

## PUBLIC OPINION ON PUBLIC OPINION ON ADAPTATION OF COMPANIES TO CLIMATE CHANGE

### STAVOVI JAVNOSTI O PRILAGODBI KOMPANIJA KLIMATSKIM PROMJENAMA

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#### *Abstract*

Alleviating the effects of and adapting to climate change present some of the main global objectives and challenges facing modern governments responsible for working towards sustainable development in both economy and society. Energy risks in the economy brought about by attempts to adapt to climate change and the drastic reduction in carbon gas emission require new approaches to using fuels with a lower carbon emission factor than the existing fossil fuels. New technologies and new methods of energy consumption, those which would not contribute to climate change, must be found. Carbon dioxide is the main greenhouse gas that contributes to climate change, as well as the only greenhouse gas emitted by the cement industry in large quantities. Reduction, according to the guidelines defined by the Kyoto Protocol for the cement industry, is to be achieved by substituting fossil fuels with replacement fuels made from waste, which contain the largest possible amount of biomass. In this paper, the results of an empirical study of public awareness and opinions on the measures for achieving the desired goals in adapting to climate change will be presented. The study was conducted on a purposive, non-random sample using the methods of in-depth interview and participant observation. In the study of empirical data the qualitative method of grounded theory was used. Descriptive analysis and quantification of the coded, qualitatively analysed sample of the conditional matrix were carried out as a prerequisite for further analysing the differences. The coded material underwent quantitative analysis and was processed using the Statistica software package, ver. 11.00. The aim of the study was to

#### *Sažetak*

Ublažavanje i prilagodba klimatskim promjenama jedan je od glavnih globalnih ciljeva i izazova u provedbi današnjih vlada i njihovoj odgovornosti za održivi razvoj gospodarstva i društva. Energetski rizici gospodarstva zbog prilagodbe klimatskim promjenama i oštrog smanjenja emisije stakleničkih plinova, zahtijevaju nove pristupe u korištenju goriva sa nižim emisijskim faktorom ugljika u odnosu na postojeća fosilna goriva. Potrebno je pronaći nove tehnologije i načine korištenja energije bez prijetnji klimatskim promjenama. Ugljični dioksid je glavni staklenički plin koji pokreće globalne klimatske promjene te je jedini staklenički plin kojeg industrija cementa emitira u značajnoj količini. Smanjenje se, prema mjerama koje je definirao Kyoto protokol za cementnu industriju, postiže supstitucijom fosilnog goriva sa zamjenskim gorivima proizvedenim iz otpada, koje u sebi sadrži što veći udio biomase. U ovom radu predstavljaju se rezultati empirijskog istraživanja informiranosti i stavova javnosti kroz ciljne i sektor grupe prema mjerama za dostizanje postavljenih ciljeva u prilagodbi klimatskim promjenama. Istraživanje je provedeno na ciljanom uzorku metodom dubinskog intervjua i sudjelujućeg promatranja. U analizi empirijskog materijala korištena je kvalitativna metoda utemeljene teorije. Izvršena je deskriptivna obrada i kvantifikacija kodiranog kvalitativno obrađenog uzorka kondicionalne matrice, radi daljnje provedbe analize razlika. Kodirani materijal je kvantitativno obrađen i izračunat s računalnim paketom Statistica ver 11.00. Cilj istraživanja bio je utvrditi informiranost i stavove zainteresirane javnosti o prihvatljivosti korištenja goriva proizvedenog iz

determine how informed the concerned public was and what its opinions were on whether the use of waste fuel by the company CEMEX Hrvatska d.d. was acceptable under optimal conditions and with strict control and supervision. An analysis of the results revealed that the representatives of the target and sector groups differ in their relation to the variables used in the study depending on the group to which they belong.

