

# AG ACP Energies – 27/01/2023



## Decarbonation in Ghana Leveraging Technology for the Energy Transition



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# GOPC 2022

## GHANA OIL & POWER

Conference

# Decarbonation

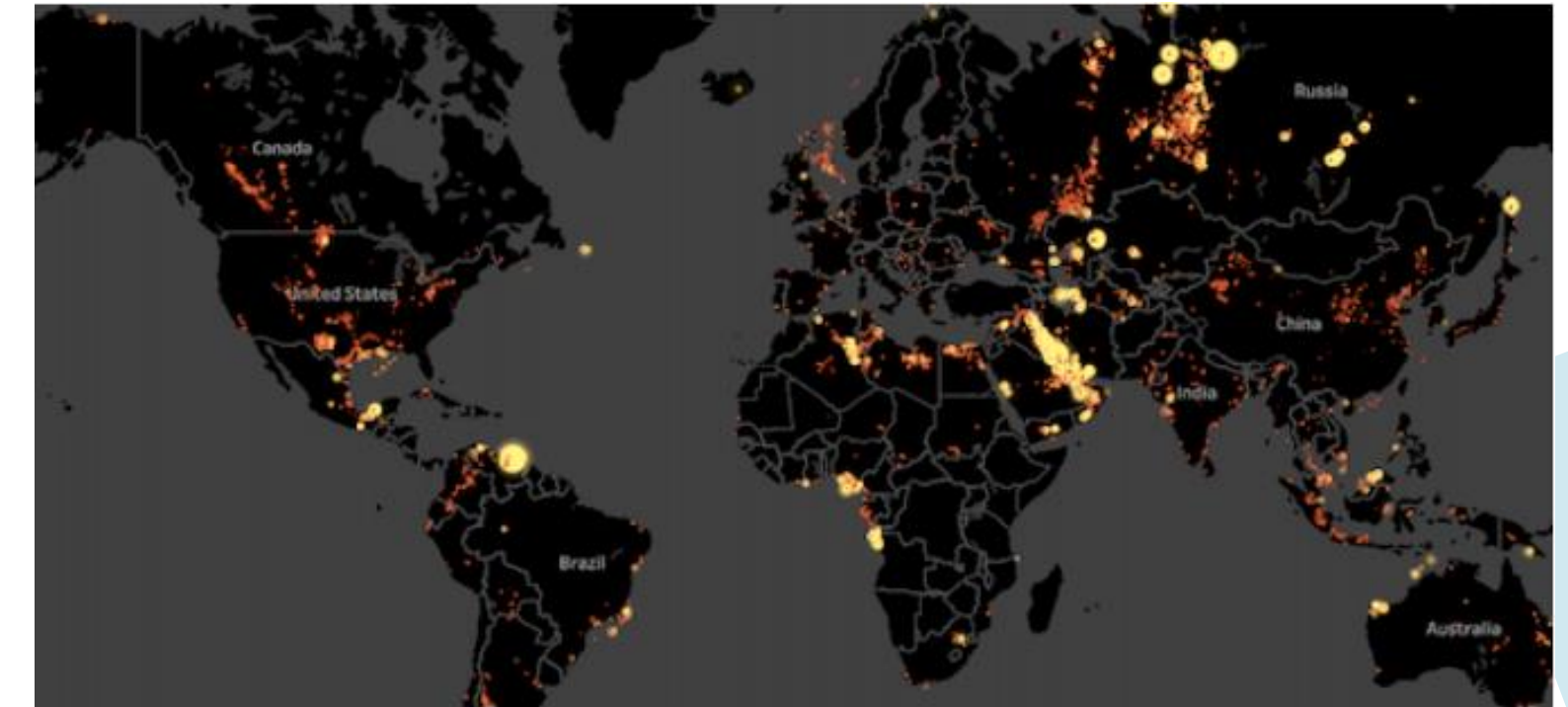
## Leveraging Technology



## AREAS OF STUDIES IN O&G INDUSTRY

### ■ Flared gas = symbol of waste & pollution (+ lost of revenues)

- Why excess gas ? ex : lack of infrastructure (treatment / storage), incident of production
- Why flare gas ? prevent explosion and reservoir destruction (impact of gas reinjection)
- How to reduce it ? conversion in electrons (waste to power) or for domestic / industrial use



Global flaring map (source Skytruth.org)

⚠ **CH<sub>4</sub>** : global warming power 80 x > CO<sub>2</sub> (1t CH<sub>4</sub> ≈ 25teq CO<sub>2</sub> over 100 yrs)

**Gas flaring reduction** : not a solution to meet NetZero target but **a way to mitigate emissions.**



Nigerian fertilizers plant

### Case of Nigeria

**2019** : Nigerian Gas Flare Commercialization Program

**2021** : FID mega complex of ammonia (NH<sub>3</sub>), urea (CH<sub>4</sub>N<sub>2</sub>O), and methanol (CH<sub>3</sub>OH) from unused residual gas contributing to other products (e.g fertilizers).



