



What is the missing piece for building 'green'?

'Green' and 'net-zero carbon' buildings in South Africa

A 'green' building is a building that, in its design, construction or operation, reduces or eliminates negative impacts, and can create positive impacts, on our climate and natural environment. A net-zero carbon (NZC) building is highly energy efficient and fully powered from on-site and/or off-site renewable energy sources (World Green Building Council).

Research from the Green Building Council South Africa shows that 'green' buildings are not just environmentally beneficial; they also offer multiple benefits to occupants, landlords and investors. Occupants benefit from improved ventilation, temperature and lighting control, which result in improved health, productivity and well-being. Landlords improve their competitive advantage through lower utility costs and the ability to offer occupancy benefits. Emerging market data indicates that investors obtain a better return on investment over a 'traditional' or 'standard' building project¹. With rising utility costs and declining efficiency and renewable technology costs, these benefits are steadily improving. This begs the question: why are 'green' buildings not more mainstream?

Despite the emerging business case for 'green' or NZC buildings, the perception that such buildings have a higher capital cost with low returns on investment remains a barrier. National policy directions are pushing for ever-increasing levels of stringency with regard to building efficiency (the National Development Plan, Chapter 5, has NZC buildings by 2030 as a policy goal; the National Regulator for Compulsory Specifications is busy undertaking a review of the South African National Standards with regard to building efficiency), yet even here there remains a perception that this will unduly burden the economy.

Towards net-zero carbon new buildings: the case for low-carbon buildings and the C40 South Africa New Buildings Programme

Rapid urbanisation, the increasing demand for buildings and the long lifespan of buildings are but a few characteristics that make the buildings sector a priority action area for climate change mitigation in cities. C40 Cities Climate Leadership Group's Deadline2020 research shows that building energy use accounts for over half of total city emissions on average. In South African metros, the buildings sector contributes to around 36% of emissions, while a NZC pathway for all new buildings by 2030 can deliver 12 – 25% of our metros' emissions abatement efforts. Building efficiency is also one of the most affordable ways to cut emissions, while achieving significant co-benefits such as air quality and health.

The C40 South Africa New Buildings Programme is supporting the four South African C40 cities – Cape Town, eThekweni, Johannesburg and Tshwane – in developing policy to achieve NZC in all new buildings by 2030. This aligns with the Paris Agreement commitments, ratified by South Africa in 2016, which require significant greenhouse gas emissions reductions across all sectors by 2050, while the global buildings sector – existing and new stock – must operate at net-zero carbon emissions by 2050.

¹ IPD South Africa Annual Green Property Index: <https://www.msci.com/documents/10199/8ff1284e-9b50-4e9a-ba04-f8be4ce9a7d2>



A model to assess the NZC 'cost premium'

An initial scoping exercise, in support of the C40 Buildings Programme, highlighted the common concern that 'green' or NZC building requirements would financially burden and constrain development, particularly in a time of recession. This prompted the implementing team at Sustainable Energy Africa to explore the question in some detail, hoping to establish an evidence-base of the cost differential between 'standard specification' buildings and NZC buildings. The exercise was undertaken by SEA with the eThekweni advisor for the C40-SEA New Buildings Programme.

A model was developed to compare standard specification and NZC building costs, using information provided by the Green Building Council (GBC) South Africa and AECOM South Africa. The model shows cumulative discounted costs for construction (financed over a specified number of years), PV capex (where applicable; also financed) and electricity consumption; per m² floor area; over a 30-year time period; for various building types (residential, office, retail and school); for (1) standard buildings, (2) energy efficient buildings and (3) energy efficient buildings with rooftop PV.