## INTRODUCTION

One of the main challenges faced today is the decarbonisation of the economy, coupled with finding new ways of producing and consuming energy. Carbon dioxide is the main greenhouse gas released by the burning of fossil fuels, with the largest shares belonging to energy-industry and transportation /1/. Reduction, according to the guidelines defined by the Kyoto Protocol for the cement industry, is to be achieved by substituting fossil fuels with replacement fuels made from waste, which contain the largest possible amount of biomass /2/. EU member states have already gone through two stages of quantifying the reduction of greenhouse gas emissions, including a system of trading emission units, from 2005 to 2012. As of 1 January 2013, EU states have entered the post-Kyoto period, which will bring new changes to the system of distributing emission units to individual sectors and industries, as well as additional stricter demands for reducing greenhouse gas emission - a 20% reduction is to be achieved by 2020 and a 40% reduction by 2030 (in relation to 1990 as the base year). What the industrial sector and those obliged to reduce greenhouse gas emission find troubling are the mechanisms at their disposal for achieving the required goals /3/. The most efficient way of reducing emissions in the cement industry is by using replacement fuels made from biomass in the process of producing clinker /4/. In this concept of

otpada u tvrtki CEMEX Hrvatska d.d. u optimalnim uvjetima sa strogom kontrolom i nadzorom. Analizom rezultata utvrđeno je da se predstavnici ciljnih i sector grupa između sebe razlikuju u korištenim varijablama u zavisnosti o skupini kojoj pripadaju.

sustainable development, a complete system of waste management plays an important role, consisting of reducing the amount of waste originally produced, primary selection and sorting, recycling and the reuse of waste as material or energy source /5/. The economy has to meet the new desires for cleaner technologies that come from renewable energy sources. Setting up a complete system of waste management requires significant financial resources, but also a prepared and involved public /6/. The economy cannot be observed as separate from its environment, but rather as a part of a system. The successful integration of all the elements in the value creation chain is now more and more dependent on the public being informed and interested in a particular project /7/. The aim of this study was to determine how informed the concerned public was and what its opinions were on whether the use of waste fuel by the company CEMEX Hrvatska d.d. was acceptable under optimal conditions and with strict control and supervision.

## METHODS

The sample was defined as consisting of 100 people, 55 of which are male and 45 female. The average age of the participants is 47.9. The study was conducted from April to July 2012. The age, education, employment status, and place of residence are shown in Table 1.

Table 1 Demographic composition of sample

		N	%
Entire sample		100	100%
Sex	Male	55	55%
	Female	45	45%
Age	Up to 30 years old	3	3%

	31 to 44 years old	22	22%
	45 to 60 years old	62	62%
	More than 60 years old	13	13%
Education	Primary school	28	28%
	College/university	72	72%
Employment status	Unemployed	7	7%
	Employed	82	82%
	Retired	6	6%
	Student	5	5%
City	Kaštela	39	39%
	Solin	36	36%
	Split	25	25%

Legend: N - number of participants % - relative values

Participants were divided into nine subsamples (target groups) that were qualitatively defined:

NGOs - representatives of environmentalist NGOs from Split-Dalmatia county, 10 people; *CITIES* - representatives of those employed in local government in the cities of Kaštela, Solin and Split, 10 people; *BUYERS/SUPPLIERS* - representatives of the buyers and suppliers of CEMEX Hrvatska d.d., 10 people; *POLITICS/SCIENCE* - representatives of local political structures and scientists, 10 people; *BENEFICIARIES OF SPONSORSHIPS AND DONATIONS* - representatives of the beneficiaries of sponsorship or donation deals with CEMEX, 10 people; *CITIZENS OF KAŠTELA* - representatives of the people living in the vicinity of the "Sveti Juraj" factory in Kaštel Sućurac, 15 people; *CITIZENS OF SOLIN* - representatives of the people living in the vicinity of the "Sveti Kajo" factory in Solin, 15 people; *CEMEX EMPLOYEES* - representatives of CEMEX employees, 10 people; *COUNTY* - representatives of local government employees employed by Split-Dalmatia county, 10 people.

Based on these subsamples, three new control clusters (sectors) consisting of 70 people were qualitatively defined:

*PUBLIC SECTOR* - 30 people from the following target groups: *CITIES*, *POLITICS/SCIENCE* and *COUNTY*.

*CIVIL SECTOR* - 20 people from the following target groups: *NGOs* and *BENEFICIARIES OF SPONSORSHIPS AND DONATIONS*.

*ECONOMIC SECTOR* - 20 people from the following target groups: *BUYERS/SUPPLIERS* and *CEMEX EMPLOYEES*.

The variable sample consists of 3 qualitatively defined questions that were used in an open in-depth semi-structured interview.