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### Leveraging Technology



- **CCS\* technology** : big investments with help of public funds

### Worldwide

- 40 Mt CO2 captured & stored / year
- ~ 30 operational projects (+40 % natural gas treatment)
- 135 installations at industrial scale
- ~ 200 new projects announced since 2021 - under investigation - more and more on power generation



(\*) CCS : Carbon Capture & Storage

Facilities - Global CCS Institute ([co2re.co](https://www.co2re.co))



CCS projects in Africa : (2 cases supported by World Bank)

- **South Africa** :
  - under **evaluation** with **CO2 storage** sites on the horizon (onshore deep saline formation)
  - from the **power sector** (particularly coal fire plants)
- **Nigeria** : analytical & exploratory programme
  - Assessment & mapping of CO<sub>2</sub> sources & storage potential
  - Technology & capacity building studies

➔ **Potential of CCS in Africa highlighted during COP 27**  
**Key role of carbon market**

Consolidated CAPEX & OPEX by Sector - Base Case



- **Phase II**
  - Budget: US\$ 42.4 million (World Bank – US\$27.4 million; Government of South Africa – US\$ 15 million)
  - Focused on two pilot projects
    - Pilot CO<sub>2</sub> Storage Project – proof of concept for CO<sub>2</sub> storage in South Africa; technical and governance capacity building
    - CO<sub>2</sub> Capture Pilot Project – technology assessment and Front-End Engineering and Design (FEED)
  - Status ongoing for completion in 2024

Data from : GCCSI & World Bank June 2022



**OTHER AREAS OF STUDIES IN RENEWABLES SECTOR** (especially biomasse)

Achieving net zero considering integration of bio energies and circular economy.

**Biomass** = C & H<sub>2</sub>O (C<sub>x</sub>H<sub>y</sub>O<sub>z</sub>)

- ✓ 1<sup>st</sup> source of renewables
- ✓ non intermittent energy
- ✓ C neutral only if no deforestation !



(\*) Biochar = carbon sink recognized by IPCC as a solution for long term carbon removal & a negative emission technology



➔ **Scoping study on decarbonation** based on local industries inventory to extend the analyse to other ways like other renewables sources (hydro, geothermal, wind, PV, tide, wave) or nuclear.

