Title	Green Walls for Clean Air
Authors(s)	Gölsdorf, Katrin, Müller, Hans, Collier, Marcus
Publication date	2013-07-19
Publication information	Gölsdorf, Katrin, Hans Müller, and Marcus Collier. “Green Walls for Clean Air,” 2013.
Conference details	AESOP / ACSP 5th Joint Congress, Dublin, Ireland, 15 - 19 July 2013
Item record/more information	http://hdl.handle.net/10197/6867

Green Walls for Clean Air

Katrin Gölsdorf, Hans Müller

Helix Pflanzen GmbH

Marcus J. Collier

School of Geography, Planning & Environmental Policy, University College Dublin, Ireland

Can plants help to improve the air quality? People have often complained about Ivy on buildings, but research by Helix Pflanzen GmbH, a company that is specialised in the cultivation of ivy species and the development of green wall technology, is shedding new light on an old problem. Using a cultivated variety of ivy (*Hedera helix* 'Wörner'), experiments were carried out that illustrated the binding effect that this Ivy has on fine dust particles. This is particularly important in urban areas, where fine dust can lead to significant impacts on quality of life.

Introduction

Air quality influences health and well being and pollutants like fine dust particles have the greatest impact on health. Their noxious effects are dependent on the particle size and the substance of content. Fine dust with a smaller diameter than 10µm can be transported to the bronchi and bronchioles. But more dangerous are particles less than 2,5µm. They directly enter the bloodstream through the alveolus. Studies from the WHO (Ostro, 2004) show that fine dust contaminated air reduces life expectancy by about 10 months. In Germany, measurements have been taken on fine dust since the 80's, and recently there have been attempts to improve German air quality using new action plans and providing incentives to fight air pollution. Nevertheless, threshold values for fine dust have been exceeded, especially in congested urban areas. 20% of all measuring stations in Germany exceeded the maximum allowed daily threshold value for fine dust on more than 35 days per year with more than 50µg of fine dust (PM10) per cubic meter of air [µg/m³] averaged across the day. Stuttgart is one of the regions with the highest fine dust concentrations in Germany (figure 1).

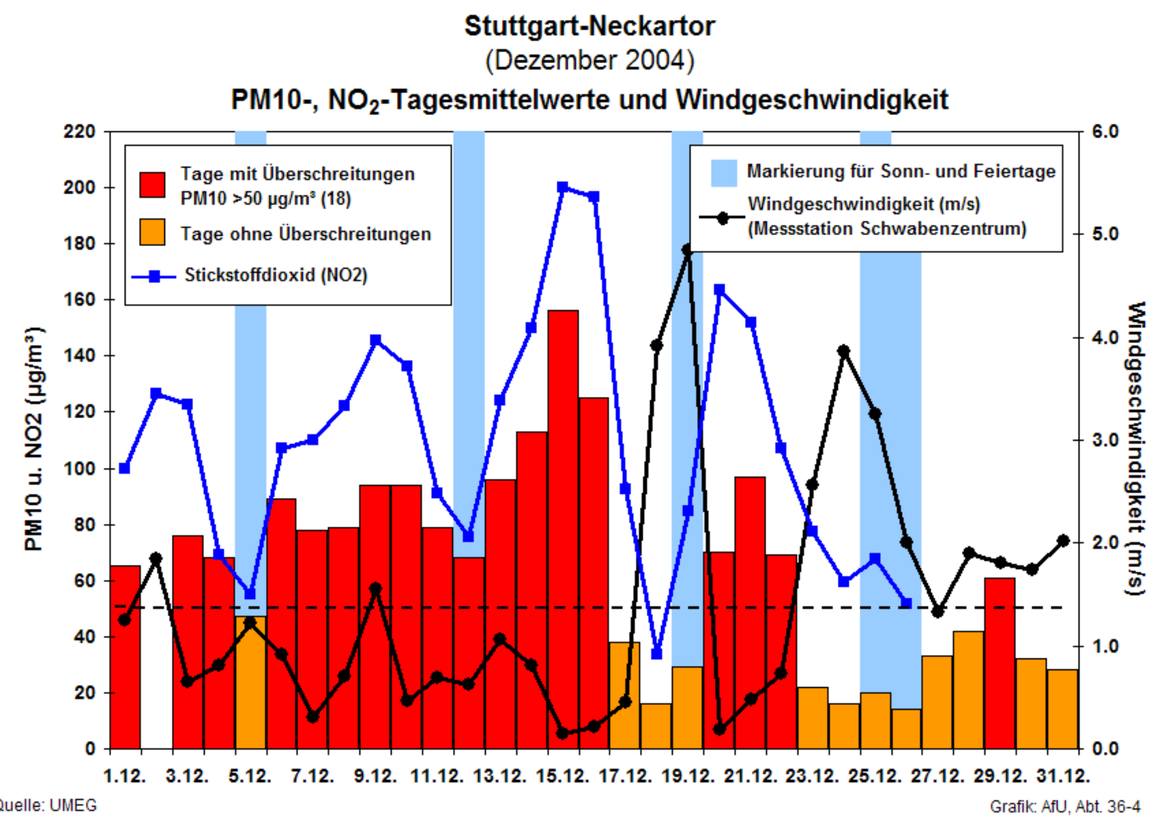

Figure 1. The average daily PM10 and NO2 concentration in Stuttgart December 2004 (www.stadtllima-stuttgart.de).
Red bars: days > 50µg/ m³ Black line: velocity of wind
Orange bars: days < 50µg/m³ Blue line: NO2 concentration
Blue bar: weekend, public holiday

