

# The economic side of urban green for soundscape design

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# HOSANNA: Low vegetative barrier between the pathway along La Saône river and a noisy street (with Mats Nilsson , Maria Rådsten Ekman, Vincent Gissinger, Bruno Vincent)



Important task: obtain monetary valuations

# Cost Effectiveness

- Choose the least costly alternative satisfying the objective
- Compare €/unit improvement– we want this figure to be as **SMALL** as possible
- Disadvantages:
  - Disregards non-acoustic benefits (air pollution, aesthetics, CO<sub>2</sub>)
  - No time dependency  
However, we prefer improvements to be enjoyed quickly rather than late
- Advantages
  - No need to calculate benefits – we need less information on the various effects, and we have an easier job of obtaining results
  - Can compare measures for beneficiaries and effects where no valuations are readily available (shoppers, park users, pedestrians, cyclists)

## Current thinking: Local measures not cost effective

Table 4. Possible noise abatement measures, their most important attributes and the cost of making one less annoyed by road traffic noise for one year

Measure	Noise reduction	Reduction in annoyance score	Limitations on use	Cost per reduction in annoyance (per year)
Vehicle noise reduction	3 dB	19,7 mill	None	€ 15
Thin Layer asphalt	2 dB	2,4 mill	Not motorways (with high speed and density)	€ 125
Porous asphalt single layer	2 dB	1,1 mill	Only motorways (high speed)	€ 280
Façade insulation (2 windows)	8 dB	0,8 mill	None (indoor effect only)	€ 400
Porous asphalt double layer	4 dB	0,3 mill	Only motorways (high speed)	€ 900
Noise barrier	8-1 dB	0,2 mill	Not in city streets (city center?)	€ 1800

# Soundscape can be part of a holistic approach where other factors are counted

- Urban environments are experienced multi-sensory
  - Thermal comfort
    - Chill factors
    - Urban Heat Islands
  - Aesthetics
    - Greenery – barriers, walls, roofs
    - Cultural heritage
    - Architectural
    - Natural landscapes
    - Cultivated landscapes
  - Smellscapes
    - Flowers
    - Fruits
    - Bakeries
    - Perfumes
  - Local air pollution – dust/exhaust
  - Cleanliness and upkeep/tagging – dysfunctional/disrepair
  - Liveliness and vibrancy
  - Safety and security
  - Aesthetic Design

# Cost Benefit Analysis

- Benefits are valued against costs
- $B/C \text{ Ratio} = \frac{\Sigma(\text{Benefits in } \text{€})}{\Sigma(\text{Costs in } \text{€})}$
- We want this figure to be as **BIG** as possible
  
- **CRUCIAL ADVANTAGE** – Tool can incorporate
  - Improvements in aesthetics
  - Improvemets in other non-acoustic benefits
  
- **Disadvantages:**
  - Valuation for important benefits/beneficiary groups lacking
  - Valuation currently take only dB into account
  - Recreational values and restorative values need to be obtained
  - Several difficult to value benefits have not been quantified/valued

