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CONNECTING THE DROPS: CIRCULAR WATER MANAGEMENT FOR URBAN GREENING

Workshop Day 1

Thursday 27th April 2023

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1. Executive Summary

The Circular Water Management for Urban Greening Day 1 Workshop took place on Thursday 27th April 2023. The workshop's focus was to highlight the need for more green areas in urban communities as well as encouraged attendees to come up with their own innovative solutions on making water circular economy a possibility.

The workshop was held at Esplora Interactive Science Centre in Kalkara.

Participants were able to sign up for the workshop through the link <https://water.org.mt/join-the-drops/conference-3>, where they could fill in a form, or by calling +356 2777 2777, or by sending an email to info@emcs.com.mt to register.

The ample parking spaces and Esplora's perfect location facilitated the attendance of the participants. A standing lunch was organised for all attendees as well where networking was also possible. A coffee break was organised during the workshop which provided attendees with a short break and an opportunity to network and meet new people.

In total, 99 people attended this conference: comprising of 73 students and 26 experts and lecturers. The attendees were made up of private and public individuals, NGOs, and different ministerial representatives. All attendees registered their attendance at the registration desk. The workshop was open to all.

The workshop lasted till late in the afternoon and was hosted by two well-known TV presenters and moderators: Ian Busuttil and Ashley Peschel who animated the event. The workshop consisted of six presentations delivered by different experts in the sector as well as a panel discussion. Throughout the report, one can find the presentations that were used by the various speakers, as well as the key points of each speech.

Apart from an exhibition stand set up by the Water Be the Change, there were multiple exhibition stands including that of Project Green and Ambjent Malta. MCAST presentation posters from students were situated at the exhibition area. Various Water Be the Change campaign related merchandise items including pencils, pens, notebooks and sticky notes were displayed at the registration desk and exhibition stand and handed out to participants. Other merchandise was prepared for every individual and placed on their respective tables, which were used during the Deep Dive Hackathon.

2. Conference Agenda

Date: April 27th, 2023

Venue: Esplora, Kalkara, Malta

Time

08:30 Registration & Welcome Coffee

08:45 Welcome and Introduction

09:00 Opening of Day 1

Keynote on Circular Water Management for Urban Greening | Mr Manuel Sapiano
Panel discussion on the local water scenario
Introduction to The Deep Dive Challenge: Integrating rainwater harvesting and greywater reuse for urban greening | Mr Boudewijn Grievink & Ms Laura Roebroek

09:45 Teambuilding Exercise - understanding the value in each of the members of the team

10:30 Exploration of The Challenge at Hand

12:00 Lunch & Marketplace

12:45 Current Innovation Cases – Part 1

Connecting The Drops: Circular Water Management for Urban Greening | Mr Antoine Gatt
Designing and Assessing Sustainable Water Reuse Systems | Dr Paul Refalo
Characterising the ecohydrology of Wied il-Luq sub-catchment | Mr Alexander Borg Galea
New Water: Investment in the Resource for Irrigation for Agricultural Purposes | Mr Jake Diedo
The Restoration of Degraded Habitats and Landscapes in Malta with a Particular Focus on Chadwick Lakes | Mr Eman Calleja

13:30 Exploration of Possible Solutions for The Challenge: Ideas with Coffee Break

14:30 Sharing of Results

15:00 Closing

3. Detailed report of conference proceedings

3.1 Keynote Speech

MR MANUEL SAPIANO, CEO, ENERGY AND WATER AGENCY

TITLE: CIRCULAR WATER MANAGEMENT FOR URBAN GREENING

Mr Sapiano addressed the audience and introduced the topic of Circular Water Management for Urban Greening. He asserted that it is much more pleasing to see trees and greenery than concrete, further stating that water cannot be forgotten in the equation, as green requires water. He stated that the scope of this discussion is to move towards a comprehensive approach. This being the reason why a thorough discussion is needed with the participants.

According to Mr Sapiano, the idea of urban greening is a northern one, that is, in Northern Europe and Northern America. The Maltese landscape tends to be browner. Thus, Mr Sapiano posited whether the Maltese population actually wants greenery, and if so, by what means will water be obtained for such greenery. When water is needed, the easiest thing to do is to increase supply. However, Mr Sapiano argued for an alternative option: limiting the demand. He gave the example of using vegetation which has already thrived on the Maltese islands for a number of years rather than using alien vegetation which might require more water.

The Energy and Water Agency (EWA) have developed an education centre on water conservation, referred to as "GHAJN", and is situated in Rabat. Mr Sapiano stated that all the vegetation in this establishment is local. He went on to say that when they opened in summer, the first few comments they received on social media were negative ones due to the fact that the vegetation was not green. Thus, people's perception and education is important.

Mr Sapiano encouraged the attendees to think deeply on what needs to be done and to develop comprehensive solutions during the workshop and beyond. He acknowledged that there has been a lot of development in the energy field and questioned whether water could be given the same importance, whether net zero water could become a possibility like net zero energy. It is always important to keep in mind that in order to have a more sustainable future, the current way of doing things need to be challenged constantly.

He then went on to introduce and explain the function of the EWA which is to formulate and coordinate the implementation of the Government's national policies for energy and water, as well as EU legislation for energy and water sustainability. EWA also acts on laws



and sets in motion policies related to renewable energy, energy efficiency, water demand management, and the security of Malta's electricity, gas and water supply. Mr Sapiano asserted that this two-day workshop will not end with then. The outcomes faring from the participants will be analysed and a follow up can lead to ideas which can eventually be developed further, leading to positive results.

He concluded by saying that the discussion at hand is about water management in a dense urban context, which is challenging. However, Mr Sapiano maintained that opportunities come when there is a challenge. Once more, he expressed the need to work together in order to start developing a more sustainable vision for the future. He closed off his speech by thanking his team for the organisation of the event and thanking all of the attendees.

3.2 Panel discussion: The Local Water Scenario

MR MANUEL SAPIANO, CHIEF EXECUTIVE OFFICER, ENERGY AND WATER AGENCY

The Energy and Water Agency is a policy agency which supports the Government. Mr Sapiano stated that the process of developing policy can happen in different ways. Data needs to be collected and analysed to be able to show the real situation on the water environment at present and in order to come up with proposed policy. Through extensive modelling and research, Mr Sapiano affirmed that EWA forecasts Malta's energy and water demands and work to ensure energy and water are delivered across the country in an environmentally stable way.

MR ALEXANDER BORG GALEA, CHIEF SCIENTIFIC OFFICER, AMBJENT MALTA

Mr Borg Galea asserted that the purpose of Ambjent Malta is to come up with and implement projects. He went on to state that in order to implement such projects, there needs to be a multidisciplinary team. Although Ambjent Malta does not solely focus on water, Mr Borg Galea maintained that in order to improve a particular habitat, it is essential to look into the water demand. Thus, the water aspect is very important.

MR STEVE ELLUL, CHIEF EXECUTIVE OFFICER, PROJECT GREEN

Project Green has been tasked with cleaning up the country. Mr Ellul stated that in the last four months, ever since the agency was set up, Project Green has been hitting the ground running. They have started projects on parks and green open spaces. Mr Ellul ascertained that the agency's commitment is to change the way the Maltese islands look. Further stating that the only way to achieve such a task is by getting those present at the workshop on board.

MS ADIEL CUSCHIERI, MINISTRY FOR PUBLIC WORKS AND PLANNING

Ms Cuschieri stated that, although her focus is on redistributing storm water in urban areas, the Ministry for Public Works and Planning department has other units which focus on other things, such as coastal erosion and storm water units.

SRNA STAJIC, ASSISTANT ENVIRONMENT PROTECTION OFFICER, ENVIRONMENT AND RESOURCES AUTHORITY (ERA)

Ms Stajic stated that she is part of the water team in ERA. She elaborated that her role plays an important part in the Urban Wastewater Directive. One of most important roles are

programmes of measure and protection of marine waters. Ms Stajic stated that ERA is part of the Barcelona Convention. She highlighted that the organisation is treating urban wastewater from the industrial sector. ERA is also in line with the Nitrates directive: implementing policies to protect our waters from nitrates.

MR TREVOR CHIRCOP BRAY, MANAGING PROFESSIONAL DISCHARGE PERMITTING, WATER SERVICES CORPORATION

Water Services Corporation is a local utility company responsible for the collection and distribution of water. Mr Chircop Bray stated that the company keeps tabs on local industries. However, he went on to state that the company is much larger than this. According to Mr Chircop Bray, wastewater is now considered as a resource.

MR ANDREW CAMILLERI, SENIOR ENVIRONMENTAL HEALTH PRACTITIONER, ENVIRONMENTAL HEALTH DIRECTORATE

Mr Camilleri affirmed that the Environmental Health Directorate deals with the health aspect of the environment, having one unit that deals specifically with water. He stated that their water unit specialises in investigating diseases relating to water.

QUESTION: WHAT KIND OF JOBS ARE AVAILABLE IN YOUR ORGANISATION?

MR ANDREW CAMILLERI, SENIOR ENVIRONMENTAL HEALTH PRACTITIONER, ENVIRONMENTAL HEALTH DIRECTORATE

Mr Camilleri stated that the Environmental Health Directorate offers jobs for environmental health officers. The aforementioned job role does not deal with just water but with other aspects as well, such as food. He maintained that the organisation deals with other entities; thus, making it a group effort.

MR TREVOR CHIRCOP BRAY, MANAGING PROFESSIONAL, WATER SERVICES CORPORATION

According to Mr Chircop Bray, Water Services Corporation employs around 1,100 people and is one of the largest entities in Malta. The Corporation ranges expertise from science, law, engineering, architecture, accountancy, social sciences, and so on. Mr Chircop Bray maintained that they cater for an all-round process. Thus, job opportunities are quite rich. Furthermore, the Corporation tends to manage a lot of projects and is one of the most successful in Malta in using EU funds.

SRNA STAJIC, ASSISTANT ENVIRONMENT PROTECTION OFFICER, ENVIRONMENT AND RESOURCES AUTHORITY

As an Authority, the Environment and Resources Authority (ERA) needs to be in line with legislation. Ms Stajic declared that the whole entity itself offers interesting work opportunities as it presents a holistic picture.

MS ADIEL CUSCHIERI, MINISTRY FOR PUBLIC WORKS AND PLANNING

Ms Cuschieri asserted that the Ministry for Public Works and Planning is very similar to the Water Services Corporation. She went on to state the job roles which the attendees would find the most interest in, namely architects, engineers, and project managers. Ms Cuschieri assured that the employees' backgrounds are very diverse, having, for instance, project managers working with a geology background. She concluded that there is a boom for such projects at the moment.

MR STEVE ELLUL, CHIEF EXECUTIVE OFFICER, PROJECT GREEN

Mr Ellul stated that Project Green is at that stage of capacity building. The organisation needs a lot of architects, project managers, environmental scientists, administrators, and so on. Mr Ellul emphasised the importance of looking for a career prospect and not a job, and to never be siloed in one job description. He suggested to the attendees to look for mentors and not jobs; to find people that help them grow in their knowledge. He closed off by remarking that Project Green just needs people that want to deliver.

MR ALEXANDER BORG GALEA, CHIEF SCIENTIFIC OFFICER, AMBJENT MALTA

Mr Borg Galea stated that he feels privileged as he is able to change and improve things through his work in Ambjent Malta. He added on to this by stating that the people that work in Ambjent Malta are very fortunate as they are able to create observable change. Due to this, the organisation needs a lot of different types of expertise, ranging from engineering, to IT, and so on.

MR MANUEL SAPIANO, CHIEF EXECUTIVE OFFICER, ENERGY AND WATER AGENCY

Mr Sapiano described policy as planning the future. He explained that in the case of Malta, since it is a member state of the European Union, planning the future for Malta needs to be done in tandem with other countries. The aforementioned organisation is developing the know how through data to be able to sustain Malta. This data, which is collected all throughout the year, comes from fieldwork and from other entities. The EWA then needs to analyse it. Thus, there is an element of coding and statistics. Due to this, the agency



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needs a lot of different types of expertise, ranging from science, law, engineering, architecture, accountancy, social sciences.

Mr Sapiano affirmed that a very multidisciplinary team is needed in this regard. He concluded that this organisation has a very strong international component to it as it sees what is out there, brings it to Malta, and makes it work for the Maltese islands.

3.3 The Deep Dive Challenge

MR BOUDEWIJN GRIEVINK & MS LAURA ROEBROECK, SENIOR PROJECT MANAGER & SENIOR PROJECT LEADER, WIJ ZIJN KATAPULT

TITLE: INTRODUCTION TO THE DEEP DIVE CHALLENGE: INTEGRATING RAINWATER HARVESTING AND GREYWATER REUSE FOR URBAN GREENING

Ms Roebroeck started the presentation by listing off some of the current major societal problems, namely: water scarcity, water redundancy, heat island effect, mental health issues, city pollution, decline in biodiversity, and world population growth. She asserted that as soon as a city becomes greener, the effect of heat lessens, and it also has a positive effect on mental health.

Malta is very densely populated and still growing. Plants can reduce smog, protect against UV radiation, reduce flooding, and are very good for wellbeing. Ms Roebroeck maintained that there is scientific research behind her statements.

Mr Grievink elaborated that although in their hometown there is not much space, they still have greenery. City councils all across Europe are looking to become greener in cities. Mr Grievink gave the example of Utrecht, where its citizens got rid of the concrete and put green instead.

Building on this point, Ms Roebroeck posited that in order for this to occur, a shift in paradigms is required: from ego to eco, from me to us, as vegetation needs a lot of water. Thus, if the water problem is not solved, cities will never be filled with green.

They then introduced the hackathon, which is defined as an occasion where individuals work in a quick and collaborative manner over a condensed amount of time. Ms Roebroeck outlined the participants' assignment for these two days workshops: on Day One they would be developing their ideas and finding problems, while on the second day they would be developing their solution and pitch it to a team of jurors. She explained that they would be starting with some team building exercises, with every table choosing a particular problem to solve and guidance provided by mentors throughout this process.

Dr Michael Schembri Chief Policy Officer from EWA announced that the winning team and those individuals who distinguish themselves will be offered a paid internship with EWA.

