



Study of local energy needs: management strategy for the construction of sustainable rural energy systems

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Palabras clave

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Resumen

Rural energy consumption differs from urban consumption, since it responds to specific needs, with the use of local energy technologies and resources that do not always converge with the context of urban areas. This research shows some strategies for energy management aimed at building a sustainable energy system in indigenous rural communities in Mexico. The methodological proposal is based on a community as a case study, and considers four stages: (a) generating a diagnosis at the community level, to identify energy needs that have been classified as residential, community and productive; (b) estimating a baseline of the identified needs, their economic costs and environmental impacts, considering CO₂, CH₄ and NO_x emissions for all types of energy, as well as CO and particulate matter PM_{2.5} for the combustion of firewood; (c) constructing a scenario with the projection of energy needs for 20 years, and the benefits from the implementation of more efficient technologies in the needs of greater residential and community energy demand, as well as the impacts generated by this replacement; and (d) discussing some recommendations for energy management in communities like the one in this study. The results show that 98.9% of the energy is destined for residential needs, 0.6% for community needs and 0.5% for productive needs. Costs by type of need maintain the hierarchy of energy consumption, while total emissions are estimated annually at just over 27,000 tCO₂, 17 tCH₄, 4 tNO_x, approximately 470 tCO and 3 tPM_{2.5}, the latter associated with combustion processes in the residential sector. With the proposed scenario, at the end of year 20, a reduction in consumption of just over 200 TJ is estimated, together with present value savings of \$490,000 USD, and a decrease in emissions of approximately 960 tCO₂, 520 kgNO_x, 1 tCH₄, 4400 tCO and 30 tPM_{2.5}. Finally, by virtue of possible actions at the community level, this type of proposal is expected to provide information for local management oriented towards the construction of sustainable rural energy systems.