



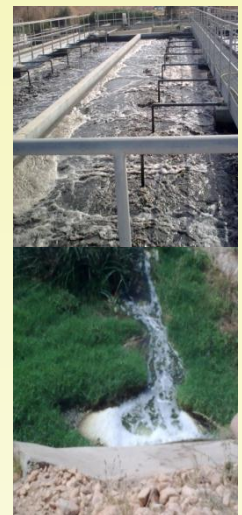
Reusing Treated Wastewater in Muscat: Social Survey



Mahad Baawain¹, Hallah Treiky¹ & Amal Al-Sabti²

**¹Department of Civil & Arch. Engineering,
Sultan Qaboos University, Oman**

²Haya Water, Oman





Outline

- Introduction (WW in Oman)
- Background of TE reuse
- Objectives
- Current TE applications
- Future TE reuse potentials
- Social Survey Results
- Conclusions





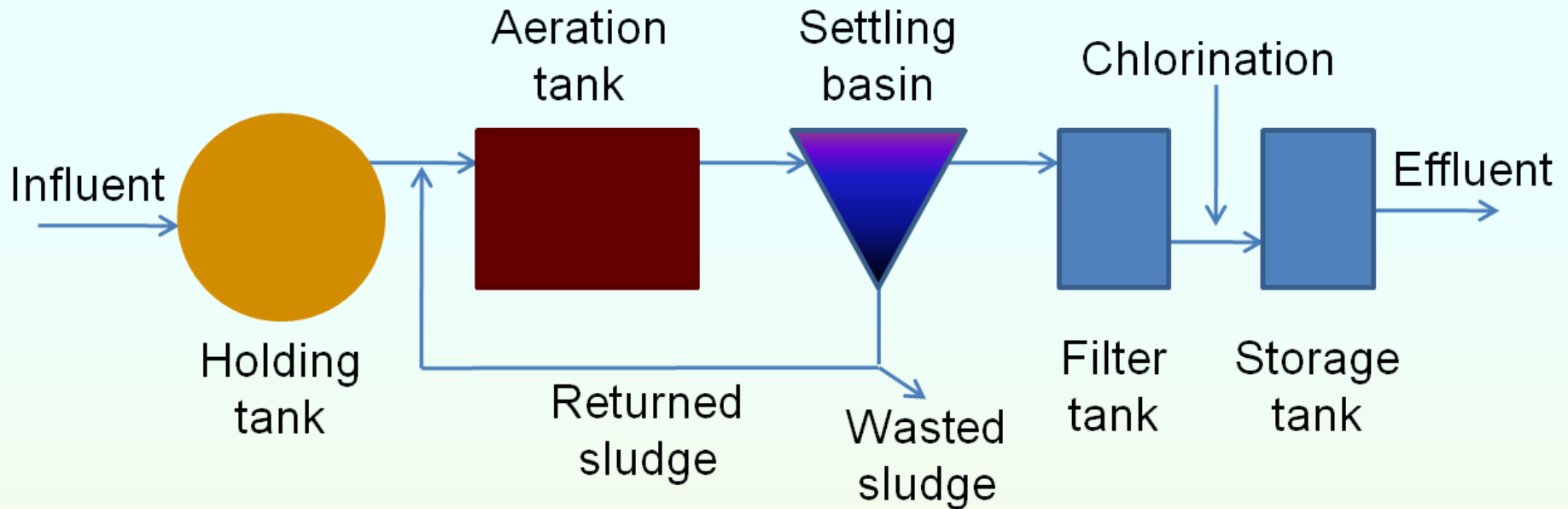
Introduction (WW in Oman)



- Regarding wastewater in Oman
 - Treatment: varies from no treatment to secondary to tertiary (Muscat, Salalah & Sohar)
 - Disposal: landscape irrigation, injection to groundwater, cooling & process water, wadi overflow
- Regarding sludge in Oman
 - Generally no treatment, only disposal to dumping sites
 - Recently Haya Water started composting of sludge



Introduction (WW in Oman)





