Multi-purpose rainwater harvesting

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Summary

• RW costs and benefits
• Low energy systems
• Zero energy systems
• Dual purpose systems
• Potable supply systems
• Conclusions
RWH costs & benefits

**Costs**
- Storage tank
- Pumping: energy/GHGs
- Treatment
- Installation (retrofitability)

**Benefits**
- Water resource: corporate
- Water saving: individual (potable/non-potable)
- Stormwater: flood control
- Stormwater: pollution control
- Resilience/emergency
RWH for UK houses

**Costs**
- Storage tank
- Pumping: energy/GHGs
- Treatment
- Installation (retrofitability)

**Benefits**
- Water resource: corporate
- Water saving: individual (potable/non-potable)
- Stormwater: flood control
- Stormwater: pollution control
- Resilience/emergency
RWH water saving efficiency
An explosion of new system configurations
Storage tanks & configurations
Storage tanks & configurations
Low energy RWH

Costs
- Storage tank
- Pumping: energy/GHG
- Treatment
- Installation (retrofitability)

Benefits
- Water resource: corporate
- Water saving: individual (potable/non-potable)
- Stormwater: flood control
- Stormwater: pollution control
- Resilience/emergency
Low energy RWH

A) Chamber connected to downpipe  B) Illustration of chamber discharging to downpipe  C) Illustration of chamber being pumped empty
Low energy RWH – lab testing

Laboratory energy use: 0.12-0.18 kWh/m³
## Water supply power consumption

<table>
<thead>
<tr>
<th>System</th>
<th>Consumption (kWh/m(^3))</th>
<th>Ref</th>
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<tbody>
<tr>
<td>This study</td>
<td>0.12 – 0.18</td>
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<tr>
<td>Commercial RWH</td>
<td>0.54</td>
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<td>Market Leader RWH</td>
<td>0.68</td>
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<td>Municipal supply</td>
<td>0.60</td>
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<td>Median of 10 RWH studies</td>
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<td>Global desalination</td>
<td>3.60</td>
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Low energy RWH – lab testing
System components
Low energy RWH – field trials

0.5m³ RWH tank supplying 10-20m³/annum

BENEFITS = £120/year

COSTS = £6/year
Zero energy RWH – lab testing
Zero energy RWH – product
Dual purpose systems: water supply & stormwater

Costs
- Storage tank
- Pumping: energy/GHGs
- Treatment
- Installation (retrofitability)

Benefits
- Water resource: corporate
- Water saving: individual (potable/non-potable)
- Stormwater: flood control
- Stormwater: pollution control
- Resilience/emergency
Dual system: passive control
Dual system: passive control

2.5m³ RWH tank supplying 30-60m³/annum.  
PLUS >2.5m³ of stormwater attenuation (source control)
Dual systems: active control

Local control

Global control
RWH: direct potable supply

Costs
- Storage tank
- Pumping: energy/GHGs
- Treatment
- Installation (retrofitability)

Benefits
- Water resource: corporate
- Water saving: individual (potable/non-potable)
- Stormwater: flood control
- Stormwater: pollution control
- Resilience/emergency
RWH: direct potable
## RWH: direct potable

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<th>Inlet (no/ml)</th>
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<td>PCV</td>
<td>Range</td>
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<td>TVC37</td>
<td>10</td>
<td>0-1350</td>
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</table>

Based on 26 weekly samples taken during 2015
Decreasing whole life benefit

Increasing whole life cost

Conclusions

• RWH can come in many configurations

• **Lower cost:** smaller, retrofitable tanks (€1,500/house, ~3x cheaper than existing systems).

• **Lower GHG emissions:** high-level systems (comparable or lower than central delivery)

• **Lower stormwater discharges:** larger tanks, dual configuration (active improves over passive).
Conclusions

• All systems deliver water saving benefits AND stormwater benefits to varying degrees

• Where demand is low, tanks are likely to be emptied less frequently so yield is higher

• Where demand is high, tanks are likely to be emptied more frequently so yield is lower, but this provides greater stormwater control.

• Multi-purpose RWH systems – tailored solutions for droughts & floods!
Multi-purpose rainwater harvesting

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