TECHNOLOGY IN WATER RESOURCE MANAGEMENT

A TOOL FOR DIPLOMACY

By Kamal Jalouqa

Spatial Planner,

Associate of Hydropolitics Academy, Ankara, Turkey

Member, Jordanian Planning Forum

Water Sector-specific features

- Water and sanitation are segmented sectors that involve multiple stakeholders (users, sector employees, different layers of government, and
- public agencies, communities, donors, private sector, NGOs and environmental associations).
- Water is a human need with important externalities. Its management is highly politicised.
- The sector may involve the construction of particularly large physical infrastructure with potentially important impact on local communities (dams) and of facilities that may generate local controversies (treatment plants).
- Labour intensive sector.
- Important cross-jurisdictional and cross-country
- dimension.
- Important vertical and horizontal co-ordination
- dimension across levels of government.

Global estimates of the number of people living in areas with high water stress differ significantly among studies (Vörösmarty et al., 2000; Alcamo et al., 2003a, b, 2007; Oki et al., 2003a; Arnell, 2004b).

Climate change is only one factor that influences future water stress, while demographic, socio-economic, and technological changes may play a more important role in most time horizons and regions.

In the 2050s, differences in the population projections of the four SRES scenarios would have a greater impact on the number of people living in water-stressed river basins (defined as basins with per capita water resources of less than 1,000 m^3/year) than the differences in the emissions scenarios (Arnell, 2004b).

Managing Climate Change

In theory, the effects of climate change can be slowed down in many ways, including:

1.Increasing sinks of greenhouse gases

2.Decreasing sources of greenhouse gases

A sink is a process that removes greenhouse gases from the atmosphere. For example, growing a tree where one did not previously exist provides a sink for carbon dioxide, because the tree extracts carbon dioxide for photosynthesis. A source is a place or activity from which greenhouse gases are emitted such as coal burning.

3. Also Growing Algae, in solar-hydroponic ponds in sea water reduces CO_2 and produces Oxygen and oily contents that can be used as fertilizer, animal feed and Bio Diesel

Considerations for governments

1. Facilitate clear understanding of roles and responsibilities of all stakeholders, notably through the creation of capacity and space for dialogue.
2. Develop co-ordination mechanisms. Consider ways of meaningfully involving weaker communities.
3. Involve the employees and their representatives in project development.
4. Develop consumer trust and awareness through information campaigns on public policies and disclosure on key project information and expected outcomes.
5. Communicate on the reasons for unpopular decisions or actions.
6. Public consultation should be developed according to the principles of clear focus, representation and transparency and follow published standard procedures.
7. It requires time and resources and should therefore be organised strategically at important stages of policy making and preferably start at the early stage of the projects.
8. Consultation should involve explicit feedback from the public authority.
9. Consider greater involvement of civil society (NGOs, consumer groups) in
10. protecting consumer rights, monitoring service provision and determining model of utility management.
11. Consider providing adequate training.

Reduction in groundwater depletion

Through :

- reduced over abstraction
- Reduced land degradation through flood and drought management and reduced nutrient loss in the soil
- Reductions in CO_2 emissions through energy optimisation and reduced energy consumption
- Reduced water consumption through leak detection and reduced demand and increased reuse Governance benefits • Improved management and knowledge, as measurement is critical for effective management
- improved accuracy of data, as real-time data should also be SMART (specific, measurable, actionable, relevant and time-bound) data.

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Reduction in groundwater depletion cont.

- Increased community-led decision-making opportunities as water users can make decisions based on real-time water use and information
- Improved transparency as water users have access to water use and quality in realtime Technology benefits
- The opportunity to test and develop new and innovative tools for water management
- Innovative technologies created with the potential for commercialization • Identification of the remaining gaps in technology adoption (e.g. standardisation of software and tools to make it easier to adopt the 'right' mix of tools for each situation
- Showing the potential for SWM tools to deliver successful outcomes and in turn lead to significant social, environmental, governance and financial impacts

