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ESCAP Economic and Social Commission for Asia and the Pacific | HACK Hackathon Thailand | UNDP | unesco | YECAP | ASIA LEDS PARTNERSHIP | Global Climate Action Partnership regional leadership, global change

YOUTH CLIMATHON

INNOVATIVE SOLUTIONS FOR THE ACCELERATION OF CLIMATE ACTION IN ASIA & THE PACIFIC

ChangEco - Electric Mobility

Broadening the scale of application of EV charging stations powered by renewable energy sources with cooperations between global companies and governments:
(1) expanding renewable energy-powered charging infra in target area, (2) standardizing EV outlet

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Team Members

Bomin Sohn

Role: Idea Developer
Education:
- Ewha W.Univ Bachelor
- Waterloo Univ Engineering Exchange

Experiences:
- College Leader UN
- AIESEC Greenism PM
- 1st Place Engineering Capstone Design Winner

Yukyeong Kim

Role: Idea developer
Education:
- Ewha W.Univ Bachelor
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Experiences:
- Representative of the central environmental club of Univ
- Winner of Seoul Zero Campus Idea Contest

Eugene Suh

Role: Team Member
Education:
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Experiences:
- ALSA Korea, Ewha
- ESL laboratory Internship

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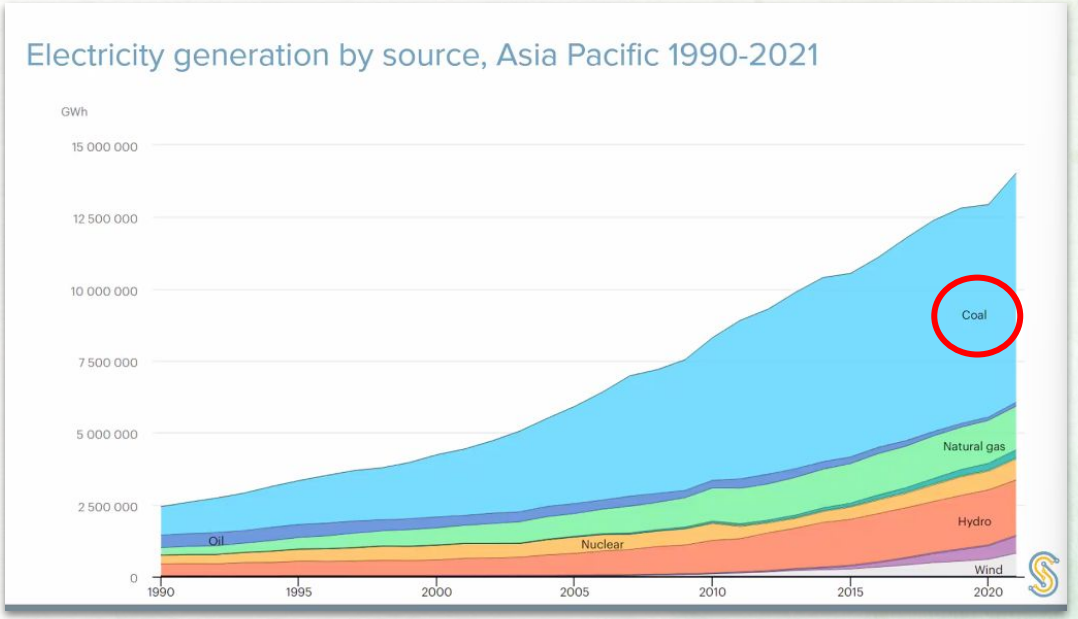
1. Problem

Problem 1. South Korea,

Heavy Reliance of EVs on Fossil Fuels

- According to Korea Electric Power Corporation (KEPCO), **40% of the electricity used for electric car production** and charging is estimated to be **generated from coal**.

- According to Korea's Ministry of Environment, Inclusive of the complete life cycle, encompassing vehicle and battery production as well as disposal, electric cars **emitted 49.12g of carbon dioxide per kilometer** traveled which is higher than gasoline and diesel cars, which stood at 44.55g.



Coal fuel, which still constitutes a significant portion of the energy sources in the Asia-Pacific region.

