D7.2 Report on satisfaction of building managers, workers, passengers and visitants

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EXECUTIVE SUMMARY

The aim of this document is to quantify the sensations experienced by the building occupants and visitors at the target zones, in order to improve the process of S4ECoB system integration for future occasions and to calibrate the response of the S4ECoB system, according to customer's needs.

The questionnaires are different because different HVAC systems are the target of the optimization strategies at each demo site.

Thermal comfort/Indoor Air Quality standards state that the most valuable answers are coming from people staying at the target zones for a long time: in this case managers and workers. These people are even able to compare the current conditions with the past conditions, due to the long exposure time at the target zones. However, the number of people working at the target zones is reduced: about 20-30 people at each demo site.

Instead of a continuous survey for a long time, it was determined to carry out a "snapshot" survey during a 2-3 hours' time, to all the people present at the target zones that were willing to participate. In this way, the following advantages are achieved.

- The moment to carry out the survey can be better synchronised with the optimization strategies operation.
- Although the survey seems to be only a snapshot of the present conditions, groups like workers have a very valid opinion about the recent past environmental conditions.
- Staff carrying out the survey can go with a portable digital device and ask target people at the target zone (e.g. all the workers at the target zone have been asked).
- Everybody is describing similar environmental conditions, as they are asked at the same time.

After analysing the answers for Maremagnum, it can be concluded that the IAQ has improved after the implementation of the S4ECoB system and the IAQ is quite acceptable for most people, as the average mark is 7/10. There are no significant differences between the different groups when evaluating the current IAQ.

Regarding Principe Pío, after the manual implementation of the strategy at the target zones, people still are in thermal comfort. This is the most important and reliable result of the questionnaire, as the people answers about what they feel at the time of filling out the questionnaire.

In Linate no questionnaire has been presented to passengers considering that no direct interventions (monitoring and control) of the HVAC system were performed in the context of the project.

1 INTRODUCTION

1.1 Purpose of this document

The aim of this document is to quantify the sensations experienced by the building occupants and visitors at the target zones, in order to improve the process of S4ECoB system integration for future occasions and to calibrate the response of the S4ECoB system, according to customer's needs.

1.2 Structure of the deliverable

The document contains five main sections: methodology, one for each demo site, plus a conclusions section.

At first, in an introduction part, each demo section describes the specific demo conditions. Afterwards, there is a reference to the questionnaire form that was filled out by customers and employees of the demo site, located in the annexes. Finally, the questionnaire answers are shown and analysed too.

The questionnaires are different because, different HVAC systems are the target of the optimization strategies at each demo site. E.g. the optimization of the ventilation is related to indoor air quality while changing the heating set point is related to thermal comfort.

The conclusions section draws conclusions from the questionnaires answers.

1.3 Relationship to the project objectives

In order to optimize the Energy efficiency in Buildings (EeB) it must be ensured that the desired thermal/hygienic conditions at the target zones are kept, otherwise energy savings are not enough to determine if the system is successful. This deliverable is aimed to quantify the sensations experienced by the building occupants, after the S4ECoB implementation.

1.4 Relationship to other deliverables and tasks

This deliverable is mainly related to WP6 outputs: deployment and demonstration, as it complements the implementation works with the feedback from the users.

1.5 Contributions of Partners

Corio has been the partner in charge of asking specific groups of people to fill out the questionnaire, at their shopping centres. SEAxxxx Solintel has elaborated the questionnaire and processed the answers in order to draw conclusions about people's opinions.

2 METHODOLOGY

In order to evaluate the indoor environmental conditions of the target places, some standards [1] [2] have been used as reference. The purpose of any thermal comfort/IAQ (indoor air quality) standard is to ensure that a room, building, etc. is comfortable for a substantial majority (at least 80%) of the occupants. Therefore, an effective way to evaluate the environmental conditions is to survey the occupants, asking them specific questions.

This survey should be theoretically performed for every operating mode, in every design condition and it requires a check sheet (questionnaire) to be provided to end user by the team responsible for validating the thermal environment/IAQ of the space.

The intermittent operation of the optimization strategies due to factors like malfunctions in the Maremagnum S4ECoB system, and the manual implementation of the strategy in Principe Pio, made impossible to carry out a continuous survey during a long period. This kind of continuous surveys has the advantage of having a bigger sample space, but also has the following drawbacks:

- The survey answers belong to different moments in time. Therefore a classification is needed afterwards.
- The information desk or similar where these surveys are filled out, can be far away from the target zone. People do not usually remember the particular conditions unless they are asked at the specific zone.
- People filling out the questionnaire are not chosen, they are usually walking nearby.
- More people/resources (and usually they are less committed) are necessary for a continuous survey.

Instead of the continuous survey it was determined to carry out the survey during a 2-3 hours' time period, to all the people present at the target zones at that time. In this way, the following advantages are achieved.

- The moment to carry out the survey can be better synchronised with the optimization strategies operation.
- Although the survey seems to be only a snapshot of the present conditions, groups like workers have a very valid opinion about the recent past environmental conditions.
- Staff carrying out the survey can go with a portable digital device and ask target people at the target zone (e.g. all the workers working at the target zone can be asked).
- Everybody is describing similar environmental conditions, as they are asked at the same time.

The questionnaires for Maremagnum and Principe Pio were prepared with Google forms, and most questionnaires were filled out by using tablets connected to the internet, at the specific target zones of the shopping mall. All the answers were uploaded to the cloud, also adding the exact time when the questionnaire was finalised.

The literal translation of the two presented questionnaires from Spanish language to English language is provided in Annex A for Maremagnum and Annex B for Principe Pio.