Within the model, an energy efficient building was attributed an 8.5% financial premium when compared to 'standard specification' construction costs (based on the GBC and AECOM data) and assumed to use 30% less electricity. Additionally, a NZC building was assumed to source all its electricity needs through renewable energy, at the cost of rooftop PV capex and installation². The model assumes a financing term of 20 years with a finance rate of 12%. A discount rate of 8% is used, i.e. it takes into account that the same amount of money today is worth more than the same amount in future, even with inflation taken into account. All variables mentioned can be modified by the user to test alternative scenarios. The model results indicate:

- A strong financial case for 'green'/NZC in mid- to large-scale retail and commercial buildings, with the cumulative discounted cost being no more than that for a standard specification building within the first year, due to PV in particular being immediately beneficial to the overall costs.
- An exception appears to be high-rise office blocks and the largest retail stores where 'green' buildings only achieve cost parity with 'standard' buildings at 20 and 7 years respectively. However, the financial case still holds with the inclusion of PV (NZC buildings cheaper than conventional within the first year).

² It is noted that due to roof space limitations, in some cases it will not be possible to generate all electricity requirements from rooftop PV. Yet within the model, the cost of renewable energy is costed as such, even if the building could potentially be sourcing this renewable energy from the grid.

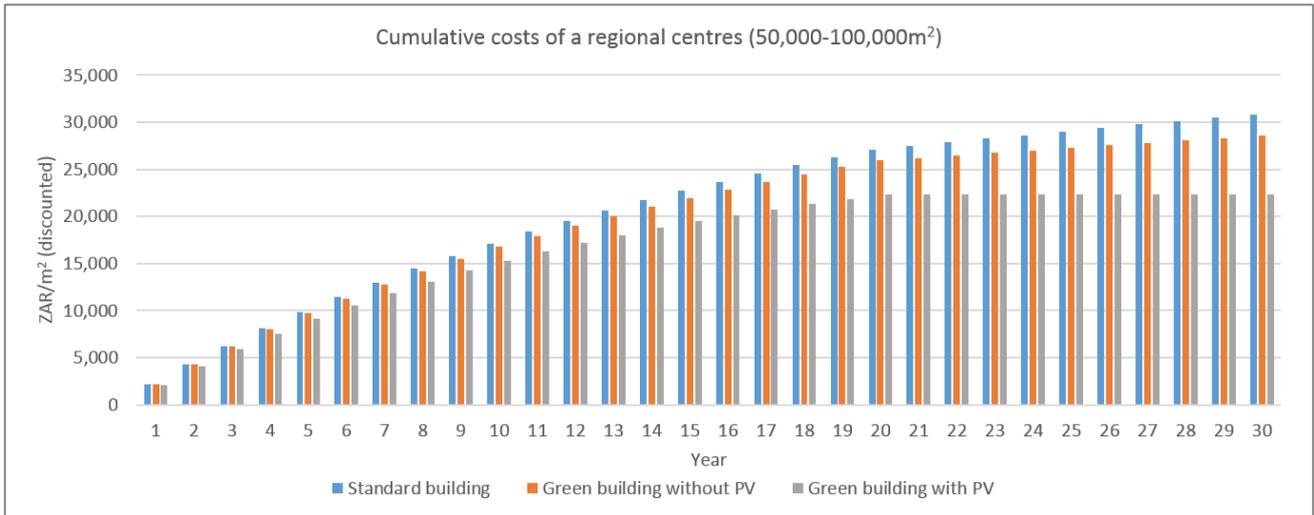


Figure 1: Cumulative discounted capex and electricity costs of 'standard' and 'green' regional centres (retail)

