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Energy solutions in rural Africa: mapping electrification costs of distributed solar and diesel generation versus grid extension*

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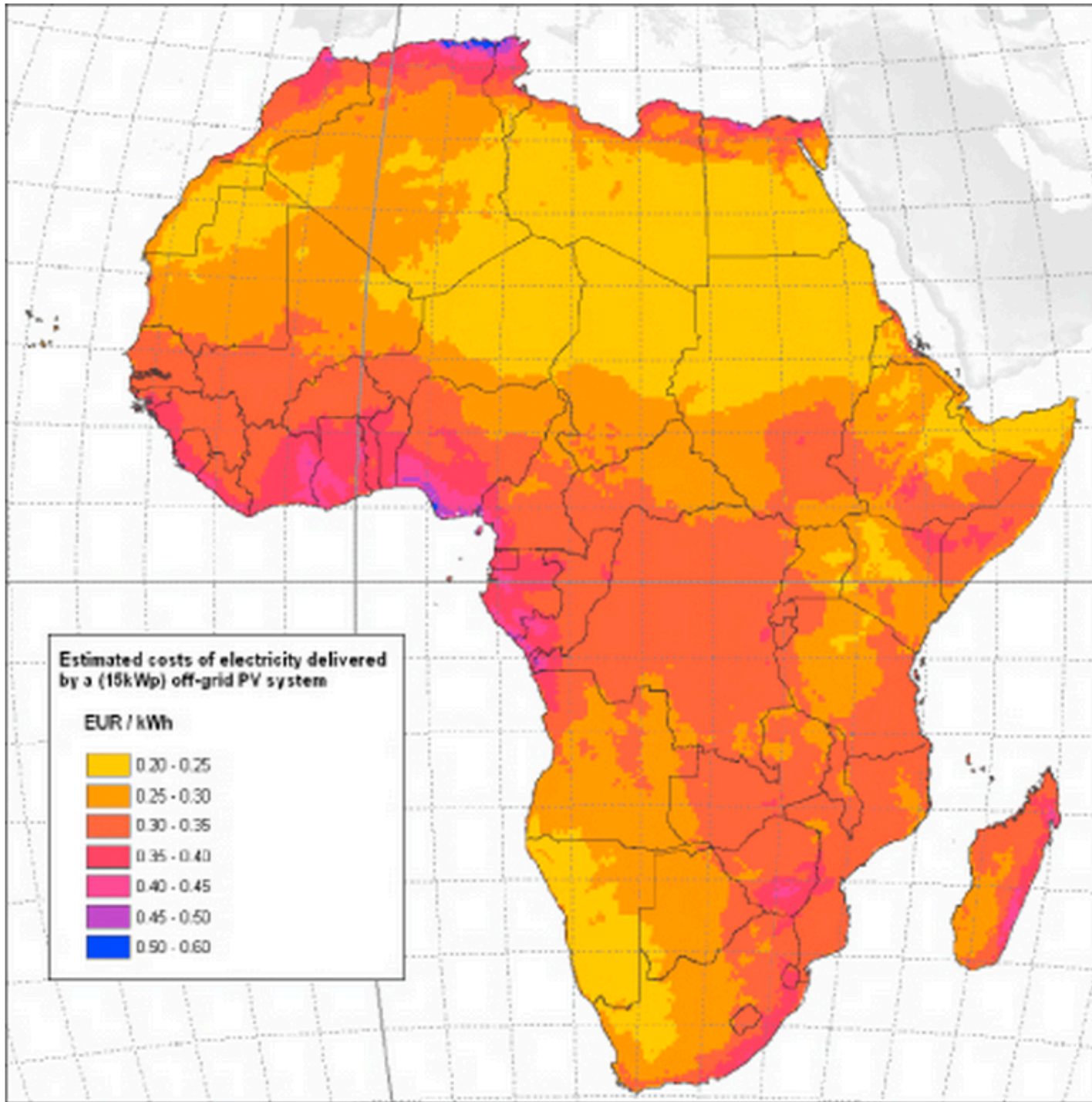
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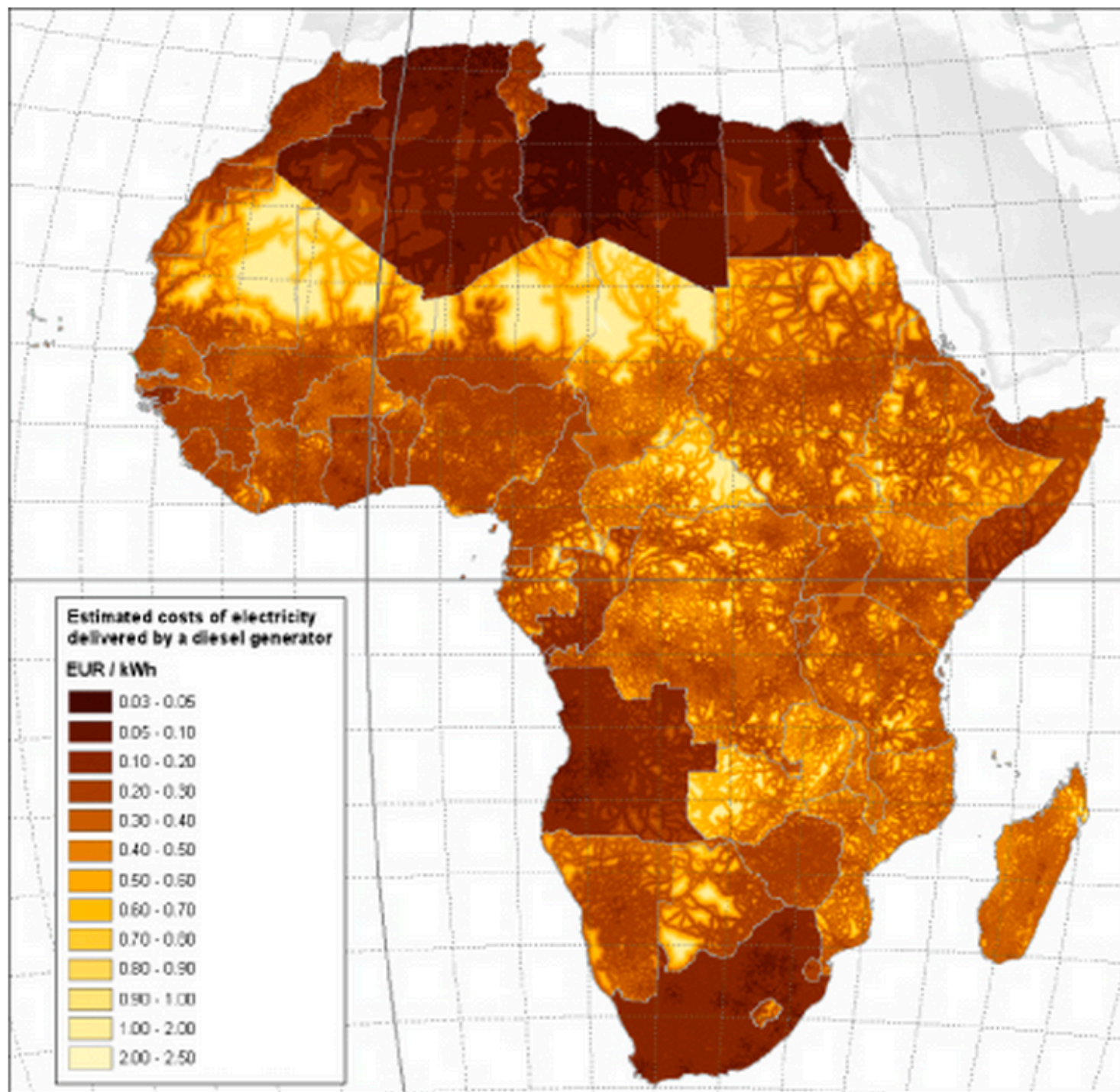
