Tokyo peak air blast winds due to Ground Impact of 90-meter secondary
Tokyo

Initial crude approximation of Tokyo Impact Damage 270 meter object (Purdue impact simulator)

<table>
<thead>
<tr>
<th>City</th>
<th>Tokyo</th>
<th>Approx Pres(psi)</th>
<th>Approx. Wind (mph)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crater radius (km)</td>
<td>3.82</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Truss Bridge Collapse (km)</td>
<td>21</td>
<td>&gt;17.5</td>
<td>&gt;450</td>
</tr>
<tr>
<td>Wood Building Collapse (km)</td>
<td>49</td>
<td>&gt;3.8</td>
<td>&gt;128</td>
</tr>
<tr>
<td>Windows shatter (km)</td>
<td>112</td>
<td>&gt;0.98</td>
<td>&gt;35</td>
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**Potential Damage (Tokyo, Japan)**

- Crater (1.91 km)
- Truss Bridge Collapse (21 km)
- Wood Building Collapse (49 km)
- Windows Shatter (112 km)
Tokyo Demographics & Industry

• Tokyo-Yokohama worlds largest populous metropolitan area > 37.8M ¹
• Population of prefecture including special wards + 13.7M
• World’s largest agglomeration economy; combined population, industry, firms, markets clustered together ²
• Heavy industry and manufacturing in Chiba, Kawasaki and Yokohama; light industry in Tokyo proper
• Kawasaki is home to one of the 3 major heavy industrial manufacturers: Kawasaki Heavy Industries (motorcycles, heavy equipment, aerospace and defense, rolling stock and ship, industrial robots, gas turbine and industrial products), Kawasaki Steel and Kawasaki Kisen (Transportation: Marine, Land and Air) ²
• Tokyo is home to a large financial and insurance market ³

¹ https://en.wikipedia.org/wiki/Tokyo
² https://en.wikipedia.org/wiki/Kawasaki_Heavy_Industries
³ https://www.city-data.com/world-cities/Tokyo-Economy.html
Tokyo Accounts for 20% of Japan’s GDP

• GDP of Tokyo in 2013 was 93.1 trillion yen. Japan GDP was 480 trillion yen in 2013.

• The graph below shows the breakdown of Tokyo GDP and Japan GDP by industry.

Tokyo and Prefecture in 2015, World’s 3rd largest Solar/Photovoltaics Installed Capacity

34,150 MW; 3.5% of Nation’s Annual electricity
• Solar and Thermal
  • Oi Power Station
  • Ohgishima Solar Power
  • Ukishima Solar Power
  • #12

East Tokyo Bay
• Anegasaki
• Sodeguara
• Futtsu*

* 2nd largest NG gas-fired power station in the world.
5,040 MW 4 units, 2 @ 1,520 MW and 1 @ 1,000 MW
Tokyo Gas-fired Infrastructure

Kawasaki Natural Gas
Capacity: 840 MW – 2 Units
Tokyo Gas Capacity 400 MW
Start of operations 2008
49 % of Tokyo Gas Interest

Tokyo Gas Yokusuka Power
Capacity: 240 MW
Tokyo Gas Capacity 180 MW
Start of operations 2006
75 % of Tokyo Gas Interest

Ohgishima Power
Capacity: 1,221 MW – 3
Stations
Tokyo Gas Capacity 900
MW
Start of operations 2010
75 % of Tokyo Gas Interest

Tokyo Gas Baypower
Capacity: 100 MW
Tokyo Gas Capacity 100
MW
Start of operations 2003
75 % of Tokyo Gas Interest

Simulated Tsunami In Japan Trench – Resulting from Impact of 270-meter primary

- Inundation up to 2 km inland at places
- Fairly uniformly around half a kilometer
- The colors show amplitude of computed waves
- The model computes about 50km^2 flooded in that area.
Tsunami Risk Mitigation at Fukushima

- The reactor although shuttered; is still seeping contamination
- "Ice wall" implemented to prevent the continued release of radiation
- 1.5 km deep ice wall designed to keep soil frozen
- Any breach would certainly draw further contamination into the ocean

Damage area is insensitive to energy deposition height

12km

6km

Ground Impact

Damage Zones
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<thead>
<tr>
<th>Damage Description</th>
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<tbody>
<tr>
<td>Light Damage (15 - 30 m/s)</td>
<td>7,731,379</td>
</tr>
<tr>
<td>Moderate Damage (30 - 45 m/s)</td>
<td>5,286,166</td>
</tr>
<tr>
<td>Severe Damage (45 - 60 m/s)</td>
<td>4,590,846</td>
</tr>
<tr>
<td>Complete Damage (&gt; 60 m/s)</td>
<td>4,799,187</td>
</tr>
<tr>
<td>TOTAL</td>
<td>22,407,578</td>
</tr>
</tbody>
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<tr>
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<th>12 km Airburst</th>
<th>6 km Airburst</th>
<th>Ground Impact</th>
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<tr>
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<td>7,731,379</td>
<td>7,948,603</td>
<td>7,459,451</td>
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<tr>
<td>Light Damage</td>
<td>5,286,166</td>
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<td>4,210,800</td>
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<tr>
<td>Moderate Damage</td>
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<td>2,409,942</td>
<td>2,620,167</td>
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<td>22,407,578</td>
<td>21,196,735</td>
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