Results

In 2008 Helix-Pflanzen GmbH collaborated with the University of Wuppertal to investigate fine dust capture by ivy (*Hedera helix* 'Wörner'). The cleansing efficiency of this variety of plant was described by the fraction that could be removed by washing under active overhead irrigation as a function of surfaces, dimensions and mass. From the measuring results it was shown that *Hedera helix* 'Wörner' contributes to the particulate matter separation. This is characterised by a rain-induced leaf cleaning. *Hedera helix* 'Wörner' can significantly collect fine dust on its leaf surface. Particles < 5µm were deposited during low water flow velocity. If there is enough rain water and drop energy, particles > 5µm will be washed off the leaf surface (Reznik & Schmidt, 2009), shown in figure 2.

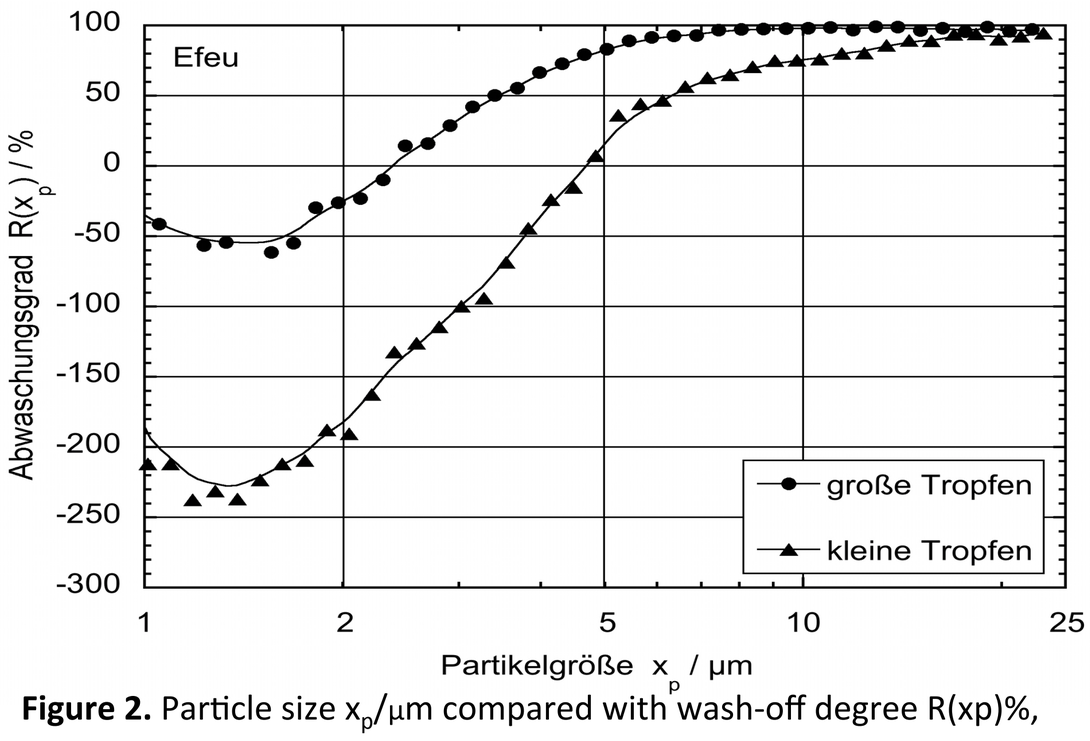

Figure 2. Particle size x_p/µm compared with wash-off degree R(xp)%,

● large droplets ▲ small droplets

Conclusion

While Ottlé et al. (2010) show that ivy can capture many polluting compounds, while also mitigating the effects of the urban heat island, the air 'cleaning' potential of these plants has now been confirmed by Pugh et al. (2012). They demonstrate that walls covered with grass, ivy, or other plants filter the air in urban street canyons and that ivy covered walls may reduce air pollution by a factor greater than ten rather than by one to two per cent. The results of the Helix Pflanzen GmbH study support these findings, and offer planners and practitioners a green infrastructure solution to a complex urban problem.

REFERENCES

Ostro B. (2004) Outdoor Air Pollution: assessing the environmental burden of disease at national and local levels. Geneva, World Health Organisation. WHO Environmental Burden of Disease Series, No.5.

Ottelé, M., van Bohemen, H. D. and Fraaij, A. L. A. (2010) Quantifying the deposition of particulate matter on climber vegetation on living walls. *Ecological Engineering*, **36** (2), 154-162.

Pugh, T.A.M., MacKenzie, A.R., Whyatt, J.D. and Hewitt, C.N> (2012) Effectiveness of green infrastructure for improvement of air quality in urban street canyons/ *Environmental Science & Technology*, **46** (14), 7692–7699.

Reznik, G. and Schmidt, E. (2009) Reduction of emissions by vegetation – dry collection and wet resuspension of fine dust particles on ivy. *GRdL* **69** (10), 434 – 438. www.gefahrstoffe.de/gest (in German).