Mr Grievink reiterated the importance of knowing one another before diving into the content of the exercise. He then declared that now is the time to start working on this green dream of Malta. Ms Roebroeck agreed that now is the time to choose the main problem.



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Mr Grievink assured the participants that they could be as negative as they want to be with their proposed issue. He went on to explain their task with an example, as such: make a list, divide it in three columns, and write down the three main problems of water in three minutes. Once that is done, each participant would read another participant's list of problems and choose which problems are the most important and try to tackle it.

3.4 Current Innovation Cases – Part 1

MR ANTOINE GATT, RESEARCH SUPPORT OFFICER II, FACULTY FOR THE BUILT ENVIRONMENT, UNIVERSITY OF MALTA

TITLE: CONNECTING THE DROPS: CIRCULAR WATER MANAGEMENT FOR URBAN GREENING

During his presentation, Mr Gatt introduced the audience to the concept of Green Roofs as part of green infrastructure. He defined green infrastructure as an intentionally built and managed network of natural and semi-natural areas with environmental features that provide a range of ecosystem services and enhance biodiversity. Mr Gatt explained that a green roof is a roof with a growing medium on it, which can be categorized into three types: extensive (requiring little maintenance), semi-intensive, and intensive (requiring high maintenance).

Moving on to the benefits of green roofs, Mr Gatt outlined how they offer advantages to individuals, society, and the environment. He then discussed the construction of green roofs, emphasizing how various layers such as the roof slab, damp proofing, root barrier, protection layer, drainage board, filter fabric, substrate, and vegetation can help eliminate building issues and problems.

He went on to explain how Mr Gatt and his team conducted a study to assess whether green roofs could be constructed in Malta and found that it was a success. They concluded that green roofs could improve air quality and reduce flooding by collecting between 60% to 80% of most rainfall. Based on their findings, they were able to publish green roof standards and advocate for green roof policies.

Mr Gatt emphasized the need for incentives to encourage the adoption of green roofs. He presented four ways to incentivize the population: direct financial incentives, indirect financial incentives, ecological compensation, and incorporation into regulations.

Questions

1. What happens if your home is not designed for a green roof?
Response: The building can be retrofitted and needs to be certified by a structural engineer. However, one can always work around a specific size.
2. Can you select the type of growing medium used?
Response: If the selected substrate is one that absorbs a lot of water then this is not suitable as the roof will get very heavy. However, if one chooses to use native plants one does not want a substrate that soaks up a lot of water.
3. Is it a big financial investment?
Response: It all depends on what design you are going for. Something that is more intricate will be more expensive. However, it is important to keep in mind the benefits of having a green roof.

4. Would a green roof work in Malta in our scorching summers?

Response: It is important to remember that plants need sun and water to grow. In summer there isn't enough water however the team managed to keep the University of Malta green roof going with minimal water throughout the summer. However, one needs to keep in mind the species they are choosing when designing the green roof. Plants that are native will require less water.

DR PAUL REFALO, SENIOR LECTURER, FACULTY OF ENGINEERING, UNIVERSITY OF MALTA

TITLE: DESIGNING AND ASSESSING SUSTAINABLE WATER REUSE SYSTEMS

Dr Refalo's presentation focused on the design and evaluation of sustainable water systems. He began by engaging the attendees on their understanding of sustainability and subsequently explained the concept of sustainable thinking. This entails three key elements:

1. **Systems thinking:** Acknowledging that the system being designed will not operate in isolation but rather in tandem with other systems.
2. **3-Pillar thinking:** Ensuring that the system benefits not only the environment but also the financial and social aspects of the community.
3. **Lifecycle thinking:** Considering the full lifespan of the system and its impacts through life cycle assessments.

Dr Refalo ended his delivery by explaining a study he worked on with a team, in collaboration with the University of Malta and MCAST, to develop a greywater system. Before its implementation, the team evaluated its environmental performance and conducted a life cycle assessment with a baseline to reduce its carbon footprint.

MR ALEXANDER BORG GALEA, CHIEF SCIENTIFIC OFFICER, AMBJENT MALTA

TITLE: CHARACTERISING THE ECOHYDROLOGY OF WIED IL-LUQ SUB-CATCHMENT

Mr. Borg Galea's presentation delved into the characterization of the ecohydrology of Wied il-Luq sub-catchment, which is a 2km target area (approximately 20ha) situated upstream and is Malta's largest catchment area, located in Buskett. The project was based on four pillars aimed at:

1. Improving the hydrological regime by enhancing spring yield, discharge, and connectivity.
2. Enhancing ecological function.
3. Restoring water infrastructure of heritage value and potential for recreation.

4. Establishing a long-term monitoring and management system.

The research team discovered that for the habitat to thrive, it requires a constant flow of water, hence their focus on restoring and improving the area's infrastructure to improve watercourse flow. They are also implementing a monitoring plan to gather data for better understanding and ensuring system resilience to climate change. The baseline studies being monitored include three significant spring point sources, spring-valley bed physical continuity, and the water harvesting network.

During the presentation, Mr. Borg Galea also discussed the primary land alterations and main stresses faced by the sub-catchment, which included urbanization, plantation of orange groves, afforestation projects, privatization of land, quarrying, nutrient loading, high-risk recreational impacts, invasive alien species, and fly-tipping.

In conclusion, Mr. Borg Galea briefly outlined the project's strategic objectives, which are focused on hydrology, ecology, and recreational/didactic aspects.

Questions

1. Can you use the infrastructure that there is already?

Response: They are trying their utmost to use what there already is.

2. Where does the water in the catchment area go?

Response: The area itself is quite rural and there is a high percentage of the water that goes into the aquifer.

MR JAKE DIEDO, PROJECT MANAGER AT WATER SERVICES CORPORATION

TITLE: NEW WATER: INVESTMENT IN THE RESOURCE FOR IRRIGATION FOR AGRICULTURAL PURPOSES

In Mr Diedo's presentation, the focus was on the utilization of New Water, a term used to describe the high-quality water that results from the Water Services Corporation's (WSC) process of treating and filtering wastewater. Mr Diedo began by providing an overview of the WSC, emphasizing their responsibility in providing safe potable water and properly treating wastewater. He then delved into the process of sewage treatment, which involves the removal of bacteria, chemicals, and remaining pollutants, and is carried out at three different plants located on the Maltese Islands.

Mr Diedo highlighted the strategic placement of New Water dispensers around the islands, with approximately 360 currently in use, and plans to add another 60 in the future. These dispensers are connected through a network of pipes located under various fields, enabling farmers and other sectors, such as landscaping, to access the treated water.

According to Mr Diedo, the WSC has observed an increase in the catchment area for New Water as awareness and usage among farmers has grown. He also outlined their ambitious target of distributing 7 million cubic meters of New Water per year by 2030. Overall, the presentation showcased the successful utilisation of New Water and the WSC's commitment to providing safe and sustainable water solutions for the Maltese Islands.

Questions

1. Can the pollutants be used or recycled?

Response: The sludge collected is used as compost.

2. Can the water be supplied to urban areas?

Response: there is a distinction between entity and agricultural use. WSC are currently only providing this water for agricultural use. However, one can noticed that the demand is a lot greater than the supply.

3. Is the new water fit for organic farmers to use?

Response: The New Water is termed as Class A and one can irrigate directly with it and directly eat the leaf it would have watered.

4. How can you use the New Water?

Response: Currently one needs to be registered as a farmer on Jobsplus in order to benefit from this. However, they are revamping the whole system and therefore they are looking into other different options or cases.

5. How can you access the water?

Response: The infrastructure is underground and if the is close to a dispenser one can connect directly to it, however, if this is not the case one can fill a bowser and transport the water to the agricultural land.

DR EMAN CALLEJA, INSTITUTE OF APPLIED SCIENCES, MCAST

TITLE: THE RESTORATION OF DEGRADED HABITATS AND LANDSCAPES IN MALTA WITH A PARTICULAR FOCUS ON CHADWICK LAKES

Dr Calleja's presentation focused on the restoration of degraded habitats and landscapes in Malta, with a specific emphasis on Chadwick Lakes. The speaker began by defining what an intermittent stream is, which is a stream or river that is dry for a certain period of time. Chadwick Lakes, for example, only has water flow for 8 months of the year.

Before commencing the restoration project, the team had to select a target habitat. To do this, they examined similar areas in Sicily and chose a stream there that they could replicate specific systems.

The steps taken to restore the habitat were as follows:

1. Weed bed clearance
2. Widening of the stream bed
3. Introduction of numerous willows
4. Utilization of bio-engineering systems to stabilize the stream flow
5. Conducting a training course

The majority of the work was carried out during the COVID-19 period. The team has now established a more diverse habitat, and several irrigation systems have been installed to aid in the growth of new plants. Dr Calleja concluded the presentation by stating that they were fortunate to have someone from Nature Trust presently managing the site.

Questions

1. What were the greatest challenges?


Response: One of the major challenges encountered was managing the high volume of visitors to the site, which posed a significant risk to the conservation efforts. Despite the positive intentions of the visitors, their actions often resulted in inadvertent destruction of the ecosystem. Additionally, natural elements also posed a challenge to the project, such as the occurrence of a severe storm which caused significant damage to the piping infrastructure.

2. What plants should you plant in a water catchment area?

Response: In order to select suitable vegetation for a particular area, it is important to consider the duration of water flow. In the case of longer water flows, plants such as willow poplars and ash trees are appropriate. On the other hand, if the water flow is shorter, lasting only 2-3 days, species such as carob and oak trees would be more suitable. However, it is crucial to conduct a thorough study of the area before selecting any plant species for planting.

3. Are the crayfish a threat to the plants and trees?

Response: Dr Calleja stressed that they are a very invasive species and that they effect the freshwater vertebrates.



Once the presentations were completed Laura & Boudewijn explained the next task for the participants attending the Workshops. This was to develop as many solutions as possible on integrating rainwater harvesting and greywater reuse for green urban areas and then pick the best one to work on it into more in detail for the second day.



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5. Presentations

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Challenges towards a utopic green future city for all earthlings
Lars van Ginkel





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What major societal problems are we facing?

