

DOC n°2 – WP 4.1.2

First draft on: 28th June 2014

Report on settlements adaptation to SWMED solutions

The case of Tunisia



SOCIO-ECONOMIC SURVEY ON MED SETTLEMENTS IN URBAN AND RURAL AREAS IN TUNISIA

1. Research Objectives and strategy

In Tunisia, as area target parallel to the West Bank, during summer-autumn 2013, the SWMED Project staff research carried on a survey with the intent of accounting for the water supply and sanitation conditions in some local communities of the area. During the development of this study, the specific characteristics of urban and rural settlements in Tunisia were analyzed in order to allow the identification of the best measures to optimize the management of water demand, wastewater treatment and the reuse in the country. This project also deals with the development of national and regional policies, aimed at improving the wastewater treatment needs and the reuse practices, and thereby contributing to the sustainable use of water resources. In fact, the entire research has been strongly required by the CERTE in order study the real needs of local populations and to make more “anatomical” the tools for sustainable water management that the SWMED Project proposed. The identification of the target areas to be experimented with the tools installation was enabled by the collaboration of the National Water Services, SONEDE and ONAS, with which CERTE discussed the criteria useful to select three specific representative localities that can be easily used as model for replication of similar approaches in several comparable situations in the country. These criteria are:

- 1) Eligibility region for the project
- 2) Fitting with national priorities
- 3) Fitting with EU-MED priorities
- 4) Representativeness
- 5) Previous experiences
- 6) Synergy with other projects if possible
- 7) Adherence of target groups and stakeholders to the objectives of SWMED.

Basing on these presented criteria, the three target areas selected are:

- Chorfech 24: rural settlements having in-house water distribution systems but with no sewage system (individual sanitation)

- Zaouiet El Mgaiez (ZEM): rural villages with in-house water distribution systems and a partial sewage system but with no treatment plant
- Bardo Center: urban areas with prevalence of multi-floor buildings: in house water distribution systems and sewage systems and treatment plant.

Fig. 1. Survey areas in Tunisia and Selection criteria adopted



Survey Areas

- **Chorfech** (Rural settlements having in-house water distribution systems but with no sewage system)
- **Zaouiet El Mgaiez - ZEM** (Rural villages with in-house water distribution systems and a partial sewage system but with no treatment plant)
- **Bardo** (urban settlement)

Selection criteria:

- ✓ National strategy for sanitation and water supply for rural area due to water shortage
- ✓ Urban and rural communities with water network and with partially WWTP in the targeted municipalities
- ✓ Local initiatives for sanitations

In these three target areas, the staff research of CERTE used a semi-standard and structured questionnaire, to collect data from resident population¹. As for the West Bank interviews, the selected criteria, to identify different typologies of settlements, aimed to highlight differences about water supply and wastewater management system, treatment and wastewater disposal (sewer network, wastewater treatment system, drains).

¹ A copy of the questionnaire in Arab and English language is present as Appendix.

The approach adopted follows the lines of quantitative research, and the empirical basis has been designed and built according to sampling criteria coherent with the exploratory objectives of the study. In fact, as the survey did not seek to reach statistical conclusions, but it aimed to point out water and sanitation problems in some areas and communities (in function of the wider objectives of the SWMED project), a non-probability sampling strategy was more suitable. Thus, the research staff developed a purposive sampling procedure, coherent to a number of factors such as the type of community (small municipality with partial existent facilities; refugee camp; rural region with diffused villages) and the quality of connection to the water network. In the presence of interviewers, the questionnaires were distributed to and filled by 84 households, who are the most appropriate referents to show the needs and problems experienced by the entire family within each community.

The final outcome regarded 27 households in Chorfech, 39 in ZEM and 18 in Bardo (Fig. 1).

The questionnaire is composed of 49 questions referred to seven sections as follows:

- A. General information about the interviewed
- B. Demographic status, social and economic situation of the house
- C. Income
- D. Water information and conditions
- E. Culture and values associated with water
- F. Interests and environmental awareness
- G. Political Concerns

2. Socio-economic status of the families and characteristic of the house

The sample is exclusively composed of men, coherently with the choice of interviewing chiefly the households in order to gather data on the needs and problems experienced by the families. Data (Fig. 2) reveal that 85,7% of sample is house owner (only 12 respondents declared to live in a rented or family house) and the majority of the families involved in the research (69%, more than West Bank ones) are of small/medium size (1-5 members). This aspect is particularly relevant as directly linked to water consumptions and family needs.

