

# 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

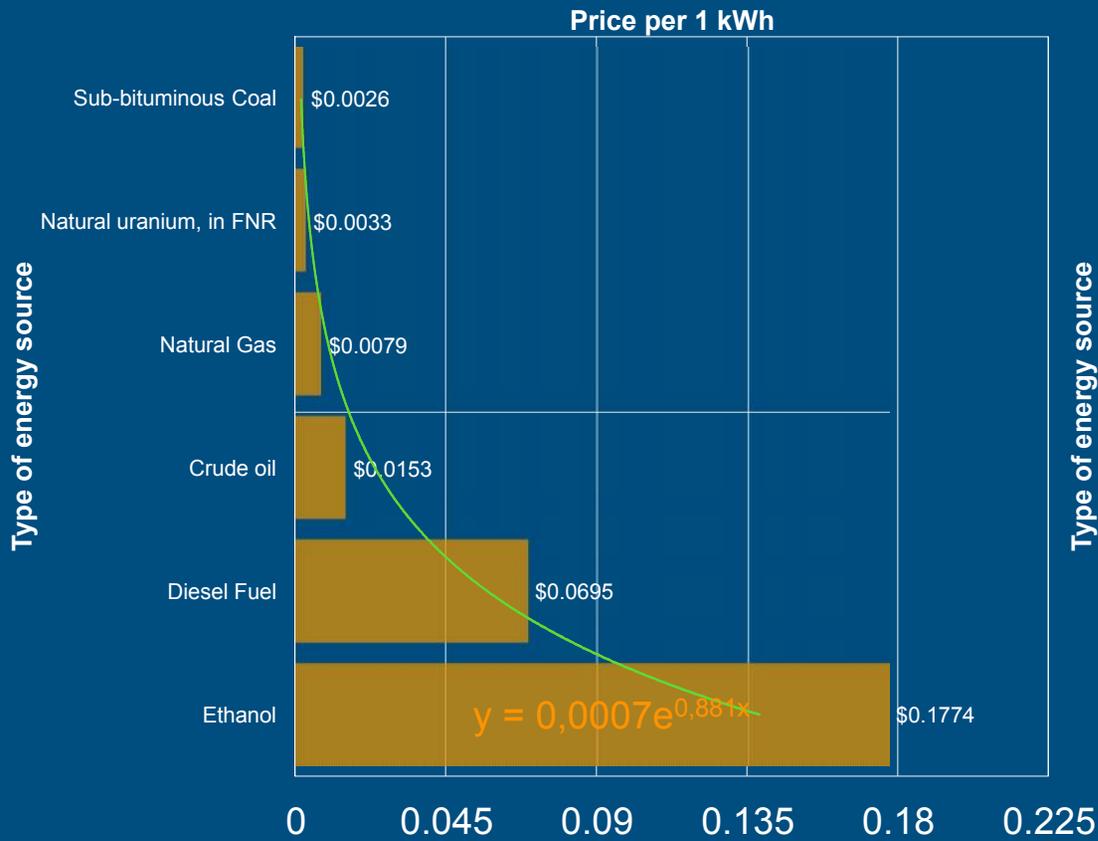
Alexander Ivakhnenko & Bakytzhan Beibarys

## Methodology

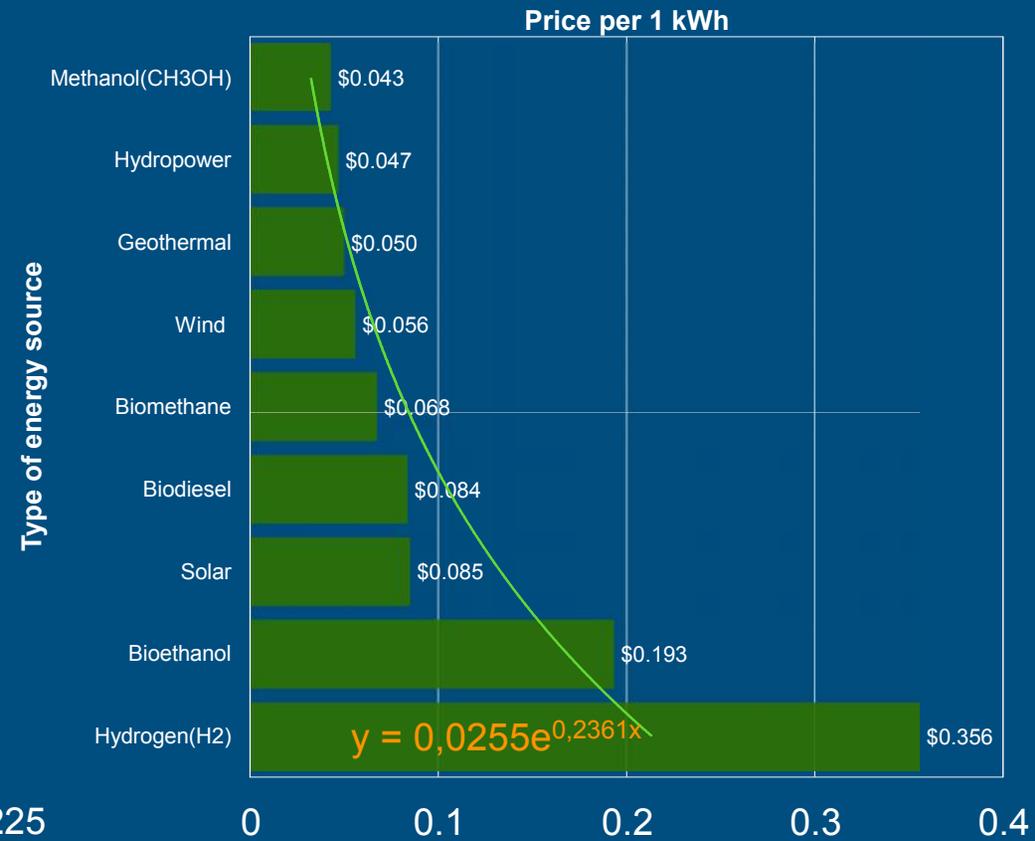
- Renewable energy sources
- Non-renewable energy sources
- Perspective of energetic sources in Kazakhstan
- Comparison of nonrenewable and renewable energy prices
- Converting different units to find best benchmark and optimal reference point
- Comparison of prices between average prices in the World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



