Climate Resilient City and Urban Environmental Sustainability

JAKARTA
INDONESIA
The emblem of Jakarta, featuring shield with images of Monas (National Monument), Rice and Cotton, Wave of Water, the words: Jaya Raya = The great Jakarta

The gold color on the edge of the shield, is a symbol of glory.
The red color in seloka, is the epitome of heroism.
The white color on the gate, is the symbol of sanctity.Pancasila
The white color in the National Monument, is a symbol of the glory of glorious creations.
The yellow color in rice, as well as green and white on cotton, is a symbol of prosperity and justice.
The blue color, is the symbol of free and wide space.
The white color in the waves, is the epitome of the ocean of love.
Landmark of Jakarta Province

National Monument

symbolizing the fight for Indonesia. It is the national monument of the Republic of Indonesia, built to commemorate the struggle for Indonesian independence.

Post Office at Fatahillah Square

the building was built in 1710 as the "Sadhus" (city hall) of Batavia. Jakarta History Museum opened in 1974 and displays objects from the prehistory period of the city region, the founding of Jayakarta in 1527, and the Dutch colonization period from the 16th century until Indonesia’s Independence in 1945.

Ondel-Ondel puppet figure

Fatahillah Museum
Location of the Jakarta CITIES

WEST JAKARTA
NORTH JAKARTA
CENTRAL JAKARTA
SOUTH JAKARTA
EAST JAKARTA

KETERANGAN
- ISTANA PRESIDEN
- KANTOR GUBERNUR JAKI
- KANTOR WAKIL GUBERNUR
- LAMPIRAN
- OELANGKANG REMAJA

LAUT JAWA TELUK JAKARTA
Thousand Islands Regency
# Characteristic of the City

## Jakarta’s Cities/Municipalities (Kota Administrasi/Kotamadya)

<table>
<thead>
<tr>
<th>City/Regency</th>
<th>Area (km²)</th>
<th>Total population (2010 Census)</th>
<th>Total population (2014)</th>
<th>Population Density (per km²) in 2010</th>
<th>Population Density (per km²) in 2014</th>
<th>HDI 2015 Estimates</th>
</tr>
</thead>
<tbody>
<tr>
<td>South Jakarta (Jakarta Selatan)</td>
<td>141.27</td>
<td>2,057,080</td>
<td>2,164,070</td>
<td>14,561</td>
<td>15,319</td>
<td>0.833 (Very High)</td>
</tr>
<tr>
<td>East Jakarta (Jakarta Timur)</td>
<td>188.03</td>
<td>2,687,027</td>
<td>2,817,994</td>
<td>14,290</td>
<td>14,987</td>
<td>0.807 (Very High)</td>
</tr>
<tr>
<td>Central Jakarta (Jakarta Pusat)</td>
<td>48.13</td>
<td>898,883</td>
<td>910,381</td>
<td>18,676</td>
<td>18,915</td>
<td>0.796 (High)</td>
</tr>
<tr>
<td>West Jakarta (Jakarta Barat)</td>
<td>129.54</td>
<td>2,278,825</td>
<td>2,430,410</td>
<td>17,592</td>
<td>18,762</td>
<td>0.797 (High)</td>
</tr>
<tr>
<td>North Jakarta (Jakarta Utara)</td>
<td>146.66</td>
<td>1,645,312</td>
<td>1,729,444</td>
<td>11,219</td>
<td>11,792</td>
<td>0.796 (High)</td>
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<tr>
<td>Thousand Islands (Kepulauan Seribu)</td>
<td>8.7</td>
<td>21,071</td>
<td>23,011</td>
<td>2,422</td>
<td>2,645</td>
<td>0.688 (Medium)</td>
</tr>
</tbody>
</table>


