Lake Bardawil and Sinai Regeneration Initiative

A unique large-scale nature-based project providing unprecedented climate change mitigation potential (including carbon capturing) through a holistic and inclusive approach with the local population of Northern Sinai, Egypt.
ORG Permanent Modernity is a research, (implementation) strategy and design group, with offices in Brussels and New York City. Architects, engineers, urban planners, ecologists, economists, strategists, policy and process designers work together to tackle complex projects. The group thinks, designs and connects on multiple levels of scale: from architecture to regional and international systems.

They have developed integrated processes that work from research through implementation, across sectors for intelligent, well supported, successful programs. We apply innovation through collaboration; curating the insights of stakeholders to make projects the best they can be and get them built.

R20: Regions of Climate Action Foundation, a Swiss based NGO, has initiated the first international blended finance mechanism dedicated to Nature Based Solution sub national infrastructure: The Sub national Climate Fund (SCF).

R20 was assigned to develop a specific investment facility for Mediterranean sub national authorities within the PAMEX (Plan Mediterranean exemplaire 2030) framework. The PAMEX Locally Investment Facility (PLIFF), will be officially announced at COP 27 as a Finance Facility platform of different investments vehicles with a pilot phase period which contributes to the Bardawil and Sinai initiative.

R20 provides international recognition to the Bardawil and Sinai restoration initiative and initiates an international funding support.

The Weather Makers (TWM) focusses on the restoration of water cycles by ecosystem regeneration. This will improve our livelihood and climate, increase biodiversity and create water and food security. We created the Weather Making Approach to regenerate ecosystems as a basis for restoring water cycles.

At TWM, ecology and engineering are used to identify and leverage cross-scale, cross-disciplinary synergies to generate positive, transformative change at local-to-global scales, with the ultimate goal to stabilize the climate system.
2. BSI PARTNERS AND SCIENTIFIC & TECHNICAL SUPPORTERS

BSI can rely on a strong network of technical and scientifical partners off which the most important ones are presented below.

2.1. The Bardawil & Sinai Initiative coalition partners

2.2. Technical Supporters

2.3. Scientific Supporters

3. STATUS QUO

3.1 Location and climate

The Sinai Peninsula is situated in Egypt, with the Mediterranean Sea and Lake Bardawil to the north. The Sinai has an area of approximately 61,000 km² and is characterised by dune fields and sand sheets in the north and mountainous landscape towards the south, reaching an elevation of 2,642 m above sea level at the tip of Mount Catherine. The Sinai has a Mediterranean climate in the north (precipitation of 120 mm/yr) and desert climate towards the south (precipitation of 32 mm/yr). Maximum summer temperatures in the north and south vary between 28°C to 37°C and 31°C to 42°C, respectively. Winter day-time temperatures are usually between 10°C to 20°C, occasionally dropping below 0°C during night-time.
3.2. Coastal ecosystems in collapse

4,500 fishermen are depending on the natural resources of Lake Bardawil, but there is an overall decline of fish catch in tonnage and quality. Decreasing tidal influence from the Mediterranean Sea has led to an increase of salinity levels and decreasing depth in the lake, combined with unsustainable fishing practices the fish population further declines.

3.3. Land ecosystems in collapse

Historical overgrazing and depletion of water has led to increased desertification. The local population suffers from heat waves, sand storms and flash floods. An extensive North Sinai floristic composition and structure survey performed in 2005 and 2006 revealed that the flora and fauna has dramatically changed in the past 40-50 years, in which more than 60% of species recorded in previous surveys were no longer found (Kamel et al. 2008).

3.3. Future pressures and risks

Climate change, combined with a fast growing population of Egypt, will accelerate the collapse of the ecosystems. Natural resources will further decrease, leading to food and water insecurity. All combined leading to degrading livelihood, less future perspective and potential instability in the region.

Lake Bardawil

<table>
<thead>
<tr>
<th></th>
<th>History</th>
<th>Today</th>
</tr>
</thead>
<tbody>
<tr>
<td>Surface</td>
<td>680 km²</td>
<td>580 km²</td>
</tr>
<tr>
<td>Water</td>
<td>20 – 40 m</td>
<td>1 – 2 m</td>
</tr>
<tr>
<td>Salinity</td>
<td>1035 kg/m³</td>
<td>1060 kg/m³</td>
</tr>
</tbody>
</table>

Lake Bardawil and Sinai Desert Restoration Project

“Our changing climate also comes with huge potential security impacts as the increasing droughts and floodings affect the food- and water security of complete regions in the world. This has a disrupting effect on societies, especially in fragile regions, resulting in internal friction, migration flows and new breeding grounds for extremism. New concepts are needed to turn that tide. The Bardawill & Sinai Initiatives can help restore the relationship between society and nature, and counter the disruptive security effects of our changing climate.”

