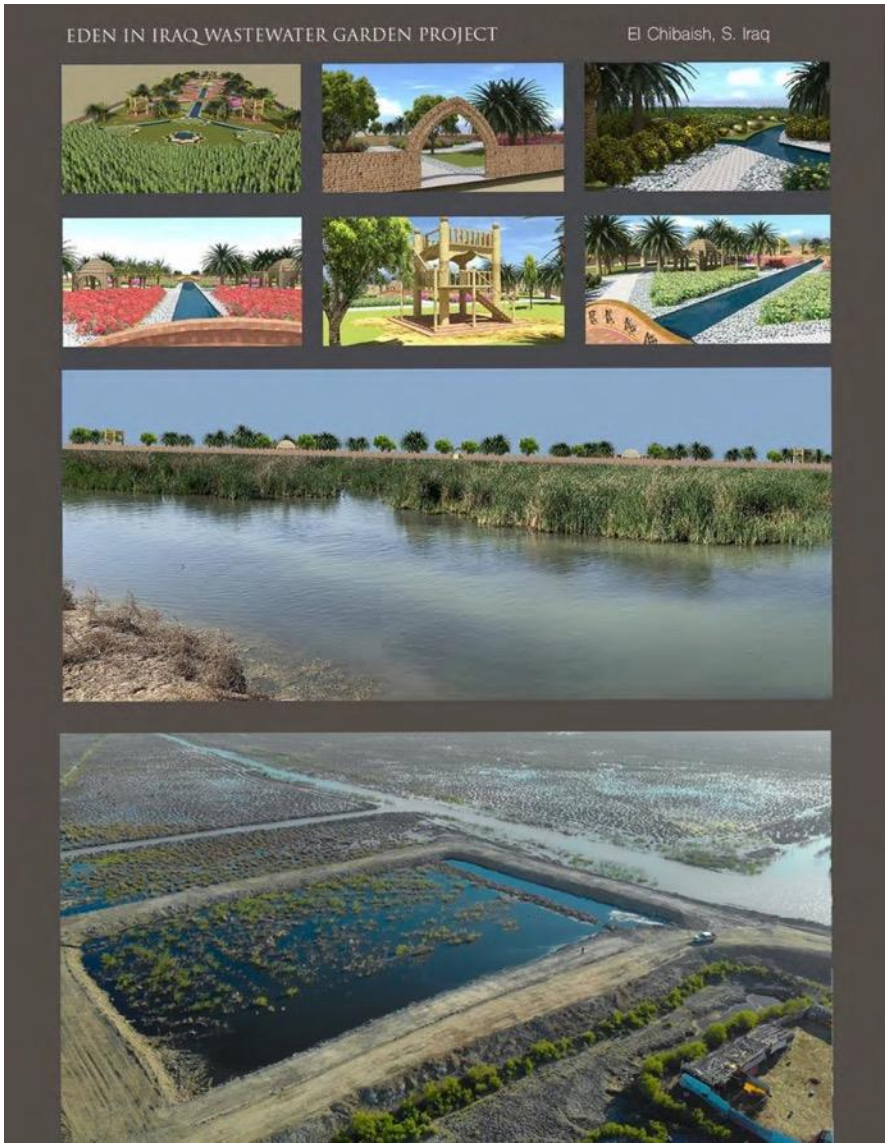
EDEN IN IRAQ WASTEWATER GARDEN PROJECT



A project of: *Nature Iraq* (NGO) and the non-profit, *Institute of Ecotechnics(USA and UK)*. Project Directors are environmental artist Prof. Meridel Rubenstein and constructed wetland engineer, Dr. Davide Tocchetto, with the support of environmental engineers Dr. Mark Nelson. Chairman of the Institute of Ecotechnics and, Jassim Al-Asadi, engineer, Managing Director, *Nature Iraq*

<u>An immediate solution to clean water in the critically endangered Mesopotamaian Marshes</u>

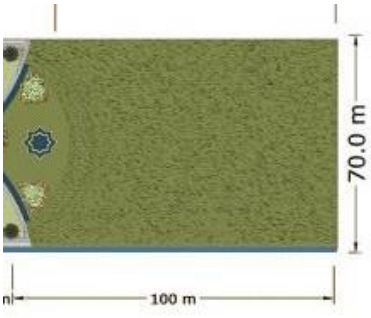
In the midst of catastrophic drought, there is no sewage treatment in the Marsh Arab towns and cities. Sewage is discharged, without treatment, into the Euphrates river or the marshes. This results in disease and ill-health for the local communities and environmental damage and degradation of the marshes.