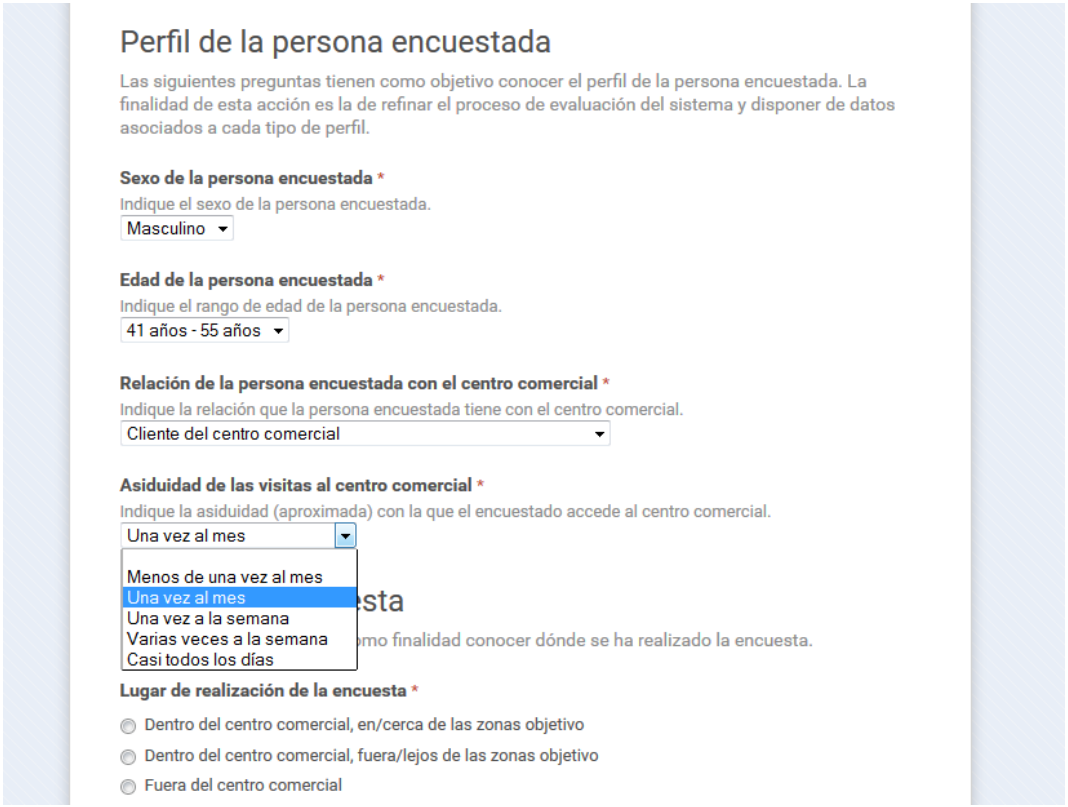

Figure 1: Google form Maremagnum questionnaire screenshot

3 DEMONSTRATION SITE MAREMAGNUM SHOPPING MALL

3.1 Introduction

The high level of natural ventilation of the mall space and the shops having the doors continuously open to the mall is the reason provided by maintenance staff to have all the air handling units turned off in Maremagnum shopping mall. However it has been measured that (WP6), in several occasions, the indoor air quality (IAQ) at the shopping mall is much lower that it should be (according to national regulations). It can be said that natural ventilation is not always enough.

Therefore, it has to be noticed that the "before" condition is a status where energy is saved but health standards are not fulfilled. After the implementation of the S4ECoB system, a controlled amount of energy will be used, but the IAQ will improve.

This deliverable is aimed to quantify the sensations experienced by building occupants and visitors during those periods, in order to improve the process of integration for future occasions and to calibrate the response of the system according to customer's needs.

S4ECoB system activates fans in the air handling unit number 3 (AHU#3) according to the occupancy level. As it has been stated in WP6 deliverables, this strategy saves energy when compared to traditional operation. The shops that are ventilated by this unit are shown in the following pictures, within the red line domain.