US Example

STRATEGIC OBJECTIVE 3: REDUCE CONFLICT BY PROMOTING COOPERATION ON SHARED WATERS

More than 260 river basins and 600 aquifers are shared between two or more countries. In many of these basins or aquifers, no formal agreement or institutional relationship exists between 6 the parties to govern use of these shared water resources. As these resources degrade or become scarce, competition is likely to increase, raising tensions and increasing the likelihood of conflict. These can be particularly challenging problems to solve, as there are often legitimate competing interests. Countries often view water as a strategic asset and a national security priority. Water disputes are often embedded within a broader context of social, economic, and political challenges or animosities, and the data on disputed water systems are often sparse or not publicly available. Many of these same challenges also exist at the local level as competition increases between different communities or water users, such as farmers and pastoralists. At the same time, water issues represent an important means of bringing communities and countries together, strengthening regional integration, and providing a stabilizing influence in regions of conflict. To reach this strategic objective, the U.S. government will work to strengthen the political will for cooperation, and promote the development of agreements and mechanisms that support the cooperative management of shared water resources in regions where water is, or may become, a source of conflict.

Agreements. United Nations Environment Programme (UNEP), Food and Agriculture Organization of the United Nations (FAO), and Oregon State University, 2002.

Example of Policy, Strategy, Objective, Means and Actions **hierarchy**

U.S. Government Global Water Strategy

STRATEGIC OBJECTIVE 4: STRENGTHEN WATER SECTOR GOVERNANCE, FINANCING, AND INSTITUTIONS.

Key outcomes of Strategic Objective 3 will include: ● Increased number of cooperative events on water in priority regions; and, ● Stable, adaptive, and responsive institutions that support the cooperative management of shared waters.

Promote science, technology, innovation, and information: Provide direct and in-kind support to improve science and technology capacity, water conservation and water use efficiency; promote common data exchange formats and access to data for decision-making; and build knowledge to monitor the quality and quantity of water resources, improve forecasting, and model water related systems. Provide support for the monitoring and evaluation of programs to identify the most effective interventions and activities to spur innovation and catalyze the deployment of new technologies — particularly those with U.S. export potential

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[5] UN World Water Development Report. United Nations, 2017. [6] Atlas of International Freshwater

Definition of Smart Water Management

Smart Water Management (SWM) is the use of Information and Communication Technology (ICT) to provide real-time, automated data for use in resolving water challenges through IWRM.
SWM can be used for planning and operational purposes, from daily use to organizational and policy planning at a range of scales, across contexts and regions.

Policy recommendations for Smart Water Management implementation Strategies Policy direction SWM for an improved quality of life (Society):

1. Facilitate adoption of SWM tools, especially in developing countries, to support access to basic services, and to support equality for poverty reduction, public health and quality of life. Include capacity development, technology sharing, collaborative business models and community governance and decision-making opportunities.
2. Build trust and community engagement using SWM tools in areas where the community feel unsafe using the local water sources.
3. Empower people in developing countries with smart tools to reduce the time spent on water management and increase farm income and time available for other activities (e.g. further schooling, and additional work opportunities). Investment in SWM for improved resilience and sustainable development (Economy)

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Policy recommendations for Smart Water Management /cont.

- Strengthen collaboration across and within sectors to provide opportunities for networks to share information and data to assist with effective and efficient water management. Value non-financial benefits (e.g. environmental, social, governance and technical benefits) as equally important as financial benefits for SWM implementation, as they contribute to building resilience to the effects of climate change and increasing populations.
- Support long-term investments for SWM implementation to enable adequate research, development and testing. SWM for protecting and conserving water resources and ecosystems (Environment)
- Introduce policies, regulations and incentives to drive environmental and ecosystem protection through use of SWM.
- Encourage SWM solutions to increase water quality, manage demand and use, water reuse, reducing groundwater depletion and increase energy efficiency, etc.
- Introduce SWM solutions for climate adaptation plans for flood and drought planning and management and major storm events

Water Demand Management

has long been acknowledged as a critical tool to cope with the pressures of growing populations and their demand for natural resources. Today, the growing evidence of climate change makes development and implementation of

Water Demand Management policies even more important for national institutions responsible for managing water.

Intensifying water scarcity, problems with deteriorating water quality, and the effects of more severe and frequent extreme climatic events (storms, floods and droughts) will almost certainly increase the need for Water Demand Management measures.