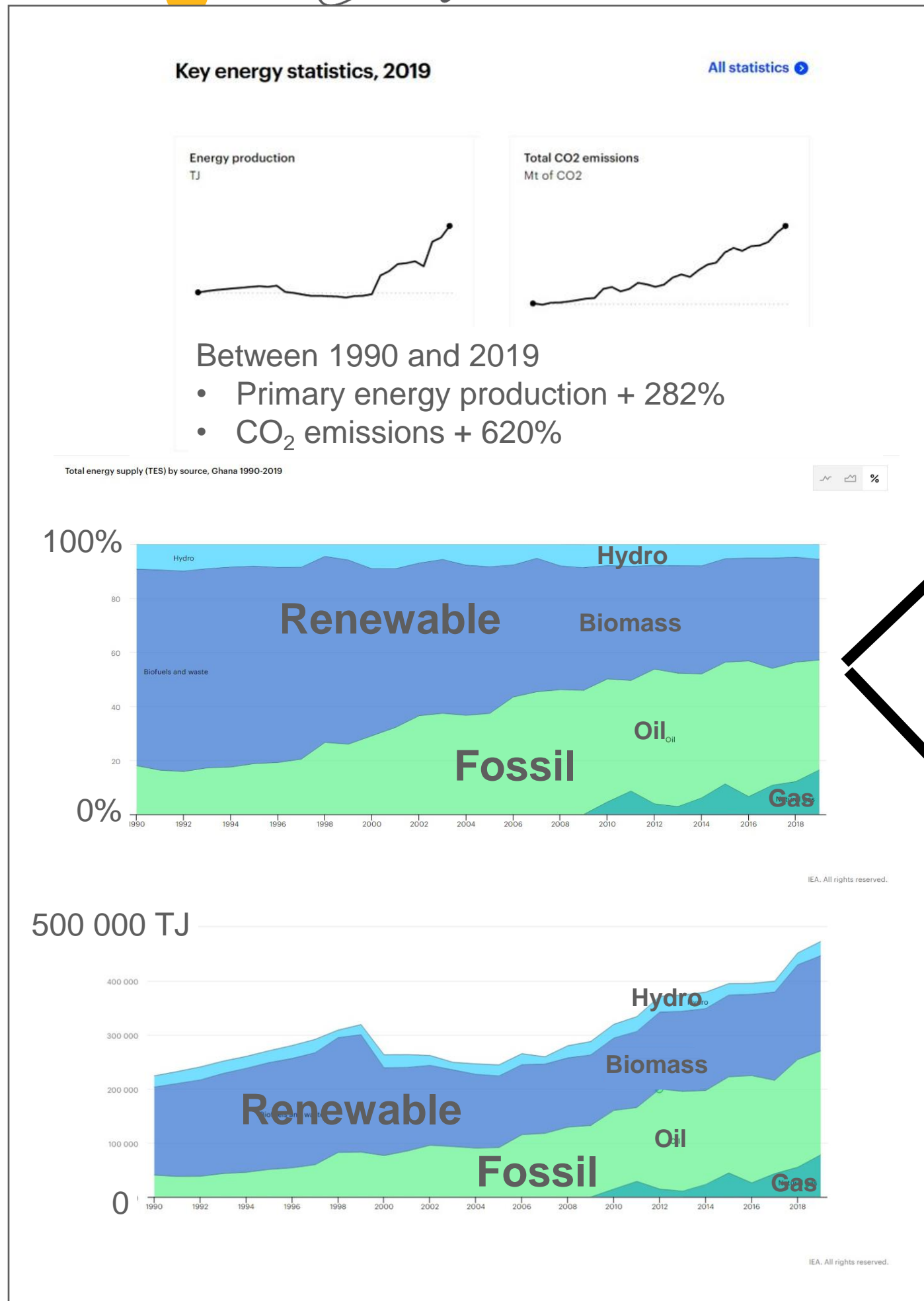


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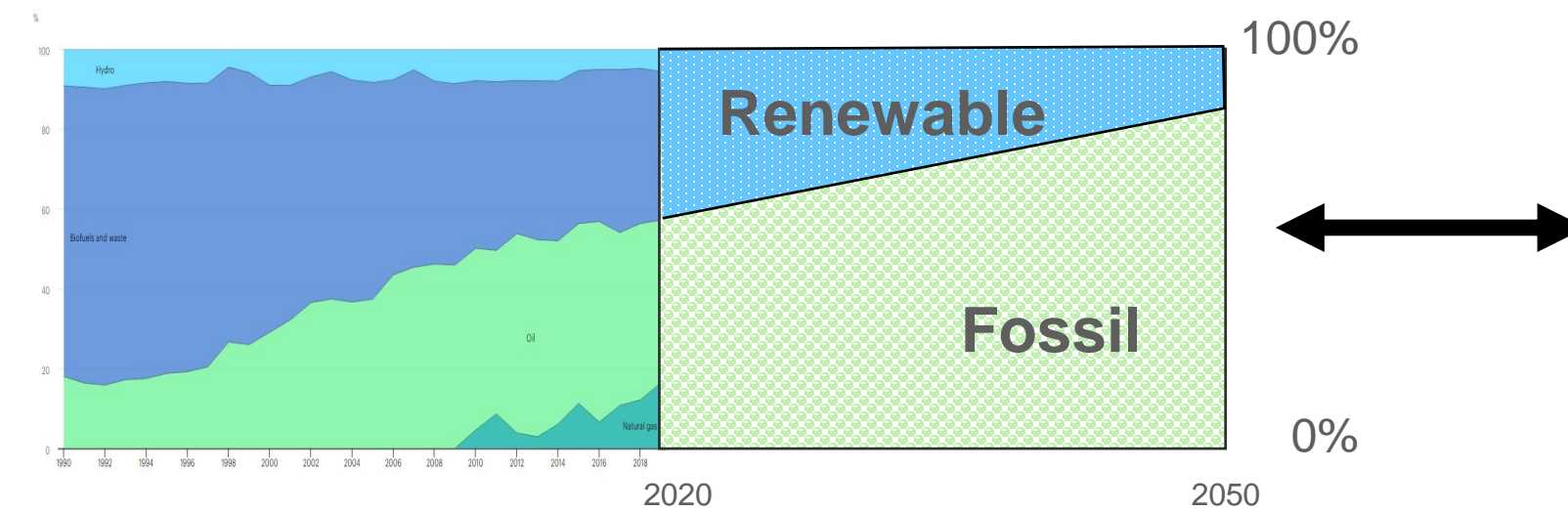
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# Decarbonation strategies