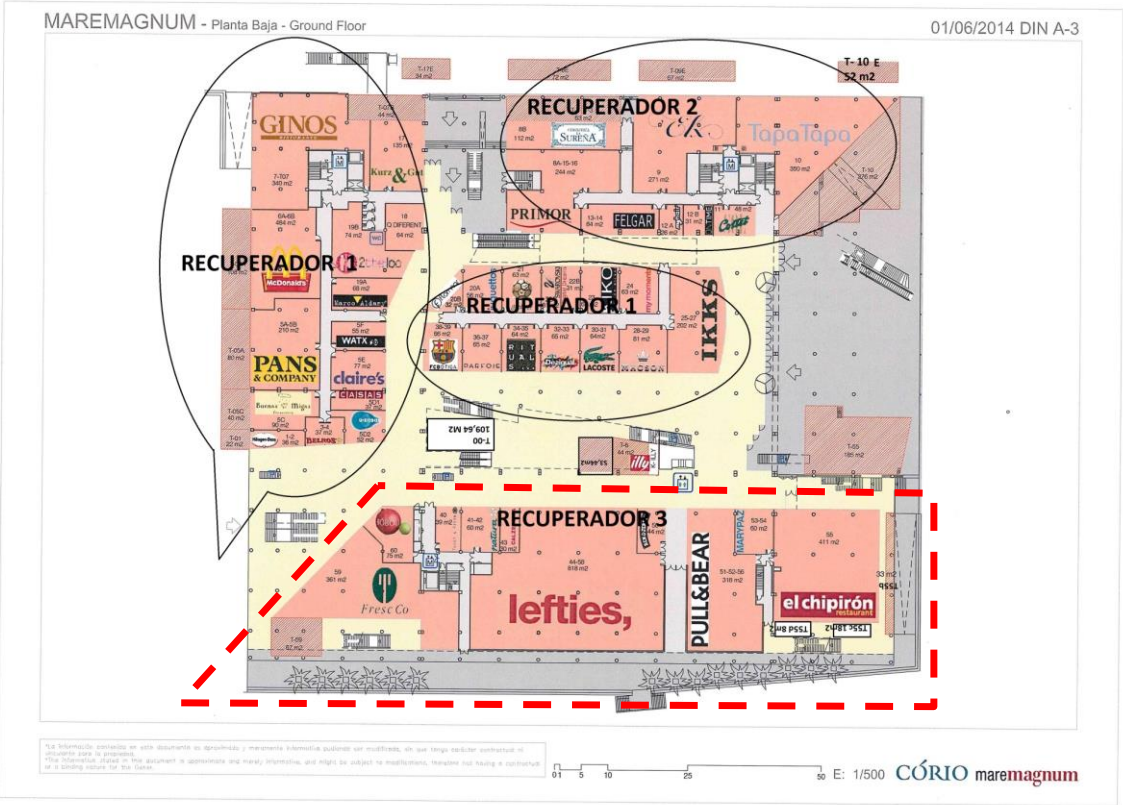

Figure 2: Shops ventilated by AHU#3 on the ground floor / Maremagnum

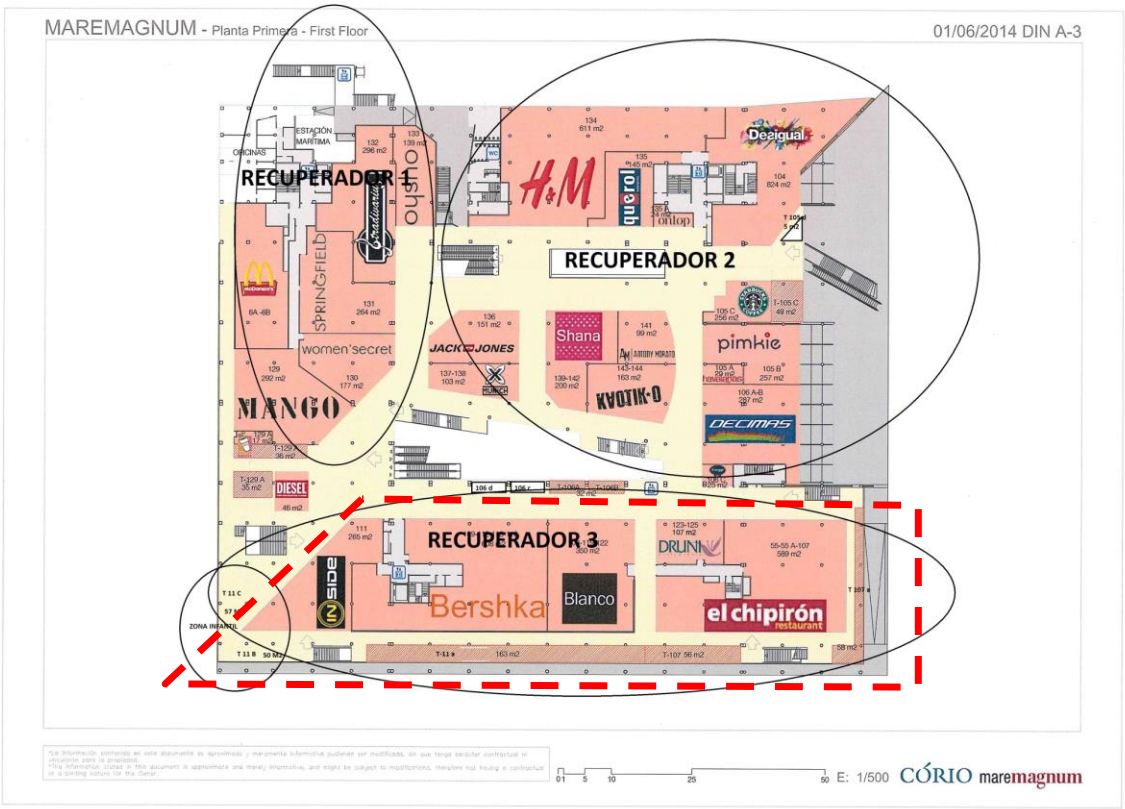

Figure 3: Shops ventilated by AHU#3 on the first floor / Maremagnum

3.2 Results

People filling out the questionnaire, classification according to sex:

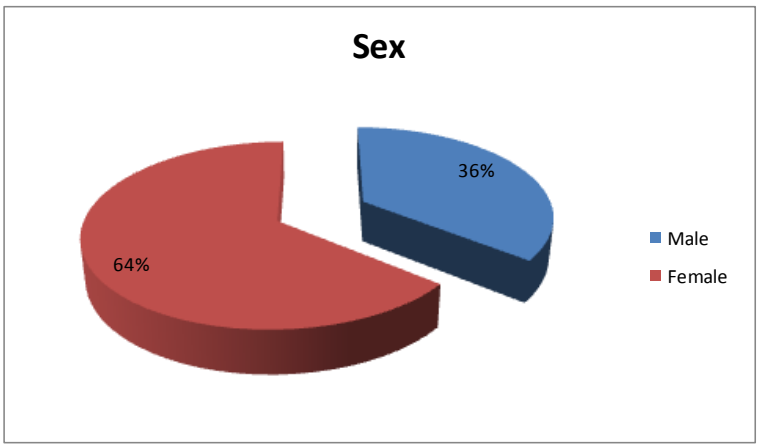

Figure 4: Sex of the people filling out the questionnaire

People filling out the questionnaire, classification according to age:

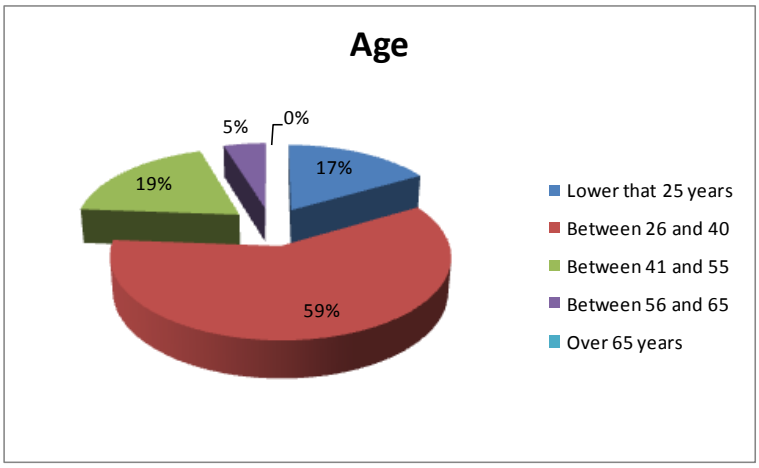

Figure 5: Age group of the people filling out the questionnaire

People filling out the questionnaire, classification according to the relationship between people and the shopping mall:

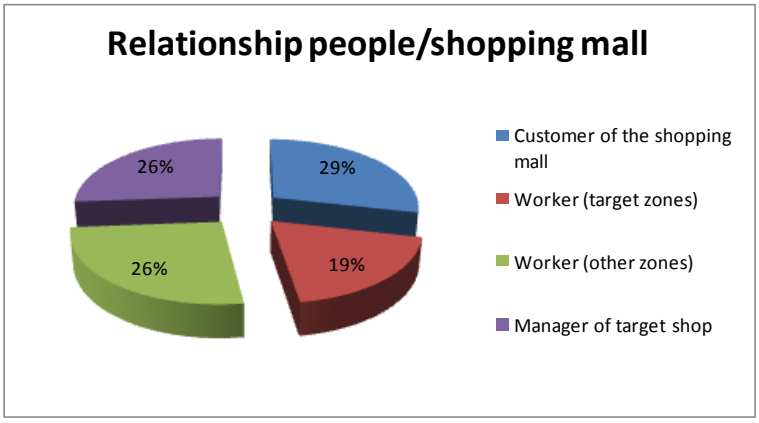

Figure 6: Relationship between the people and the shopping mall

According to the results of intermediate questions (no graphs are shown), it can be said the following:

- Most part of the customers answer that they visit the shopping mall less that once a month (92%). Although in many aspects customers are the most important group of people, it seems unlikely that they could remember previous stays and associated feelings in the target zones. However, they can evaluate the current conditions under a mood that is different to other groups.

- The workers of target shops report that they work "almost every day" in the shopping mall (87%), a smaller percentage say "several times a week" (13%). This group of people spends more time in the target zone than any other. Therefore it is important to differentiate their opinions from the others.

- The workers from "outside of the target shops" spend time in the shopping centre although not necessarily in the target zone. The variety of results shows that it is a heterogeneous group of people that knows about the general conditions at the shopping centre.

- The managers of the shops answer that they are "almost every day" in the shopping mall (91%), a smaller percentage say "several times a week" (9%). At the time of filling out the questionnaire most part of them were in the target shops (82%). It can be concluded that the managers are valid people to evaluate the IAQ changes, first personally, due to the amount of time spent at the target areas and also because their responsibility guaranteeing healthy conditions for workers and customers.

The following graph shows the average, maximum and minimum IAQ score given by each group of people.

