

UDESMO(Urban Development, Energy infrastructure and Sustainable MObility network)

# The demand for EV charging infrastructure at the local level, and a supply strategy based on activity-travel patterns: current status in Korea

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# About KRIHS

- ✔ Korea Research Institute for Human Settlements
- ✔ Founded in 1978 to support territorial development of South Korea
- ✔ 1980's~ present : Comprehensive National Territorial Development Plans(every 10 year)
  - National Expressway Construction and Management Plans (2016, 2021)
  - National Freeway Construction and Management Plans(2001, 2006, 2011, 2016, 2021)
  - Master Plan for the Capital Region Promotion(1982, 1997, 2006, 2021)
  - Master Plan for Administrative Central City Construction(2006)
  - Major policies on housing

# About my presentation of today



## 기본

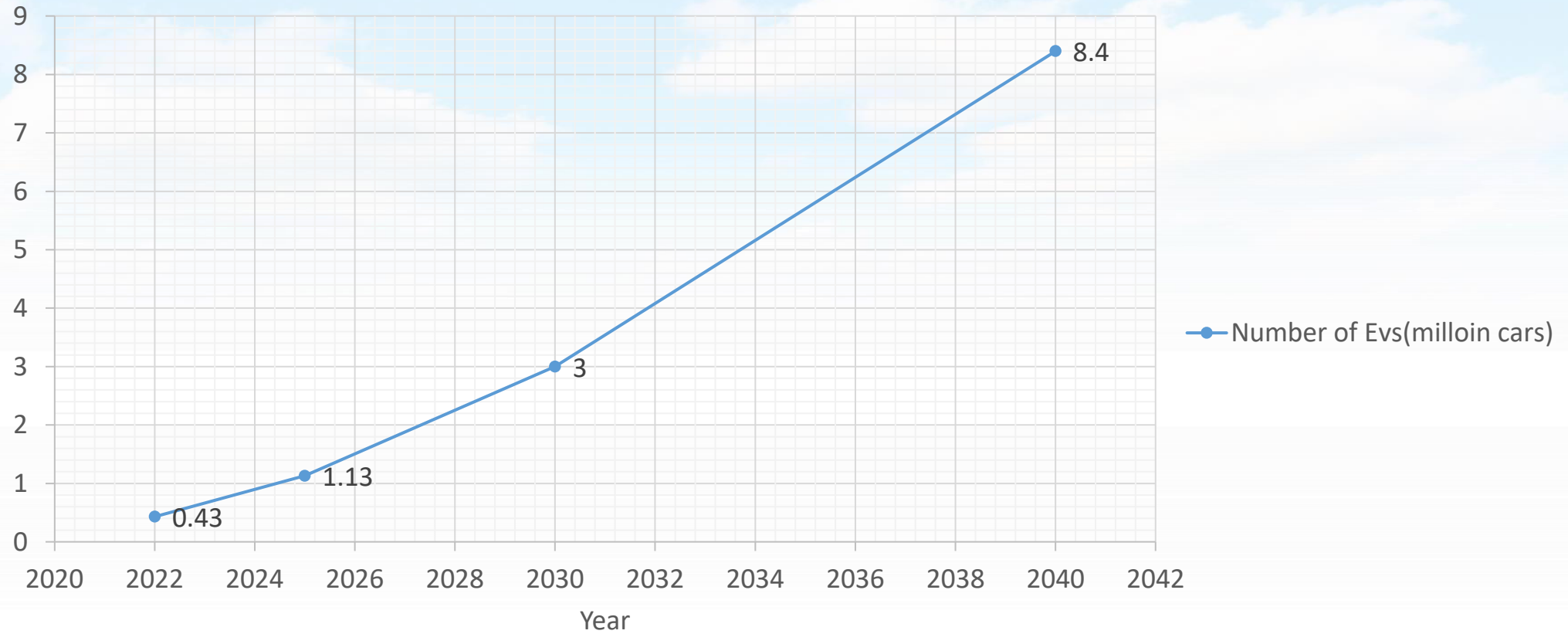
### 친환경차 활성화 추이에 따른 이용자 중심 충전인프라 구축 방안(Development of User-centric Charging Infrastructure Policies for Rapid Adoption of Zero Emission Vehicles)

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원문보기 🔍

다운로드 ⬇

# The Korean government's EV distribution targets(2020)



Total Number of Cars Registered in Korea: 25,279,790

Number of EVs Registered: 313,801(as of 2022.07)



# EV policy framework (in Korea)

## Government(Policy & Regulation)

- ✔ Subsidy
- ✔ Improvement of EV usability
- ✔ Support for EV industry

## Industry(Technology & Production)

- ✔ Giving priority to EV technology development & production

## Decision to buy an EV rather than a fossil fuel vehicle

### ✔ Monetary and Technical Benefit

- Purchasing price
- Maintenance cost
- Technical advancement(driving assistance, etc)

### ✔ Psychological Benefit

- Identity(who am I, what kind of person I want to look like)
- Social responsibility
- Anxiety about charging

