

Characterisation of economic and ecological advantages and challenges in development of conventional and unconventional hydrocarbon, non-hydrocarbon and renewable energy sources for resource-based economy in Kazakhstan

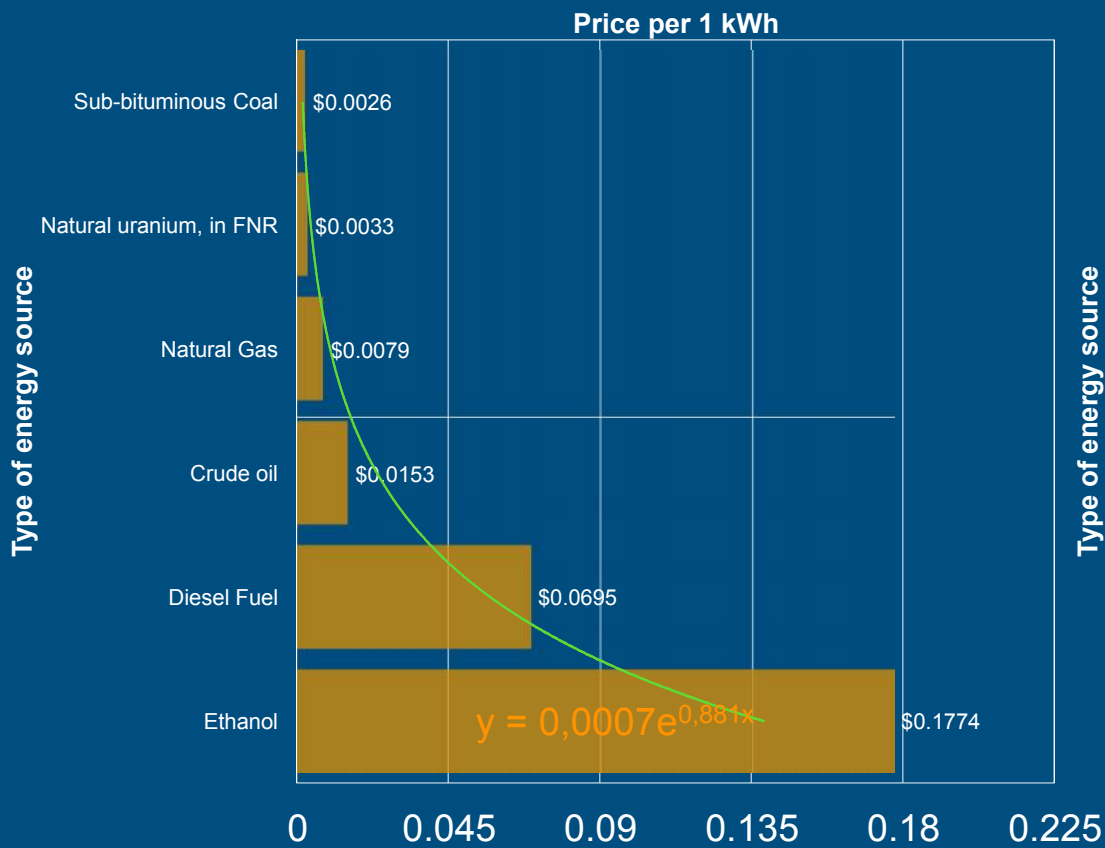
Alexander Ivakhnenko & Bakytzhan Beibarys

Methodology

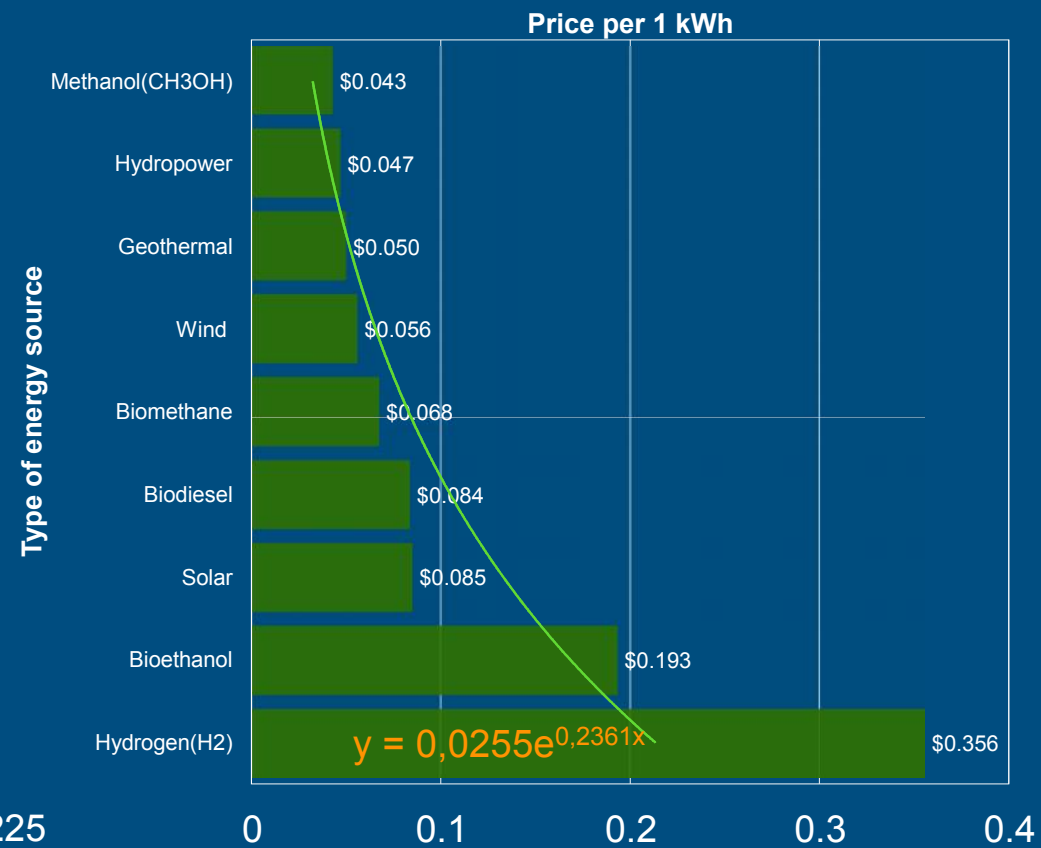
- Renewable energy sources
- Non-renewable energy sources
- Perspective of energetic sources in Kazakhstan
 - Comparison of nonrenewable and renewable energy prices
 - Converting different units to find best benchmark and optimal reference point
 - Comparison of prices between average prices in the World and in Kazakhstan
 - United formulae for nonrenewable energy