Fig. 2. Family Types.

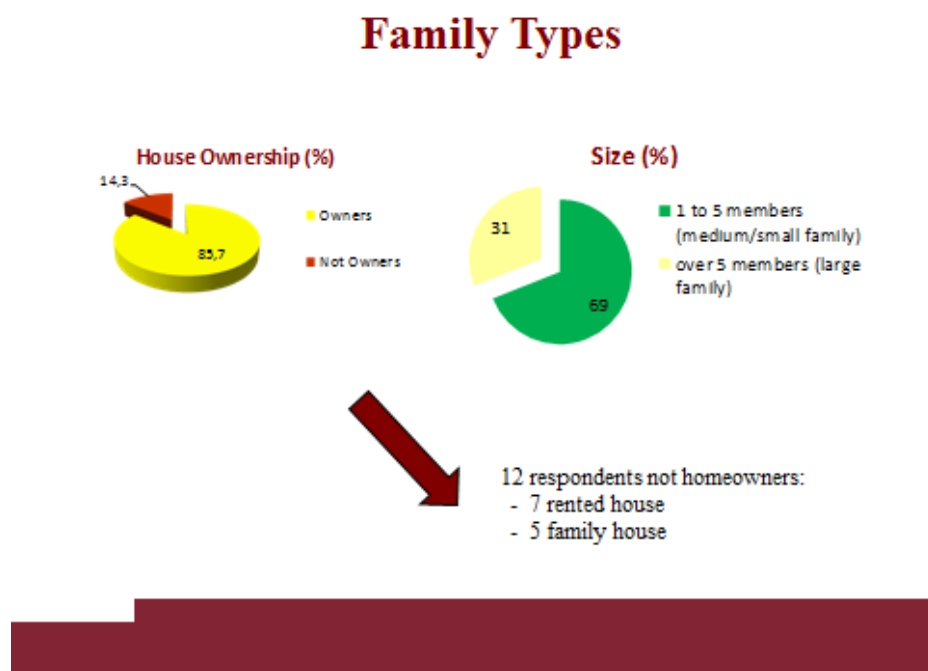


Fig. 3 shows that socio-economic status of families tends to a low level. In fact, most of them (86,4%) are composed of only 1 employed, nearly three-quarters of the families have a monthly income lower than 1200 TND, and almost the same percentage don't own a private car. Nevertheless, it worth to point out that in Bardo 83,3% of respondents have an air conditioner, due to the higher standard of living in the place than in the other two.

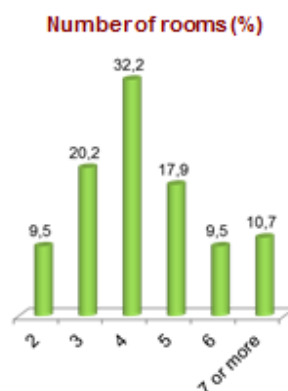
In general, the houses are predominantly characterized by a medium number of rooms: 32,2% of them have 4 rooms, 20,2% 3 rooms and 17,9% until 5 rooms. Looking in detail at the characteristics and conditions of the houses taken into account (Fig. 4), data show that 70% of the kitchens are not connected to the waternet and this aspect is quite interesting compared to the West Bank cases where, instead, all kitchens are connected. More than 90% of the house have a dish washer machine and an automatic (29,8%) or semi-automatic (63,1%) washing machine. In three-quarters of the houses involved in the survey there is only one bathroom and only 65,5% of them have flush toilets available.

