Title: ***Dystopian Transition?***

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Abstract

The need for reducing carbon emissions and tackling the climate crisis has prompted urban regeneration initiatives that propose visions of more sustainable futures for urban environments supplied with renewable energy generated locally. With the increasing electrification of heating and transport, raising the electricity demand in cities, distributed energy generation from renewable sources in built environments becomes even more appealing. Showing great potential for integration into building roofs and vertical facades, photovoltaic technology can contribute to the green transition. However, a closer look at the changing image of cities driven by an energy focus may reveal negative impacts on local communities.

This article examines the issue of urban regeneration for the renewable energy transition with attention to how its potential effects on the quality of public spaces can offer a dystopian future. Through a reflection on existing literature and case studies, the article considers how new or retrofitted facades designed to improve the energy performance of buildings or supply these with renewable energy may deprive urban spaces of their character. It explores how energy-focused renovations can negatively affect a sense of place, harming vulnerable population segments and exacerbating social disparity. The article sheds light on the hiatus between the ongoing transformation of cities and the idea of urban regeneration benefitting local communities. It proposes to challenge technocratic urban dystopias and explore a bottom-up approach to reshaping the image of cities for the implementation of renewable energy solutions. The approach should be attentive to the perceptions and needs of local communities. It should be considerate of their attachment to places as well as their needs for expression and interaction with the environments they live in. It should fully engage local communities in informing the transformation of their cities.

Short Bio

Dr Eleonora Nicoletti is an architect and Senior Lecturer in Architecture and Environmental Engineering at UWE Bristol (University of the West of England). Her area of expertise includes technologies and processes for designs that can enhance the experiential quality of urban spaces while enabling the renewable energy transition. Her teaching in higher education spans architectural design and representation, technology and computational design.

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Urban Regeneration in the Energy Transition

Confirmed by the Paris Agreement (United Nations, 2015), the commitment to tackle the climate crisis and reduce carbon emissions worldwide produces major urban transformations for reducing dependence on fossil fuels. As noted by Blazquez, Fuentes and Manzan (2020), the move towards more sustainable energy sources and electrification is generally identified as the 'energy transition' which entails increasing reliance on renewable energy technologies, including solar among others. It is a long process, deeply affected by variations in policies, and is influenced by market conditions, business models and users' rising preference for renewable energy. It involves substantial technological transformations such as the switch from centralised to distributed electricity generation.

The growing electrification of transportation and heating systems, raising the demand for electric power in cities, requires new approaches to energy supply, integrated with decentralised energy generation (Mittelviefhaus, Georges and Boulouchos, 2022). This uses renewable sources and is seen as a desirable solution. The 'solar city' of Freiburg in Germany (Hopwood, 2007) and the BedZED project in the United Kingdom (Chance, 2009) exemplify urban developments that boast solar technologies supplying buildings with energy generated onsite as part of roofs and vertical facades instead of subtracting land from other uses. Among solar technologies, photovoltaics offer greater flexibility for building integration (Farkas and Horvat, 2012, p. 33) and can play a role in the energy transition. This, however, can have negative impacts. As suggested by Carley and Konisky (2020), it can exacerbate social inequalities. Whether the transformation may be positive for local communities can be questioned through a closer examination of specific cases or urban contexts.

This essay delves into the issue of urban regeneration for the energy transition, by considering examples of how it may affect local communities and the quality of public spaces. It explores how the image of urban environments may change through the spread of building-integrated photovoltaics (BIPVs). It looks into how these may impact the character and people's experience of urban environments while improving buildings' energy performance and supplying electric power from a renewable source. To facilitate this reflection, the article considers the case of Bristol in the United Kingdom in relation to exemplary low- or zero-carbon urban projects and existing literature.

Towards Energy-Focused Urban Renovations and Green Gentrification

If it negatively impacts local communities and increases inequality, the prospect of the energy transition may be seen as an 'eco-dystopia'. According to

Malvestio (2022), the negative scenario visualised in 'dystopia' includes elements of the present and serves as a warning against a possible transformation. When such a scenario has a focus on environmental aspects, the same author identified it as 'eco-dystopia'. This could be brought about by energy-focused renovations that can have non-negligible negative implications whilst improving the energy performance of the built environment.