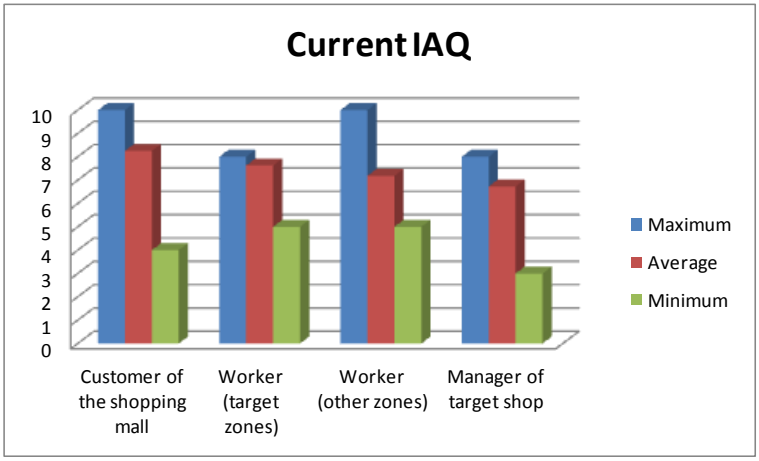

Figure 7: Evaluation of the IAQ in the target areas

It can be said that according to all groups, the average IAQ is currently quite high (about 7 on average). It is important to stress that the questionnaires were filled out while the S4ECoB strategy was active.

Regarding the comparison between current IAQ and the previous condition, before the implementation of S4ECoB system, all the customers (100%) answered that they could not remember how was the IAQ in the past. Therefore, the customer group has been removed from the following graphs. Most part of workers and managers do remember how it was in the past, due to their constant exposure to the building conditions. These are their answers:

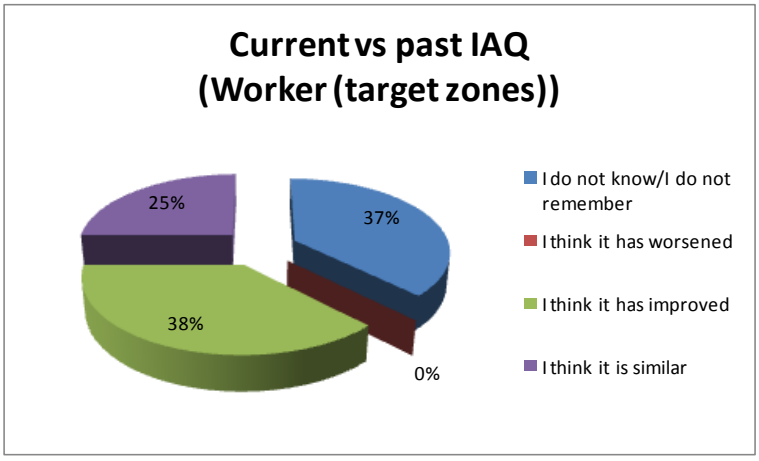

Figure 8: Current vs. past IAQ for workers (target zones)

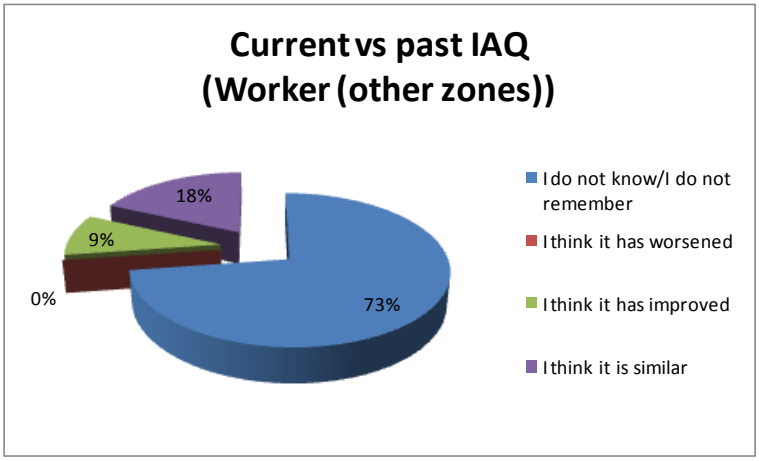

Figure 9: Current vs. past IAQ for workers (other zones)

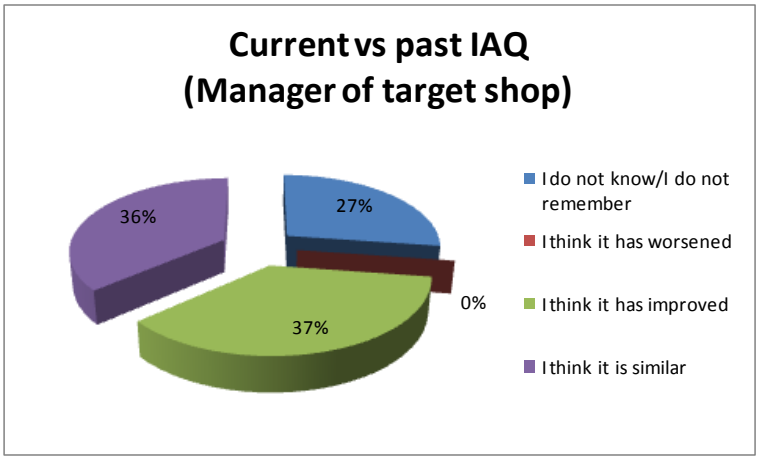

Figure 10: Current vs. past IAQ for managers of target zones

When comparing the current IAQ with the previous IAQ, there is an important amount of people answering that they do not remember the previous conditions, this is normal. When focusing on the remaining people that do remember, it is important to notice that more than a half of the managers and workers of the target zones think that IAQ has improved. Moreover, there was not a single opinion saying that the IAQ has worsened in any group.

Regarding the question about the IAQ changing according to the occupancy level, the groups that are more suitable to answer this question are the workers and managers of the target zones. Most people belonging to the other groups have answered "I do not know". Therefore the only graphs shown are the ones from workers and managers.

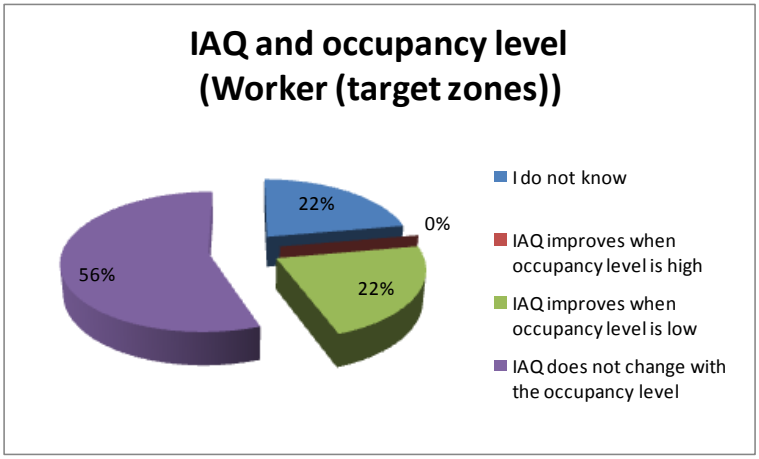

Figure 11: IAQ and occupancy level for workers (target zones)