Fig. 3. Economic conditions of the Tunisian families involved in the research

Economic conditions of families

Workers/House	% Cases
1	52,4
2	17,9
3 and more	9,5
n.a.	20,2

Monthly family income	% Cases
Less than 1200 TND	76,2
1200-2000 TND	11,9
Over 2000 TND	11,9



➤ 70,2% of respondents without a private car

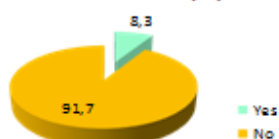


Fig. 4. Houses characteristics and conditions: kitchen connection to waternet and appliances

House: Characteristics and Conditions

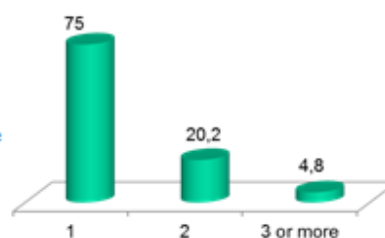
➤ 70,2% of kitchens NOT connected to waternet

Dish washer available (%)



	% Cases
Authomaticwashing machine	29,8
Semi Authomaticwashing machine	63,1
Hand washing machine	7,1

Number of bathrooms(%)



➤ 65,5 % of toilet flush available

3. Water conditions

Like in the West Bank areas involved in the research, the majority of the houses have a h24-water supply (89,3%) but it is worth to highlight that 25% of Tunisian sample (more precisely, ZEM interviewed) have water wells (Fig. 5). Moreover, respondents expressed an ambivalent evaluation on the water service provided by SONEDE: the majority have demonstrated a bad evaluation about water quality (55,6%) but a good one about pressure (81%).

Furthermore, the Tunisian householders seem very sensitive in regard to the information on water use: 84,6% of respondents declared that it is important receiving it, above all on

- discharge wastewater cost
- water supply
- water source and treatment methods
- better positioning of septic systems

- frequency of use of water wells and groundwater effect sweats
- how to dig well
- causes of water pollution
- how to protect our water resources
- water quality and lime content
- origin and composition of drinking water
- tap water impact on human health.

Regarding to the payment (Fig. 6), slightly more than half of the sample believes that it is fair to pay for water (less than West Bank interviewed) and not all respondents are actually paying for water supply (76,2%). Furthermore, 61% of the sample think that the price is not appropriate and 72,6% of them don't know how the water bill is calculated; however, the majority (81,3%) pay less than 50 TND,.

Fig. 5. House water conditions

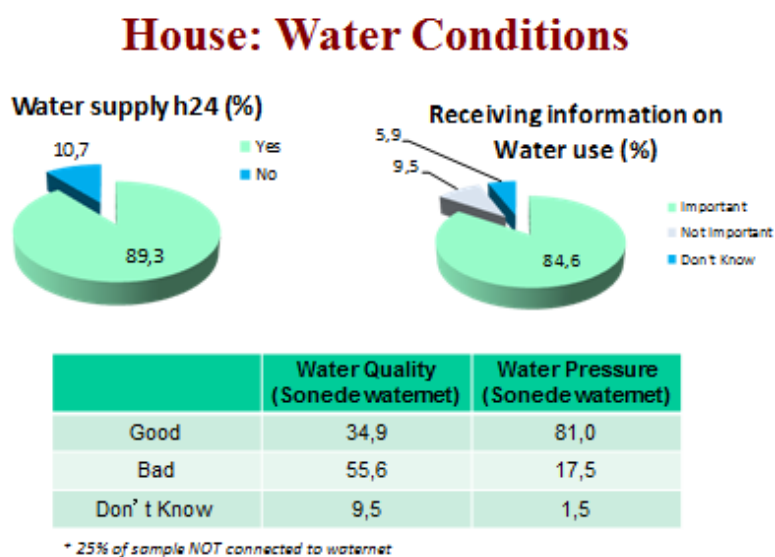
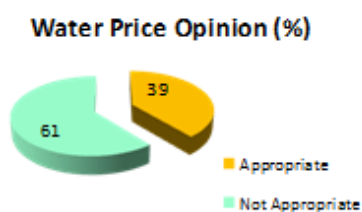


Fig. 6. Water payment

Water payment

- ✓ 53,6 % of respondents retain fair to pay for water
- ✓ 76,2 % of respondents are actually paying for water supply
- ✓ 72,6 % of respondents don't know how the water bill is calculated

Price/Month	% Cases
1 to 34TND	54,7
34 to 50 TND	26,6
Over 50 TND	18,7



4. Water conservation and sewage: problems and attitude

Due to the chronic shortage afflicting Tunisia, it is not surprising that most of the respondents (86,9%) are perceiving very urgent problems about water conservation (Fig. 7). Moreover 82,2% of interviewed give importance to actions aimed to solve this specific problem.

