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Sustainable conditions of biodiesel production: An approach of system dynamics - Colombian case

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**Introduction**: Sustainability assessment of biodiesel production is a topic of increasing importance due to the interest of governments to define sovereignty strategies, diversification of their energy matrix, and to set up the impact of biofuels production. In this context, this work proposes a hierarchical framework of sustainability assessment and this application through system dynamic model in Colombian case.

**Methods**: This research has followed a stepwise design for a new hierarchical sustainability assessment framework of PC&I (principles, criteria and indicators) for biodiesel production in the three traditional dimensions social, economic, environmental, and two new dimensions politic and technological. The first stage was to define such framework. In the second, the PC&I set was validated through several mechanisms that included expert consultation. In third stage, a system dynamics based model was designed as methodological tool oriented to display the characteristics, interaction, and influences among the PC&I that compose the sustainability assessment framework. The system dynamics (SD) model was developed and applied to a particular case, assessing the sustainability of biodiesel production in Colombia, following five stages: problem definition, dynamic hypothesis formulation, description of the model boundary, description of the model structure and the definition of the functions that will describe the selected indicators, and testing of the model and result analysis.

**Results**: SD methodology enabled the articulation of the problem and its conceptualization through causal loop diagrams. These diagrams describe the complex relationships between dimensions and indicators, integrating the economic, social, environmental, political and technological indicators. The SD model is defined by five sub-models: biodiesel production, land and social, water demand, net energy ratio, greenhouse gas saving in the life cycle of biodiesel and pollutant emission that affect air quality: biodiesel blended by diesel.

**Discussion**: The model was applied in three scenarios: baseline, optimistic and pessimistic. As a result, the social, economic, environmental, politic, technological conditions required for a sustainable biodiesel production in Colombia were proposed.

## Biography

Sandra Bautista has completed her PhD in Industrial Engineering Sustèmes of the University of Lorraine and Doctor of Engineering with emphasis in Chemical Engineering from the National University of Colombia. She is teaching the Environmental Engineering Department of the Central University, with professional experience in environmental audits, both urban environmental management and rural, sustainability assessent in different sectors such as agriculture and industry.

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