<table>
<thead>
<tr>
<th>Month</th>
<th>Jan</th>
<th>Feb</th>
<th>Mar</th>
<th>Apr</th>
<th>May</th>
<th>Jun</th>
<th>Jul</th>
<th>Aug</th>
<th>Sep</th>
<th>Oct</th>
<th>Nov</th>
<th>Dec</th>
<th>Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Record high ºC (ºF)</td>
<td>33.3 (91.9)</td>
<td>32.6 (90.7)</td>
<td>33.3 (91.9)</td>
<td>33.3 (91.9)</td>
<td>33.3 (91.9)</td>
<td>34.4 (93.9)</td>
<td>36.6 (94.5)</td>
<td>35.6 (91.1)</td>
<td>35.6 (91.1)</td>
<td>35.6 (91.1)</td>
<td>33.9 (92.8)</td>
<td>35.6 (91.1)</td>
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</tr>
<tr>
<td>Average high ºC (ºF)</td>
<td>26.1 (78.9)</td>
<td>26.1 (78.9)</td>
<td>26.4 (79.5)</td>
<td>27.4 (80.1)</td>
<td>27.7 (80.5)</td>
<td>28.0 (82.4)</td>
<td>28.5 (82.3)</td>
<td>28.5 (82.5)</td>
<td>28.7 (83.6)</td>
<td>27.3 (81.1)</td>
<td>27.0 (80.6)</td>
<td>26.4 (79.5)</td>
<td>26.7 (79.9)</td>
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<tr>
<td>Daily mean ºC (ºF)</td>
<td>23.3 (73.9)</td>
<td>23.3 (73.9)</td>
<td>23.3 (73.9)</td>
<td>23.9 (75.0)</td>
<td>23.9 (75.0)</td>
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<td>23.9 (75.0)</td>
<td>23.9 (75.0)</td>
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<tr>
<td>Average low ºC (ºF)</td>
<td>20.6 (69.1)</td>
<td>20.6 (69.1)</td>
<td>20.6 (69.1)</td>
<td>20.9 (69.3)</td>
<td>21.0 (69.8)</td>
<td>19.4 (66.9)</td>
<td>19.4 (66.9)</td>
<td>19.4 (66.9)</td>
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<td>19.4 (66.9)</td>
<td>20.6 (69.1)</td>
<td>20.6 (68.1)</td>
<td>18.9 (65.1)</td>
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<tr>
<td>Record low ºC (ºF)</td>
<td>149.7 (11.6)</td>
<td>149.7 (11.6)</td>
<td>149.7 (11.6)</td>
<td>150.8 (11.9)</td>
<td>151.8 (11.1)</td>
<td>151.8 (11.1)</td>
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<td>151.8 (11.1)</td>
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<tr>
<td>Average precipitation mm (inches)</td>
<td>369.7 (14.5)</td>
<td>369.7 (14.5)</td>
<td>369.7 (14.5)</td>
<td>347.3 (13.6)</td>
<td>347.3 (13.6)</td>
<td>379.3 (14.9)</td>
<td>379.3 (14.9)</td>
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<td>379.3 (14.9)</td>
<td>379.3 (14.9)</td>
<td>379.3 (14.9)</td>
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<tr>
<td>Average relative humidity (%)</td>
<td>85</td>
<td>85</td>
<td>83</td>
<td>82</td>
<td>82</td>
<td>81</td>
<td>76</td>
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<td>76</td>
<td>75</td>
<td>77</td>
<td>81</td>
<td>82</td>
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<tr>
<td>Mean monthly sunshine hours</td>
<td>109</td>
<td>102</td>
<td>107</td>
<td>107</td>
<td>107</td>
<td>107</td>
<td>107</td>
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<td>107</td>
</tr>
</tbody>
</table>

Source #1: Sistema de Clasificación Bioclimática Mundial
Source #2: Danish Meteorological Institute (humidity and sun only)
### Characteristic of the City