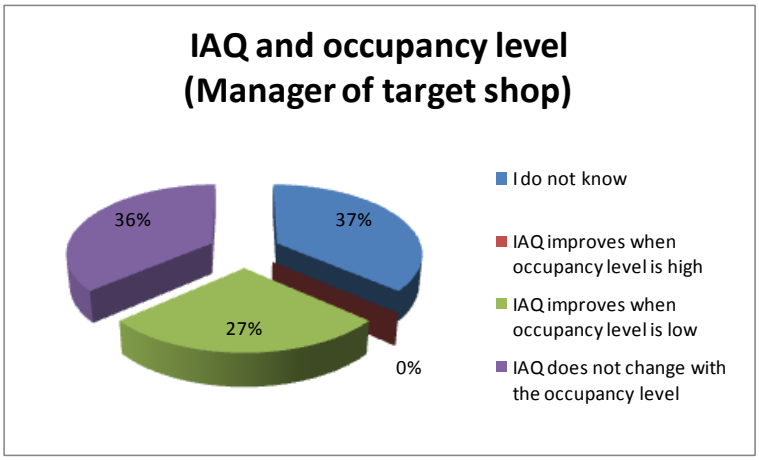

Figure 12: IAQ and occupancy level for managers of target zones

From the graphs it can be concluded that about 25% of the people think or are able to sense that the IAQ is better when the occupancy level is low. This is generally true, in the natural ventilation case, but also in the optimization case with the AHU working (See strategy from WP6).

Regarding last question, all the groups have been merged in order to evaluate if the IAQ in the target zones is different than the IAQ in the common space of the shopping centre (mall zone).

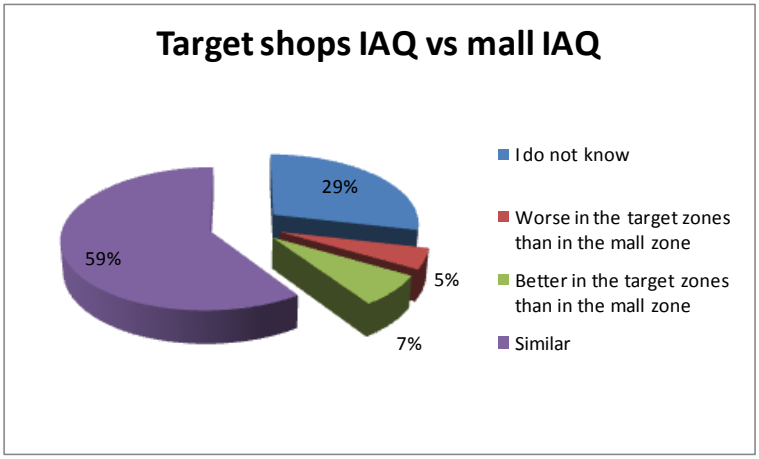

Figure 13: IAQ target shops vs IAQ mall

Most people think that the target shops IAQ is similar to the mall IAQ. This answer is useful to determine that it is quite sure that there is not a big difference in air quality between both types of spaces.

4 DEMONSTRATION SITE PRINCIPE PIO SHOPPING MALL

4.1 Introduction

The specific zones of the building that are the demo zones of the S4ECoB project are located in the New Building of Príncipe Pío shopping mall. The New Building has three floors intended for shops, leisure spaces and shows located at the first basement floor (-1), ground floor (0) and first floor (+1). There are three additional underground floors dedicated to parking.

As the parking floors are unconditioned spaces and therefore they have neither heating nor cooling, they are out of the analysis. The first floor is almost entirely dedicated to the multi-cinema with an autonomous HVAC system that is independent of the HVAC system of the New Building. Therefore this first floor is also out of the analysis and only two floors are thermally conditioned by CORIO: basement floor (-1) and ground floor (0).

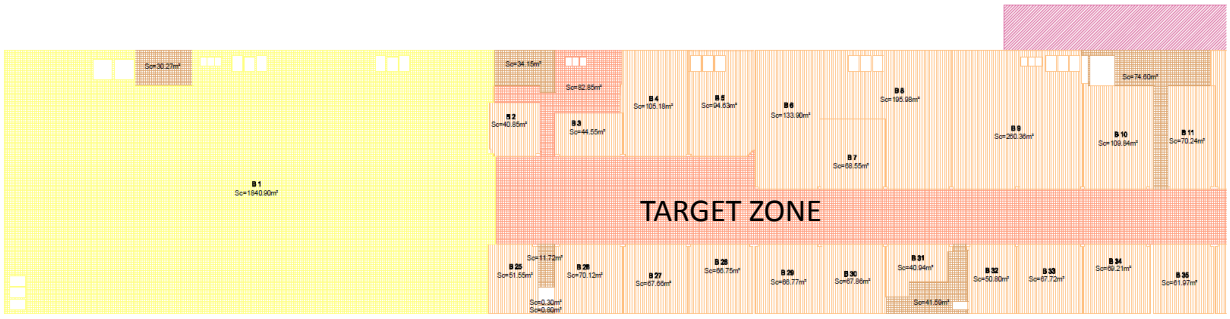

Figure 14: Basement floor (-1) / Príncipe Pío

Figure 15: Ground floor (0) / Príncipe Pío

Shop zones have its own water source heat pump units that provide heating or cooling in order to keep these zones in thermal comfort. The electricity consumed by these heat pumps is paid by the shop's owners. Therefore these zones are out of the analysis too.

The target mall zones are thermally conditioned by means of two rooftops autonomous units that introduce treated air inside these zones.

The kind of optimization strategy that has been manually implemented in the target zones has been described in deliverable 5.1. It basically consist of providing a heating setpoint of 19ºC when the occupancy level is low (occ=0, occ=1, occ=2) and providing a bigger thermal comfort with a heating setpoint of 21ºC, when the occupancy level is higher (occ=3 and occ=4).

People have filled out the questionnaire at the same time that the optimization strategy was being applied to the target zone.