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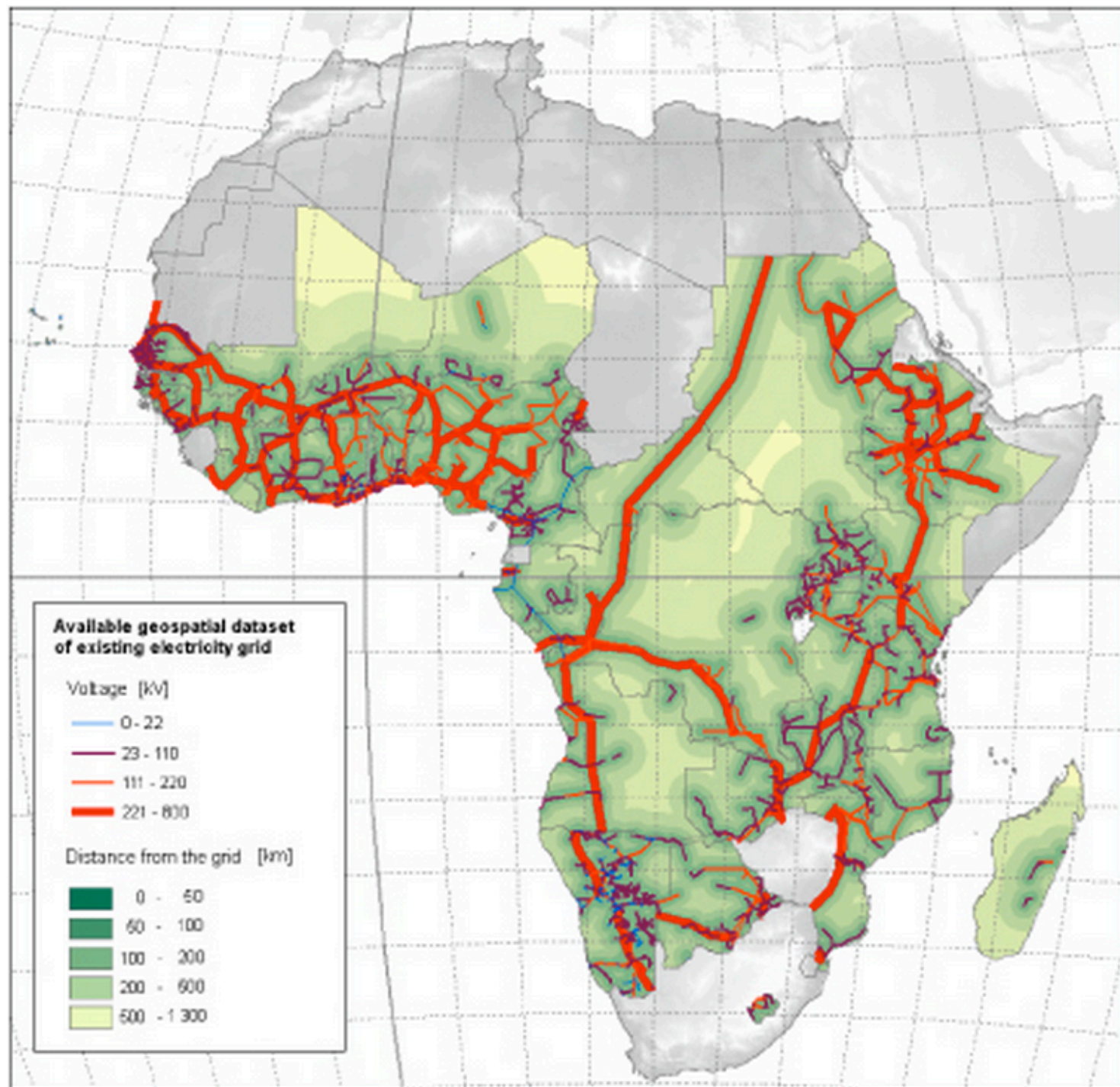
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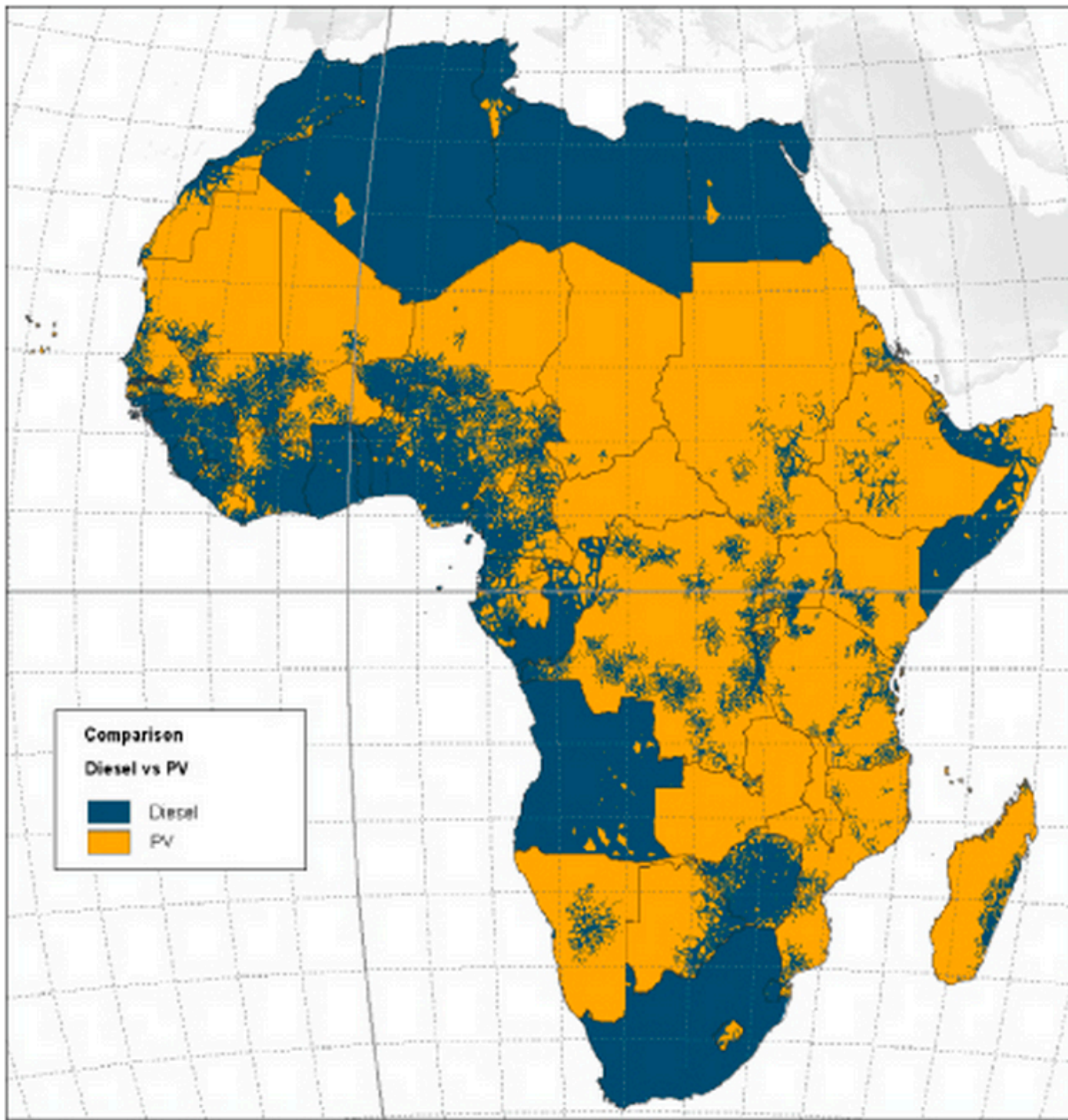
Abstract. Three rural electrification options are analysed showing the cost optimal conditions for a sustainable energy development applying renewable energy sources in Africa. A spatial electricity cost model has been designed to point out whether diesel generators, photovoltaic systems or extension of the grid are the least-cost option in off-grid areas. The resulting mapping application offers support to decide in which regions the communities could be electrified either within the grid or in an isolated mini-grid. Donor programs and National Rural Electrification Agencies (or equivalent governmental departments) could use this type of delineation for their program boundaries and then could use the local optimization tools adapted to the prevailing parameters.