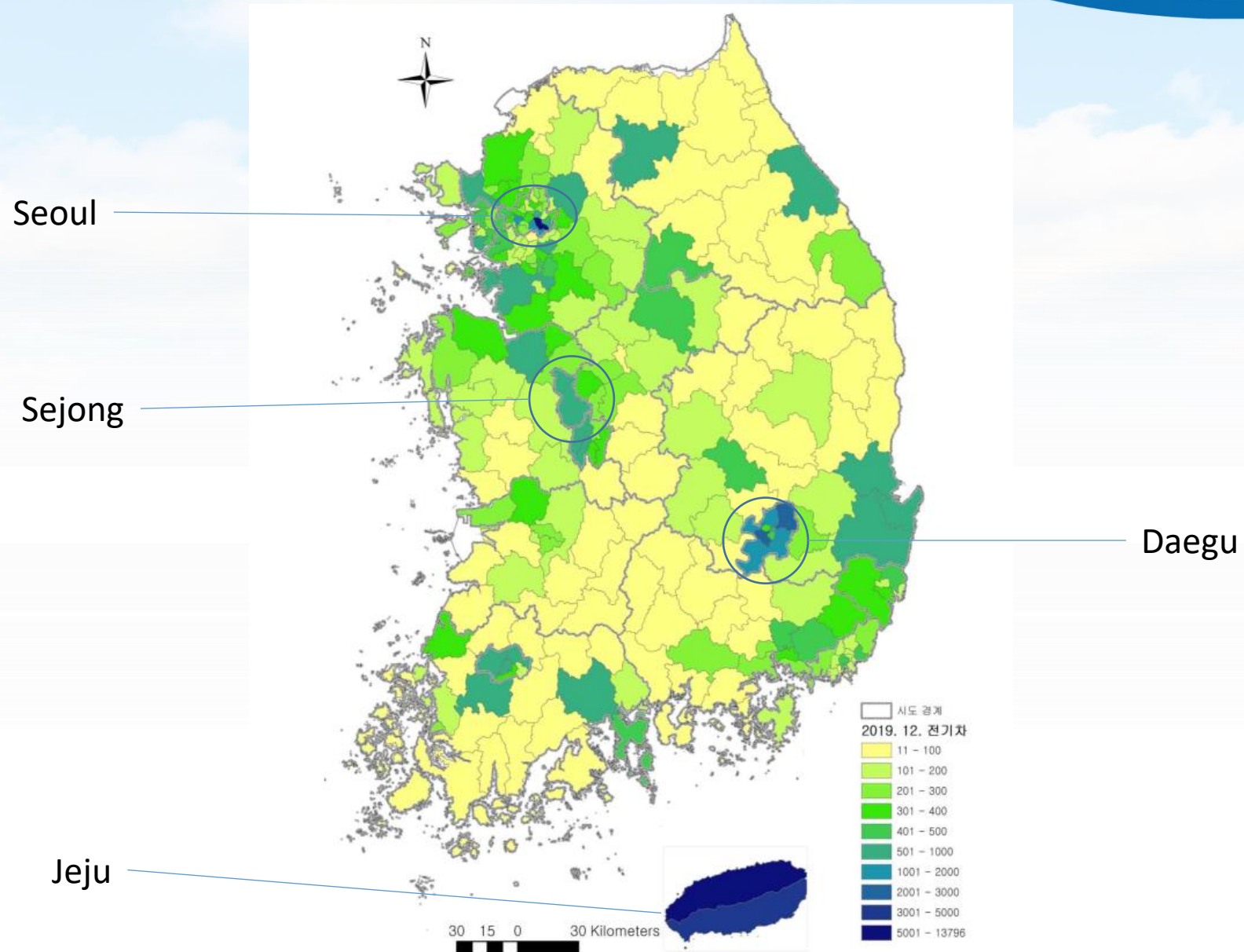
### ✔ Monetary Subsidy

- Subsidy for purchase (central / local)
- Subsidy for installing EV charger (central)
- Discount for EV charging electricity (central)

### ✔ Non-Monetary Subsidy (Differ by locality)

- Designated parking space with charging
- Public charging infrastructure

# EV registered at each si-gun-gu(equivalent of civil parish in UK, 2020)



# Subsidy for purchasing EV(passenger car)

- ✔ EV purchase subsidies vary by si-gun-gu ranging from KRW 9.0 mil to 16.5 mil
- ✔ Amount of subsidy per each EV is decreasing every year to support more EV
- ✔ There are caps on the number of EVs that receive subsidies for purchase for each metropolitan cities and si-gun-gu's in non-metropolitan area
- ✔ Central government subsidy for passenger cars: maximum of KRW 6 million depending on efficiency and price of EV
- ✔ Local government subsidy: KRW 4~10 million

표 2-4 | 친환경차 보조금 현황(지방보조금)

구분	전기차
서울	450
부산	500
대구	500
인천	500
광주	600
대전	700
울산	600
세종	400
경기	500~600
강원	600~700
충북	800
충남	700~900
전북	900
전남	600~800
경북	600~1,000
경남	600~800
제주	500

Metropolitan areas

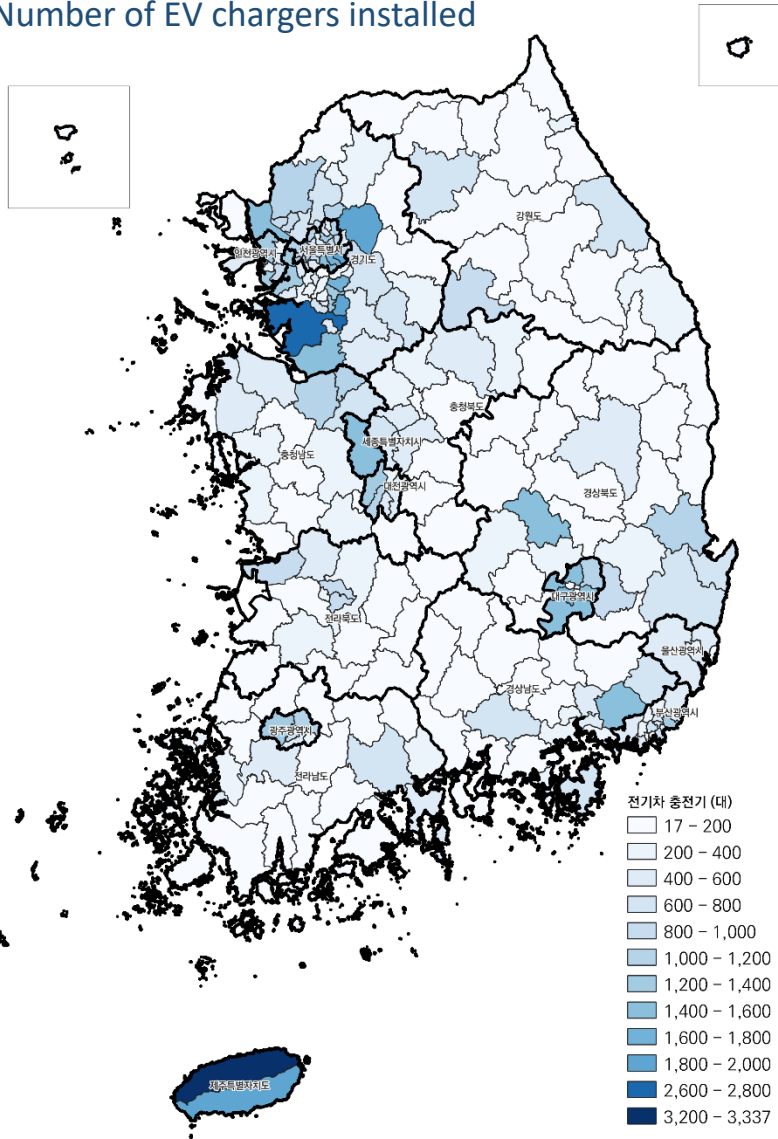
# Obligation to install EV chargers

- ✔ Effective date: 2022. 1. 28
- ✔ Applies to
  - Apartments with more than 100 units of housing (previously,  $\geq 500$  units of housing)
  - Public use facilities with more than 50 parking spaces (previously,  $\geq 100$  parking spaces)  
(Public institutions, lodgings, vacation/leisure facilities, hospitals, business buildings, cultural facilities, commercial buildings, parking lots, etc.)
- ✔ Standards to be met
  - New facilities and existing public facilities:  $\geq 5\%$  of parking spaces (previously,  $\geq 0.5\%$ )
  - Existing private facilities:  $\geq 2\%$  of parking spaces (new)
- ✔ Deadline
  - Public-owned facilities: 2023.1.28
  - Private-owned facilities: 2024.1.28
  - Apartments: 2025.1.28
- ✔ Miscellaneous
  - Chargers installed at public facilities must be public-use

