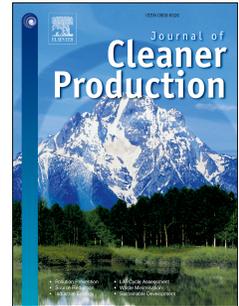


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Environmental responsibility accounting in complex energy systems

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1 Environmental Responsibility Accounting in Complex 2 Energy Systems

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9 **Abstract:**

10 Environmental considerations have imposed new restrictions in the planning and management
11 of energy systems. This research aims at describing the necessity and application of a new
12 concept in environmental responsibility accounting. The method is based on physical quantities
13 to overcome the weaknesses of already developed allocation approaches, and to internalize the
14 external environmental damages using the exergy concept. The proposed method is a
15 modification of the exergoenvironmental analysis in order to take into account the effect of non-
16 energy streams in a macro-level energy system. In the proposed method, environmental
17 responsibilities are to be calculated based on the exergy destruction within the system. As a case
18 study, the method is applied to a complex energy system. It is shown that the derived
19 environmental responsibilities are representative of the units' role in total emissions and
20 corresponding contributions to an integrated environmental management. Comparison of the
21 results shows that the responsibilities are higher than the emission reduction limits for service
22 consuming units, while they are less for service providing units. The differences between the
23 responsibilities and permits could represent the non-internalized external damage costs.

24 **Keywords:**

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