ENVIRONMENTAL HEALTH | SHORT COMMUNICATION

South Korea’s big move to hydrogen society

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Abstract: Extensive energy consumption has become a major concern due to increase of greenhouse gas emissions and global warming. Hence, hydrogen has attracted attention as a green fuel with zero carbon emission for green transportation through production of electric vehicles with hydrogen fuel cells. South Korea has launched a hydrogen society policy with the objective of expanding production of hydrogen from renewable energy sources. The hydrogen economy will play a critical role in reducing atmospheric pollution and global warming. However, new development of infrastructure for hydrogen refueling and increasing awareness of the hydrogen economy is required together with reduced prices of hydrogen-driven vehicles that are promising options for a sustainable green hydrogen economy.

Subjects: SDG; Climate Action; SDG; Affordable and Clean Energy; Climate Change; Sustainable Transport Engineering

Keywords: Hydrogen economy; renewable energy sources; green transport; zero carbon emission

Increasing energy consumption is a major threat to the global environment unless it is decarbonized because it will accelerate GHG emissions and influence air quality (Chen et al., 2018). The Paris Agreement (PA) aims to keep the increase in average global temperature below 2°C, which...
paves the way for developing a carbon-neutral world with renewable energy sources (RES) (Chen et al., 2018; Rockström, 2017).

Due to PA aims, hydrogen has once again gained attention as a green and clean fuel with zero carbon emission (Cano et al., 2019). This is also due in part to the significant advances in other fields, such as graphite nanofibers and carbon nanotube materials and catalysis in chemistry which paves the way for hydrogen fuel development. Countries such as the United States, Germany, and Japan are actively pushing hydrogen research and development (R&D) and policies (Service, 2018). Green transport via the hydrogen economy and fuel cell electric vehicles (FCEV) emitting only water from the tailpipe has garnished extensive R&D activity (Creutzig et al., 2015; Stephens et al., 2016).

As a roadmap for a green energy revolution in the transport and hydrogen economy, South Korea has launched a hydrogen society policy with the aim of expanding production of hydrogen from RES. In addition, South Korea intends to reduce 30% of its GHG emissions by 2020 and to achieve 20% RES by 2030 under its business as usual (Normile, 2017). However, as South Korea is an islanded grid system, increasing generation from RES will be more problematic due to the inherent variability of wind and solar power.

Production of hydrogen from variable RES for use in FCEV during power system curtailment or congestion events is another revenue stream for RES operators. Reacting hydrogen from RES with CO$_2$ will also play a critical role in mitigating the carbon footprints in transport. Thus, the hydrogen economy proposed by South Korea and other nations will bring further self-sufficiency in energy in transport, an alternative revenue stream for the power system while also reducing atmospheric pollution and ultimately global warming.

Acknowledgement
This research was supported by the Hydrogen Energy Innovation Technology Development Program of the National Research Foundation of Korea (NRF) funded by the Korean government (Ministry of Science and ICT (MSIT)) (No. NRF-2019M3E6A1064197).

Funding
The authors received no direct funding for this research.

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Citation information
Cite this article as: South Korea's big move to hydrogen society, Pavani Dulanja Dissanayake, Christian Sonne, Won Chul Cho, Chang Hee Kim & Yong Sik Ok, Cogent Environmental Science (2020), 6: 1856459.

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