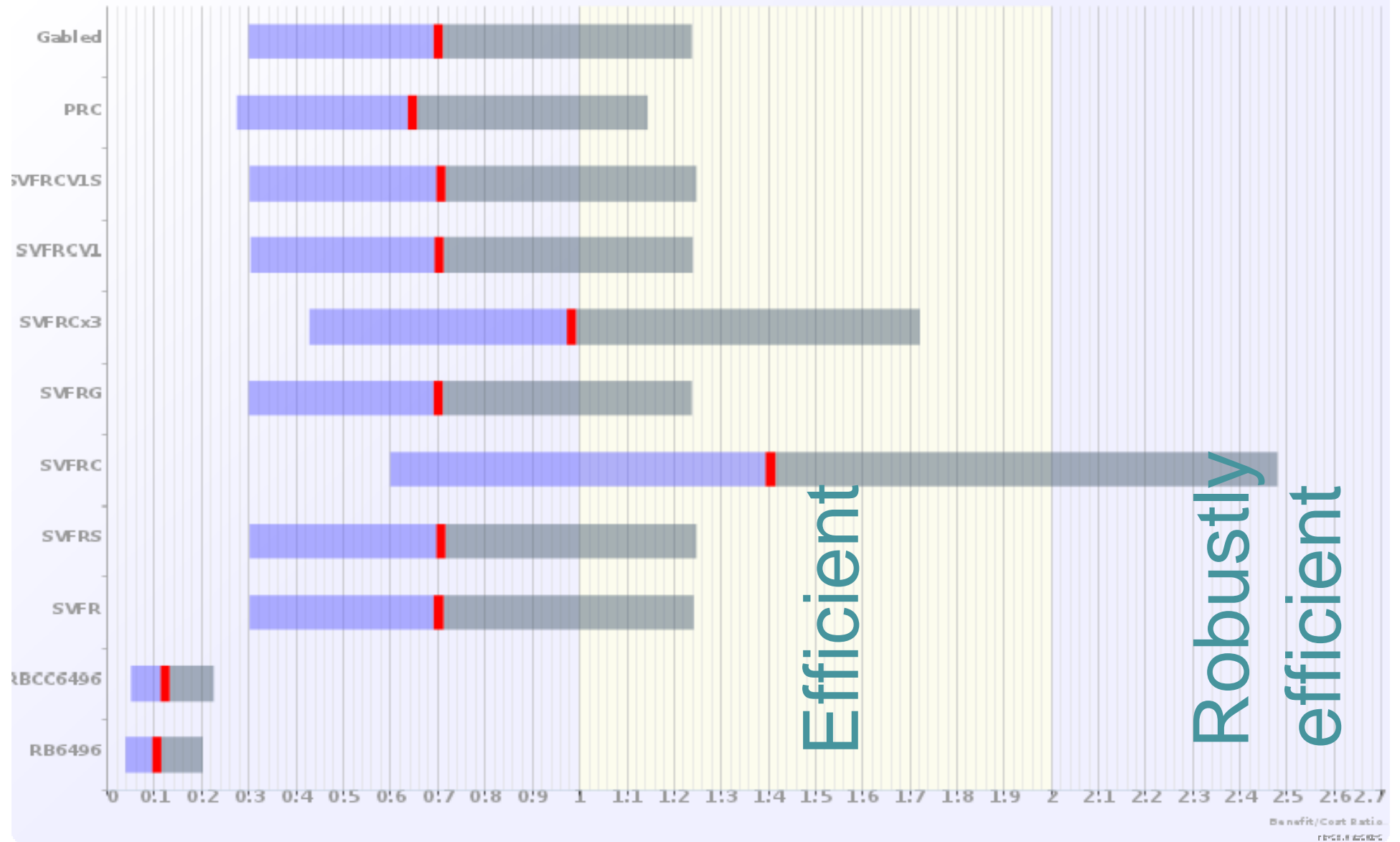
# Benefit/Cost Ratio – Three areas



	Bene f.	Base dBA	$\Delta$ dBA	m <sup>2</sup>	Invest. cost €	Main- ten. Year €	Last s Year s
<b>Vegetated flat roof</b>	100	51.4	2.7	688	40	2	50
<b>Vegetated shed roof, angled towards street canyon</b>	100	51.4	7.0	688	40	2	50
<b>Vegetated gabled roof</b>	100	51.4	8.2	688	40	2	50
<b>Vegetated roof with one convex corner</b>	100	51.4	6.5	344	40	2	50
<b>Vegetated roof with three convex corners</b>	100	51.4	6.5	492	40	2	50
<b>Vegetated roof with one concave corner</b>	100	51.4	2.7	688	40	2	50
<b>Vegetated roof with one concave corner, slopes towards courtyard</b>	100	51.4	3.7	688	40	2	50
<b>Periodic roof roughness, coarse</b>	100	51.4	1.9	737	40	2	50