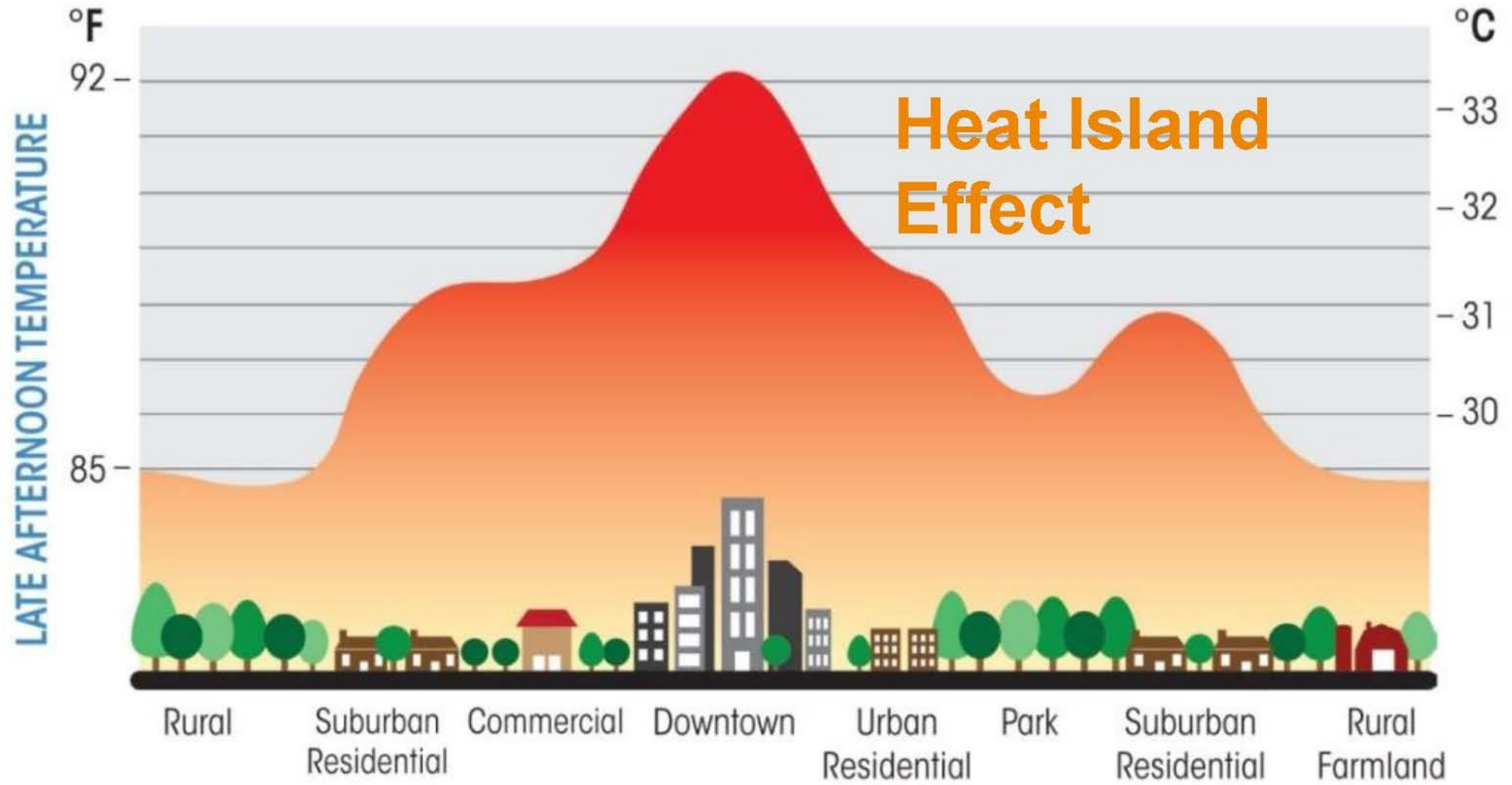




Water scarcity

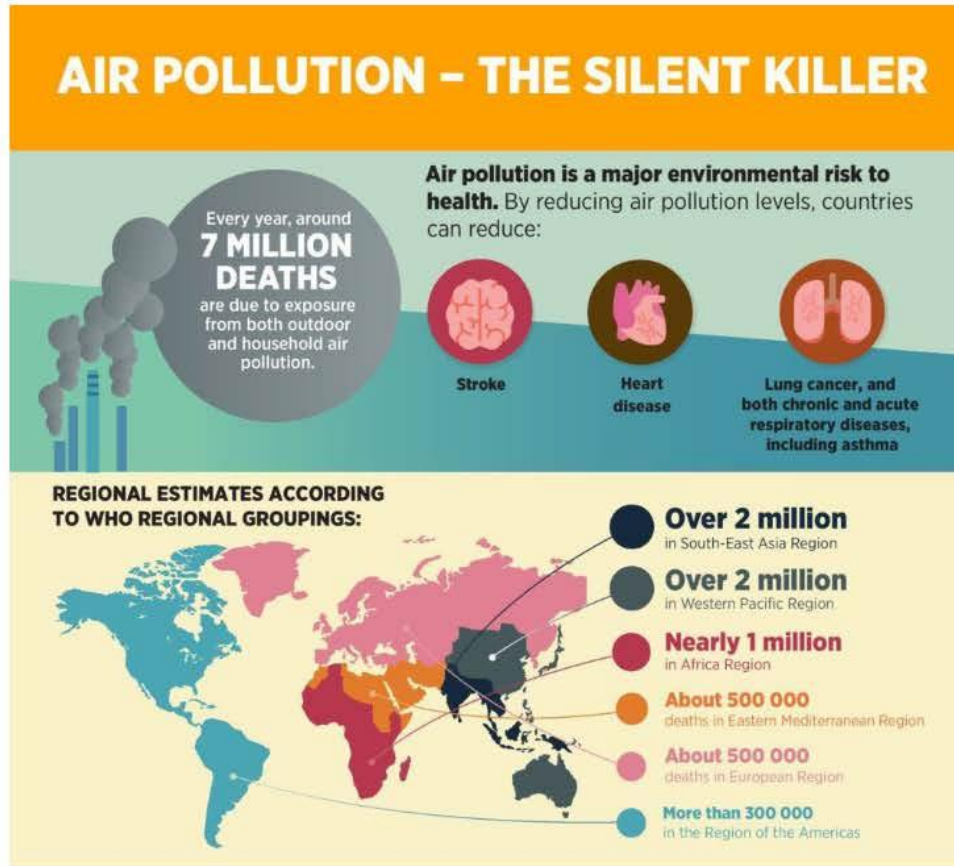
Water redundancy





(Mental) Health issues





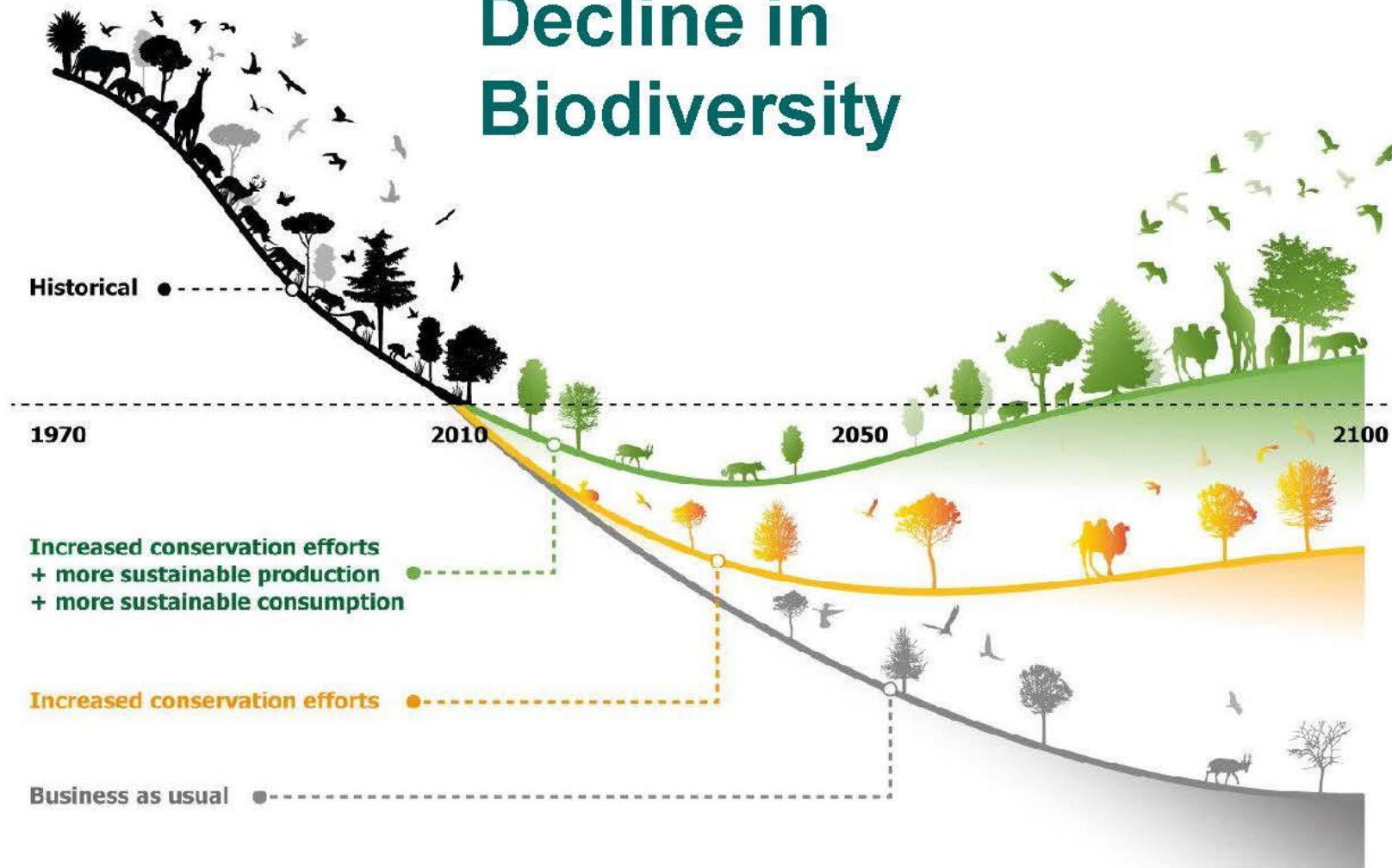
CLEAN AIR FOR HEALTH

#AirPollution



City pollution

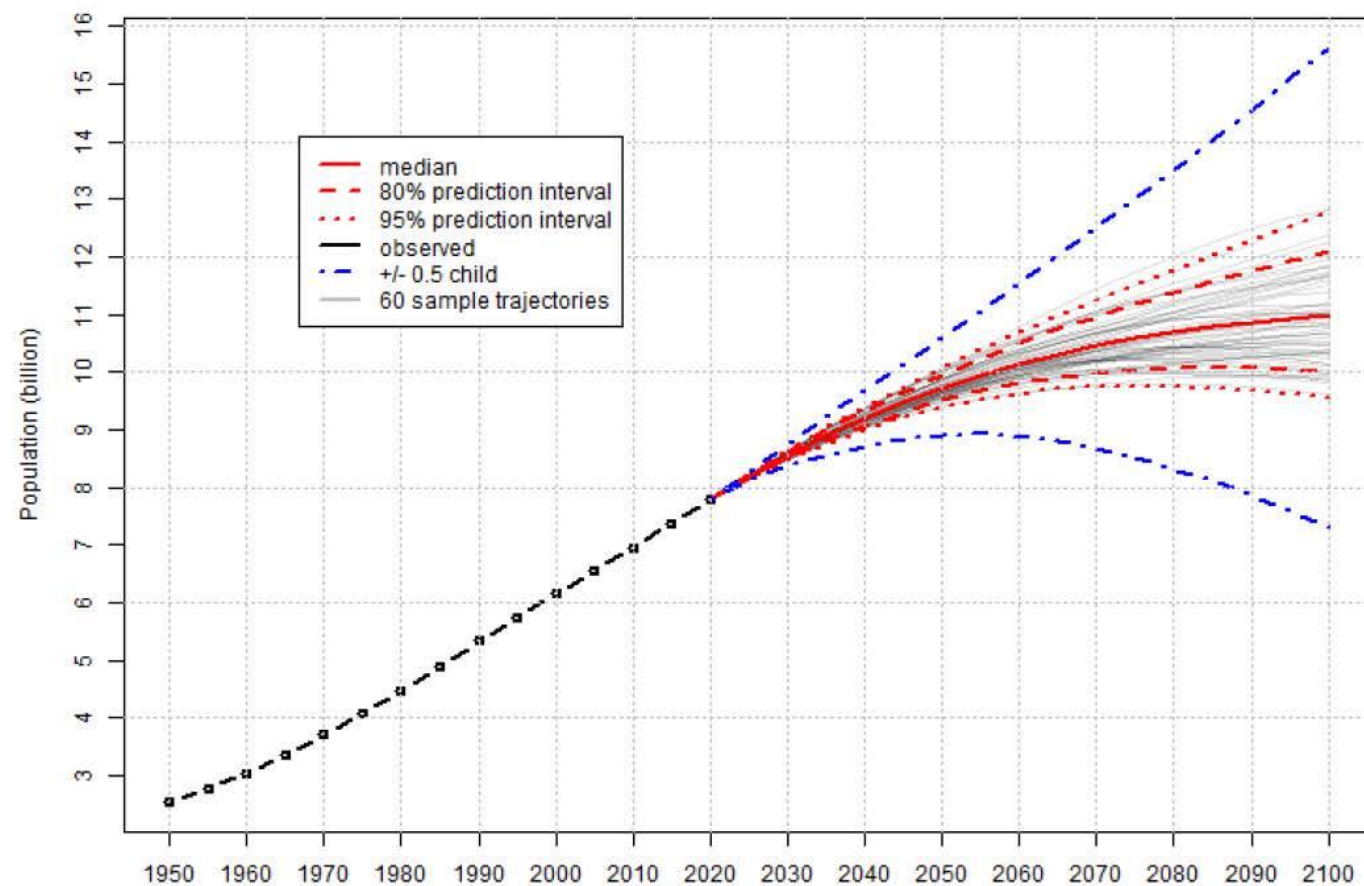
Decline in Biodiversity



This artwork illustrates the main findings of the article, but does not intend to accurately represent its results (<https://doi.org/10.1038/s41586-020-2705-y>)

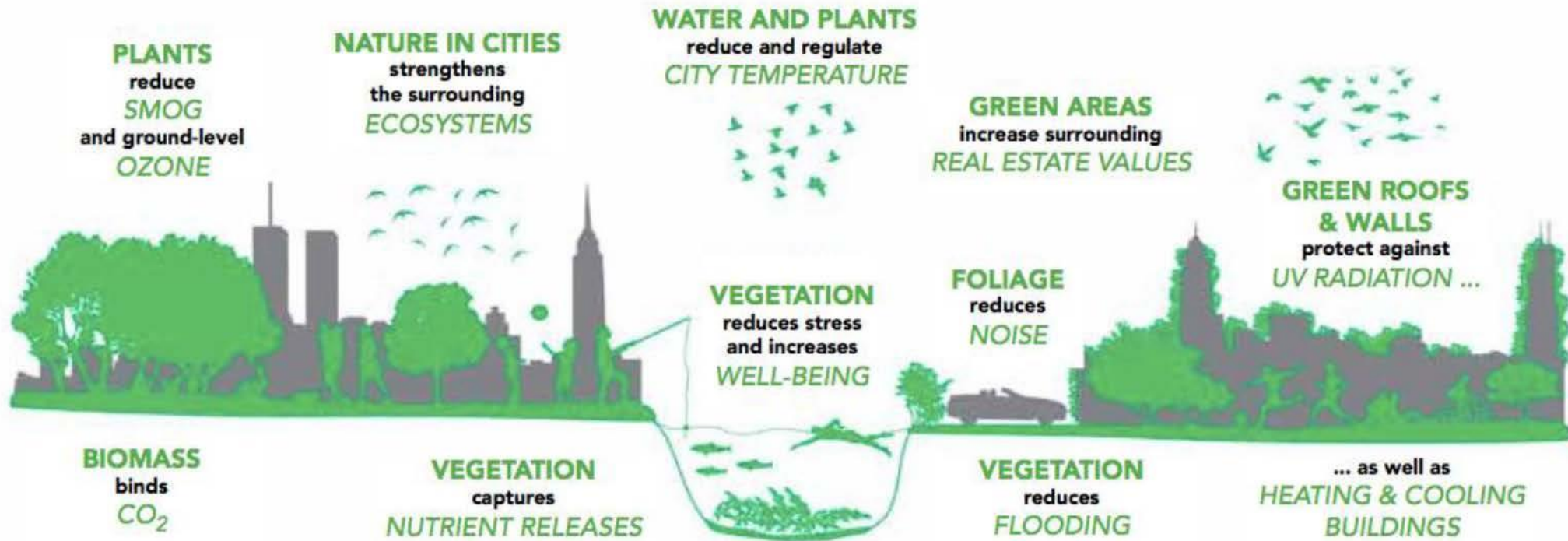
World population growth

World: Total Population



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United Nations, DESA, Population Division. *World Population Prospects 2019*. <http://population.un.org/wpp/>



The potential of Green Solutions




The potential of Green Solutions

JOURNAL ARTICLE EDITOR'S CHOICE

Biodiversity and human health: mechanisms and evidence of the positive health effects of diversity in nature and green spaces ^{FREE}

Raf Aerts , Olivier Honnay, An Van Nieuwenhuysen  Author Notes











British Medical Bulletin, Volume 127, Issue 1, September 2018, Pages 5–22,

 Landscape and Urban Planning 

Volume 134, February 2015, Pages 221–228

Research Paper

Go greener, feel better? The positive effects of biodiversity on the well-being of individuals visiting urban and peri-urban green areas

