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Championing smart cities for clean air and energy efficiency

With a passion for smart cities and energy modelling, Nurkhat and his team want to develop and strengthen networks within Kazakhstan and internationally between policymakers, academics, and citizens to achieve affordable clean energy and sustainable growth of cities and communities.

The challenge

Kazakhstan is a dynamically developing country that has set ambitious targets to implement the 2030 Agenda for Sustainable Development. The country aims to reduce total greenhouse gas emissions by 15-25% by 2030 and has a target that 50% of energy will come from renewable and alternative energy sources by 2050.

However, the capital city of Nur-Sultan is still heavily reliant on coal-based heat and power plants to meet the significant heating demand during winter, accounting for around 80% of the total electricity output in Kazakhstan. Continuing urban population growth also poses several challenges related to energy consumption and infrastructure, as well as air quality. Air quality issues can have a direct impact on health, but this is poorly understood by most citizens in Nur-Sultan. Nurkhat believes that improving the quality and availability of data for policy decision-making in Kazakhstan is crucial to achieve the UN's Sustainable Development Goals.

The ambition

Nurkhat and his team, including Dr Didar Yedilkhan, want to improve energy efficiency and air quality for citizens by advancing Nur-Sultan's transition to become a smart city. They hope to do this by raising awareness about the possible alternatives for effective energy production and air quality management among government, policymakers, entrepreneurs, and citizens.

The team will convene experts in smart cities, energy modelling, urban planning, IT, applied mathematics, and operational research, to calculate how to integrate renewables further into the energy mix for optimised efficiency. They will engage stakeholders, including local decision-makers and researchers from the UK, through a series of seminars and workshops to share knowledge and build networks between the UK and Kazakhstan. The experts will also consider how Internet of Things (IoT) technology and wireless sensors in homes can achieve air purification, with geospatial visualization that city planners can use to identify hotspots of low air quality within Nur-Sultan.

Nurkhat hopes to influence government policy and build an opportunity for Nur-Sultan to become greener, cleaner and smarter for future generations.

Relevant UN Sustainable Development Goals (SDGs)

- Affordable clean energy (SDG 7)
- Sustainable cities and communities (SDG 11)

Involvement with the Royal Academy of Engineering

Nurkhat first became involved with the Academy in 2016, receiving a grant via the Newton Fund Industry-Academia Partnership Programme for a project to optimise energy efficiency in combined heat and power plants. After attending Frontiers Symposia in 2020 and 2021 on resource resilience and smart communities, Nurkhat decided to apply to be a Frontiers Champion.

Nurkhat recommends that people apply to be part of the Frontiers programmes, describing it as, “a knowledge-sharing platform where people from different parts of the world with different professional and cultural backgrounds gather to pursue a common goal, which is a better world for the present and future.”

Project collaborator, Dr Didar Yedilkhan, believes that clean and sustainable cities worldwide will be the basis for the happy life of millions. To develop such cities, innovative solutions are needed today that will deliver long-term results tomorrow.