WEALTH & RENEWABLE ENERGY: THE GLOBAL AND LOCAL IMPACT OF GDP ON RENEWABLE ENERGY GENERATION

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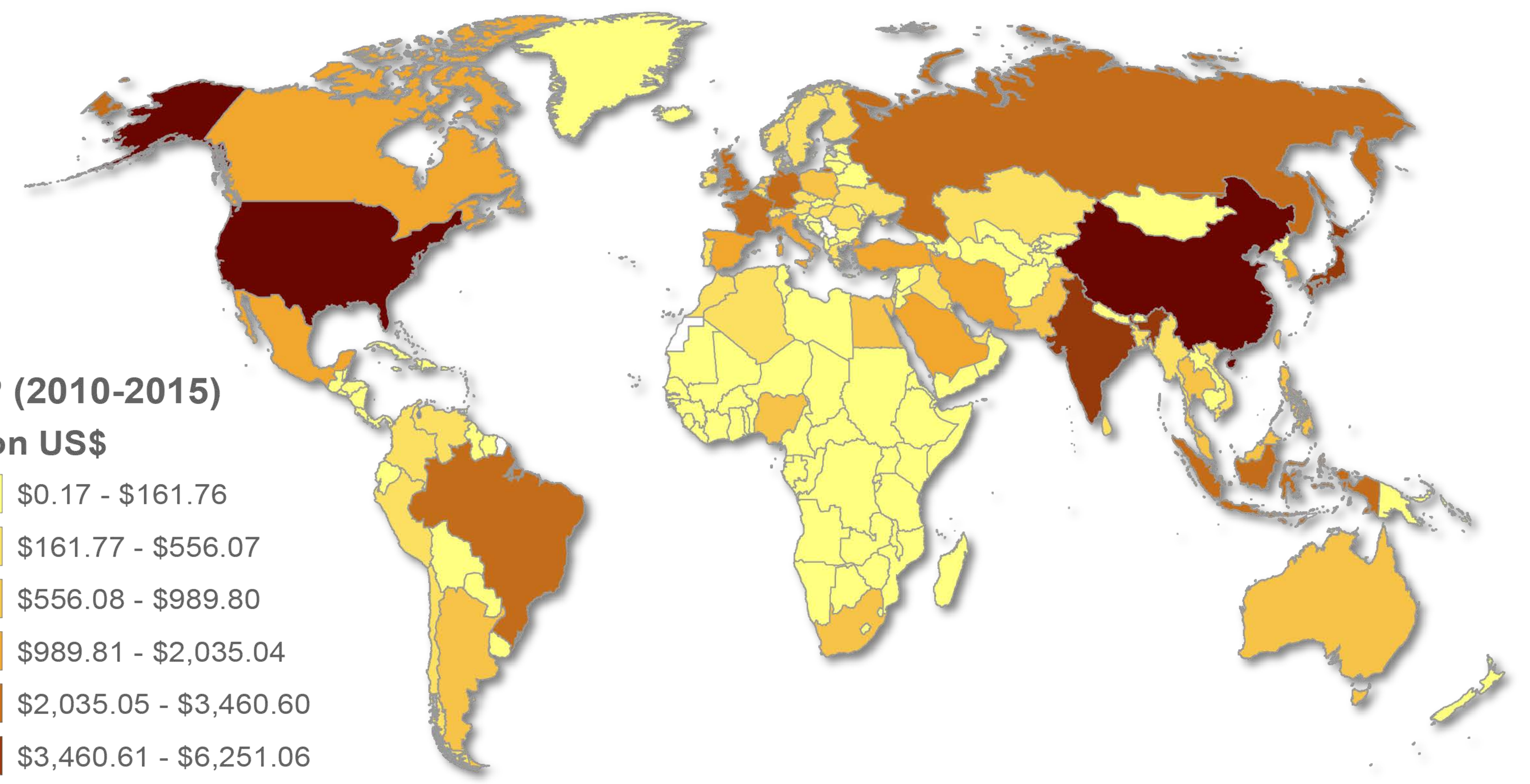
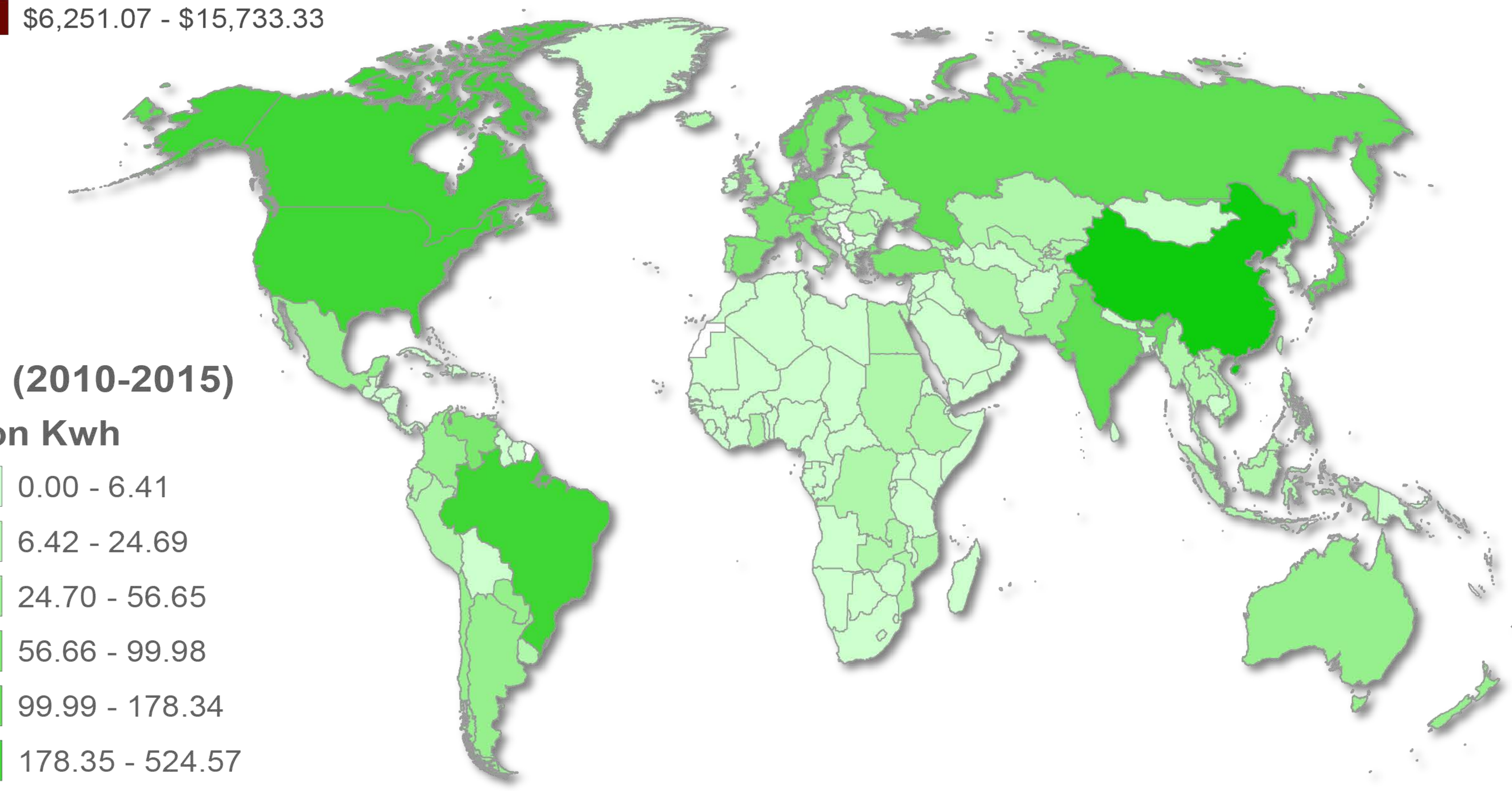
Wealth has a significant impact on the ability of a country to generate renewable energy. Results from the ordinary linear regression (OLR) and geographically weighted regression (GWR) models show a significant relationship between these variables. However, the GWR model shows spatial non-stationarity.



