



# 2022 DRAGON 5 SYMPOSIUM

## MID-TERM RESULTS REPORTING

17-21 OCTOBER 2022

[PROJECT ID.58894]

[SEISMIC DEFORMATION MONITORING AND  
ELECTROMAGNETISM ANOMALY DETECTION BY  
SATELLITE DATA ANALYTICS WITH PARALLEL  
COMPUTING (SMEAC)]



< Tuesday, 18/Oct/2022 >

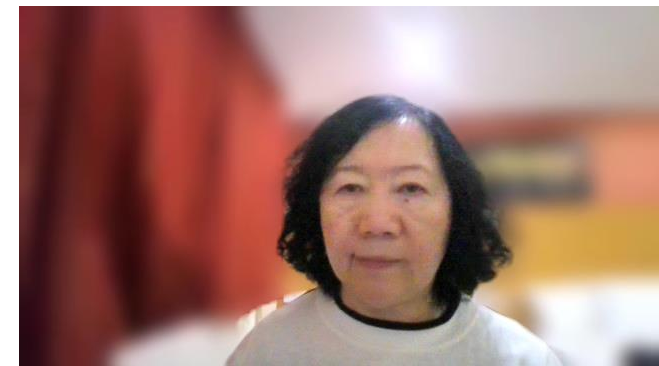
**ID. 58894**

**PROJECT TITLE: ASSESSING EFFECT OF CARBON EMISSION REDUCTION WITH INTEGRATING RENEWABLE ENERGY IN URBAN RANGE ENERGY GENERATION SYSTEMS**

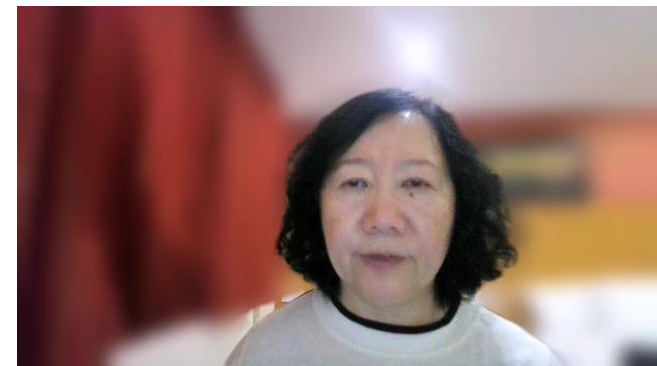
**PRINCIPAL INVESTIGATORS: [PROF MINGJUN HUANG, PROF XINGYING ZHANG]**

**CO-AUTHORS: [PROF NEIL HEWITT]**

**PRESENTED BY: [PROF MINGJUN HUANG]**

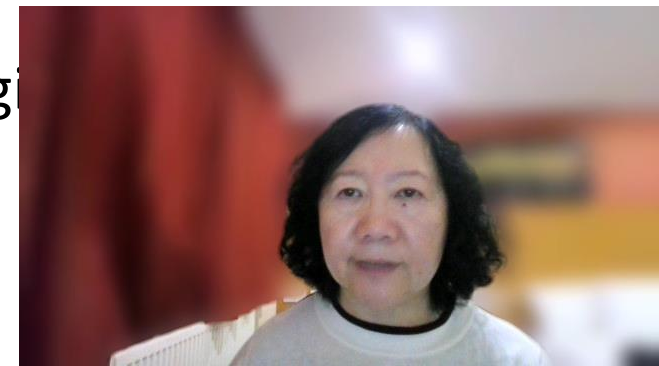


- The objectives
- Detail the Copernicus Sentinels, ESA, Chinese and ESA Third Party Mission data utilised after 2 years
- The progressed results after 2 years of activity
- The planning and achievements
- Academic exchanges





- Assess and select flux inversion systems for the project,
  - ✓ transport model used, spatial and temporal flux resolution, prior fluxes, etc. and
  - ✓ adopt two inversion modelling systems of CTE2016-FT (van der Laan-Luijkx et al., 2017) and ACTM-IEA (Saeki and Patra, 2017)
- Analyse the total renewable energy development trend in quarter and annual based  
Develop retrieve algorithms of CO<sub>2</sub> from satellite and combined measurements
  - ✓ based on 11 year renewable energy data from 2008 to 2020 cross the UK, including Wind, Shoreline wave / tidal, Solar PV, Hydro, etc
- Select CO<sub>2</sub> retrieval algorithms from existing ones, such as from NIES v02 (the National Institute for Environmental Studies, Japan), ACOS B2.10a (the NASA Atmospheric CO<sub>2</sub> Observations from Space), UoL-FP v3Gb (University of Leicester) and so forth
- Apply them and the IAPCAS algorithm developed to obtain XCO<sub>2</sub> emission from measurements by GOSAT and TanSat satellites to estimate CO<sub>2</sub> emission in the UK and regions in China.
- Provide policy makers with the evidence of CO<sub>2</sub> reduction over region integrated REs as energy suppliers.

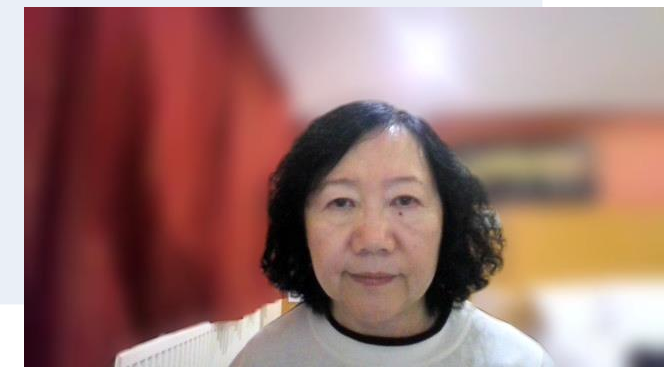


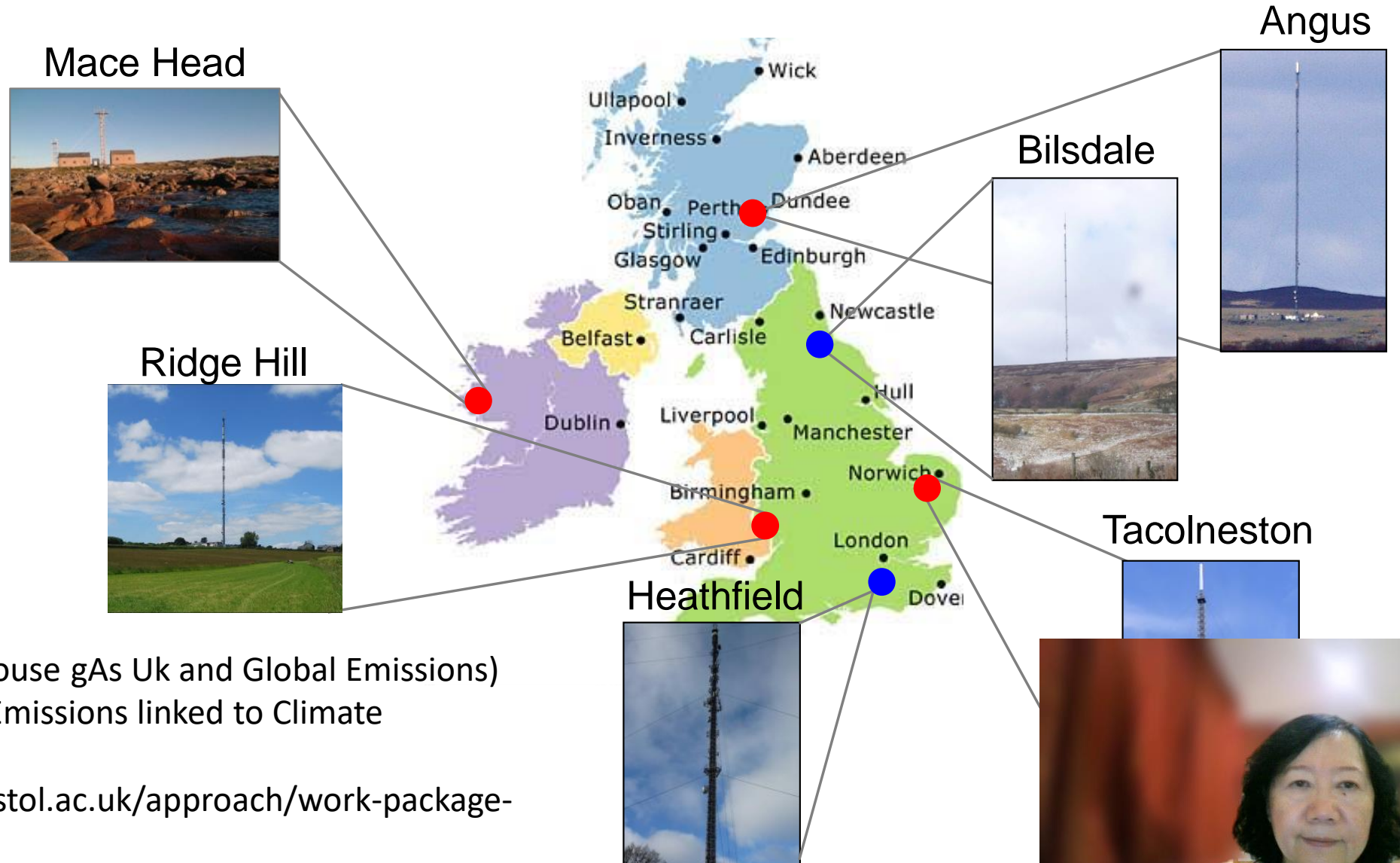




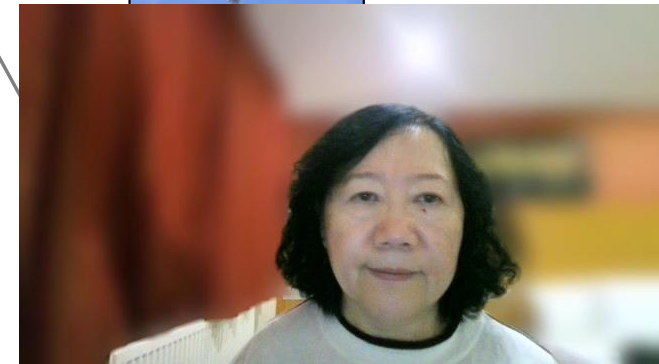
Data access (list all missions and issues if any). NB. in the tables please insert cumulative figures (since July 2020) for no. of scenes of high bit rate data (e.g. S1 100 scenes). If data delivery is low bit rate by ftp, insert “ftp”

ESA Third Party Missions	No. Scenes	ESA Third Party Missions	No. Scenes	Chinese EO data	No. Scenes
1. GOSAT, OCO2		1.Sentinel-5P Tropomi L1B, L2		1. TanSat	
2.		2. Sentinel-4 (O3, NO2, SO2, HCHO)		2.	
3.		3. Sentinel (aerosol optical depth)		3.	
4.		4. Sentinel-5 UV-VIS-NIR-SWIR L1B, L2		4.	
5.		5.		5.	
6.		6.		6.	
Total:		Total:		Total:	
Issues:		Issues:		Issues:	