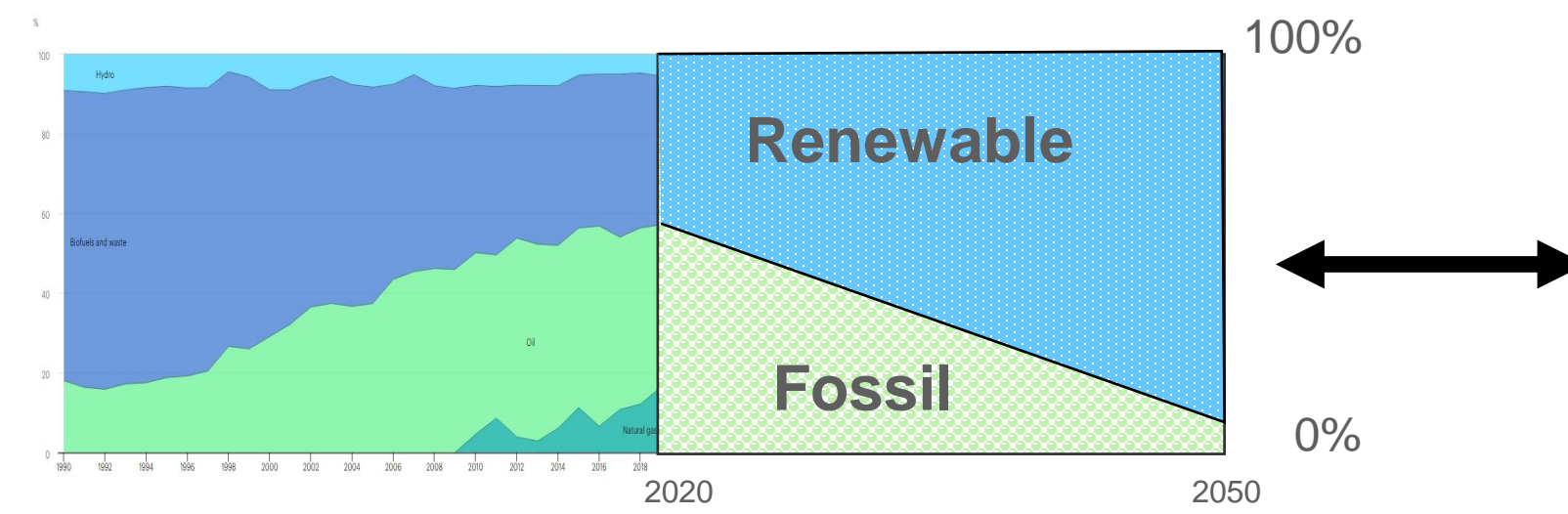


## Fossil based scenario



Develop oil and gas fields with a CCS hub strategy  
In a carbon-negative way

## Renewable based scenario



Develop locally solar for domestic needs

Develop offshore wind and hydro (regional electricity, green H<sub>2</sub>)

Develop nationwide biofuels (bio-ethanol, methanol, methane) for mobility and biochar for fertilization

- Agro-waste
- Forest, shrub and savannah seasonal crops
- Local decentralized biofuel productions
- Biol Energies with CCS (BECCS)



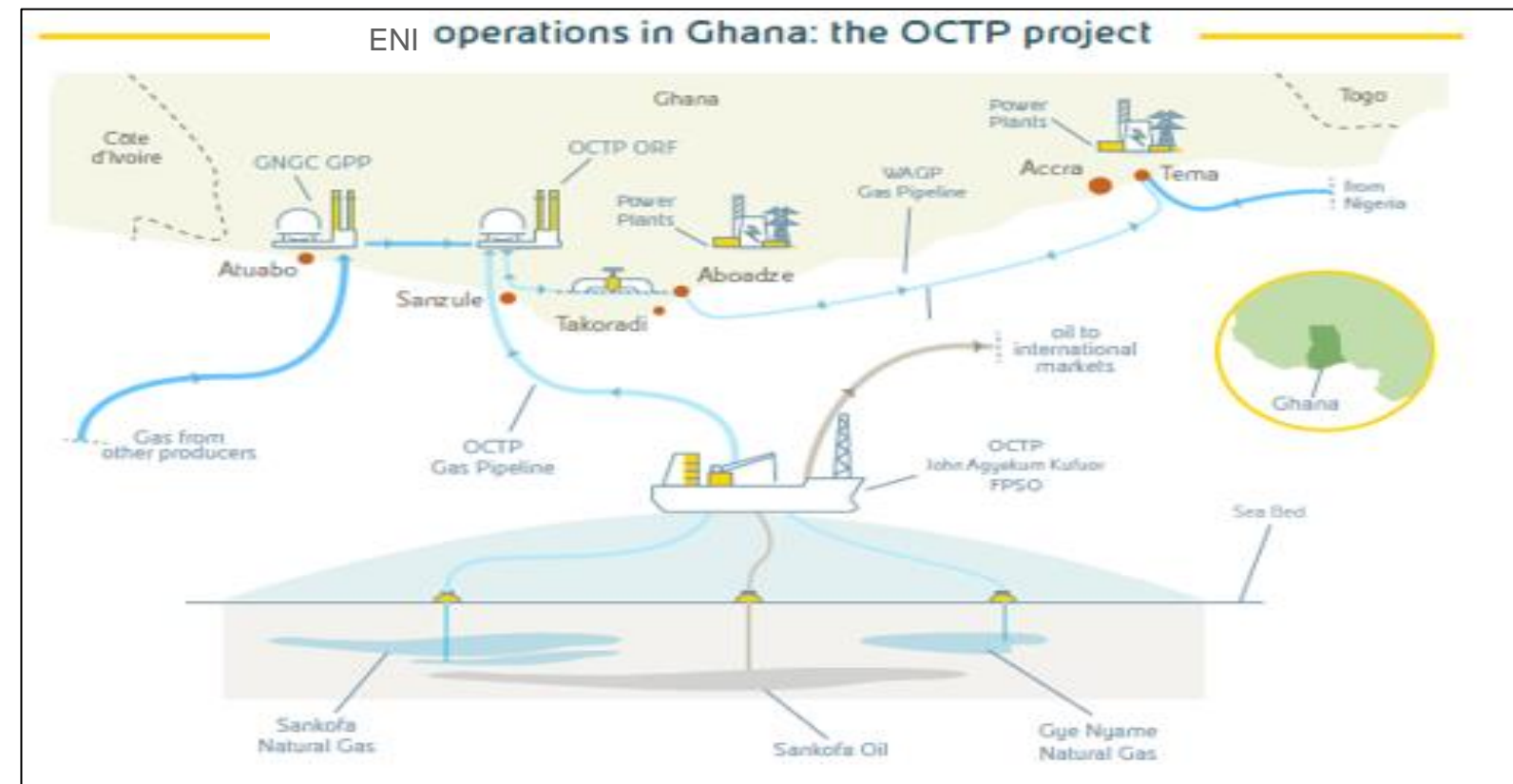
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# Decarbonation strategies

