

# CITY CLIMATE LEADERSHIP AWARDS

## Singapore Climate Close-Up

### Fast Facts

- Singapore's GDP was close to USD \$296 billion in 2013.
- Manufacturing, Wholesale & Retail trade, Business services and Finance and Insurance are Singapore's top sectors by value.
- Singapore is at full employment, with an unemployment rate of only 2%.
- Singapore's population is 5.2 million.
- Singapore currently has 1.2 million housing units. By 2030, it will need an additional 700,000 units to accommodate the growing population.
- Similarly, due to growing infrastructure requirements, Singapore will need 77,000 hectares of land for development, as opposed to the 71,000 currently supplied.

- Singapore contributes less than 0.2% of global greenhouse gas (GHG) emissions.
- According to Siemens' Asian Green City Index, Singapore is Asia's greenest metropolis. It is ranked second in the World Economic Forum's Sustainable Competitiveness Index.
- In 2012, Singapore ranked 123rd of 137 countries (~0.3 kg CO<sub>2</sub>/US\$) in emissions per GDP (a relatively low level of CO<sub>2</sub> emissions) but 27th (9 tons of CO<sub>2</sub> emissions per person) in terms of emissions per capita.
- A government-conducted survey in 2013 showed that 78.5% of participants felt that Singapore would be affected by climate change, and 70% were concerned about climate change.

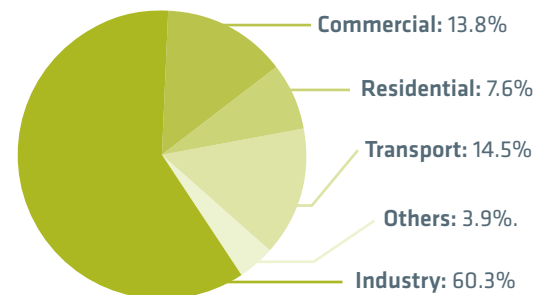
### City population statistics



	2013	2020	2030
City of Singapore	5.4 million	6.0 million	6.5 – 6.9 million

Sources: <http://www.bloomberg.com/news/2013-02-04/singapore-says-2030-population-projection-for-planning-purposes.html>, Singapore White Paper on Population, [http://www.nptd.gov.sg/content/NPTD/news/\\_jcr\\_content/par\\_content/download\\_98/file.res/population-white-paper.pdf](http://www.nptd.gov.sg/content/NPTD/news/_jcr_content/par_content/download_98/file.res/population-white-paper.pdf), [http://www.singstat.gov.sg/statistics/browse\\_by\\_theme/population.html](http://www.singstat.gov.sg/statistics/browse_by_theme/population.html)

### Sources of CO<sub>2</sub> (eq.) emissions



Projected 2020 business as usual baseline.  
Sources: UNFCCC, [http://unfccc.int/ghg\\_data/ghg\\_data\\_unfccc/ghg\\_profiles/items/4626.php](http://unfccc.int/ghg_data/ghg_data_unfccc/ghg_profiles/items/4626.php); UN Stats, [http://unstats.un.org/unsd/ENVIRONMENT/envpdf/Country\\_Snapshots\\_Aug%202013/Singapore.pdf](http://unstats.un.org/unsd/ENVIRONMENT/envpdf/Country_Snapshots_Aug%202013/Singapore.pdf), National Climate Change Strategy 2012

### CO<sub>2</sub> (eq.) emissions



**Annual CO<sub>2</sub> (eq.) emissions:**  
41.5 million tons (2012)

**Emissions reduction target:** 7% to 11% reduction below 2005 Business-as-usual (BAU) level by 2020. Singapore has pledged to reduce our emissions by 16% from the 2020 BAU level, contingent on a legally binding global agreement.

Sources: <https://app.mewr.gov.sg/web/Contents/contents.aspx?ContId=683>

The figures do not include non-CO<sub>2</sub> greenhouse gases and CO<sub>2</sub> emissions from other sources such as waste incineration. The predominant greenhouse gas in Singapore is CO<sub>2</sub> that arises from the combustion of fossil fuels. Bunker fuels are excluded in accordance with United Nations Framework Convention on Climate Change (UNFCCC) reporting guidelines.

## Intelligent City Infrastructure winner 2013: Intelligent Transport System (ITS)

### Summary

Singapore won the 2013 C40 & Siemens Climate Leadership Awards' Intelligent City Infrastructure category for its Intelligent Transport System (ITS), which incorporates a range of "smart" transportation technologies, including one of the world's first Electronic Road Pricing Systems, real-time traffic information delivered through GPS-enabled taxis, and a highly integrated public transportation system. These intelligent solutions allow Singapore to enjoy one of the lowest congestion rates anywhere in the world for a city its size.