4.2 Results

People filling out the questionnaire, classification according to sex:

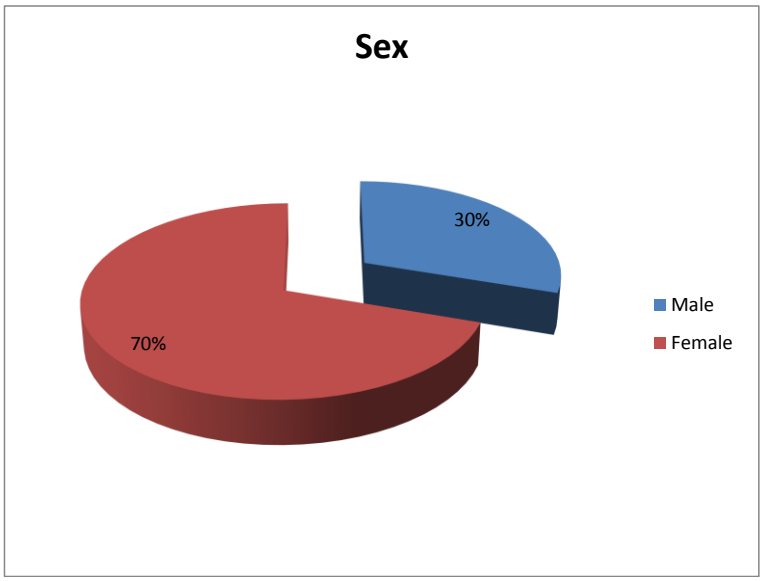

Figure 16: Sex of the people filling out the questionnaire

People filling out the questionnaire, classification according to age:

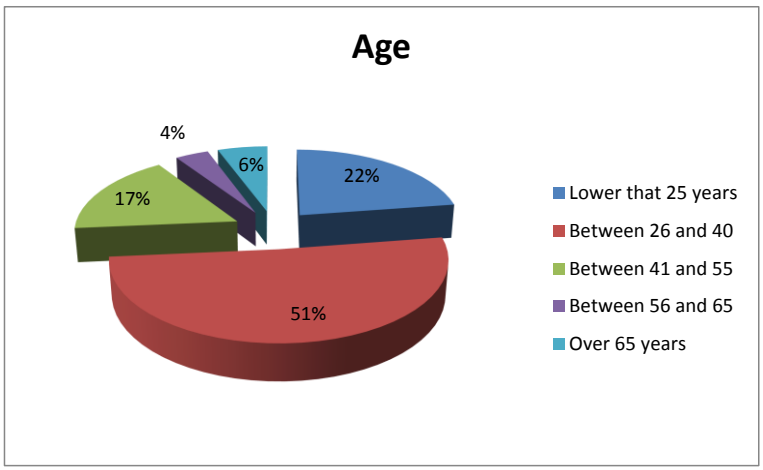

Figure 17: Age group of the people filling out the questionnaire

People filling out the questionnaire, classification according to the relationship between people and the shopping mall:

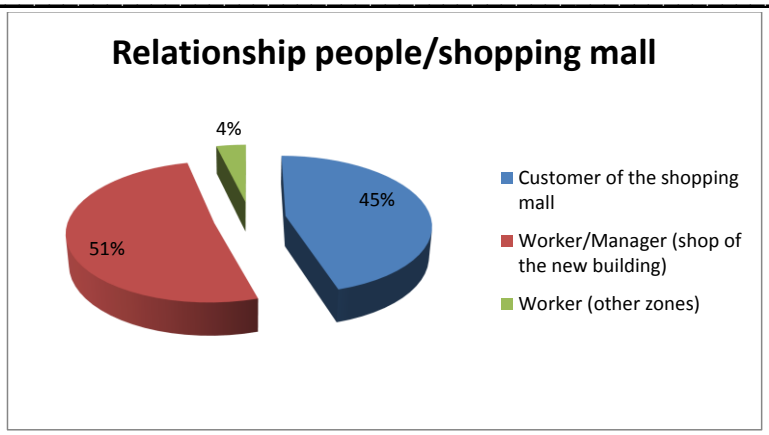

Figure 18: Relationship between the people and the shopping mall

According to the results of intermediate questions, it can be said the following:

- The workers/managers of the new building shops report that they work "almost every day" in the shopping mall (100%). This group of people spends more time in the target zone than any other. Therefore it is important to differentiate their opinions from the others.

- Workers from other zones represent a very small percentage of the people filling out the questionnaire. Besides that, there are many sub-classes that make this group very heterogeneous. Answers of this group will be left out of the analysis.

- More than half of the people filling out the questionnaire are customers. Their frequency visiting the shopping mall is as follows.

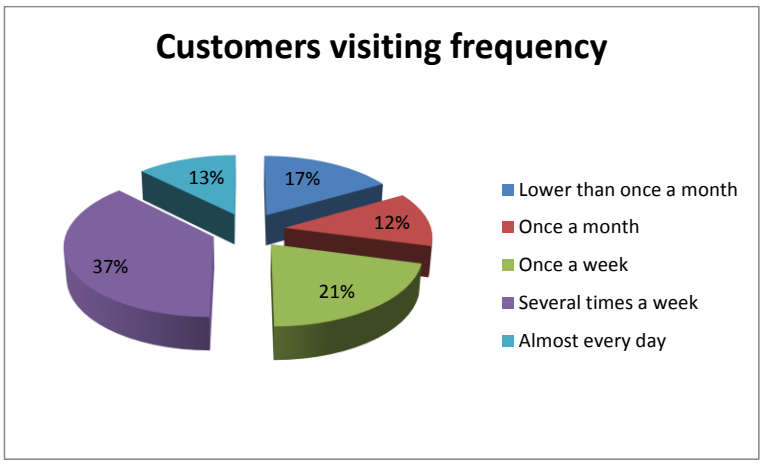

Figure 19: Customers visiting frequency

When asking about the current thermal conditions at the target zone, seven different possibilities were given to the people. In order to calculate the predicted mean vote index (PMV) according to the EN-ISO 7730 standard, the following values were assigned to each answer.

- I am very hot (+3)
- I am hot (+2)
- I am a little bit hot (+1)
- I am ok (0)

- I am a little bit cold (-1)
- I am cold (-2)
- I am very cold (-3)

By evaluating numerically the answers, the PMV for each group has been obtained. The Predicted Percentage Dissatisfied is a function of the PMV. It is important to underline that the energy optimization strategy was active at the time of people filling out the questionnaire.

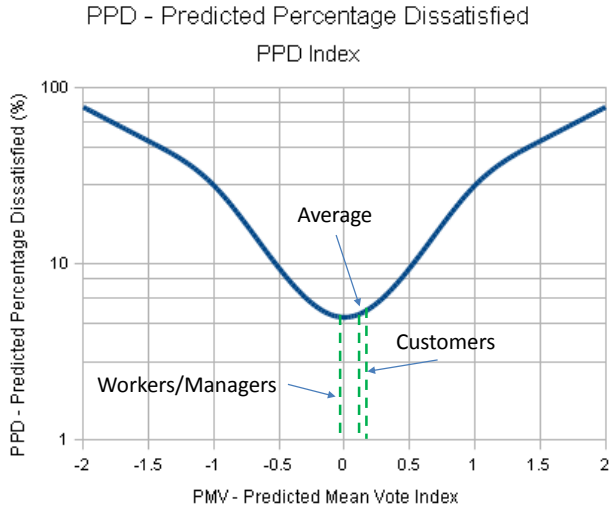

Figure 20: Predicted Mean Vote index (PMV) and associated Predicted Percentage Dissatisfied (%) (current conditions)

The strategy is running and thermal comfort is still very good according to customers and workers/managers.
A similar question was asked, but this time people had to remember how were the thermal conditions in the past weeks, months, where the optimization strategy was not connected, but still during winter time (see next figure).