While urban renewal projects may be intended for the collective benefit of stakeholders, they seldom focus on benefitting existing local communities. The increasing involvement of the private sector in driving urban developments has turned the city into 'a place to invest', and urban planning into a process depending on the market rather than on the engagement of residents. These tend not to be actors in the process of urban transformation or recipients of the benefits it may bring. By increasing the value of properties, urban renovations can raise the profits of investors. On the other hand, they can make housing less affordable for residents who may be forced out of the renovated areas (Tasan-Kok, Atkinson and Refinetti Martins, 2019).

Anguelovski et al. (2021) mentioned the issue of 'green gentrification', a type of urban transformation which introduces new 'environmental amenities' by attracting capital investments in undervalued urban areas, for the conversion of existing neighbourhoods. Gentrification attracts new, high-income residents to the transformed areas, and displaces vulnerable and lower-income residents whose physical and mental health and wellbeing are deeply affected. Among other cities, Bristol has been impacted by gentrification which negatively affects, for instance, individuals with lower incomes or belonging to ethnic minorities, as well as young people and the elderly (Anguelovski et al., 2021). Earley (2023) also highlighted the pressure of gentrification on local communities in Bristol, pointing at the challenges faced by community organisations in formerly industrial areas that have undergone substantial transformations. The same author stressed how the lack of support from the state does not facilitate urban regeneration processes led by local communities. Thus, these tend not to be involved in shaping the urban transformations they are affected by, including energy-focused renovations.

Energy-Focused Renovations: Reimagining the Urban Landscape

Within urban renovations, the energy performance upgrade of existing construction generally involves retrofitting the building envelope, which offers opportunities for the building integration of solar technologies like photovoltaics. These may be distinguishable as part of roofs or facades, as can be found in the Freiburg and BedZED examples or may be integrated invisibly as in the façade of

Copenhagen International School (Corti et al., 2018, pp. 68-69). The latter shows how covering buildings in energy-generating elements can become a reality. Urban blocks and districts may be renovated through the integration of more thermally insulating materials and photovoltaics into the building envelope. This may be seen as an appealing solution to tackling the growing demand for energy efficiency and electricity from renewable sources. At the same time, it can be expected to deeply transform the image of cities.

If we refer to the Freiburg, BedZED and Copenhagen International School examples, we can notice that the appearance of photovoltaics tends to be characterised by modularity, standardisation, and often large areas of darker colours or glass surfaces. These features can be undesirable in certain contexts and could have significant effects on people.

Large photovoltaic surfaces with reflective glass covers can contribute to urban overheating. This is referred to as the Urban Heat Island (UHI) effect and may be exacerbated by BIPVs (Elhabodi et al., 2023). The rise in temperature in cities can be uncomfortable for many and can be expected to be a source of suffering especially for some demographic groups. The most affected include older and younger citizens, people living alone, women, ethnic minorities, low-income workers, pregnant women and individuals with health conditions among others who are at a higher risk of illness or mortality (Ramly et al., 2023). In other words, vulnerable people can be expected to be affected the most.

The possible impacts of the extent, colour and modular patterns of photovoltaic surfaces on neurodivergent and sensitive individuals should also be considered and further explored. In autistic individuals, certain visual features of spaces, including particular uses of light, colours and patterns, may be triggers of different reactions such as overstimulation (Gaines et a., 2014). For migraine sufferers, patterns such as square-wave gratings can be a cause of discomfort as well as anxiety (Hine and White, 2021), which might result from arrays of typically dark-coloured solar modules. The spread of BIPVs may strongly alter the appearance and identity of urban environments, with potential repercussions on health and wellbeing.