Overview simulation results



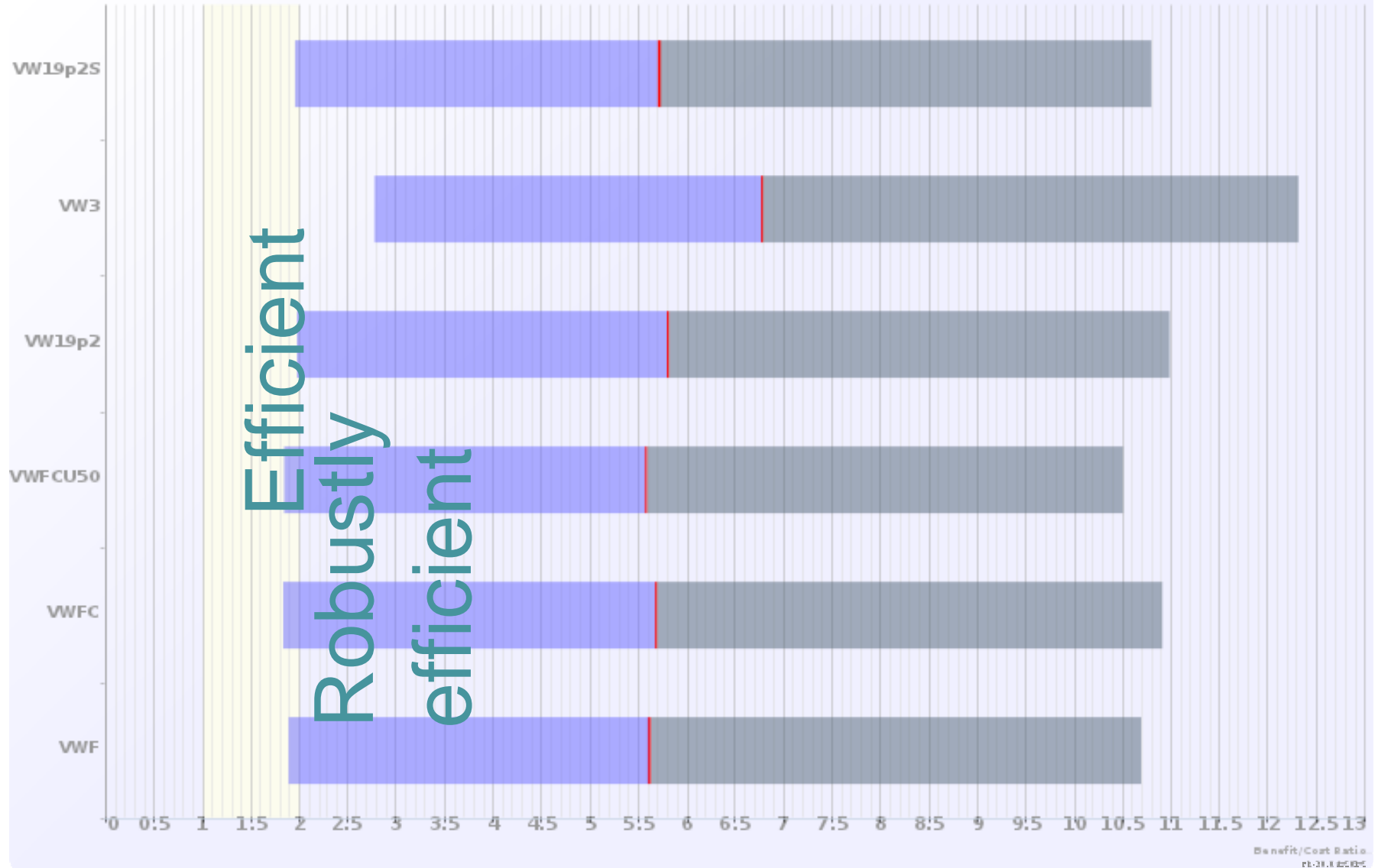
	Bene f.	Base dBA	$\Delta$ dBA	m <sup>2</sup>	Invest. cost €	Main- ten. Year €	Last s Year s
<b>A vegetated barrier of 0.64 m width and 0.96 m height at roof edges of the canyon</b>	100	51.4	0.8	115	500	25	10
<b>A vegetated barrier of 0.64 m width and 0.96 m height at roof edges of courtyard</b>	100	51.4	0.9	58	500	25	10
<b>Vegetated facades in canyon</b>	100	51.4	1.0	2949	500	25	10
<b>Vegetated facades upper half of canyon</b>	100	51.4	1.0	1475	500	25	10
<b>3m tall facade opening to cross street</b>	100	47.9	3.4	58	500	25	10
<b>19.2 m tall facade opening to cross street</b>	100	59.3	4.1	369	500	25	10
<b>3 m tall facade opening to trafficked street</b>	100	56.3	4.5	58	500	25	10