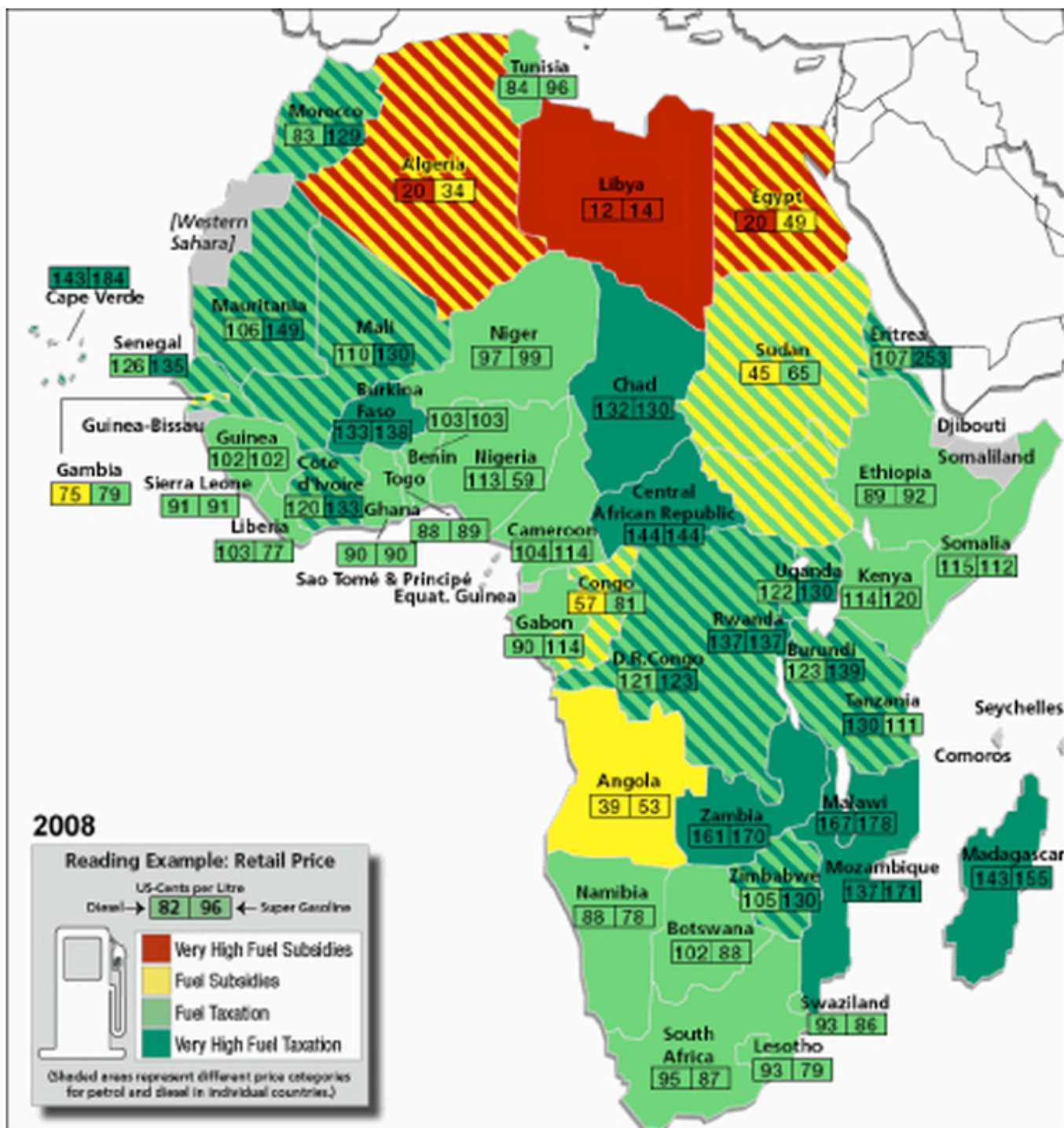
Keywords: rural electrification, economic analysis, developing countries, geographical information systems

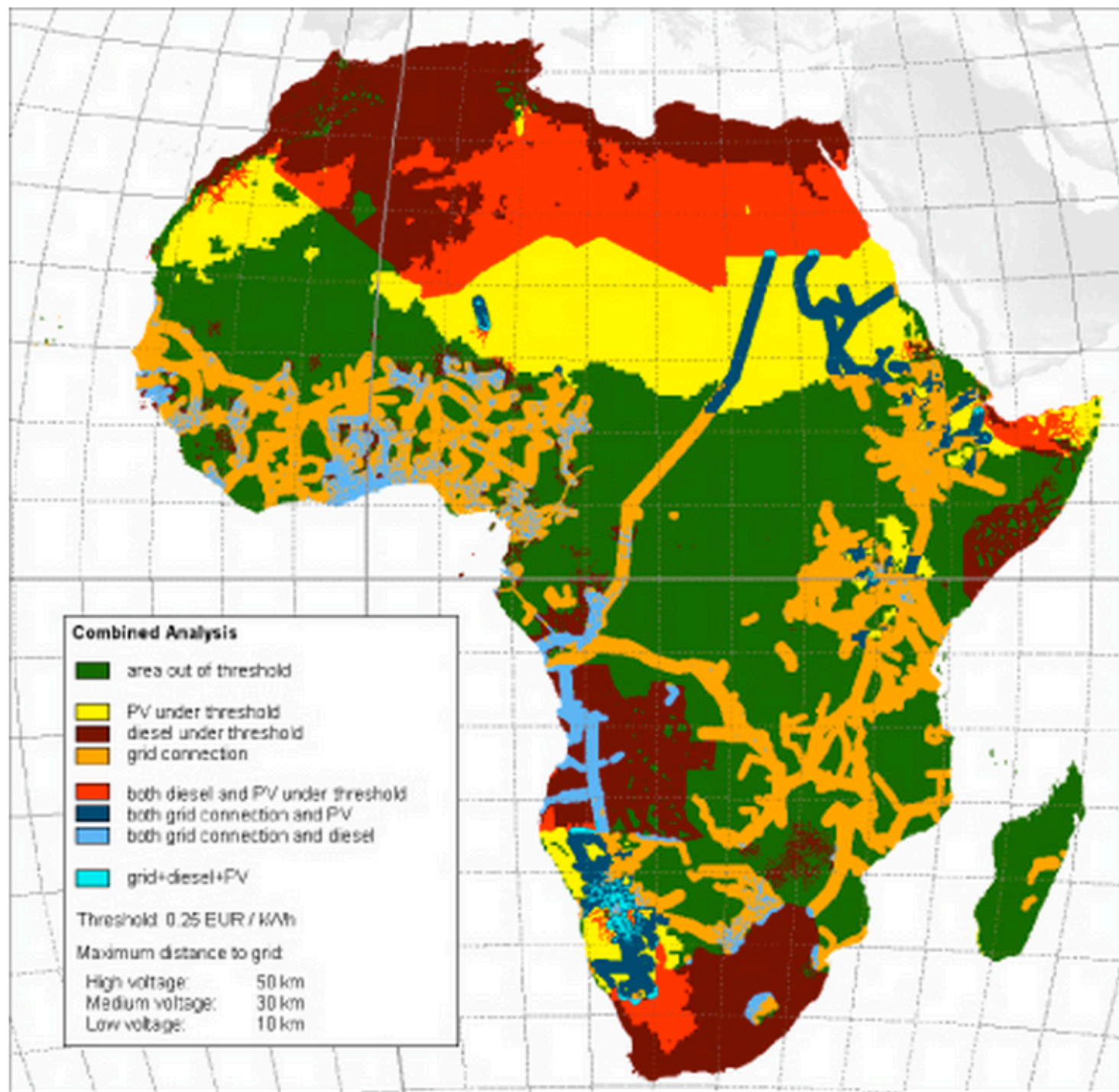


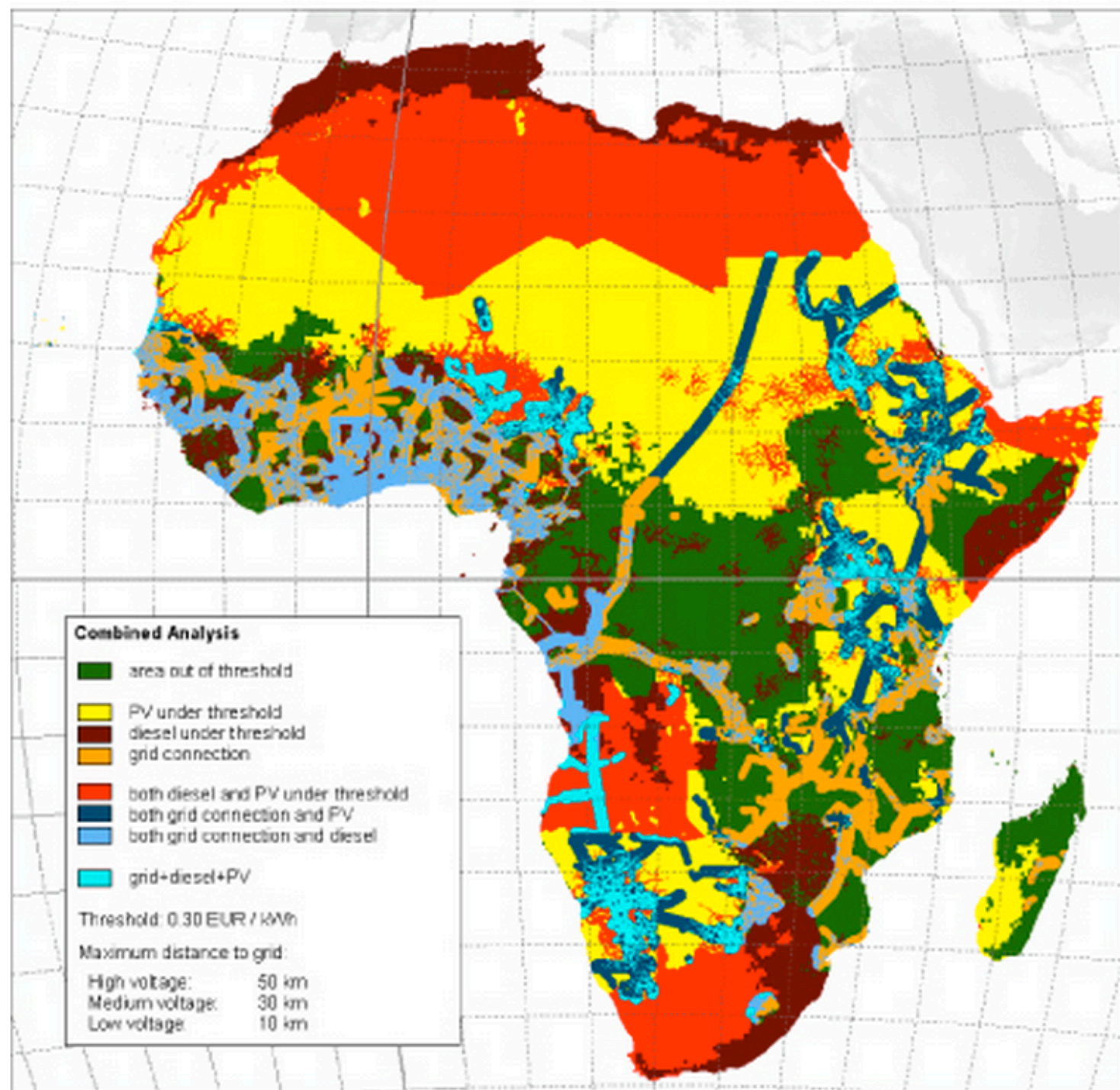












Energy service options	Potential population (millions) served by the energy service cheaper than the ATP		Per cent change when consumers can pay 0.05 € kWh ⁻¹ more for energy service (%)
	0.25 € kWh ⁻¹	0.30 € kWh ⁻¹	
Ability to pay =	0.25 € kWh ⁻¹	0.30 € kWh ⁻¹	
All energy service costs higher than ATP	179.6	91.3	- 50
PV costs under ATP	19.8	55.4	180
Diesel costs under ATP	194.7	192.4	- 1
Both diesel and PV costs under ATP	10.9	65.9	500
Grid connection costs under ATP	320.6	115.8	- 64
Both grid connection and PV costs under ATP	23.3	62.2	170
Both grid connection and diesel costs under ATP	118.2	191.9	63
Three energy option costs (grid, diesel and PV) under ATP	1.5	93.8	6153

