

## **D 1.1 Choosing an occupational heat stress index -- the "HEAT-SHIELD Index".**

### *Preface*

The present summary and report is intended for decision-makers (e.g. politicians, international health/occupational organizations) and stakeholders (e.g. future collaboration with other climate services and researchers within thermal physiology) to provide an overview and background for the rationale leading to our choice of heat-stress index.

On behalf of all contributing experts and authors

Tord Kjellström, Andreas Flouris and Lars Nybo



### **About the Heat-Shield logo:**

The red temperature/degree sign signifies the heat and the seriousness of hot temperatures and heat stress, while the dark green font chosen for the HEAT-SHIELD is the complementary colour to the red and hence symbolize the project aims of counter-acting heat stress. Furthermore, the green heat-shield font associates to nature and our aims of providing sustainable solutions for addressing heat stress.

## **THE "HEAT-SHIELD Index" - an occupational and practical applicable heat stress index**

### **Summary and recommendations**

The impact of environmental thermal stress on human health and functioning relies both on the surrounding climate and physiological factors such as the individual thermoregulatory capacity, work intensity, clothing and other behavioral strategies. More than 170 heat stress indices are described in the literature, but it is clear that no perfect index may cover all heat stress scenarios. The HEAT-SHIELD project has decided to use a modified WBGT index calculated from validated formulas using weather station data. This includes open in-sun (non-sheltered) and in-shade (sheltered) conditions for both long-term projections and short-term warning of environmental heat-stress conditions. We may label our index the "HEAT-SHIELD Index" as it depends on calculations based on current and future modeled weather station data, which does not fit the formal international standard method for WBGT measurement. However, this index and the interpretation of its values will be further explored in WP2 of this project.

The WBGT index is chosen because it can be calculated (estimated) from standard weather and climate model data as well as measured locally at workplaces. The purpose of using this index in HEAT-SHIELD is for general environmental warning at population level, whereas more sophisticated/complex indices may be used for evaluating specific work conditions when individual factors such as clothing, metabolic heat production, age, gender and acclimatization status are known. We encourage that future analyses include other indices in addition to WBGT (calculating from climatic data – temperature, humidity, wind speed and heat radiation) to identify the best heat stress variable for assessing health or productivity impact. Such analyses should also evaluate differences in the impact of the mean, maximum or minimum daily values.

At this stage, the modified version of the WBGT is considered to fulfill the purpose for general warning (with individualized limits for different populations and industries) and for identifying long-term effects of importance for impact on policy making. Comparisons of current and future heat-stress scenarios in Europe with other parts of the world experiencing major heat stress can also be performed.