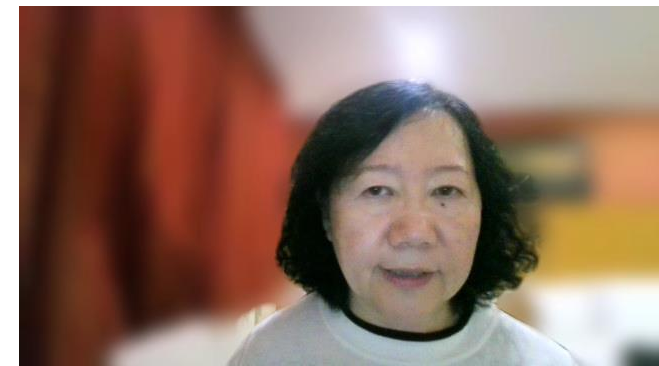


GAUGE project (Greenhouse gAs Uk and Global Emissions)  
The UK DECC (Deriving Emissions linked to Climate  
Change) Network  
<https://dareuk.blogs.bristol.ac.uk/approach/work-package-2/>





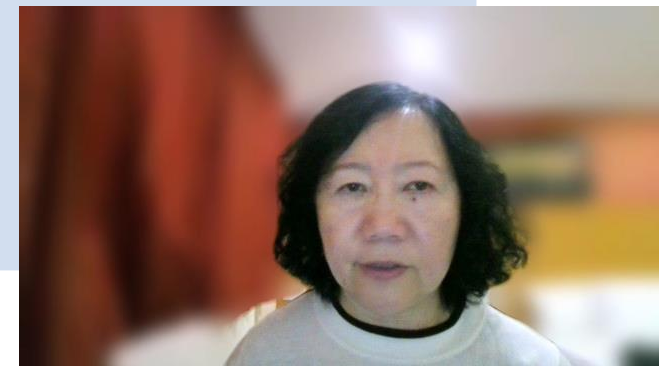
Name	Institution	Poster title	Contribution
Mr Muhammad Abid	Ulster University		
Mr Ajay Nail	Ulster University		





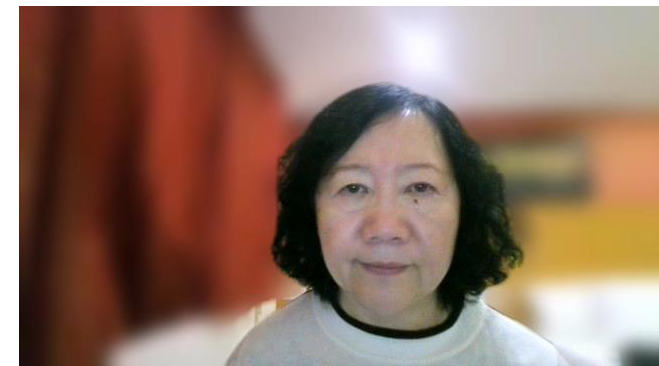


Name	Institution	Poster title	Contribution
Dr. Shupeng Wang	National Satellite Meteorological Centre, China Meteorological Administration		
Dr. Fu Wang	National Satellite Meteorological Centre, China Meteorological Administration		
Mr. Seng Yang	National Satellite Meteorological Centre, China Meteorological Administration		

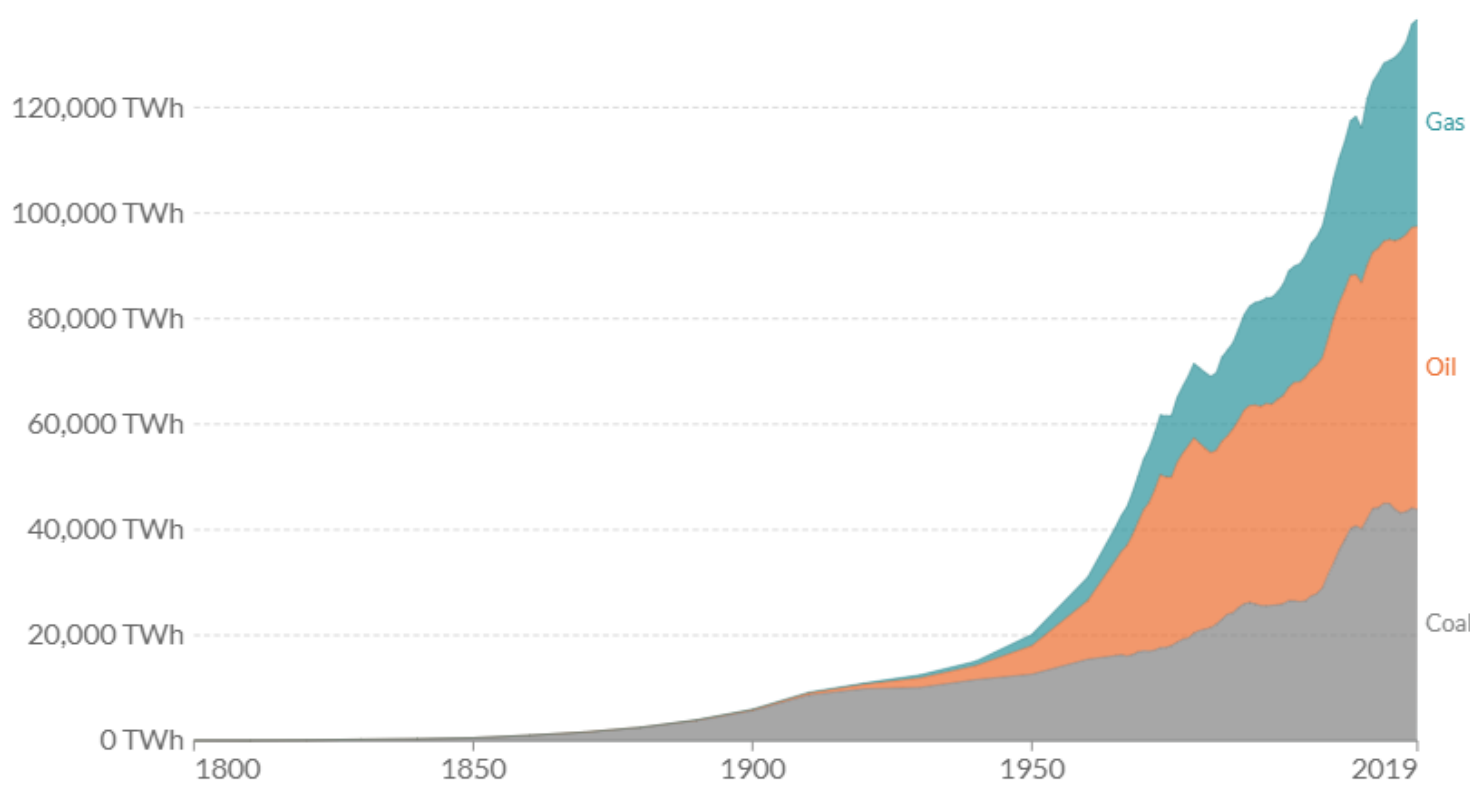




- Energy security,
- Energy equity (accessibility and affordability),
- Environmental sustainability.

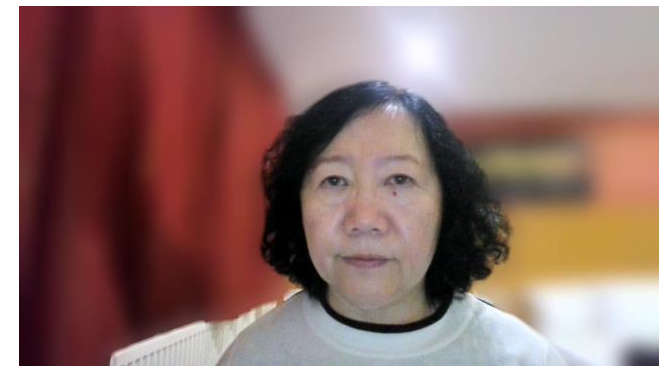


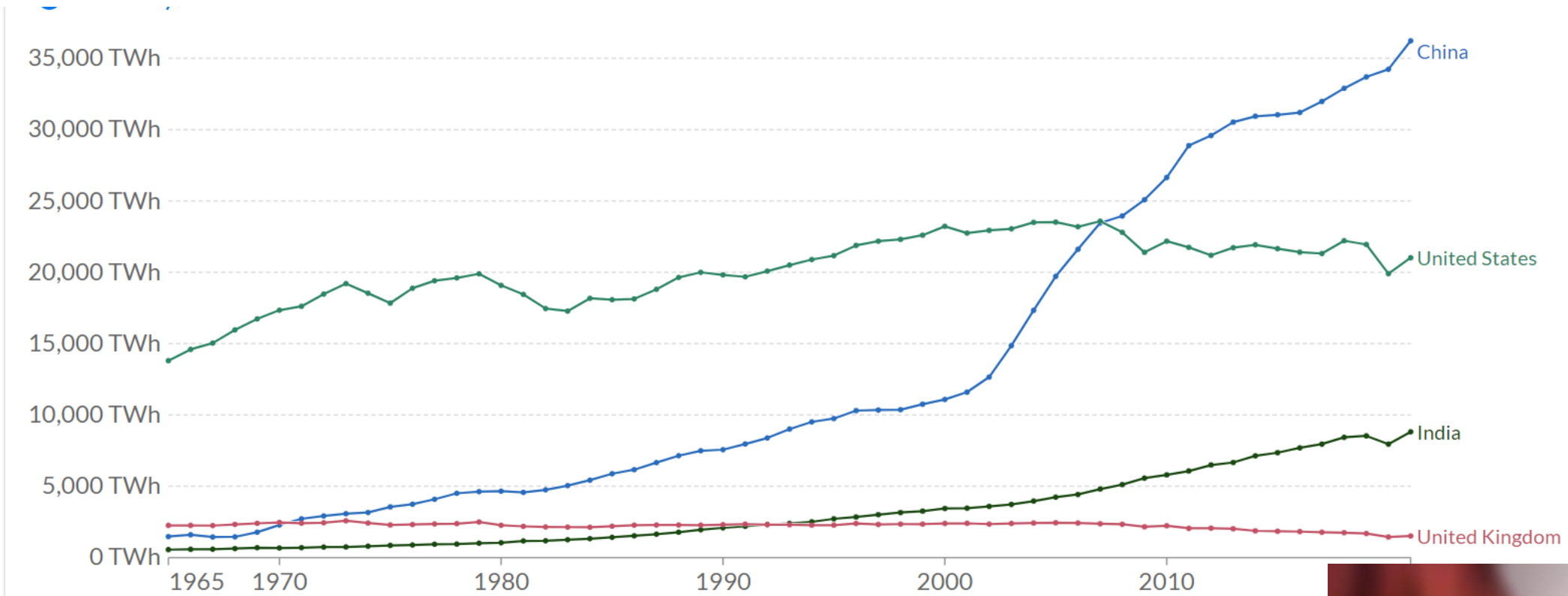
# 86% of Global primary energy comes from fossil fuels