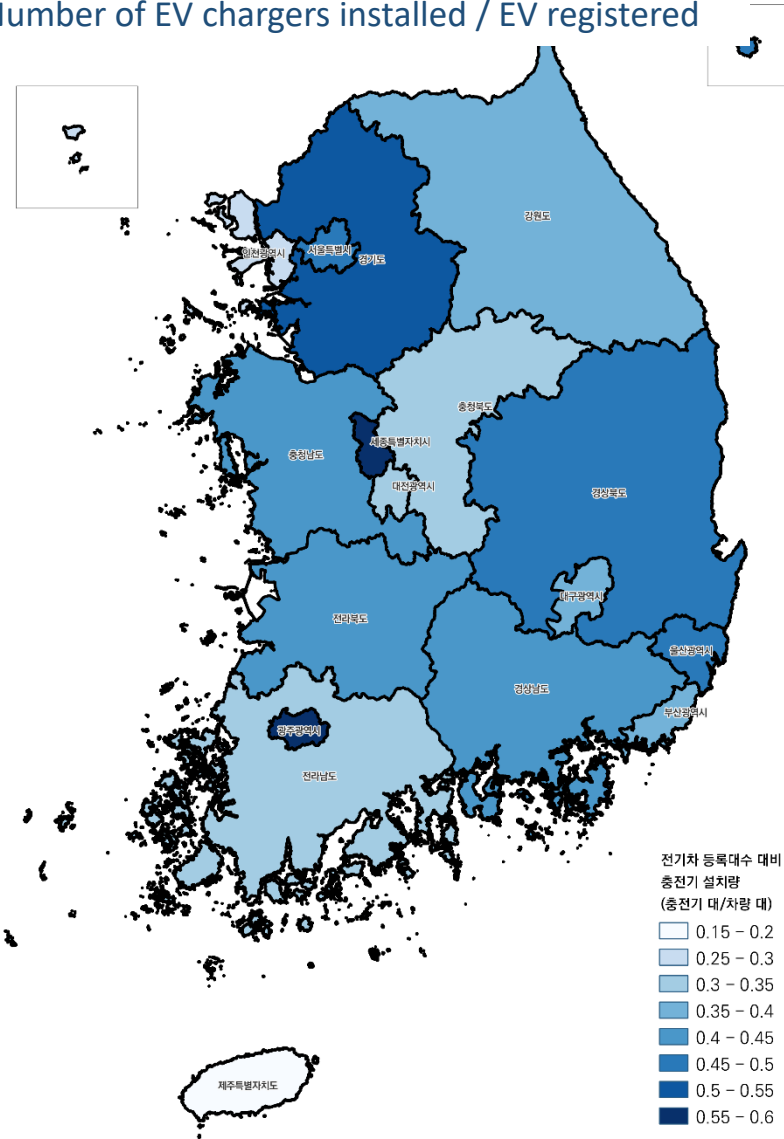


# Charging infrastructure (2022)

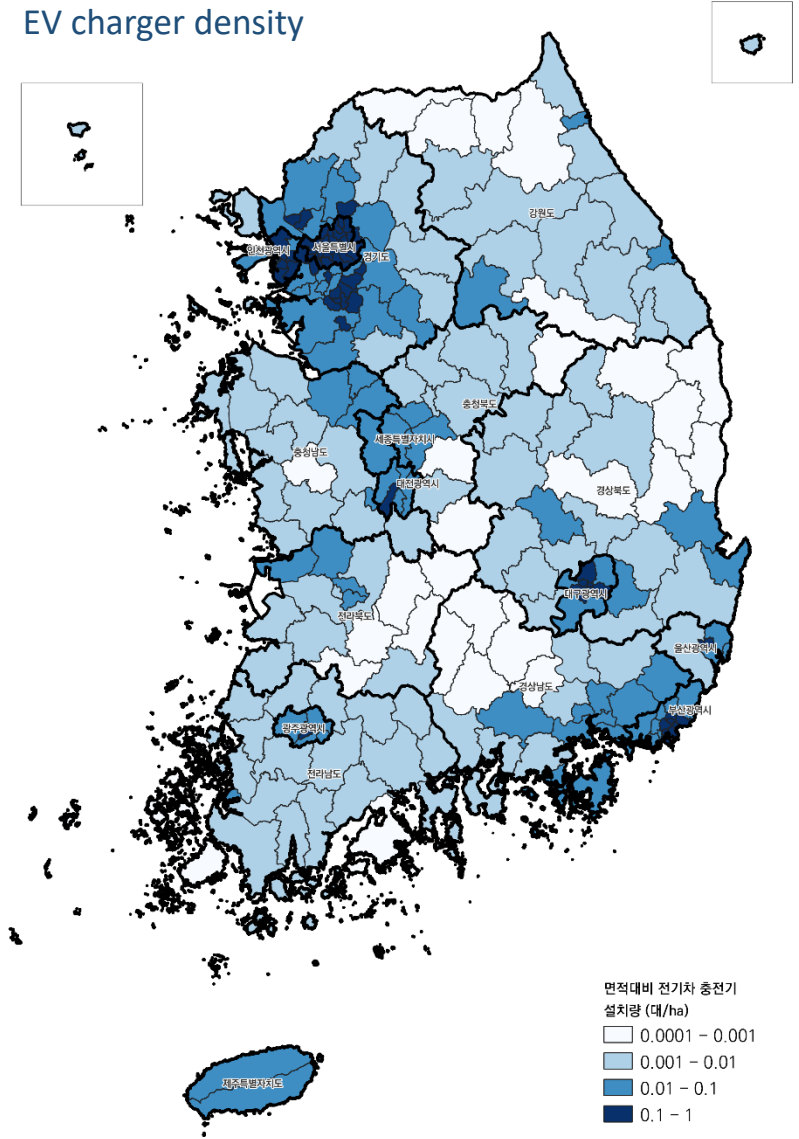
Number of EV chargers installed



Number of EV chargers installed / EV registered



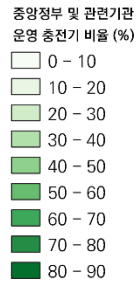
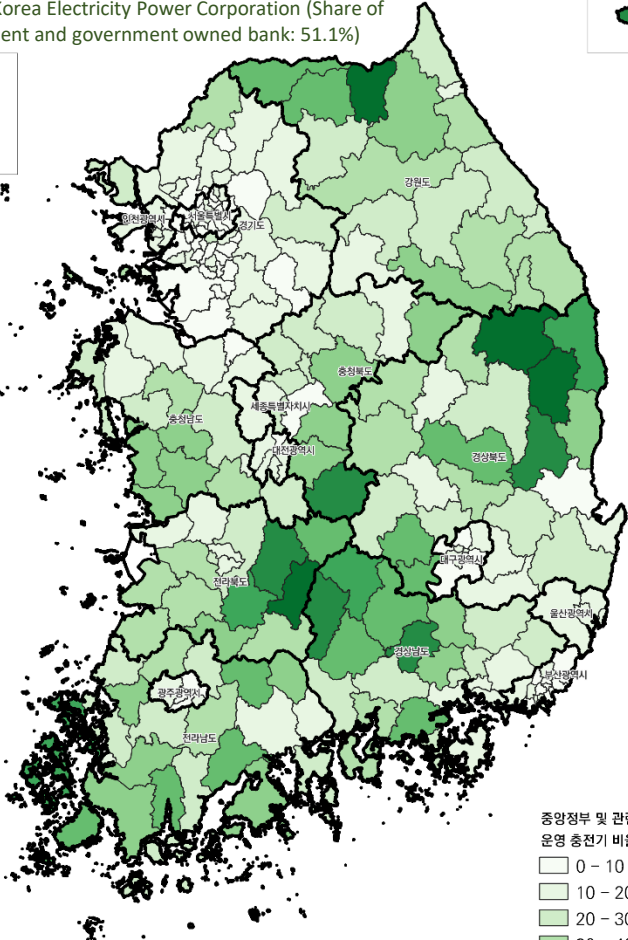
EV charger density