Giuseppe Carrus ^a  , Massimiliano Scopelliti ^b  , Raffaele Laforteza ^c  , Giuseppe Colangelo ^c  
 , Francesco Ferrini ^d  , Fabio Salbitano ^e  , Mariagrazia Agrimi ^f  , Luigi Portoghesi ^f  , Paolo Semenzato ^g  
 , Giovanni Sanesi ^c  

 Environmental Pollution 

Volume 159, Issues 8–9, August–September 2011, Pages 2119–2126

Positive effects of vegetation: Urban heat island and green roofs

T. Susca ^{a, b}  , S.R. Gaffin ^b  , G.R. Dell'Osso ^a  

Green Perspectives for Public Health: A Narrative Review on the Physiological Effects of Experiencing Outdoor Nature

by  Daniela Haluza ^{*}  ,  Regina Schönbauer and  Renate Cervinka

Institute of Environmental Health, Center for Public Health, Medical University of Vienna, Kinderspitalgasse 15, A-1090 Vienna, Austria

Green roofs against pollution and climate change. A review

[Yanling Li](#) & [Roger W. Babcock Jr.](#) 

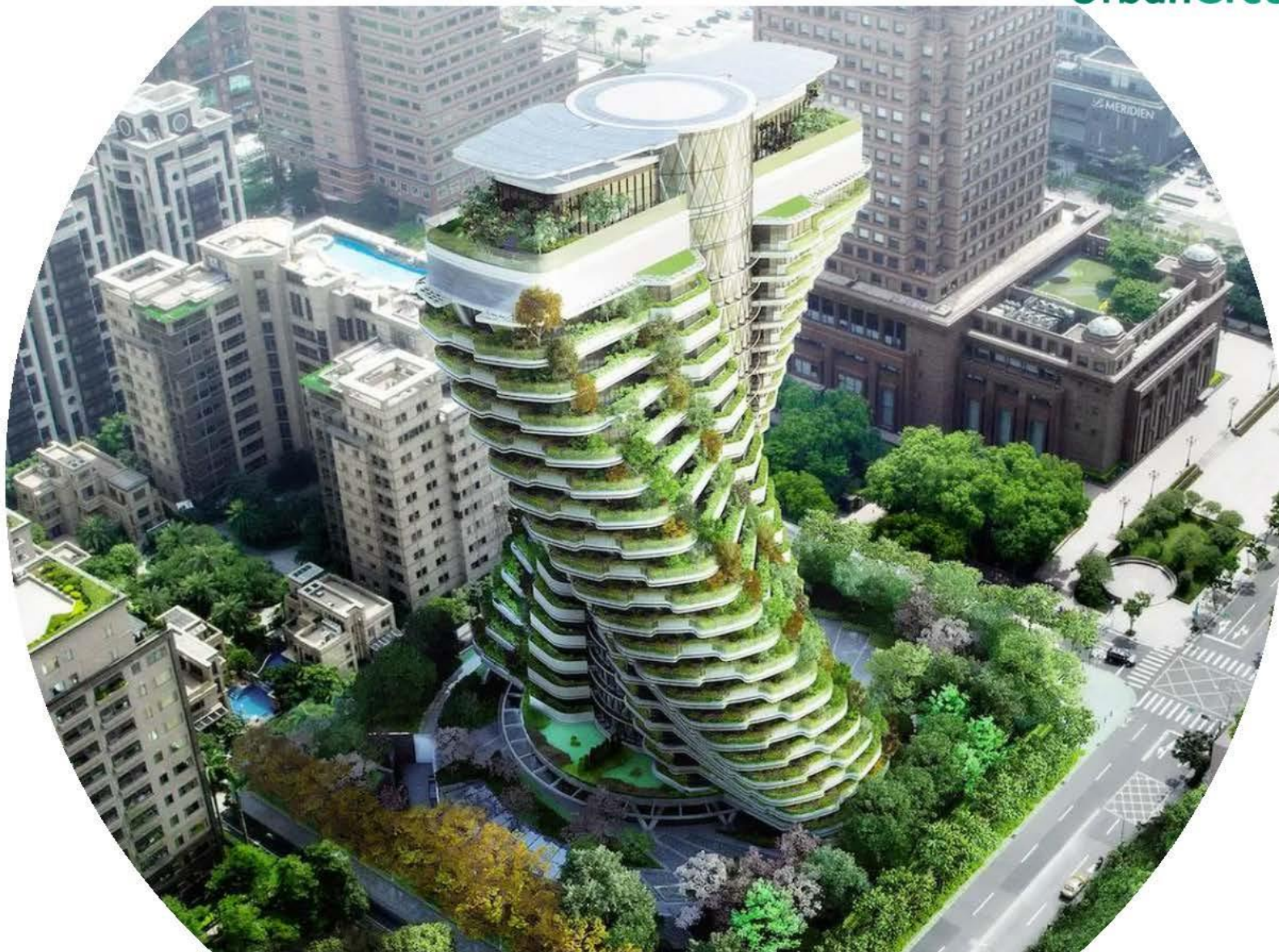
Agronomy for Sustainable Development **34**, 695–705 (2014) | [Cite this article](#)



The utopic green city of the future, for all earthlings

Our big hairy audacious goal













Reinventing Society | Render Vision (CC BY NC SA 4.0) | www.realutopien.de



EGO



ECO



This urban environment demands a paradigm shift



Sustainability and water

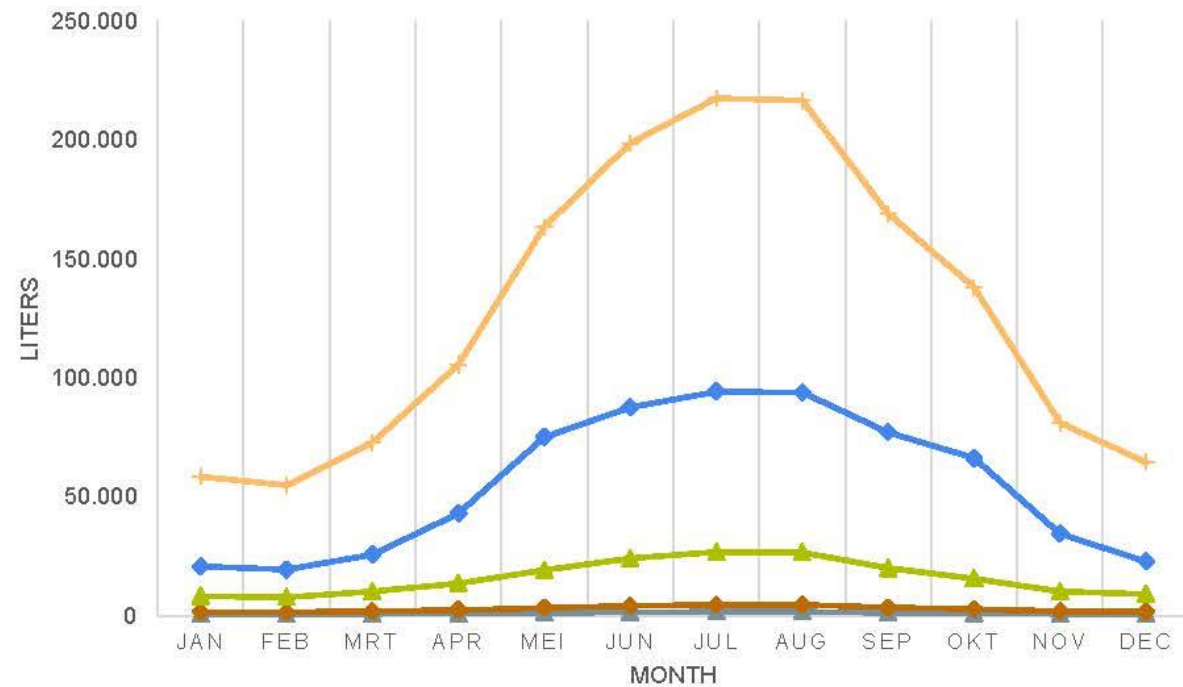
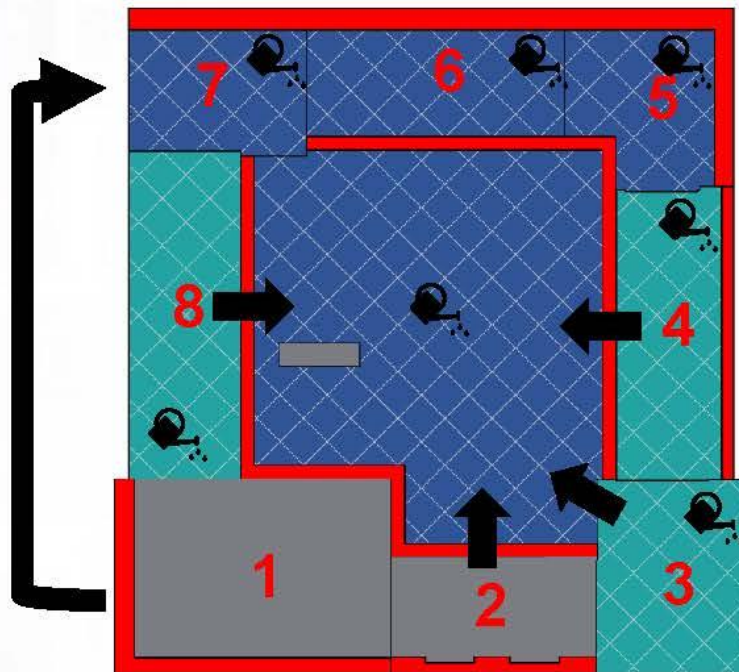
www.ginkelgroep.nl



1950m² of vegetation needs up to 200k liters of water per month

EVAPORATION/WATERNEED VEGETATION PER MONTH

◆ A binnentuin
 ■ B liftgebouw
 ▲ C parkeergebouw
 ▲ D valleidaken
 — Totaal



[BUSINESS](#) [TECH](#) [NATURE](#) [INNOVATION](#) [DROUGHT](#) [WEATHER](#) » [MORE TAGS](#)

MONDAY, 26 SEPTEMBER 2022 - 08:43

SHARE THIS:



Looming drinking water shortage a threat to the Netherlands, suppliers say

Water companies in the Netherlands said that a combination of drought, pollution, and the growing population is a threat to the supply of clean, potable water in the country, they said in a letter. A shortage of drinking water could be just a few years away, the companies said [according to NRC](#).

2 minute read · August 3, 2022 3:40 PM GMT+2 · Last Updated 3 months ago

Dutch government declares water shortage due to drought

[NATURE](#) [IRRIGATION](#) [IRRIGATION BAN](#) [DROUGHT](#) [RIJKSWATERSTAAT](#) [WATER BOARD](#)
» [MORE TAGS](#)

MONDAY, 9 MAY 2022 - 15:30

More measures taken as Netherlands' spring drought continues

SHARE THIS:



Shortage of drinking water imminent, Dutch water companies warn



26 September 2022, By [Victoria Séveno](#)

A report published by 10 major [Dutch water companies](#) has warned that much of the [Netherlands](#) faces an imminent shortage of drinking water, largely due to population growth, pollution, and drought.



Reinventing Society | Render Vision (CC BY NC SA 4.0) | www.realutopien.de





The utopic green city of the future, for all earthlings

Our big hairy audacious challenges

Challenge: A balanced waste- & rainwater cycle in green urban areas

We know how to collect water, filter water and reuse both grey and rainwater. How do we create a balanced system with the reuse of waste & rain water to create a self-sustained and water-balanced utopic green country?

Wouldn't it be great if we...

...could make Malta fully water-balanced and self-sustainable in water (re)use?

Assignment: find a creative solution on

'How can we create a balanced system with reuse of waste & rain water to achieve the goal of creating a self-sustained and water-balanced utopic green country?'

How to deal with the likely enormous amount of water required?

How to deal with enormous cloudbursts and/or long periods of drought?

How to deal with possible competition on water between users?

What other challenges do we expect in such an self-sustaining city?

How can we ensure that the water quality is sufficient for the purpose?

DEEP DIVE URBAN GREENING BLUE FOR GREEN

April 27th & 28th 2023 – The Malta Edition !



Co-funded by the
Erasmus+ Programme
of the European Union



EuropeanPlatform
UrbanGreening 

DOON 
ideate.validate.create



**KATA
PULT**



What is a hackathon???



A hackathon is an event where people engage in rapid and collaborative engineering over a relatively short period of time such as 24 or 48 hours.

