

Supplementary Information for the Article

Water Consumption and Environmental Impact of Multifamily Residential Building: A Life Cycle Assessment Study

*Mehzabeen Mannan & Sami G. Al-Ghamdi**

Division of Sustainable Development, College of Science and Engineering, Hamad Bin Khalifa University, Doha, Qatar.

SUPPLEMENTARY INFORMATION

The following is a supplementary information for study.

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* Corresponding author: Tel.: +974-50110340; Fax: + (974) 4454 0281. E-mail address: salghamdi@hbku.edu.qa

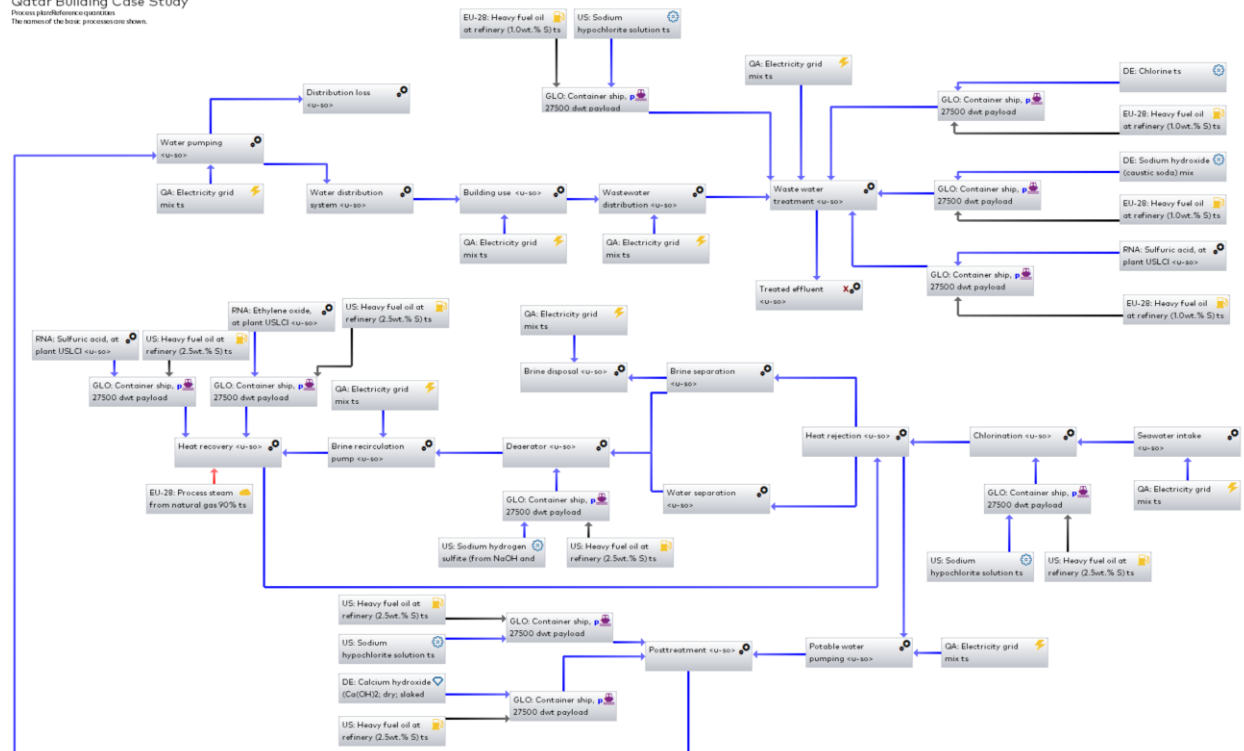


Figure S1. GaBi process flow diagram of the case study in Doha

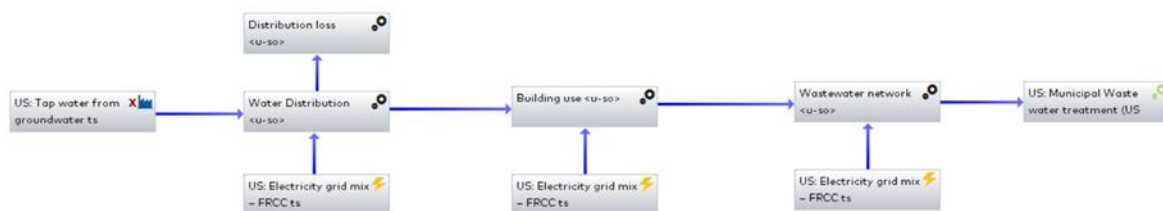


Figure S2. GaBi process flow diagram of the case study in Miami

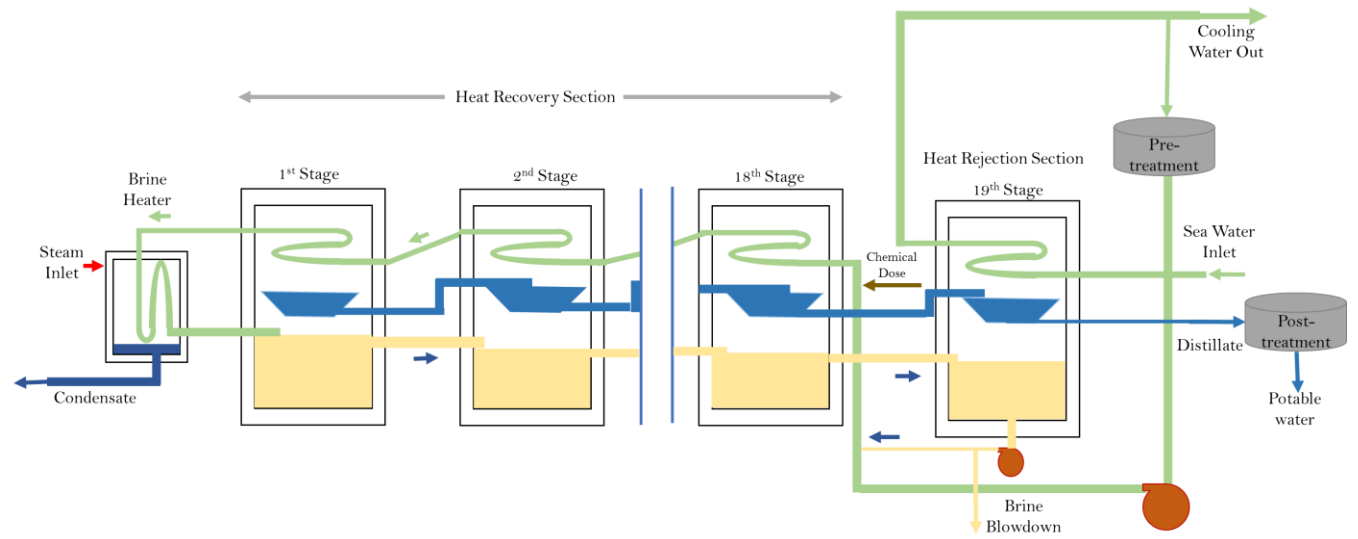


Figure S3. Raw water treatment plant configuration for Doha case study

Table S1. Building details and assumptions for Doha case study

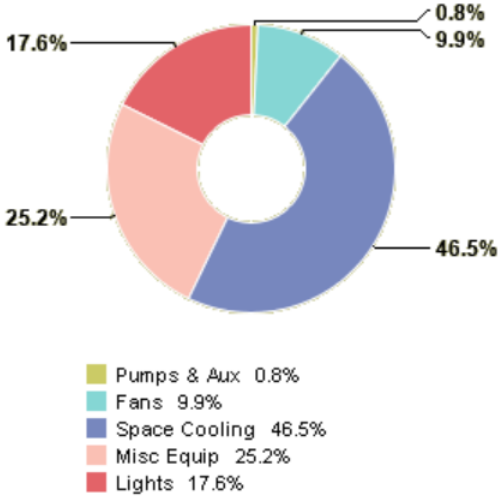
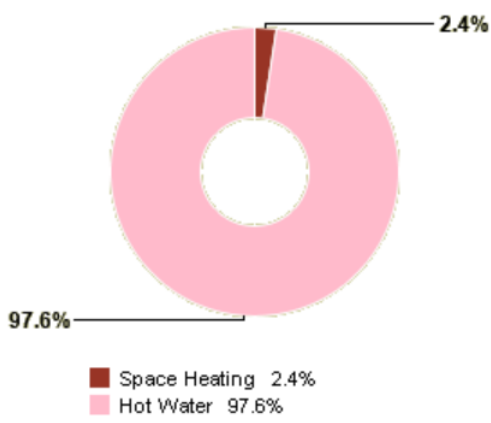
Building Summary																			
Annual Energy																			
Energy use intensity (EUI): 57 Btu/ft ² /year Electric: 183,491 kWh Fuel: 1,004 Therms Annual peak demand: 48.6 kW																			