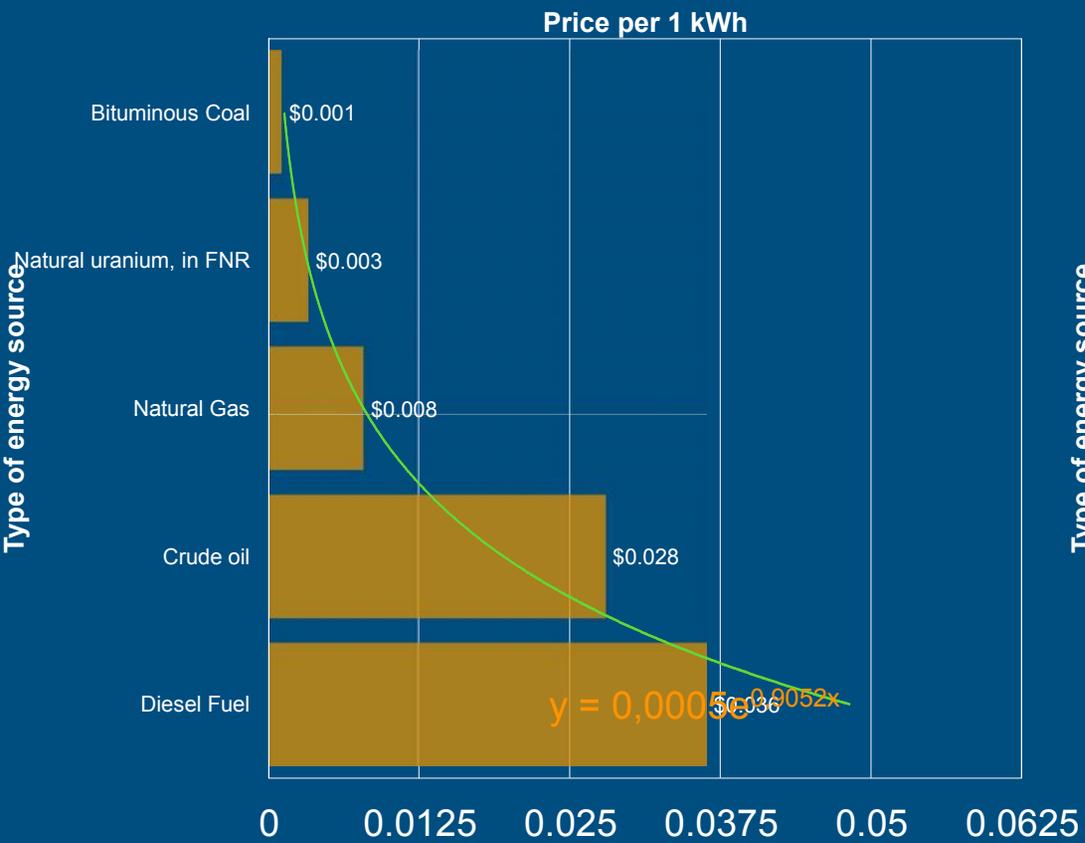
# Non-renewable energy sources



# Renewable energy sources



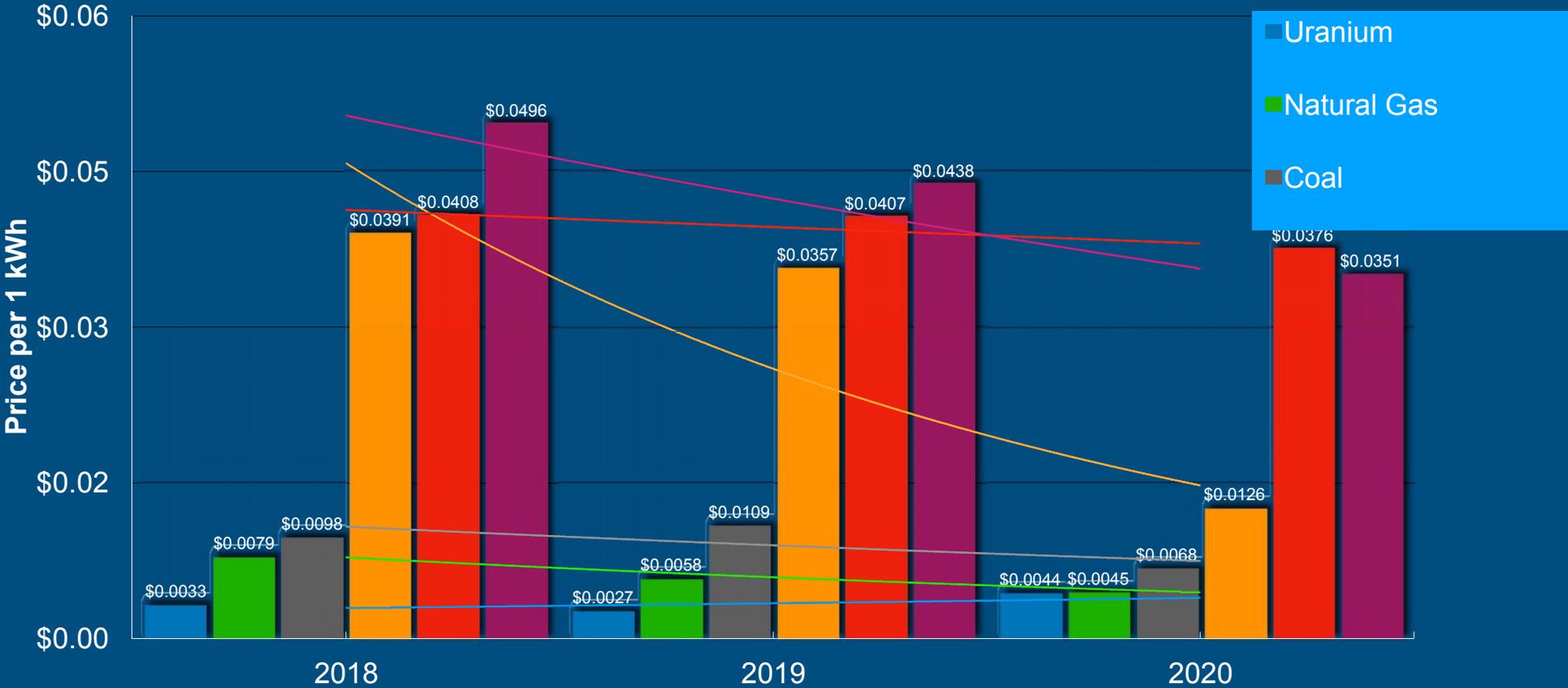
# Non-renewable energy sources in Kazakhstan



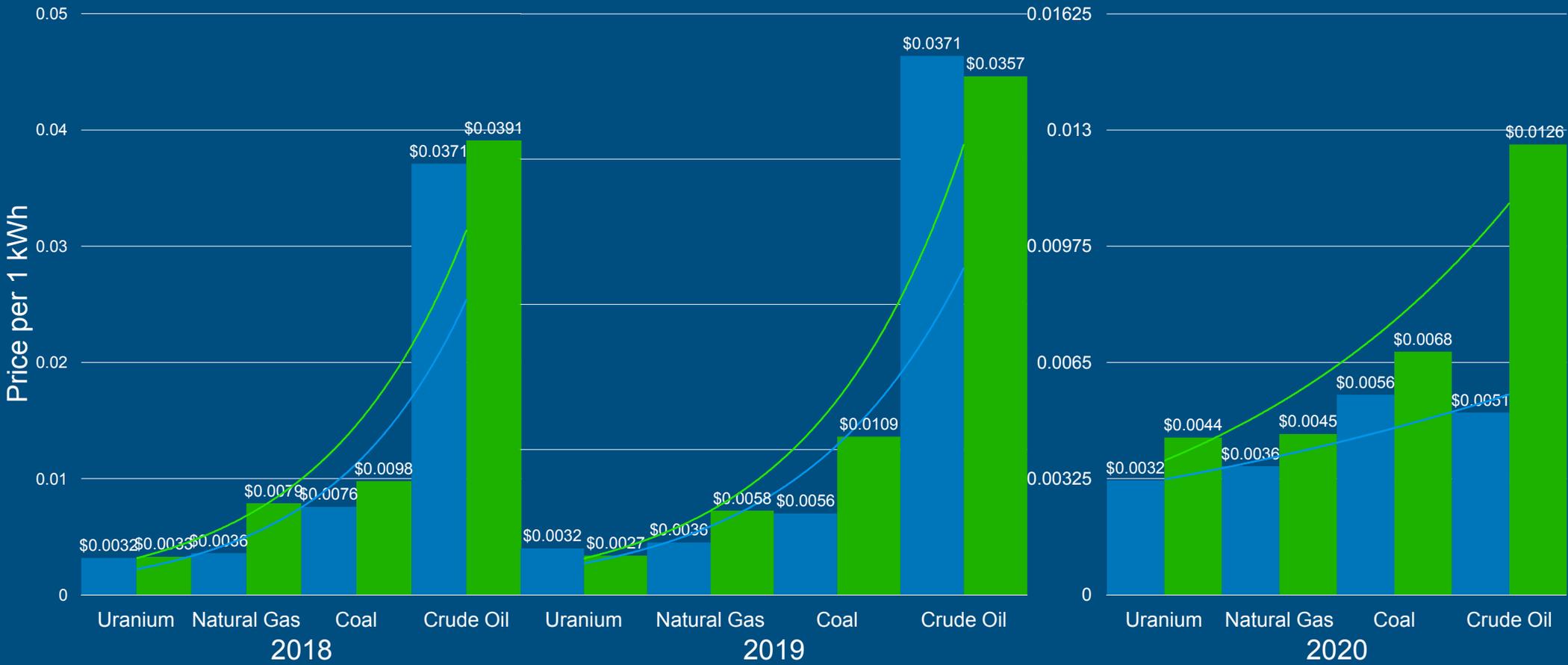
# Renewable energy sources in Kazakhstan