Global Outline Deep Dive



Preparation:

- Inspiration and in-depth deepdives
- Training coaches

Thursday April 27th

Day 1: Team building and definition

- TEAMBUILDING
- EXPLORE THE CHALLENGE AND DEVELOP AN IDEA

DESIGN THINKING

Friday April 28th

Day 2: design solution and pitching

- CREATE YOUR SOLUTION
- PRESENT AND SELL YOUR SOLUTION

AGILE / SCRUM

LEAN START-UP

The assignment for this Deep Dive

Day 1

- Explore your challenge & define a main issue (dream big!)
- Develop an idea for a solution

Day 2

- develop/build/design your solution
- visualise your solution
- prepare a max 5-minute pitch



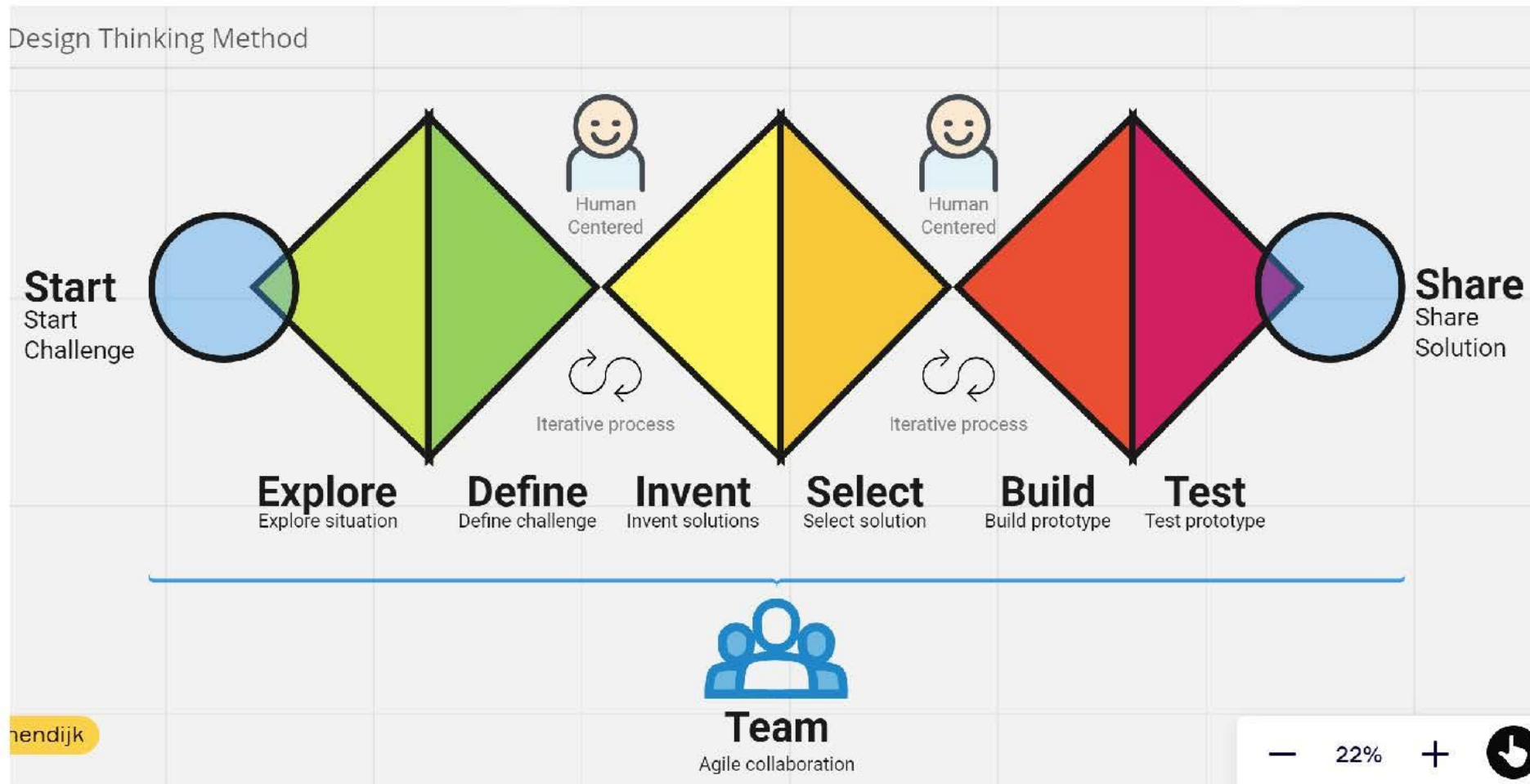
Five sprints in two days

- Teambuilding
- Explore the challenge and choose a main problem or issue
- Develop possible ideas and choose the best

- From an idea to a good solution
- Prepare your pitch



Design thinking methodology



Teambuilding

15 mins

- Who are you?
- What do we not know about you?
- What would your mum say is your talent?
- What can you add to the group?

In couples: interview each other

Pitch the other to the group

Make a talent map for these two days!



Explore challenge & choose main problem

- **Black hat** (3 minutes)
What 2-3 big problems can you come up with – regarding water & green?
- **Brainwriting:** Make a good analysis
Elaborate by shifting paper every 3 minutes
What are obstacles, problems and issues? But also opportunities & chances.
- **Summarize** on Flipover: what are the clusters of problems?
- **Choose** the 'best' problem to work on (dot voting)
- (start brainstorming on solutions, but only if you have time left)



Session 3: Develop possible ideas and choose the best

- **Silent brainstorm**
- Present to each other & **cluster**
- **Magic wand**: Wouldn't it be great if....
- Write on the table cloth: use images, texts, drawings, arrows etc. Build upon each others ideas

- **The selection box + dot voting**: choose the best solution

- prepare your **5 mins presentation** to the group
 - What problem did you identify?
 - What is your idea to solve it?
 - What (or who) do you need to develop idea into proper solution?



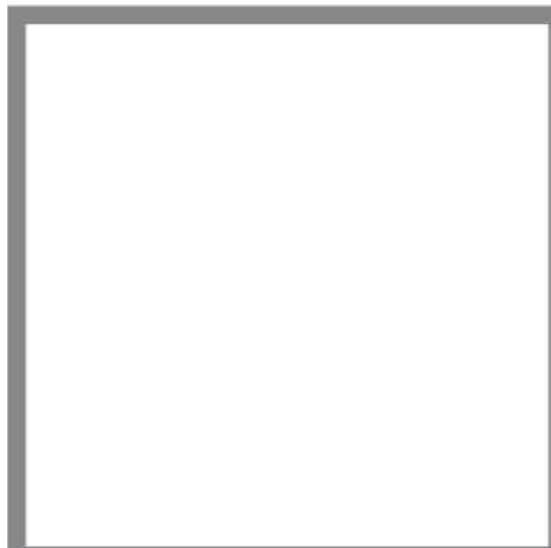
COCD BOX

For:

Date:



not (yet)
feasible ideas



YELLOW IDEAS

Ideas for the future
Dreams & Challenges
Can be the red ideas of tomorrow

HOW

feasible ideas

BLUE IDEAS

Easy to implement
Few risks involved,
High acceptability
Past examples available

NOW

RED IDEAS

Innovative ideas
Breakthrough
Exciting ideas
Can be implemented

WOW

common ideas

original ideas



From an idea to a good solution

- Elaborate on your idea
- For whom is it a solution? Who is the end user? What consumer insights do you have?
- How does it work?
- Develop the storyline of your idea
- Use all the knowledge and network available in the workshop
- Visualise!!! Use LEGO, draw, film, whatever!

Result is 3-5 minute pitch for jury



Pitch training

- Gadgets!
- What is the problem / challenge?
- What is your solution?
- How does it work?
- Why is this the best possible solution?



Questions?



THE ENERGY & WATER AGENCY IN COLLABORATION WITH MCAST & UNIVERSITY OF MALTA INVITE YOU TO AN INTERACTIVE WORKSHOP ON:

CONNECTING THE DROPS

CIRCULAR WATER MANAGEMENT FOR URBAN GREENING

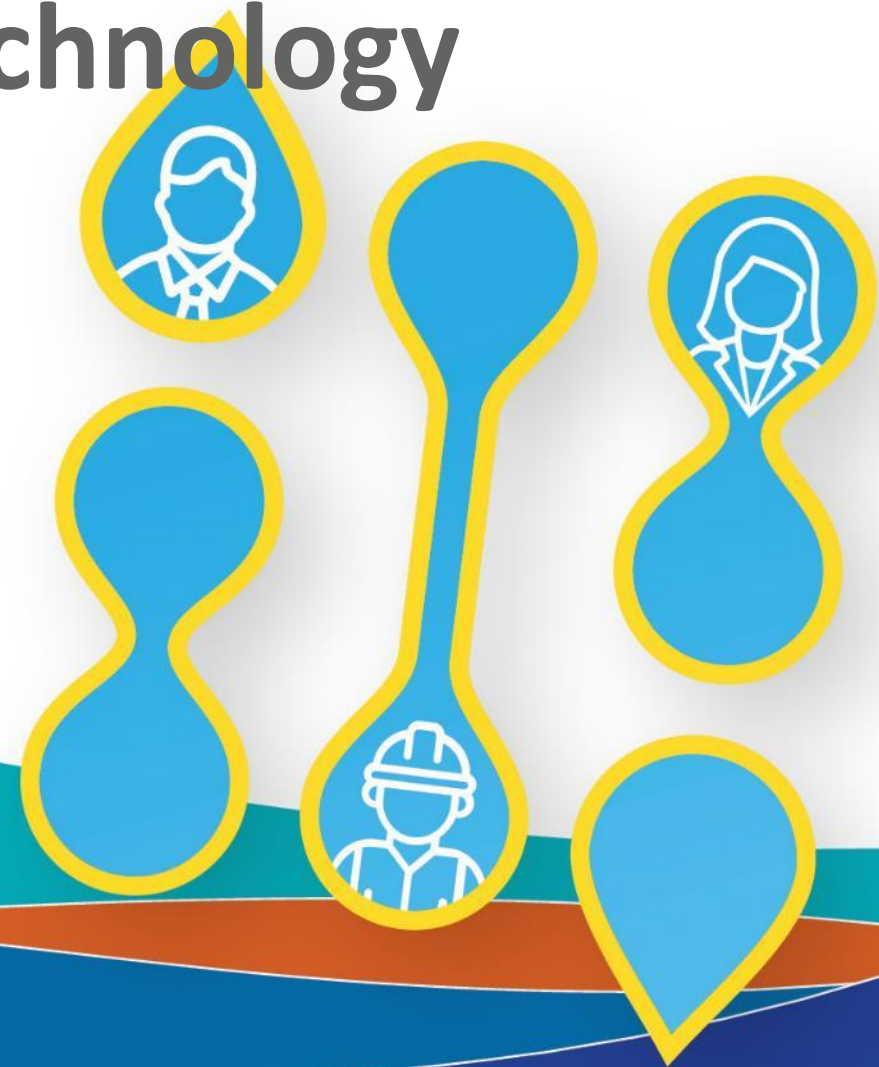


THU 27TH APRIL 2023 | FRI 28TH APRIL 2023

WATER.ORG.MT

Incentivising Green Roof technology

Antoine Gatt - Landscape Architect
Research Support Officer, Uni of Malta



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Some definitions...

What is infrastructure?

the basic physical and organizational structures and facilities (e.g. buildings, roads, power supplies) needed for the operation of a society or enterprise.

<https://languages.oup.com/google-dictionary-en/>

What is grey infrastructure?

Grey infrastructure refers to structures such as dams, seawalls, roads, pipes or water treatment plants.

<https://www.conservation.org/projects/green-gray-infrastructure>

What is green infrastructure?

“A strategically planned network of natural and semi-natural areas with other environmental features, designed and managed to deliver a wide range of ecosystem services, while also enhancing biodiversity.”

https://environment.ec.europa.eu/topics/nature-and-biodiversity/green-infrastructure_en



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... more definitions...

What is a green roof?

A roof on a building or other structure which is partially or completely covered with an engineered substrate which is then planted up.

Green roof can be

- Extensive
- Semi-intensive
- Intensive



Benefits of green roofs

Urban areas are riddles with issues compromising quality of life. Green roofs mitigate these issues and render urban areas resilient to climate change.

For the individual:

- Increase in property value
- Increase in insulation
- Reduction in air-conditioning costs
- Increase PV efficiency
- Reduction in carbon footprint
- Reduction in repairs and costs
- Amenity space
- Visual respite
- Buffers noise
- Improves public relations - corporate

For Society:

- Reduction in urban heat island
- Reduce flooding
- Increase in aesthetic value
- Increase economic activity
- Increase environmental awareness
- Increase in ecosystem services
- Improves air quality
- Reduces energy demand
- Improves aesthetics
- Increases well-being
- An educational tool
- Climate change mitigation/adaptation

For the environment:

- Provide wildlife habitat
- Provide foraging ground
- Replaces lost habitats
- Prevents sewer overflow
- Replenishes oxygen
- Reduces water contamination



How are green roofs constructed?

Various components are laid down on the roof to eliminate issues. These layers guarantee the protection of the underlying structure from damage.



7. Vegetation
6. Substrate
5. Filter fabric
4. Drainage board
3. Protection layer
2. Root barrier
1. Roof slab and damp proofing



Case study – LifeMedGreenRoof project

tested the technology and successfully adopted it to the local situation.

Findings:

- Identified ideal growing medium
- Identified suitable plant species
- Established thermal performance
- Established flood mitigation potential
- Published green roof standard(SM3700:2017)
- Published a green roof policy proposal document



WATER
BE THE CHANGE

How do we incentivise green roofs?



Many countries incentivise green roof to reap their benefits
Malta seems to be lagging behind – lack of understanding
- political reasons

Issuing incentives and development regulations which target owners of different building types will ensure a wider uptake of the technology.
Making green roof installation mandatory for certain building types is also an option which should be considered and investigated (Ngan , 2004).



How do we incentivise green roofs?

Direct financial incentives: Direct financial incentives take the form of subsidies paid to property owners who construct green roofs very similar to the PV panel incentives in Malta.

Indirect financial incentives: These relate to property owner is charged for storm water fees the pay-per-use concept of storm water disposal. The based on the total area of impervious surfaces over a property.

Ecological compensation: Greenfield and brownfield sites within urban areas provide important ecosystem services and are an important conservation hub (Dearborn & Kark, 2010). Thus the construction of buildings over such sites deprive society from such benefits. To a certain extent, green roofs can be said to compensate in part to this reality.

Incorporation into regulations: The adoption of green roof technology should be based on two actions if it is to be successful; incentives and regulations. Incentives are adopted voluntarily by the benefactors whereas regulations are imposed. Through such regulations, specific developments could be targeted and minimum performance stipulated.