Background of TE Reuse



- Planned reuse has gained importance as the demands for water radically increased due to technological advancement, population growth, industrialization, & urbanization, which put great stress on natural water cycle
- In Oman, authorities are anticipating tremendous amounts of TE (several millions of cubic meters) (need best options for disposing/reusing such large volumes of TE)



Reasons & Drivers for Reuse



- In general, drivers for TE reuse include:
 - Lack of adequate local supply (quality or quantity)
 - Conserving natural waters for potable supplies
 - TE is nearly always available (needs to get rid of it continuously, needs to use it continuously).
 - Alternative to discharge to sensitive waters
 - May be less costly than treatment needed for discharge or alternative sources of supply
 - Regulatory requirement to reuse TE under certain conditions



Objectives



- To present the current treatment systems, and reuse applications of WW in Oman
- To discuss 6 reuse options of wastewater in Muscat, Oman through social survey study (urbane reuse, industrial reuse, agricultural reuse, groundwater recharge, power generation, & potable reuses)



Current TE Applications



WWTP	TE (m ³ /d)	Sludge (Ton/d)	Main TE Application
Al-Ansab	21,000	66	Landscaping
Darsait	18,000	33	Landscaping
Rusayl Ind.	800	(~2)	Landscaping
Rusayl Dom.	285	(~0.7)	Landscaping
Salalah STP	20,000	35.5	Recharge wells
Salalah Ponds	1,500	(~3)	Wadi overflow
Raysut Ind.	150	(~0.4)	Landscaping
Sohar STP	6600	(~15)	Landscaping
Sohar Ind.	300	(~0.8)	Landscaping



Future TE Reuse Potentials



- Urban reuse (irrigation public parks, landscapes, fire protection, etc)
- Agricultural reuse (irrigation of nonfood crops)
- Industrial reuse (process water & cooling water)
- Indirect potable reuse (groundwater recharge)
- Environmental reuse (artificial wetlands)
- Power generation (renewable energy source)