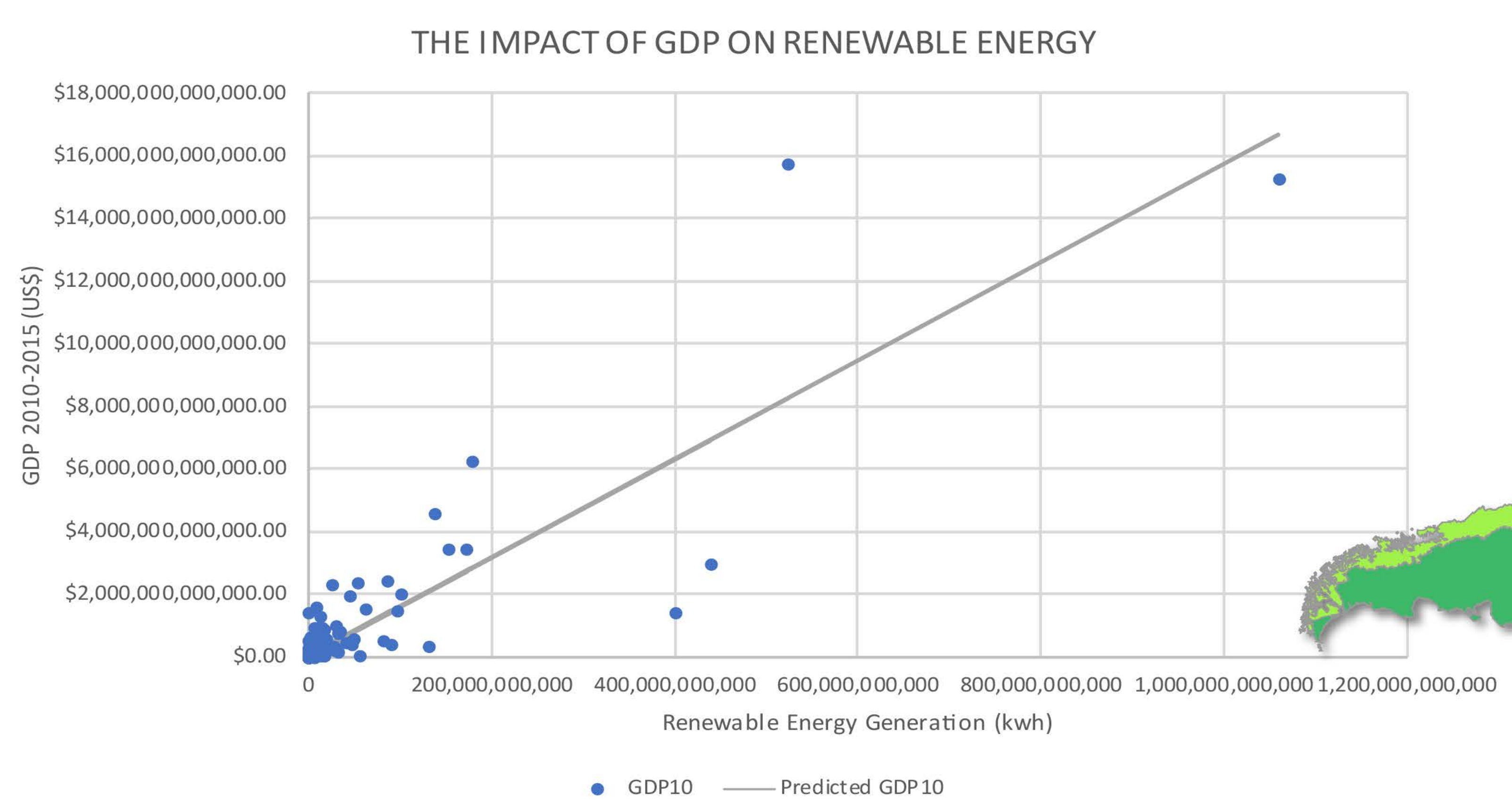
GDP (2010-2015)
Billion US$

- $0.17 - $161.76
- $161.77 - $556.07
- $556.08 - $989.80
- $989.81 - $2,035.04
- $2,035.05 - $3,460.60
- $3,460.61 - $6,251.06
- $6,251.07 - $15,733.33