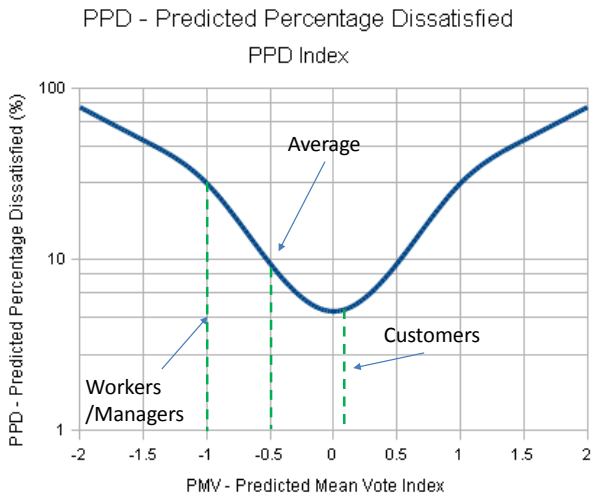

Figure 21: Predicted Mean Vote index (PMV) and associated Predicted Percentage Dissatisfied (%) (past, winter conditions)

According to the questionnaire, workers think that the target zones are places where they usually were a little bit cold (-1), in the past, during winter time. It has to be stresses that this is an opinion about past thermal conditions and therefore the answers are not as reliable as answers about current conditions.

According to indoor temperature records, the target zone was not colder, when the optimization was not implemented. Therefore the workers opinion about the past conditions, somehow contradicts the facts. It can be due to workers crossing target zones before the opening time, when the HVAC system is not active. On the other hand, customers do remember a good thermal comfort when staying in the past at the target zones. Customers stay at the target area during the time that HVAC is working. In fact the HVAC system works mainly for them to be comfortable.

Finally, an analogous question was asked, where people had to remember how the thermal conditions were in the past, where the optimization strategy was not connected, but during summer conditions.

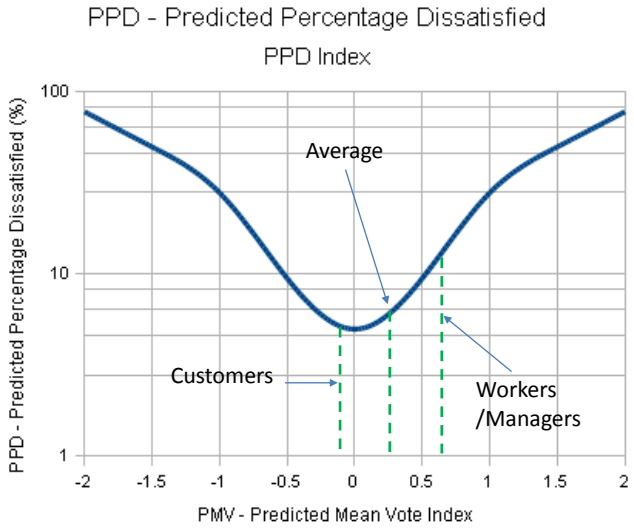

Figure 22: Predicted Mean Vote index (PMV) and associated Predicted Percentage Dissatisfied (%) (past, summer conditions)

Workers/managers remember being a little bit hot in the target zones, while customers remember being perfectly well at those places. As the average PPD value of all the samples is around 0.25 it seems that it is still room for energy savings, as the set points can be still modified by a strategy aimed to reduce energy.

Therefore, it seems that according to the average people's opinion about past summer conditions, the cooling set points for the next summer can be a little bit higher. A 15% of dissatisfied people (on average) can be acceptable during extreme winter/summer conditions, therefore a predicted mean vote of +0.7 (a little bit hot) for the summer time would be perfect in order to save energy while keeping thermal comfort.

However, it is important to notice that this was a question about the past conditions, and it is not as reliable as a question regarding current conditions at the target zone.

5 CONCLUSIONS

The conclusions drawn from the questionnaires depend on the demo-site, as different HVAC systems have been controlled by the optimization based on the occupancy level, and therefore different questions have been asked at each demo site.

The air handling units of the shops are usually turned off in Maremagnum shopping mall. Therefore the baseline condition is a state where energy is saved but health conditions are not fulfilled.

The optimization strategy drives the AHU#3 in a way that reduces its energy consumption when compared to conventional operation (see WP6 deliverables), but still providing enough make-up air (fresh air). As the initial status is having the ventilation system off, after the implementation of the S4ECoB system a controlled amount of energy will be used, but theoretically the IAQ should improve.

When asking about the past IAQ, more than half of the people that do remember how was the situation before the S4ECoB system (managers and workers), think that the IAQ has improved. There was not a single opinion saying that the IAQ has worsened, in any group. When asking the people about comparing IAQ at the open-air mall and the IAQ at the shops, most people think that both IAQ are similar.
It can be concluded that the IAQ has improved after the implementation of the S4ECoB system and the IAQ is quite acceptable for most people, as the average mark is 7/10. There are no significant differences between the different groups when evaluating the current IAQ.

In Principe Pio, after the manual implementation of the strategy at the target zones, people still are in thermal comfort. Whether this strategy has saved energy or not, this will be described in D6.3 “Report on Technical evaluation of BEMO platform integration”. This is the most important and reliable results of the questionnaire, as the people answer about what they feel at the time of filling out the questionnaire.

When asking about past conditions (for winter and summer periods) customers think that they usually were in thermal comfort in the target zones. On the other hand, workers/managers think that they usually were a little bit cold in winter and a little bit hot in the summer.

Having a look to winter indoor temperature records at the target zones, it can be seen how indoor temperatures were not lower before the implementation of the optimization strategy. This contradicts workers/manager opinion. Therefore, workers/manager opinion can be due to other factors, like passing through the target zones before opening and/or after closing time. It is important to notice that the HVAC schedule is mainly focused on providing thermal comfort to customers, therefore the schedules are focused on them.

Regarding the summer period 26ºC is the maximum temperature allowed in the target zones. According to the customers they are usually quite ok at the target zones during the summer time. It seems that the optimization strategy will also work during the summer time, as the average percentage of dissatisfied can still increase. A 15% PPD (about 0.7 PMV) would be acceptable in order to save energy while keeping a good thermal environment.

In Linate no questionnaire has been presented to passengers considering that no direct interventions (monitoring and control) of the HVAC system were performed in the context of the project.

REFERENCES

[1] EN-ISO 7730:2005. Ergonomics of the thermal environment – Analytical determination and interpretation of thermal comfort using calculation of the PMV and PPD indices and local thermal comfort criteria.

[2] ANSI/ASHRAE Standard 55-2004, Thermal Environmental Conditions for Human Occupancy.

ANNEX A MAREMAGNUM QUESTIONNAIRE

Questionnaire

This is the English translation of the questionnaire that has been used to evaluate people's opinion. The total number of people filling out the questionnaire is 42.

Questionnaire form

EVALUATION OF THE S4ECOB SYSTEM IN MAREMAGNUM SHOPPING MALL
The system S4ECoB has been installed in some places of this building in order to optimize energy consumption.