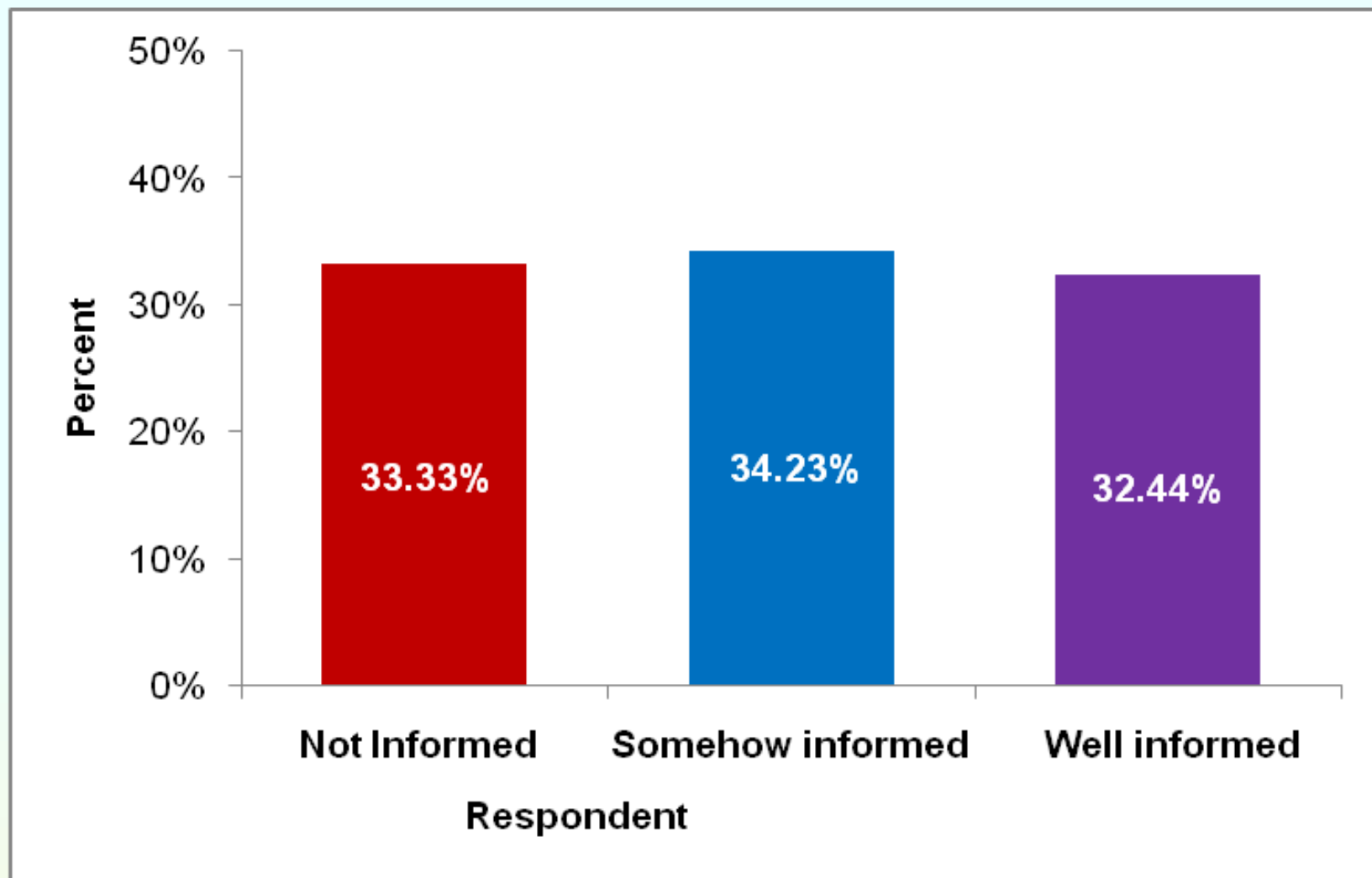


Social Survey Results



Percentage		Percentage	
Gender		Occupation	
Male	62.1 %	Engineer	28.8 %
Female	37.9 %	Doctor	9.9 %
Age Ranks		Employee	29.7 %
20-29 years	54.8 %	Technician	12.6 %
30-39 years	26.1 %	Student	10.8 %
40-49 years	11.3%	Others	8.2 %
50+ years	7.8%	Number of Children in household(s)	
Educational Level		No children	43.9%
Under high school	5.3%	0-5 years	27.2%
High school	11.4%	6-10 years	5.3%
College graduate	65.8%	1-15 years	6.1%
Others:	17.5%	16+	16.7%
Living in Muscat			
0-1 years	2.6%		
2-5 years	18.4%		
6-10 years	12.3%		
11+ years	65.8%		