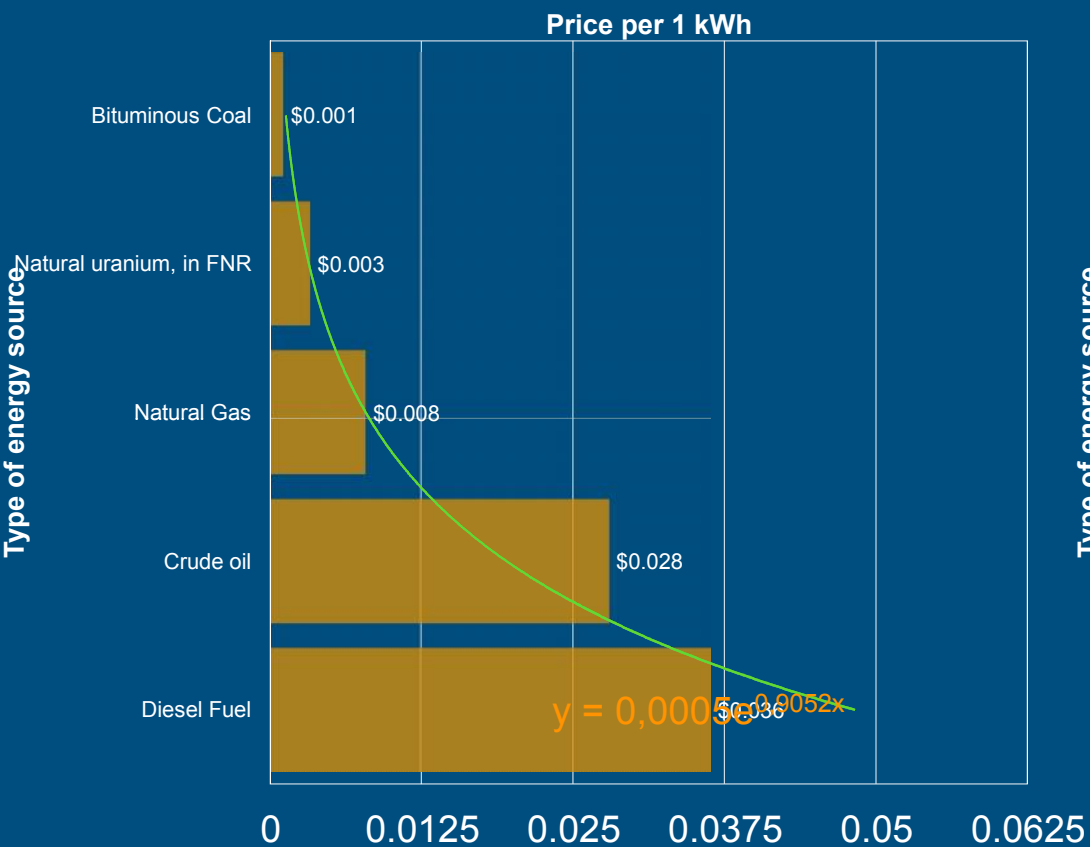
Non-renewable energy sources



Renewable energy sources



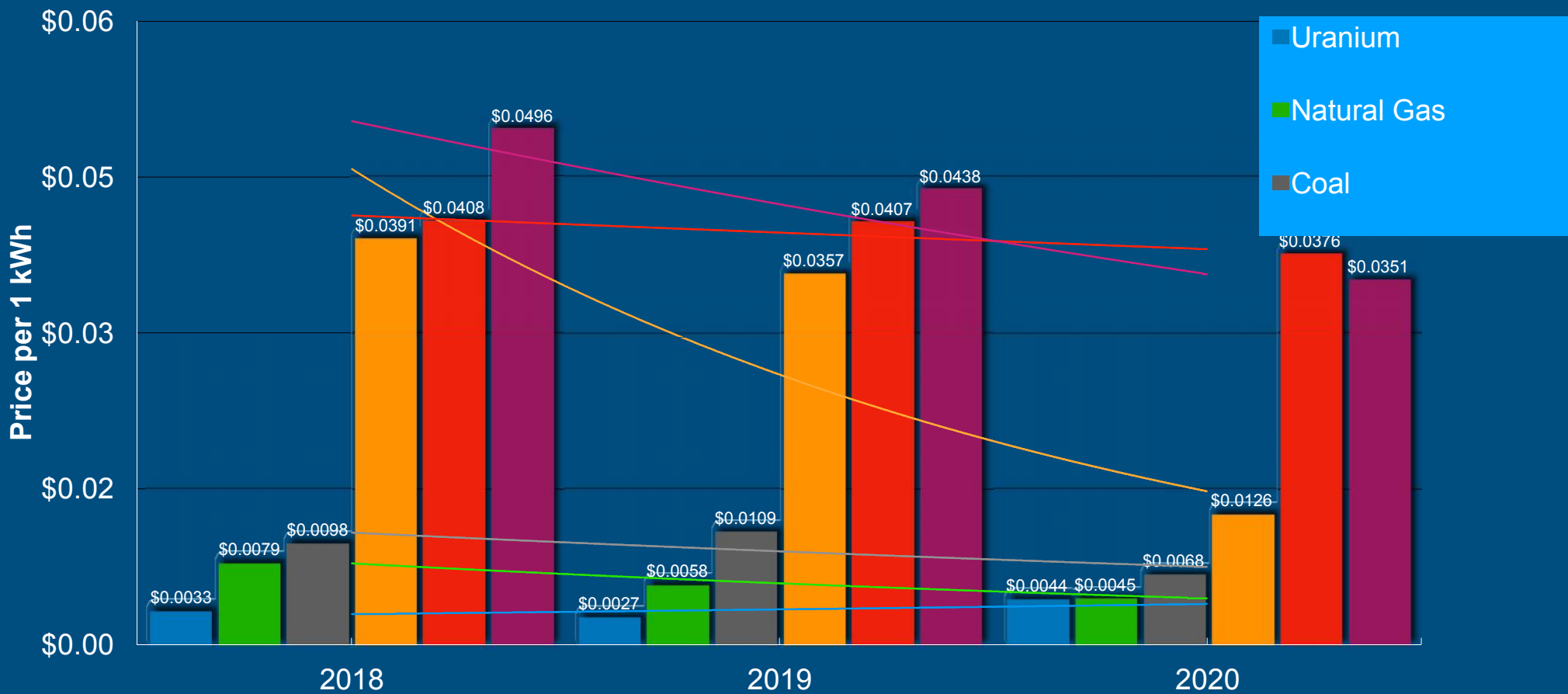
Non-renewable energy sources in Kazakhstan