WATER POLICY COMPARED TO POPULATION INCREASE

Demand Management :

- Scarity value
- Allocation on priorities
- Best possible overall use

Holistic view on water :

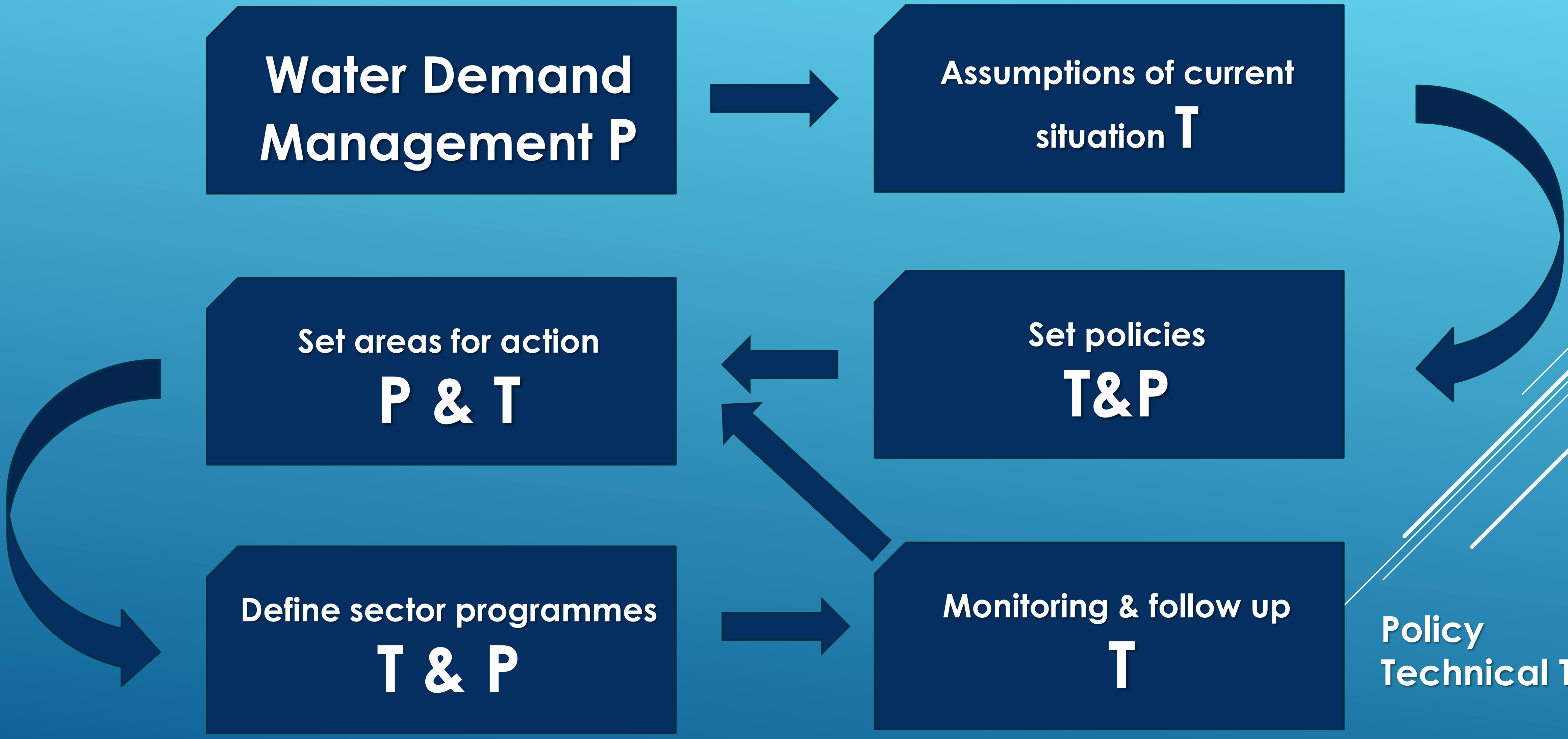
- Inter-sectoral competition
- Environmental competition

Supply Management :

- Technical & logistic challenges
- Cost

Comparative Easy Access :

- Low cost
- Simple technology
- Low inter-sectoral competition



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Technical T

K. Jalouqa

Elon Musk is donating $100 million to fund a competition to find new ways to remove carbon from the air or water:

in a bid to help fight climate change. The race for the prize – the largest in the XPrize's history – will start on Earth Day and will run for four years, through 2025.

https://www.xprize.org/prizes/elonmusk?newtab=0#email

Numerous companies, researchers and institutions will definitely show interest in this offer, like the ones in the next slide:

Are we ?????