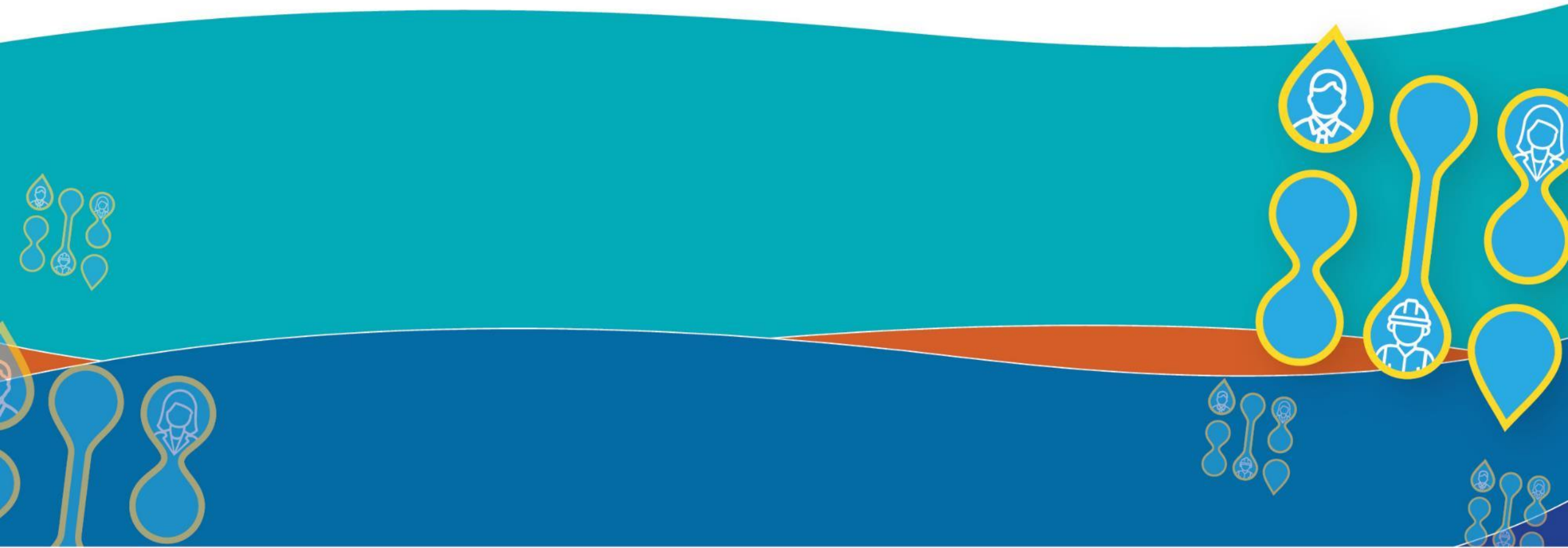
GOVERNMENT OF MALTA

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EU funds for Malta
2014-2020



MCAST



L-Università ta' Malta



Operational Programme I – European Structural and Investment Funds 2014-2020
"Fostering a competitive and sustainable economy to meet our challenges"
Project part-financed by the Cohesion Fund
Co-financing rate: 85% European Union Funds, 15% National Funds



Designing and Assessing Sustainable Water Reuse Systems

Dr Ing. Paul Refalo
Senior Lecturer

Department of Industrial and Manufacturing Engineering
Faculty of Engineering - University of Malta

WATER
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Sustainable Thinking



- **Systems Thinking**
- **3-Pillar Thinking**
 - Financial
 - Social
 - Environmental
- **Lifecycle Thinking**

Sustainable Thinking

Life Cycle Assessments

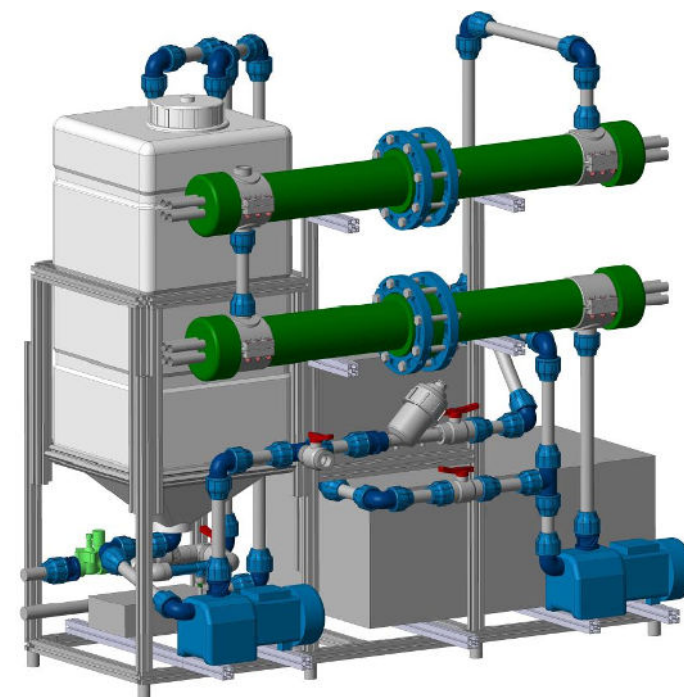
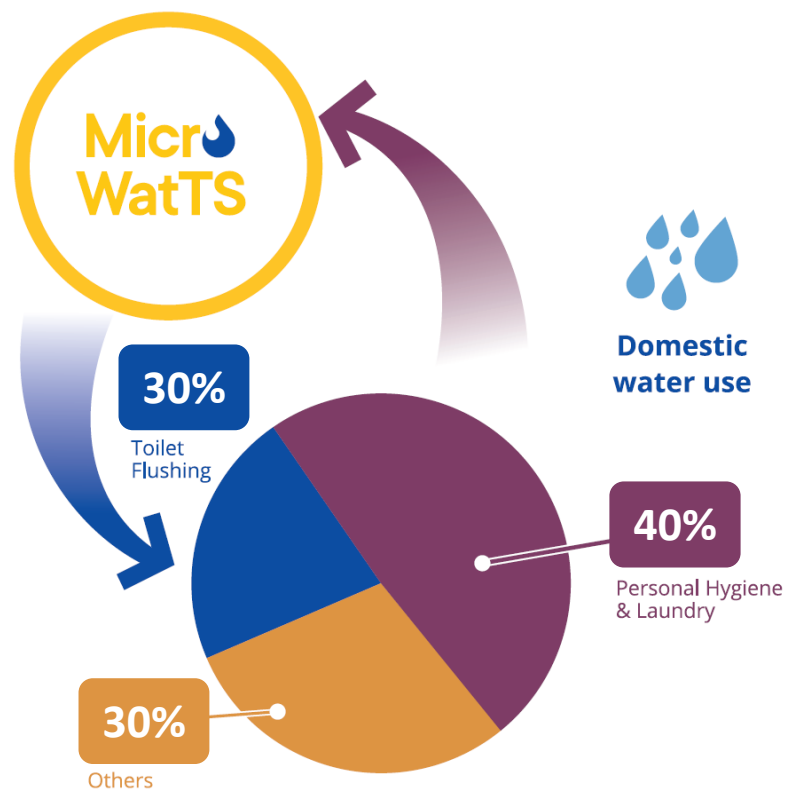
To assess and compare various environmental impacts quantitatively, over the whole lifecycle.



Assessing Water Reuse Systems

Micro Wastewater Treatment Systems using Photocatalytic Surfaces

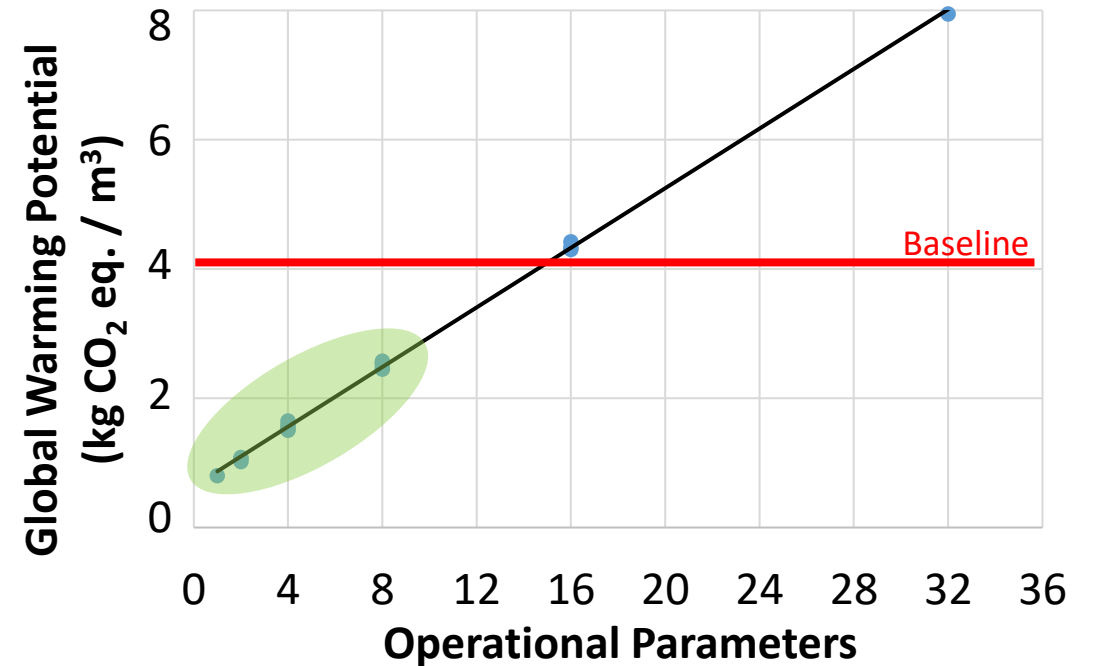
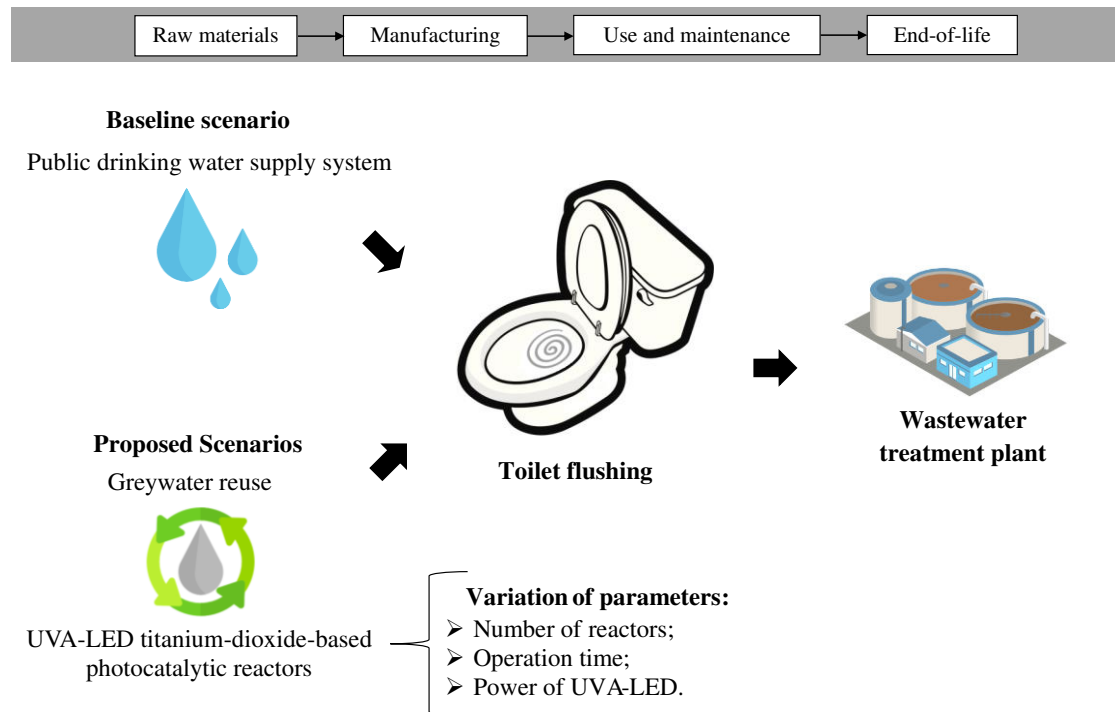
Hugo de Simone Souza, Paul Refalo, Maurice Grech, Stephen Abela, Julian Mamo, Ryan Xuereb, Luciano Falqui



Assessing Water Reuse Systems

Micro Wastewater Treatment Systems using Photocatalytic Surfaces

Hugo de Simone Souza, Paul Refalo, Maurice Grech, Stephen Abela, Julian Mamo, Ryan Xuereb, Luciano Falqui



Thank You



Dr Ing. Paul Refalo

paul.refalo@um.edu.mt



L-Università ta' Malta
Faculty of Engineering

Department of Industrial
& Manufacturing
Engineering



WATER
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Characterising the ecohydrology of Wied il-Luq sub-catchment

Alexander Borg Galea
Chief Scientific Officer

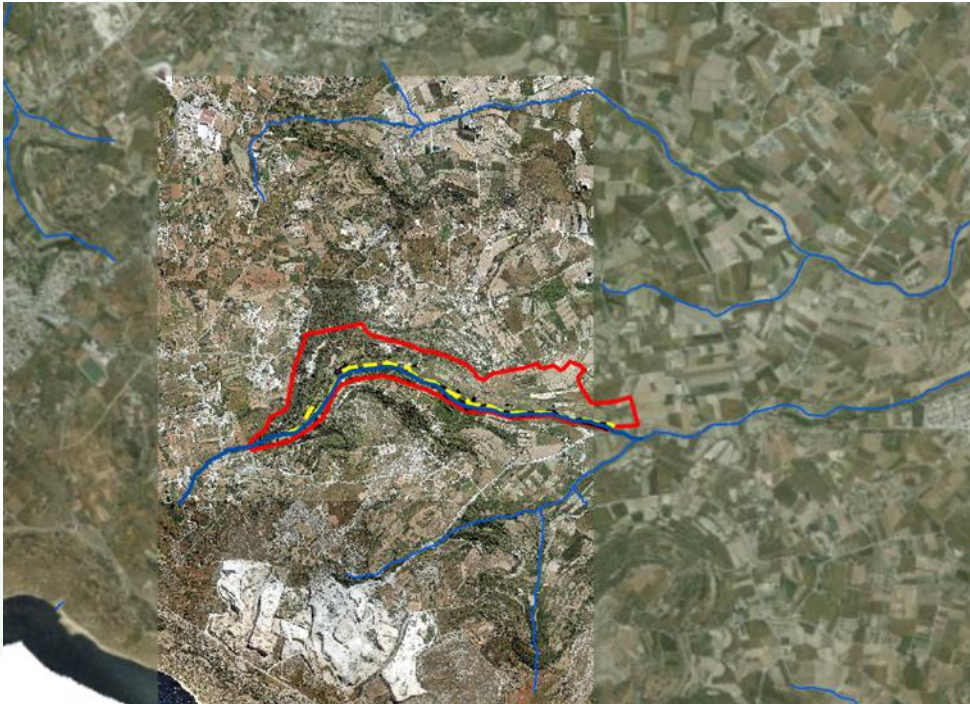


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ENERGY AND ENTERPRISE





Project Area



- Target area is a 2km stretch – approx. 20ha
- Upstream watercourse in Malta's largest catchment