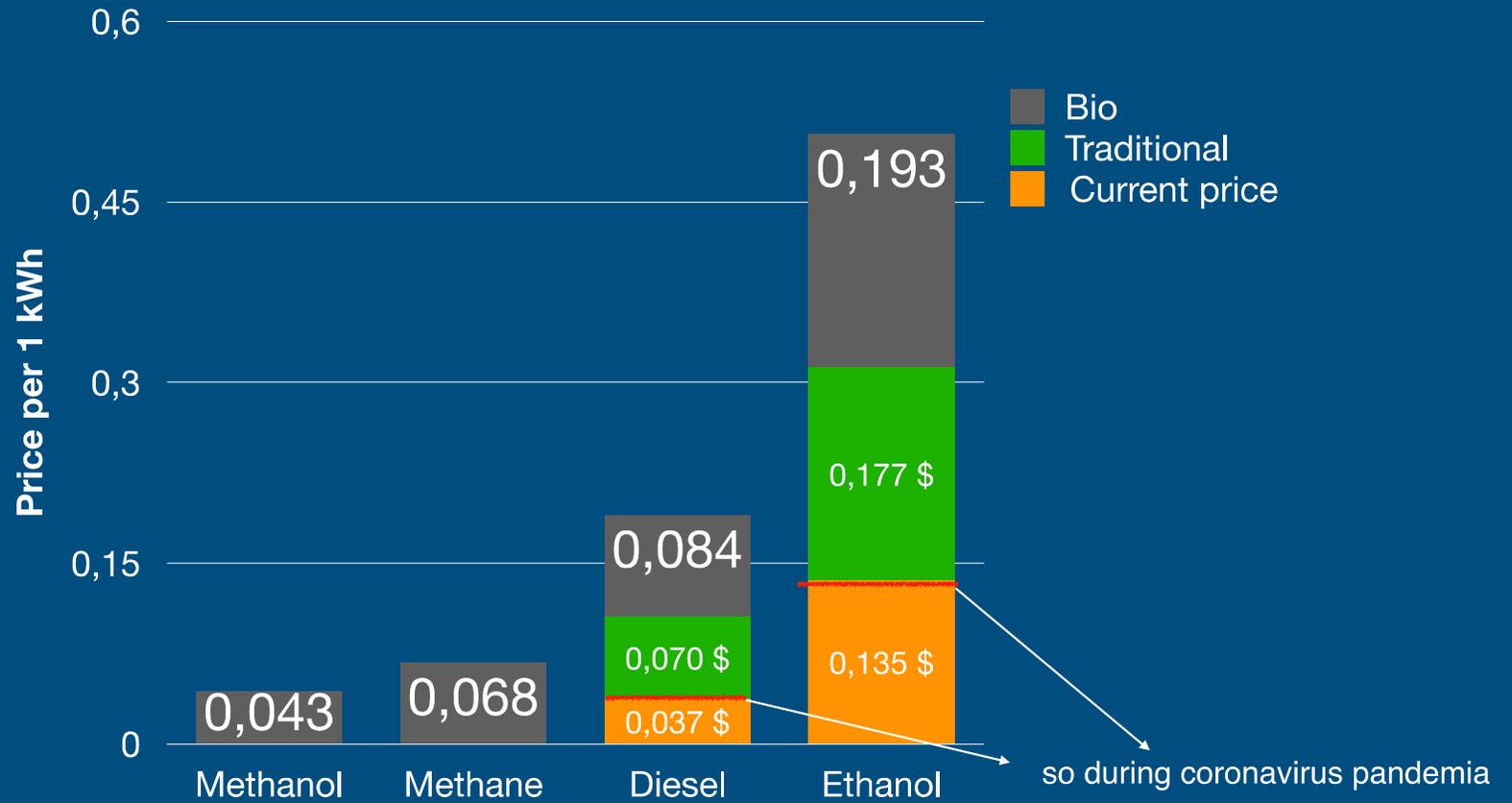
# Nonrenewable energy sources in the period 2018-2020