The first variable, named "*acceptability of using waste fuel in CEMEX*", was defined based on the first question:

1. *Do you find the use of waste fuel in CEMEX acceptable under optimal conditions and with strict control and supervision?*

The second variable, named "*change of opinion when presented evidence*", was defined based on the second question:

2. *If your answer to the previous question was negative, would you be ready to change your opinion and answer if presented with evidence that there would be no harmful health or environmental effects?*

The third variable, named "*sufficient information on the use of waste fuel in CEMEX*", was defined based on the third question:

3. *Do you believe that you have been provided sufficient information on the use of waste fuel in CEMEX?*

The problem-driven in-depth interview was conducted with 100 interviewees divided in nine target groups and three control sector groups that make out the purposive, non-random sample representing the concerned public, aptly informed and able to affect the formation of other people's opinions /8/. All the participants were asked for their permission and then allowed for the interviews to be recorded. After the issue was presented to them, all the suggested participants voluntarily agreed to participate in the study, except for two local government employees, who consented initially, but later declined due to the interviews

being recorded. They expressed insecurity and apprehension about the possible lack of understanding by their superiors. In the study of empirical data the qualitative method of grounded theory was used /9/. Based on interview transcripts, numerical coding of the answers was carried out in order to form a matrix defined by the total number of participants and the coded variables for further statistical analysis /10/. Descriptive analysis was used to determine the frequency of every coded variable attached to each question, as well as their cumulative value /11/. The quantification of the qualitative empirical data and its transformation into a numerical form was required before analysing the data using statistical methods. Complete statistical analysis was carried out using the STATISTICA software package, ver. 11.00.

## RESULTS AND DISCUSSION

The answers of the participants to the first question were divided in three groups. *The first group* was defined based on negative replies and included those participants with answers such as: No, it is unacceptable because profit is above everything and not the issue of climate change; unacceptable, it is too close to residential and tourist areas, as well as urban centres with more than 300,000 inhabitants; no, because we do not trust the institutions in charge of control and supervision; no, we have already had bad experiences with industry in the past, with negative impact on the environment and people's health; unacceptable, this would make waste burning the primary economic activity, rather than producing cement, etc. Quantitatively, these answers were coded with the number 0 (zero) for the later statistical analysis of data.

*The second group* was defined based on positive replies and included those participants with answers such as: Yes, we are aware of the strict requirements industry faces because of climate change and we believe that the use of waste fuel is acceptable if properly controlled and supervised; yes, but not if the waste is imported; I approve of using waste fuel, but only if the public will be openly and transparently informed of all the details of the enhanced supervision and control, as well as allowed to request additional independent studies; yes, if it will be done according to the same standards applied to European cement factories; yes, waste fuel can be used in factories owned by CEMEX, but only if all the relevant information and measurement data will be available to the public, etc.

Quantitatively, these answers were coded with the number 1 (one) for the later statistical analysis of data.

*The third group* included those whose answers were: I am not sure, I am only partially informed, I do not know enough on the subject, I know a little, but not enough, etc.

Quantitatively, these answers were coded with the number 2 (two) for the later statistical analysis of data.

Descriptive analysis was used to determine the frequency of the coded answers in the entire sample, then the nine target groups, which were reclassified as three separate sectors during the process of analysis. Finally, all the defined subsamples were analysed and statistically processed.

The frequency of the first variable (*"acceptability of using waste fuel in CEMEX"*) among all the participants is shown in Table 2.

Table 2. Frequency and relative cumulative values of the variable *"acceptability of using waste fuel in CEMEX"*, N=100

Var	Freq	%
0	33	33.00
1	61	94.00
2	6	100.00
Total	100	100.00

Legend: 0 - no; 1 - yes; 2 - not sure, do not know

The frequency of the first variable (*"acceptability of using waste fuel in CEMEX"*) among all the partici-

pants is shown in Table 2. Of those interviewed, 61% said that they were aware of the issue of cli-

mate change and found the use of replacement fuel in CEMEX factories acceptable with strict control and supervision. 33% of the participants did not approve of using replacement fuel in CEMEX factories because they believe that it is only being done because of profit, the cement factories would then turn into waste incineration facilities, as well as that the institutions in charge of control

and supervision cannot be trusted. 6% of the participants think that they are only partially informed, are not sure or do not know enough about the issue, which is why they opted for an undefined answer.