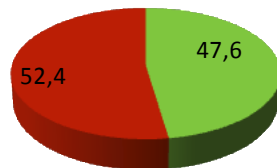
It is important to remark that also if less than half of respondents (47,6%) are aware about the existence of water conservation devices, a large part of the sample, 80,9%, claimed to be ready to install this kind of instruments in their own house; further, a high percentage of households, 65,6%, is willing to contribute financially to the installation procedure.

Fig. 7. Water conservation: problems and attitude

Water and Conservation Problems

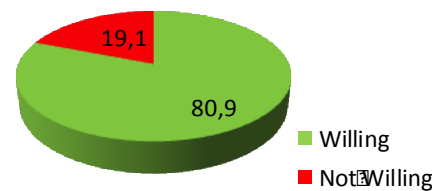
- ✓ 86,9 % of respondents perceive urgent water problems
- ✓ 82,2 % of respondents give importance to water conservation

Water Conservation Device Existence (%)



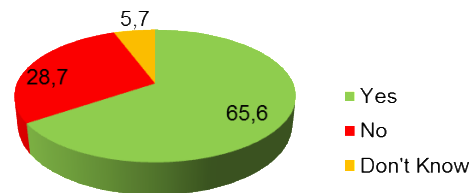
■ Aware
■ Not Aware

Install Water Conservation Devices (%)



■ Willing
■ Not Willing

Intention to contribute financially to WCD (%)



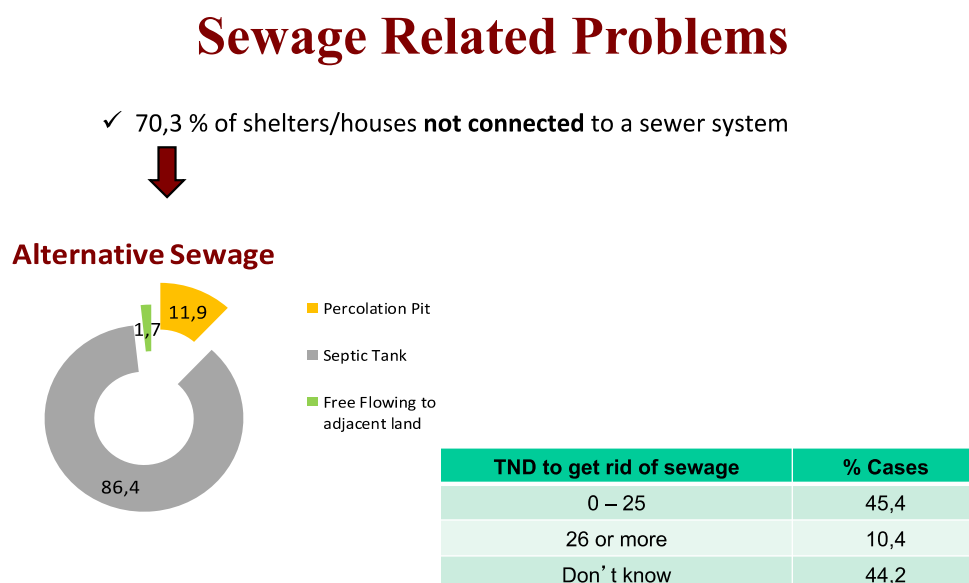
■ Yes
■ No
■ Don't Know

The lack of adequate sewage emerged as acute and severe trouble, too (Fig. 8). In fact, 70,3% of shelters or houses are not connected to a sewer system; as alternative sewage tool, 86,4% of respondents declared to use septic tanks to dispose of sewage, while 11,9% of them said to make use of percolation pits; only a tiny part of the sample, 1,7%, must resort to the free-flowing to the adjacent areas. In these cases, the costs to get rid of sewage are normally less than 25 TND (45,4% of respondents).

The percentage distribution among the different types of alternative sewage systems is, therefore, very different from the West Bank one, where septic tanks are less used, while the

number of percolation pits and free-flowing is higher. And this is an important aspect also for the level of the intervention to be tested in the target areas of each country involved in the SWMED Project.