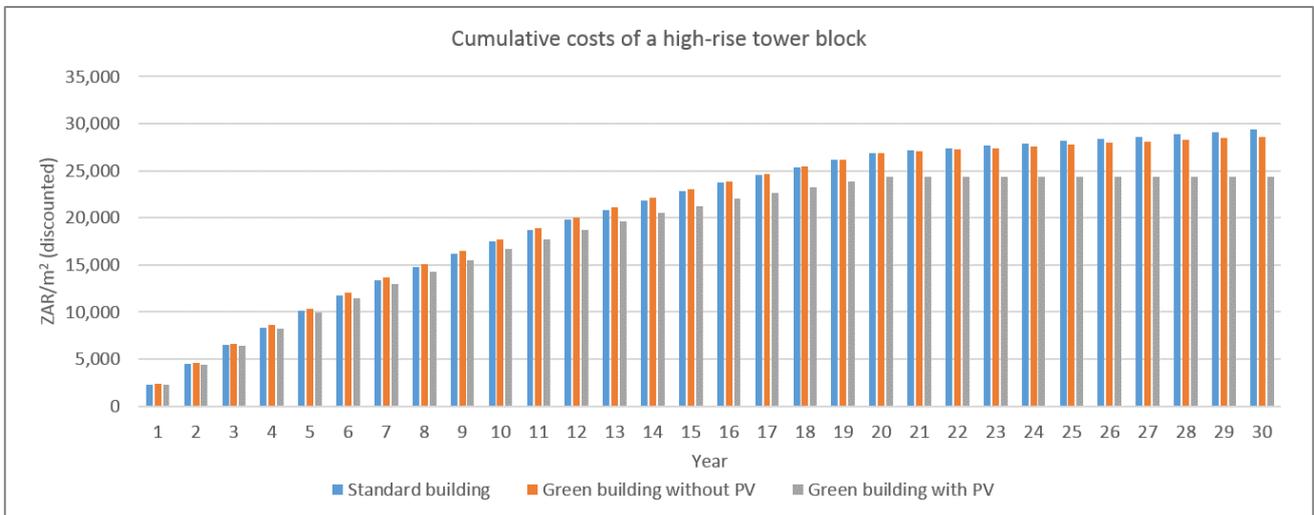


Figure 2: Cumulative discounted capex and electricity costs of 'standard' and 'green' high-rise tower blocks (office)

- The case was less compelling for residential and small commercial buildings. While there was not an immediate upfront case, the efficiency/PV interventions were not a big additional cost burden.

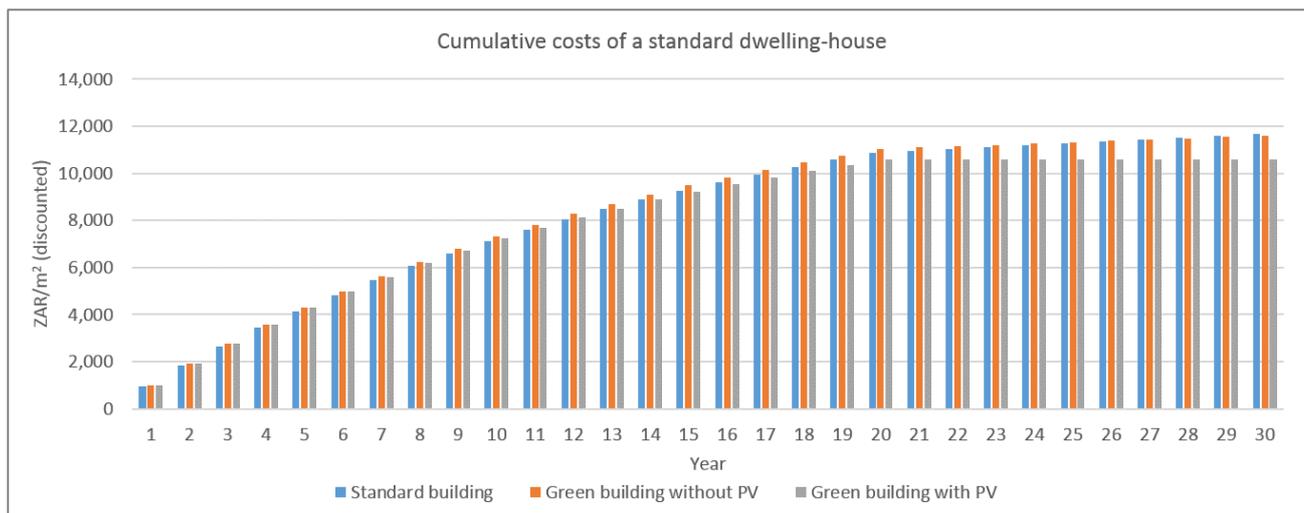


Figure 3: Cumulative discounted capex and electricity costs of 'standard' and 'green' house (residential)