### Challenges

The growing population and lack of available physical space have made traffic management increasingly challenging in Singapore. By 2020, travel demand is expected to rise from 8.9 million journeys per day to about 14.3 million, signifying the marked increase in the city-state's population. Concurrently, Singapore faces major constraints in space, with 12% of land already occupied by the 3,300 km-road network and another 15% devoted to housing. Expanding the road network to address transport demand has not been seen as a sustainable option. Instead, the Singapore government has utilized policy and technology to manage transport demand and supply, maximizing the current sustainable systems while minimizing more environmentally impactful modes of transit.

### Actions

Singapore has implemented a sophisticated Intelligent Transport System (ITS), which uses data collection and ITS solutions to keep road traffic running safely and smoothly. The ITS acts in concert with a number of other transport initiatives: free public

transportation in pre-morning peak hours, a vehicle quota system, a congestion charge, and an extensive public transport system. As part of ITS, the city has pioneered a variety of transport technologies, including one of the world's first Electronic Road Pricing systems. The ERP acts as a de facto congestion charge. The ERP uses a short-range radio communication system to deduct charges from smart cards inserted in all vehicles, and charges varies according to traffic flows and the time of day.

Other ITS elements include an expressway monitoring and advisory system, alerting motorists to traffic accidents on major roads; a GPS system installed on city taxis, which monitors and reports on traffic conditions around the city; and a parking policy in which the government determines the minimum parking provision and empowers car park operators to determine charges based on demand. Information from the systems feeds into the ITS Operations Control Centre, which consolidates the data and provides real-time traffic information to the public.

While developing ITS, the Singapore government convened public and private stakeholders to discuss Singapore's many issues with land transport policy and to formulate the Land Transport Master Plan. During these meetings, the government used a number of innovative approaches towards citizen engagement, including focused group discussions, online feedback on the Talk2LTA portal, and the Great Transport Challenge 2020 e-game.

### Projected Outcomes

The ITS has prompted Singapore to be one of the world's least congested major cities, with an average car speed on main roads of 27km/h (17 miles per hour), compared to an average speed of 16km/h in London, 11km/h in Tokyo, and 5km/h in Jakarta. This is an impressive feat considering that the population has more than doubled since 1990.



## In detail

### Electronic Road Pricing

The strength of the ITS is its holistic approach towards traffic management, which draws on transport tools Singapore has been using and continually updating for the past 20 to 30 years. For example, Singapore's Electronic Road Pricing (ERP) system was introduced in 1998, and replaced the first road-pricing scheme in Singapore, the Area Licensing Scheme, which was introduced in 1975.

The ERP operates as a user charge, charging cars for use of roads in a market-based attempt to match road supply with car demand at all times of the day. From a technical perspective, cash cards compatible with the ERP payment system are inserted into each vehicle. As a vehicle passes through an ERP entry point, a charge is deducted from the card using short-range radio communication. The rate varies by the type of car, time of day, road, and level of local traffic, and charges can change as often as every half hour. The range of charges is reviewed each quarter to determine if it is too high/low based on actual versus optimal speeds of traffic. Cameras at each gantry, or ERP entry point (of which there are now 70 in the city), monitor violators of the ERP.

Annual revenues from the ERP (in 2003) were about \$45 million, which greatly outweighed annual operating costs of only \$9 million. In 2010, annual revenues from the ERP rose to roughly \$90 million, with the most lucrative gantry collecting more than \$15,000 each day. The initial cost of installation for the ERP in 1998 was approximately \$115 million.

In addition to making payment of the charge easier for the driver, the ERP also enables the government to collect data on traffic throughout the city in a consistent, accurate, reliable, and efficient manner. These data can then be transmitted to drivers via roadside displays, web sites, and even mobile

devices so that they are able to time their trips based on levels of congestion and the implied charge.

While building roads and using technology to upgrade transport systems manage transport supply in Singapore, the ERP manages transport demand. The next generation ERP will go even further in managing transport demand: indeed, it will likely replace physical 'gantries' (ERP payment points where charges are deducted from the cash card) with a GPS-based system. This will enable calculation of charging on distance traveled on congested routes, rather than simply on usage of congested roads.

### Parking Guidance System

The Land Transport Authority of Singapore launched the Parking Guidance System (PGS) in 2008 in response to rising congestion in the city-state. At various car parks across Singapore, the PGS collects data on available parking spaces. It then displays the collated data on nearly 30 electronic information panels located across the city. Cars, searching for spots in the various neighbourhoods, can view parking options from the road. The PGS therefore reduces the time and fuel costs of parking in the most congested areas of the city.

The PGS works in tandem with the ERP to manage road demand. The ERP charges drivers directly for causing congestion, providing a disincentive for driving and facilitating road speed. The PGS ensures that cars pay the market rate for their parking spaces, and facilitates the parking process by furnishing information of availability. Both systems are controlled by the Intelligent Transport Systems' (ITS) 24-7 Control Centre.