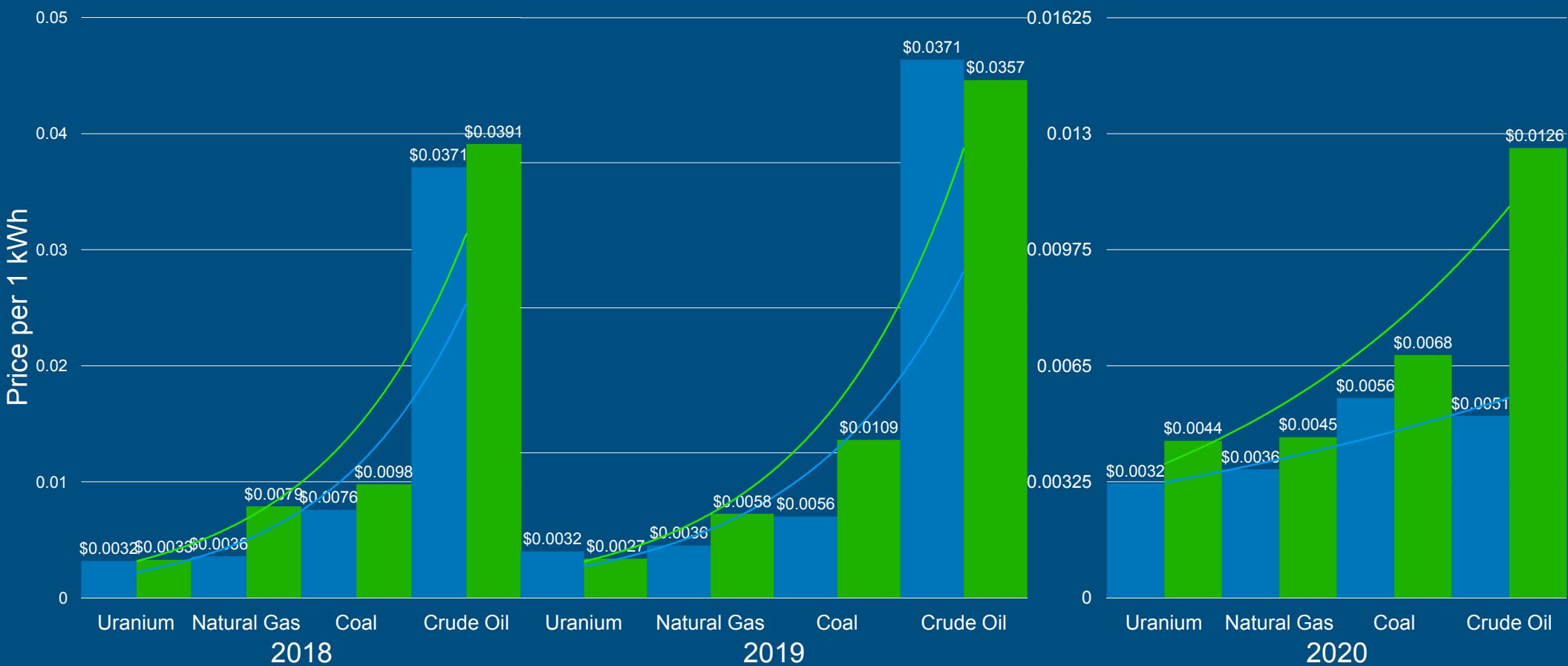
Renewable energy sources in Kazakhstan



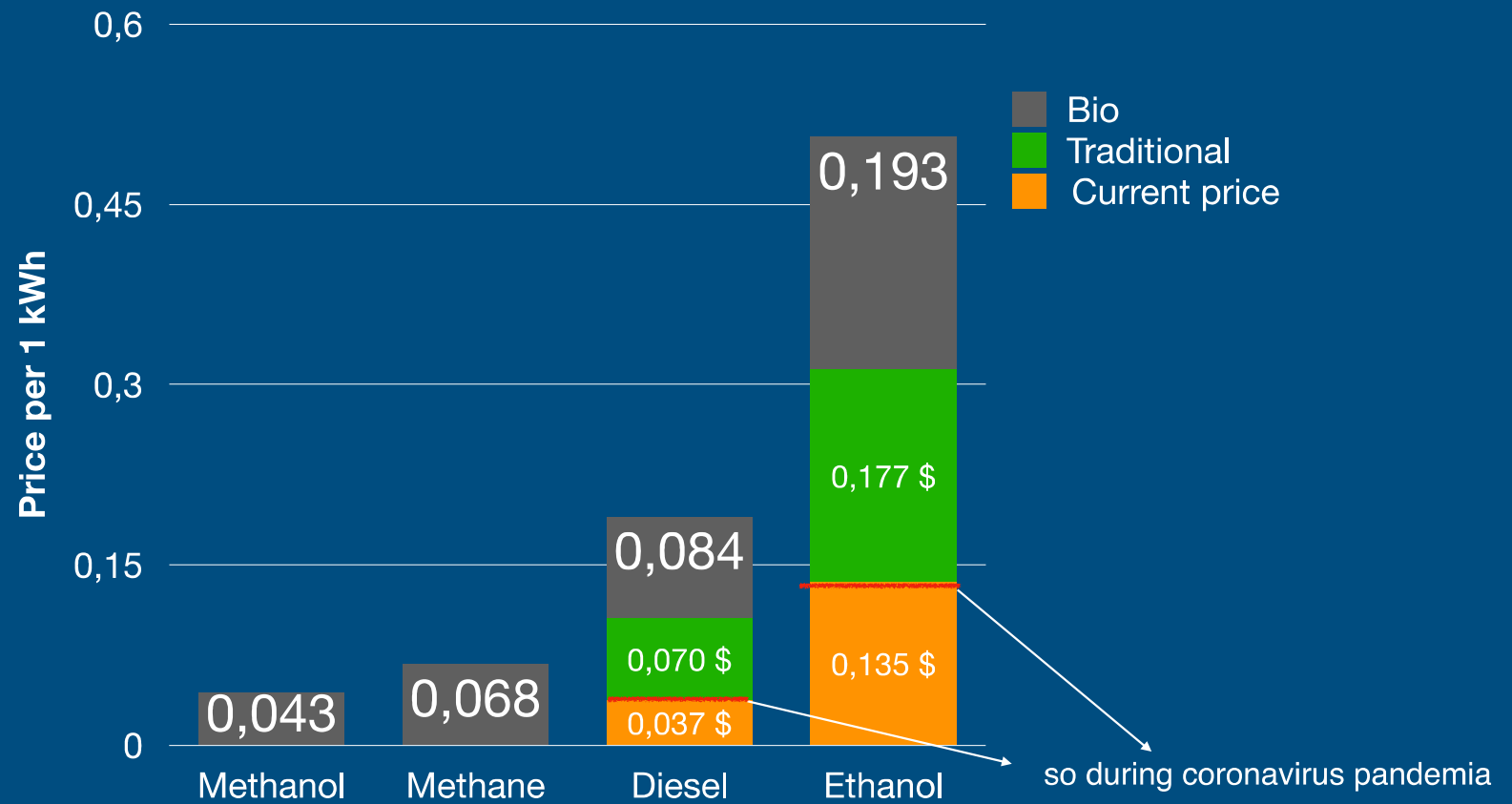