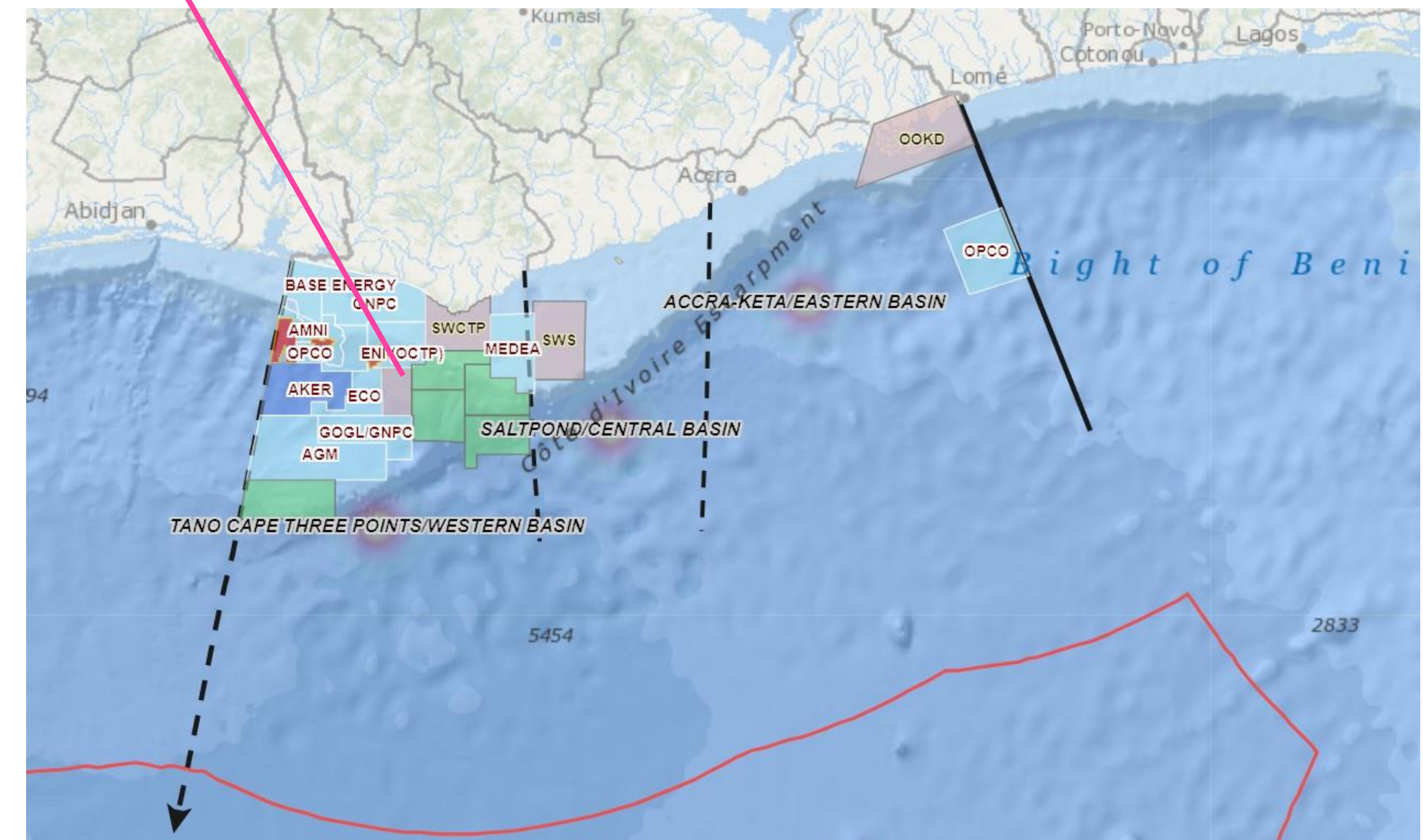
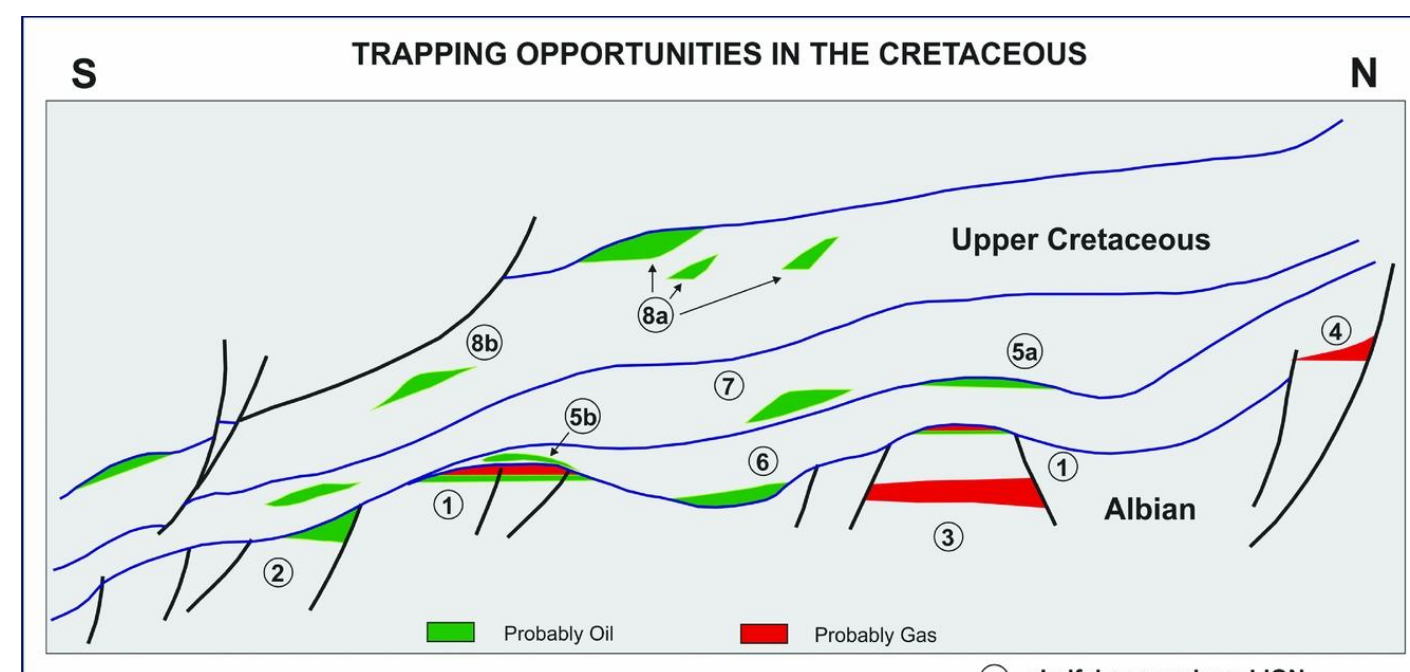
## Fossil Based Scenario