#### GROSS DOMESTIC PRODUCT JAKARTA

<table>
<thead>
<tr>
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<th></th>
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</tr>
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<tbody>
<tr>
<td>Pengeluaran Konsumsi Rumah Tangga</td>
<td>156 685 837.99</td>
<td>172 708 828.79</td>
<td>191 140 005.78</td>
<td>219 585 864.75</td>
<td>247 935 866.67</td>
<td>270 227 204.18</td>
<td>294 355 802.24</td>
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<tr>
<td>Pengeluaran Konsumsi LPNRT</td>
<td>3 135 624.83</td>
<td>3 503 503.77</td>
<td>3 976 384.30</td>
<td>4 421 655.12</td>
<td>5 845 590.40</td>
<td>5 912 117.96</td>
<td>6 664 428.89</td>
</tr>
<tr>
<td>Pengeluaran Konsumsi Pemerintah</td>
<td>6 666 566.80</td>
<td>7 613 564.57</td>
<td>8 662 431.03</td>
<td>9 899 707.59</td>
<td>10 431 351.81</td>
<td>11 273 671.14</td>
<td>11 967 237.64</td>
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<tr>
<td>Pembentukan Modal Tetap Bruto</td>
<td>102 967 189.37</td>
<td>114 437 217.62</td>
<td>135 405 287.19</td>
<td>144 433 127.84</td>
<td>159 528 207.97</td>
<td>171 910 907</td>
<td>179 749 397.87</td>
</tr>
<tr>
<td>Perubahan Inventori</td>
<td>3 042 239.58</td>
<td>376 938.36</td>
<td>509 925.29</td>
<td>1 461 587.45</td>
<td>1 897 693.72</td>
<td>2 151 222.45</td>
<td>2 164 828.43</td>
</tr>
<tr>
<td>Ekspor Barang dan Jasa</td>
<td>32 025 941.22</td>
<td>38 912 446.96</td>
<td>48 072 825.98</td>
<td>55 704 902.65</td>
<td>60 623 109.06</td>
<td>71 884 958.38</td>
<td>69 415 147.31</td>
</tr>
<tr>
<td>Dikurangi Impor Barang dan Jasa</td>
<td>122 502 515.23</td>
<td>131 601 382.09</td>
<td>159 384 394.86</td>
<td>176 829 063.95</td>
<td>193 280 104.72</td>
<td>204 963 245.86</td>
<td>205 071 680.88</td>
</tr>
<tr>
<td>Produk Domestik Regional Bruto</td>
<td>182 020 884.57</td>
<td>205 951 117.97</td>
<td>228 382 464.71</td>
<td>258 677 781.45</td>
<td>292 981 714.92</td>
<td>328 396 835.25</td>
<td>359 245 161.50</td>
</tr>
</tbody>
</table>

Source: [https://www.bps.go.id/](https://www.bps.go.id/)

#### GROSS DOMESTIC PRODUCT per CAPITA

<table>
<thead>
<tr>
<th>Provinsi</th>
<th>[Seri 2010] Produk Domestik Regional Bruto Per Kapita (Ribu Rupiah)</th>
<th>Harga Berlaku</th>
</tr>
</thead>
<tbody>
<tr>
<td>RIAU</td>
<td>60 701.03</td>
<td>84 811.19</td>
</tr>
<tr>
<td>JAMBEI</td>
<td>29 160.16</td>
<td>32 682.04</td>
</tr>
<tr>
<td>SUMATERA SELATAN</td>
<td>25 932.00</td>
<td>29 830.37</td>
</tr>
<tr>
<td>BENGKULU</td>
<td>16 463.68</td>
<td>18 368.30</td>
</tr>
<tr>
<td>LAMPUW</td>
<td>19 722.39</td>
<td>21 981.47</td>
</tr>
<tr>
<td>KEP. BANGKA BELITUNG</td>
<td>28 906.78</td>
<td>32 465.38</td>
</tr>
<tr>
<td>KEP. RIAU</td>
<td>65 703.34</td>
<td>72 571.75</td>
</tr>
<tr>
<td>DKI JAKARTA</td>
<td>111 528.06</td>
<td>125 533.92</td>
</tr>
<tr>
<td>JAWA BARAT</td>
<td>20 974.94</td>
<td>23 251.17</td>
</tr>
</tbody>
</table>