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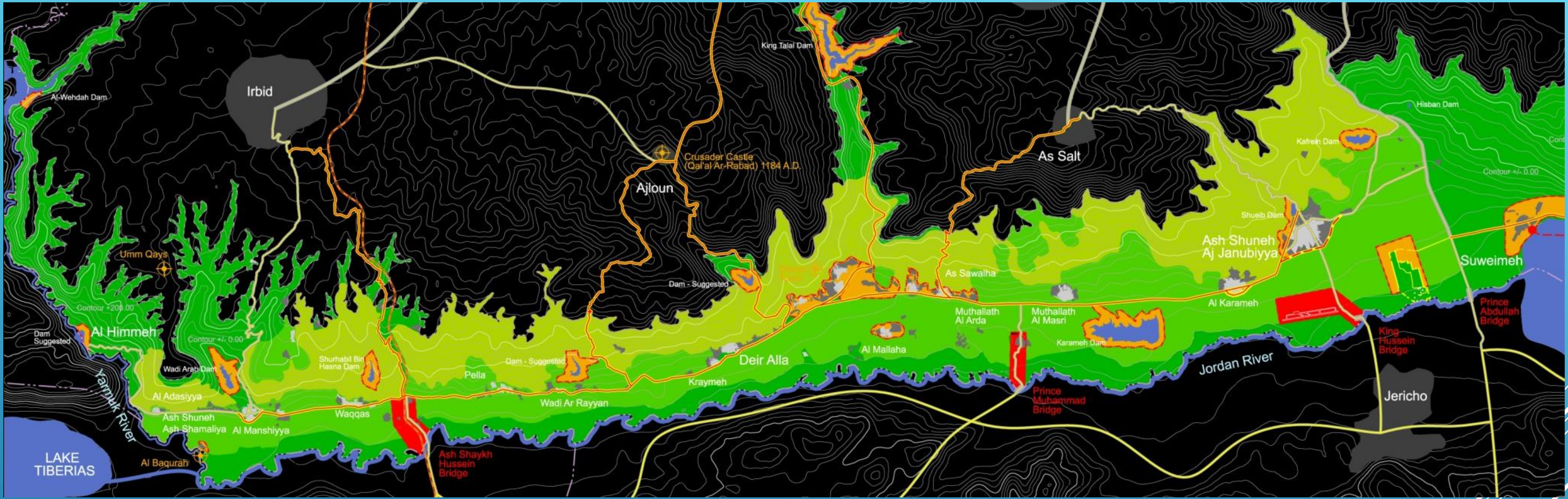


INCREASE PRODUCTIVITY IN AGRICULTURE

SALINE ECONOMY – BIO FUEL COMPARISON

Energy yield = 1.8 x input

Corn

Bio Ethanol

1

Required Area/energy unit

Energy yield = 8 x input

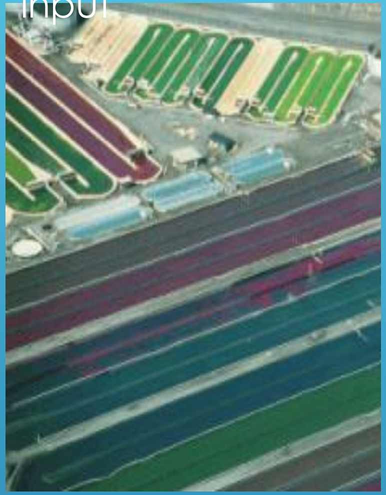
Sugar Cane

Bio Ethanol

1/4

Required Area/energy unit

Energy yield = 30 x input



Algae Open pond

Vegetable Oil

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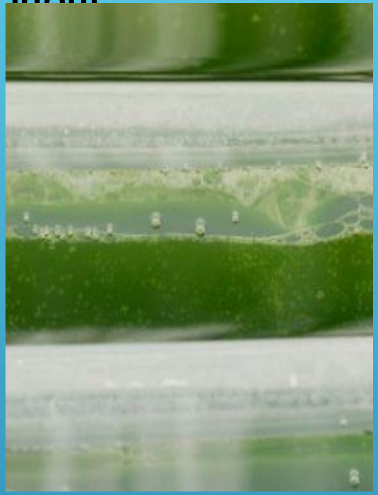
Required Area/energy unit