Source: Vaclav Smil (2017). Energy Transitions: Global and National Perspective & BP Statistical Review of World Energy  
OurWorldInData.org/fossil-fuels/ • CC BY

Today, coal consumption is falling in many parts of the world. But oil and gas are still growing quickly

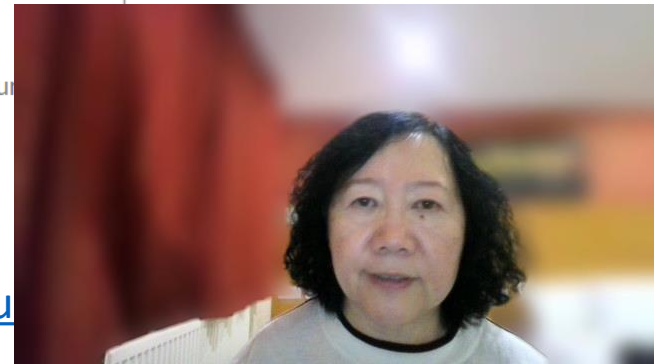




Source: Our World in Data based on BP Statistical Review of World Energy

Our

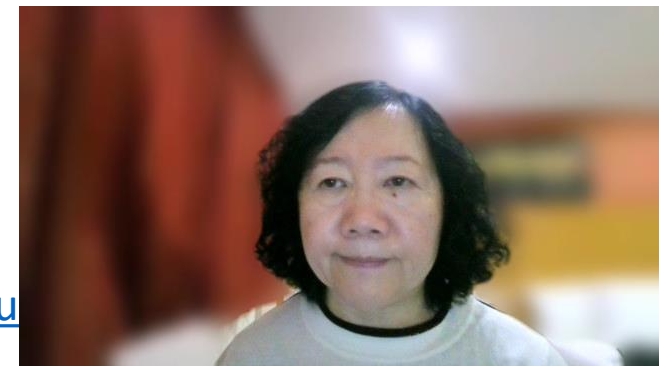
Fossil Fu



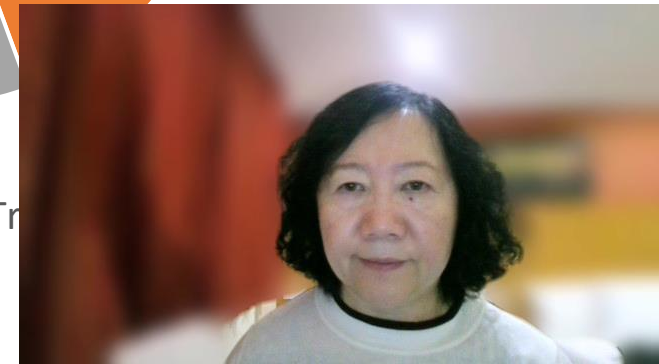
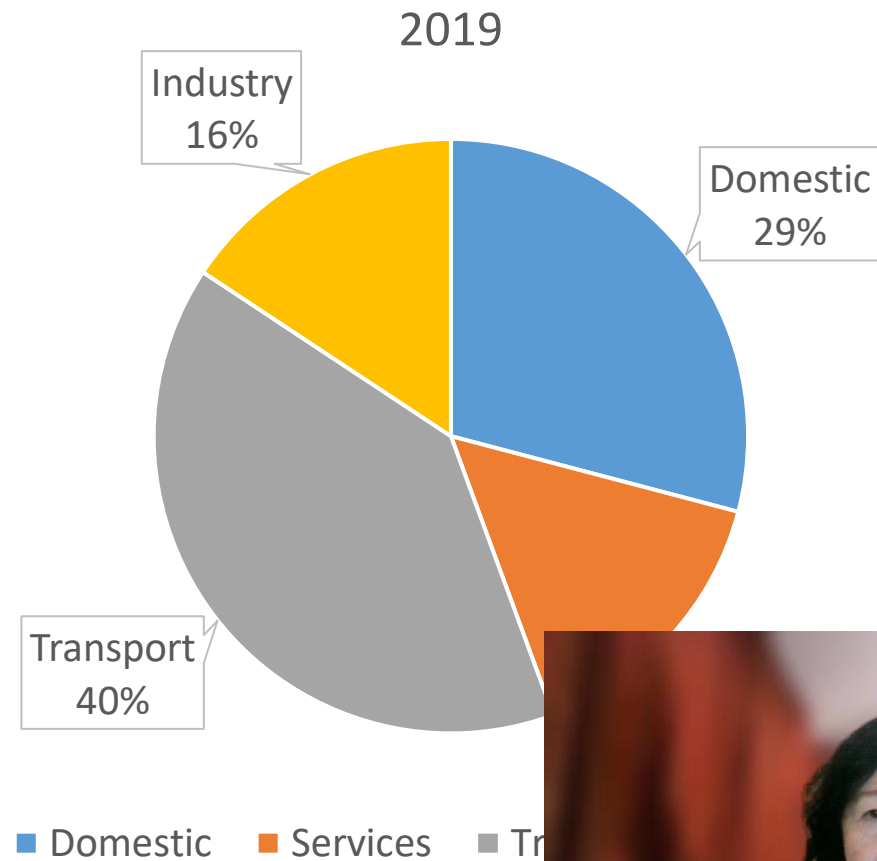
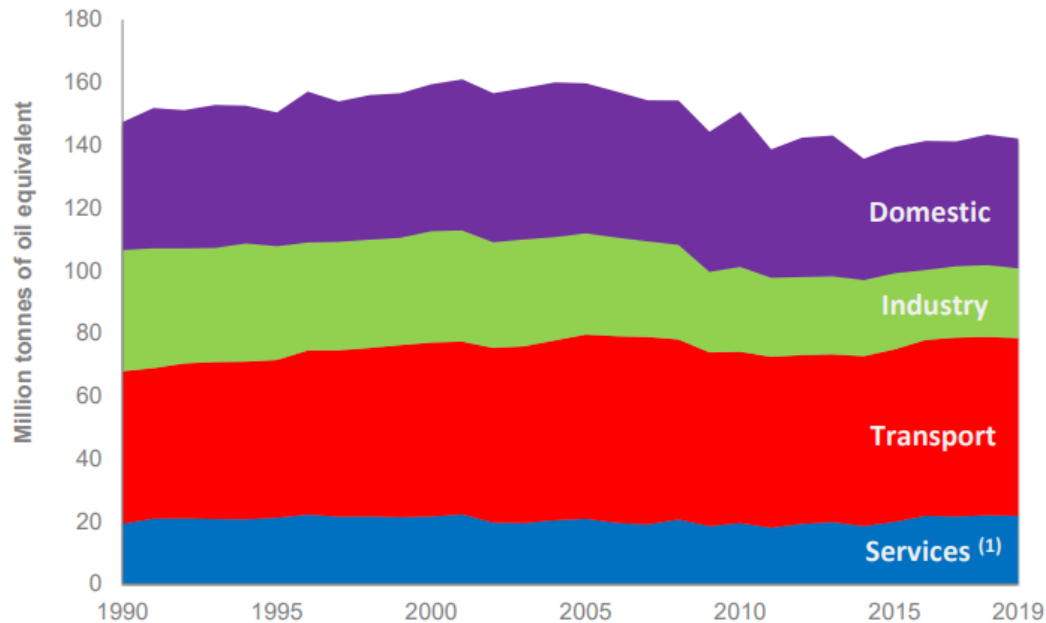


Despite many efforts by governments to tackle the causes of global warming, CO<sub>2</sub> emissions from energy and industry have increased by 60% since the United Nations Framework Convention on Climate Change was signed in 1992.

Renewables, including solar, wind, hydro, biofuels and others, are at the centre of the transition to a less carbon-intensive and more sustainable energy system.