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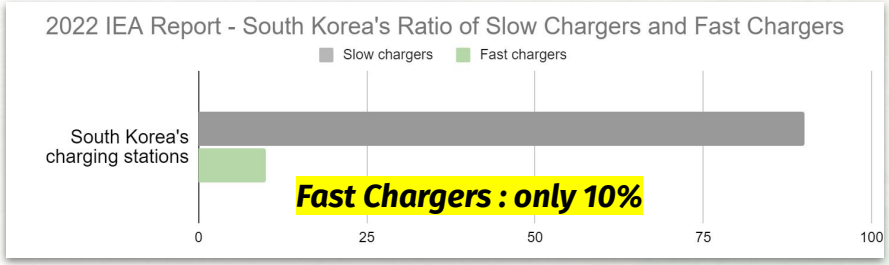
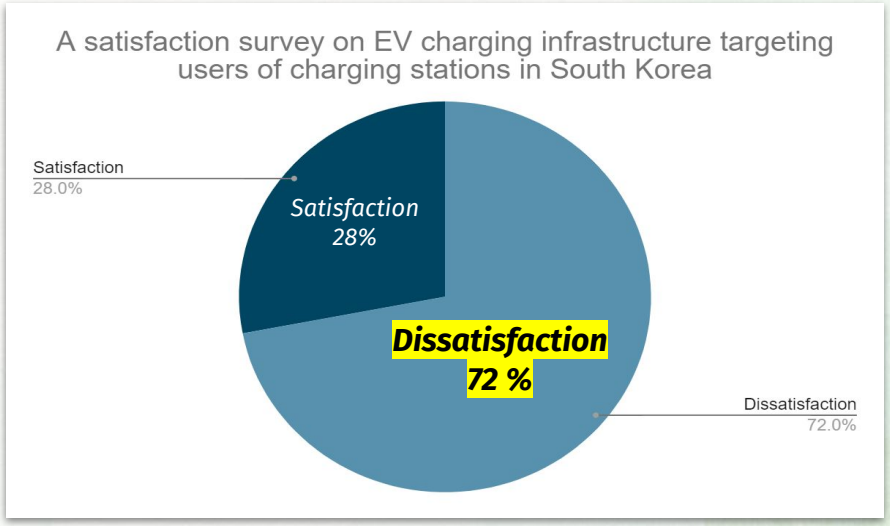
1. Problem

Problem 2. South Korea & Seoul

Serious Lack of EV Infrastructure

- According to an IEA report, South Korea faces a **shortage of fast-charging infrastructure**, with slow chargers comprising around 90% of the total 184,000 charging stations.
- **Drivers who need to charge for an extended period are highly dissatisfied :(** due to the severe shortage of fast chargers available for on-the-go charging.
- Major EV industrial nations have established their national standards charging outlet; EU-Combo and China-GB/T. In contrast, South Korea have **different outlets** depending on individual automotive manufacturers which is a serious problem.
  → **The reason why South Korea's EV infrastructure cannot expand enough to satisfy the EV drivers !**





Source : A survey on electric vehicle (EV) policy satisfaction was conducted with 1,896 users of an South Korea's EV infrastructure app - 2023

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2. Proposed Solution:

Q. How can we expand EV green charging infra in Seoul, South Korea?

→ Synergistic Solutions: Local Government and Domestic Enterprises Collaborating for Enhanced EV Charging Infrastructure and Renewable Energy Adoption in South Korea

Role of local governments

After producing electric energy obtained from areas with high renewable energy generation in S.Korea such as Sinan, we can use generated electrical energy in the EV charging infrastructure in Seoul

Benefits (e.g. market expansion)

Renewable Energy

Role of domestic enterprise

Expanding EV green charging infrastructure in Seoul that utilizes electric energy generated from renewable energy sources in Sinan

Cooperation between local governments with high renewable energy generation and domestic enterprises that can expand EV charging infra could solve two problems in target area, S.Korea : This can solve the problem of low proportion of renewable energy usage when charging EV and the small number of charging infrastructure.

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2. Proposed Solution:

Q. How to maximize efficiency through EV outlet standardization

A. Strategic Collaboration for Sustainable EV Charging Infrastructure: BMW's Charging Project in the South Korean Market and Domestic Enterprises Driving Standardization and Innovation

Role of overseas enterprise

BMW has ESS for storing renewable energy to charge EV. As BMW is now focusing on expanding their green charging infrastructure, Charging Next Project, we can consider BMW foraying into the S.Korea market

Standardization

Spearhead S.Korea market

Role of domestic enterprise

Companies such as Hyundai Motor group, Samsung, SK and LG in the EV industry can achieve standardization of EV charging outlet using their technology and cooperation

Cooperation between overseas enterprise with ESS to ensure supply of renewable energy-powered EV charging infra and domestic enterprises that can achieve standardization of EV charging outlet can benefit stakeholders:

BMW forays into the S.Korea market based on their Charging Next Project, Domestic enterprises can share all kinds of EV charging systems which can lead to an increase in EV sales in S.Korea.