Note: n= 115

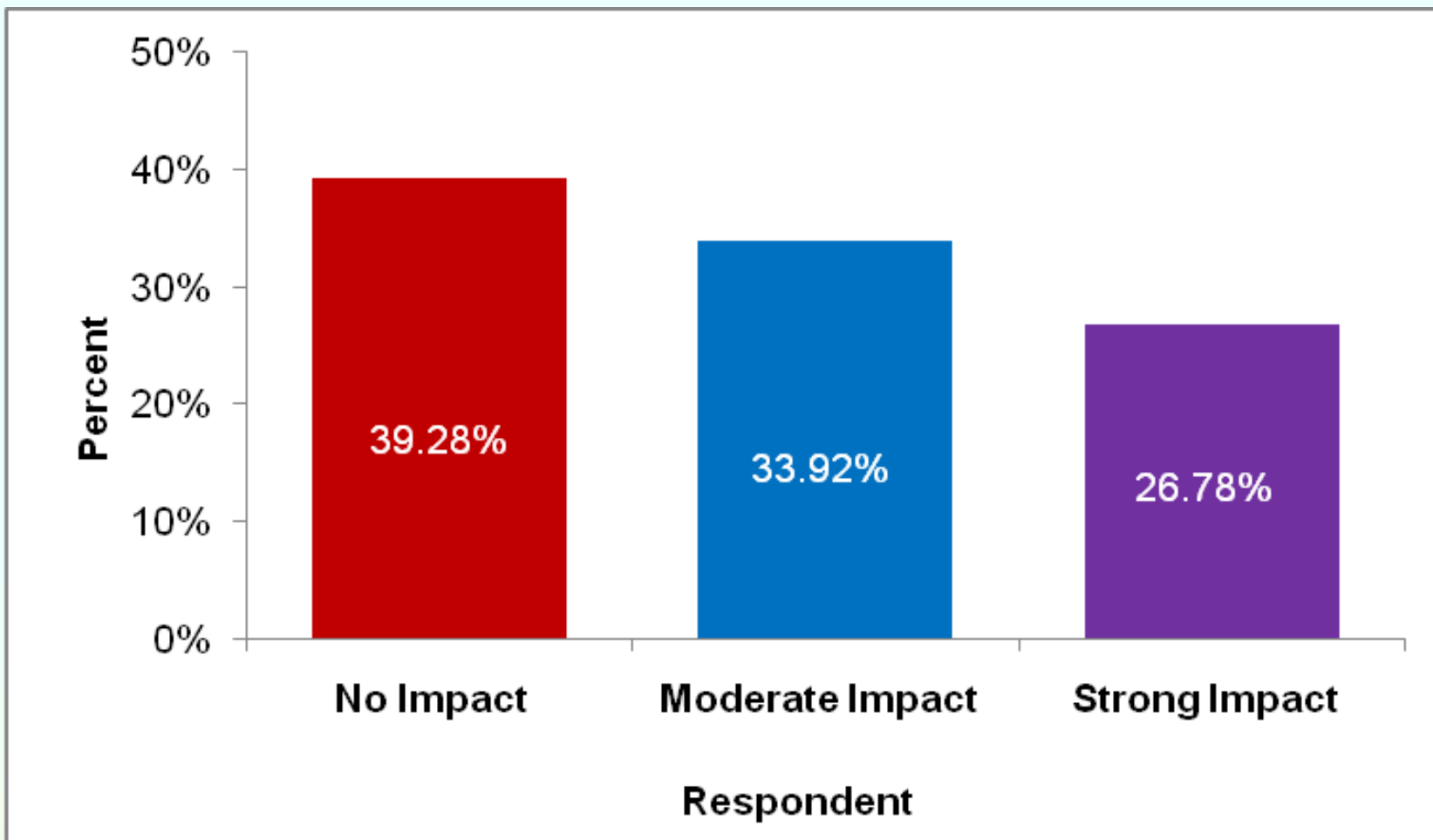


Knowledge of respondents about WW treatment

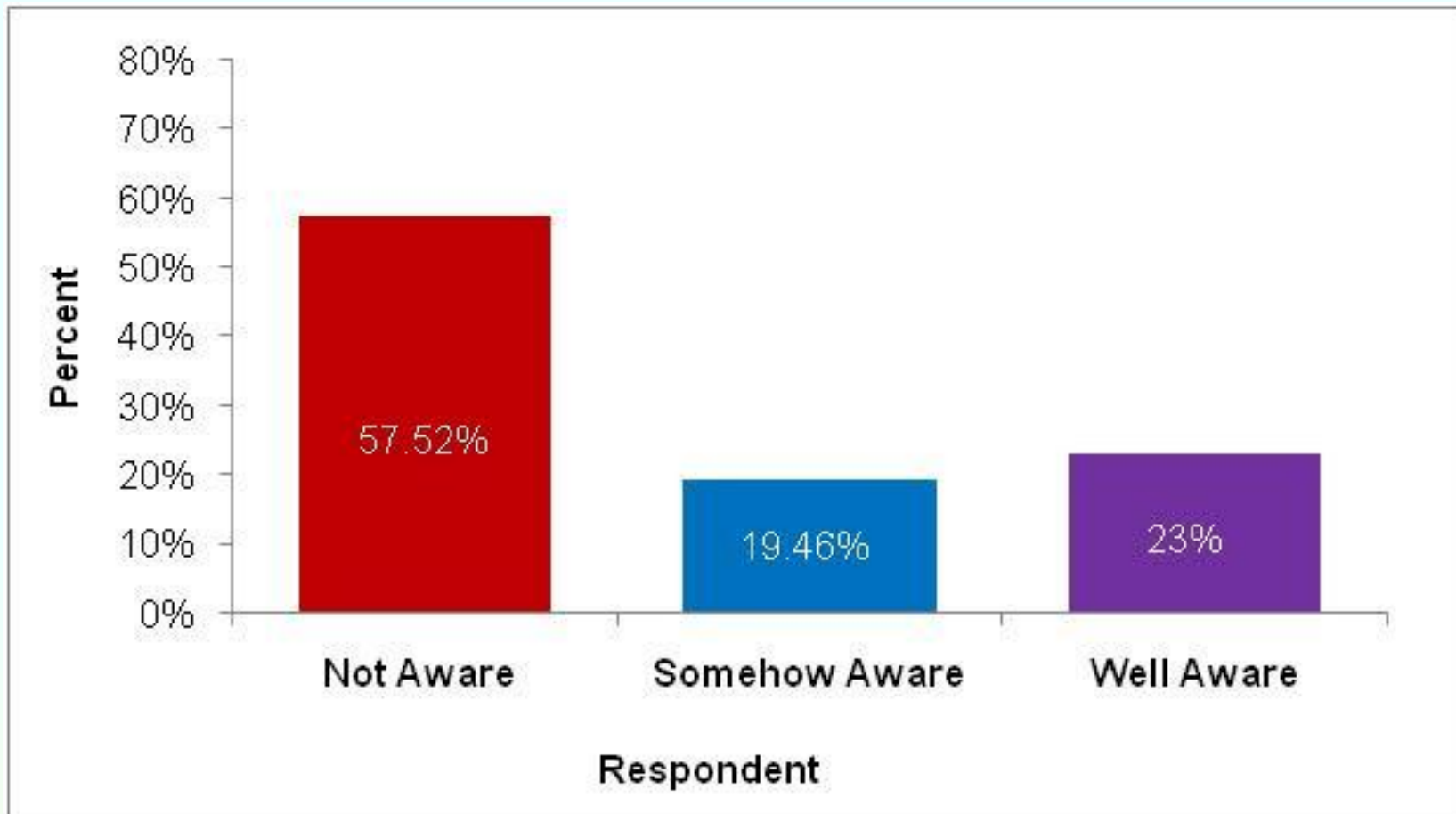


Respondents knowledge about water and wastewater terminologies

The Terms	Not Informed	Moderately Informed	Well Informed
Portable Water	11.32%	7.50%	81.18%
Waste Water	18.09%	27.52%	54.39%
Grey Water	55.31%	16.49%	28.10%
Sewage Recycled water	34.04%	14.89%	51.06%
Treated Effluent	36.27%	16.67%	47.05%



Perspective of respondents about their individual impact on policy making regarding WW reuse