The frequency of the variable "acceptability of using waste fuel in CEMEX" with respect to previously defined target groups is shown in Table 3.

Table 3. Frequency of the variable "acceptability of using waste fuel in CEMEX" with respect to target group

N=100

Var	NGO	CIT	BUY/ SUPP	POL/ SCI	BEN.SPO N./DON.	CIT/ KAŠ	CIT/ SOL	EMPL/ CEM	COUN	TOTAL
0	8	3	5	3	4	6	4	0	0	33
1	2	7	5	7	6	9	5	10	10	61
2	0	0	0	0	0	0	6	0	0	6
TOTAL	10	10	10	10	10	15	15	10	10	100

Legend: 0 - no; 1 - yes; 2 - not sure, do not know.

Analysing the variable "acceptability of using waste fuel in CEMEX" in relation to target groups reveals that the answers differ according to which group the participant was classified as part of.

Eight participants from the NGO target group, or 8% of the total sample, believe that the use of waste fuel in CEMEX factories is unacceptable. Participants classified as members of the CEMEX EMPLOYEES and COUNTY groups fully support the use of waste fuel by CEMEX, as all the participants belonging to these two groups provided positive answers.

Members of the CITIES, POLITICS/SCIENCE, BENEFICIARIES OF SPONSORSHIPS AND DONATIONS target groups, as well as those belonging to CITIZENS OF KAŠTELA, approve of the use of

waste fuel in cement factories by quantitative majority, while those classified under BUYERS/SUPPLIERS are divided in their opinions on whether waste fuel should be used at CEMEX factories.

The total quantitative value of approving of the use of waste fuel is 61%.

Members of the target group CITIZENS OF SOLIN are the only ones who believe that they do not have enough information or are not familiar enough with the issue at hand, with their share amounting to 6% of the total number of participants.

The frequency of the variable "acceptability of using waste fuel in CEMEX" with respect to previously defined sector groups is shown in Table 4.

Table 4. Frequency of the variable "acceptability of using waste fuel in CEMEX" according to sector group

N=70

Var	PUBLIC	CIVIL	ECONOMIC	TOTAL
0	6	12	5	23
1	24	8	15	47
2	0	0	0	0
TOTAL	30	20	20	70

Legend: 0 - no; 1 - yes; 2 - not sure, do not know.

The Public Sector, with a share of 36% (24 out of 30 members of the sector group), and the Economic Sector, with a share of 23% (15 people), have the same opinions and approve of the use of waste

fuel at CEMEX factories under optimal conditions and with controlled supervision. The Civil Sector, with a quantitative value of 12 participants or 17%, does not approve of its use, while 8 members

of this sector group or 11% approve of the use of waste fuel at CEMEX.

As for the second question (*"If your answer to the previous question was negative, would you be ready to change your opinion and answer if presented with evidence that there would be no harmful health or environmental effects?"*), 33% of those whose find the use of waste fuel at CEMEX unacceptable stated that they would consider changing their opinions if presented with evidence which showed that there was no negative impact on either people's health or the environment.

The answers of the interviewees were classified based on the frequency of those whose answer to the second question was also negative. These were given the code number zero (0) for the statistical analysis.

Those who were willing to change their opinions if presented with evidence were given the code number one (1) for the statistical analysis.

Finally, those whose answers point at a possible change in opinion, but who are only partially sure about it or who said that they would *"maybe"* do so, were given the code number two (2) for the statistical analysis.

Descriptive analysis was used to determine the frequency of the coded answers among the 33 participants, then the nine target groups, which were reclassified as three separate *sectors* during the process of analysis. Finally, all the defined subgroups were analysed and statistically processed.

The frequency of the second variable (*"change of opinion when presented evidence"*) among the 33 participants is shown in Table 5.

Table 5. Frequency of the variable *"change of opinion when presented evidence"*, N=33

Var	Freq
0	29
1	0
2	4
Total	33

Legend: 0 - no; 1 - yes; 2 - not sure, do not know.

88% or 29 out of 33 people would not change their opinion on the use of waste fuel in CEMEX cement factories because they believe the evidence to be manipulative. Only 4 interviewees responded that they would perhaps change their opinion,

but that they were not sure. No interviewee gave a positive answer.