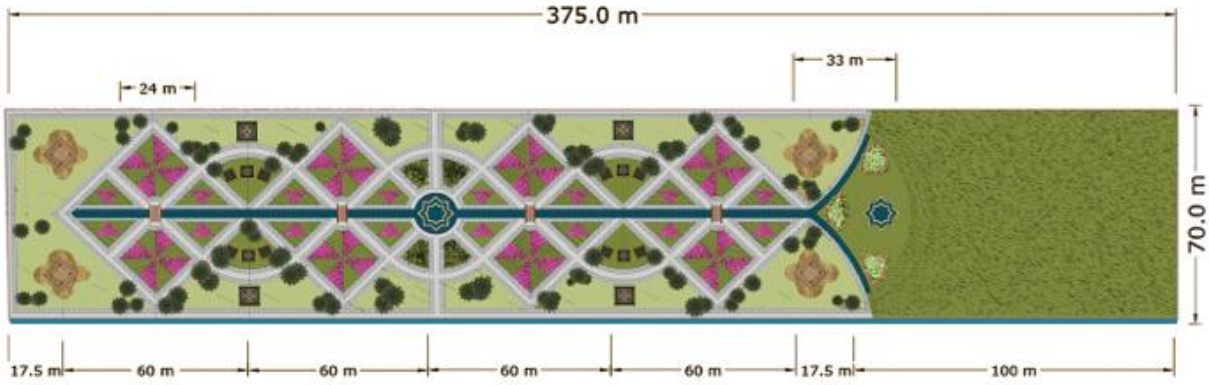
This solution to prevent water contamination is through the utilization of simple and sustainable wastewater recycling phyto-technology to create a beautiful public garden that embodies the rich cultural heritage and tradition of the marshes and the Marsh Arab community, and provides a model for healthy recycled water for the region. Our Wastewater Garden technology, a type of constructed wetland, harnesses the power of microbes and plants to clean water, transforming wastewater into a resource.

The great news is with the support of the Iraqi Ministry of Water Resources, the first stage of our pilot demonstration project, the "Eden in Iraq Wastewater Garden" was completed in May, 2023. Minister Aun led the ribbon-cutting and voiced support for the importance of this project as a template for the rest of the country. He announced eight other sites where the Wastewater Garden approach will be implemented. Now, with the support of the United Nations World Food Program, three of those projects are underway.

Project Budget

First stage (now complete) $300,000 US, Total Project, still to be raised $2.938 million US





We are now fund-raising to be able to finish the entire Eden in Iraq Wastewater Garden project which will transform the sewage of 8,000-10,000 people in the largest Marsh Arab city, El-Chibaish, creating a public park celebrating their unique and ancient culture and history.

The Project – Why Iraq?

 Iraq is the 5th most vulnerable country to the devastating effects of climate change

 Wetlands like the southern Iraqi marshes are very important carbon sinks. Eden in Iraq WWG Project will help protect the marshes from environmental degradation so they can continue to sequester carbon.

 The Eden in Iraq Wastewater Garden Project joins an urgently needed nature-based water remediation phyto-technology with cultural heritage and history near the historic Garden of Eden.

 The Marsh Arab culture, at least eight thousand years old, is one of the world's greatest examples of sustainable living using the local resources of the marshes. These wetlands were once the 3rd largest wetlands in the world and the largest in the Middle East.

 The southern marshes are a key biodiversity area in Iraq. There are endemic plant and animal species for which the marshes are key habitat.

 The marshes are important on Asia-Pacific flyways for migratory birds and is also home to the Iraqi marsh warbler.

 The project is a powerful symbol of regeneration in an area which has seen war, cultural conflict and civil war, environmental degradation and now faces water shortages, extreme heat and drought due to climate change.

 The resonance of this project in the Fertile Crescent, the birthplace of Western civilizations is trans-cultural: restoration of the Garden of Eden, the return of the Marsh Arabs after civil war and the deliberate desertification of one of the world's largest wetlands

 The project will include a celebration of the Marsh Arabs and their rich history and artistry with tiles, reed shade structures and other elements which pay tribute to their unique architecture and cultural creations.



The Technology: Wastewater Gardens (WWG)

 Wastewater Gardens are a truly green solution. They use minimal electricity/technical equipment and the vegetation planted, and their root zone microbes, absorb and store carbon, turning sewage into beautiful shady landscapes.

 Contamination of potable water by untreated or inadequately treated sewage contamination is a leading cause of death, especially in children, since contaminated drinking water causes dehydration through diarrhea and death and severe illness from other water-borne diseases.