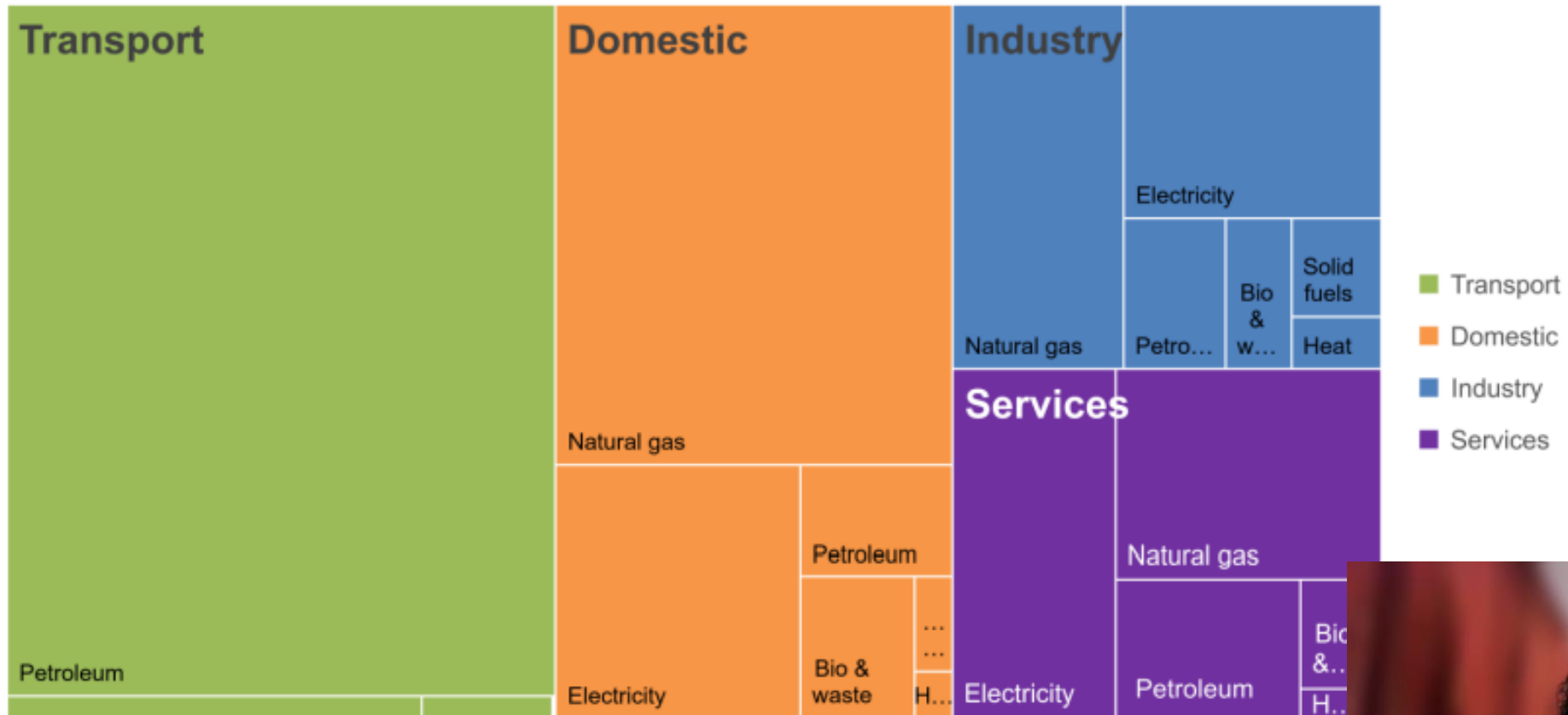


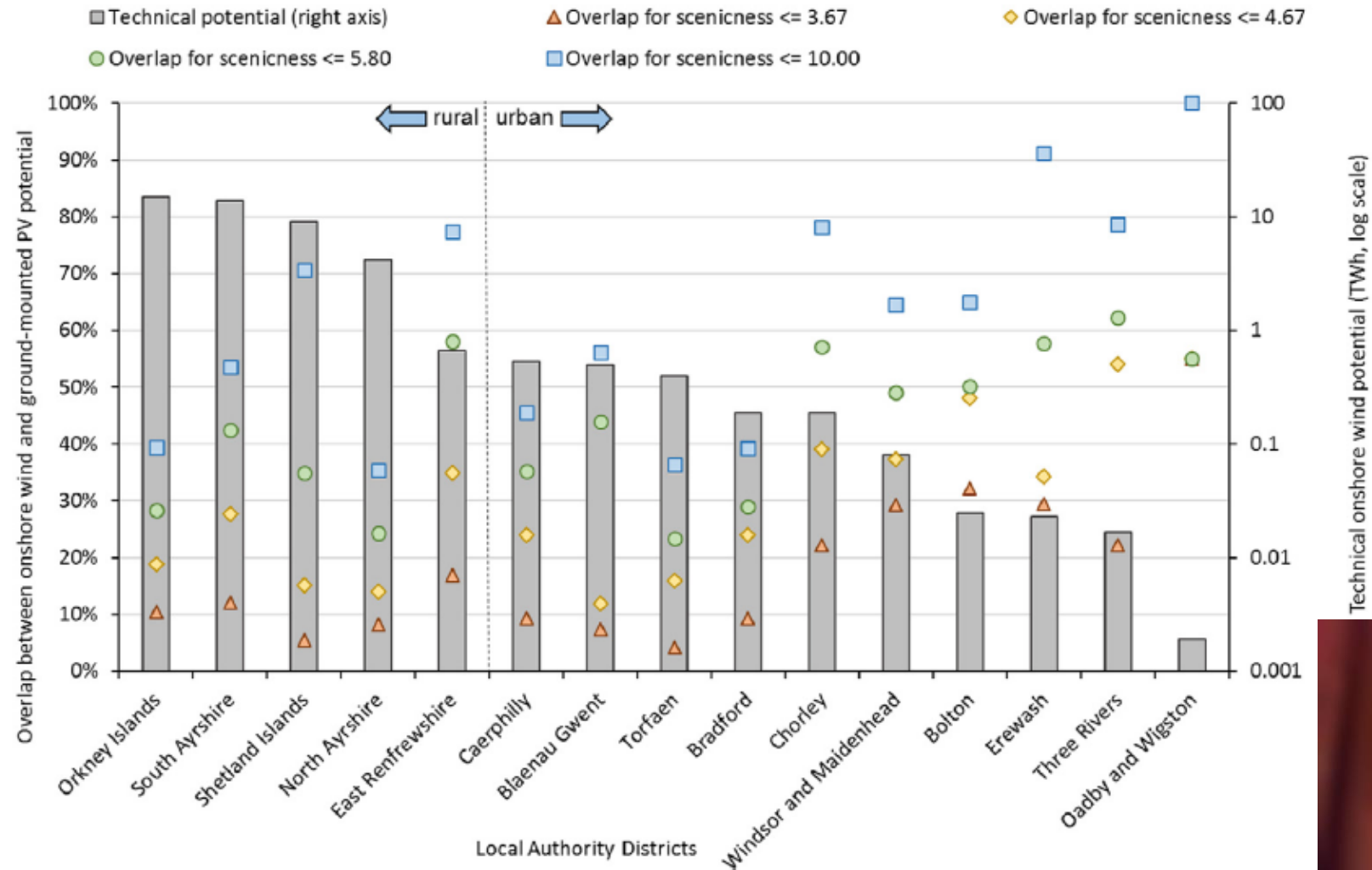
- Total down by 7%
- Domestic down by 6%
- Industry down by 69%
- Transport increased by 11%
- Services increased by 5%



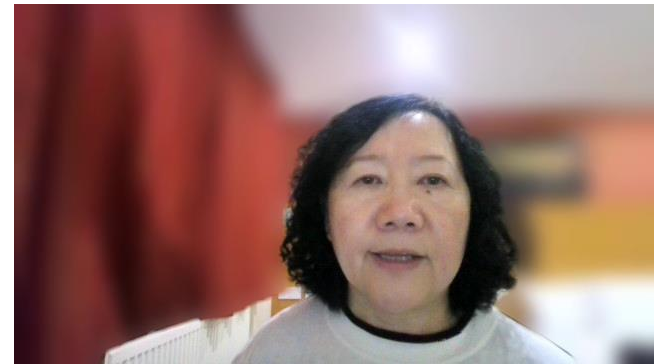


2018 Consumption by Sector

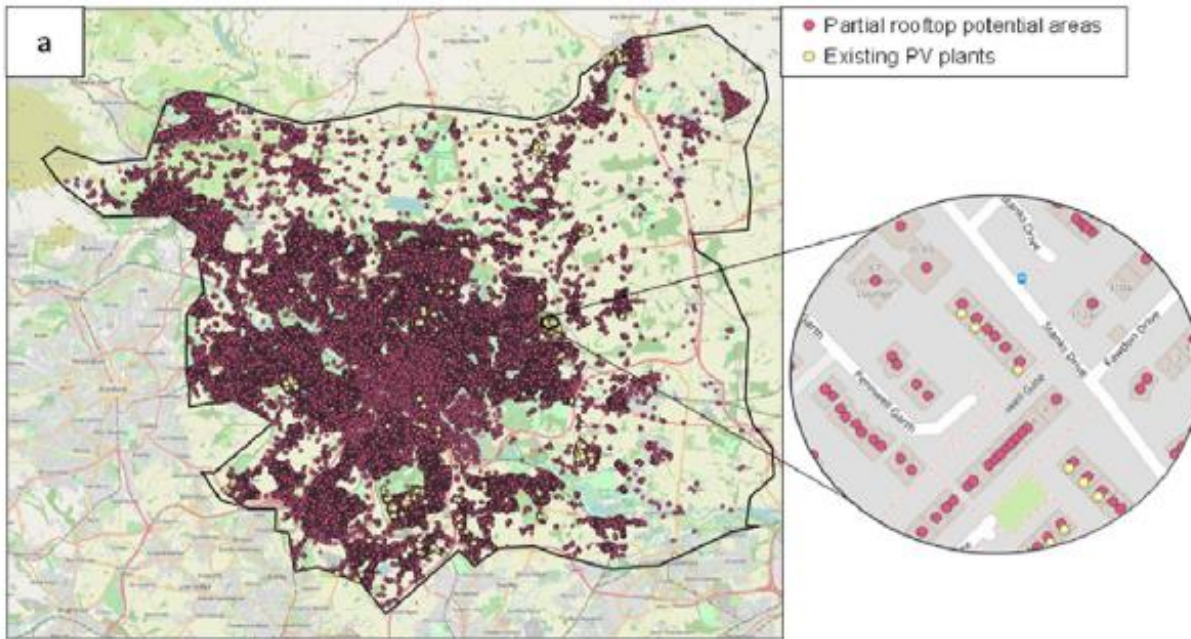




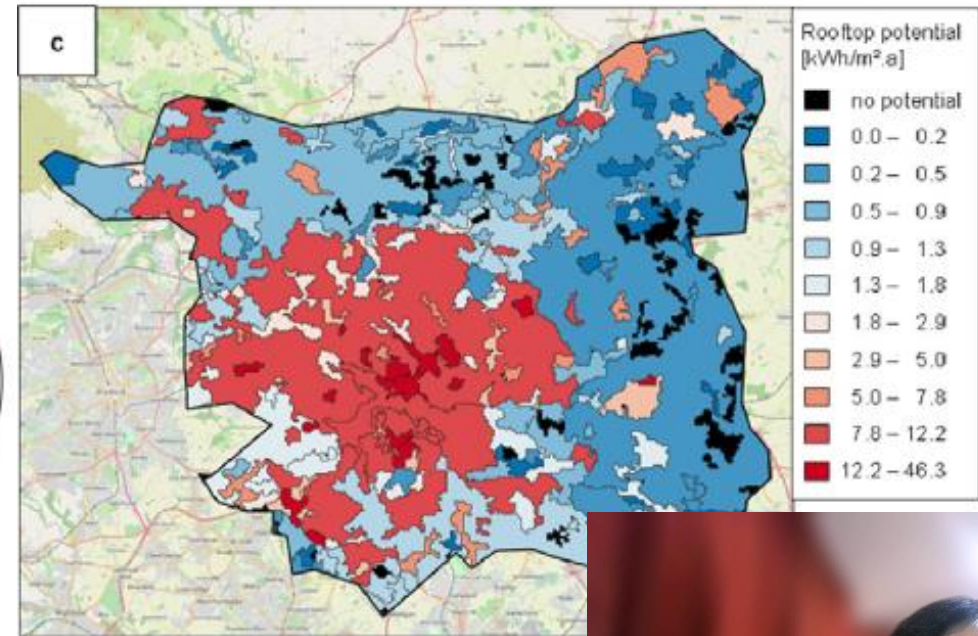
Technical onshore wind potential (TWh, log scale)