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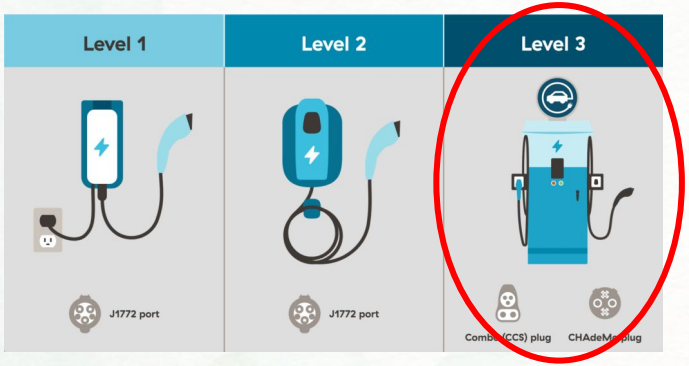

Level 3 & Standardization of DC combo

Standardization

Spearhead S.Korea market

Role of domestic enterprise

Companies such as Hyundai Motor group, Samsung, SK and LG in the EV industry can achieve standardization of EV charging outlet using their technology and cooperation

Brand	Kia		Hyundai	BMW	BYD	Tesla	Volkswagen	Toyota	Mercedes-Benz	Audi
Model	EV6	EV9	ionic5	i4	e6	model3	ID4	bZ4X	EQ	e-tron
Proprietary Charging Standard	DC Combo	DC Combo	DC Combo	DC Combo	AC	Unique	DC Combo	CCS Combo	DC Combo	DC Combo

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2. Proposed Solution:

1) Synergistic Solutions: Local Government and Domestic Enterprises Collaborating for Enhanced EV Charging Infrastructure and Renewable Energy Adoption in South Korea

2) Strategic Collaboration for Sustainable EV Charging Infrastructure: BMW's Charging Project in the South Korean Market and Domestic Enterprises Driving Standardization and Innovation

- Platform connecting companies and local government bodies to utilize renewable energy
- WIN-WIN relationships among foreign companies, domestic companies, and local government bodies
- South Korea's first unified charging standard
- Introduction of V2G (Vehicle-to-Grid) usage in electric vehicles, treating them not just as transportation but also as Energy Storage Systems (ESS)

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3. Target Country: South Korea

Target Group	Benefits
Seoul, South Korea	Build Standardized Renewable Energy EV charger Infrastructure
Sinan, South Korea	Renewable Energy Market Expansion
BMW Munich, Germany	Economic benefit of selling renewable energy EV charger
SK-on, Hyundai Motor, Kia Motors, LG Energy Solution, Samsung SDI (EV corporates in Seoul)	Addressing the current issue of stagnant growth in electric vehicle infrastructure by standardizing car charger specifications → Benefit from increased sales of electric vehicles
People driving electric vehicles in Seoul	Addressing the issue of insufficient electric vehicle charging stations → ensure convenient accessibility Gain economic benefits such as 'green money'

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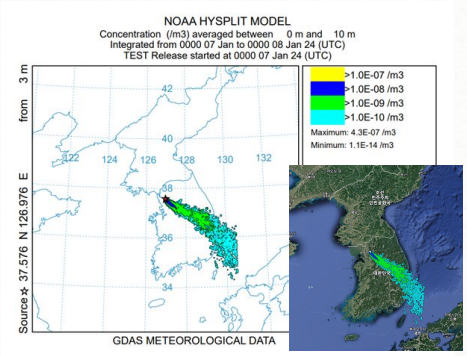
4. HYSPIT Modeling

Modeling input data: South Korea's current EV requires approximately 3000 kWH electricity for charging annually, with an average 5.6 times chargings per month. 457g of CO_2 was emitted when generating 1 kWh of electricity domestically. For, ChangEco's sustainable EV requires approximately 6120 mg CO2/hr.

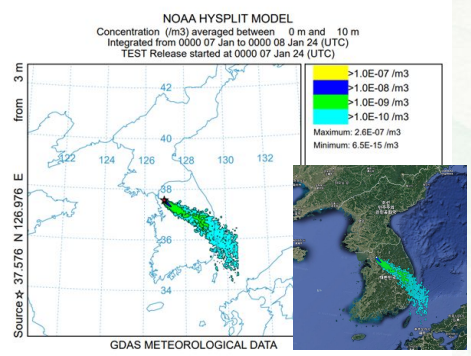
Environmental Impact *While Charging*

Current EV chargers based on fossil fuels



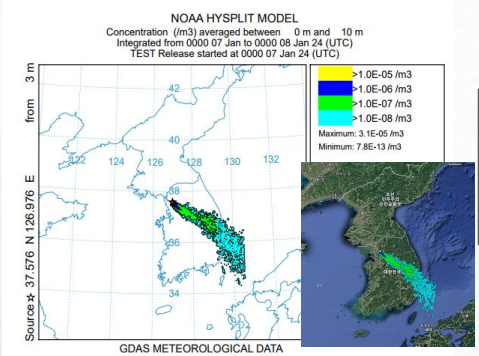
Reduce
4080 mg CO2 / hr*car
97,920 mg CO2 / day*car
35740.8 g CO2/ year*car