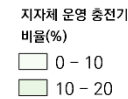
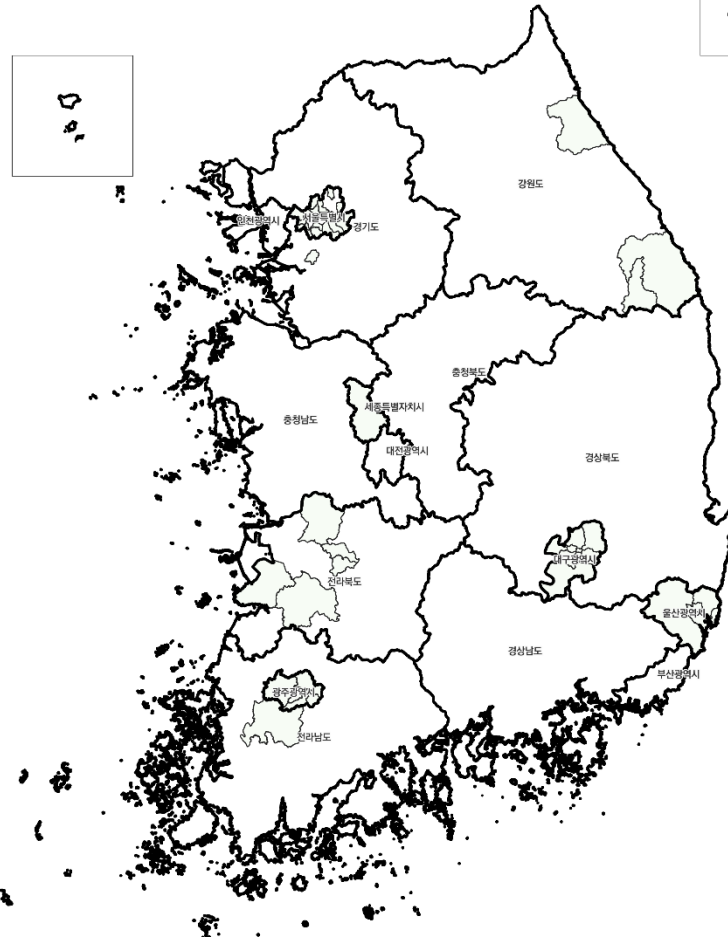
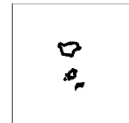
# Ratio by operating entity(2022)

## Central government or KEPCO

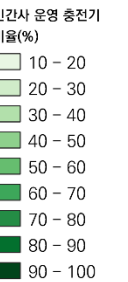
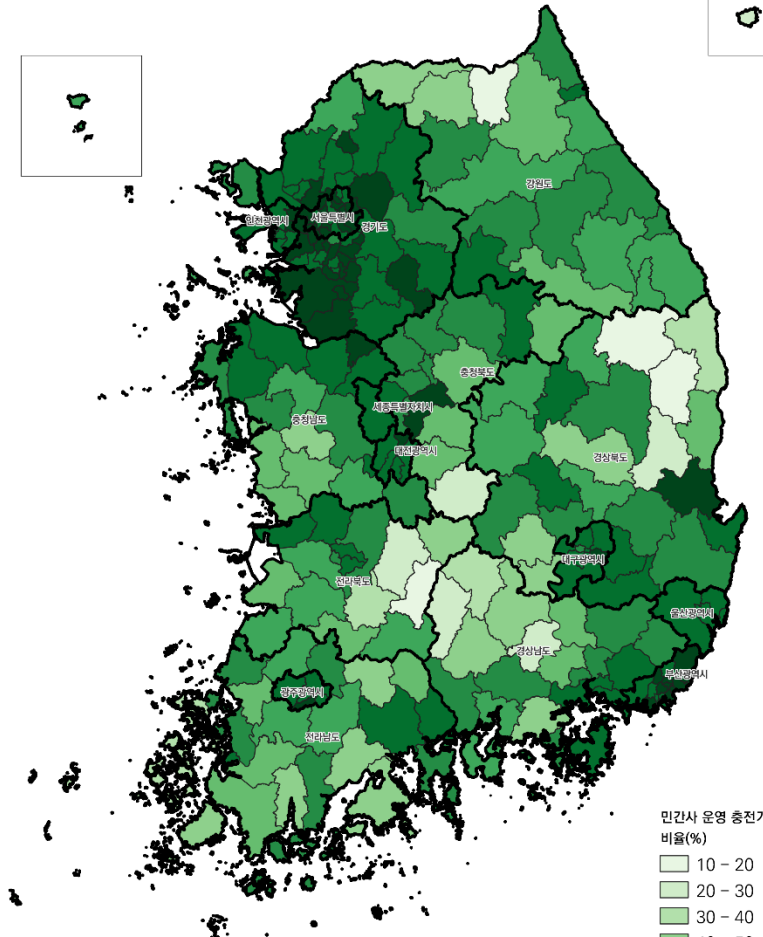
KEPCO: Korea Electricity Power Corporation (Share of government and government owned bank: 51.1%)