Source: [https://www.bps.go.id/](https://www.bps.go.id/)
Key Vulnerability

• Flood

Variables cause flood:
1. Extrem weather; trend of long period of rainfall
2. Urban issues:
   - Problem to water absorption- (misdrainage system, lack of open space, uncontrolled urban construction like building coefficient) → land-use data
   - Long period of evaporation issue due to lack of vegetation (open space), blue artificial (dam, lake, reservoir, river, riverine, etc)
   - Squatter and slum areas.
3. Sea level rise
4. Uncontrolled underground water exploitation
AVerage Monthly Rainy Days Over the Year

This is the number of days each month with rain, snow, hail etc.
Groud Water Exploitation (GWE) contributes to THE LAND SUBSIDENCE: ± 5-6 M by 2100

Control over GWE is estimated save the land subsidence to 70% by 2025
OPEN PUBLIC/GREEN SPACE

Statutory Plan: 30%
Available: 10%
Goal

Capacity of megapolitan (JABODETABEK) to cope with Jakarta Flood is upgraded by 2025.

Strategy:
- Smart and green drainage system management
- Smart green building and innovative construction (biopore structure design, green infrastructure, integrated city plumbing system—multi benefits)
- Resilient seawall (video)
- Forest restoration up to 200 per cent by 2025 at upstream region
- Compact city platform and affordable housing development in the city.
Action Plan Flow

Hierarchy process

- SWOT Analysis
- 4WsH
- SMART
- IFA (Investment Feasibility Analysis)
- FGD/PH

EXECUTION PROCESSES

1st
2nd
3rd
4th
5th
<table>
<thead>
<tr>
<th>Action Plan</th>
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<th>Adaptation</th>
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<th>Timeframe</th>
</tr>
</thead>
</table>
Smart Drainage System

- Internet Management Server
- IoT Gateway
- GPRS
- RF 2.4GHz
- Alarm Node
- Sensor Node (Water Level)
- Sensor Node (Water Speed)
- Solar Power Charger & Battery
- Communication Module
- Water Level Sensor or Water Speed Sensor
- Sensor Node

River Bridge
AUTOMATIC CHANNELISATION PROCESS

West Flood Canal

WESTERN STREAM

CENTRAL STREAM

EASTERN STREAM

DAM EARLY WARNING SYSTEM
Tree pit green drainage
<table>
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</tr>
</thead>
<tbody>
<tr>
<td>Smart green building and innovative construction</td>
<td>- Applying integrated MEP (Mechanical, Electrical, Plumbing) on public buildings that connects to ICT system.</td>
<td>- To reduce 80% operational and maintenance costs.</td>
<td>- Automatic water bank for building.</td>
<td>- State Company (Power company).</td>
<td>- 2018-2020</td>
<td>- 2018-2020</td>
<td>- Review on the current design Plan: 2018</td>
</tr>
<tr>
<td></td>
<td>- Applying Environmental friendly construction materials, green roofs, roof top planters, green facades and green walls.</td>
<td>- To save energy use up to 85% by 2025</td>
<td>- Using Local material</td>
<td>- Green Building Council Indonesia (GBCI).</td>
<td>- focus on the building on Medan Merdeka, Jakarta City Hall</td>
<td>- 2018-2025</td>
<td>- Upgrading system: 2019-2021</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- To accelerate the evaporatiom process</td>
<td>- Recyclable approach for construction materials i.e recycled metal</td>
<td>- Public Works Ministry</td>
<td></td>
<td>Evaluation and Monitoring: 2021-2025</td>
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<tr>
<td></td>
<td></td>
<td>- To reduce CO2</td>
<td></td>
<td>- Multy Donor Fund</td>
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<td></td>
<td>- Private Sector Company</td>
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<td></td>
<td>- Ministry of Environment</td>
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<td>The donors covers 40% and the rest belongs to Central and Jakarta Prov Gov 40 % and 20% respectively.</td>
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</tbody>
</table>