Renewable Energy EV chargers by ChangEco Infra Platform



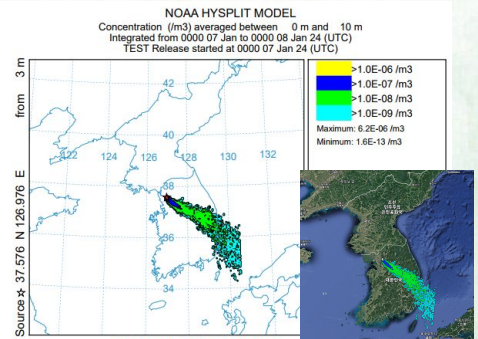
Environmental Impact *While Driving*

Current EV chargers based on fossil fuels



Reduce
586,477 mg CO2 / hr*car
14,075 g CO2 / day*car
5.7 ton CO2/ year*car

Renewable Energy EV chargers by ChangEco Infra Platform



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4. Environmental Impact

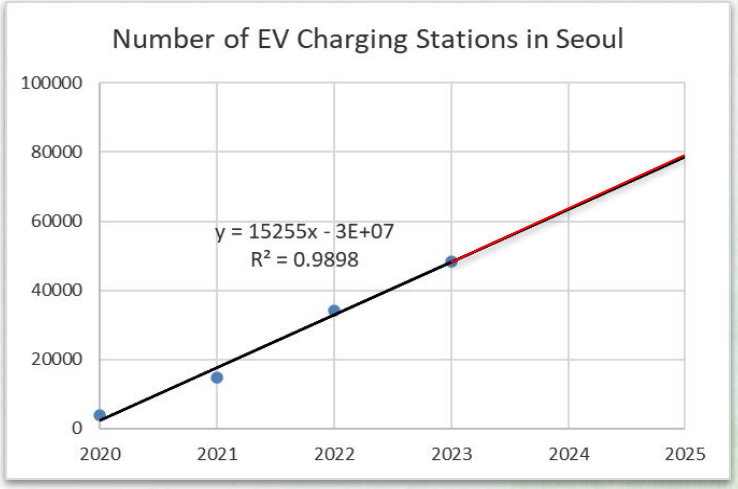
1. Projected Increase in the Number of EV Cars in Seoul, South Korea:
   - 2023 : 72,937 vehicles which needs 3,000 KWh/year currently
   - Considering the growth in the number of electric vehicles (EVs) in 2025, it is expected to be approximately 10,000 EVs

2023 : 72,937 EVs

2025 : 10,000 EVs

2. Expansion of renewable energy (solar energy) in Sinan, an undeveloped region, to meet the increasing demand

3. Current EV Charging Station Statistics:
   - As of 2023, according to the Seoul Metropolitan Government: Total EV chargers in Seoul = 48,468 units
   - Rapid chargers at transportation hubs (roadsides and public parking lots): 3,845 units
   - Slow chargers at residential and public facilities (apartments, workplaces, etc.): 44,623 units
   - This information provides an insight into the potential size of the opportunity in the EV charging infrastructure sector.



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Social Impact;Achieving the SDGs goals

Electric mobility aligns with SDGs #7 (Affordable and Clean Energy), #11 (Sustainable Cities and Communities), and #13 (Climate Action)

01 Broadening Green EV charging stations in Seoul

Seoul's EV charging station expansion includes 1,000 units by BMW Korea, incorporating ESS systems and utilizing renewable energy.

02 Local Economic Expansion -Sinan Sunlight annuity-

(2024) **Sinan can earn**
218,811MWh*$36.76/MWh
=**$8.04 million**
*using Hecate Energy(California)'s solar energy price

Profits from Sinan's renewable energy are being allocated to the "Sinan Sunlight Annuity". The additional $8.04 million from this idea, contributing to the growth of the annuity and the economic capacity of local residents and foster sustainable regional economic development through market expansion.