The target zones of this study are the following shops: INSIDE, BERSHKA, BLANCO, DRUNI, EL CHIPIRON, FRESC CO, LEFTIES, PULL&BEAR, BOBOLI, NATURA, CALZEDONIA, BEN&JERRY'S, MARYPAZ y TUSET&RIERA.

By means of analyzing sounds, the S4ECoB system estimates the number of people present at the shopping mall, at every time. This value is used to adjust the setpoints of the HVAC system.

The aim of this questionnaire is evaluating the level of satisfaction of the people present at the target zones. The purpose is quantifying the sensations experimented by these people, before and after the system implementation.

PERSON PROFILE
The following questions are aimed to determine the profile of the person filling out the questionnaire. The purpose is refining the system evaluation process and getting data associated to each type of profile.

Sex
Please indicate the sex of the person filling out the questionnaire.
- Male
- Female

Age
Please indicate the age group of the person filling out the questionnaire.
- Lower than 25 years
- Between 26 and 40
- Between 41 and 55
- Between 56 and 65
- Over 65 years

Relationship between the person and the shopping mall
Indicate the type of relationship between the person and the shopping mall.
- Customer of the shopping mall
- Works in the shopping mall (inside the target zones)
- Works in the shopping mall (outside the target zones)

- Manager of target shop

Frequency of the person being inside of the shopping mall

Indicate the frequency of the person entering the shopping mall.

- Lower than once a month
- Once a month
- Once a week
- Several times a week
- Almost every day

PLACE

The following question is aimed to know where was the questionnaire filled out.

Place where the questionnaire was filled out

- Inside the shopping mall, inside/close to the target zones
- Inside the shopping mall, far away from the target zones
- Outside the shopping mall

EVALUATION OF THE INDOOR AIR QUALITY (IAQ) IN THE TARGET ZONES

The following questions are aimed to evaluate the level of satisfaction of the person with the indoor air quality (IAQ) of the target zones. It will be considered that the IAQ is good if the person perceive the air as not irritating and not foul.

Evaluate the current IAQ inside the target zones, according to your personal impressions

Indicate your opinion about the current IAQ in the target zones. (0=very bad, 10=very good)

- 0
- 1
- 2
- 3
- 4
- 5
- 6
- 7
- 8
- 9
- 10

If you remember previous stays inside the target zones (before November 2014), have you noticed if the current IAQ has changed when compared to previous stays?

Indicate your opinion about the current IAQ when compared to previous stays (before 2014). This question is especially interesting if the person works in a target zone.

- I do not know/I do not remember
- I think it has worsened
- I think it has improved
- I think it is similar

Currently, have you noticed if the IAQ changes according to the occupancy level of the target zones?

Indicate your opinion about if you have noticed that the IAQ changes with the occupancy level of the target zones. This question is especially interesting if the person works in a target zone.

- I do not know
- I think that the IAQ improves when the occupancy level is high
- I think that the IAQ improves when the occupancy level is low
- I think that the IAQ does not change with the occupancy level

In comparison with the inner space of the shopping mall, the mall zone, how would you define the IAQ of the target zones?

Indicate your opinion about the current IAQ of the target zones in comparison with the common zone inside of the shopping mall (mall zone).

- I do not know
- I think it is worse in the target zones than in the mall zone
- I think it is better in the target zones than in the mall zone
- I think it is similar

Observations

Use the following box in case you want to explain better any of your responses or if you want to put on record any observation regarding the IAQ of the target zones.

ANNEX B PRINCIPE PIO QUESTIONNAIRE

Questionnaire

This is the English translation of the questionnaire that has been used to evaluate people's opinion. The total number of people filling out the questionnaire is 53.

Questionnaire form

EVALUATION OF THE S4ECOB SYSTEM IN PRINCIPE PIO SHOPPING MALL
The system S4ECoB has been installed in some places of this building in order to optimize energy consumption.

The target zones of this study are the common zones (mall) of the new building: basement floor (-1) and ground floor (0). The cinema floor (+1) has an independent HVAC system, therefore it is not included in the analysis. The dome zone is out of the analysis too.

By means of analyzing sounds, the S4ECoB system estimates the number of people present at the shopping mall, at every time. This value is used to adjust the setpoints of the HVAC system.

The aim of this questionnaire is evaluating the level of satisfaction of the people present at the target zones. The purpose is quantifying the sensations experimented by these people, before and after the system implementation.

PERSON PROFILE
The following questions are aimed to determine the profile of the person filling out the questionnaire. The purpose is refining the system evaluation process and getting data associated to each type of profile.

Sex
Please indicate the sex of the person filling out the questionnaire.
- Male
- Female

Age
Please indicate the age group of the person filling out the questionnaire.
- Lower than 25 years
- Between 26 and 40
- Between 41 and 55
- Between 56 and 65
- Over 65 years

Relationship between the person and the shopping mall
Indicate the type of relationship between the person and the shopping mall.
- Customer of the shopping mall
- Works in the shopping mall (worker/manager), in a shop of the new building (therefore connected to the target zone)

- Works in the shopping mall (other zones)

Frequency of the person being inside of the shopping mall
Indicate the frequency of the person entering the shopping mall.
- Lower than once a month
- Once a month
- Once a week
- Several times a week
- Almost every day

PLACE
The following question is aimed to know where was the questionnaire filled out.

Place where the questionnaire was filled out
- Inside the shopping mall, inside/close to the target zones
- Inside the shopping mall, far away from the target zones
- Outside the shopping mall

EVALUATION OF THE THERMAL COMFORT IN THE TARGET ZONES
The following questions are aimed to evaluate the level of satisfaction of the person with the thermal conditions of the target zones.

Evaluate the current thermal comfort inside the target zones, according to your personal impressions
Indicate your opinion about the thermal conditions in the target zones.
- I am very hot
- I am hot
- I am a little bit hot
- I am ok
- I am a little bit cold
- I am cold
- I am very cold

If you remember previous stays inside the target zones, during the winter time, how would you describe the thermal conditions at the target zones?
Indicate your opinion about the past thermal conditions at the target zones, experienced during previous stays in winter time. This question is especially interesting if the person works in a target zone.

- I do not know/I do not remember
- I think I am very hot
- I think I am hot
- I think I am a little bit hot
- I think I am ok
- I think I am a little bit cold
- I think I am cold
- I think I am very cold

If you remember previous stays inside the target zones, during the summer time, how would you describe the thermal comfort at the target zone?

Indicate your opinion about the past thermal conditions at the target zones, experienced during previous stays in winter time. This question is especially interesting if the person works in a target zone.

- I do not know/I do not remember
- I think I am very hot
- I think I am hot
- I think I am a little bit hot
- I think I am ok
- I think I am a little bit cold
- I think I am cold
- I think I am very cold

Observations

Use the following box in case you want to explain better any of your responses or if you want to put on record any observation regarding the thermal comfort of the target zones