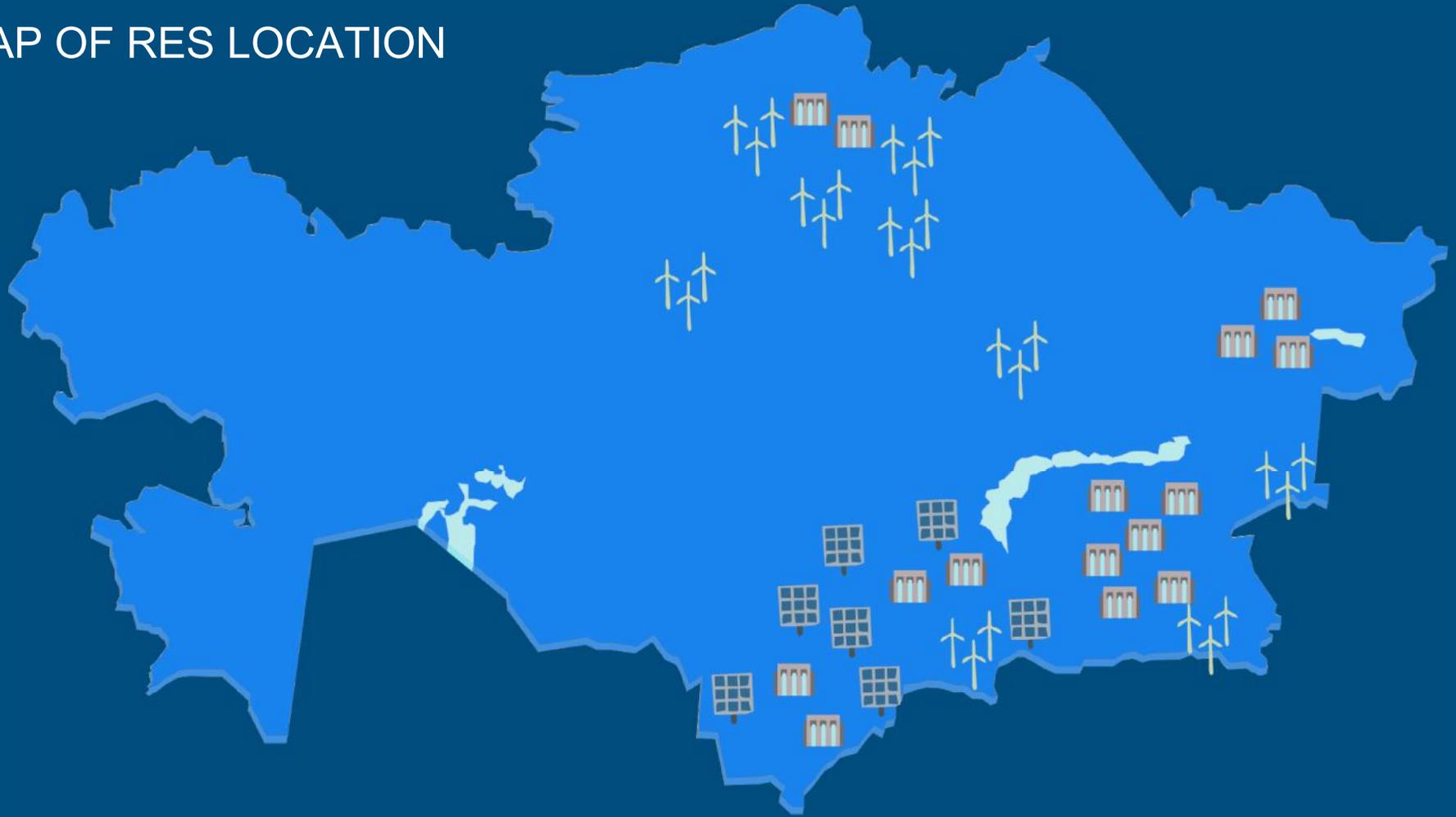
# Non-renewable energy sources between Kazakhstan and World prices



