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
Decreasing whole life benefit

Increasing whole life cost

## RWH costs & benefits

<table>
<thead>
<tr>
<th>Costs</th>
<th>Benefits</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Storage tank</td>
<td>• Water resource: corporate</td>
</tr>
<tr>
<td>• Pumping: energy/GHGs</td>
<td>• Water saving: individual</td>
</tr>
<tr>
<td>• Treatment</td>
<td>(potable/non-potable)</td>
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<td>• Stormwater: flood control</td>
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<td>• Stormwater: pollution control</td>
</tr>
<tr>
<td></td>
<td>• Resilience/emergency</td>
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</tbody>
</table>
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

Roof located RWH with suction pump
- Loft located tank
- Low storage capacity <1m³
- Low cost to retrofit

Diagram: Water flow diagram with RWH components including roof, header tank, suction pump, filter, collector, downpipes, and sewer.
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/m³)</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>
<td>1.40</td>
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<td>Global desalination</td>
<td>3.60</td>
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</table>

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

www.atlaswaterharvesting.co.uk
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

**Diagram:**
- Traditional RWH with passive stormwater attenuation
- Below ground tank
- Header tank feed system
- Upper region of tank drains via trickle orifice following storm
- Roof
- Mains water back-up
- Header Tank
- Rainfall
- WC1
- Laundry
- Garden
- Stormwater control volume
- Downpipes
- Filter
- Flow control
- Pump
- Tank
- Sewer
- WC2
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

2.7 - Traditional RWH with active stormwater attenuation
- Below ground tank
- Header tank feed system
- Active controller drains tank using pump based on desired control philosophy.

2.8 - Traditional RWH with realtime control for stormwater attenuation
- Below ground tank
- Header tank feed system
- Controller drains tank using pump based on instruction from telecoms system.

Safe & SuRe
Water management
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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</table>

Based on 26 weekly samples taken during 2015
Conclusions

• RWH can come in many configurations

• **Lower cost**: smaller, retrofittable 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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