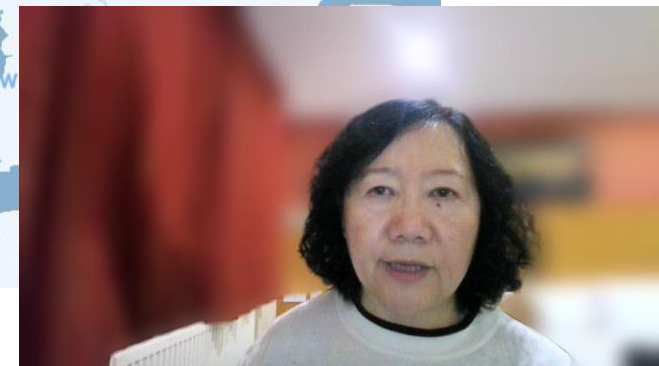
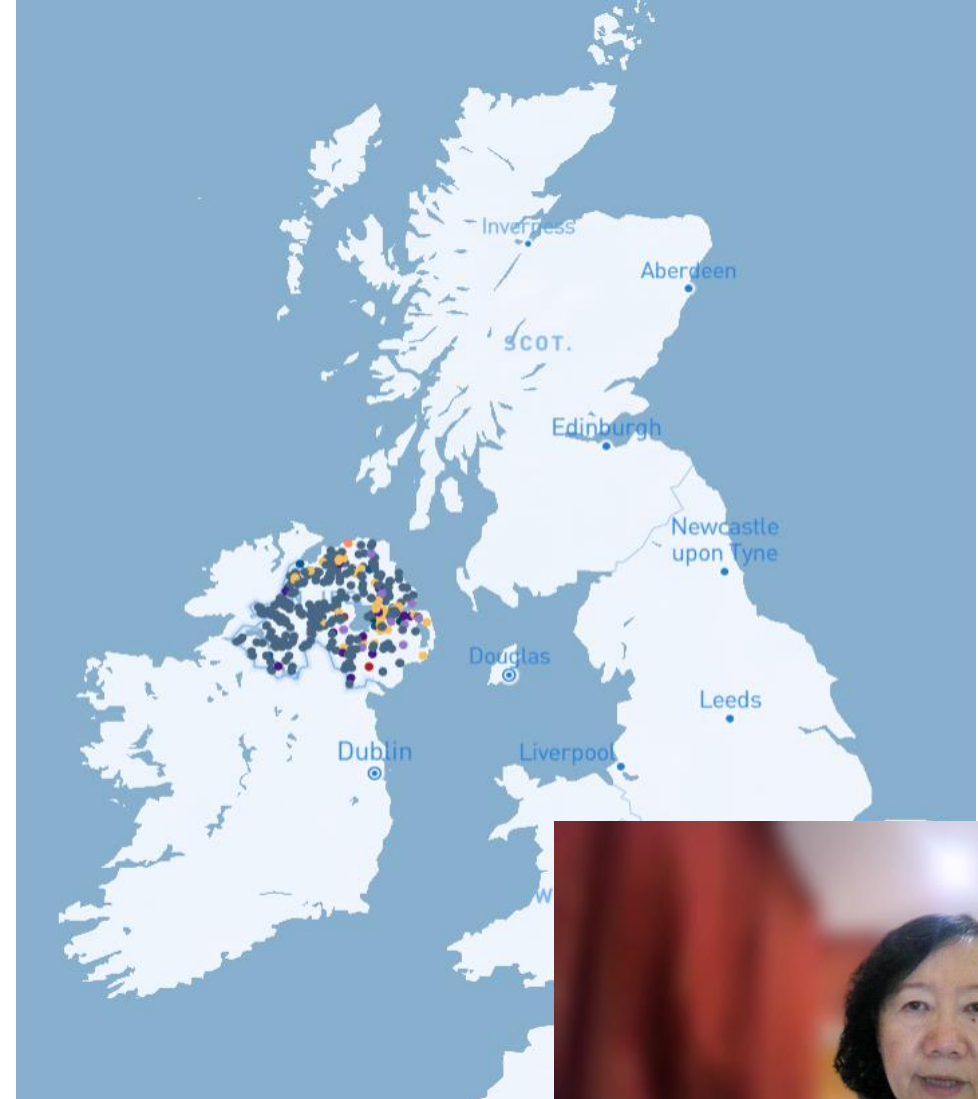
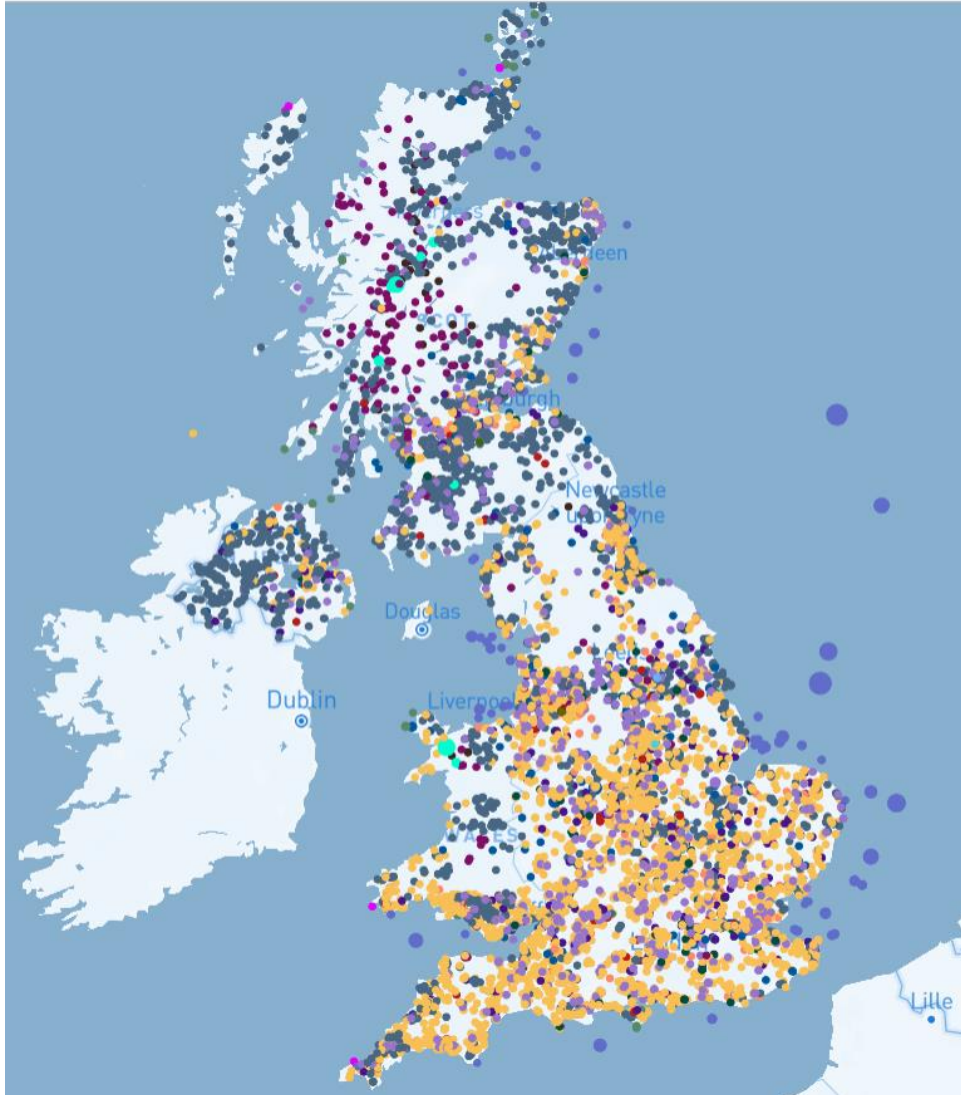


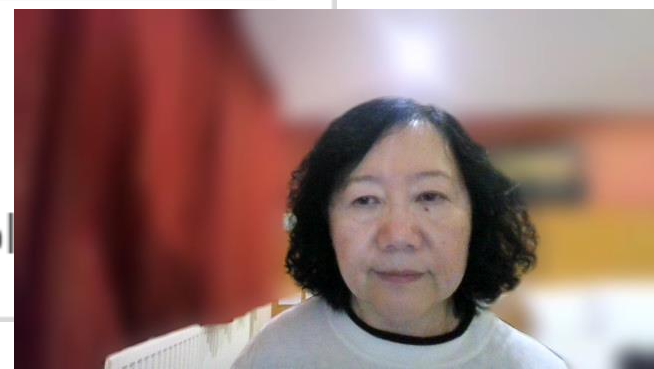
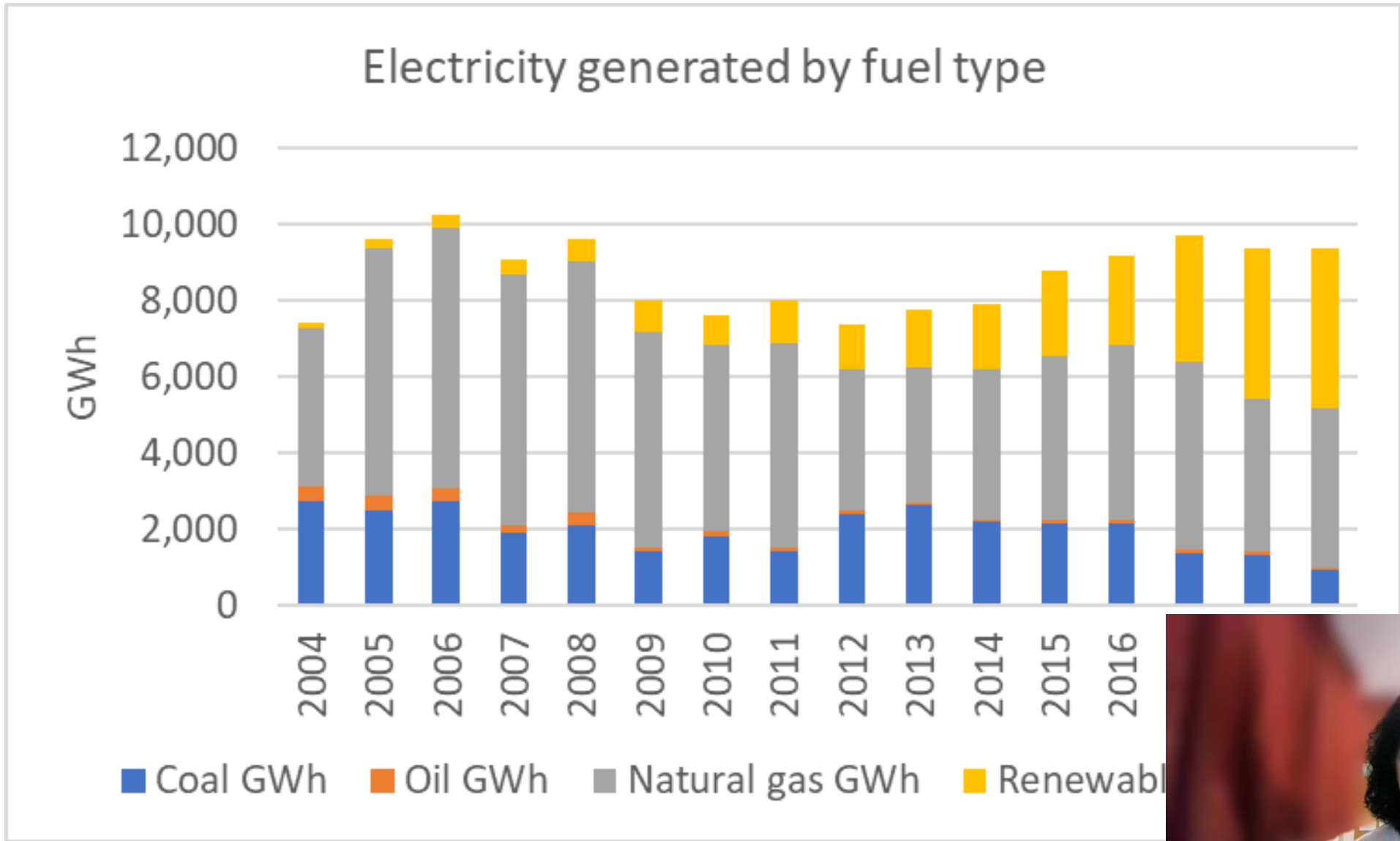
PV rooftop existing