## Prices of traditional and biofuel



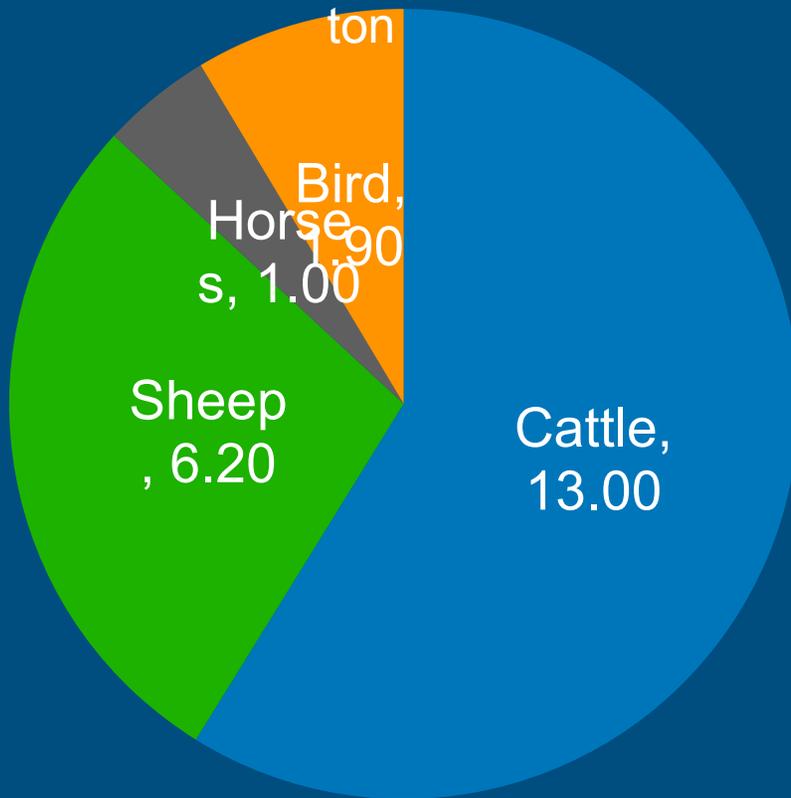
# MAP OF RES LOCATION



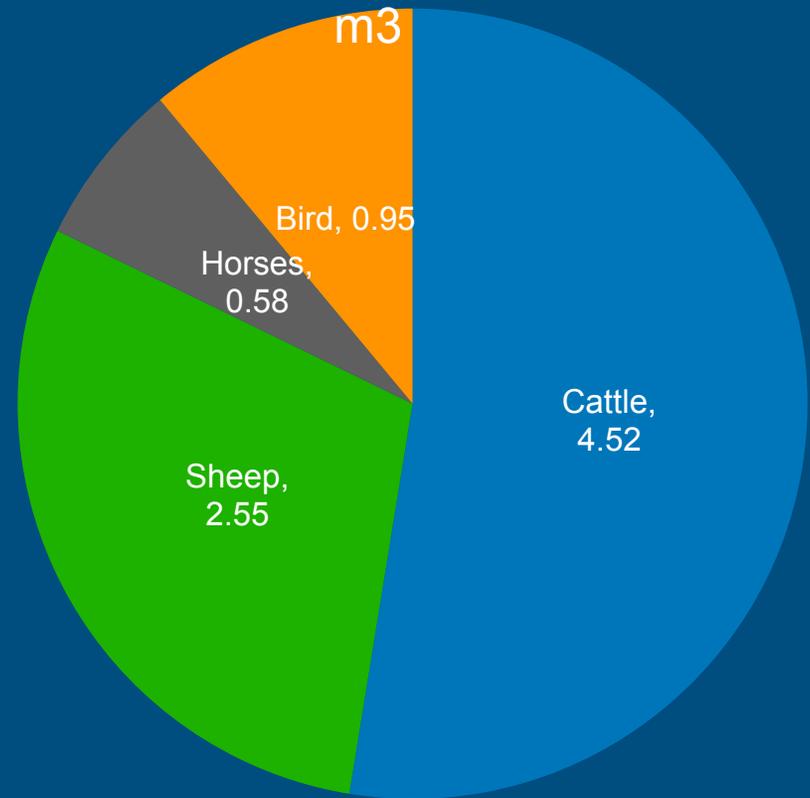
NOT TO SCALE

## Potential of biogas (animals) per year

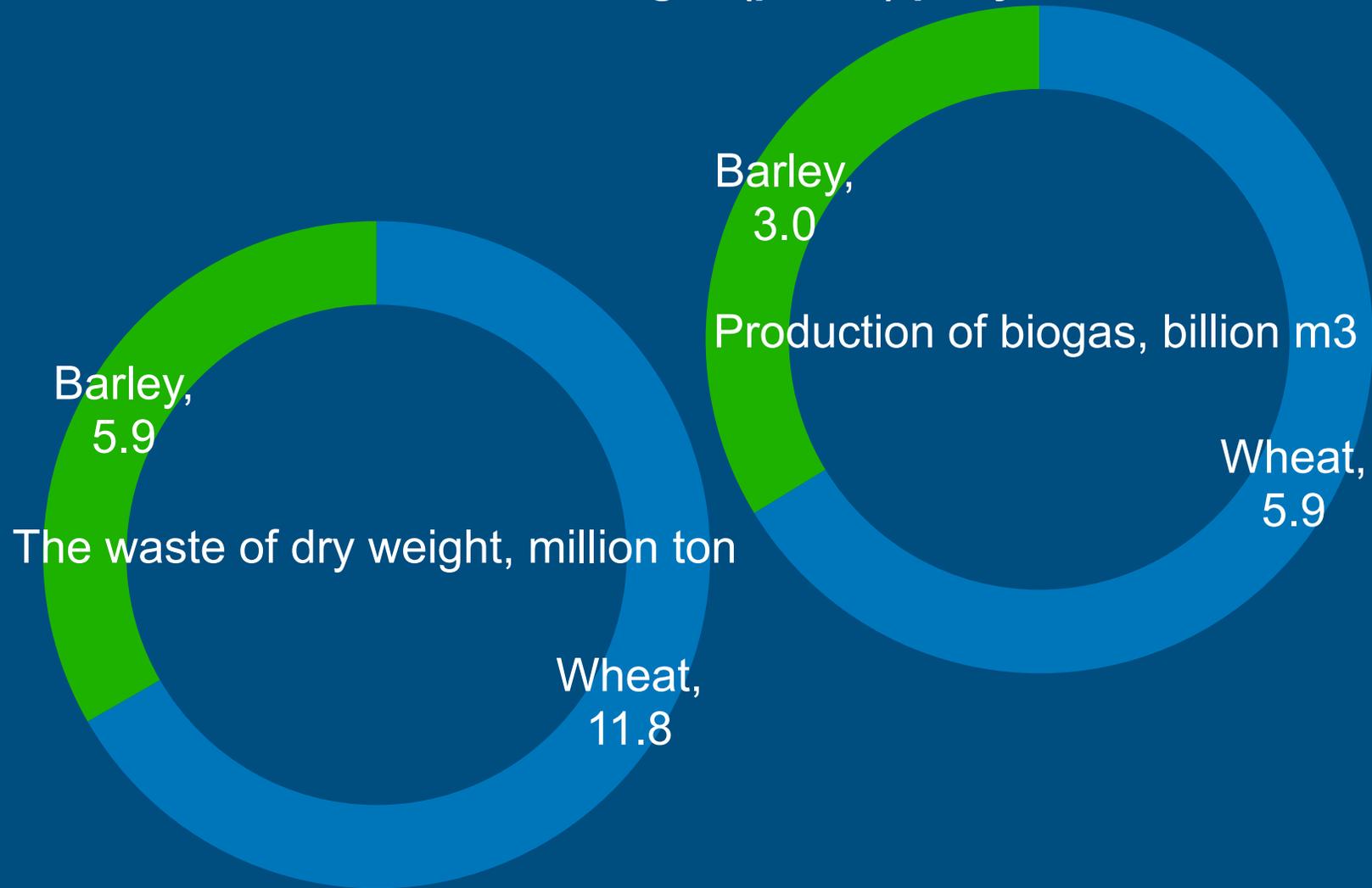
