Number/code: OM/SM23

Title: RAINWATER RECOVERY AND REUSE

Guidelines section:

[ ]	Governance	[X]	Operational management

[ ]	*Context of the event*	[ ]	*Procurement*
[ ]	*Event*	[ ]	*Mobility and logistics*
[X]	*Stadium management*	[ ]	

Description:

Day after day there is a high consumption of water in flushing, baths, clothes washing and diverse washes. Since these operations do not require the use of potable water, the recovery of rainwater for these operations is increasingly seen as a key point in the strategy to combat water lack.

The compact stormwater systems allow the treatment and storage of rainwater and grey water, in order to allow their reuse in conditions of total efficiency and hydraulic - sanitary safety.

Rainwater and grey water after treatment can be reused in the following uses:

- Washing of floors and/or stadium benches after each game or at cleaning times;
- Discharge of flushing;
- Irrigation of turf area.

To complement, it will be of interest to use:

- flow reducers on all faucets and showers in the stadium;
- Install shuffling with double discharges;
- Flow reducer in compressors used for cleaning the stadium.

Environmental benefits:

Creation of a strategic water reserve, useful in periods of lack of water due to temporary interruption of supply (breaks, drought, ...).

Preservation of natural resources (water), reducing their consumption and thus contributing to their preservation and sustainable use.

Economic benefits:

Management and optimization of consumption with consequent reduction of the cost associated with the consumption of drinking water quality.

Applicability and replicability potential

This practice can be applied to all stadiums (bathrooms, bars and restaurants, offices, etc). The replicability potential is linked by the acquisition of the products for the system installation.

Sources

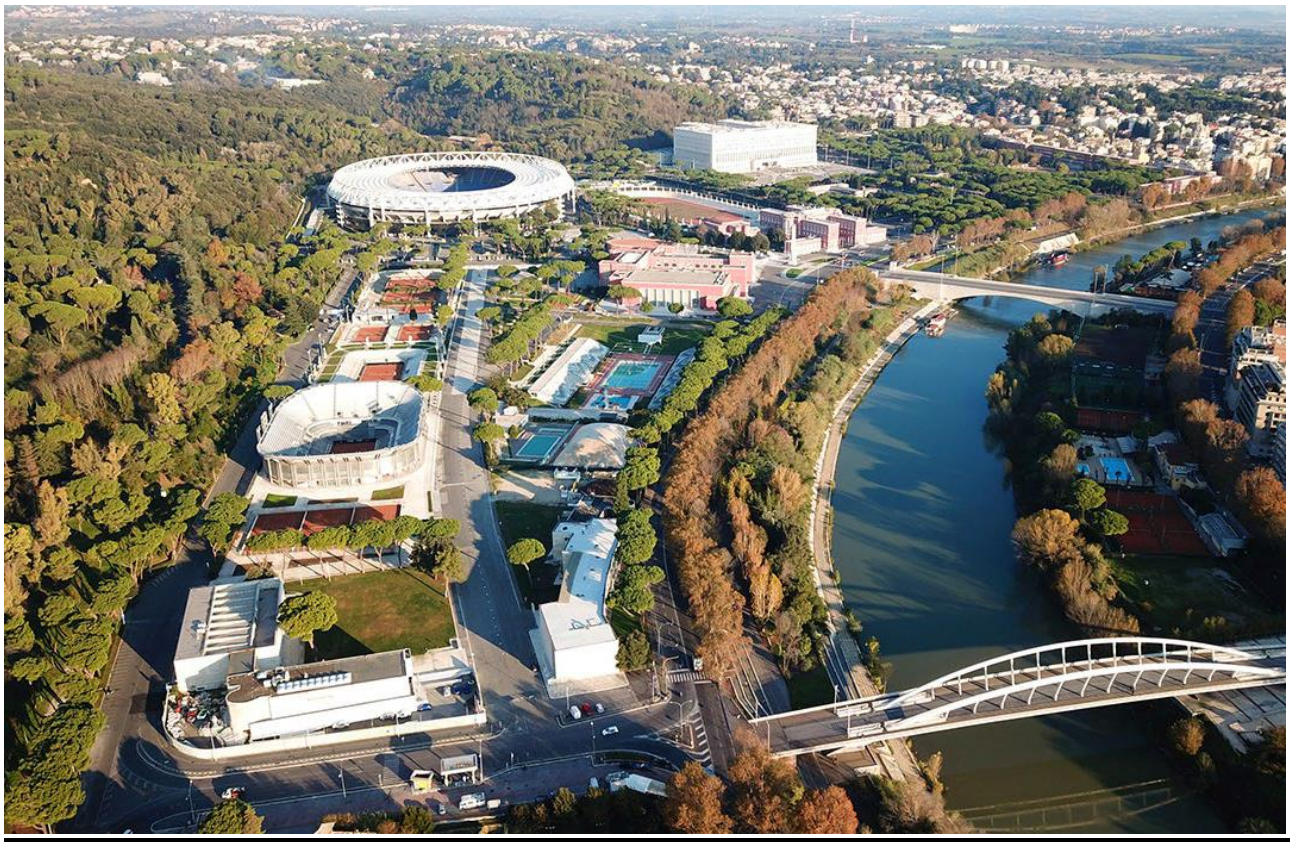
Rainwater Recovery (spanish)

Field irrigation and water recycling

Green Clubs Environmental Module

LIFE TACKLE Pilot test at the Olympic Stadium in Rome, Italy:

Study for the reuse of rainwater and groundwater for irrigation and mixed use in the Foro Italico Park



The objective of the study, performed by Eng. Augusto Pretner and issued in its final version in January 2022, was the optimization of the sustainable use of water resources in the Foro Italico Park by identifying solutions that:

- make the use of water sustainable in sporting events;
- are reproducible on a large scale;
- reduce the water supply from the city water network (ACEA) by finding alternative and sustainable water sources.