Project Pillars

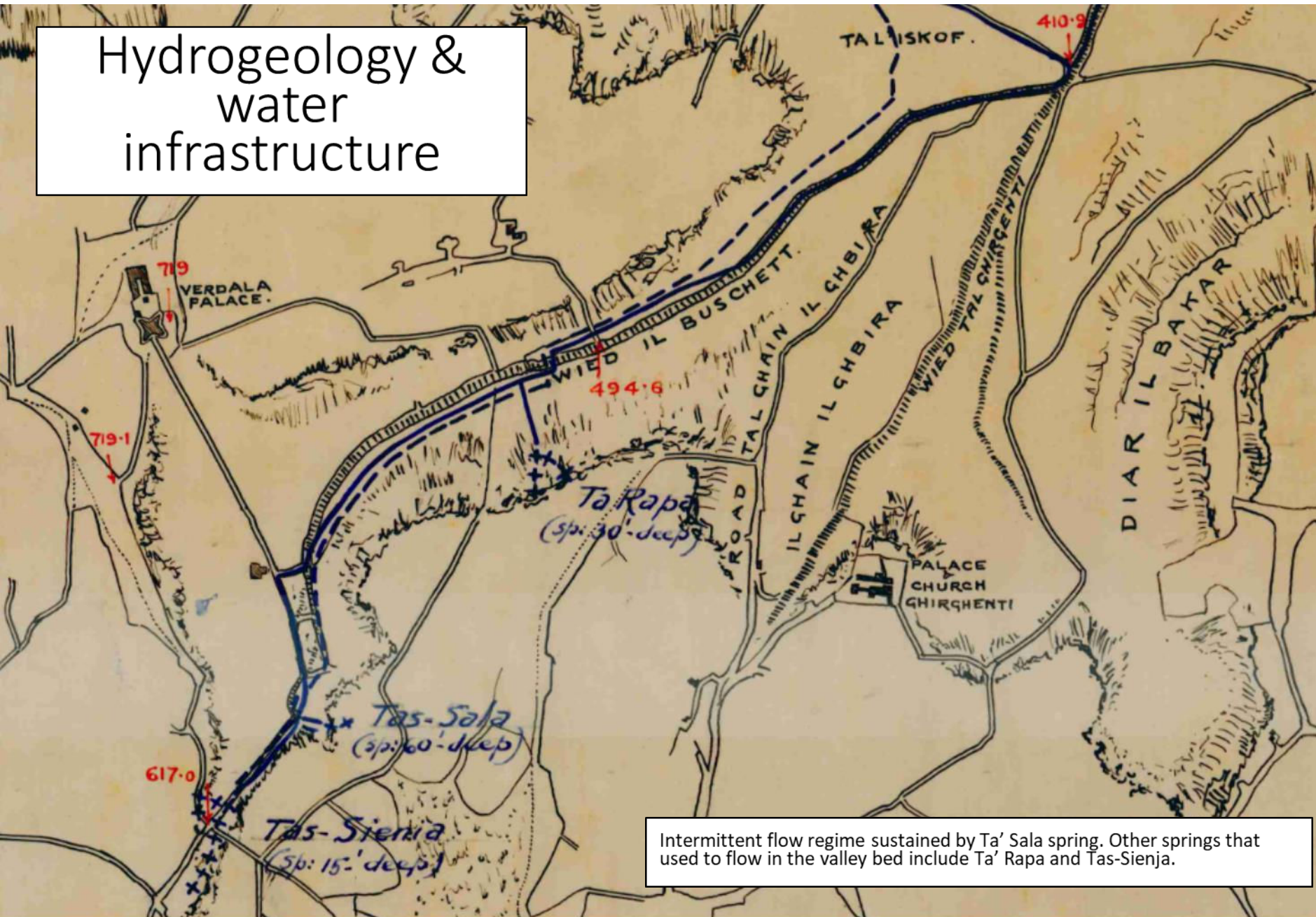
Improving the hydrological regime – spring yield, discharge and connectivity

Amelioration of ecological function

Restoring water infrastructure of heritage value and potential for recreation

Establishing a long-term monitoring and management system

Hydrogeology & water infrastructure



Intermittent flow regime sustained by Ta' Sala spring. Other springs that used to flow in the valley bed include Ta' Rapa and Tas-Sienja.



- 3 major spring point sources (Sala, Sienja and Rapa)
- Spring – valley bed physical continuity
- Water harvesting network



Land alterations and main stresses

- Urbanization (Roads, private dwellings..)
- Plantation of Orange Grove
- Afforestation projects
- Privatization of Land
- Quarrying
- Nutrient loading
- High risk recreational impacts
- Invasive alien species
- Fly tipping





Strategic objectives

Hydrology

- Maintain water and spring stewardship for ecological purposes
- Reduce groundwater use and nutrient load in a buffer area
- Restore Spring – Valley bed – Habitat continuity and flow
- Upgrade water retention capacity
- Restoration of existing spring systems
- Establishment of environmental flows
- Monitoring and reporting system

Ecology

- Control and/or eradication of invasive and non-native species
- Reduce soil loss and accumulation of sediment
- Explore possibilities for new habitats for flora and fauna
- Expansion of existing habitats (flora and fauna)
- Inventorization of ecological assets
- Potential introduction of new species
- Restore water specialist species

Recreational /Didactic

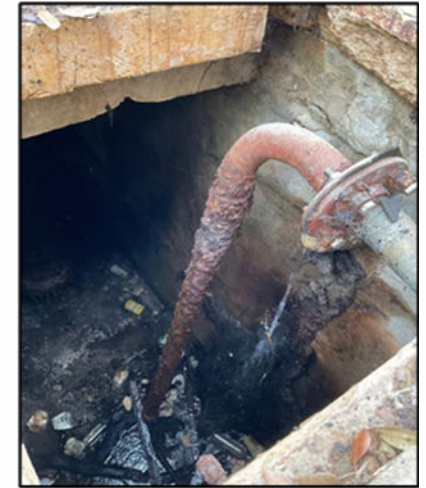
- Establish new attractive recreational areas
- Remodulation of visitor infrastructure
- Establish new footpaths and access ways
- Establish a Buskett Water Heritage Trail
- Cycling route
- Provide didactic and research opportunities





Main Project Actions

- Establishment of E-flows
- Participatory stakeholder engagement
- Control of IAS
- Restoration and use of historic water features
- Reduce soil loss and watercourse siltation through the restoration of existing retaining walls
- Introduction of tracking trail connecting downstream Wied il-Luq to Buskett Woodland
- Establishment of facilities to monitor meteorological, hydrological, hydro-morphological and ecological parameters to inform valley management and provide opportunities for didactic and research activities





NEW WATER

INVESTMENT IN THE RESOURCE FOR
IRRIGATION FOR AGRICULTURAL
PURPOSES



JAKE DIEDO



WATER SERVICES CORPORATION

OVERVIEW

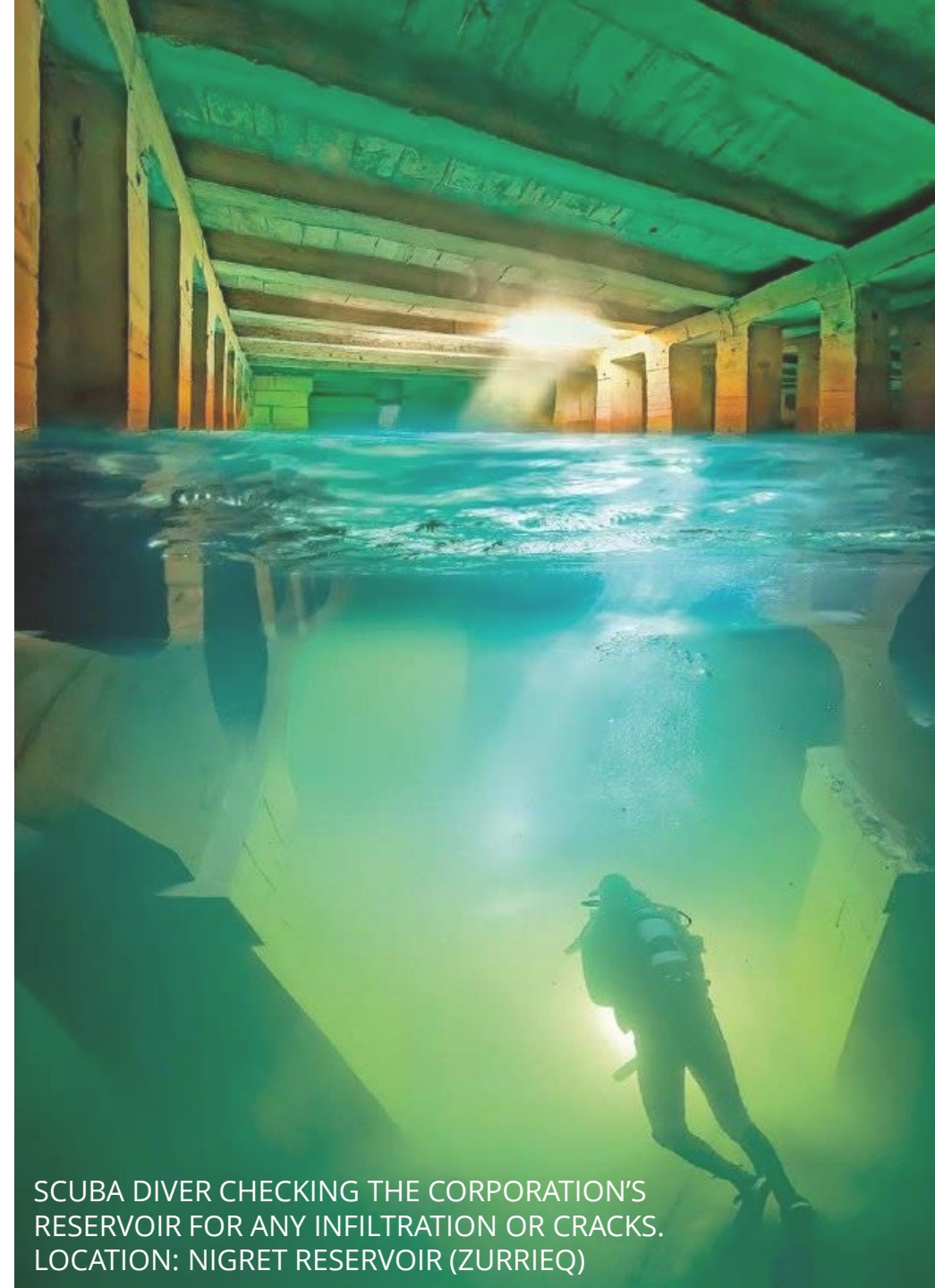
RESPONSIBLE FOR THE COMPLETE **DRINKING** AND **WASTEWATER CYCLE** IN THE **MALTESE ISLANDS**

- PRODUCTION OF DRINKING WATER
- COLLECTION TREATMENT AND SAFE DISPOSAL OF WASTEWATER (SEWAGE)

CONSTANTLY MOVING TOWARDS A BETTER **CIRCULAR ECONOMY** & A '**NET ZERO IMPACT**' ON THE WATER CYCLE

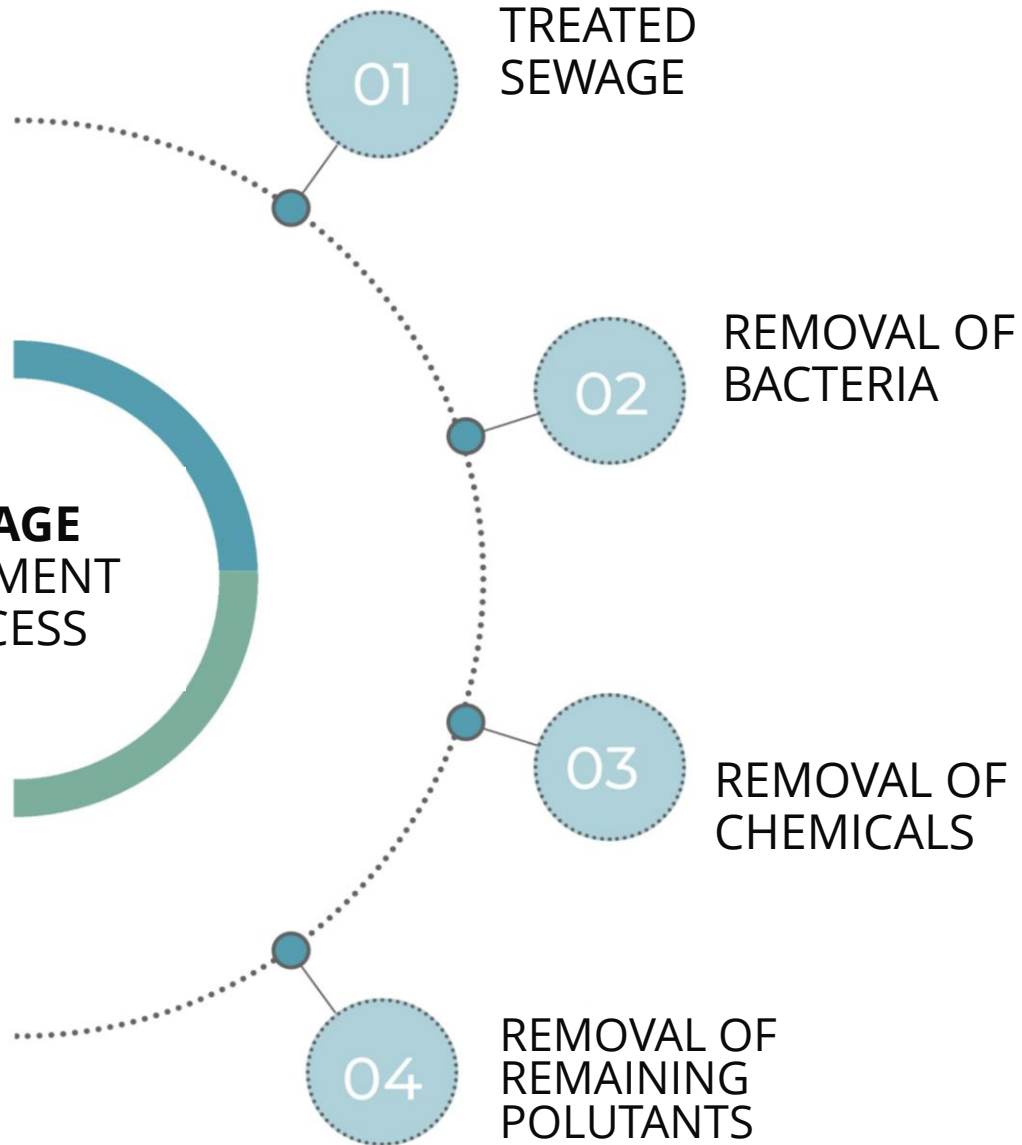
TREATS AND FILTERS WASTE WATER WHICH RESULTS IN A **HIGH-QUALITY WATER** WHICH IS **SAFE** FOR THE **ENVIRONMENT** AND FOR USE BY **AGRICULTURAL**, AND **LANDSCAPING** SECTORS.