The waste of dry weight, million ton



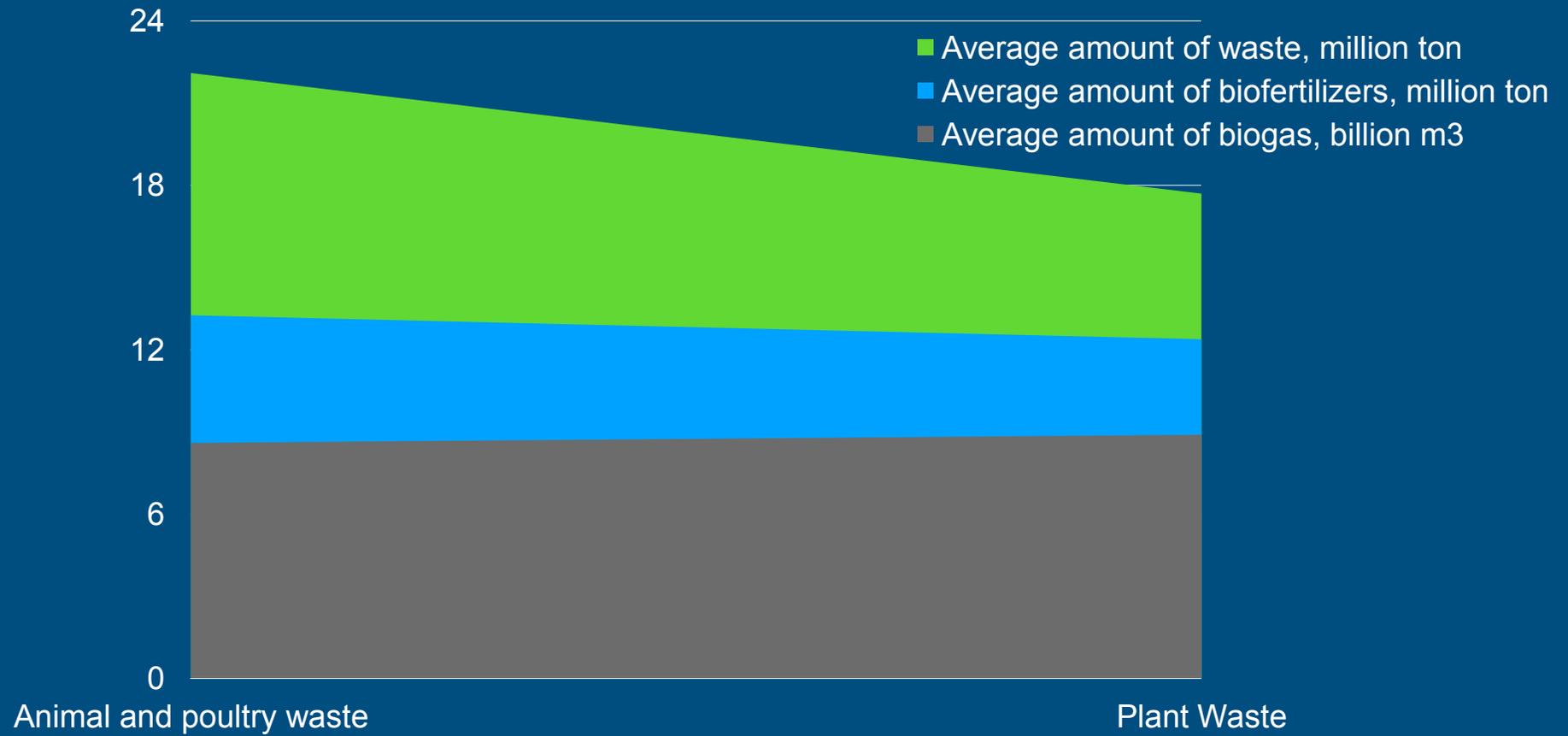
Production of biogas, billion m<sup>3</sup>



## Potential of biogas (plants) per year



## Average annual output of biogas and