Rainwater harvesting: What are the potential effects of roof maintenance on runoff quality? France as an example

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Plan

• Introduction

• Methodology

• Results / Discussion

• Conclusion
Introduction

• Currently in France:
  ▫ Success of rainwater harvesting & re-use
  ▫ Governmental promotion harvesting & re-use (tax reduction) for soil cleaning, toilets,...

• BUT...
  ▫ No reflexion about rainwater quality & risks associated → rainwater are « pure »
  ▫ Contaminations by trace metals (Robert-Sainte, 2009) & organic micro pollutants (Burkhardt et al., 2007)
Introduction (2)

- Practices are source of micro pollutants
  - Cleaning the roof for embellishment
  - Use of biocide

- During rain possible leaching of these biocides

⇒ Necessary to evaluate level of contamination & risks of roof runoff re-use!
Methodology

• Listing roof treatment products / Survey of professionals
  ▫ Determination of practices
  ▫ Knowledge of roof treatment undertaken
• Compositions (SDS)
  ▫ Isolation of biocide molecule(s) & toxicity
• Bibliography
  ▫ Types of contamination in countries where rainwater is drunk (developing countries, ...)

WWW-YES, Rainwater harvesting, Van de Voorde
Results & Discussion: Listing / Survey

- Fungicide is the most popular treatment product.

- Result confirmed by survey:

<table>
<thead>
<tr>
<th>Product Type</th>
<th>Number of Products</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary cleaning</td>
<td>3</td>
</tr>
<tr>
<td>Fungicide</td>
<td>18</td>
</tr>
<tr>
<td>Waterproofing</td>
<td>7</td>
</tr>
<tr>
<td>Paint</td>
<td>4</td>
</tr>
<tr>
<td>Embellishment / Waterproofing</td>
<td>2</td>
</tr>
</tbody>
</table>

- Secondary utilisation:
  - Elimination of plants
  - Destruction of fungi and incrusted lichens
  - Increase of resistance to water for porous material
  - Embellishment / Waterproofing
Results & Discussion: Biocide used

- Quaternary Ammonium Compounds (QACs):

- Toxicity:
  - Highly toxic for aquatic environment (EC50 < 1 mg/L)
  - Irritant and allergen to skin contact, possible asthmatic reactions

- For 100m² roof: 400g $\rightarrow$ 1000g of QACs

→ Risks exist for users and environment by mobilisation of QACs
Results & Discussion: Drinking water

• Rainwater = Source of drinking water for countries without good or enough water resources

• Not a novel concept in Africa
  ▫ South Africa: Rainwater → major source of drinking water during rainy season
  ▫ Development in rural areas
Results & Discussion: Drinking water (2)

• For drinking water → Quality has to be good enough!

• Studies in New Zealand and India:
  ▫ Bacteriological factor limits the consumption of rainwater (for 30 to 90% of cases)
  ▫ Small proportion of chemical contamination but more difficult to eliminate

→ Risk by bacteriological & chemical pollution
Conclusion

- Rainwater harvesting → contemporary issue
- Contaminations exist for countries with good source of drinking water (a) and countries which need rainwater for drunk (b)
- Sources of pollution different
- Different approaches:
  - (a): guide maintenance of roof and storage tank
  - (b): increase knowledge of rainwater contamination & harvesting technics and guide population if possible health risks
Thank you for your attention