Annual Electric End Use  <table border="1"> <thead> <tr> <th>Category</th> <th>Percentage</th> </tr> </thead> <tbody> <tr> <td>Pumps & Aux</td> <td>0.8%</td> </tr> <tr> <td>Fans</td> <td>9.9%</td> </tr> <tr> <td>Space Cooling</td> <td>46.5%</td> </tr> <tr> <td>Misc Equip</td> <td>25.2%</td> </tr> <tr> <td>Lights</td> <td>17.6%</td> </tr> </tbody> </table>	Category	Percentage	Pumps & Aux	0.8%	Fans	9.9%	Space Cooling	46.5%	Misc Equip	25.2%	Lights	17.6%	Annual Fuel End Use  <table border="1"> <thead> <tr> <th>Category</th> <th>Percentage</th> </tr> </thead> <tbody> <tr> <td>Space Heating</td> <td>2.4%</td> </tr> <tr> <td>Hot Water</td> <td>97.6%</td> </tr> </tbody> </table>	Category	Percentage	Space Heating	2.4%	Hot Water	97.6%
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Assumptions																			
Average lighting power density: 0.70 W/ft ² Average equipment power density: 1.0 W/ft ² Specific fan flow: 0.8 cmf/ft ² Specific cooling: -1ft ² /ton Total fan flow: 9,608 cfm Piping: Generic Pump: CV HW pump	Hot water boiler efficiency: 80% Boiler capacity: 526,764 Btu/hr Pump flow: 26 gpm Hot water demand: 25,550 Btu/hr Air conditioner components: 0.25" wg static CV duct system, Cooling capacity: -199,998 kBtu/hr																		