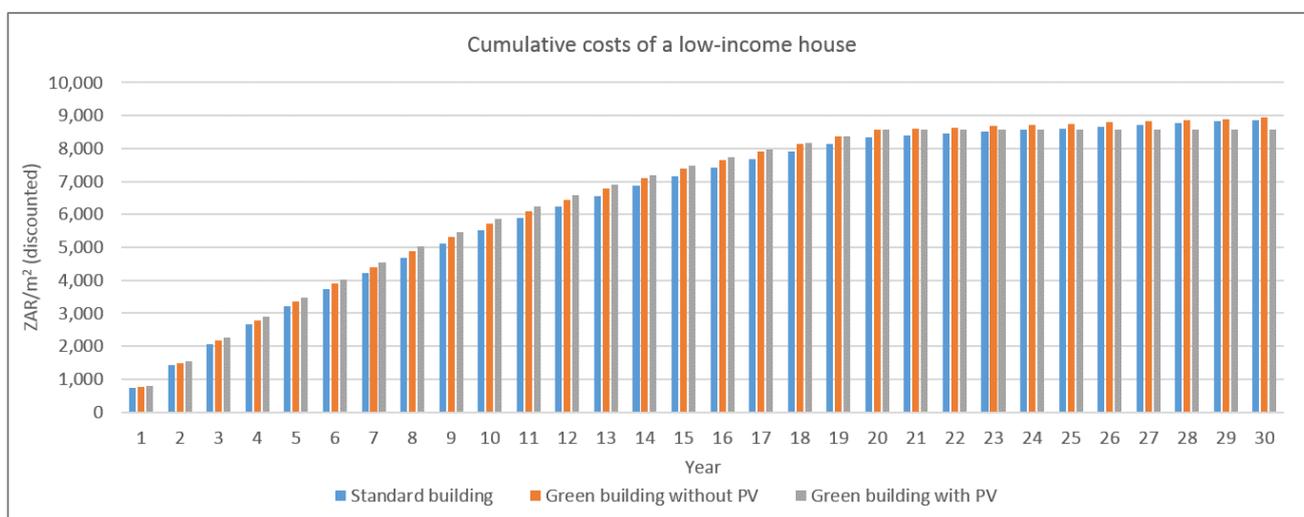


Figure 4: Cumulative discounted capex and electricity costs of 'standard' and 'green' low-income house (residential)

- The model indicated high sensitivity to solar PV prices and the cost of finance: dropping the finance rate from 12% to 8% and decreasing rooftop PV cost by 30% makes the financial case viable, even for low-income housing (cheaper than conventional building in 7 years).

The model can be altered for relevance to other cities and is available for use here:

http://www.cityenergy.org.za/uploads/resource_469.xlsx.

Should cities incentivise 'green' / NZC buildings?

Given that buildings often last from 50 to 100 years, we should be building for the customer of the future. This customer will expect to occupy sustainable, liveable, efficient and economic buildings. Mechanisms to catalyse such investments now – until such a time as it is mainstream and mandatory – seem worthwhile. Incentives to induce investments to 'go green' / NZC can include both fiscal measures, such as tax / rates rebates, and non-fiscal measures, such as the provision of design support or expedited approval processes. Financial incentives to enhance the case for NZC developments need to be based on sound policy footing.



Not only have 'green' buildings demonstrated higher returns, they cost less to operate and are less risky given the lower dependence on utility resources and the fact that they are 'future-proofed' against the potentially-rising cost of carbon emissions. 'Green' buildings attract tenants due to their healthier and more productive living and working conditions.

Green Building Council South Africa: www.gbcsa.org.za