 As water becomes scarcer and more valuable, the use of human wastewater to create landscape beauty also conserves potable water, which is usually used for creating greenery. Since wastewater contains valuable nutrients and organic compounds which plants/microbes need – they eliminate the need for synthetic fertilizers, also large source of greenhouses gases and major contaminant of soils and waters.

 Wastewater Gardens are a tested technology. They were developed in Biosphere 2 project in the early 1990s and have been successfully implemented at over 200 locations in 14 countries.

 Wastewater Garden systems continue functioning for decades even in remote and harsh environmental conditions.

They cost far less to build and operate than conventional sewage treatment and don't require sophisticated machinery, chemicals and operators since natural systems do the work.



Expected benefits of Eden in Iraq WWG project

 Better Hygiene and environmental conditions in a UNESCO World Heritage Site

 Water quality amelioration for the Southern Iraq Marshes and Euphrates River.

 Restoring a much carbon sink to combat climate change and rising temperatures in the region.

 Increase of local green landscape, Biodiversity and Habitat

 Low maintenance water treatment solution that can be maintained across generations

 This Nature-Based Solution can provide long lasting change to a fragile area, with clean water, health, and adaption to climate change

 Safeguarding Wetlands like those of southern Iraq plays a crucial role in our global biosphere and in combatting rising temperatures

 Because the wastewater system operates underground, it can withstand climate change

The Project in Numbers

- 10,000 people served (estimation)
- 80,000 people will benefit in the project area
- 26,250 square meters (6.4 acres), footprint of the garden
- 890 meters of perimeter wall with adobe bricks, ceramic tiles, and traditional design
- 105,000 local plants will be planted (both wetland, fruit and flowers, shade trees and ornamental)
- 12 In-country team meetings with Iraqi Ministry of Water Resources, Ministry of the Environment, CRIMW, local, city and regional government councils
- 15 Project presentations at international conferences

The Wastewater Garden is constructed in two stages:

In the first stage, COMPLETED May 2023, construction took 60 days and involved perimeter wall building, pipe connections and planting of reeds and other marsh plants which have begun the sewage treatment. This eliminates the smell and begin to clean the water by 50%. Now complete, native marsh vegetation is rapidly growing, using the organic compounds which would otherwise be a human health and environmental danger.

In the 2nd stage, over 3-6 months, after an underground pipe system is installed, the vegetation grown in the project nursery will be planted and cultural elements and shade structures built. Design features will involve local craftspeople, to make the garden an important Cultural Heritage Site and Learning Center.

The Wastewater Garden® features locally significant design details and will engage with local craftspeople, using local materials, and ancient crafts e.g. reed structures, earthen (adobe) brick, ancient cylinder seal patterns for ceramic tiles, and a floral design layout that is inspired by Mesopotamian embroidered wedding blanket patterns. Treated water will be reused to irrigate shrubs and fruit trees, creating a beautiful public garden/park.

This first demonstration Wastewater Garden will create a green space that can be scaled up and down throughout Iraq and the region, where adequate sustainable sewage control is lacking. It will be a hub for a community-centric culture to continue to manifest, allowing for local trade and cottage industries to bolster the regional economy. In addition, this nature-based solution will help to lessen climate change by providing additional green areas for carbon sequestration, shade for local residents and visitors and protection of natural wetlands which are the most effective carbon-storing ecosystems. Rather than add to greenhouse gas production like conventional sewage treatment plants which use enormous amounts of energy, Wastewater Gardens and contribute to its mitigation.

An Environmental Impact Assessment Report has been completed and detailed plans and budgets drawn up for the project (with prior research funding (2013-2017) from Nanyang Technological University in Singapore. The **EDEN IN IRAQ** Wastewater Garden Project was recognized by UNESCO as one of its outstanding Global Green Citizen projects in 2020. The Ministry of the Interior has provided a 26,250 sq meter/6.4acre site where we can treat the sewage of 8000-10,000 inhabitants. This is available as a separate document.

Project Timeline and Budget

The budget is split in two parts: first and second stage. This is due to construction and funding necessities.

Stage 1: COMPLETED May 2023 the realization of the surface flow wetland in order to do appropriate pre-treatment and to remove smell and bad hygienic conditions from the Marshland. The cost of this step was $300,000 US approx. and was funded by the Iraqi Ministry of Water Resources.

Stage 2: the realization of the WWG and the full designed project accomplished. The cost of this step is $2.9 million US $ approx. This second stage is split in two parts:
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Stage 2.a: realization of the underground basin and hydraulic connection (digging, pipes and pumps installation, gravels deposit, treatment cells, etc).