The Ghana sedimentary basins are still largely underexplored

Oil and gas fields that can be exploited in a carbon-negative way with a CCS hub strategy should be prioritized

There exists plentiful opportunities for Geological Carbon Storage, both onshore and offshore, in oil/gas fields and aquifers



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# Decarbonation strategies

## Renewable Based Scenario

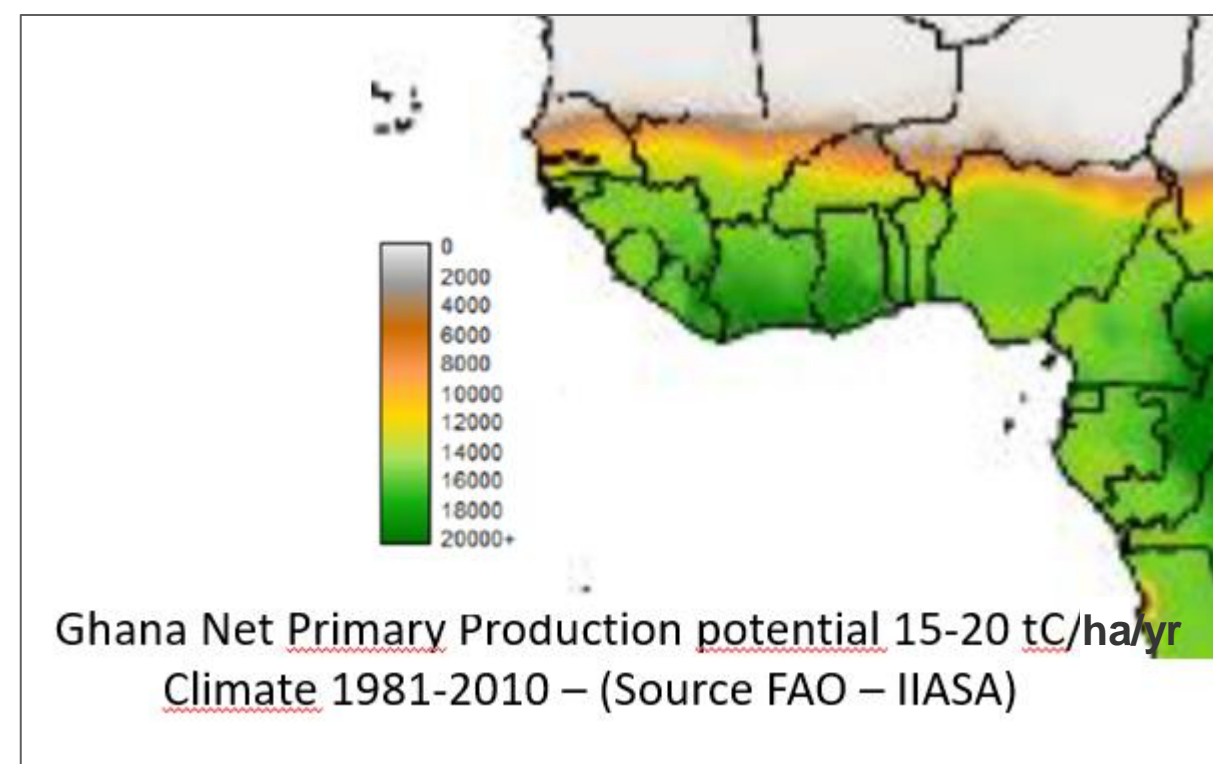
Develop biofuels (bio-ethanol, methanol, methane) and biochar nationwide for mobility and fertilizers