Fig. 8. Sewage related problems

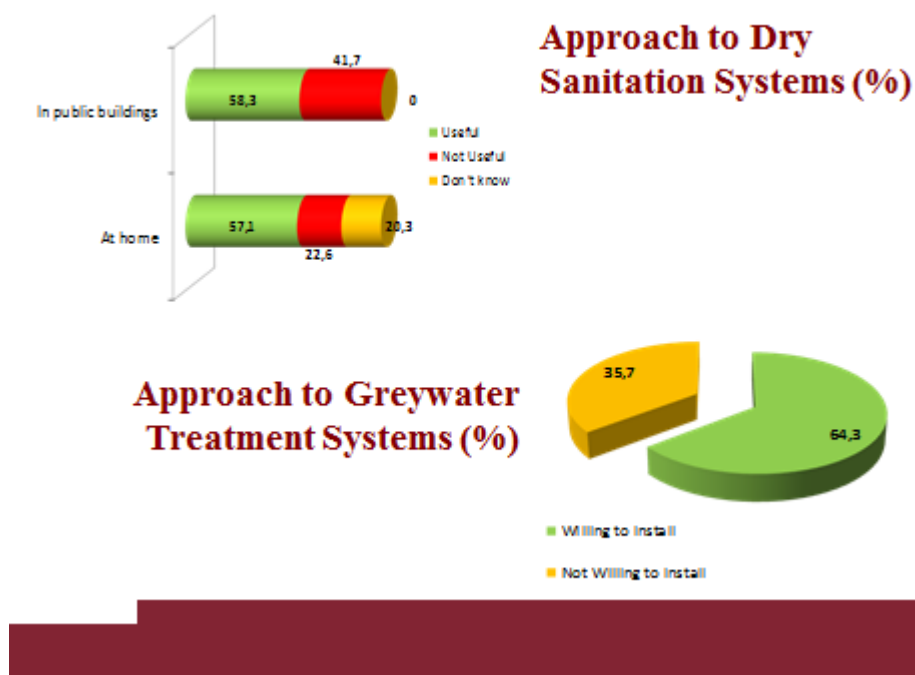


5. Approach and consciousness to water saving

The Tunisian sample is very aware about water problems: in Bardo the most urgent is the water consumption while in Chorfech the discharge of wastewater and pollution is more perceived; the inhabitants of ZEM, in addition to these problems, feel even other ones, such as the lack and bad quality of drinking water, the decreased level of ground water, the low flow in the high areas and the reduced amount of fresh water.

Consequently, the attitude of the respondents towards the installation of the dry sanitation systems is certainly more uniform than in the West Bank: more than a half of the sample think that installing dry sanitation systems, both in private houses and in public buildings (as mosques, ministries, public offices, schools), is useful (Fig. 9). And there is a similar attitude towards greywater treatment systems, as 64,3% of respondents are willing to install them.

Fig.9. Approach to dry sanitation and greywater treatment systems



Despite this positive approach of Tunisian respondents to the mentioned systems, it is important to highlight that almost all of them (94%) didn't receive any awareness training: it means that they don't know whether and how dry sanitation and greywater treatment systems operate, but they perceive in any case an advantage by the mere existence of systems that allow the water conservation (Fig. 10).

Almost all the respondents (97,6%) show high sense of responsibility for future generation on water protection and conservation, as they consider the resource as a basic need and a human

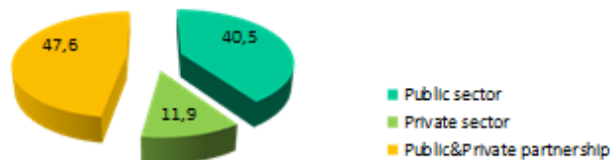
right. And the most interesting aspect is that, unlike the West Bank respondents (who show more confidence in the private water management), Tunisians enhance more the public sector: over 47% of them prefer a public-private management (like the West Bank interviewed), but a good 40,5% want public water (instead, in the West Bank only 19% of respondents prefer the public sector).

Fig. 10. Consciousness about water and perception about water providers

Consciousness about Water

- ✓ 94% didn't receive any awareness training about water and environment
- ✓ 97,6% of respondents with high sense of responsibility for future generation on water protection and conservation

Opinion about better water supply (%)



6. Socio-economic feasibility and local water scarcity perception: a cross study

As for the West Bank, in the last part of the report it can be useful to cross some results of the “Feasibility study on tailormade SWMED solutions for the project target areas in Tunisia” (WP 4.2.1) with the survey on water scarcity perception in the three target areas.

