**The impact of setback regulations on PV deployment strategies in Gyeonggi province, South Korea**

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# Supplementary Materials

# Note 1: Korean administrative

South Korea has three-tier local governance systems: Tier 1 (province-level or state-level) includes 8 provinces and 7 metropolitan cities, including Seoul. Tier 2 (county-level) includes 226 counties and cities affiliated with the Tier 1 governments, and 2 autonomous jurisdictions (Sejong city and Jeju Island). Lastly, Tier 3 (town-level) governments are affiliated with the Tier 2 governments. Even if Gyeonggi-do, a province in tier 1, consists of 31 cities and counties, both cities and counties will be collectively referred to as ‘cities’. (Ko, 2023)

# Note 2: Assumed parameters for PV generation potential

The area factor and density factor were calculated using data (Public data portal, 2024) on solar installations established under relevant laws, including the "ACT ON THE PROMOTION OF THE DEVELOPMENT, USE AND DIFFUSION OF NEW AND RENEWABLE ENERGY" and municipal ordinances, as illustrated in the Figure SM 1 and Figure SM 2 below.

텍스트, 스크린샷, 도표, 라인이(가) 표시된 사진

자동 생성된 설명

Figure SM 1. Area covered by PV to total area of individual site. (Total area vs. PV installation area)

텍스트, 스크린샷, 도표, 그래프이(가) 표시된 사진

자동 생성된 설명

Figure SM 2. Required area for PV installation (capacity(kW) vs. area(m2))

# Note 3: Assumption for calaculating LCOE and results.

Previous studies (Lee and Lim, 2021) calculated region- and type-specific LCOE using the assumptions outlined in Table SM 2 below and the LCOE formula presented in the main article. The results of the previous study were utilized in this study as shown in Table SM 3. For your reference, KRW stands for Korean Won, and as of October 4, 2024, the exchange rate against the US dollar is 1,320 KRW per USD.

Table SM 2. Assumed parameters for calculating LCOE in previous study

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Type | Ground-mounted PV | | | | Roof-top PV | Water-surface PV |
| Scale | 100kW | 1MW | 3MW | 20MW | 1MW | 3MW |
| Capital expenditure (Thousand KRW/kW) | 1,491 | 1,310 | 1,213 | 1,154 | 1,113 | 1,786 |
| Operating expenditure (KRW/kW·year) | 29,360 | 22,243 | 23,496 | 12,860 | 21,552 | 25,402 |
| Land lease expense | Applied differently depending on the region | | | | - | - |
| Interest rate (%) | 4.4% | | | | | |
| Corporate tax rate (%) | Applied differently depending on net income  Below 200 million KRW: 11%, 200 million KRW to 20 billion KRW: 20%, 20 billion KRW to 300 billion KRW: 22% | | | | | |
| Economic lifetime (year) | 20 | | | | | |
| Degradation rate | 0.54% | | | | | |

Table SM 3. LCOE by cities and PV types.

|  |  |  |  |
| --- | --- | --- | --- |
| City | Town | grdmtd\_PV  (Won/kWh) | rftp\_PV  (Won/kWh) |
| Gapyeong-gun | - | 155 | 137 |
| Goyang-si | Deogyang-gu | 379 | 360 |
| Ilsandong-gu | 524 | 506 |
| Ilsanseo-gu | 521 | 504 |
| Gwacheon-si | - | 650 | 632 |
| Gwangmyeong-si | - | 744 | 726 |
| Gwangju-si | - | 237 | 219 |
| Guri-si | - | 592 | 573 |
| Gunpo-si | - | 546 | 528 |
| Gimpo-si | - | 261 | 243 |
| Namyangju-si | - | 267 | 249 |
| Dongducheon-si | - | 203 | 185 |
| Bucheon-si | - | 991 | 973 |
| Seongnam-si | Bundang-gu | 1,139 | 1,120 |
| Sujeong-gu | 722 | 703 |
| Jungwon-gu | 873 | 854 |
| Suwon-si | Gwonseon-gu | 507 | 489 |
| Yeongtong-gu | 773 | 755 |
| Jangan-gu | 444 | 425 |
| Paldal-gu | 933 | 915 |
| Siheung-si | - | 393 | 376 |
| Ansan-si | Danwon-gu | 334 | 317 |
| Sangnok-gu | 504 | 486 |
| Anseong-si | - | 168 | 150 |
| Anyang-si | Dongan-gu | 1,140 | 1,121 |
| Manan-gu | 654 | 636 |
| Yangju-si | - | 225 | 207 |
| Yangpyeong-gun | - | 166 | 148 |
| Yeoju-si | - | 161 | 144 |
| Yeoncheon-gun | - | 146 | 129 |
| Osan-si | - | 407 | 389 |
| Yongin-si | Giheung-gu | 489 | 471 |
| Suji-gu | 556 | 538 |
| Cheoin-gu | 212 | 194 |
| Uiwang-si | - | 451 | 432 |
| Uijeongbu-si | - | 443 | 425 |
| Icheon-si | - | 178 | 160 |
| Paju-si | - | 205 | 187 |
| Pyeongtaek-si | - | 239 | 221 |
| Pocheon-si | - | 166 | 148 |
| Hanam-si | - | 492 | 473 |
| Hwaseong-si | - | 220 | 203 |

# Note 4: Setback regulation by local government

As of July 2024, 12 cities in Gyeonggi Province have implemented setback regulations as outlined in the Table SM 1 below.

Table SM . Setback regulation by local government

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Location and cities\* | SW | IC | AS | YP | YeJ | GC | PJ | YaJ | PC | DD | GP | YC |
| Residential housing | - | 300 | 500 | 300 | 200 | 100 | 100 | 100 | 300 | 100 | 500 | 300 |
| Roads | - | 300 | 200 | 200 | 200 | - | 100 | 100 | 200 | 100 | 300 | 200 |
| Rivers | - | - | - | - | - | - | - | - | - | - | - | 200 |
| Tourist attractions | - | - | 200 | 200 | 200 | - | - | - | - | - | 300 | - |
| Natural parks | - | - | - | 200 | - | - | - | - | - | - | 300 | - |
| Educational institutions | - | - | - | - | - | - | - | - | 300 | - | - | - |
| Medical facilties | - | - | - | - | - | - | - | - | 300 | - | - | - |
| Cultural heritage sites | 100 | 300 | - | 200 | - | - | - | 100 | - | 100 | 300 | - |
| Public sports facilities | - | - | 200 | - | 200 | - | - | - | - | - | - | - |
| Natural habitation areas | 100 | - | - | - | - | - | - | - | - | - | - | - |
| \*SW: Suwon-si, IC: Iceon-si, AS: Ansan-si, YP: Yangpyeong-gun, YeJ: Yeoju-si, GC: Gwacheon-si, PJ: Paju-si, YaJ: Yangju-si, PC: Pocheon-si, DD: Dongducheon-si, GP: Gapyeong-gun, YC: Yeoncheon-gun | | | | | | | | | | | | |

**References**

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