

# Muslim’s mega-event pilgrimage in Mina, city of Makkah, Saudi Arabia: Hajj’s pilgrims recycling intention and behaviour

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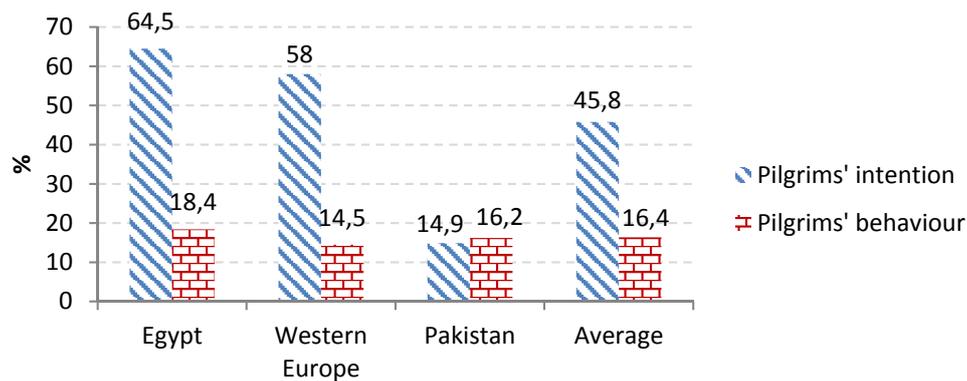
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Hajj, one of the world’s biggest Muslims pilgrimages events, takes place in Makkah, Saudi Arabia. Annually, about four million pilgrims gather in sacred places in Makkah to perform Hajj, where they spend most of the time (4-5 days) in a place called Mina. During their Mina stay, they generate about 17,000 tonnes of solid waste. This quantity is disposed of in a nearby landfill without any treatment or resource recovery. Here we aim to study pilgrims’ potential and actual recycling behaviour, with a view to inform future full-scale application of recycling schemes during Hajj.

Aspects explored were intention to segregate and recycle (when recycling is presented either as optional or compulsory) and the factors affecting such intentions. Such information was subsequently used to introducing an exemplar recycling scheme in Mina camps through. In the exemplar project, pilgrims in three camps were asked to separately dispose of their plastic waste optionally, in suitably designated bins. A questionnaire was designed to study pilgrims’ sorting intention. Based on this questionnaire, two predictive models ((i) “optional” and (ii) “compulsory”) were built by using multinomial logistic regression analysis and an econometric model to predict the intention to recycle. Optimal model was selected by using the McFadden pseudo  $R^2$  to estimate the goodness of fit (Veall and Zimmermann, 1996).



**Figure 1.** Comparison between recycling intention and behaviour during Hajj for three pilgrim groups.

Pilgrims tend to state higher intentions of sorting if it is “compulsory”, with factors affecting their intention being: ethnicity, level of education, food catering method, recycling background, socio-demographic indicators (GDP, EPI, waste arising), educational campaigns, recycling regulations, and Mina streets cleanness level.

**Table 1.** The parameters of the two models (“optional” and “compulsory” sorting).

Factors	Optional sorting model			Compulsory sorting model		
	B	Std. Error	p-value	B	Std. Error	p-value
Intercept	-4.505	1.121	.000	-4.029	1.152	.000
<b>Countries indicators</b>						
GDP/capita	.000	.000	.000	.000	.000	.000
EPI	.047	.015	.001	.040	.015	.006
Waste Generation	.003	.002	.050	.005	.002	.018
<b>Level of education</b>						
Post graduate degree	1.019	.371	.006	.819	.373	.028
University degree	.141	.334	.672	.766	.339	.024
School degree	.622	.282	.027	.590	.273	.031
No Degree	0	.	.	0	.	.
<b>Twafah Company</b>						
Western Countries	-1.935	.666	.004	-1.580	.669	.018
Non-Arab African Countries	.127	.652	.845	.048	.699	.945
Non-Arab Asian	-1.113	.682	.102	-.583	.752	.438
Arabian Countries	.243	.544	.655	.467	.587	.427
Saudi Arabia Pilgrims	0	.	.	0	.	.
<b>Q1- Do you eat in your Mina camp?</b>						
Always + sometimes	1.091	.346	.002	1.359	.318	.000
Rarely	0	.	.	0	.	.
<b>Q2- From where do you get your food?</b>						
Camp catering	-.342	.236	.148	-.838	.240	.000
Buy it + both	0	.	.	0	.	.
<b>Q3- Did you hear anything about waste sorting and recycling?</b>						
Yes	1.412	.268	.000	1.373	.252	.000
No	0	.	.	0	.	.
<b>Q4- consider the definitions, do you think you can sort your solid waste?</b>						
Yes	1.168	.303	.000	.806	.279	.004
No	0	.	.	0	.	.
<b>Q5- Do you sort your solid waste at your home in your country?</b>						
Yes	.552	.244	.024	.680	.241	.005
No	0	.	.	0	.	.
<b>Q7- Are you satisfied about the level of cleanliness in Mina streets during Hajj?</b>						
Unsatisfied	-.811	.315	.010	-1.153	.310	.000
Satisfied	0	.	.	0	.	.
<b>Q8- Are you satisfied about the level of cleanliness in your Mina camp during Hajj?</b>						
Unsatisfied	-.181	.310	.558	.167	.303	.582
Satisfied	0	.	.	0	.	.

The actual percentages of the sorted plastic in the three camps were: Egyptian camp 18.4%wt., Pakistani camp 16.2%wt., and Western Europe camp 14.5%wt. Overall, it is concluded that pilgrims’ intention to recycle is much higher than their actual behaviour. Such a difference is not unusual; in these particular circumstances could have been amplified by: misunderstanding of what to sort, general waste bins capacity, food catering diversity, and communication problems. Thus, it is recommended to establish waste “compulsory” recycling system in Makkah taking into account the socioeconomic factors with potential affect its effectiveness.

## References

Veall, M.R. and Zimmermann, K.F. 1996. Pseudo-R<sup>2</sup> measures for some common limited dependent variable models. *Journal of Economic Surveys* **10**(3), pp.241–259.