The results of the analysis of the frequency of the coded variable *"change of opinion when presented evidence"* with respect to *target groups* is shown in Table 6.

Table 6. Frequency of the variable *"change of opinion when presented evidence"* according to *target group*, N=100

	NGO	CIT	BUY/ SUPP	POL/ SCI	BEN.SPO N./DON.	CIT/ KAŠ	CIT/ SOL	EMPL/ CEM	COUN	TOTAL
0	8	3	5	3	0	6	4	0	0	29
1	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	4	0	0	0	0	4
TOTAL	8	3	5	3	4	6	4	0	0	33

Legend: 0 - no; 1 - yes; 2 - not sure, do not know.

No members of the *target groups* NGOs, CITIES, BUYERS/SUPPLIERS, POLITICS/SCIENCE, CITIZENS OF KAŠTELA, and CITIZENS OF SOLIN would change their opinion if presented with evidence that showed that the use of waste fuel in

CEMEX factories did not produce any harmful effects on human health or the environment. Each of the 29 interviewees once again gave the answer NO.

Four members of the *target group BENEFICIARIES OF SPONSORSHIPS AND DONATIONS* gave the same reply: *MAYBE*. Interviewees classified under *CEMEX EMPLOYEES* or *COUNTY* were not asked this question, as their answer to the previ-

ous one was positive, i.e. they consider the use of waste fuel an acceptable practice.

The frequency of the variable “*change of opinion when presented evidence*” with respect to previously defined *sector groups* is shown in Table 7.

Table 7. Frequency of the variable “*change of opinion when presented evidence*” with respect to *sector group*, N=33

	PUBLIC	CIVIL	ECONOMIC	TOTAL
0	6	8	5	19
1	0	0	0	0
2	0	4	0	4
TOTAL	6	12	5	23

Legend: 0 - no; 1 - yes; 2 - not sure, do not know.

The *Public Sector* is represented by 6 interviewees, while the *Economic Sector* by 5 interviewees who would not change their opinion if presented with evidence that showed the use of waste fuel in CEMEX factories under optimal and controlled conditions would not produce any harmful effects.

Out of 12 interviewees belonging to the *Civil Sector*, 8 would not change their opinion, while 4 gave the answer: *MAYBE*.

The third question asked was: *Do you believe that you have been provided sufficient information on the use of waste fuel in CEMEX?*

The three answer groups were defined as follows: *The first group* was defined based on a negative answer and included those who said: No, I do not have enough information on the use of waste fuel in CEMEX factories.

Quantitatively, these answers were coded with the number 0 (zero) for the statistical analysis of data.

*The second group* gave a positive answer: Yes, I have been sufficiently informed, I am well in-

formed about the issue, I have enough information on the use of waste fuel in CEMEX cement factories.

Quantitatively, these answers were coded with the number 1 (one) for the statistical analysis of data.

*The third group* was defined based on a negative answer and included those who said: I am only partially informed, I am not completely informed, I cannot determine whether I am sufficiently informed, etc.

Quantitatively, these answers were coded with the number 2 (two) for the statistical analysis of data.

Descriptive analysis was used to determine the frequency of the coded answers in the entire sample, then the nine target groups, which were reclassified as three separate sectors during the process of analysis. Finally, all the defined subsamples were analysed and statistically processed.

The frequency of the third variable (“*sufficient information on the use of waste fuel in CEMEX*”) among all the participants is shown in Table 8.

Table 8. Frequency and relative cumulative values of the variable “*sufficient information on the use of waste fuel in CEMEX*”,

N=100

	Freq	%
0	37	37.00
1	57	94.00
2	6	100.00
Total	100	100.00

Legend: 0 - no; 1 - yes; 2 - not sure, do not know.

The analysis of the results related to the frequency of the third variable (“*sufficient information on the*

*use of waste fuel in CEMEX*”) in the entire sample revealed that those participants who believed that

they were only partially or incompletely informed about the use of waste fuel in CEMEX factories. 37% believed that they are not informed about the use of waste fuel in cement factories. The remaining 57% of the analysed participants have claimed that they were well or sufficiently informed about the use of waste fuel at CEMEX.