Nonrenewable energy sources in the period 2018-2020



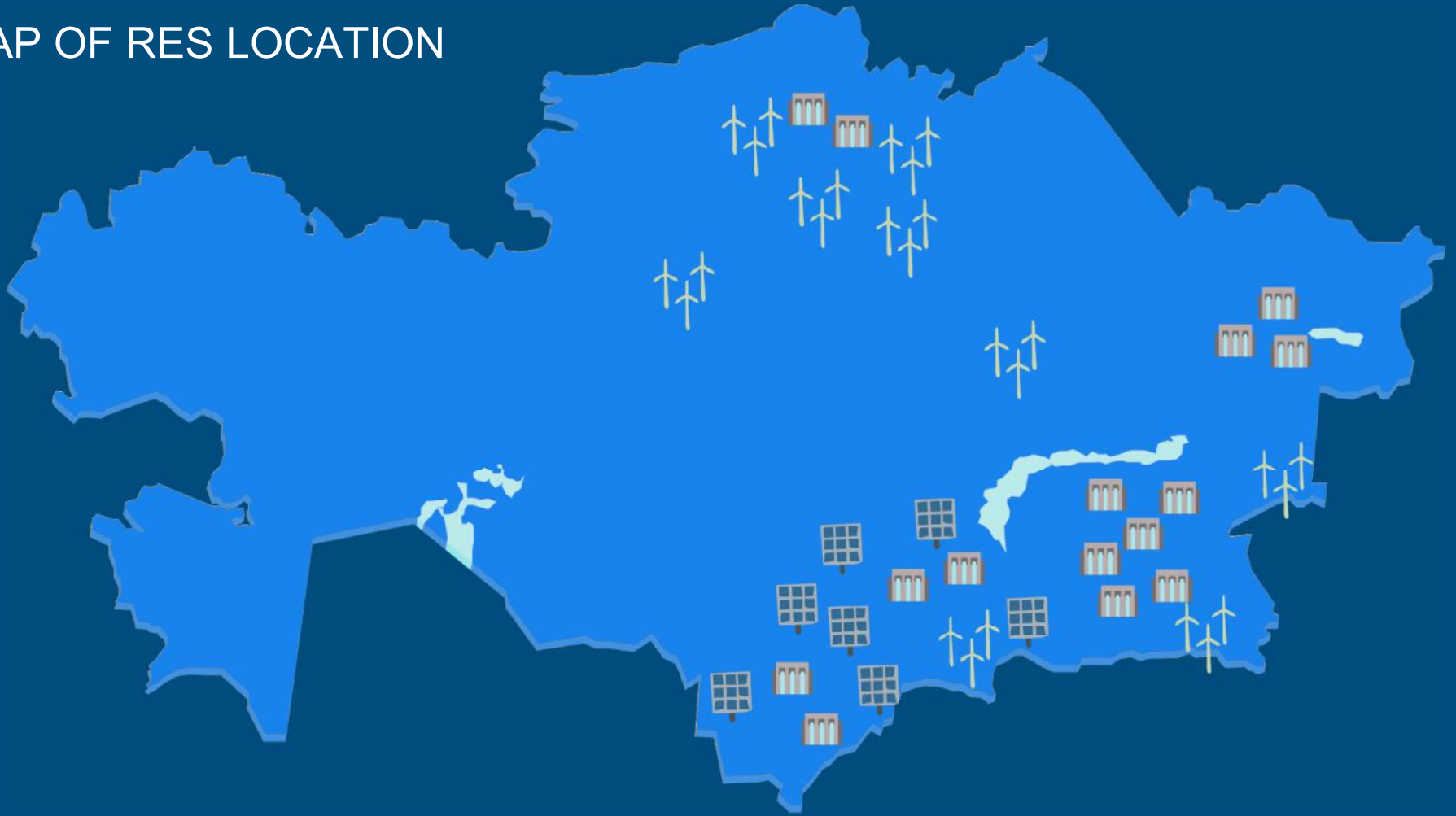
Non-renewable energy sources between Kazakhstan and World prices