## In detail

In addition to the PGS, the Government of Singapore has enacted other parking measures aimed at reducing vehicle use. It has minimized the number of parking spaces required for new developments, so that if all of Singapore's buildings fell under new development restrictions, the City is estimated to have only 29,000 parking spaces instead of the 49,000 currently supplied. Furthermore, it has empowered car park operators and building owners to determine the appropriate parking charges for the limited number of spaces on their lots.

Nevertheless, because many of the buildings in Singapore were constructed when more generous policies applied to parking provisions, Singapore still has a large number of parking spaces, and parking charges are low relative to other global cities. For example, season parking in Singapore's Central Business District (CBD) is an average of S\$160-200 per month, compared to S\$720-850 in Hong Kong, and there are 165 parking spaces per 1,000 jobs in the CBD versus 85 in London. In the future, the Government of Singapore hopes to gradually draw down the parking supply in the CBD, and, in the meantime, uses PGS as an important tool for disincentivizing parking, as well as reducing congestion while parking.





## References

- C40 Profile  
<http://c40.org/c40blog/singapore-issues-national-climate-change-strategy>
- Singapore White Paper on Population  
[http://www.nptd.gov.sg/content/NPTD/news/\\_jcr\\_content/par\\_content/download\\_98/file.res/population-white-paper.pdf](http://www.nptd.gov.sg/content/NPTD/news/_jcr_content/par_content/download_98/file.res/population-white-paper.pdf)
- C40-Siemens Climate Leadership Awards  
[http://issuu.com/siemens\\_the\\_crystal/docs/singapore/5?e=3714297/4956037](http://issuu.com/siemens_the_crystal/docs/singapore/5?e=3714297/4956037)
- C40-Siemens Climate Leadership Awards  
[http://issuu.com/siemens\\_the\\_crystal/docs/singapore/5?e=3714297/4956037](http://issuu.com/siemens_the_crystal/docs/singapore/5?e=3714297/4956037)
- Land Transport Authority of Singapore  
<http://www.lta.gov.sg/content/ltaweb/en/roads-and-motoring/managing-traffic-and-congestion/electronic-road-pricing-erp.html>; <http://www.lta.gov.sg/content/ltaweb/en/roads-and-motoring/managing-traffic-and-congestion/intelligent-transport-systems.html>
- Land Transport Authority of Singapore, ERP in Singapore – 5 Years  
<http://ltaacademy.lta.gov.sg/doc/ERP%20in%20Singapore%20-%205%20years.pdf>
- Land Transport Authority, Singapore Transport Plan  
<http://www.lta.gov.sg/content/dam/ltaweb/corp/PublicationsResearch/files/ReportNewsletter/LTMP-Report.pdf>
- Land Transport Authority, Statistics in Brief - 2012  
[http://www.lta.gov.sg/content/dam/ltaweb/corp/PublicationsResearch/files/FactsandFigures/Stats\\_in\\_Brief\\_2012.pdf](http://www.lta.gov.sg/content/dam/ltaweb/corp/PublicationsResearch/files/FactsandFigures/Stats_in_Brief_2012.pdf)
- Ministry of Trade and Industry in Singapore  
<http://www.mti.gov.sg/ResearchRoom/pages/default.aspx>
- National Climate Change Strategy  
<http://app.nccs.gov.sg/data/resources/docs/Documents/NCCS-2012.pdf?AspxAutoDetectCookieSupport=1>
- National Climate Change Secretariat Singapore, Climate Change Public Perception Survey 2013  
<https://app.nccs.gov.sg/data/resources/docs/Documents/Appendix%20I.pdf>
- One Motoring  
[http://www.onemotoring.com.sg/publish/onemotoring/en/on\\_the\\_roads/traffic\\_management/intelligent\\_transport\\_systems/parking\\_guidance\\_system.html](http://www.onemotoring.com.sg/publish/onemotoring/en/on_the_roads/traffic_management/intelligent_transport_systems/parking_guidance_system.html)
- Singapore Urban Redevelopment Authority, Concept Plan 2011 (Land Use Plan)  
<http://www.mnd.gov.sg/landuseplan/e-book/files/assets/basic-html/index.html#page5>
- Sustainable Singapore  
<http://app.mewr.gov.sg/web/contents/ContentsSSS.aspx?ContId=1299>
- Urban Redevelopment Authority, Singapore Concept Plan  
<http://www.ura.gov.sg/uol/concept-plan.aspx?p1=View-Concept-Plan>
- Yahoo News  
<http://sg.entertainment.yahoo.com/news/erp-system-collects-about--150-million-each-year.html>
- Department of Statistics Singapore  
[http://www.singstat.gov.sg/statistics/browse\\_by\\_theme/national\\_accounts.html](http://www.singstat.gov.sg/statistics/browse_by_theme/national_accounts.html)