In the case of Bristol, the city is characterised by a colourful image rich in street art which serves as a strong medium for expression, reflecting the diversity and creativity distinctive of the local community. The various murals across the city have become attractions and make the local urban landscape unique. Blanché (2015) mentioned Bristol to exemplify how street art can help boost the local economy through tourism. The same author noted how being characterised by images that occupy surfaces in public spaces, street art can convey messages

to large audiences. Unlike other art forms, street art is 'site-specific' and shared extensively through online media (Blanché, 2015). Bristol's street art is periodically celebrated through Upfest, a festival in Bedminster, which can draw several thousands of visitors to the area (BBC News, 2022). The live painting which distinguishes the festival further highlights the 'performative' and 'participatory' characteristics of street art, that were mentioned by Blanché (2015). Thus, street art has the power to engage the community and contribute to the identity and the economy of the city.

Bristol can illustrate how the green transition may lead to an eco-dystopia. Not only it could increase inequalities in urban environments, but depriving the city of its street art in favour of energy-efficient and energy-generating building surfaces would deny the local community one of its key media for expression. Andron (2018) noted urban surfaces are qualitatively different from areas of the city that can be clearly defined as public or private. The same author stressed that people should be free to use urban surfaces and participate in the creation of the spaces they occupy, which includes the freedom of creating urban art and shaping a city's identity. Forte and De Paola (2019) showed that street art can benefit the local economy and enhance people's perception of urban spaces by encouraging social interaction, producing a sense of place and improving the quality of urban areas. Hence, reducing opportunities for street art appears to be a dystopian prospect.

Retrofitting buildings with BIPVs could have a major impact on the city's identity. There is potential for reimagining how the modern building stock with poor energy performance would become after energy-focused renovations. The visual features of BIPVs may be restrictive and unappealing for a city where facades become the canvas for street art. Increasing the extent of photovoltaic areas on buildings in Bristol could produce a city image unwanted by the local community. If energy-generating installations replaced street art on urban surfaces, it would be a cultural loss, besides potentially exacerbating inequalities as discussed earlier. On the other hand, if murals were painted on photovoltaic arrays, these would be stopped from absorbing sunlight and turning it into electricity. Extensively covering building surfaces with solar installations could affect residents' emotional bonds with places in Bristol. Such ties derive from the physical features of the city along with the activities and meanings people associate with spaces, which identifies a 'sense of place' as defined by Najafi and Shariff (2011). The 'sense of 'place' could be negatively affected by energy-focused renovations reducing street art in Bristol. Nonetheless, possibilities may be explored for maximising the benefits of both street art and energy-focused transformations. Engaging the local community in the discussion and decision-making about how

the city could change for the energy transition could lead to more just, less profit-oriented and more context-specific solutions, respecting the unique identity of the city and its people.

Energy Transition: An Urban Dystopia?

The above considerations expose some of the issues found in views of the energy transition as a positive change for cities, showing how it can lead to an urban dystopia rather than sustainable development. Energy-focused renovations carrying environmental benefits can be expected to exacerbate social inequalities and generate cultural losses reducing diversity in cities. The possible environmental advantages do not justify the aggravation of existing social issues. These are already intensified by disasters caused by climate change and should not be worsened by the solutions to it. Negative effects could include broadening the gap between wealthy and low-income groups, marginalising minorities, displacing vulnerable individuals, and breaking people's emotional bonds with places, as well as possible impacts on health and wellbeing.

Monaco (2023) highlighted the drawbacks of technology-centred strategies for tackling the climate crisis, stressing the importance of systemic transformations. These should address social inequalities through collaborative efforts while implementing technology changes. Thus, a technocratic approach to overcoming the current climate crisis should be challenged. Instead, a bottom-up approach involving local communities in shaping their environments could divert us from turning the energy transition into a dystopian reality. Such an approach should be respectful of the needs of local communities, their emotional attachments to places, and their preferences for free expression and interaction within the urban areas they inhabit. Local communities should be fully engaged in transforming their cities within the energy transition. They should be enabled to have a say on whether and how renewable energy technologies should be integrated into the built environment they live in.

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