- Review the existing design Plan: 2018
- Redesign 2019 month)
Integrated MEP

- Passive solar gain through glazed south facade warms space in winter.
- Sliding doors to south facade allow ventilation of main block warm air escapes through opening rooflight at roof apex.
- Geothermal boreholes provide energy for efficient underfloor heating.
- Rainwater collected and recycled as grey water, used in toilet flushing and for garden irrigation.
- Ventilation through north facade.
Eco Material

- Eco-Resin Plex
- 100% Recyclable Aluminum
- Low V.O.C. Ply
- LED Lamps
- Graphics Printed on Recyclable Material
- Recycled Laminate
- Printed Eco-Fabric
- 100% Recycled Carpet
- Low V.O.C. Padding
- 100% Recyclable
Vegetation
Growth medium
Drainage, aeration, water storage and root barrier
Insulation
Membrane protection and root barrier
Roofing membrane
Structural support

plants
-growing medium
-filter fabric
drainage/storage layer
-insulation
-waterproof membrane
-protection board
-roof deck
Functional Structure for Sustainable Construction

1. Design & Plan
2. Construction
3. Functional Period
4. Operation of Function
5. Removal
6. End of Functional Requirement
7. Transfer & Re-use
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<tr>
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</thead>
<tbody>
<tr>
<td>Giant Seawall</td>
<td>A giant dike (32 km length)</td>
<td>0% Tidal Flood</td>
<td>Multi Benefits</td>
<td>Indonesian government, Ministry Marine and Fisher, Maritime Ministry, the local Jakarta Administration and Private Investors</td>
<td>Joint Venture project</td>
<td>North Coastal Jakarta Area (from the city of Tangerang in the west of Jakarta to Jakarta's Tanjung Priok harbour).</td>
<td>2014 - 2025</td>
</tr>
</tbody>
</table>
GIANT SEA WALL
<table>
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<tbody>
<tr>
<td>Compact city and affordable housing development</td>
<td>Creating one data Sustainable urban design innovation Building active transport facilities (cycling, pedestrian routes) Bioclimatic design and construction Redesigning the Land Use and Vulnerable Area Map</td>
<td>To cut 75% bureaucracy line, to generate new behaviors and new social norms (increasing awareness) Contribute to more water storage and availability of water catchment area. To prevent reconstruction and relocation To achieve environmentally friendly building</td>
<td>Smart Water storage system Bioclimatic design Active transport accessibility Vulnerable Zones Map Urban Block Plan</td>
<td>- Public Works, Ministry - Jakarta Prov Gov - Internatio nal Donors - IAI and IAP</td>
<td>International and national Banks covers 50 per cent and the rest belongs to Central and Jakarta Prov Gov 30 per cent and 20 per cent respectively</td>
<td>Tanjung Barat, Dukuh Atas, Ciracas, Cibubur</td>
<td>EIS: 2018 FS: 2019 Block Plan and DED: 2020 Execution: 2020-2024 Monitoring and Evacuation: 2025</td>
</tr>
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</table>
| Forest restoration up to 200 per cent by 2025 at upstream region | - Landscape assessment project.  
- 10 million plantation  
- Land restoration | - To reduce water debit contribution from upstream to Jakarta up to 50%.  
- To reduce emission up to 60%.  
-- To reduce water debit contribution up to 50%  
-- To provide electrical power up to 30 MW | - Management Forest system  
Execution: 2020-2025  
Monitoring and Evaluation: 2020-2025 |
| 10 Billion M3 Dam | - Dam Facility on Upstream Ciliwung River, Bogor | | | | | | Assessment: 2018  
Execution: 2018-2024  
Monitoring and Evaluation: 2018-2025 |
Forest Restoration

The effect of changing the land use to flood debit

Ideal

Reality

Upstream area

Low land area

Forest Restoration