Policy Brief

Creating healthy & flood resilient neighbourhoods through SuDS[1] induced Soundscapes

Flood Resilience | Soundscape | Blue-Green Infrastructure

INTRODUCTION

- ***Urban transformation, urbanization and increasing climate variability, render UK susceptible to urban flooding threats.***
- ***Noise pollution impacts residents' health and threatens biodiversity as an indirect impact.***
- ***Quality of life is enriched by areas of quiet and green restorative environments which can be severally impacted by urbanization induced noise and air pollution.***

Emerging SuDS solutions (blue-green infrastructure) and noise mitigation policies haven't caught up with **local adaptations which require interdisciplinary, multi-stakeholder engagement, a challenging process.** Carefully designed urban soundscapes can provide **additional restorative health and wellbeing benefits to residents**, besides noise mitigation.

Aim: Therefore, within the gamut of sustainable urban development, this research aims to provide **preliminary understanding of the linkage between SuDS and the resultant restorative soundscapes, which might be created as a by-product. The research also suggests how to assess and design urban neighbourhoods, with SuDS created restorative soundscapes.**

The research was conducted context-specific within Glasgow city using a comparative case study-based approach. With an inter-disciplinary stance, the research proposes a **preliminary methodology to assess and design neighbourhoods with SuDS based soundscapes, providing maximum benefits as a nature-based, localized solution.**

The research identifies a set of key variables that can be utilized to design healthier and water sensitive neighbourhoods, by comparing two case examples in Glasgow city.

The output is guidance for analysing and designing neighbourhoods which incorporate SuDS based soundscapes and benefits.

KEY RECOMMENDATIONS

SUDS mitigate floods and soundscapes provide benefits beyond noise mitigation if designed effectively for urban residential neighbourhoods. Both can be combined to provide multiple adaptive benefits for sustainable urban development.

Soundscapes can likely be created through carefully designing urban environments with SUDS, due to their wildlife enhancing flora and fauna.

Interdisciplinary and multi stakeholder engagement is required to develop proposals for local implementation of such sustainable neighbourhoods.

Community buy-ins are required for implementation for long- term benefits and sustainability. The approach to retrofit SUDS based soundscapes in existing or new neighbourhoods is challenging and requires considering a larger set of variables.

[1]SuDS: Sustainable Urban Drainage Systems
Banner image is from Sustainable Drainage Systems - Thames21

OVERVIEW OF METHODOLOGY

The research has used concurrent mixed methods approach, combining both qualitative and quantitative methodologies, with multiple stages undergoing an iterative process and triangulation occurring across data sets. Specifically, the methodology involved the following:

1. Nineteen tentative independent variables were identified through literature for assessing urban soundscapes, SuDS, and urban design components. These variables were categorized as per their suitability for *1) Neighbourhood Planning and urban design, 2) Designing and Assessing SuDS and 3) Soundscape design and assessment.*
2. Two case study neighbourhood sites were chosen:
   a. *Greenfield modern development with SuDS = Athlete's Village*
   b. *Historical neighbourhood without SuDS but has a natural stream and parks = Yorkhill.*
3. Site-surveys were undertaken assessing the applicability of identified variables for each type of case. This was used to determine suitability for either retrofitting SuDS based soundscapes or their management.
4. A survey was conducted of 17 experts from the fields of soundscapes, urban planning and SUDS. Through an iterative and sequential ranking process, a Ranking Chart for all identified variables was generated, to guide priority for assessment or designing neighbourhoods with SuDS induced soundscapes (Figure 1).
5. Expert opinion on the benefits and challenges for the implementation of the proposed approach was analysed qualitatively.
6. The output from the research is ***1) A Ranking Chart with priority of assessment for identified variables to assess SUDS based Soundscapes and 2) Identified benefits and challenges for this approach.***

While the newly developed neighbourhood has its urban design landscape and street elements integrated with SuDS, the older neighbourhood reflected an absence of such integration; whereupon urban design was limited to street parking facilities and traditional urban drainage with existing natural elements.