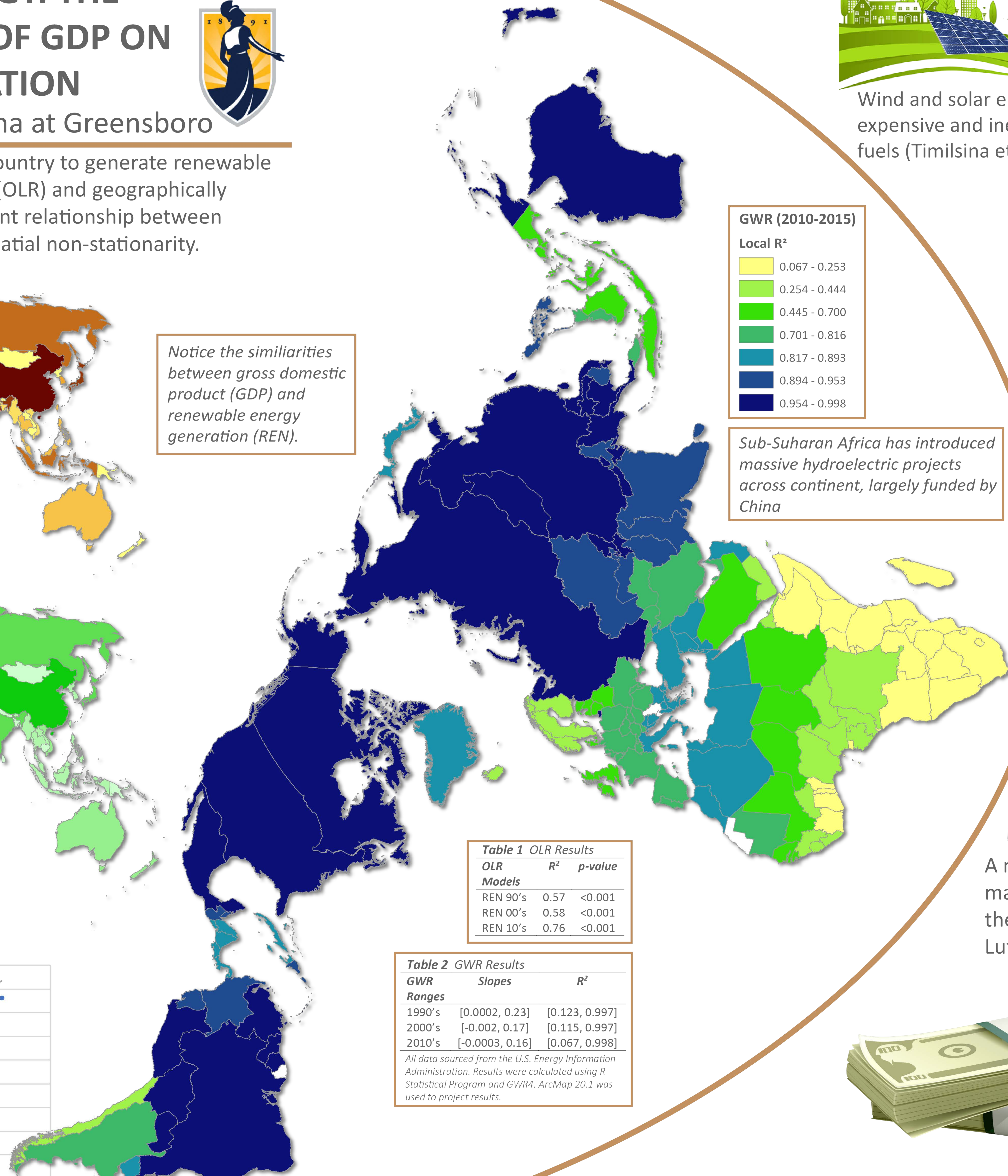


REN (2010-2015)
Billion Kwh

- 0.00 - 6.41
- 6.42 - 24.69
- 24.70 - 56.65
- 56.66 - 99.98
- 99.99 - 178.34
- 178.35 - 524.57
- 524.58 - 1060.33



Notice the similiarities between gross domestic product (GDP) and renewable energy generation (REN).



GWR (2010-2015)
Local R²

- 0.067 - 0.253
- 0.254 - 0.444
- 0.445 - 0.700
- 0.701 - 0.816
- 0.817 - 0.893
- 0.894 - 0.953
- 0.954 - 0.998

Sub-Suharan Africa has introduced massive hydroelectric projects across continent, largely funded by China

Table 1 *OLR Results*

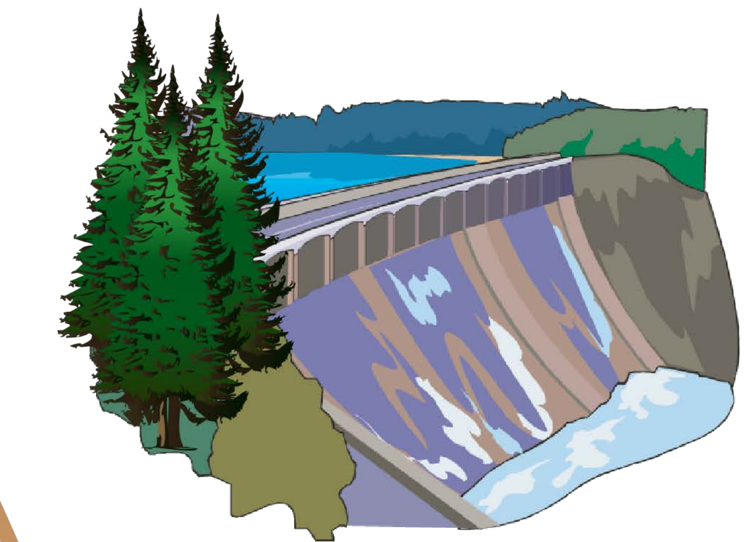
OLR Models	R^2	***p-value***
REN 90's	0.57	<0.001
REN 00's	0.58	<0.001
REN 10's	0.76	<0.001

Table 2 *GWR Results*

GWR Ranges	***Slopes***	R^2
1990's	[0.0002, 0.23]	[0.123, 0.997]
2000's	[-0.002, 0.17]	[0.115, 0.997]
2010's	[-0.0003, 0.16]	[0.067, 0.998]

All data sourced from the U.S. Energy Information Administration. Results were calculated using R Statistical Program and GWR4. ArcMap 20.1 was used to project results.

Wind and solar energy still remain highly expensive and inefficient to compete with fossil fuels (Timilsina et al., 2013).



Hydropower and biomass have the highest potential to be competitive with fossil fuels (Bildirici & Gö kmenoğlu, 2017; Caputo et al., 2005).

A more competitive energy market is needed to counteract the oil monopoly (Greene, 1997; Luft, 2013).

While access to capital is important to renewable energy generation, Sub-Saharan Africa is an outlier. More research is needed to understand why this is the case.