fertilizers



Location: near the Kordai village, Zhambyl region

A2

KORDAI  
WIND FARM

FIELDS FOR FARMING

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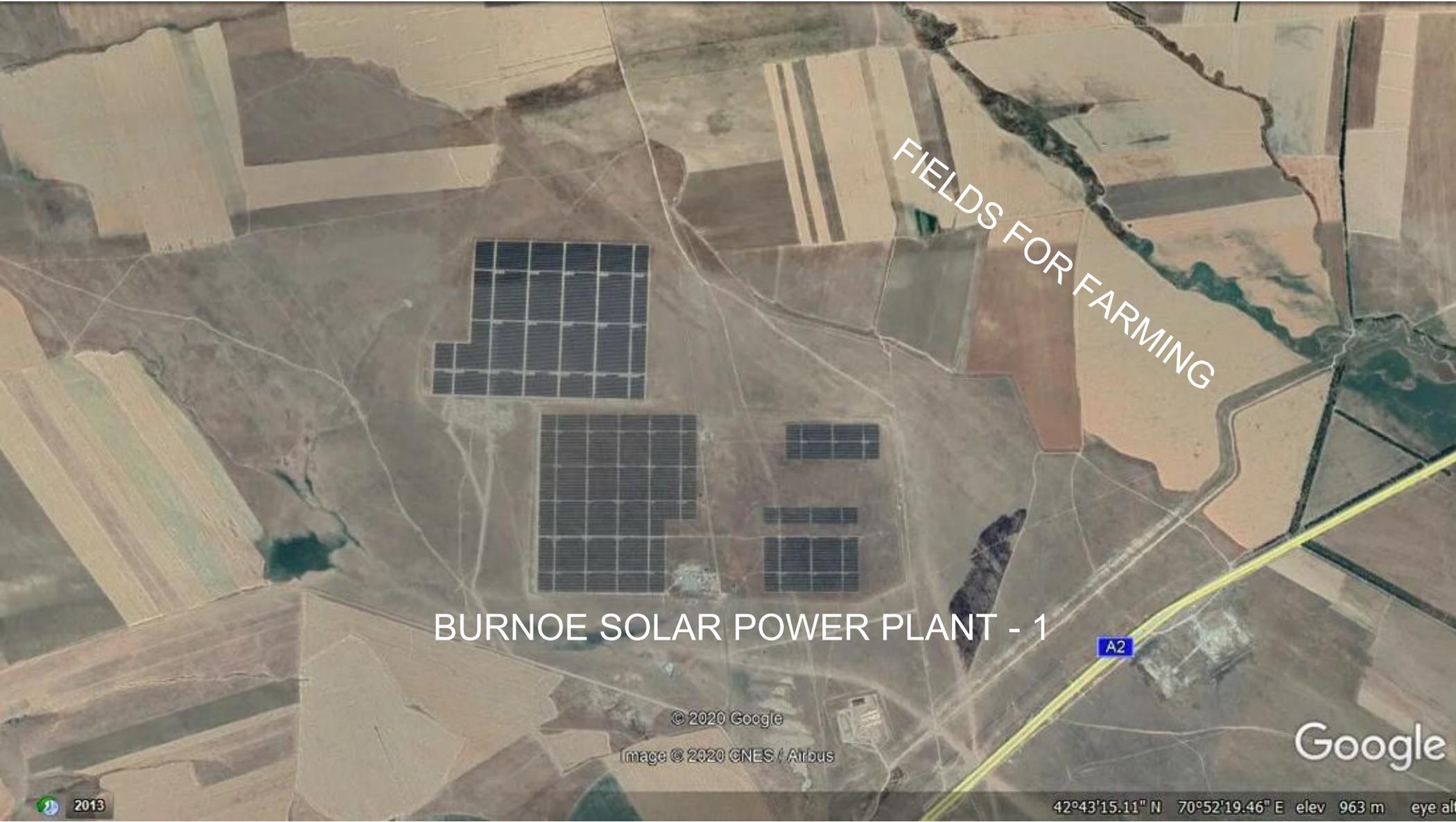
Image © 2020 CNES / Airbus