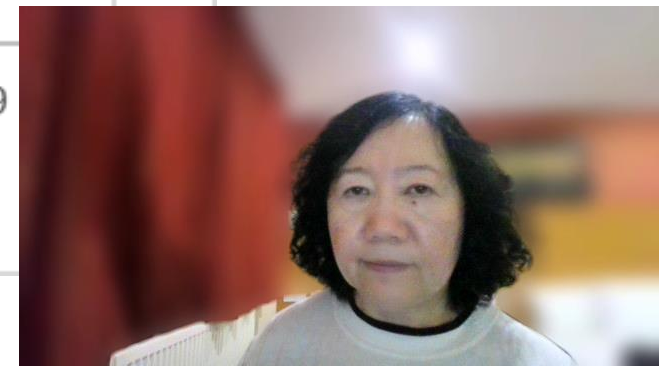
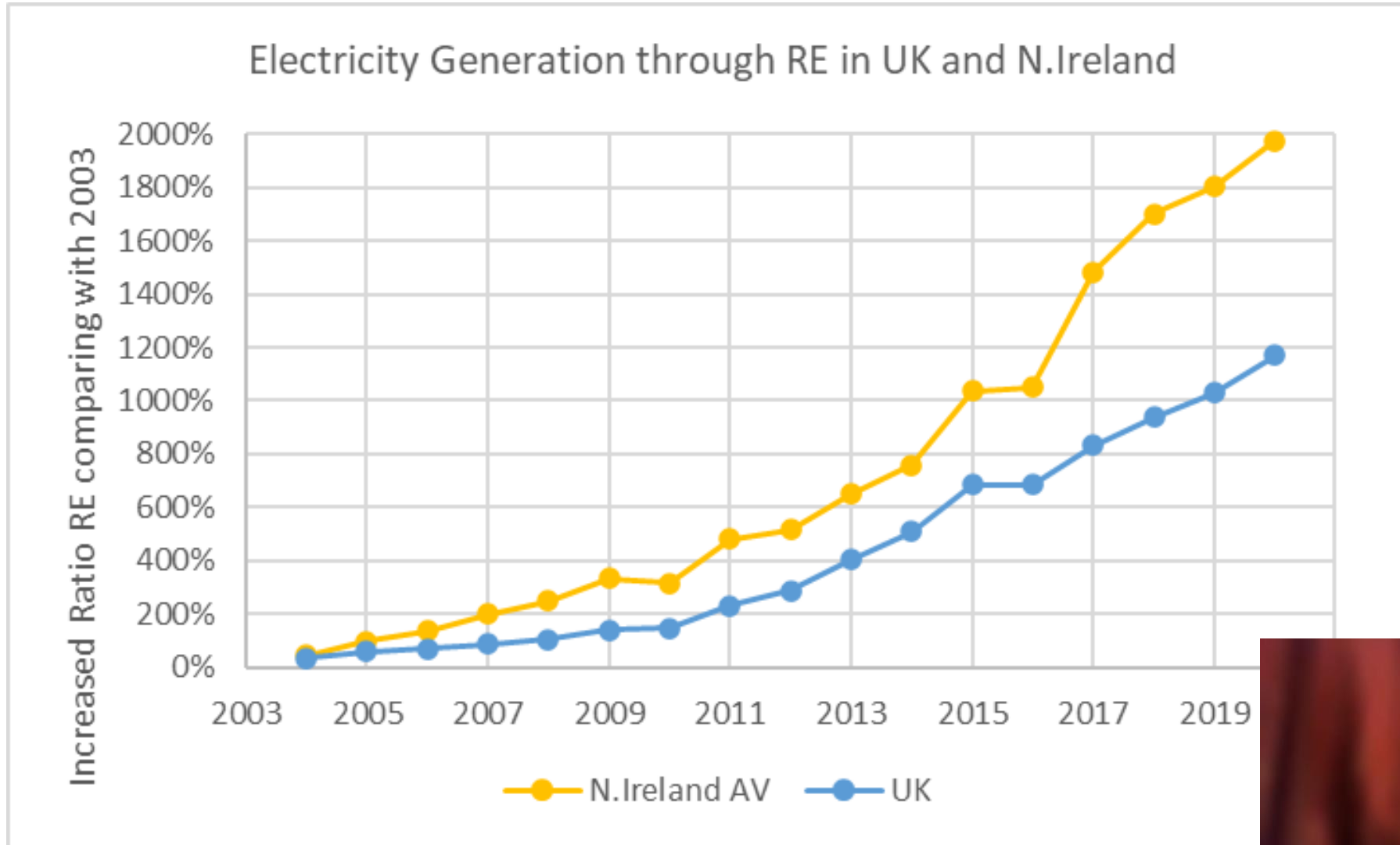


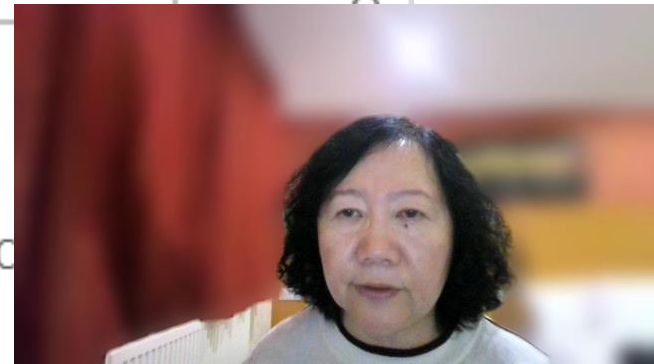
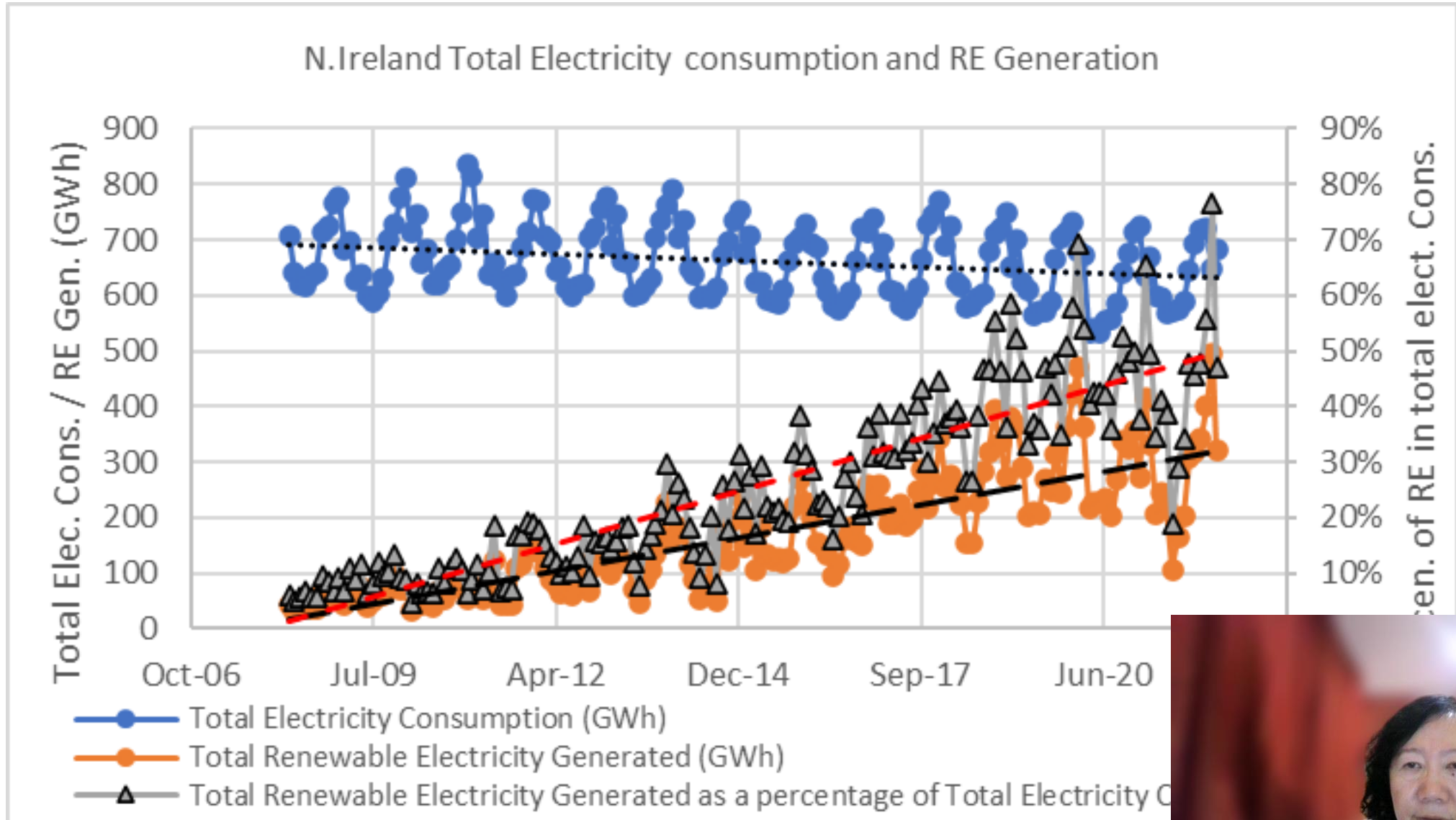
Technical potential in units