Knowledge of respondents about Omani WW reuse and discharge laws and regulations



When choosing an appropriate reuse option it is dependent on the following factors

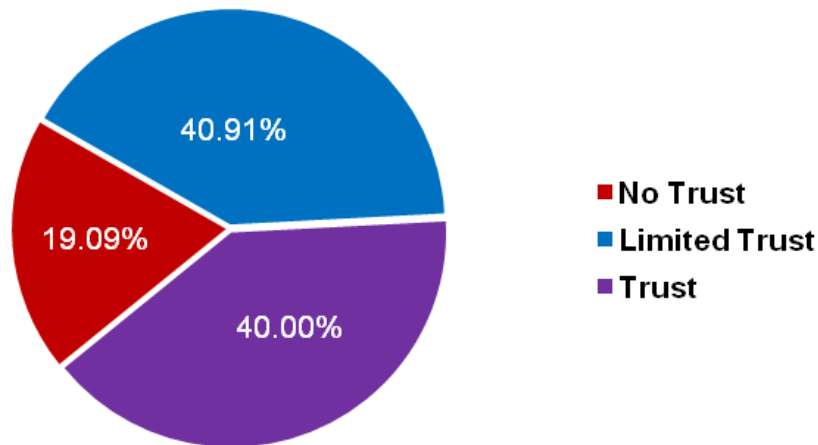
Factor	Not Important	Important	Very Important
Prevent pollution	14.81%	12.03%	73.14%
Protect human health	13.39%	9.82%	76.78%
A long term solution	8.57%	14.30%	77.14%
Energy efficient	14.15%	19.81%	66.03%
Financially sound	14.95%	14.95%	70.09%
Protect wildlife	14.29%	23.80%	61.90%
Low green house emissions	20.20%	29.29%	50.50%



