UABDIVULGA
BARCELONA RECERCA I INNOVACIÓ

03/12/2018

Urban solar cookers: Have you thought about their environmental, economic and social benefits?

A study published by ICTA-UAB and the University of Manchester proves the potential sustainability benefits of using urban solar cookers (in Spain) made with low-impact household materials instead of microwaves. The authors have observed that there is a reduction of the environmental impact and the economic costs, even if microwaves are used in unfavourable weather conditions. Moreover, making and using the urban solar cooker contributes to a social improvement.

Researchers from the Sustainable Industrial Systems (SIS) group of the University of Manchester and the Institute of Environmental Science and Technology (ICTA) of the Autonomous University of Barcelona (UAB) have developed a comprehensive study to demonstrate the potential sustainability benefits of using home-made solar cookers, instead of microwaves, to heat food in cities with suitable climatic conditions. Spain was used as an illustrative example. The solar cookers considered in this work – box solar cookers, panel solar cookers and parabolic solar cookers – were designed by students from the eco-design module of the Master of Environmental Studies (Specialty: Industrial Ecology) taught at ICTA-UAB over a 5-year period (2010-2014). Students were asked to build solar cookers for individual use (e.g. heat one meal at a time) by reusing low-impact household materials (e.g. packaging boxes, glass

panels, aluminium sheets, dark fabrics, etc) and applying eco-design criteria, including modularity, easy transport, use and maintenance and high reparability and recyclability over time. The eco-designed solar cookers must reach a temperature of at least 80ºC in late autumn (November and early December in Barcelona) to be considered effective products because this was assumed the minimum temperature o heat food relatively quickly (e.g. around 10 minutes) in periods with low solar irradiation. The life cycle assessment (LCA) and life cycle costing (LCC) methodologies were applied to calculate the environmental and cost savings compared to the use of microwaves to heat food. The contribution of urban home-made solar cookers to deploy a circular economy and enhance social wellbeing was also explored.

The results from the study suggest that solar cookers could reduce annual economic costs by up to 40% and environmental impacts by up to 65% compared to the use of microwaves to heat food in cities. It means that the use of urban solar cookers, with microwaves as backup appliances for days with unfavourable climatic conditions, could avoid annual emissions of 42,600 t of CO2 eq. and reduce the consumption of primary energy by 860 TJ at the country level (Spain). Furthermore, household waste would be reduced by 4200 t/yr. Other environmental impacts, such as acidification, eutrophication, human toxicity and ozone depletion could be reduced by over 65%. If solar cookers were built entirely by reusing household materials, up to €23.2 million could be saved annually in Spain; always due to a reduced use of microwaves. Finally, the development of craft activities to build and repair the cookers can help people to engage socially and reduce stress, thus enhancing their social wellbeing. It can also increase people's awareness of a more sustainable use of resources. Thus, home-made solar cookers represent a promising opportunity to motivate behavioural changes towards urban sustainability in developed countries.

Joan Rieradevall Pons
Institute of Environmental Science and Technology (ICTA)
Universitat Autònoma de Barcelona
Joan.Rieradevall@uab.cat

References

Mendoza, J.M.F., Gallego-Schmid, A., Schmidt-Rivera, X.C., Rieradevall, J., Azapagic, A. (2018). **Sustainability assessment of home-made solar cookers for use in developed countries**. *Science of the Total Environment* 648: 184-196. DOI: 10.1016/j.scitotenv.2018.08.125

View low-bandwidth version