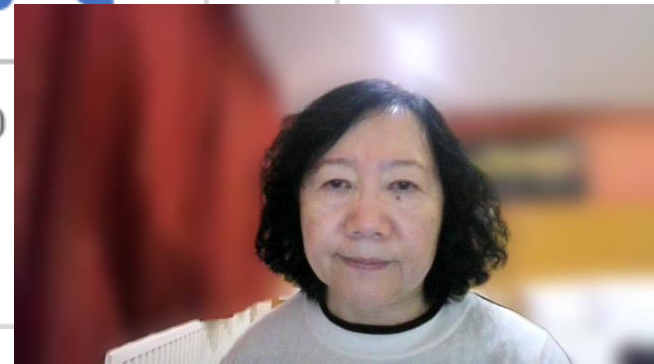
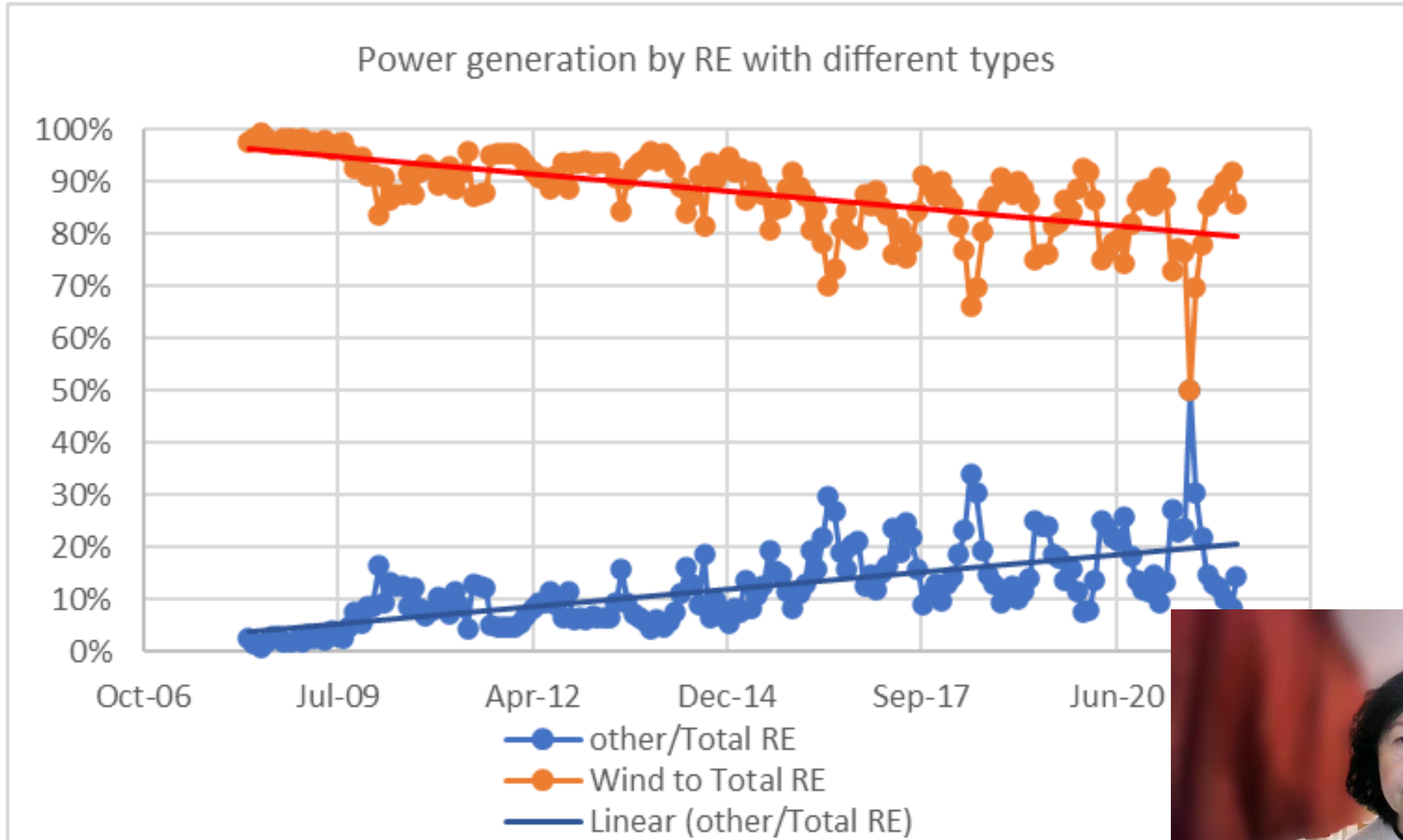




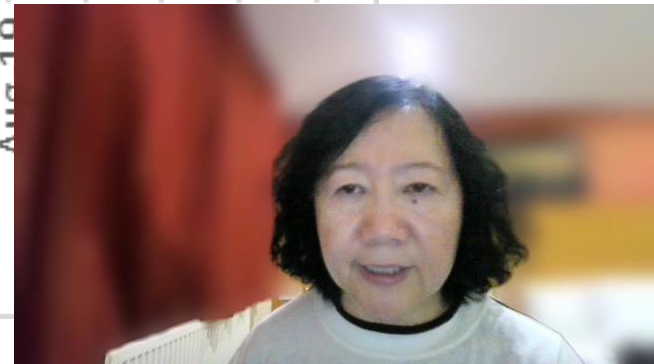
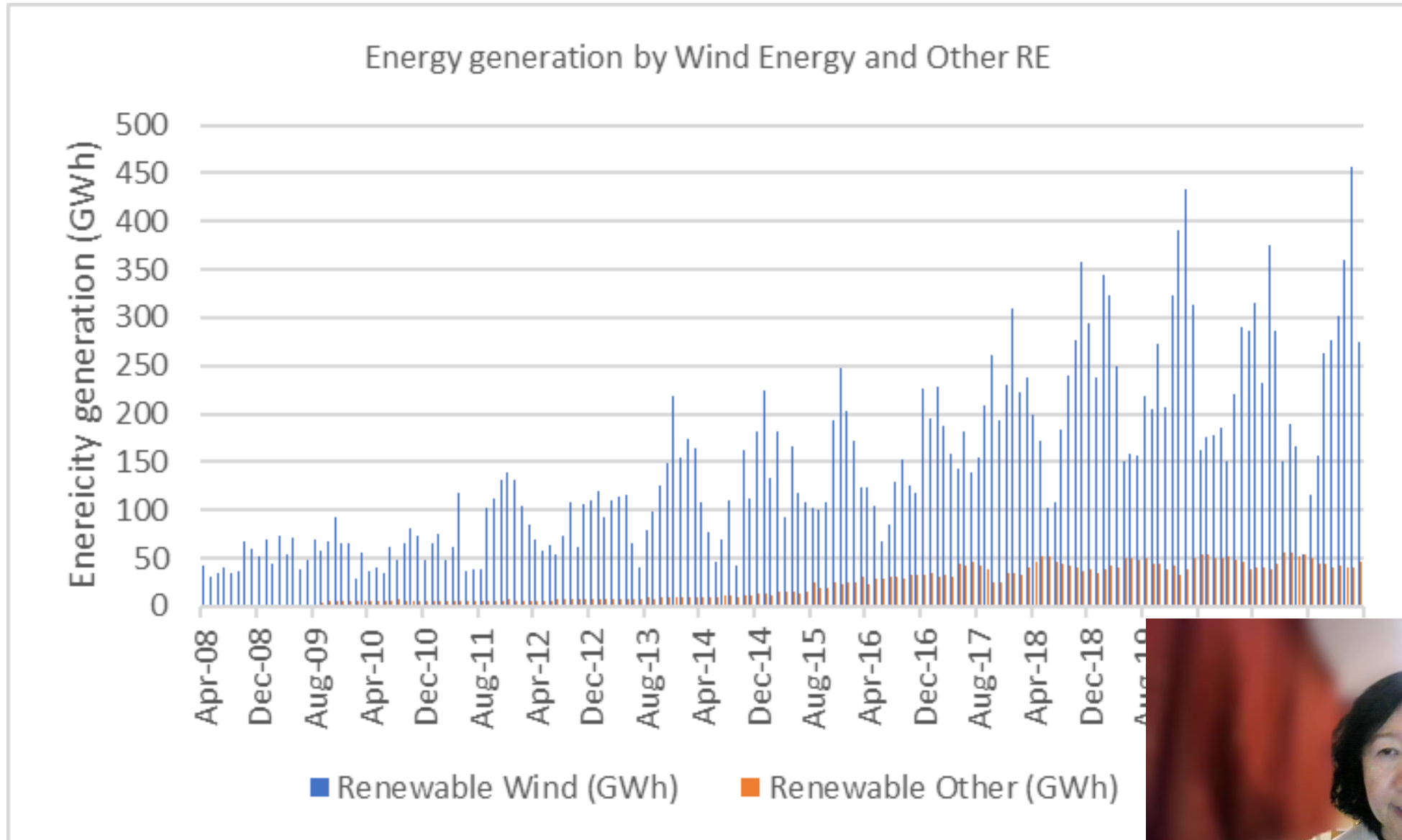


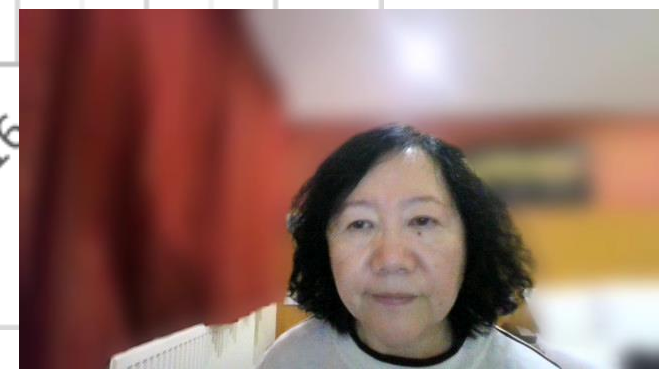
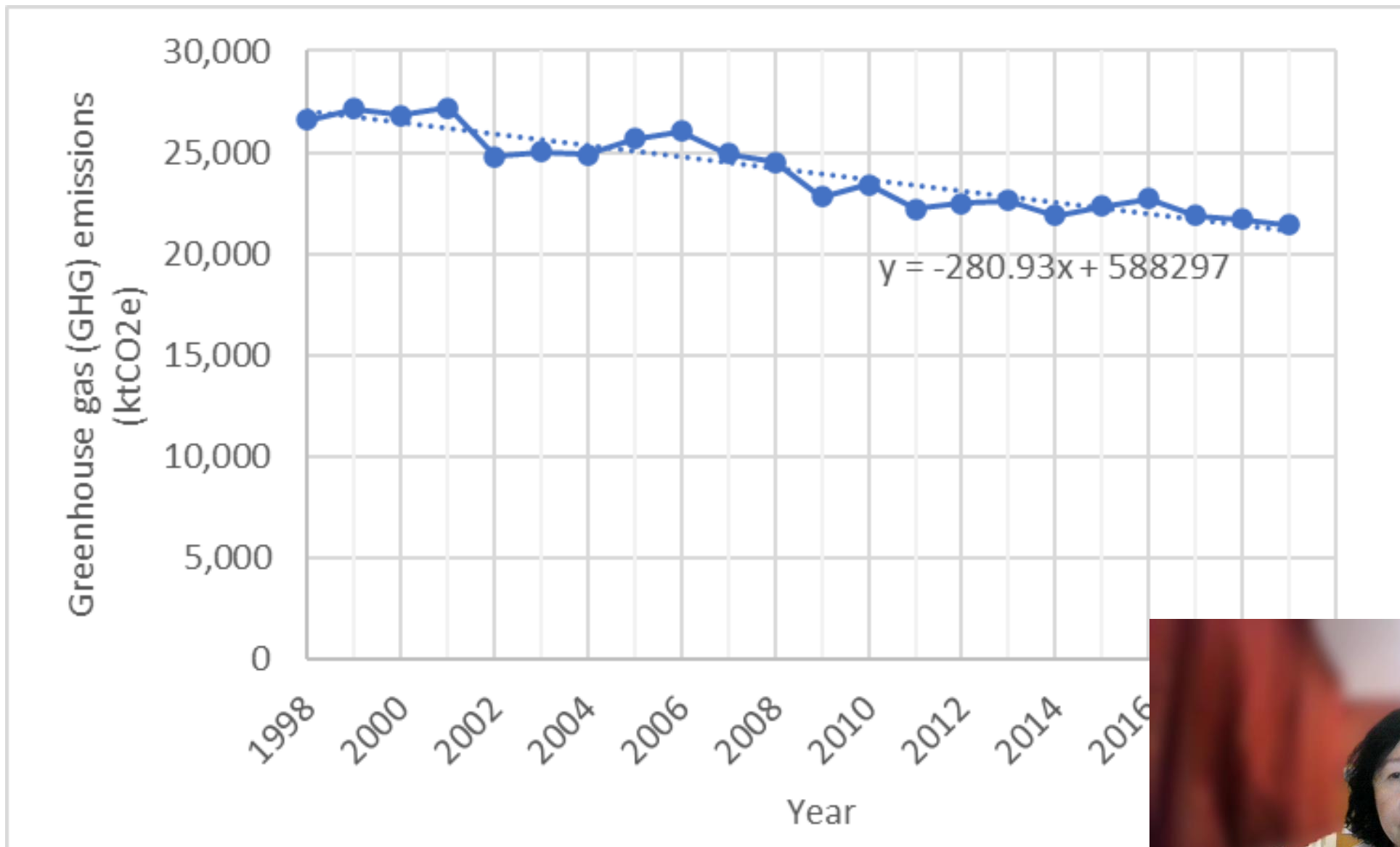