Stage 2.b: realization of the garden (pathways and bridges, flora, shade structures and towers, arches, tiles -for pathways, rivulets, and ceramic relief wall tiles-, perimetral wall, etc)

The updated timeline for the whole project is described below:

Stage 1: two months (60 days) COMPLETED

Stage 2.a: three months and half (100-110 days)

Stage 2.b: three months and half (100-110 days)
The whole project could be finished in six to nine months when fully funded.

Budget table

Project stages and description	**Dollar**
Stage 1 – Surface Flow Wetland	300,000 (completed)
Stage 2.a - Underground cells and Hydraulic:	
- Pipes, gravels, liner, flora, excavation, etc	1,731,050
Stage 2.b - Garden realization:	
- Bridges, arches, perimetral wall, tiles, fountains, etc	417,400
Travel costs (flight, accommodation, rent, translator, etc)	60,200
Project design, insurance and fee	470000
Contingency 10%	260,000
Total remaining costs	**2,938,650**

In building this first Wastewater Garden site, we hope to stimulate ongoing research projects, create learning centers in Iraq, and lead to the adoption of this technology throughout Iraq and the region to protect the health of humans and water. Proximity to Iraq's first National Park-The Mesopotamian Marshes National Park- and the UNESCO World Heritage Site will bring new audiences to visit our site nearby who will gain new tools for resisting climate change in Iraq as well as cultural understanding of the unique enduring Marsh Arabs.

PROJECT PARTNERS: Nature Iraq NGO; Institute of Ecotechnics; Governor of Dhi Qar Province; Municipality of El Chibaish; Center for Reconstruction of Iraqi Marshland and Wetlands; UNESCO Green Citizen 2020; Iraq Ministry of the Environment, Iraq Ministry of Water Resources; Nanyang Technological University; Arizona State University, School of Sustainability; Blue Tech Research, Vancouver and Ireland

SPONSORS

Nature Iraq (NGO) in Iraq, http://www.natureiraq.org/wastewater-garden-project.html

Institute of Ecotechnics (UK and USA), a registered USA nonprofit 501(c)(3) Corporation; a registered charity in the United Kingdom Nº 1081259; www.ecotechnics.edu

THE EDEN IN IRAQ PROJECT TEAM

PROJECT DIRECTOR - PROF. MERIDEL RUBENSTEIN, MFA, Adjunct Professor School of Sustainability, Arizona State University, USA, (2015-), Associate Professor, School of Art, Design, and Media, Nanyang Technological University, Singapore (2007-18); Direction and garden design

CO-PROJECT DIRECTOR - DR. DAVIDE TOCCHETTO, PHD, Research affiliate, University of Padua; lecturer of Agronomy. Direction of construction, wastewater system, plantings

PROJECT MANAGER- DR. HYDAR LAFTA ALI, Centre for the Restoration of the Iraqi Marshlands and Wetlands (CRIMW), Ministry of Water Resources, Baghdad, Iraq

IN COUNTRY SPECIALIST AND COORDINATOR- JASSIM AL-ASADI, engineer, Managing Director, Nature Iraq (NGO)

CONSULTANT - DR. MARK NELSON, PHD, environmental engineer, Chairman, Institute of Ecotechnics, USA and UK, Director, Wastewater Gardens International, developed new ecological approach to sewage treatment and water reuse, "Wastewater Gardens®"

Board of Directors of the Project

Dr. Azzam Alwash, Ph.D. (Engineering) - founder of Nature Iraq, is an Iraqi hydraulic engineer and one of the country's leading environmentalists. He was awarded the Goldman Environmental Prize in 2013 for his work on restoring the salt marshes in southern Iraq. Azzam helped create the marshlands as Iraq's first national park, protecting 386 square miles of an area roughly half the size of the Florida Everglades and home to 28 of the country's most unique birds.

Peter Gross, P.E. - is a water policy voice on new tech innovation, also a three-time water entrepreneur starting and growing domestic and global companies, a water/wastewater technology inventor, holding 10 patents in water and wastewater treatment, a board member on various water/wastewater companies, a consultant, and an investor.

Dr. Joppe Cramwinckel, M.Sc. - with technological economics and chemical engineering degrees, Joppe has broad international experience, including 25 years at Shell (Netherlands, Brunei, Oman and the UK) and six years at the World Business Council for Sustainable Development (Geneva) as Water Director. He currently consults to UNEP and serves on the Advisory Council of the World Energy and Meteorological Council.

Julia Watson, MLA II, GDLA - designer, activist, academic, and author of Lo-TEK, Design by Radical Indigenism. She is a TED fellow and a leading expert of nature-based technologies for climate-resilience. Julia teaches at Harvard and Columbia, while also leading an experiential, landscape, and urban design practice: Julia Watson Studio.