Energy yield=450x input



Algae closed system

Vegetable Oil

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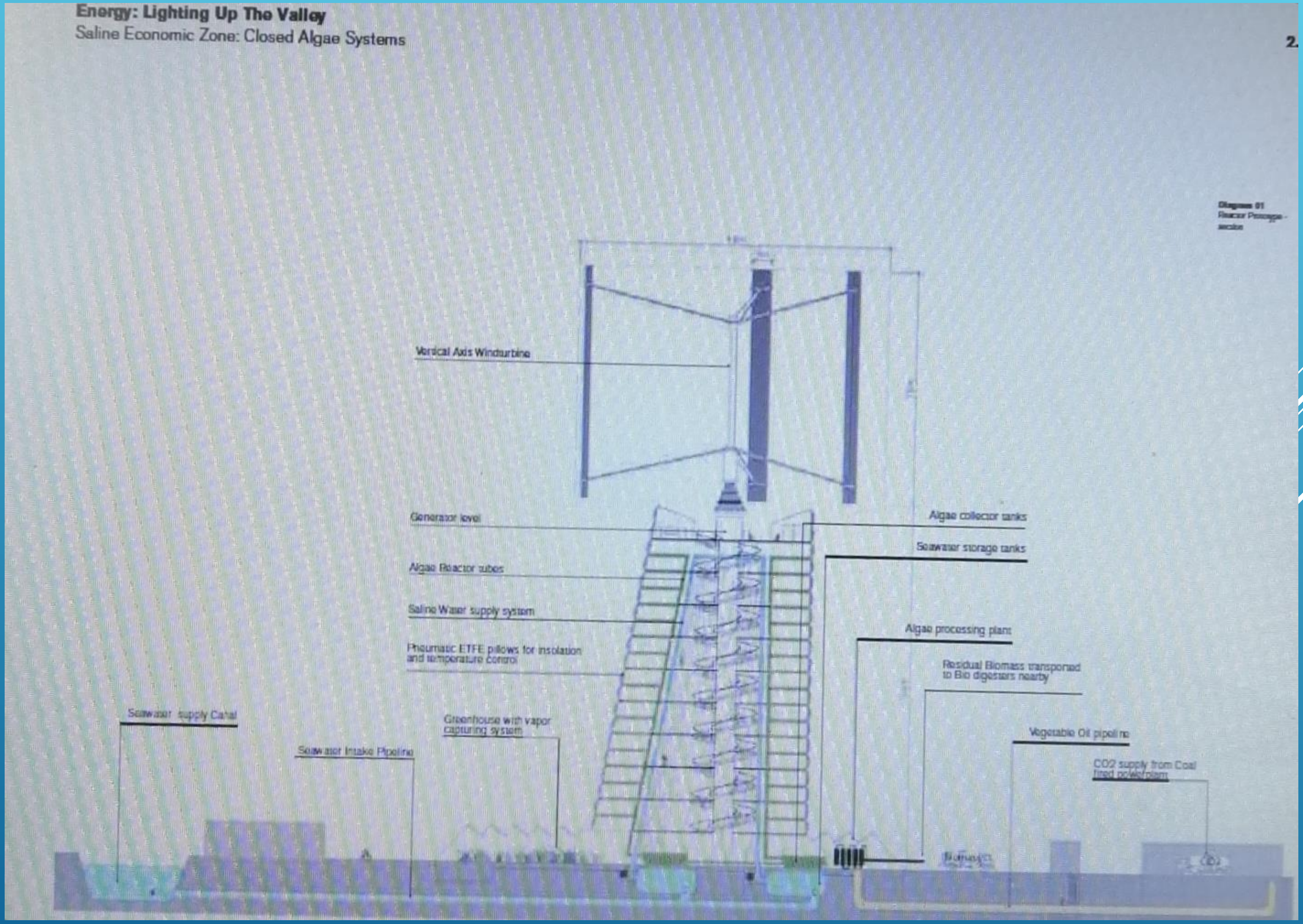
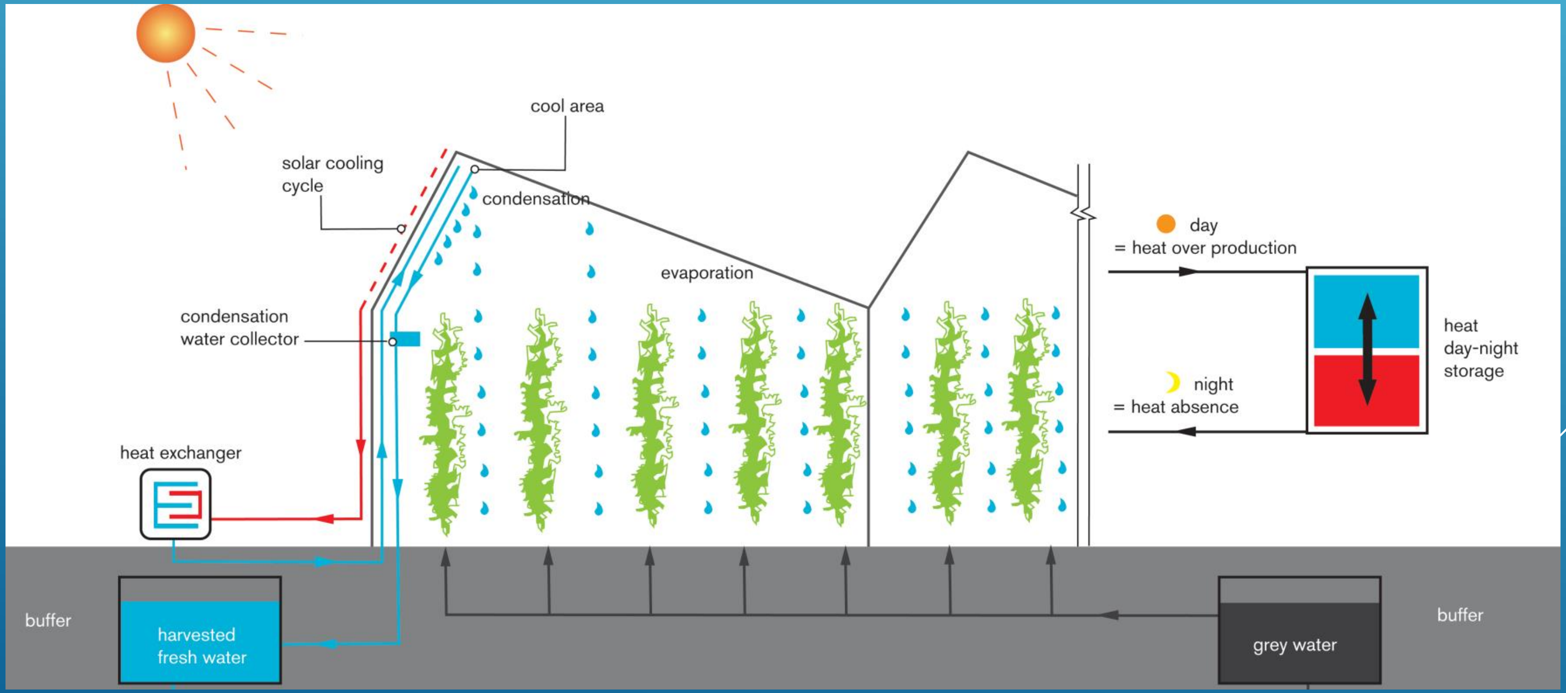
Required Area/energy unit

Multiple level Solar/sea water Algae plantation



CLOSED CONTROLLED GREENHOUSES

- **The most significant changes introduced through closed controlled greenhouses is the water efficiency, achieved through hydroponic systems and computer controlled demand driven water supply and the shift in the labour market, towards more skilled jobs rather than unskilled workers.**



How can the stakeholders in Water Resource management – and CLIMATE CHANGE meet, at local, regional and multi-state, and global levels organise, create policy, work plans, and projects will be

OUR NEXT JOINT WORK FRAME

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THANK YOU

K.J.