- Agro-waste
- Tree and savannah crops
- Bio Energies with CCS (BECCS)
- Local decentralized biofuel productions

Develop offshore wind in the South East

- Regional electricity
- Green H2

Provide base local electricity with solar nationwide

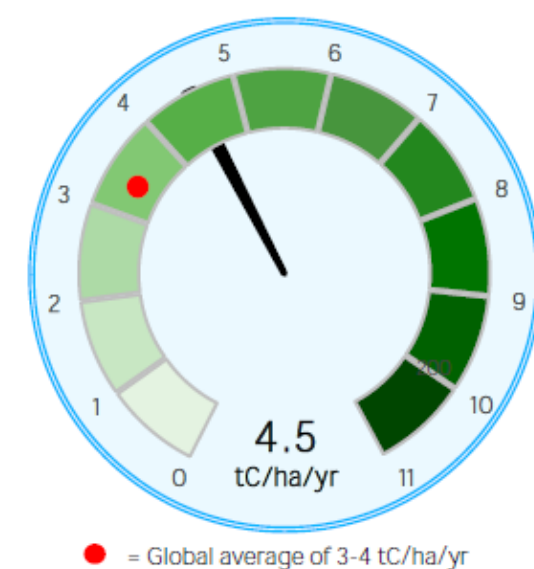


Biomass potential: net primary production

Ghana superfiery = 238 000 km<sup>2</sup>  
(31 millions hab en 2021)

**BioEnergy potential more than 3 times Primary Energy Supply (2019)**

0.238M km<sup>2</sup>\*100ha/km<sup>2</sup>\*4.5tC/ha/yr  
100 millions tC/yr bio  
40 millions toe/yr oil  
40\*41Gj/toe=1.6 millions TJ/yr



