



THE
SUSTAINABLE
CITY

The Sustainable City Greenhouse Gas Inventory 2017

Advancing Low-Carbon Urban Development in the UAE

The Partnership between Emirates Wildlife Society-WWF and The Sustainable City

Emirates Wildlife Society in association with WWF (EWS-WWF) and The Sustainable City (TSC) entered into a strategic partnership to address climate change, promote renewable energy, reduce Greenhouse Gas (GHG) emissions and understand how The Sustainable City performs on key performance indicators.

The Sustainable City demonstrates how a low-carbon business model can be transformational for real estate development in the UAE, while positively contributing to economic growth. EWS-WWF is assisting The Sustainable City in monitoring and reporting its GHG emissions. The partnership is also examining best practices for mitigating emissions from residential and non-residential activities.

Emirates Wildlife Society-WWF

Emirates Wildlife Society-WWF is a non-profit organization established to drive positive change in the United Arab Emirates to conserve the nation's natural heritage. Founded by H.H. Sheikh Hamdan Bin Zayed Al Nahyan, we represent WWF in the region.

Our vision is a sustainable UAE in which our society, economy and environment thrive side by side, enabling people to live in harmony with nature globally. We partner with individuals and institutions to achieve science-based solutions to combat climate change and safeguard the seas, the land and their associated biodiversity. Our work includes research and policy activities, community and corporate engagement, youth education and raising public awareness.

For more information, please visit: uae.panda.org

The Sustainable City

The Sustainable City by Diamond Developers is a residential and mixed-use development located in Dubailand, Dubai. Covering 46 hectares (5 million ft²), the development applies sustainability principles to achieve social, economic and environmental outcomes.

Completed in 2016, Phase 1 of the development has become an international case study for sustainable living, work, and wellness, and aims to become the first operational Net Zero Energy development in the region. It was named by Gulf Real Estate as the "Happiest Community in the Gulf" in 2017 and 2018. Phase 2, slated for completion in 2019, will comprise three facilities: Hotel Indigo, Fairgreen International School, and an Innovation Center to advance and share knowledge on urban sustainability.

For more information, please visit: www.thesustainablecity.ae

Greenhouse Gas Inventory Results

The Sustainable City's GHG inventory was prepared in accordance with The Global Protocol for Community-Scale Greenhouse Gas Emission Inventories guidelines and was independently verified by Dubai Carbon Centre of Excellence. The monitoring and reporting period is the calendar year 2017 (January 1 to December 31). During this period, villa occupancy in TSC increased from 48% in January to 73% in December. Similarly, 2017 witnessed an expansion of commercial activities, further increasing day-time population and related emissions. The emissions captured in this inventory include grid electricity consumption, fuel combustion, waste water treatment, refrigerant leakage, water consumption, intra-city transport, urea application, solid waste disposal, and enteric emissions. The inventory also includes emissions from

electricity and fuel consumption at the under-construction Phase 2 of The Sustainable City, however the emissions from embodied energy in materials used in construction activity is excluded. **The total emissions from The Sustainable City during 2017 were 8,761 tonnes of Carbon Dioxide equivalent (tCO₂e).**

The top three emissions sources were electricity (51%), waste (28%) and water consumption (11%). Electricity and water related GHG emissions are the most significant emission sources in the region as the considerable need for cooling increases electricity consumption, and most of the potable water is produced through energy-intensive desalination.

Emissions from grid electricity consumption

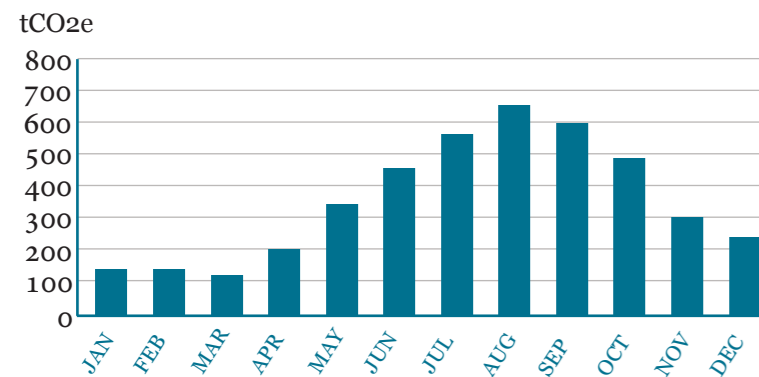


Figure 2: Monthly emissions from electricity consumption (tCO₂e)

Emissions from water consumption

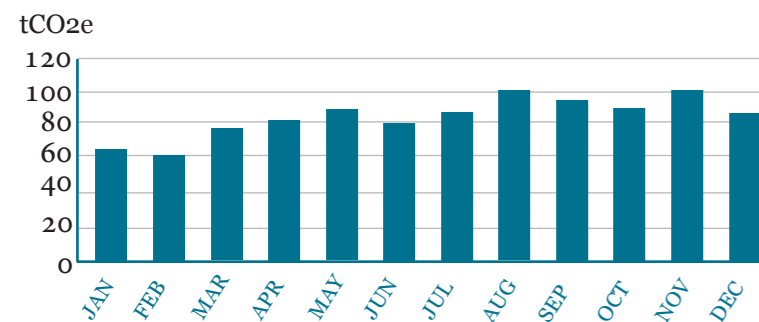


Figure 3: Monthly emissions from water consumption (tCO₂e)