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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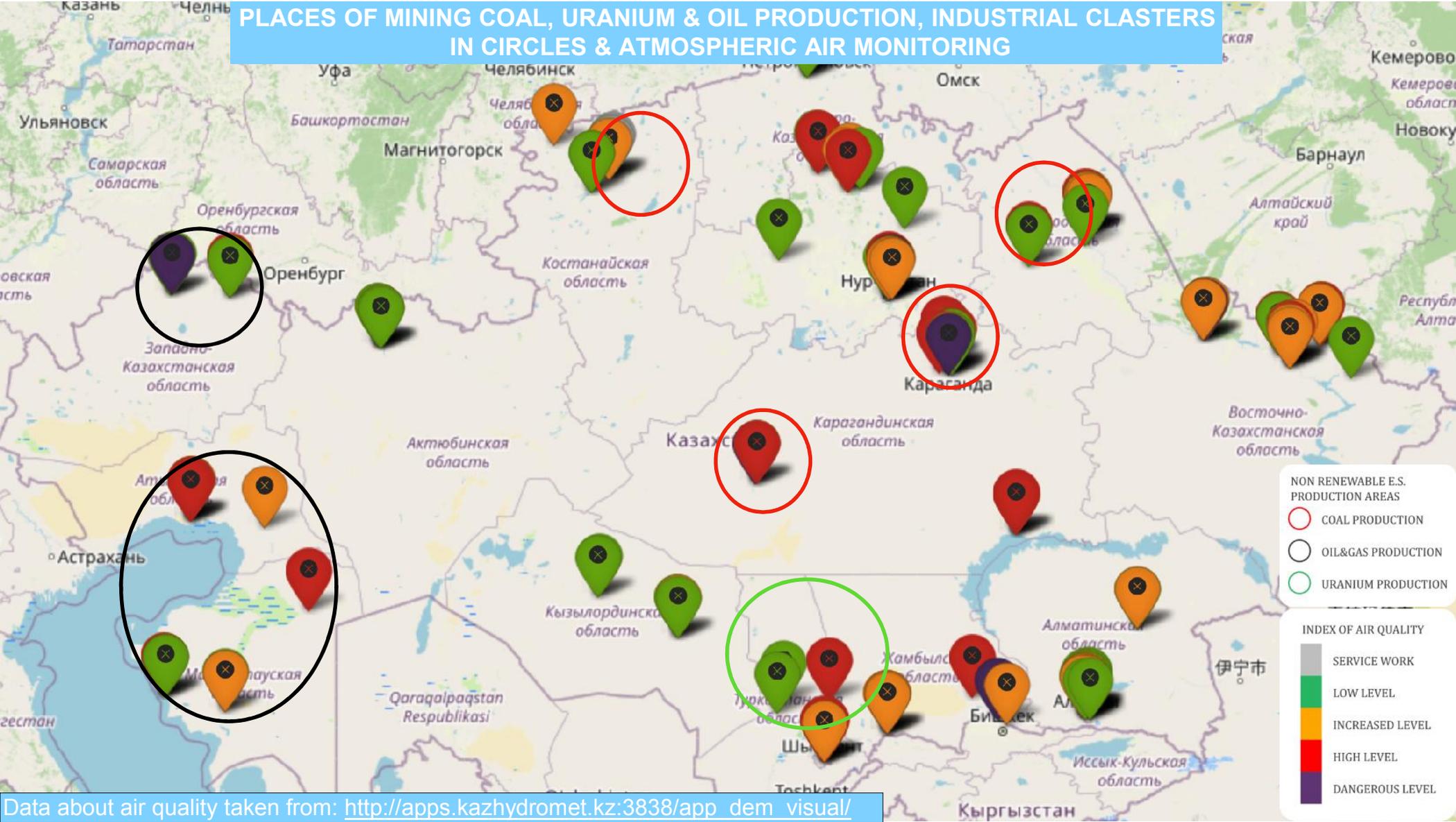
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2013

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/](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