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World energy consumption has approximately increased by a factor of 20 in the last century[1]. Conventional energy technologies, which used to constitute the main supply to satisfy this demand, are now facing significant limitations[2]. Besides depletion problems, rising concerns over their adverse effects on the environment are stimulating the transition towards cleaner renewable sources[2,3].

Although renewable technologies are in general linked to lower environmental impacts than fossil sources during their utilization phase, material and energy requirements in

other phases over the life cycle (manufacture, installation, transport, etc.) should be accounted for to determine the global environmental implications. Several life cycle assessments (LCA) have been performed to evaluate these impacts, but they usually focus on individual technologies and only evaluate the benefit in terms of carbon reduction. Few studies are available on the multi-criteria environmental assessment of an electricity supply chain based on renewable technologies[3].

The success of energy transition relies on the application of effective energy policies[2]. The specific context of insular territories makes them particularly sensitive to decisions concerning their energy strategy, which will influence their economic and social development[4]. In this study, we propose assessing potential prospective scenarios in the specific case of the French islands of Guadeloupe to compare different electricity mix scenarios in an insular framework. The environmental performance of the following four electricity scenarios is evaluated by means of LCA with a multi-criteria approach:

- BASE 2013: a baseline scenario corresponding to Guadeloupe electricity mix in 2013.
- TREND: a conservative scenario based on the trends observed in recent years with no particular effort to empower renewable technologies.
- PRERURE: a favorable scenario based on strong efforts to control energy consumption and develop renewable technologies, resulting in the diversification of the electricity mix.

- MODERATE: an intermediate scenario based on the application of moderate policies to control energy consumption and increase the share of renewable technologies.

The system boundaries of the study include the phases of construction, production and transport associated with the different technologies. The energy supply chains are modeled according to field data and reports provided by key stakeholders, such as EDF (Électricité de France) and the Regional Observatory of Energy and Climate from Guadeloupe. The results have allowed identifying the environmental implications of different energy strategies and the main sources contributing to the impacts of the considered prospective scenario.

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