Retrofitting unused spaces can help South African cities adapt to climate change

By Jan Hugo and Chrisna du Plessis

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There are two approaches to dealing with climate change: slowing it down, and adapting to it. The first is about reducing greenhouse gas emissions and absorbing more carbon. The second is about resilience to the impacts of climate change. Cities, which house more than half of the global population, have a big part to play in both approaches.

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In southern Africa, climate change is seen mostly in the form of higher temperatures, more heatwaves and less rainfall.

South Africa's climate change adaptation policies and National Spatial Development Framework tend to address climate change adaptation on a macro scale. They focus on large infrastructural, agrarian and ecosystem-based initiatives. Limited attention is given to cities, especially the way cities can adapt at the level of local neighbourhoods. Yet the built environment can help residents in various ways, from establishing food gardens and small parks to designing infrastructure that prevents flooding.

We wanted to find out more about the potential for cities to adapt to climate change – especially by finding new uses for unused or underutilised spaces. Our research in a neighbourhood of Pretoria (Tshwane), one of South Africa's main cities, suggests there are a number of opportunities for individual building owners and community groups to lower their exposure to climate change impacts by adding shading, growing food or generating renewable energies in these spaces. This is aside from top-down policies and regulations that respond to climate change impacts.

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The research

Many younger cities – those built in the 20th century – were designed with a focus on efficiency, with zones for each kind of land use, and the ideal of private vehicle ownership. The importance of public space was neglected. As a result, these cities have a lot of unused, underutilised, or simply left-over spaces. These spaces present opportunities to be retrofitted as climate change adaptation response strategies. Examples of such initiatives were undertaken in cities like Detroit, Melbourne and Rotterdam.

When these modern cities were planned, it was assumed that development would continue to be controlled. There wasn't much prospect of diverse, changing and multifunctional spaces. And the increasing number of vehicles resulted in large open spaces between buildings, idle most of the time and inhibiting any plant growth.

In South African cities, another feature of city planning under apartheid was space used as buffer zones to separate races and classes. There has also been a notable increase in the use of buffer zones and security barriers in response to insecurity and crime.

Our research project, conducted in the Hatfield neighbourhood of Pretoria (Tshwane), aimed to quantify the area's existing unused and underutilised spaces, as well as their material quality. We explored how these spaces could be used to limit the exposure of residents to the impacts of climate change.

Hatfield is an older but rapidly growing and transforming neighbourhood. It is vehicle orientated and deals with a daily influx of students who attend the University of Pretoria. In response to growing student numbers, there's been an increase in high density residential buildings. Crime levels have also affected this neighbourhood, so residents have put in place security measures such as high fences or walls. They have isolated private spaces and removed social spaces such as nightclubs and bars that are considered sources of anti-social behaviour. All these factors meant the area potentially contains many underutilised spaces to study.

Most of these spaces are flat concrete roofs and parking areas, which are often empty for long periods. These two types of space represent 67% of all the unused and underutilised spaces in the neighbourhood. They make up 5% of the Hatfield neighbourhood. They often use materials with high thermal capacities that store large amounts of heat. They provide little vegetation that could regulate local temperatures or reduce local flooding risk. These spaces are exposed to a lot of sun, which means they are suited to producing food or solar energy.

We found that all the unused and underutilised spaces (including parking areas and roofs), making up 7% of the neighbourhood's surface area, could be transformed to provide benefits to the local community.

Many of these spaces can be redesigned as public spaces because they are accessible. They could become cooling zones to lower heat stress, with water fountains to limit dehydration. These spaces will become critical as Pretoria will experience above average temperature increases (up to twice the global average).

The research identified both public and private spaces that can be retrofitted. The diversity of spatial scales and their relationship with existing functioning buildings makes these initiatives well suited for individual building owners and

community groups to undertake.

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Going forward

Many international agreements, national and municipal policies have been developed in response to climate change. Yet it's difficult for individuals to make a contribution.

Identifying opportunities for people to take the initiative on a small scale is part of an array of strategies.

These strategies must aim to limit the future impact of climate change, but also prepare for them. Even if global temperatures are limited to an increase of 1.5°C, there will be much higher average temperatures in South Africa. The country needs to develop response strategies for cities that can be undertaken by both larger governmental institutes and local communities or individuals.

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