Benchmarking Carbon Performance

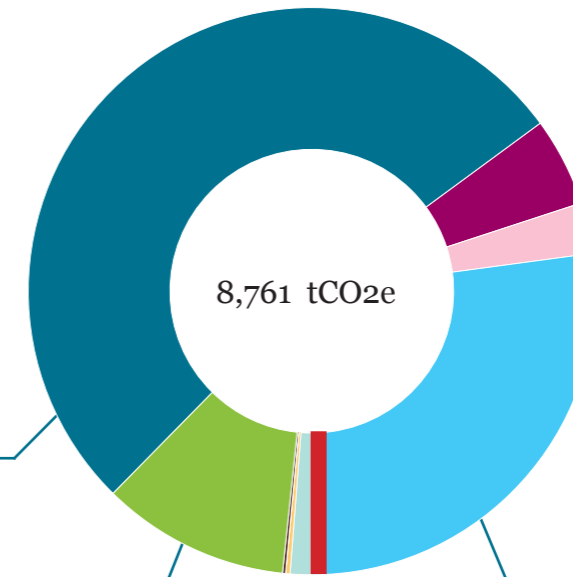
There is little published literature on GHG inventories at city or community level. Aggregate emissions at community level can be correlated with population data to evaluate the average per capita carbon footprint.

Based on this GHG inventory, the equivalent per capita GHG emissions for TSC residents in 2017 were 5.1 tCO₂e*. Although this estimate provides a unique benchmark for comparison at community level, it cannot be compared with total per capita emissions at country level. Specifically, the TSC inventory does not capture emissions from transportation outside the community, and emissions generated during food production and product manufacturing.

* As per The UAE national GHG inventory published in 2013, the per capita GHG emissions stood at 22.45 tCO₂e².

1 Water design consumption rate sourced from DEWA, 'Guidelines for New Development Projects Update - 2016'

2 The per capita emissions have been calculated using UAE's total GHG emissions data, sourced from the UAE Ministry of Energy and Industry, 'GHG Inventory Cycle II' and the population data sourced from UN Population Division, 'World Population Prospects,' <https://esa.un.org/unpd/wpp/Download/Standard/Population/>

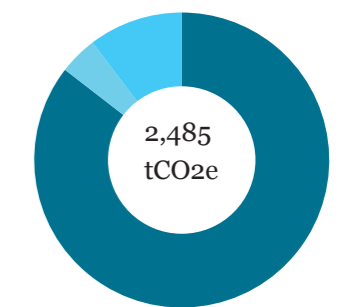


Scope 1 emissions	
Fuel Combustion	442
Intra-city Transportation	254
Refrigerant Leakage	21
Urea Emissions	0.36
Enteric Emissions	15
Scope 2 emissions	
Electricity Consumption	4,604
Scope 3 emissions	
Solid Waste Disposal	2,381
Waste Water Treatment	103
Water Emissions	938
Transmission Loss	147

Figure 1: Summary of GHG emissions and emission sources at The Sustainable City for the year 2017 (tCO₂e)

Emissions from waste disposal

The emissions from waste management at The Sustainable City come from three sub-categories: waste disposal in the landfill, biological treatment of waste, and wastewater treatment. Total emissions from waste management including disposal in 2017 were 2,485 tCO₂e.



Solid Waste Disposal	2124
Waste Water Treatment	104
Composting	257

Figure 4: Breakdown of GHG emissions from waste management (tCO₂e)

GHG Emissions Reduction at The Sustainable City

TSC villas were built with sustainable design principles and fitted with energy efficient air-conditioning and appliances. This has resulted in an Energy Use Intensity (EUI) value of 97 kWh/m², which is about 39% lower than the minimum EUI of conventional villas built according to local new building construction regulations and specifications (160 kWh/m²)³.

Additionally, The Sustainable City has installed 6.4 MWp of rooftop photovoltaic panels. The renewable energy uptake in TSC in 2017 was gradual, based on occupancy and utility approvals, reaching about 2.5 MWp. These installations provide clean energy and will further reduce total emissions in 2018 as the remaining modules come online.

Aggressive demand side management and renewable energy uptake have effectively lowered the GHG emissions intensity of TSC villas by more than 50% compared to conventional villas in Dubai. Community education has and can further reduce the emissions intensity. Working with EWS-WWF and leading universities, TSC organises frequent community seminars on the efficient use of electricity (and air-conditioning) and water conservation.

3 Sourced from Taqati, 'Dubai Demand Side Management Strategy: 2015 Annual Report,' http://taqati.ae/wp-content/uploads/2016/12/Taqati_Annual_Report_2015_English.pdf

Policy Recommendations

Drawing from the operations of TSC, including relevant opportunities and challenges for carbon mitigation, Emirates Wildlife Society-WWF has formulated recommendations directed at policymakers at federal and local levels, to advance sustainability in the built environment.



Renewable Energy

DEWA's Shams Dubai initiative has made installation of rooftop solar panels financially viable for the end user. This initiative could be adopted in other emirates so that there is an accelerated integration of solar power into UAE's electricity grids.



Urban planning authorities and real estate developers should make optimal use of net metering programs like Shams Dubai. Specifically, homes should aim to achieve zero emissions by maximizing solar uptake both on-site and off-site.



Distributed solar generation should be mandated for all new construction projects in UAE, including residential and commercial buildings. Minimum renewable energy offsets should become mandatory as part of local green building regulations.



Transportation

Transport authorities should work with community planners to ensure public transport connectivity.



Transport authorities can also facilitate the deployment of car-sharing programs and further promote the uptake of electric vehicles.



Data Access

GHG emissions calculations require access to emissions data. Specifically, community-scale inventories require electricity consumption data, as well as emissions factors for grid electricity, water, and combustion fuels. These should be made publically available.



Waste Management

The segregation, collection, and management of organic waste from residential units and commercial outlets must be improved to avoid related methane emissions. Waste to Energy facilities at municipal level would support renewable energy uptake and help reduce emissions.



Municipal waste segregation should be enforced through education programs as well as the introduction of the long-awaited 'tipping fee' to discourage the collection and disposal of mixed waste.