Tom Middendorp
Chairman of the International Military Council on Climate and Security
4. SHORT-TERM OBJECTIVES OF THE PROJECT

Creating a large sustainable fish population and a robust food web in the lake by means of improving the water quality through strategic dredging works.

Sequestration of Carbon through the increase of aquatic biomass.

Boosting the aquatic and terrestrial biodiversity due to holistic ecosystem development approach.

Increase jobs & income for the local population through the increased fishing revenues and regreening efforts in combination with regenerative fishing practices and management of the lake.

Stabilizing coastlines and inlets by creating a morphological stable system.

Wetland restoration and development in the vicinity of the Lake by re-use of dredged material.
5. LONG-TERM OBJECTIVES OF THE PROJECT

Reinstate the hydrological ancient water cycle, leading to a substantial increase in water sequestration, a decrease in land surface and air temperatures combined with an unprecedented carbon sequestration.

Creation of large-scale socio-economic benefits by improving the water quality, reducing poverty and improving food security.

Stimulation of agricultural and natural biodiversity of the Sinai Desert.

Improving the livelihood & security of local communities.
6. PROPOSED SOLUTION

Regenerating Lake Bardawil

Marine Engineering:
- Deepening and widening inlets and lake gullies to improve tidal energy in the lake and water exchange with the Mediterranean Sea
- Establish a morphologic stable system with minimal maintenance

Coastal reinforcement:
- Strengthen natural suppletion processes along the coast
- Intelligent re-use of dredged material for reinforcement

Wetland development:
- Improve and restore lake shoreline wetlands
- Increase surface area of lake wetlands (low lying areas)

Regreening the Sinai Desert

Large-Scale regeneration:
- Local and national embedded co-created masterplan based on a collaborative interscalar integral planning approach for regenerative landscape development of a total area of ~30,000 km².

Resource Based Dredging:
- Reuse fertile sediments for regreening
- Sustainable sediment treatment

Fresh Water management:
- Water Harvesting
- Flash flood prevention

Restoring the ancient hydrological cycle

Impact on local climate:
- Increase of precipitation by strategic ecosystem regeneration and water retention
- Improved climate conditions for water- and food security
- Unprecedented carbon sequestration
- Socio-economic benefits for a better livelihood and future perspective

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6.1. Regenerating Lake Bardawil and start up of Land Restoration

**Phase 1: Early Works**

- **Lake Regeneration**
  - Deepening and widening 2 existing inlets
  - Coastal reinforcement works
  - Port infrastructure development
  - Fish supply chain upgrade works
  - Wetland development: 360 Ha
  - Regenerative fish management

- **Land regeneration**
  - Regreening Pilot & co-creation of masterplan

- **Benefits**
  - Regenerative fish catch: 11,000 T/Year
  - Carbon Sequestration: 110,000 T CO₂ eq/Year
  - Job Creation: 5 – 8,000 Positions

**Phase 2: Upscale Works**

- **Lake Regeneration**
  - Creating 2 new inlets & Dredging inner gullies
  - Coastal reinforcement works
  - Port infrastructure development
  - Fish supply chain upgrade works
  - Wetland development: 2,500 Ha
  - Regenerative fish management

- **Land regeneration**
  - Masterplan implementation

- **Benefits**
  - Regenerative fish catch: 50,000 T/Year
  - Carbon Sequestration: 380,000 T CO₂ eq/Year
  - Job Creation: 50 – 80,000 Positions

**Phase 3: Long-term development**

- **Lake Regeneration**
  - Resource based dredging
  - Upscale wetland development works
  - Port infrastructure development
  - Fish supply chain upgrade works
  - Regenerative fish management

- **Land regeneration**
  - Scale up of masterplan implementation

- **Benefits**
  - Regenerative fish catch: >70,000 T/Year
  - Carbon Sequestration: TBC T CO₂ eq/Year
  - Job Creation: > 0.5 Mio Positions
6.2. Regeneration of the Sinai Desert