## Local government

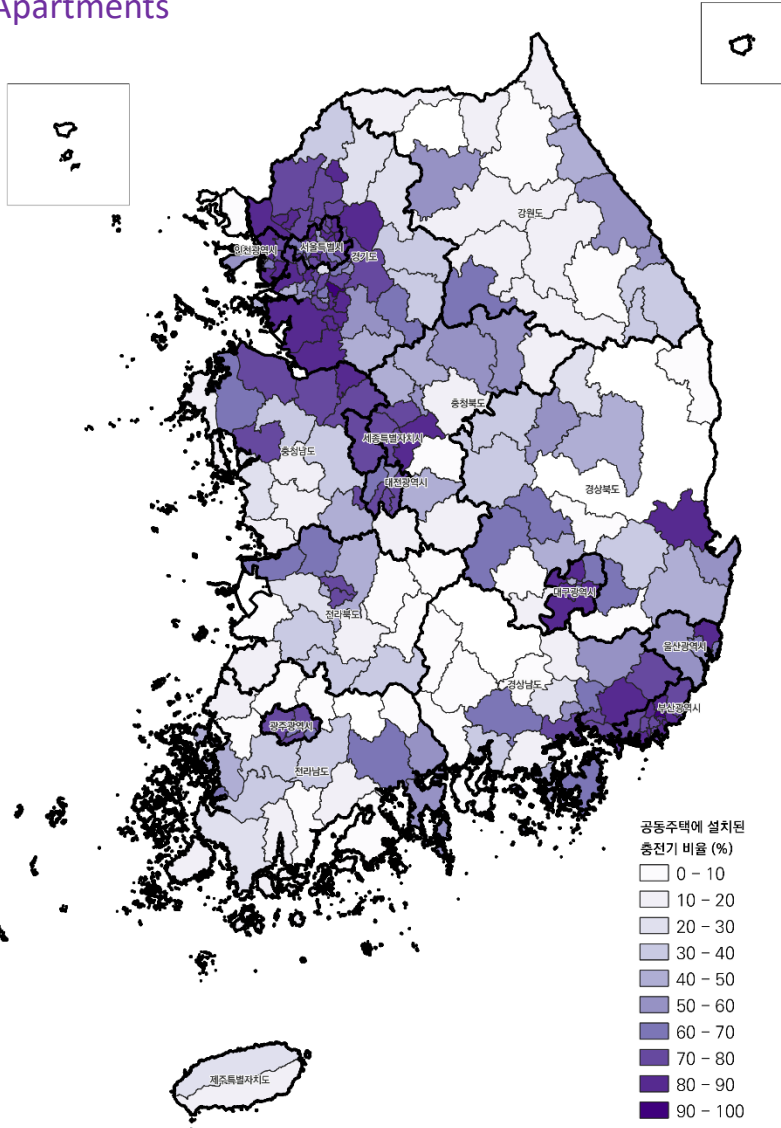


## Private company

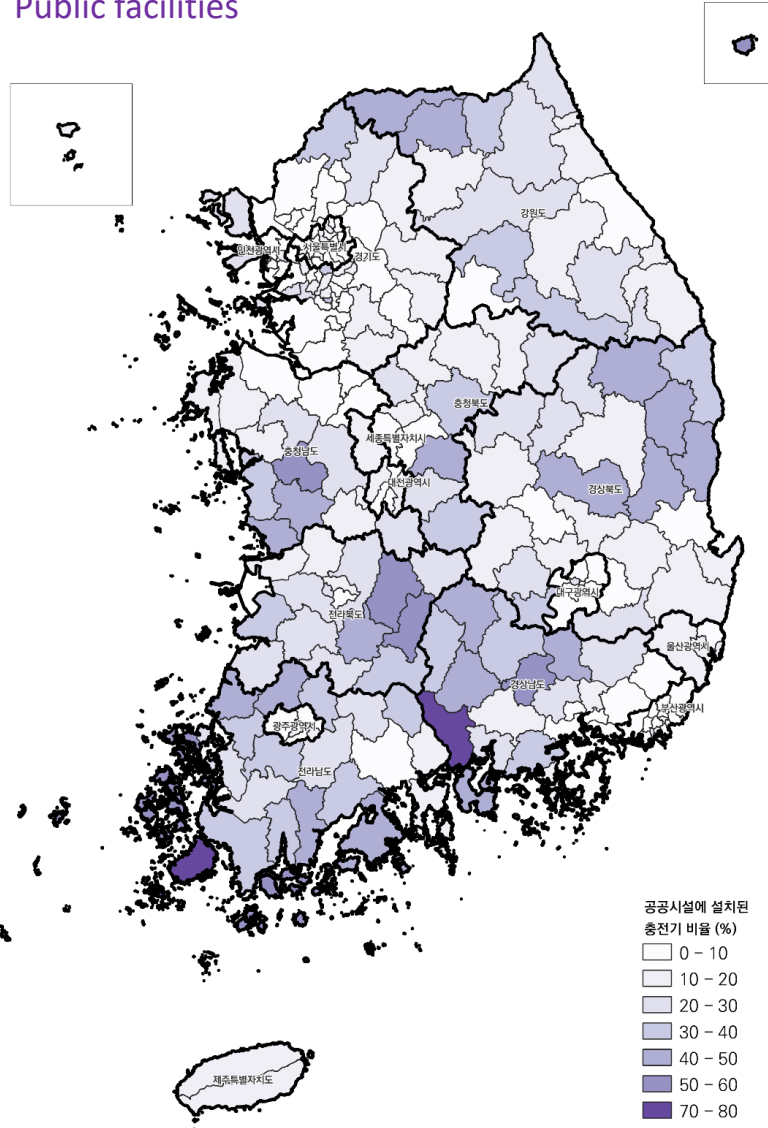


# Ratio by installed place(2022)

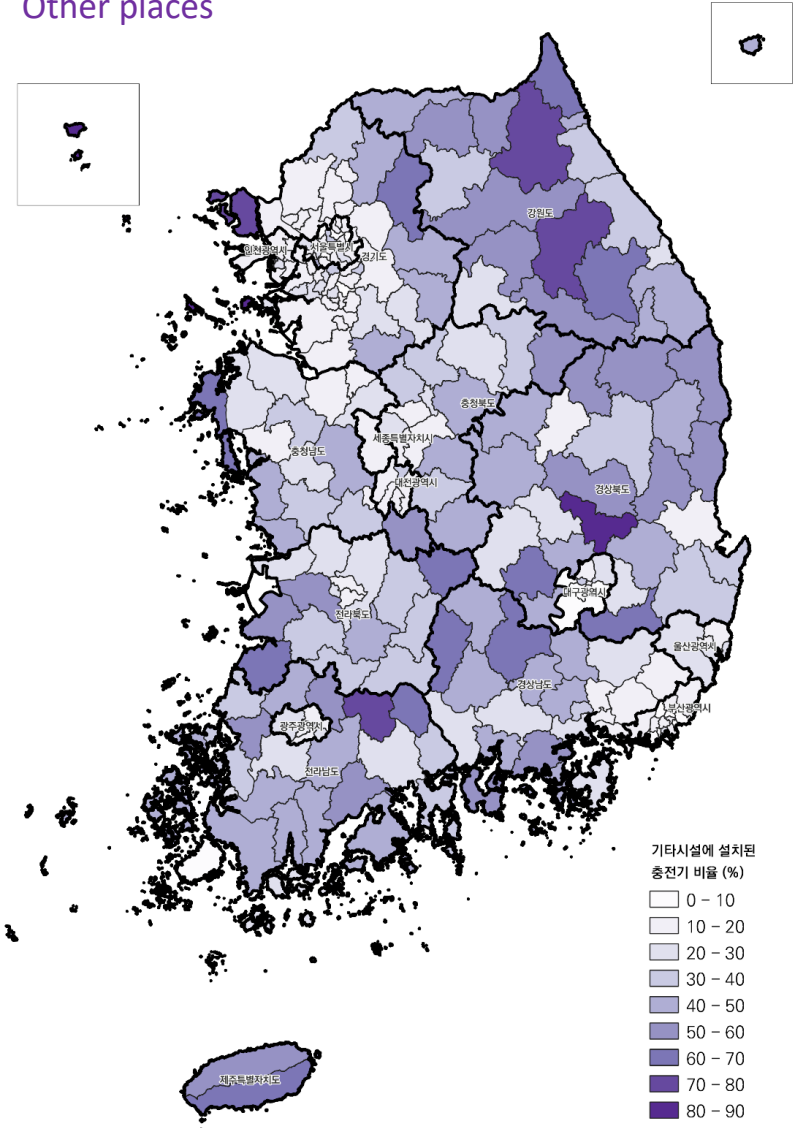
Apartments



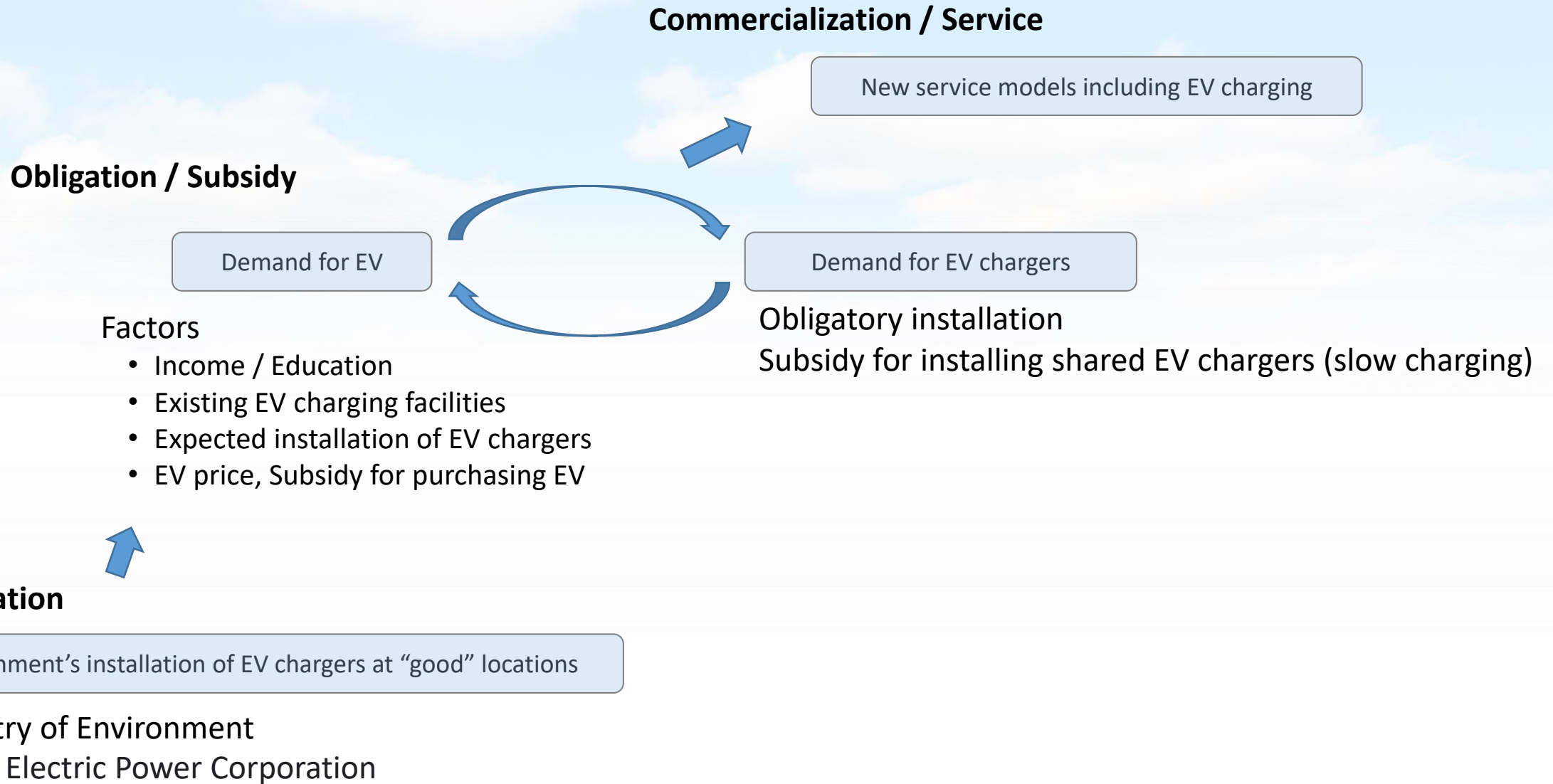
Public facilities



Other places



# Phases of charging infrastructure regarding EV market size





# Examples of new service models

- ✔ Hyundai: increased usability of EV