THIS TREATED WATER IS CALLED ***NEW WATER***



SCUBA DIVER CHECKING THE CORPORATION'S RESERVOIR FOR ANY INFILTRATION OR CRACKS. LOCATION: NIGRET RESERVOIR (ZURRIEQ)

SEWAGE TREATMENT PROCESS





GOZO REGION

8.5 KM PIPELAYING
DUCTILE IRON AND
FIBER OPTIC CABLES
(TRENCHING)

52 DISPENSERS

**RAS IL-HOBZ
STP**



NORTH REGION

24 KM PIPELAYING
DUCTILE IRON AND
FIBER OPTIC CABLES
(TRENCHING)

104 DISPENSERS

**IC-CUMNIJA
STP**

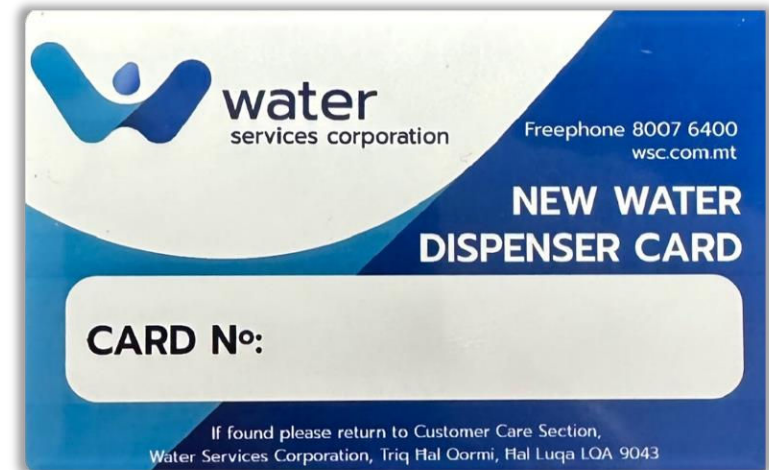
SOUTH REGION

31KM PIPELAYING
DUCTILE IRON AND
FIBER OPTIC CABLES
(TRENCHING & HDD)

212 DISPENSERS

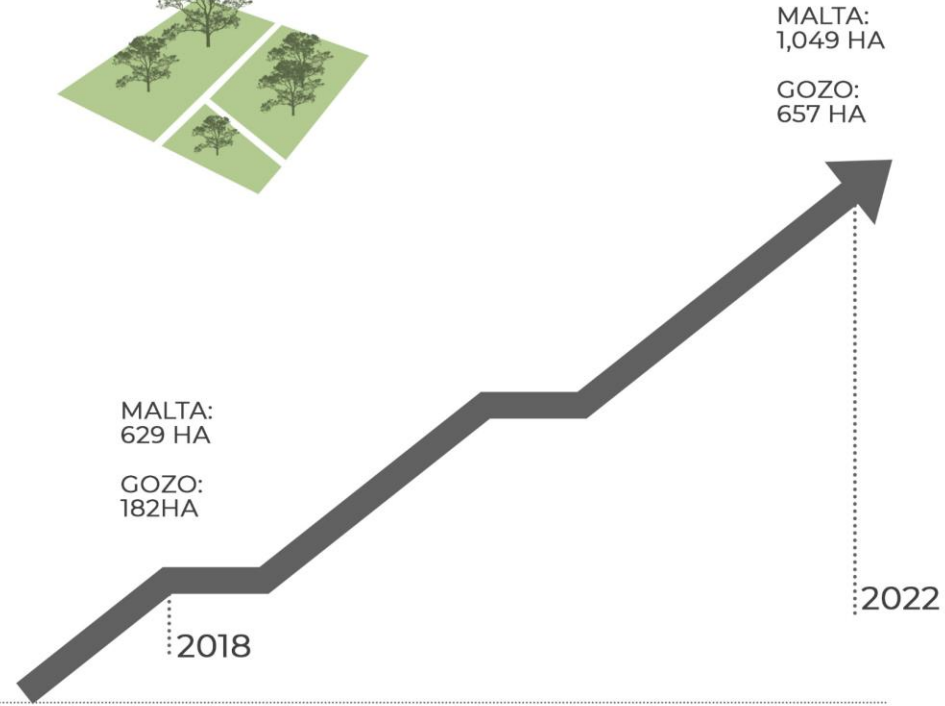
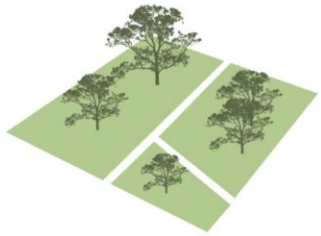
**BARKAT
STP**



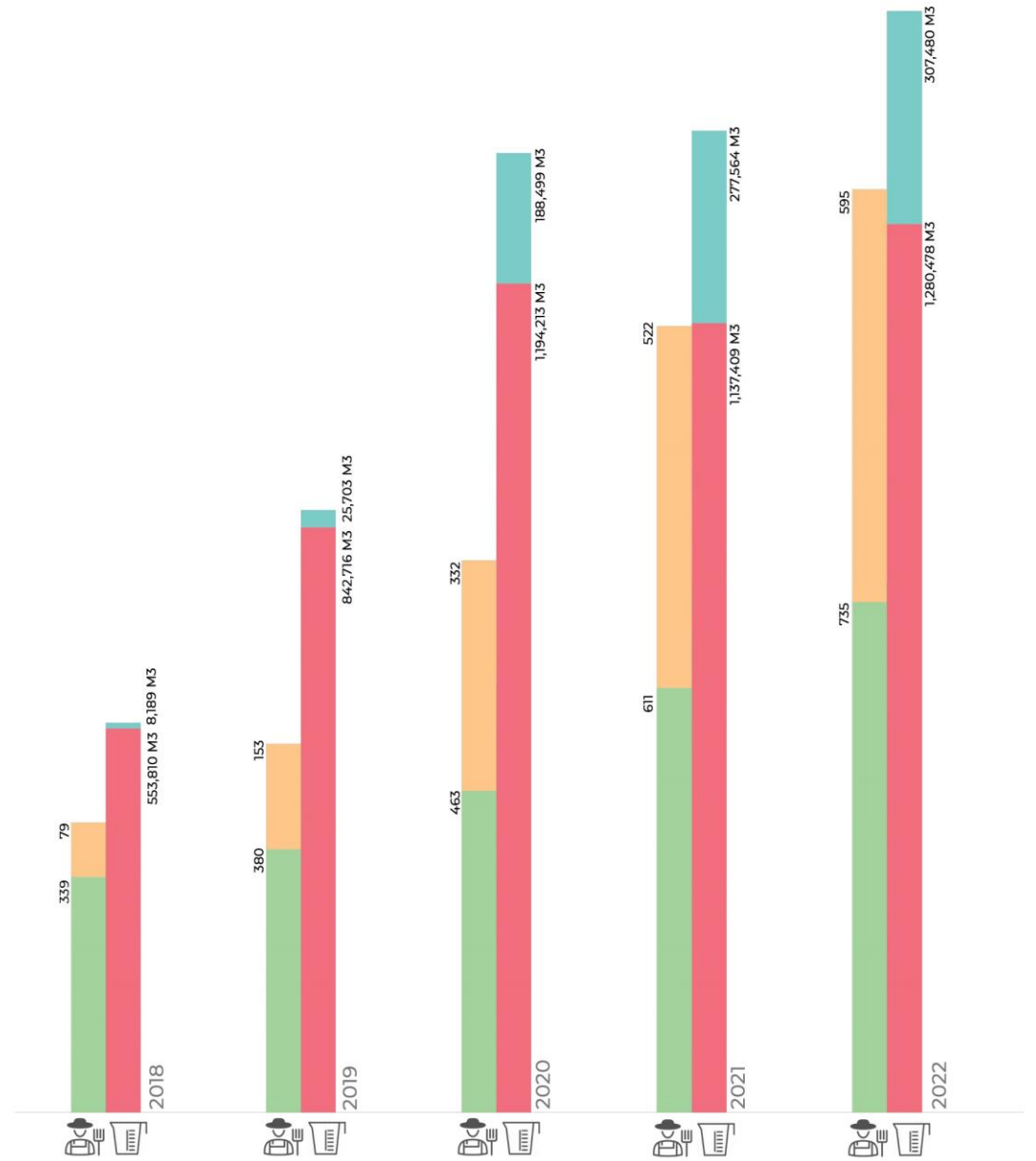


NEW WATER

ANALYTICAL OVERVIEW



LAND COVERAGE NEW WATER



CONSUMPTION

MALTA ● ●
GOZO ● ●

THE ENERGY & WATER AGENCY IN COLLABORATION WITH MCAST & UNIVERSITY OF MALTA INVITE YOU TO AN INTERACTIVE WORKSHOP ON:

CONNECTING THE DROPS

CIRCULAR WATER MANAGEMENT FOR URBAN GREENING

THE RESTORATION OF DEGRADED HABITATS
AND LANDSCAPES IN MALTA WITH A
PARTICULAR FOCUS ON CHADWICK LAKES

THU 27TH APRIL 2023 | FRI 28TH APRIL 2023

- Dr Eman Calleja
- Institute of Applied Sciences
- Malta College of Arts Sciences and Technology

Intermittent Rivers and Ephemeral streams: What water managers need to know

Edited by:

Claire Magand (Coordinator), Maria Helena Alves, Eman Calleja,
Thibault Datry, Gerald Dörflinger, Judy England, Antoni Munne, Iakovos
Tziortzis



Restoration of Intermittent and Ephemeral Streams: Chadwick lakes

Hydrology and morphology of IRES

Aquatic states
(Gallart et al., 2012)

Flow categories
(<https://crowdwater.ch>)

Aquatic phases
(Gallart et al., 2017)
Low flow levels
(<https://onde.eaufrance.fr>)



Hyperrheic: flood, drift of bed sediments and most biota



Eurheic: copious flow, most mesohabitats active and connected



Oligorheic: scarce flow, pools connected by water rivulets



Arheic: no surface flow, disconnected water pools



Hyporheic: no surface water but wet alluvium allowing active hyporheic life



Edaphic: no surface water, dry alluvium, no active aquatic life

Flowing water

Trickling water

Standing water

Isolated pools

Wet streambed

Dry streambed

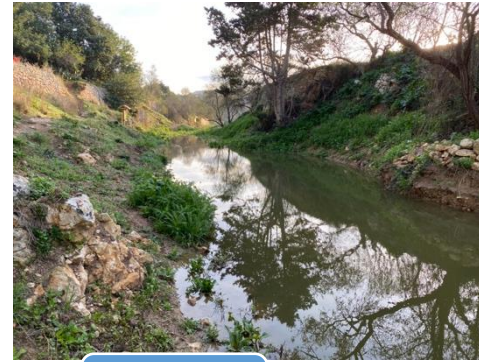
Flow

Pools

Dry



Hyperrheic



Eurheic



Oligorheic



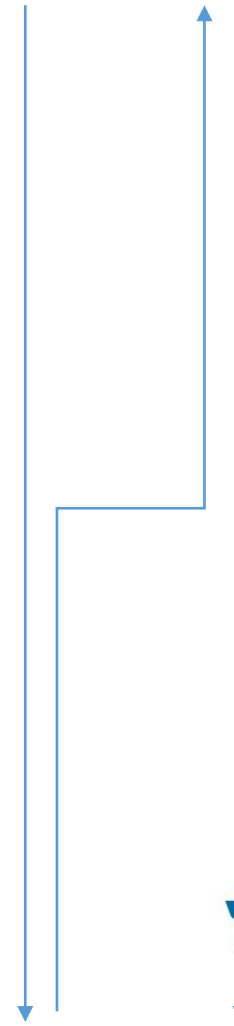
Arheic



Hyporheic



Edaphic





WATER
BE THE CHANGE

Case study target habitats

Works
started in
2019





Stream restoration training course 2019





Restoration works continued in the second summer in 2020



Before and after



WATER
BE THE CHANGE



Irrigation
required in
summer



WATER
BE THE CHANGE





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FOR EUROPEAN FUNDS

WATER
BE THE CHANGE

 EU funds
for Malta
2014-2020

Thank you for your attention

- Dr Eman Calleja
- Eman.calleja@mcast.edu.mt
- Malta College of Arts Sciences and Technology



Operational Programme I – European Structural and Investment Funds 2014-2020
"Fostering a competitive and sustainable economy to meet our challenges"
Project part-financed by the Cohesion Fund
Co-financing rate: 85% European Union Funds; 15% National Funds



6. Images

Below one can find a number of images that were taken during the event.

6.1 Registration Desk

A registration desk was provided in order to greet the participants and hand out name tags.



6.2 Set up

Backdrops, table set up, and signage.







6.3 Panel Speakers

Chairs were set up on stage for the speakers during the panel discussion.







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FOR EUROPEAN FUNDS

WATER
BE THE CHANGE



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for Malta
2014-2020

6.4 Moderators

The event was hosted by Ian Busuttil and Ashley Peschel, shown respectively in the images below.





6.5 Attendees

The conference was well attended, mainly by students either from MCAST or University of Malta.



