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Multi-criteria risk analysis for large-scale photovoltaic power plants in Libya

Ahmed S. Kagilik¹, Faculty of Engineering, Sabratha University, Libya, e-mail:

Mustafa M. Sofia, Faculty of Engineering, Al Asmarya University, Libya, e-mail:

Christian Bornhauser, GIZ Gesellschaft für Internationale Zusammenarbeit, Berlin-Germany,

as.kagilik@gmail.com¹, m.sofia@asmarya.edu.ly², cb@bornhauser24.de³

ABSTRACT

Due to the virtually no experience with renewable energy large projects in Libya, the success of such projects is challenged by a multitude of risks. These are analyzed, categorized and quantified in this work. The methodology follows the “risk matrix” approach, by which each risk is defined by two attributes: the probability and the potential damage. Both were quantified by means of a simplified scoring scheme. The risks themselves are classified according to three temporal categories (planning phase, construction phase, operation phase) and six causal categories: management, engineering, administration/regulation, social acceptance, security threats and natural hazards. The analysis reveals that particularly shortcomings of project management and engineering capacities could endanger the success of the PV projects. Other important risks are emerging from unclear regulatory and administrative procedures. Likewise noteworthy are social acceptance risks and the difficult security situation in the country. The risk that natural hazards could substantially endanger the PV power plant projects is considered low. On basis of the risk analysis, the following recommendations for risk mitigation can be given: Highest priority has the improvement of the organizational capacities of relevant national authorities. These authorities must significantly enhance the quality of its internal organization to be capable to manage and organize the tendering, construction and operation/maintenance of PV power plants. For the first projects, it is recommended to hire external expertise in order to provide Libyan engineers with guidance for successfully carrying out international PV tenders. Furthermore regulatory barriers and authorization obstacles for PV power plants in Libya must be removed. Security problems remain an issue in Libya. Therefore, a professional security concept for the construction and maintenance phase to enhance trust of international contractors to participate in the projects should be established. On the other hand, the PV power plant projects also need a valid insurance concept in order to minimize the impact of the remaining risks of damaged due to theft, vandalism and natural hazards.



Keywords: photovoltaic power plants, project phases, risk analysis, risk categories.