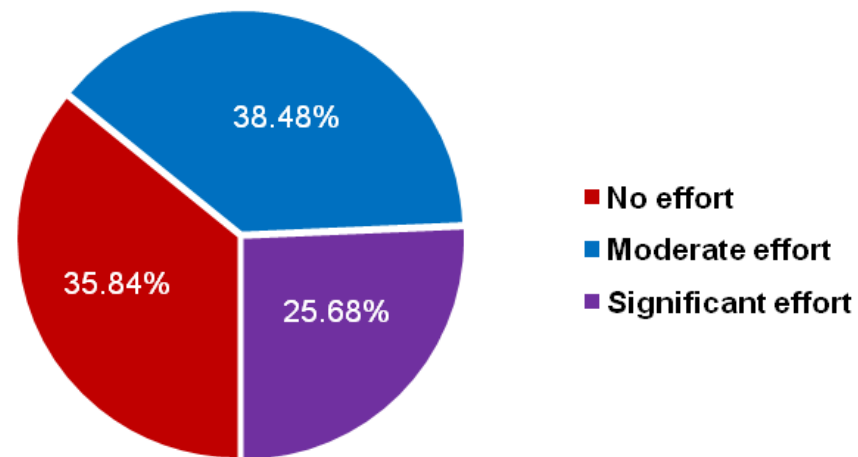
The most preferred reuse option according to the respondents



Option	Not preferred	Somehow preferred	Well preferred
Irrigate golf courses	15.23%	12.40 %	72.37%
Irrigate landscapes in business areas	17.47%	6.81%	75.72%
irrigate parks in public areas	19.79%	9.38%	70.83%
Irrigate School Grounds	18.18%	12.13%	69.69%
Irrigate non-edible crops	12.64%	8.66%	78.70%
Ground Water recharge	29.51%	23.78%	46.71%
Irrigate agricultural crops	49.12%	22.57%	28.31%
Industrial processes	24.78%	26.72%	48.57%
Cool building	14.14%	11.36%	74.52%
Toilet flushing	20.20%	12.50%	67.30%
Fire Hydrants	12.36%	12.24%	75.47%
Car wash	21.73%	14.12%	64.15%
Discharge TE in marine environment	50.48%	16.52%	33.00%
Reuse as drinking water (direct/indirect)	74.26%	16.26%	9.48%



People's trust in "Haya Water" to serve the Community and Protect environment



The degree of effort put to increase citizen participation in regards to improving wastewater reuse



Respondents' choice about the best way for “Haya Water” to communicate with citizens

The Ways	Percentage of peoples
Article in the newspaper	47.82%
Mailed informational pamphlets	13.04%
Focus groups/workshops	17.39%
Presentations at clubs or other meetings	18.26%
Public meeting	21.73%
Informational booths at community events	20.89%
Television and radio programs	46.08%
Others: (, E-mail, Facebook, Twitter, etc)	11.30%



Conclusions



- Currently TE resulted from major cities in Oman are used for landscape irrigation
- 33% of respondents have no knowledge about WW or WW treatment
- Public have a good general understanding about different water & WW terminologies
- More efforts needed to recognize users' needs & community goals for health, safety, ecological concerns and costs



Conclusions



- Knowledge gap might affect the public's perspective about WW, treatment & reuse
- Respondents are very positive to support any potential reuse option that helps: prevent pollution, protect human health, be a long term solution, etc
- The public might be reluctant to accept any kind of reuse that is directly or indirectly related to food and drinking



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THANK YOU...