03 Contribute to NDC (Carbon Credit)

Domestic enterprises are expected to positively impact the achievement of national climate goals by transitioning the energy source of domestic electric vehicle charging stations to carbon-neutral energy.

Additionally, through a collaborative project with South Korea, **BMW headquarters can support the nation's National Determined Contributions (NDC) attainment by issuing International Transferable Mitigation Outcomes (ITMO)**. This project is also anticipated to contribute to global emission reductions.

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Partnerships

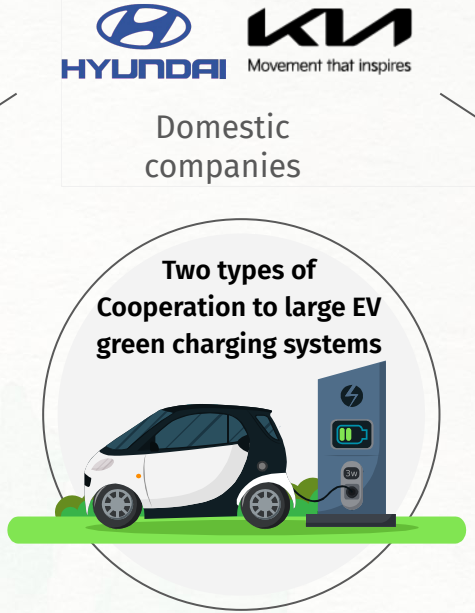
We aim to partner with private companies & local governments for expanding EV green charging infrastructure with ESS by standardizing EV outlet

Partnership of Local governments & domestic companies

Getting renewable energy-powered EV charging electricity &Use

Local Government

Domestic companies



Partnership of Overseas companies & domestic companies

(EV, charging station industry)

Maximizing charging efficiency through EV outlet standardization

Overseas company

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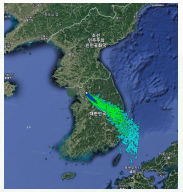


Cost Considerations

Local Governments (Sinan)

(+) Improving their own renewable energy-generated systems, local governments can get Carbon credit

(+) Employment Increasing

(-) Installation cost, operating cost

Customers

(+) Customers can get green money as there are enough EV green charging stations based on global companies cooperation

(+) Shorter mileage because of standardization of EV charging outelt

Domestic Companies (Hyundai Motor)

They can earn money with Carbon credit.
In Voluntary Carbon Market,
the Carbon Credit price is $3.5/t
(2023, The world bank)

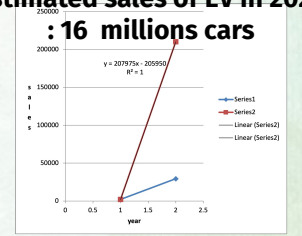
Companies can earn at least $ 3,192,000

*5.7 tons CO2/year*car*160,000*3.5 = $3,192,000

Overseas Companies (BMW)

As expected sales volume of EV in S.Korea is 16 millions, It's good opportunity for BMW foraying into the market

Estimated sales of EV in 2024 : 16 millions cars



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Implementation Plan (2024 - 2035)

Short term Plan

Jan 2024

- Specify identify areas for standardization in Seoul
- Initiate communication with major global companies specializing in eco-friendly EV charging technology to explore potential collaborations.
- Begin surveying and engaging with consumers to understand their preferences and needs regarding eco-friendly EV charging.

June 2024

- Establish a framework for standardization in collaboration with industry experts.
- Conclude discussions with selected global companies for potential partnerships and market expansion.

Dec 2024

- **Officially launch the standardized eco-friendly EV charging system in a Seoul metropolitan area.**
- Confirm agreements with major Asian green automotive companies to support infrastructure development
- Introduce a consumer incentive program, such as "Green Money," to encourage adoption.

Mid term Goals

Dec 2025

- Expand the standardized eco-friendly EV charging system to multiple metropolitan areas in South Korea.
- Strengthen partnerships with additional global companies, fostering innovation in the industry.

Dec 2027

- Achieve all Seoul coverage of the standardized eco-friendly EV charging system.
- Foster collaboration with governments and organizations globally to advocate for similar policies such as Busan and Yeosu in Korea.

Long term Vision

Dec 2030

- Establish the eco-friendly EV charging system as a fundamental component of South Korea's sustainable mobility landscape.
- Influence regional and global policies for eco-friendly transportation infrastructure.
- Continue to innovate and adapt to emerging technologies, ensuring long-term relevance.

2035

- Drawing on the relationship between South Korea and Germany in SDM, sustainable development systems can be achieved in the introduction of electric vehicles in LDMs, LLDCs, SIDs and similar contexts.

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Thank you - ChangEco

January 20, 2024