## As simple, schematic initial values we propose, **very preliminary ...**

- EUR 4.5 per person for a square meter of green roofs/walls
- EUR .9 for a square meter of urban tree canopy

... representing aesthetic/ambient/recreational benefits **per person per year** (in addition to acoustical benefits)

Overview simulation results



## Preliminary conclusions from economic analyses undertaken as part of the HOSANNA project

- When **both** acoustic and aesthetic benefits are counted, measures become economically viable that would not be so otherwise
- Innovative green measures have the potential to outperform conventional measures – if all beneficial effects are taken into account
- Thinking holistically can circumvent the most important objections – namely that the measures cost more than their "worth" and that public money is better employed elsewhere

# DELAYS, DELAYS, DELAYS

- NO MONEY AVAILABLE FOR FIELD TRIALS
- FUNDED SOUNDSCAPE IMPROVEMENTS DELAYED UNTIL PLANNING MARATON/POLITICAL PROCESSES RESOLVED

## EXAMPLES:

- Field trial gets funded – the project containing the field trial not
- Project starts before field test funded -- interferes with experimental design
- The device is ready for deployment, but there is nowhere meaningful to deploy it – no known immediate demand/site for the particular type of measure
- Need for new types of soundscape improvement measures – only the traditional ones are known
- A three-year research program can be too short
- CONSEQUENCES: EXTREME DELAYS Many years before results from field trials become available

## Delays in noise abatement and soundscape innovation have **European wide** consequences

- Delay before innovative noise and soundscape solutions become known, are tested, and come to trial hinder European cities and central authorities from deploying economically more effective and efficient solutions
- The sometimes extreme delays in getting new and promising measures into use thus have European-wide consequences
- We thus suggest there could be a need for an EC-supported noise abatement and Soundscape Innovation Network (SIN)

# Elements of a Soundscape Innovation Network

- **SPEED LINE:** Cities and road and rail authorities should specify one innovative measure, or one small experiment to be built into every noise abatement or soundscape innovation project of some size..
- **WEB-SITE/INFORMATION CENTRE**
  - PROJECT WISHES with contextual detail (city centre, ring-road, radial road, residential and city areas – distances and contextual information) allowing innovators to pin-point testing opportunities – perhaps in another district, or other country
- **SOUNDSCAPE IMPROVEMENT/NOISE ABATEMENT INVENTORY**
  - List of measures, devices, and treatments in various stages of production/testing evaluating – inviting contacts from cities, planners and entrepreneurs – and also researchers.
- **EC-WIDE**
  - Innovators, designers, cities, agglomerations, road and rail authorities, producers of acoustic materials, landscape sculptors, city planners, architects, entrepreneurs, NGO's citizen networks
- **Open innovation** – free sharing of informations between innovators, public authorities, NGO's, researchers



# Network activities and products

- To promote and lift promising solutions use:
  - Soundscape measure innovation competitions –
  - Best innovation of the Year or Best soundscape design”
  - Best visual/aesthetic artistic use/design of e.g. surface treatments / sonic crystals etc.
- **Soundscape Innovation Inventory**
  - Different measures fit in different situations and satisfy different space, size, functional, topological, and climatic constraints – as well as standards and regulations.
  - One therefore needs and inventory of measures that are suited for improving sound quality and reduce noise in given contexts and scenarios, which can be used in combinations and which are less suited
- **Soundscape mapping and usage information**
  - Soundscapes are defined perceptually in space and time. Modern mobile technologies, sensors and gadgets with user assessments and input are uniquely suited to map the spatial and temporal limits and properties of these soundscapes
- **Soundscape implementation support**
  - Barriers and obstacles in implementing new measures/devices
  - How to overcome and circumvent different types of barriers
- **Long term accumulation of reference materials:**
  - Best practices, Successes, Stories, Standards, Papers and publications
  - Sound recordings – and auralisation resources
  - Places, videos, presentations