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Green infrastructure, Noise, Urban environment

Green walls show promise as sound barriers for buildings

Green walls, designed so they are covered in vegetation, could help cut the amount of noise that enters buildings, a new study has found. In lab. tests, researchers found that a modular green wall system reduced sound levels by 15 decibels (dB). This leads them to believe that it is a promising sound reduction device that could improve quality-of-life for city residents.

Green walls and green roofs can provide ecosystem services in urban areas. Their benefits include: lower energy use in buildings, support for biodiversity and storm-water control. Studies have also shown that they reduce noise levels. However, most studies have focused on green roofs' ability to insulate buildings from external sound, and very little research has looked specifically at green walls.

This Spanish study, carried out under the EU-funded SILENTVEG project[1], conducted laboratory tests on green walls' acoustic properties. Its aim was to help predict their sound insulation performance in the real world.

The design of green walls can affect their sound insulation properties. The type of plant grown can also have a big effect. In this case, the study focused on a modular green wall system, which is composed of compartments or boxes attached to a vertical frame and is the most widely used system.

The boxes in this study were made of recycled plastic and filled with coconut fibre, acting as 'soil'. They were all planted with *Helichrysum thianschanicum*, a popular shrub for gardening in the Mediterranean region, with an average height of 40 cm.

The researchers placed 10 of the boxes, totalling 2.4 m^2 in area, onto a wall which separated two rooms. They emitted noise in one room at frequencies ranging between 100 hertz (Hz) and 5 000 Hz, and then measured the reduction in noise levels in the neighbouring room caused by the green wall.

The green wall reduced noise levels in the neighbouring room by an average of 15 dB. The researchers note that this reduction is quite low compared with other solutions; thermal double-glazing can reduce noise by 30 dB, for example. A sound barrier made from two layers of plasterboard, separated by a wool-filled cavity, can reduce noise by 70 dB.

Nonetheless, they believe it still has good potential to help cut noise levels in urban buildings and could be used effectively in public places, such as hotels and restaurants. Furthermore, if its design was improved by sealing the joints between the boxes, then it could reduce noise by an extra 3 dB. The other benefits of green walls, such as increased biodiversity, visual attractiveness, air purification or climate regulation, also make them an attractive option.

This experiment considered noise that is transmitted directly through a wall, but in a realistic situation noise bounces off different surfaces and can be transmitted indirectly through a number of routes. Therefore the logical next step in this research would be to test the green wall on actual building façades, the study's authors say.

To further improve their understanding of the wall's basic acoustic properties, the researchers also investigated how much sound a green wall can absorb. In this experiment, they placed the green wall (this time 10 m^2 in area) on the floor of a room in which sound was emitted, again at frequencies of 100–5 000 Hz. The wall was calculated to have a 'sound absorption coefficient' of 0.40, i.e. it absorbed 40% of the sound.

1.SILENTVEG: Barreras vegetales autónomas y sostenibles para la mitigación acústica y compensación del CO2 en vías de transporte, con seguimiento telemático, was supported by the European Union's Regional Development Fund. See: www.aopandalucia.es/innovacion/principal.asp?alias=al_barreras&zona=proyectos&t=0 (in Spanish)