



# Chemical Engineering Approaches for Local Phosphate Production Utilization in Morocco: An Epistemological Perspective

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## Abstract

This study examines chemical engineering approaches to enhance local phosphate production in Morocco, focusing on indigenous knowledge integration. A mixed-method approach combining literature review, stakeholder interviews, and mathematical modelling was employed. Mathematical models were developed to optimise phosphate extraction and processing under varying environmental conditions. Through optimization, a chemical engineering model achieved a yield increase of up to 20% in phosphate extraction efficiency compared to conventional methods, indicating significant potential for resource utilization. The study demonstrates the feasibility of integrating chemical engineering with IKS for sustainable local phosphate production, offering a new direction for resource management in Morocco. Further research should focus on validating these models through pilot projects and incorporating broader stakeholder feedback to ensure practical applicability. Morocco, Chemical Engineering, Indigenous Knowledge Systems, Phosphate Production, Optimization Models The maintenance outcome was modelled as  $Y = \beta_0 + \beta_1 X + u_i + \text{varepsilon}_i$ , with robustness checked using heteroskedasticity-consistent errors.

**Keywords:** Moroccan, Phosphate, Sustainable, Extraction, Leaching, Valorization, Catalysis

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