Table S2. Building details and assumptions for Miami case study

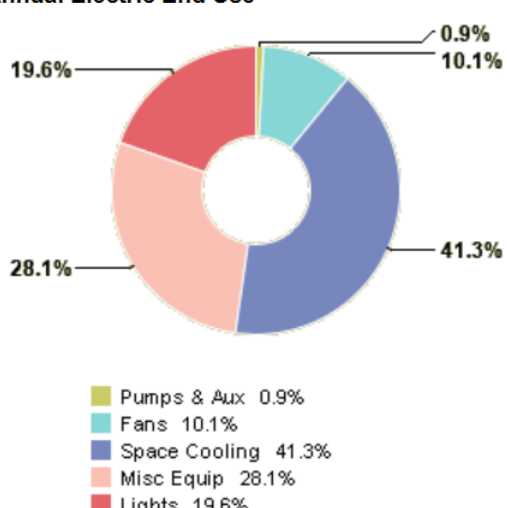
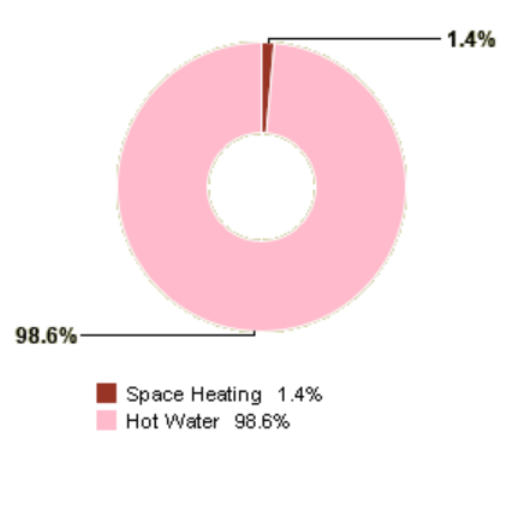
Building Summary																			
Annual Energy																			
Energy use intensity (EUI): 53 Btu/ft ² /year Electric: 164,732 kWh Fuel: 1,108 Therms Annual peak demand: 38 kW																			
Annual Electric End Use  <table border="1"> <thead> <tr> <th>Category</th> <th>Percentage</th> </tr> </thead> <tbody> <tr> <td>Pumps & Aux</td> <td>0.9%</td> </tr> <tr> <td>Fans</td> <td>10.1%</td> </tr> <tr> <td>Space Cooling</td> <td>41.3%</td> </tr> <tr> <td>Misc Equip</td> <td>28.1%</td> </tr> <tr> <td>Lights</td> <td>19.6%</td> </tr> </tbody> </table>	Category	Percentage	Pumps & Aux	0.9%	Fans	10.1%	Space Cooling	41.3%	Misc Equip	28.1%	Lights	19.6%	Annual Fuel End Use  <table border="1"> <thead> <tr> <th>Category</th> <th>Percentage</th> </tr> </thead> <tbody> <tr> <td>Space Heating</td> <td>1.4%</td> </tr> <tr> <td>Hot Water</td> <td>98.6%</td> </tr> </tbody> </table>	Category	Percentage	Space Heating	1.4%	Hot Water	98.6%
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Table S3. Energy and chemical-use data for wastewater treatment plant, Doha