**Large scale regenerative landscape development**
- Substantial increase in water sequestration
- Stimulation of agricultural and natural biodiversity
- Large Scale employment
- Improve water security
- Reduction of poverty
- Improve food security
- Peaceful environment for local communities
- Unprecedented carbon sequestration

**Benefits**
- Employment: 500,000 – 1,500,000 Jobs
- Economic development
- Soil Restoration: Regreening
- Food security: 1,000 – 15,000 km² agricultural land
- Carbon Sequestration: 300 – 1,200 Mio Ton CO2-eq
- Freshwater production by hydrological cycle: 10-100 Bio m³
- Restored Biodiversity

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6.3. Restoring the ancient hydrological cycle

Status Quo: Broken hydrological cycle
› Lack of vegetation and soil moisture
› Increase in air and ground temperature
› Loss of water vapor from the watershed
› Desertification and social unrest

Long term vision: Restored hydrological cycle
› Regenerative land use with optimized water management
› Increase of local moisture recycling and precipitation
› Stop excessive water vapor lost out of the watershed
› Stopping desertification in the region
7. PROJECT GOVERNANCE

**EGYPTIAN GOVERNMENT**
- Licenses
- Permits
- Etc.

**BSI Foundation**
- Grants, concessional loans

**Non Profit Association BSI**
- Guard the mission (monitor, validate, calibrate, manage)

**Early Works**
- Dredging inlets
- Regreening pilot

**Members**
- Founders
- Egyptian Experts
- International Experts
- Institutions
- Donors
- Academics
- etc.

**Consortium**

**Bardawil Development Company**
- Investors (debt, equity)

**Bardawil Fish Company**
- Local Egyptian wholesalers
- 1 or 2 International wholesalers

**Cooperative of Fishermen**

- Invest in certified supply chain (cooling centre, transport, etc)

**Egyptian Market**

**International Market**

**Core: 3 operating companies**
- **BSI Association**: setting up the theory of change and scientific background of the project
- **Bardawil Development Company (BDC)**: Manage the lake
- **Bardawil Fish Company (BFC)**: Harvesting the economical value of the lake

The governance shown is for the Early Works, but the structure is suitable for upscaling towards the Sinai. E.g. next to the Bardawil Development Company, other development companies can be initiated combined with cooperations/companies that develop and maintain supply chains of regenerative products.
Lake Bardawil and Sinai Desert Restoration Project

8. INFRA & FOUNDATION STRUCTURE – EARLY WORKS CAPEX ALLOCATION

Project development
- Early Development
- Foundation/Further Project Development

Lake Development Works
- Engineering
- Boughaz 1 and 2 Dredging works
- Wetland Development Works

Lake Management
- Testing, monitoring and digital twin
- Regreening pilot
- Regenerative fish management
- Seagrass expansion
- Eco Oasis

Plants for fishing & Fishing Gear
- Boat construction
- Foam box plant
- Fish collection and distribution centers
- Gas & Fuel distribution center
- Fish gear supply plant

Port development works
- Port construction works
- Onshore facilities

Current port facilities in vicinity of lake Bardawil
9. PROPOSED PROJECT FUNDING

- **Grants**: To support BSI mission and vision
- **Concessional loans**: From international institutions
- **Direct funding of the Egyptian Government**: Egypt to invest in the rehabilitation project of the lake ecosystem
- **Equity & commercial loans**: In the commercial aspects
- **Public and Private Catalytic Funding**: In carbon sequestration

**Grants**
- The BSI activity catalog is being finalize

**Concessional loans**
- The funding model and related investments are being finalized

**Direct funding from Egypt**
- Egypt to invest in the rehabilitation project of the lake ecosystem

**Equity & commercial debt**
- Raising equity and commercial debt to fund the Bardawil Development Company and Bardawil Fishing Company

**Public and Private Catalytic Funding**
- Using carbon credits as collateral to incentivize catalytic public and private investment into the project (DFI, MDB and corporates)
10. SOCIAL ENGAGEMENT STRATEGY

10.1. Socio-Cultural Environment – Northern Sinai

The majority of North Sinai’s population is from Bedouin origin. The Sinai Bedouins are groups of tribes that arrived from the Arabian Peninsula between the 14th and 18th century. Currently, the Bedouins constitute around 70% of the whole Sinai Peninsula’s population, which is roughly 300,000 people.