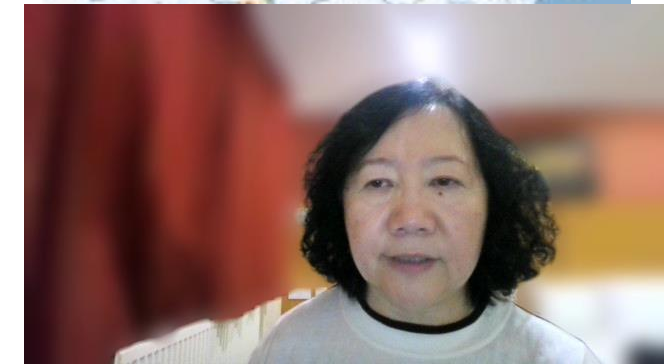
# Comparison of the electricity generated by the Wind and other Renewable Energy

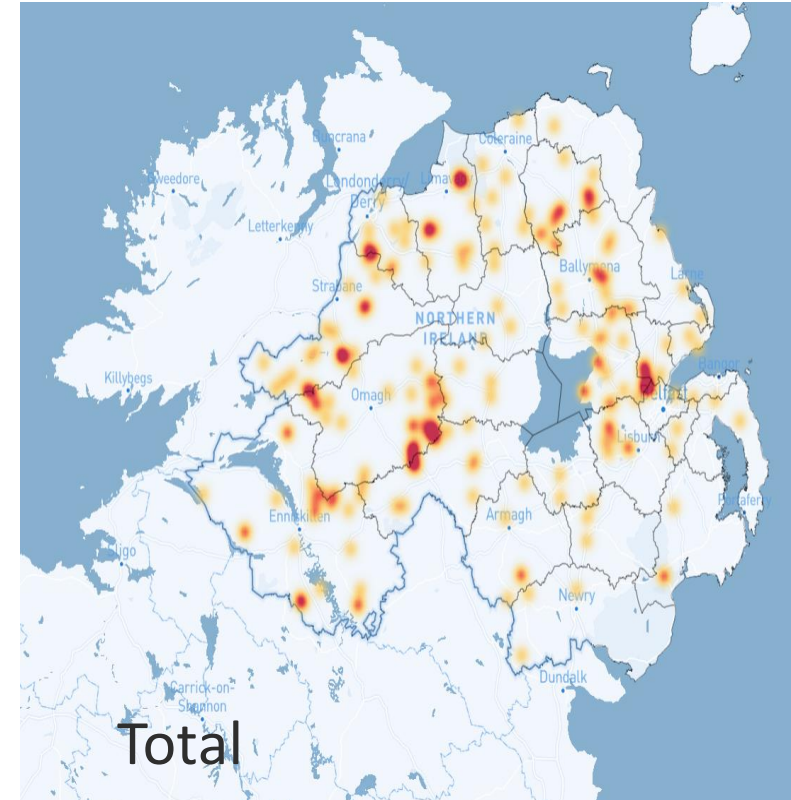
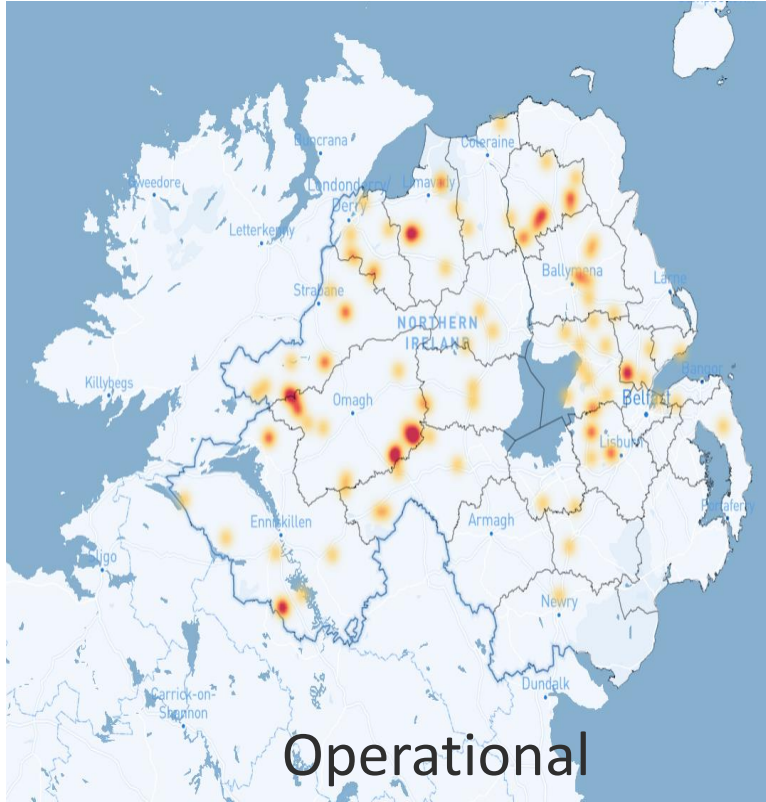


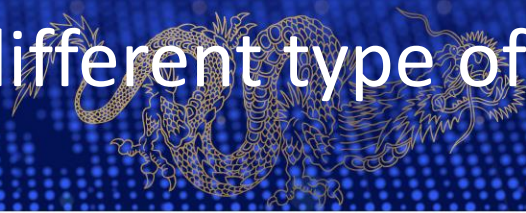




# Renewable energy applications since 1990 to 2021 with total capacity up to 48MW







Anaerobic



Biomass(dedicated)



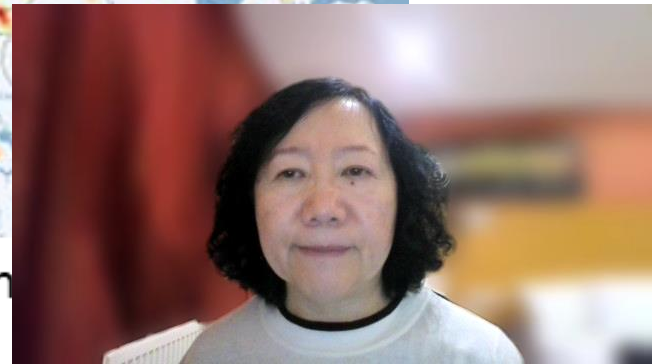
Landfill gas



Solar Photovoltaic

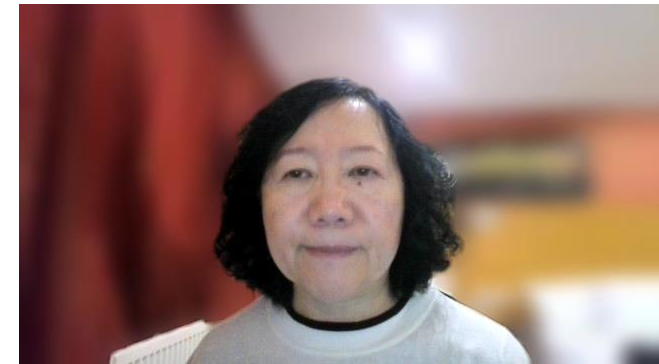


Wind on



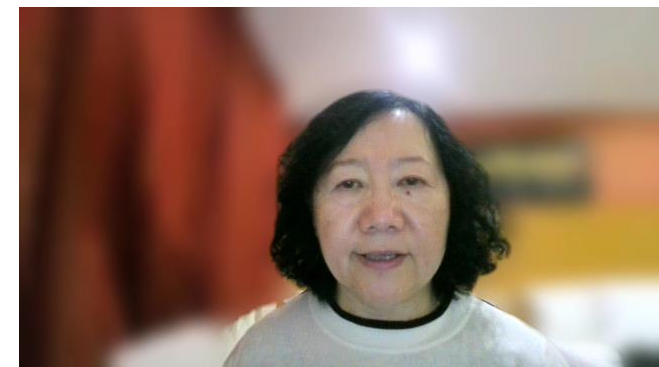


- The study has found that the total emissions 22 MtCO<sub>2</sub>e in 2013 across the NI was approximately 4% of the total greenhouse gas emissions in the UK, however NI accounts for 2.8% of the UK population and 2.1% of the UK GDP, hence it was concluded that the total emission of NI was more than the rest of the UK.
- The further results show that the NI has relatively high percentages per capita emission in the agricultural, transportation, residential, LULUCF (land use, land use change, and forestry) and power sector.
- The commitments set in Energy Strategy 'Path to Net Zero Energy' for Northern Ireland is to meet 70% of electricity generation from diverse renewable sources by 2030.



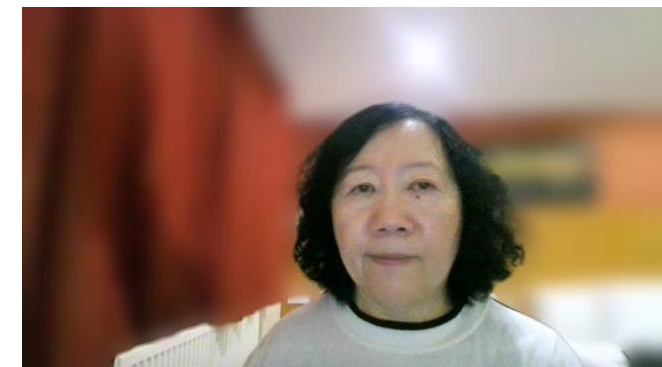


- The study details the percentage of electricity generated in the NI from renewable sources as well as information about the types of these renewable sources.
- A further study will be conducted on the relationship between the CO<sub>2</sub> emission reduction with the power generated by renewable energy with different types of renewable energy in the NI, possible approaches of capturing CO<sub>2</sub> emission by GHGSat.





- The project's progress has been slightly delayed due to the recruitment of a new young scientist
- The recruitment of a new young scientist is on the way
- Planning for next year
  - ✓ Develop XCO<sub>2</sub> retrieval algorithms along with simulation of the radiance transfer in atmosphere.
  - ✓ Investigate the relationship between the CO<sub>2</sub> emission reduction
- Mutual academic exchanges have been planned, which is subject to the restriction policy of Covid-19 in China





Thanks for your attention!

