

An innovative methodological framework to perform life cycle assessment of tourist activities

Pedro Villanueva-Rey, Diego Quiñoy, Lucía Poceiro, Samuel Domegan, María Gallego, Eduardo Rodríguez

EnergyLab, Edificio CITEXVI, Fonte das Abelleiras s/n, Campus Universidad de Vigo, 36310 Vigo

pedro.villanueva@energylab.es

INTRODUCTION

Tourism is one of the fastest growing industries as well as the main source of income for many countries; however, it involves several activities that can have adverse environmental effects. Some studies have evaluated the environmental performance of tourism activity through life cycle assessment (LCA) but, so far, it has not been properly addressed due to the poor and limited life cycle inventory data; the reluctance of the sector; and the lack of a sectoral methodological framework.

This project aims to achieve a new environmental, economic and social model in SUDOE area while informing consumers and obtaining their commitment to the environment in which tourism activity takes place.

MATERIALS & METHODS

An innovative approach to assess the environmental impact of tourism activity is presented by analyzing it from a holistic perspective, understanding the tourism sector as whole; from travelling, accommodation, drinking and eating, to the activities carried out in destination.

The methodological framework developed is based on the requirements of other LCA methodologies such as ISO 14040, ISO 14046, PEF, ILCD, and PAS 2050 among others, and it deals with matters such as life cycle inventory modelling, allocation, system limits and exclusions, end of life, and life cycle impact assessment (LCIA) reporting.

Furthermore, GREENTOUR project will promote the adoption of a circular economy strategy through the development of specific indicators and its own eco-labeling system in the destinations: Rías Baixas, Camino Lebaniego and Lloret de Mar (Spain), Guimaraes (Portugal), Ordino (Andorra), and Auvergne (France).

The final goal is to assist in the fulfillment of the 17 Sustainable Development Goals (SDGs) of the United Nations 2030 Agenda. To this end, the linkages between LCIA results and SDG indicators are explored.

RESULTS

The figures show the environmental impact, in terms of the proposed life cycle impact categories, per guest/night (which serves as Functional Unit) for accommodation activities.