The results of the analysis of the frequency of the coded variable “sufficient information on the use of waste fuel in CEMEX” with respect to previously defined *target groups* is shown in Table 9.

Table 9. Frequency of the variable “sufficient information on the use of waste fuel in CEMEX” with respect to *target group*, N=100

	NGO	CIT	BUY/ SUPP	POL/ SCI	BEN.SPON ./DON.	CIT/ KAŠ	CIT/ SOL	EMPL/ CEM	COUN	TOTAL
0	3	3	5	3	7	5	10	0	0	36
1	6	5	5	7	3	10	5	7	10	58
2	1	2	0	0	0	0	0	3	0	6
TOTAL	10	10	10	10	10	15	15	10	10	100

Legend: 0 - no; 1 - yes; 2 - not sure, do not know.

Members of the *target groups* CITIZENS OF SOLIN and BENEFICIARIES OF SPONSORSHIPS AND DONATIONS have stated that they were not informed about the use of waste fuel in CEMEX cement factories.

Interviewees who were classified as belonging to the *target groups* NGOs, POLITICS/SCIENCE, CITIZENS OF KAŠTEL, EMPLOYEES OF CEMEX and COUNTY are mostly well informed about the use of waste fuel at CEMEX.

Three members of the *target group* EMPLOYEES OF CEMEX have stated that they were either partially or incompletely informed on the use of waste fuel in CEMEX factories. Within the defined subgroups, this is also the largest quantitative value related to those participants who claimed to be only partially informed.

The frequency of the coded variable “sufficient information on the use of waste fuel in CEMEX” with respect to previously defined *target groups* is shown in Table 10.

Table 10. Frequency of the variable “sufficient information on the use of waste fuel in CEMEX” with respect to *sector group*,

N=70

	PUBLIC	CIVIL	ECONOMIC	TOTAL
0	6	10	5	21
1	22	9	12	43
2	2	1	3	6
TOTAL	30	20	20	70

Legend: 0 - no; 1 - yes; 2 - not sure, do not know.

Representatives of the *public and Economic Sectors* mostly believe to be sufficiently or well informed about the use of waste fuel in CEMEX factories in order to reduce greenhouse gas emissions and adapt to climate change. The total amount of those who believe to be well informed is quantitatively defined as 43.

The *Civil Sector* is numerically defined as 10 people who claimed to be insufficiently informed, 9 people who are well informed and 1 person who claimed to be only partially informed about the use of waste fuel in CEMEX factories.

## CONCLUSION

61% of the interviewees have stated that they were aware of the reductions in carbon dioxide emission required in the economy in order to adapt to climate change. They find the use of waste fuel in CEMEX cement factories as a replacement for fossil fuels acceptable if properly controlled and supervised, as well as if due attention is given to informing and communicating with the public. 33% of the interviewees do not approve of the use of replacement waste fuel in

CEMEX factories. They believe that the main reason behind it is profit and that the cement factories will turn into waste incineration facilities. These participants were then asked if they would consider changing their opinion if present with evidence that showed that there was no harmful effect on people's health or the environment. 88% of them would not change their opinion if shown the required evidence, as they believe the evidence to be manipulative and do not trust the institutions in charge of controlling and supervising the work carried out by the cement factories. Climate change is considered to be an excuse, rather than a real threat to the economy. The remaining 12% have stated that they might change their opinion, but were not sure. No participant gave a positive answer. 43% of the participants have stated that they were either not sure whether they were sufficiently informed about the issue (6%) or that they lacked the necessary information on climate change and its relation to the use of replacement waste fuel in cement factories (37%). The remaining 57% of the participants have claimed to be well and sufficiently informed about the use of waste fuel in CEMEX factories. An analysis of the results revealed that the representatives of the target and sector groups differ in their relation to the variables used in the study depending on the group to which they belong. The concerned public is not sufficiently or properly informed on the relation between the use of waste fuel as a replacement for fossil fuels, as well as the requirements for adapting to climate change defined by EU regulations and the Kyoto Protocol. A certain *fragmentism* is apparent, with every target group being exposed to and basing their opinions and solutions on small and insufficient fragments of information. In turn, none of the groups are informed enough to take the whole picture into account, which is why their proposed solutions only deepen, rather than solve the problem.

#### Notes

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