A cost-efficiency and health benefit approach to improve urban air quality

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When ambient air quality limit values established by the Directive 2008/50/EC are exceeded, Member States are obliged to develop and implement Air Quality Plans to cost-efficiently define and assess emission abatement measures and their associated costs and benefits on air quality and human health.

Residential wood combustion (RWC) has been recognised as a major air pollution source in many regions worldwide. In Porto, for example, RWC was found to contribute to 33% of the particulate matter (PM) levels in the air during exceedance days. This PM emission source has been extensively characterised (Fig. 1) and it was concluded that traditional equipment largely exceeds the emission limits (25-50 mg MJ^{-1}) stipulated in countries where the certification process is mandatory. It was also verified that the application of depollution technologies (e.g. catalysts or electrostatic precipitators) to the flue gas of traditional RWC equipment is ineffective.

Based on the relevance of RWC to urban air pollution levels an Integrated Assessment Modelling approach was used to evaluate the effects on air quality and health of replacing/reconverting 50% of the fireplaces in the Porto Urban Area by more efficient equipment. The application of an air quality model allowed to estimate the impact of this emission abatement measure on the PM levels in the air and then health impacts were analysed through morbidity and mortality indicators, which were converted to monetary benefits (Fig. 2). The comparison between the total investment costs and the health benefits (or avoided external costs) indicates that acting on fireplaces to reduce PM concentrations is greatly beneficial from a socio-economic point of view. To cost-efficiently protect human health, emission requirements for the eco-labelling of small-scale combustion appliances for wood logs and pellets should be mandatory. A quality certification scheme for pellets should also come into force. The creation of weatherisation and financial incentives for old stove changeouts by national governments and regional authorities is recommended.

FIGURE 1
Particulate matter emission factors (mass emitted per MJ of energy produced) for different RWC devices.

FIGURE 2
Human health benefits (€/year) of the RWC emission abatement measure.

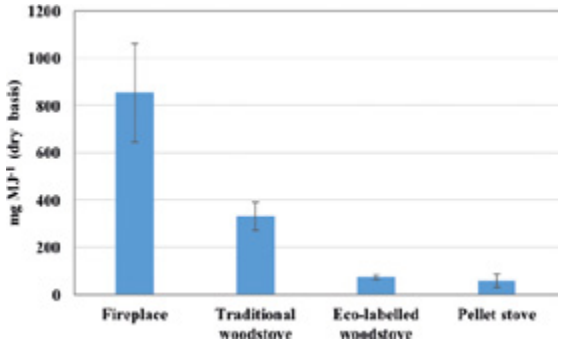

Figure 1

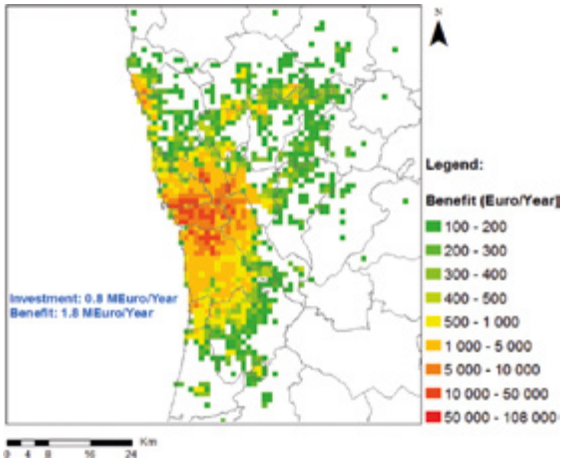

Figure 2