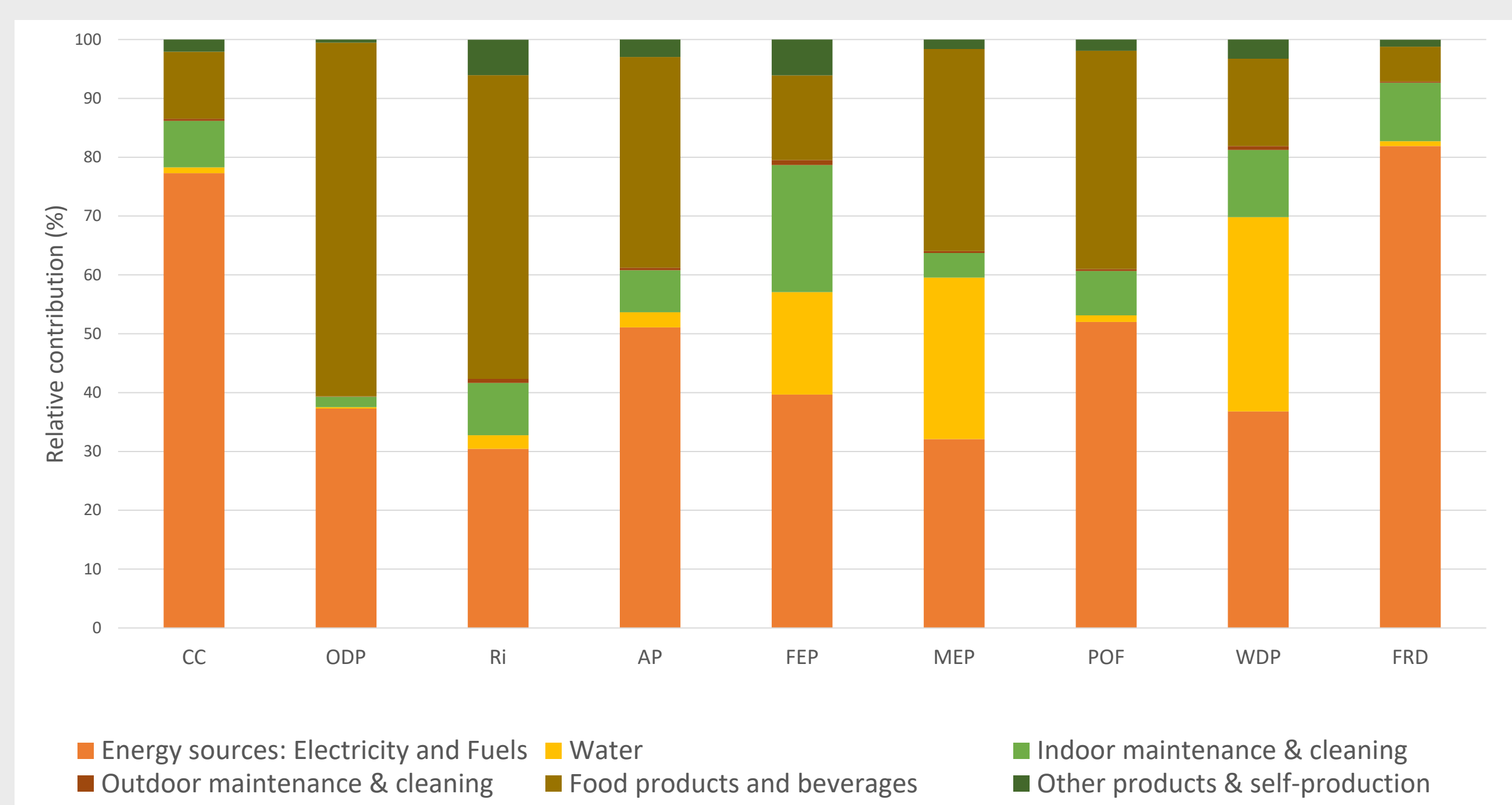


Figure 1. Life cycle characterization results per FU (one guest/night). Note: climate change (CC); ozone depletion (ODP); Respiratory inorganics (RI); acidification (AP); freshwater eutrophication (FEP); marine eutrophication (MEP); photochemical ozone formation (POF); water scarcity (WDP); resource use, energy carriers (FRD)

	CC	ODP	Ri	AP	FEP	MEP	POF	WDP	FRD
	6.56 kg CO ₂ eq	2.00E-6 kg CFC-11 eq	1.70E-7 disease incidence	3.40E-2 Mole of H ⁺ eq	1.10E-3 kg P eq	1.20E-2 kg N eq	2.10E-2 kg NMVOC eq	2.22 m ³ world eq	125.52 MJ
NO POVERTY 1									
1.4.1 Basic services									
1.5.2 Disaster costs									
ZERO HUNGER 2									
2.4.1 Sustainable production									
GOOD HEALTH AND WELL BEING 3									
3.3.5 Neglected tropical diseases									
3.4.1 Non-communicable (NCD)									
3.9.1 Air pollution deaths									
3.9.2 Water, sanitation deaths									
CLEAN WATER AND SANITATION 6									
6.1.1 Safe drinking water									
6.2.1 Sanitation and handwashing									
6.3.2 Ambient water quality									
6.4.2 Freshwater stress									
6.6.1 Water ecosystems									
AFFORDABLE AND CLEAN ENERGY 7									
7.1.2 Access to clean fuels									
7.2.1 Renewable energy									
7.3.1 Energy intensity									
DECENT WORK AND ECONOMIC GROWTH 8									
8.4.1 Material footprint									
INDUSTRY, INNOVATION AND INFRASTRUCTURE 9									
9.4.1 CO ₂ emissions intensity									
SUSTAINABLE CITIES AND COMMUNITIES 11									
11.5.2 Disaster losses									
11.6.2 Urban air pollution									
RESPONSIBLE CONSUMPTION AND PRODUCTION 12									
12.2.1 Material footprint									
12.4.2 Hazardous waste									
12.c.1 Fossil fuel subsidies									
CLIMATE ACTION 13									
13.1.1 Disaster deaths/injury									
13.2.2 Integration climate policies									
13.a.1 Green Climate Fund									
LIFE BELOW WATER 14									
14.1.1 Marine pollution									
14.2.1 Marine ecosystems									
14.3.1 Ocean acidification									
LIFE ON LAND 15									
15.1.1 Forest area									
15.2.1 Forest management									
15.3.1 Degraded land									
15.4.1 Mountain biodiversity									
15.5.1 Red List Index									
15.8.1 Invasive alien species									

Figure 2. Links between LCIA results and SDG indicators.

References

European Commission, 2018. Product Environmental Footprint Category Rules Guidance (Version 6.3 - May 2018).
SDG, 2021. United Nations. Department of Economic and Social Affairs Sustainable Development. <https://sdgs.un.org/goals>
ISO, 2014. ISO 14046 - Environmental Management - Water Footprint - Principles, requirements and guidelines.
ISO, 2006a. ISO 14040 - Environmental Management - Life Cycle Assessment - Principles and Framework.
ISO, 2006b. ISO 14044 - Environmental Management - Life Cycle Assessment - Requirements and Guidelines.
ISO, 2006c. ISO 14025 - Environmental labels and declarations - Type III environmental declarations - Principles
Zampori, L., Pant, R., 2019. Suggestions for updating the Product Environmental Footprint (PEF) method, Publications Office of the European Union.

Acknowledgements

Authors wish to thank the project "Greentour. Circular economy and sustainable tourism in destinations of the SUDOE space (SOE4/P5/E1089)"