


Chapter 10

AI for the Environmental Performance of Moroccan Public Organizations: A Comparative Analysis of Random Forests and XGBoost

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ABSTRACT

This study examines the application of Machine Learning (ML) to evaluate and predict the environmental performance of Moroccan public organizations. It compares the performance of Random Forests (RF), XGBoost, Support Vector Machines (SVM) and Partial Least Squares (PLS) regression on a dataset collected from 270 organizations between 2018 and 2022. Key variables include total solid waste production, energy consumption and the rate of achievement of National Sustainable Development Strategy (NSDS) targets. Our results, evaluated using accuracy, F1 score, R^2 and mean square error (MSE), indicate that Random Forests offer better performance for predicting environmental performance. This research contributes to the literature on the application of AI to sustainable development in the public sector, and highlights the importance of environmental policies for optimizing resource management. Practical implications suggest that public organizations can use these models to guide their strategic decisions and improve their contribution to national sustainable development goals.

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INTRODUCTION

Today, the 21st century, really, is detectable by a global awareness of the major environmental problems which humanity faces. No more a concern but a threat in fact to ecosystem stability and human well-being, threats to these dimensions are climate change, biodiversity depletion, pollution, and the depletion of natural resources. Quite certainly confronting such an ecological emergency, the transition toward more sustainable lifestyles and development becomes an imperative. Management of resources, reduction of adverse effects on the environment, and promotion of planet-friendly practices are now priorities at every level of society.

It is in this scenario that public organisations have a major responsibility. Public organisations are, after all, the key players in society, for they are the implementers of all environmental policies and developers for sustainability. They manage infrastructure and public services and regulate economic activity. Hence, it is necessary for them to adopt responsible management of the environment as well as work taking sustainable development principles into account in all their operations and decisions. Hence, it will necessarily require the active commitment and exemplarity of the public sector to realize the Sustainable Development Goals (SDGs) as they are laid out by the United Nations Agenda 2030 (United Nations, 2015). Additionally, the Agenda 2030 stresses concerted efforts on the part of governments, public institutions, and citizens to achieve sustainable development in its economic, social, and environmental dimensions.

This is true in Morocco. The country has embarked on a proactive path towards sustainable development as demonstrated in the National Sustainable Development Strategy (SNDD) adopted in 2016. The Ministry of Energy Transition and Sustainable Development (2021) broadly encourages Moroccan public organizations to embrace this approach, by innovating and sustainable uses of its available resources, and to diminish their environmentally damaging impacts by adopting applicable practices. These public organizations, whether they be central government institutions, local authorities health establishments or educational establishments, are expected to take the lead in terms of environmental management and in achieving national sustainable development goals.

Unfortunately, traditional forms of environmental management (largely based on description and linear processes) could be limiting, because they sometimes lack good large and complex data systems, of waking up to non-linear relationships between variables, and who could forecast the ramifications of decisions. For example, we need much more sophisticated qualitative processing tools to analyse issues such as waste, energy usage optimization, or greenhouse gas emissions reductions, where researchers have a lot of existing complexity to deal with.

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