Prices of traditional and biofuel



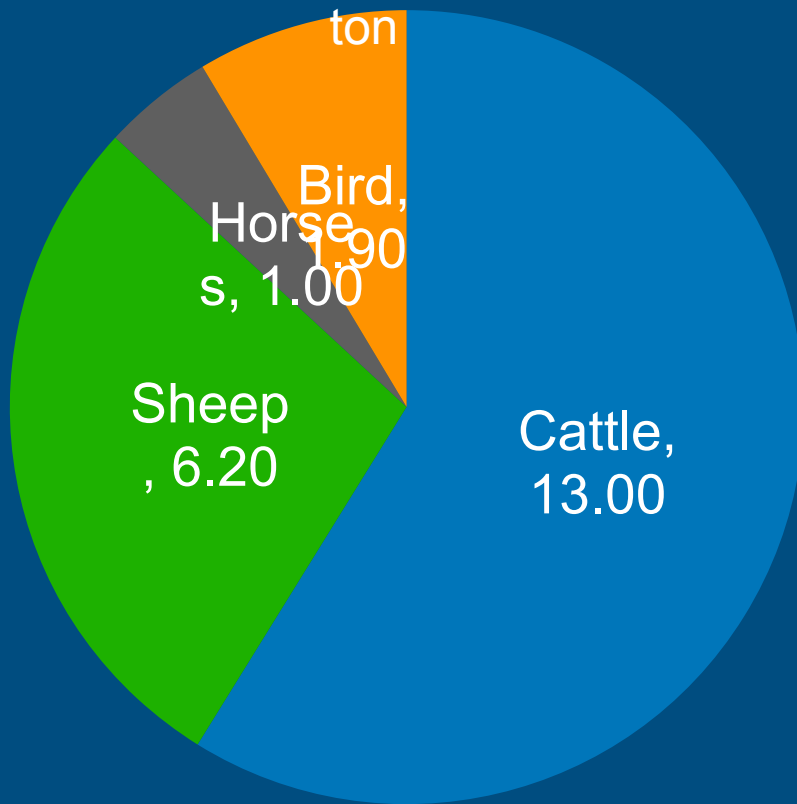
MAP OF RES LOCATION



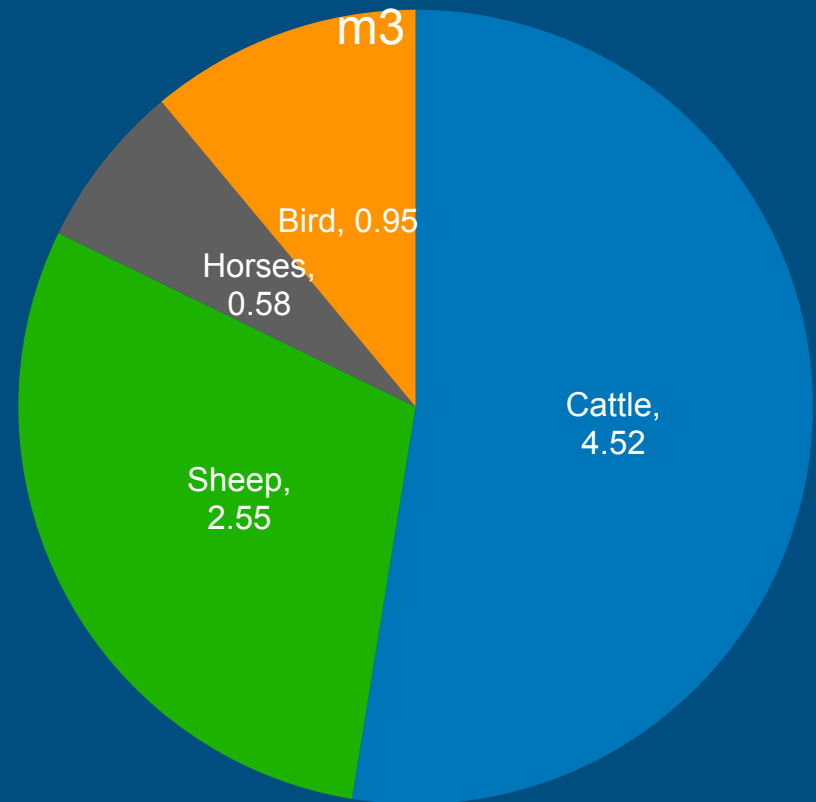
NOT TO SCALE

Potential of biogas (animals) per year

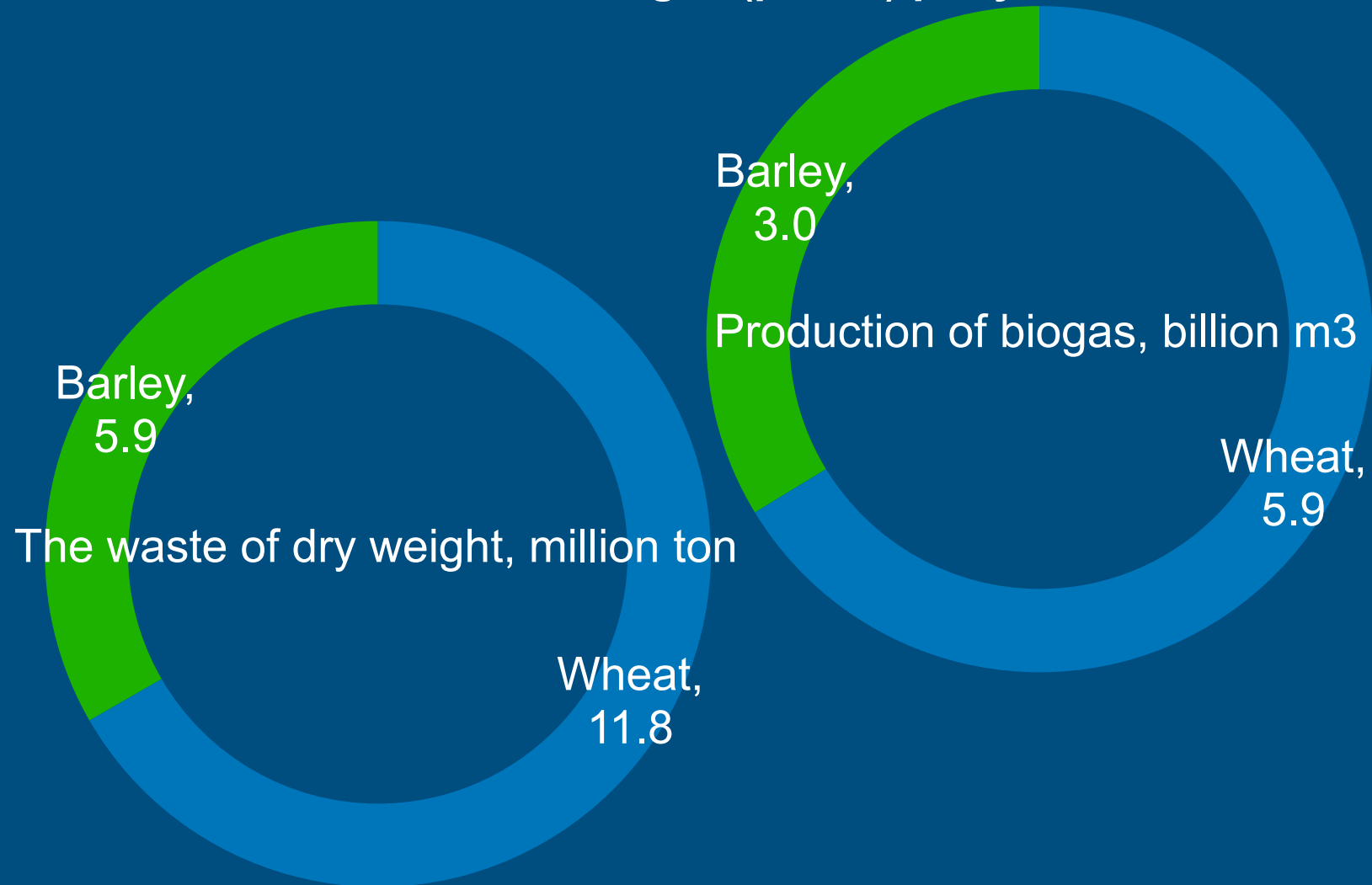
The waste of dry weight, million ton



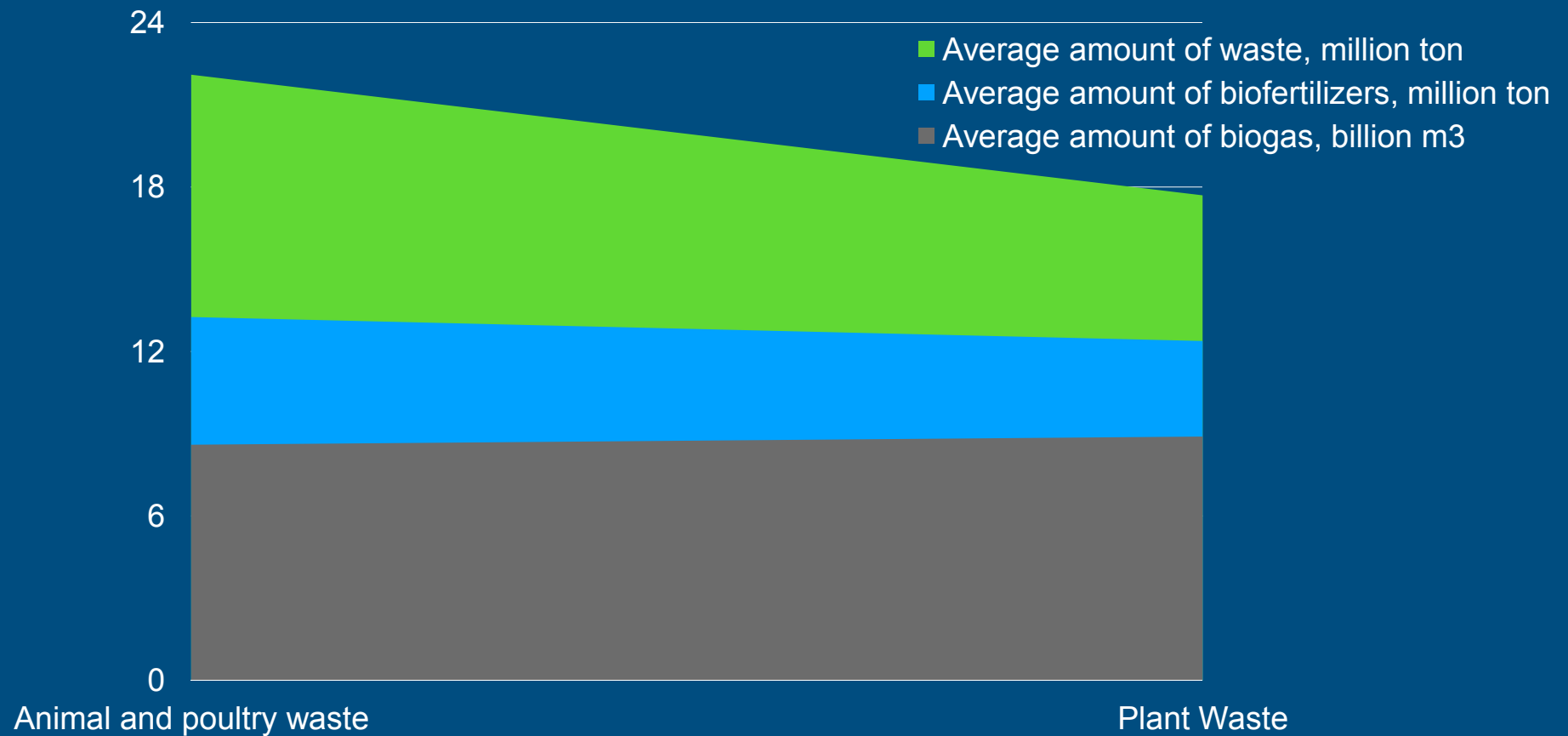
Production of biogas, billion m³



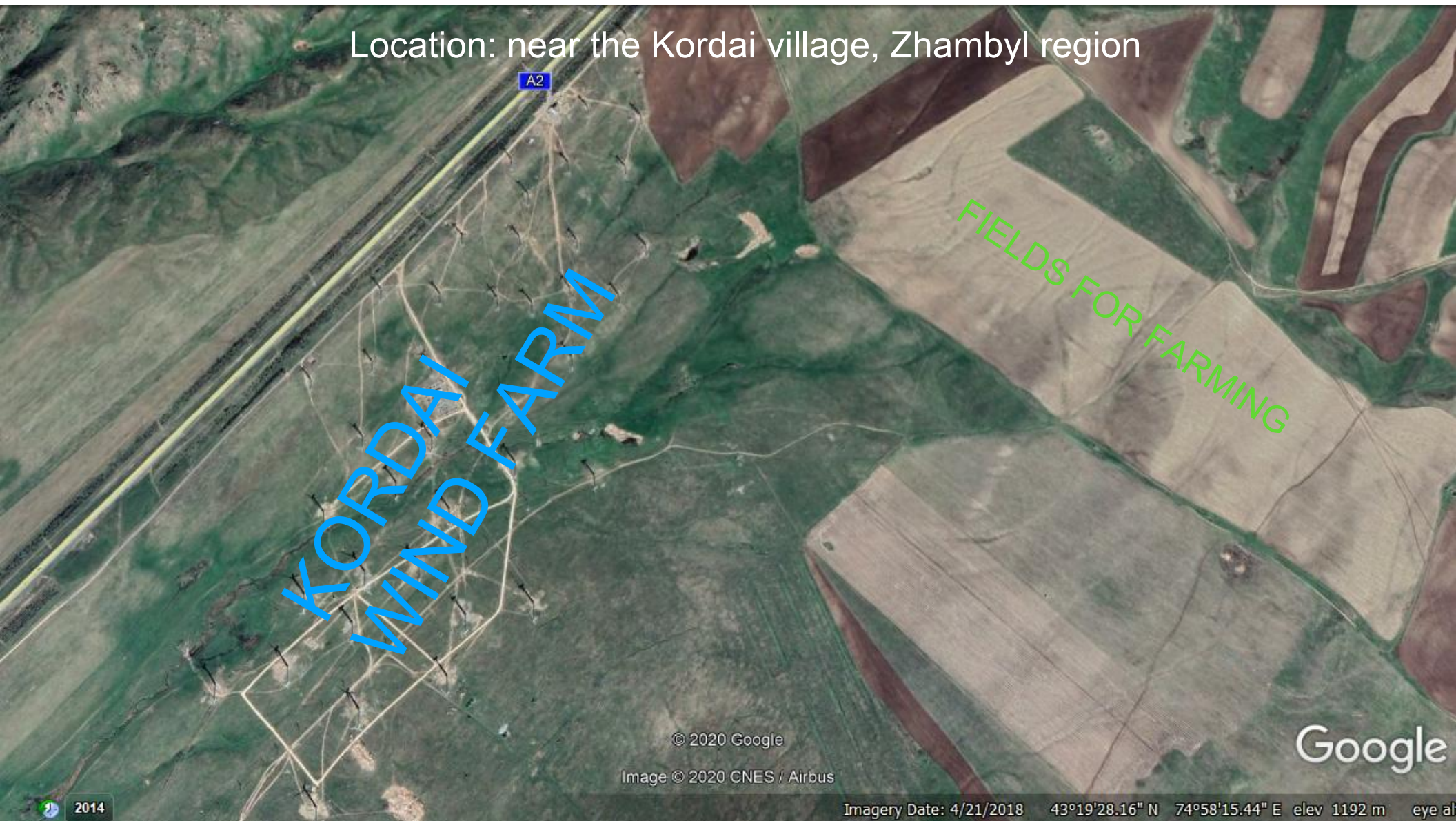
Potential of biogas (plants) per year



Average annual output of biogas and fertilizers



Location: near the Kordai village, Zhambyl region



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Image © 2020 CNES / Airbus

Google

2014