Leverage points:
- Boundaries: well, ‘wadi’ or tree
- Customary law
- Bedouin ILKs: practical, changing, evidence-based
- New knowledge may be easily adopted

10.2. Onboarding of the social engagement strategy

Knowledge building by a Demonstration Project
- Workshops
- Research
- Training
- Internships

Integral Planning & Regenerative (Landscape) Development

Series of holistic planning workshops to prepare a fully integrated holistic plan that includes social, environmental, and economic agendas

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10.3. Six steps engagement strategy

1. First steps on the ground
   - Identify grassroots partners & communication of the vision
2. Building a grassroots partnership
   - Bardawil regenerative Collective & Frameworks
3. Co-visualizing the landscape
   - Community participatory mapping
   - Multifunctional habitat restoration
4. Building capacity
   - Developing the principle “Rule of Law”
   - Community-based management
   - Compensation mechanisms
5. Managing unintended negative consequences
   - Lessons learned from previous experiences
   - Securing diversified employment
6. Pathway for scaling up
   - Co-visualizing the larger-scale landscape
   - Indigenous and local knowledges as ‘engines’ to other stakeholders

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### 11. Full Match 17 SDG’s

<table>
<thead>
<tr>
<th>SDG</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td>1.</td>
<td>Poverty: By increasing the standard of living of over 100,000 persons (at short term). Creating about 500,000-1,500,000 jobs on the long-term.</td>
</tr>
<tr>
<td>2.</td>
<td>Zero Hunger: Aiming at sustainable fish stock &amp; agroforestry products for Egyptian population. 2.4 Mio Ton Fish &amp; Development 10,000-15,000 km² agr. land (30 yr).</td>
</tr>
<tr>
<td>3.</td>
<td>Good Health and Well-being: By introducing clean water, healthy ecosystems, income, future perspective, good health and wellbeing will increase.</td>
</tr>
<tr>
<td>4.</td>
<td>Quality Education: Intensive training of farmers and fishermen as part of Local Stakeholder Engagement.</td>
</tr>
<tr>
<td>5.</td>
<td>Gender Equality: Increasing education through development of region’s infrastructures.</td>
</tr>
<tr>
<td>6.</td>
<td>Clean Water and Sanitation: By increasing green vegetation and restoring the hydrological cycle clean water availability and sanitation will improve. 10-100 Bio [m³] additional precipitation in 30 yrs.</td>
</tr>
<tr>
<td>7.</td>
<td>Affordable and Clean Energy: By developing the region’s infrastructures through the economic growth of the fish and agroforestry industries.</td>
</tr>
<tr>
<td>10.</td>
<td>Reduced Inequalities: By reducing poverty and increasing wealth, inequalities will be reduced.</td>
</tr>
<tr>
<td>11.</td>
<td>Sustainable Cities and Communities: Integrated land management plan leads to smart cities and communities.</td>
</tr>
<tr>
<td>12.</td>
<td>Responsible Consumption and Production: By implementing a sustainable fishing &amp; agroforestry development.</td>
</tr>
<tr>
<td>15.</td>
<td>Life on Land: Large-scale regreening of the desert results in cooler areas with less dust and availability of fresh water.</td>
</tr>
<tr>
<td>16.</td>
<td>Peace Justice and Strong Institutions: By providing access to knowledge.</td>
</tr>
<tr>
<td>17.</td>
<td>Partnerships for the Goals: Public &amp; Private Partnership with direct and indirect returns model.</td>
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**Sustainable Development Goals**

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12. Summary of progress up to date and way forward

12.1. Summary of progress up to date

1. Scientific

2. Governance structure & BSI

3. Political and financial support

4. Social consultation and engagement

12.2. Way forward

1. Further consultation with Egyptian Government

2. Finalize governance
   Setting up the detailed roles of the Bardawil and Sinai Initiative foundation and association.

3. Co-create a collaborative regenerative landscape strategy combined with a Eco Oasis Demonstration Farm
   Deliver a local and national embedded co-created masterplan based on a collaborative interscalar integral planning approach for regenerative landscape development.

4. Refine business/economic model of BDC and BFC

5. Refine the financial model:
   Integrated solution with a variety of financing sources ensuring financial resilience.

6. Reinforcing the local and international buy-in in the project