A reconstruction and analysis of the following elements, through inspections and bibliographic research, was carried out:

- General water scheme.
- Urban sewer and drainage system.
- Analysis of utilities and consumption.
- Hydrology and Hydrogeology

The water use in 2020 amounted to 141,103 m3. For the study, a future request of **150,000 cubic meters/year** was assumed, divided as follows:

Use	**Consumption (m3/year)**	**Consumoption (m3/h)**
Potable uses Stadio Olimpico	50,000	5.71
Irrigation, washing, etc. Olympic stadium	40,000	4.57
All other uses for the Foro Italico	60,000	6.85
Total	**150,000**	**17,12**

The study proposed **four interventions** through which the water needs of the Foro Italico Park can be fully satisfied; the variations depend on the different dimensioning of the interventions. The different dimensions of each intervention were simulated with **three different Solutions**.

N°	**Interventions**	**Reuse (m3/year)**	**Reuse %**
1	Use of groundwater with a Reverse Osmosis purification system	From 106.000 to 150.000	66 - 100 %
2	Use of rainwater collected from the covered area of the Stadium through storage tanks and with a Reverse Osmosis purification system	From 6.000 to 24.000	4 - 16 %
3	Recirculation of irrigation water and rainwater from the uncovered area of the Olympic Stadium without purification.	From 6.000 to 10.000	4 - 6%
4	Reduction of losses (14%) and waste through a monitoring, remote control and remote regulation system (SCADA).	10.000	6%

The interventions that imply the use of the waters of the Tevere river and the dual networks have been discarded because they are too expensive and unreliable for potable water standards.

Proposed solutions

Three solutions were analised. All three solutions produce the same amount of water equal to the total estimated need for the Foro Italico Park of 150,000 m3/year. All the solutions are much cheaper than the ACEA rate which is 2.35 euros/cubic meter.

Basic solution

Total cost € 810,000 and € 0.86 per m3.

This solution makes the use of groundwater predominant but provides for all the other three interventions. It is the most environmentally sound and the most technically balanced, as it involves the use of all alternative water sources, the mixing of groundwater with rainwater and the recirculation of the stadium's irrigation water.

Basic solution	**Annual volume produced m3**	**Tank volume m3**	**Investment (€)**	**m3 cost (€)**
Well and osmosis system	120,000	400	302,000	0,50
Use of water collected from the stadium's roof	10,000	600	252,000	3,69
Water recirculation (from the uncovered parts of the stadium)	10,000	200	95,000	1,47
Reduction of water losses	10,000	0	55,000	0,68
Total	150,000	1,200	705,000	0,79
Total with general expenses 23%			**810,000**	**0,86**

Solution 1

Total cost of € 1,212,000 and € 1.2 euros per m3.
It is the most expensive because it involves the construction of a very large (2500m3) and very expensive tank, to maximize the use of rainwater.
It can be taken into consideration only in the event that, once all the analyses of the groundwater have been carried out, significantly higher treatment costs or the impossibility of using it for potable purposes are highlighted.

Interventions 3 and 4 remain unchanged.

Solution 1	**Annual volume produced m3**	**Tank volume m3**	**Investment (€)**	**m3 cost (€)**
Well and osmosis system	105,000	400	302,000	0,55
Use of water collected from the stadium's roof	25,000	2,000	252,000	3,41
Water recirculation (from the uncovered parts of the stadium)	10,000	200	95,000	1,47
Reduction of water losses	10,000	0	55,000	0,68

Total	150,000	2,600	1,055,000	1,09
Total with general expenses 23%			**1,212,000**	**1,2**

Solution 2

Total cost of € 520,000 and € 0.60 per m3.

It is the most economically convenient, it envisages maximizing the use of groundwater and discarding the use of water collected from the roof.

Interventions 3 and 4 remain unchanged.

Solurtion 2	**Annual volume produced m3**	**Tank volume m3**	**Investment (€)**	**m3 cost (€)**
Well and osmosis system	130,000	400	302,000	0,48
Use of water collected from the stadium's roof	0	0	0	0
Water recirculation (from the uncovered parts of the stadium)	10,000	200	95,000	1,47
Reduction of water losses	10,000	0	55,000	0,68
Total	150,000	800	452,000	0,56
Total with general expenses 23%			**520,000**	**0,60**

Conclusion of the preliminary study:

Despite all the limitations due to the scarcity of data, the study clearly demonstrates that replacing the ACEA water supply with alternative sources is both environmentally sustainable and economically convenient.