Hyundai EV charger installed at a public owned parking lot

- ✔ Kakao, SK telecom: mobility service, payment

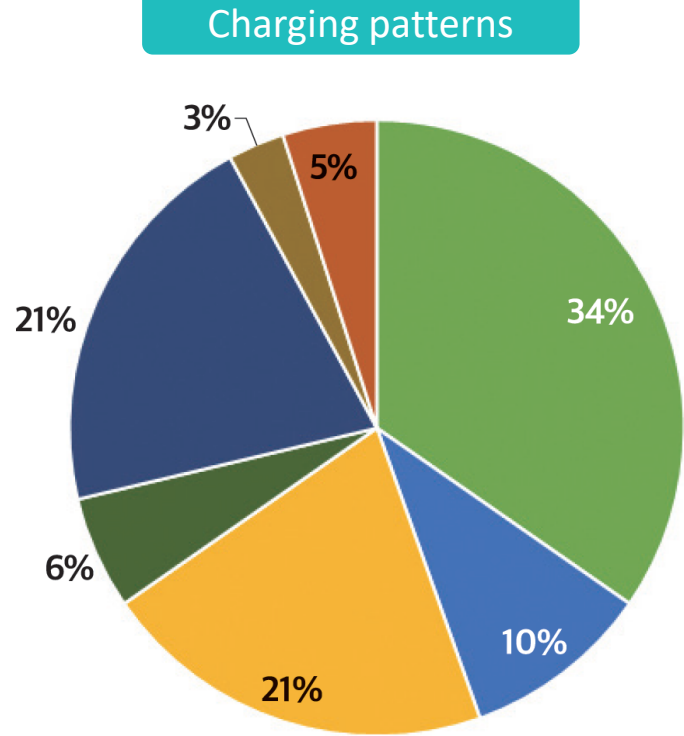


- ✔ Shopping centers, department stores: high income customers, VIP service

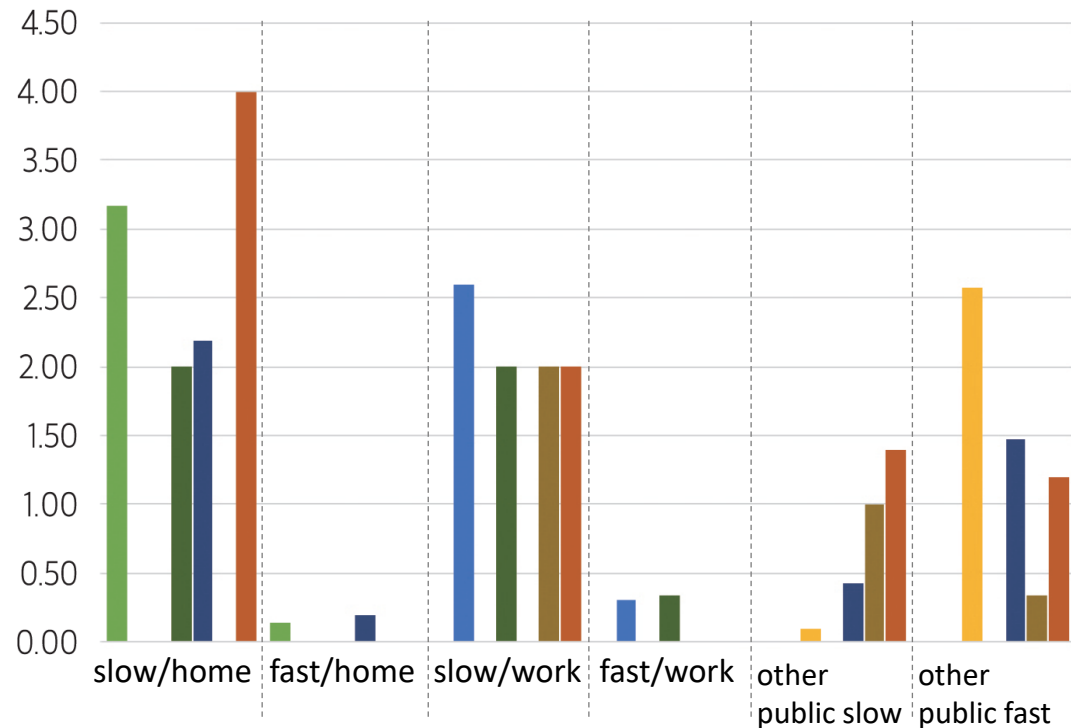


# Charging behavior: where do you charge?

✔ Survey of 117 EV users



### How many times do you charge per week at different locations?

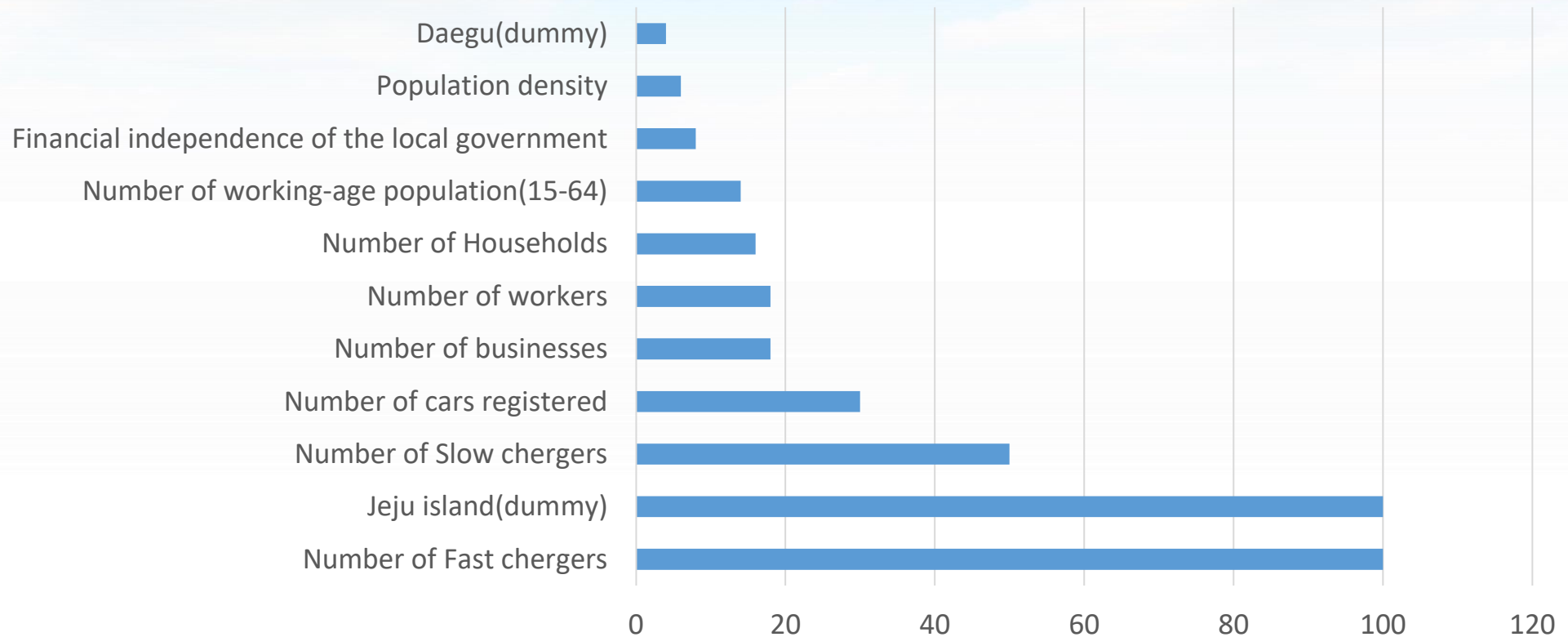


■ Only at home   
 ■ Only at work   
 ■ Only at public charging stations   
 ■ At home and work   
 ■ At home and public stations   
 ■ At work and public stations   
 ■ Anywhere available

# Spatial Modeling of EV distribution

- ✔ Radom Forest model
- ✔ Factors related to **number of EVs**

Relative importance





# Spatial Modeling of EV distribution

## ✓ Scenarios

Current installation target: 15,000 fast chargers, 30,000 slow chargers in total by 2025