	Value	Unit
Specific energy consumption	0.9051	kWh/m ³ treated water
Chlorine (Cl ₂)	0.0047	kg 100% Chlorine/m ³ treated water
Sodium Hypochlorite (NaOCl)	0.0253	kg 100% Sodium Hypochlorite/m ³ treated water
Sulphuric Acid (H ₂ SO ₄)	0.0013	kg 100% Sulphuric Acid/m ³ treated water
Sodium Hydroxide (NaOH)	0.007	kg 100% Sodium Hydroxide/m ³ treated water

Table S4. Raw water treatment plant data for Doha case study

Plant data	Value	Unit
Capacity	15	MIGD
Gain ratio	8.21	
Tube configuration	Cross-tube	
Number of effects	19	
Steam flow	328.06	t/hr

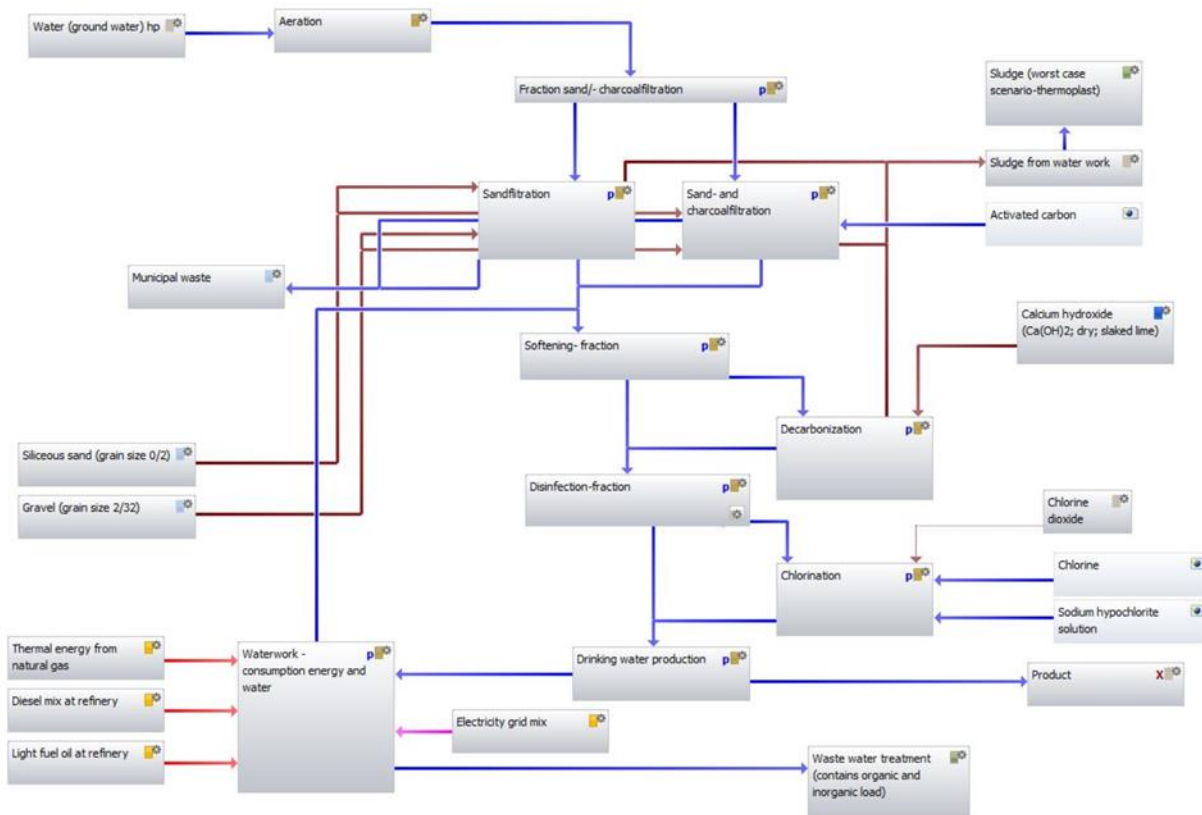


Figure S4. Process flow diagram for groundwater treatment for Miami case study (from GaBi database)

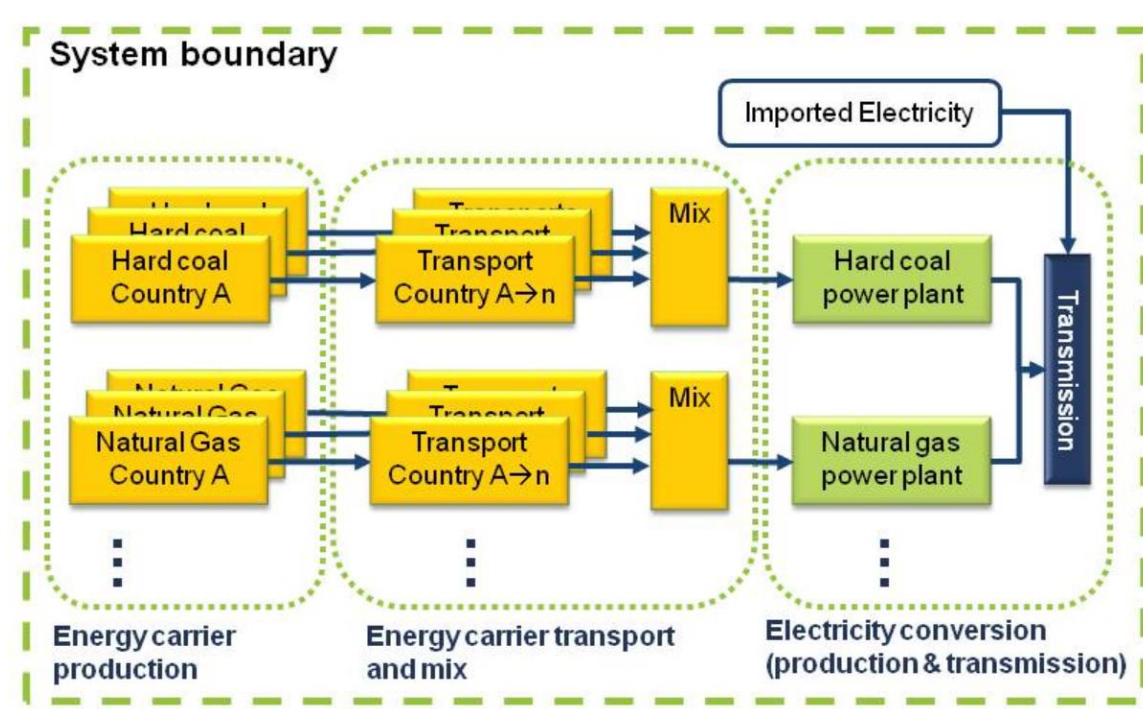


Figure S5. System boundary for FRCC electricity grid mix (from GaBi database)

Table S5. Modelling data for FRCC electricity mix for Miami, Florida (from GaBi Database)