Source Irena

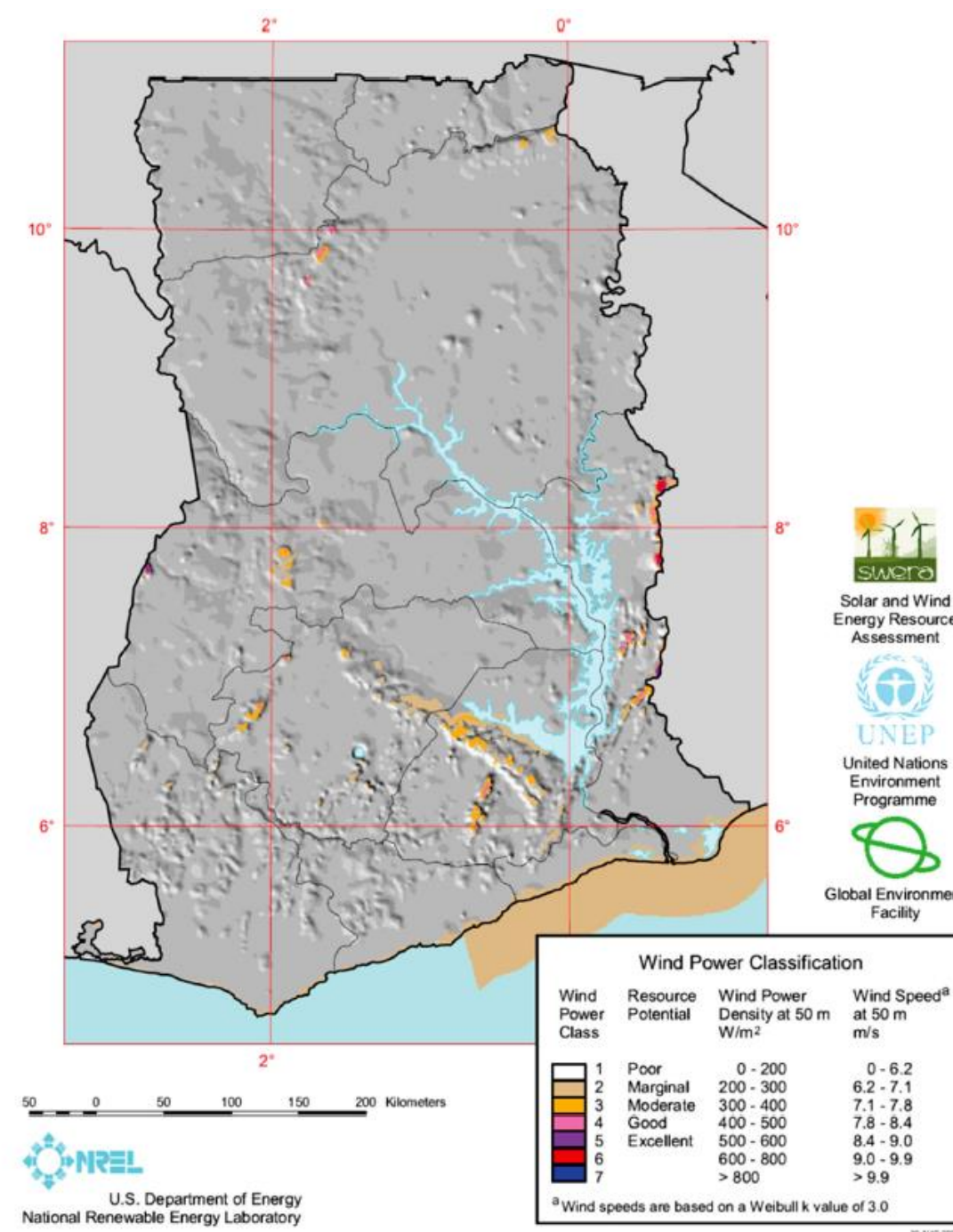


Fig. 1. Wind resource map of Ghana at 50 m [22,23].

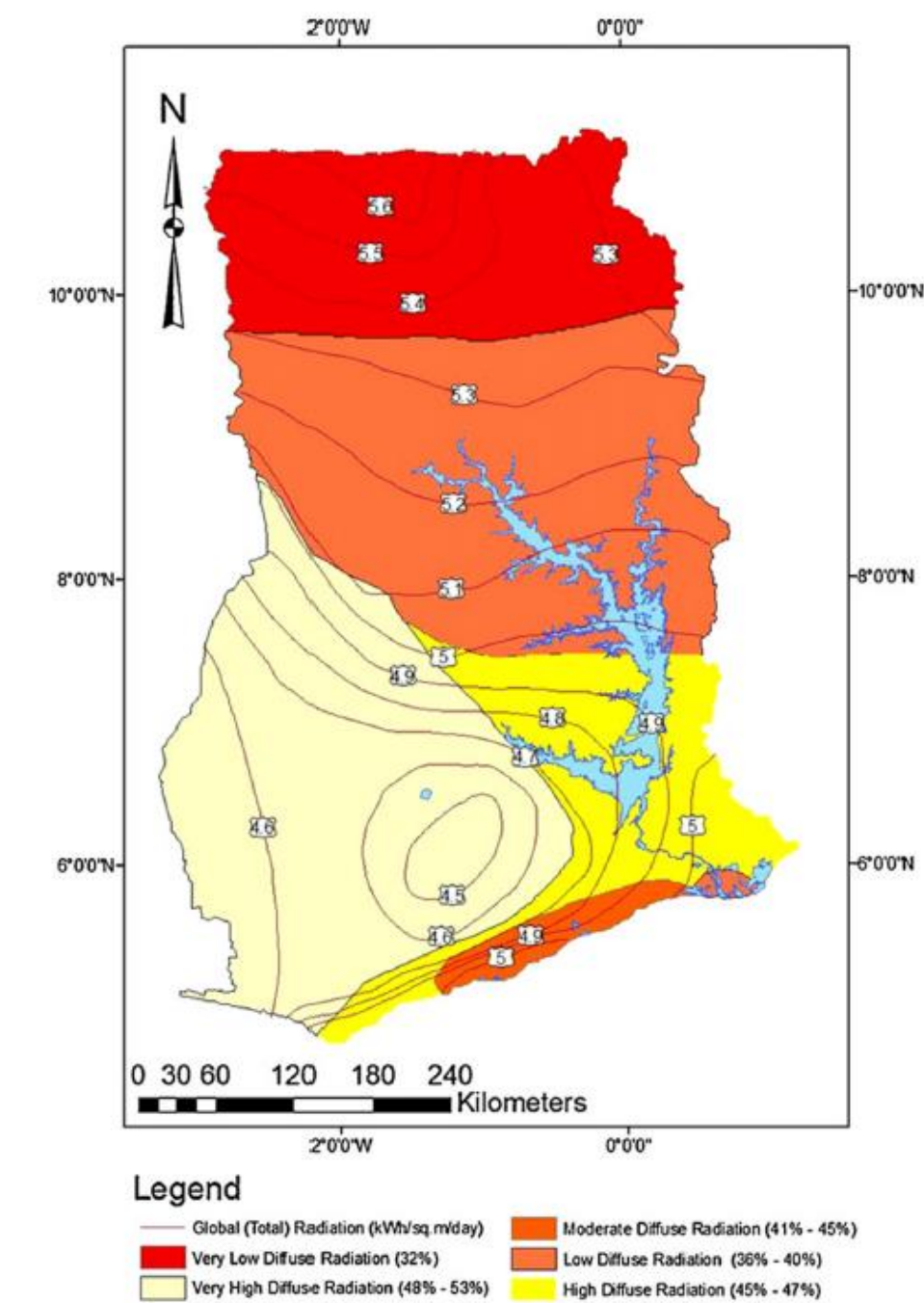


Fig. 2. Solar map of Ghana [22,30].

Source Irena



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