### Scenario 1

Installation in proportion to number of working-age population

### Scenario 2

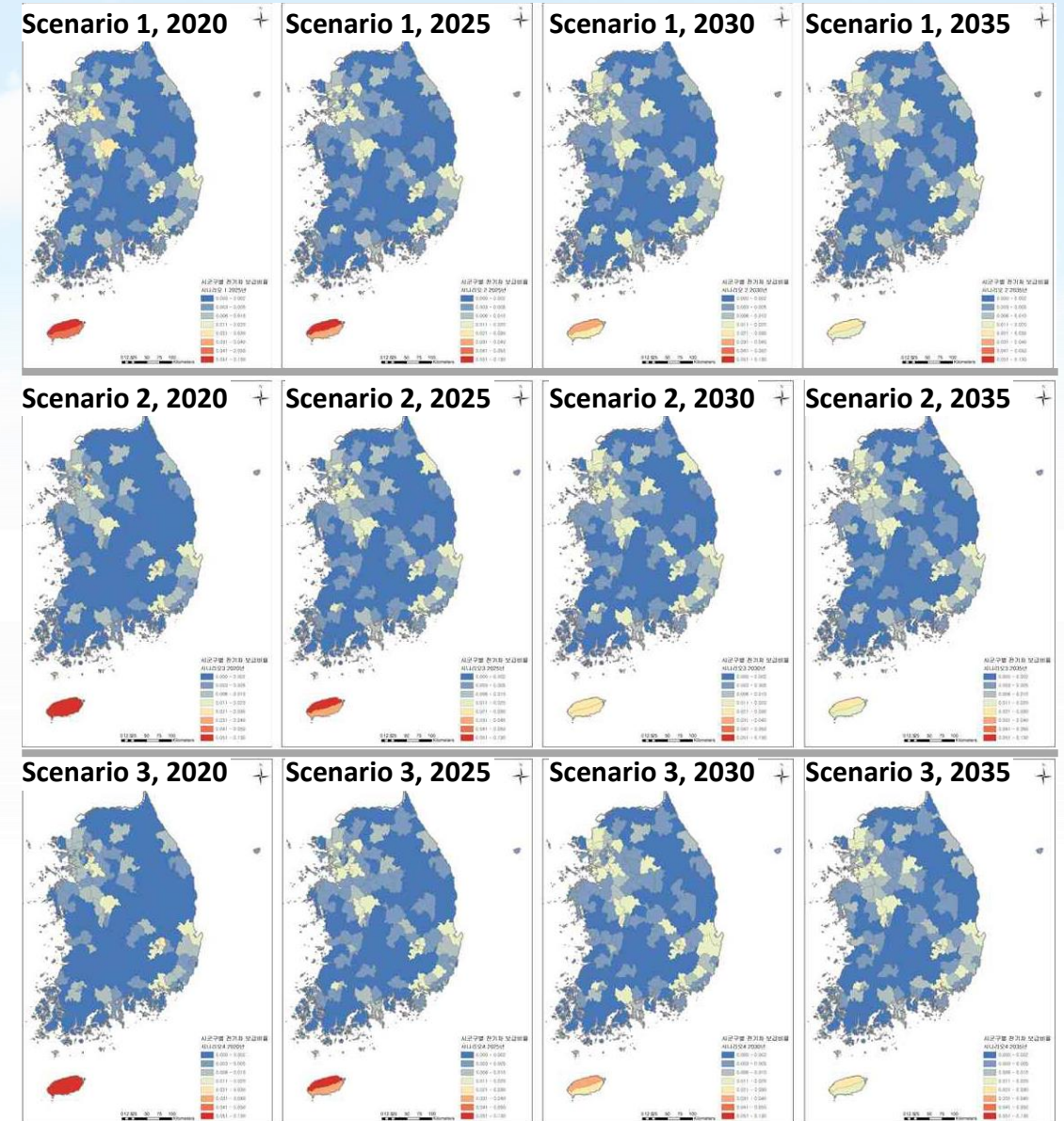
Installation in proportion to number of parking space

### Scenario 3

Installation in proportion to number of vehicles

## ✓ Result

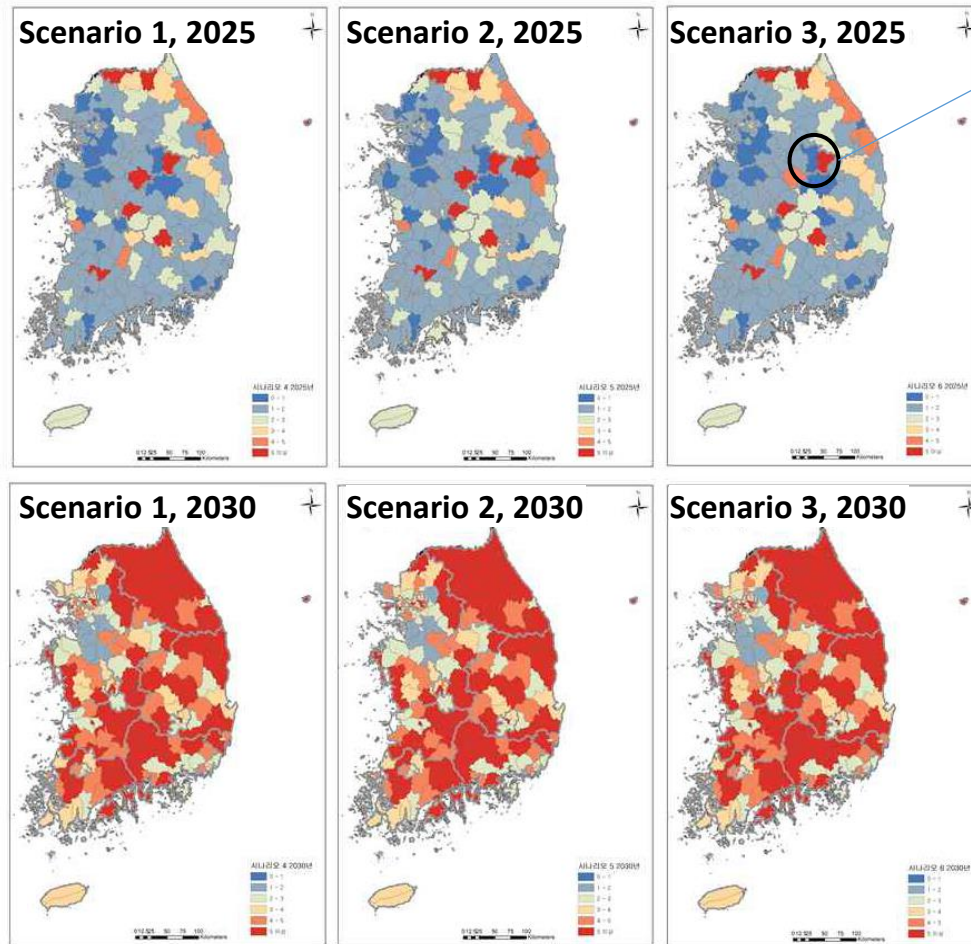
Spatial distribution of EV does not vary significantly across scenarios





# Spatial Modeling of EV distribution

## Comparison of [number of slow chargers] / [forecasted number of EVs]



Red: smallest number of chargers per EV

- ✓ Rural area will experience charger deficiency earlier
- ✓ By 2030, many of the urban area will experience charger deficiency if we only rely on obligation and subsidy.
- ✓ However, urban area will likely be a good-sized market for private companies
- ✓ “More money for areas with more people, more cars, more parking space” strategy might have to change
- ✓ We suggested the government “selling(auctioning) the operating rights for chargers at good locations to private company, and using the money to promote EV usage in rural area”

# Summary / Conclusions

- ✔ In urban areas, EV charging facilities are concentrated at apartments especially in urban areas.
- ✔ Behaviorally, there are people who formed their charging behavior around non-home locations.
- ✔ By 2030, even urban areas might experience charger deficiency, if we depend only on obligation and subsidy.
- ✔ It is necessary to analyze people's activity-travel patterns(duration, frequency), and install EV chargers at other major activity locations.
  - ➡ We are designing a activity analysis using the smartphone(GPS) tracking data.
- ✔ Rural areas is likely to experience charger deficiency earlier than urban areas.
- ✔ Korean government has to switch from the current “more money for more people/car/parking” strategy.
- ✔ Our recommendation is making money by selling old public-operated charging stations, which were installed at attractive locations, and spending a part of it for less favored areas.
- ✔ Better business opportunity for companies, better service for EV users, and budget savings for the government



Thank you!

감사합니다!