Imagery Date: 4/21/2018 43°19'28.16" N 74°58'15.44" E elev 1192 m eye alt



FIELDS FOR FARMING

BURNOE SOLAR POWER PLANT - 1

A2

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Image © 2020 CNES / Airbus

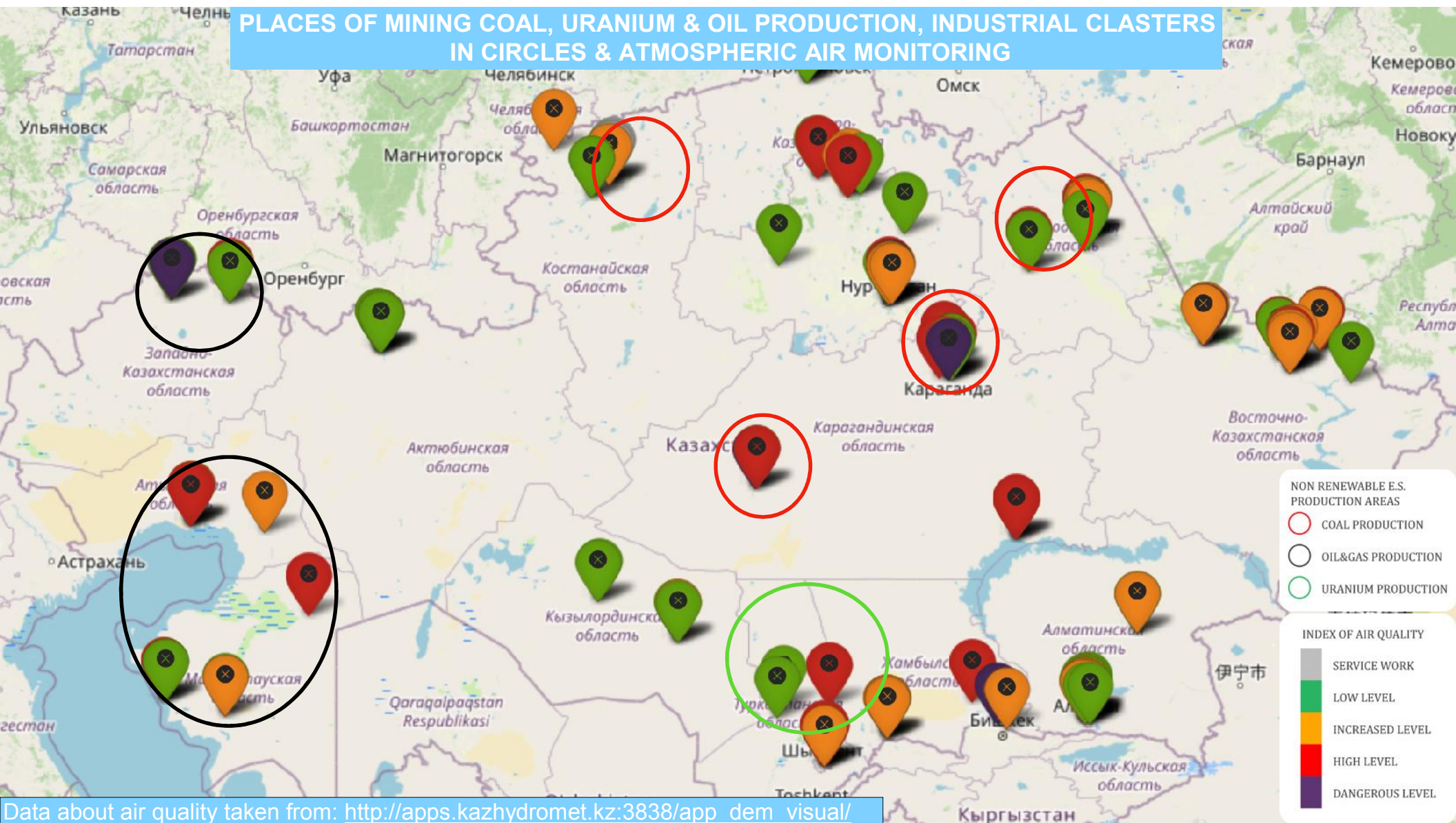
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2013

42°43'15.11" N 70°52'19.46" E elev 963 m eye alt

PLACES OF MINING COAL, URANIUM & OIL PRODUCTION, INDUSTRIAL CLUSTERS IN CIRCLES & ATMOSPHERIC AIR MONITORING



Data about air quality taken from: http://apps.kazhydromet.kz:3838/app_dem_visual/

Conclusions & Insights I

- Kazakhstan resource-based economy in transition for Sustainable Development Goals (SDGs)
- Attractive still remains cheapest energy sources coal, natural gas & oil – even more so during coronavirus pandemic.
- To low GHG emissions most attractive to development of full nuclear cycle. Kazakhstan ranks the 1st in Uranium (U) production, 21.6 thousand tons in 2018 & the 2nd in U reserves. Concerns: adverse risks and ecology of the waste with available waste storage capacity (Semipalatinsk nuclear reservation)
- Remains and grow cheapest renewable energy source (RES) in Kazakhstan is traditional hydropower

Conclusions & Insights II

- Great potential in solar and wind, so both wind and especially solar still expensive. Trends for expansion
- Great potential in biofuel production, but most expensive and subdued due to LCE available cheap resources. Attractive to utilize for efficiency SDGs
- According LCE, SDGs are bring the share of renewable energy in electricity generation to 3% by 2020, rising to 30% by 2030 & 50% by 2050. Trend is expanding amount of RES stations in Kazakhstan.
- SDGs challenges are in balancing the cheap and resourceful HCE potential versus ecological advantage and government policy trends for LCE, especially in highly populated areas. The former is dominant that objectively not easy to transform due to country specialization and competitive advantage