Tab. 1 outlines a significant problem of water supply during daytime in ZEM, while in Chorfech and Bardo, SONEDE services permit to population to receive water without trouble. Willingness to install wcd (water conservation devices) is generally high, but reaches high values in ZEM where 92,3% of respondents claim to be ready to use this kind of instruments. (Tab. 2).

Tab. 1. Water supply H24 in each target area (supplier SONEDE)

		AREAS			TOTAL
		CHORFECH	ZEM	BARDO	
WATER SUPPLY H 24	YES	27 100,0%	9 50,0%	18 100%	75 89,3%
	NO	0 0,0%	9 50%	0 0,0%	9 10,7%
TOTAL		100,0%	27 100,0%	18* 100,0%	18 100,0%

Tab. 2. Willingness to install water conservation devices in each target area

		AREAS			TO TAL
		CHORF ECH	ZEM	BAR DO	
WILLINGNESS TO INSTALL WATER CONSERVATION DEVICES AT YOUR HOUSE	Y ES	18 66,7	36 92,3 %	14 78,8	68 80, 1
	N O	9 33,3	3 7,7	4 22,2	16 19, 9
TOTAL		27 100,0%	39 100, 0%	18 100,0 %	84 100 ,0%

Values in Tab. 3 show how people in different areas are willing to contribute financially for the installations. Coherently with the answers in Tab. 2, respondents in ZEM are more inclined (79,5%) to pay to save water, while people experiencing a reduced scarcity level are reluctant to spend money for wcd.

Tab. 3. Willingness to contribute financially to install kits in each target area

		AREAS			TOTAL
		CHORFEC H	ZEM	BARDO	
WILLINGNESS TO CONTRIBUTE FINANCIALLY FOR THE INSTALLATION	YES	18 66,7%	31 79,5%	6 33,3%	55 65,6%
	NO	9 33,3%	8 20,5%	7 38,9%	24 28,7%
	DON'T KNOW	0 0,0%	0 0,0%	5 27,8%	5 5,7%
TOTAL		27 100,0%	39 100,0%	18 100,0%	84 100,0%

There is a general positive evaluation about the use of dry toilets in public buildings, especially in ZEM and Bardo (Tab. 4) and it is interesting to note (Tab. 5) that, especially in this area, dry sanitation systems are perceived as an easy-to-install instruments to save water also in private houses, thus remarking a specific need to find ways to reduce water consumption (64,1% of respondents in ZEM perceive dry toilets in the house as a useful tool).

Tab. 4. Opinion on the usefulness of dry toilets in public buildings in each target area

	AREAS			TO TAL	
	CHORF ECH	ZEM	BAR DO		
IS IT APPROPRIATE TO INSTALL DRY TOILETS IN PUBLIC INSTITUTIONS?	YES	13 48,1%	26 66,7 %	9 55,6 %	49 58,3 %
	NO	14 51,9%	13 33,3 %	8 44,4	35 41,7 %
	DON' T KNOW	0 0,0%	0 0,0%	0 0,0%	0 0,0 %
TOTAL	27 100,0%	39 100,0 %	18 100,0 %	84 100, 0%	

Tab. 5. Opinion on the usefulness of dry toilets in private houses in each target area

	AREAS			TOTA L	
	CHORFEC H	ZEM	BARDO		
DO YOU THINK IT IS USEFUL TO INSTALL SEPARATE URINATES AND DRY TOILETS AT HOUSE?	YES	13 48,1%	25 64,1%	10 55,6%	48 57,1%
	NO	7 25,9%	7 17,9%	5 27,8%	19 22,6%
	DON'T KNOW	7 25,9%	7 17,9%	3 16,7%	17 20,3%
TOTAL	27 100,0%	39 100,0%	18 100,0%	84 100,0 %	

About the installation of more sophisticated kits (tab. 6), as the greywater treatment kits, respondents show high grade of interests for areas with prominent water problems, as in Chorfech and ZEM (with positive willingness to adopt greywater treatment of 66,7% and 79,5% respectively) in comparison with Bardo where water consumption is less troublesome.