Extremely Significant (Variables with ranks 1 to 5)	Local plant species inviting suitable fauna (butterflies, birds etc.)	Urban space requirement (area available for SUDS)	Climate based factors (rainfall, temperature etc.)	Existing Urban Stormwater drainage pattern	Design Features (such as open/closed channels, green walkways, pond design etc. , water movement etc.)	Local Geography (soil morphology, gradient, surface drainage, location etc.)	Housing Density and population	Local plant species conducive for SUDS implementation	Urban Design features for open space design	Acoustic environment indicators to assess Soundscape (such as sound or noise levels)	Storm Water Quality and quantity
Very Significant (Variables selected with only ranks 1 to 4)	Footfall near the street/residence level SUDS feature.	Proximity of the street level SUDS feature to residential units	Socio-cultural context of the resident(s)	Type of residential neighborhood	House typology (such as individual house/flat/etc.)	Psycho-acoustic measures for assessment of soundscapes (such as loudness etc.)					
Significant/Important (Variables selected with only ranks 1 to 3)	Land Tenure	Property value/House price/rent price									
Key to illustrate ranking as per maximum count in each significance level	Rank 1	Rank 2	Rank 3	Rank 4	Rank 5						

Figure 1:Final Ranking Chart of Variables for SUDS-Soundscape neighbourhoods, containing all identified 19 variables and their ranks. While rank 1 depicts high priority, rank 5 represents least priority as attributed to each variable category, through expert opinion survey

KEY FINDINGS & OUTPUT

- All 19 variable categories (Figure 1) apply for the neighbourhood without SuDS, considering that **interdisciplinary suitability assessments are required for retrofitting any type of SuDS**. Decision making for retrofitting must consider **community engagement for long term impact**.
- For neighbourhoods with SuDS, **suitable variables are in conjunction to SuDS maintenance and impact assessment of the soundscape created by them.**
- The interviewed Urban planners and Glasgow City Council members are largely unaware of soundscape concept. This renders scope for **awareness creation for effective policy design and implementation**. Experts regard SuDS to be highly essential to urban residential neighbourhoods and that **soundscapes created by urban flora and fauna, can be easily incorporated for existing or new neighbourhoods** (Figure 2). They further stressed on the **multiple benefits of the proposed approach and potential gains in environmental quality and residential amenity**.
- **Experts highlighted challenges for this concept such as: -**

1)retrofitting SUDS design in existing/older infrastructure,
2)incorporating the concept into regulatory framework,
3)meeting developer's demands to maximize land value potential,
4)financial constraints for implementation and management,
5)siting and design challenges in older neighbourhoods and
6)community buy-in and awareness of the benefits of this approach for adoption. Maintenance requires community adoption to enhance self-dependability.

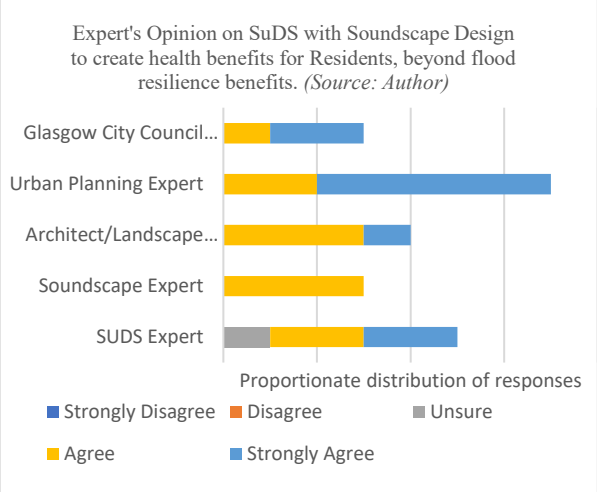

Figure 2: Experts' Opinion on multiple benefits of Soundscape and SuDS

- A practitioner or researcher can undertake an assessment or designing such neighbourhoods using the ranking chart (Figure 1) at any stage of decision-making for the project.
- SUDS may help create restorative soundscapes, though its effectiveness might vary across neighbourhoods, owing to the **site contextuality and individual perspectives of residents on environmental sounds**.
- As concluded from the Ranking Chart, ***Climate conditions, urban space availability and which local species we plant and utilize*** are primary factors to consider apart from ***assessing stormwater management systems*** as existing in the cities.

IMPLICATIONS AND RECOMMENDATIONS

This research was an exploratory study serving as an additional guide to existing urban planning and design methodologies and frameworks. Using the ranking chart, policy makers can evolve localised implementation strategies with the local councils, while designers can develop cost-effective and implementable, localised designs. Further: -

1.The combined approach of SuDS with soundscapes design is evidentially valid and can accrue multiple benefits ranging from ***social cohesion, bio-diversity enhancement in urban areas, health, and well-being benefits beside flood resilience***. All these benefits contribute to ***sustainable development goals***.

2.The approach cannot be viable without considering the site and participants'/community's perspectives thereby requiring **participatory planning tools, especially for retrofitting SuDS**.

3.Despite being a micro-planning solution, the approach would require city level integration and a regional policy context, for a holistic engagement. **A multi-stakeholder engagement for deriving action with community as key stakeholder is pertinent for success**.

4.**Bio-diversity domain's contribution** is key to assess which plant species are most suitable to create salutogenic urban soundscapes/landscapes.

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