9% of the area today it disappeared altogether, the entire area being characterized currently by the *cool* class.

Our data indicate that these developments are taking place amid the increase in the average temperature of the growing season by 0.97 °C between 1951-2013 at the level of all pilot sites, with a maximum of 1.3 °C in Saint Emilion (France) and a minimum of 0.8°C in Plumpton (UK) and Cotnari (Romania). At the same time, different precipitation patterns are observed, generally suitable for the wine growing, taking into account that in cooler areas such as Plumpton, Rudesheim and Cotnari it is a decrease or constancy of precipitation (-16.7 ... + 3.8 mm), while into warmer areas such as Ausejo, Carbonera, Bordeaux, Loire Valley a slightly increase can be observed (+ 16.7 ... + 50 mm).

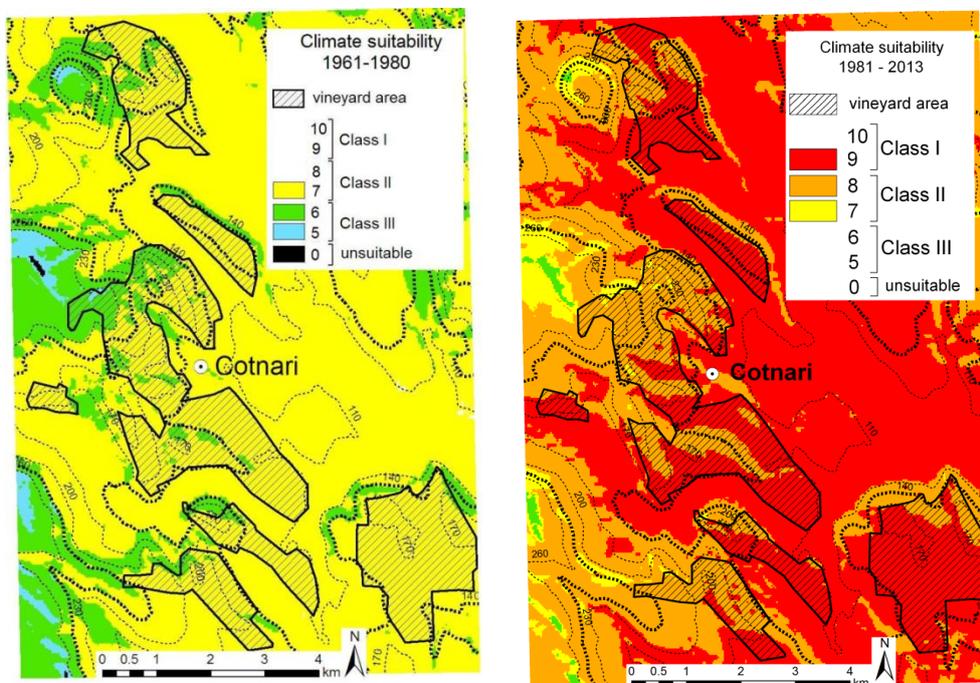


Fig. Maps of climate suitability for the wine production, for the Cotnari wine region (Romania)

<https://link.springer.com/article/10.1007/s00704-017-2033-9>

<https://www.ciencia-e-vinho.com/2018/06/10/climate-change-expandes-the-suitability-for-wine-production-to-higher-altitudes-and-to-northern-latitudes-in-europe-wine-regions-recent-findings-from-the-life-adviclim-project/>