Tab. 6. Willingness to adopt greywater treatment in each target area

	AREAS			TOTAL	
	CHORFEC H	ZEM	BARDO		
ARE YOU WILLING TO INSTALL GREYWATER TREATMENT?	YES	18 66,7%	31 79,5%	5 27,8%	54 64,3%
	NO	9 33,3%	9 20,5%	13 72,2%	30 35,7%
	DON'T KNOW	0 0,0%	0 0,0%	0 0,0%	0 0,0%
TOTAL	27 100,0%	39 100,0%	18 100,0%	84 100,0%	84 100,0%

All information in Tab. 2-6 remark high confidence about use of wcd, especially in ZEM, and Tab. 7 confirms that in ZEM and Bardo there is a general trust on the use of water saving kits to save water.

Finally, it can be useful to verify how the respondents in each target area said to dispose the wastewater (Tab. 8). In both Chorfech and ZEM areas, most of sampled use septic tanks (74,1% and 79,5%, respectively) while percolation pits and free flowing to adjacent land are limited. All sampled in Bardo are connected to wastewater net.

Tab. 7. Trust in water saving kits in each target area

		AREA			TO TAL
		CHORF ECH	ZE M	BA RDO	
DO YOU THINK WATER CONSERVATION WILL SOLVE THE PROBLEM?	YES	16 59,3%	36 92, 3%	17 94,4 %	69 82, 2%
	NO	7 25,9%	1 2,6 %	0 0,0 %	8 9,5 %
	DON'T KNOW	4 14,8%	2 5,1 %	1 5,6 %	7 8,3 %
TOTAL		27 100,0%	39 100 ,0%	18 100, 0%	84 100 ,0%

Tab. 8. Alternative wastewater disposal

		AREA			TOT AL
		CHORFE CH	ZEM	BARDO	
HOW YOU DISPOSE YOUR WASTEWATER?	PERCOLATION PIT	7 25,9%	0 0,0%	0 0,0%	7 11,9
	SEPTIC TANK	20 74,1%	31 79,5%	0 0,0%	51 86,4
	FREE FLOWING TO THE ADJACENT LAND	0 0,0%	1 2,6%	0 0,0%	1 11,7
TOTAL		100,0%	100,0%	100,0%	59* 100, 0%

* 25 families connected to wastewater net (ONAS): all respondents in Bardo (18) and 7 in ZEM

The situation emerging from the survey show three areas with distinct problems and needs and, consequently, a different perception of water saving and kits avoiding to waste water. Especially in ZEM and Chorfech there is a sharp perception of water shortage and really high propensity to accept all tools could permit to save water in house or in public buildings. The situation is worsened by the lack of a wastewater net.

In conclusion, the analysis shows that the multilevel approach adopted in the feasibility study (WP 4.2.3) is specifically suited for a scenario with different needs and facilities. Further, the strategy based on contemporary adoption of more devices, both simple and advanced (such as tools for regulating the water flow, shower diffusers, WC “Water Saving”, reuse of wastewater through roof rainwater harvesting, greywater treatment systems and so on) can better respond to the multiple and different needs highlighted by the survey.

Especially data in Tab. 8 show how can be important, as scheduled in the feasibility study, to realize an upgrade of the wastewater treatment plant in Chorfech (the realization of a sewer to connect the north part to the Constructed Wetland in the South part, rehabilitating the constructed wetland and the final pumping station) to relieve one of the most troublesome issue about water regarding the absence of a sewage plant; this kind of installation will reduce the dependence of local inhabitants by percolation pits or septic tanks with positive impact on environment and water consumption. A similar approach can be adopted also for ZEM area, (the lack of sewage is a prominent problem here) installing a sewer to connect the north part to the Constructed Wetland in the South part and, thus, rehabilitating the constructed wetland and the final pumping station.

Instead, Bardo (an urban area with a good sewage system) needs essentially to be accustomed to the kits permitting to save water, such as the segregation of greywater to be realized underground for the urban irrigation reuse, the demonstrative green roofs with the purpose of rainwater harvesting and stormwater peak reduction, and the application of water saving devices to all the household in the Bardo Centre. All these treatment systems can reduce costs of water (with a positive impact on a population still worried for water tariffs). The widespread trust in wcd’s effects in ZEM and Chorfech, with high awareness of usefulness of the

kits, seems to make unnecessary a public promotion of the tools. However it is important to remark that greywater treatment systems are perceived as costly by a large part of the population, especially in Bardo; in the light of this dominant opinion, it could be useful to adopt a public awareness campaign in Bardo to clarify to the people which are the profits about the use of this kind of water saving systems.