Autonomous Desalination System Concepts for Sea Water and Brackish Water in Rural Areas with Renewable Energies - ADIRA

Potentials, Technologies, Field Experience, Socio-technical and Socio-economic Impacts

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TROLLERS

Content

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- Main objectives & process cycle model
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Context of the project

- Focus on clean water supply for rural areas, that suffer from salty water and at the same time are often not connected to the electricity grid

- Financed by the European Commission under the Euro-Mediterranean Partnership and Regional Programme for Local Water Management

Contract N° ME8/AIDCO/2001/0515/59610

- Financial contribution by MEDREC (Middle East Desalination Research Center

- Duration: 4 years (2003-2007)

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Main objective of the ADIRA project

Problem

- Clean drinking water is becoming scarce or never has been available in certain rural areas!

Approach

- Water and energy supply are expected to stimulate socio-economic development and to enhance the quality of life
- Decentralised water treatment systems, powered by renewable energy are becoming important to manage scarce regional water resources

Objective

- Field investigation of ADS concepts for fresh water supply in rural areas
- Making use of non-conventional water resources

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Main Objectives of the ADIRA project

Objectives

- Evaluation of possible & sustainable solutions for regions & countries targeted in this project (up to 15 pilot installations are planned)
- Taking into account technical, economical, environmental, legal and social aspects
- Elaboration of methodologies and tools (e.g. handbook, questionnaires, concepts) to assist stakeholders in the realisation of future ADS projects
- Multidisciplinary, participative and integrated problem solving approach
- Top-down & bottom up approach

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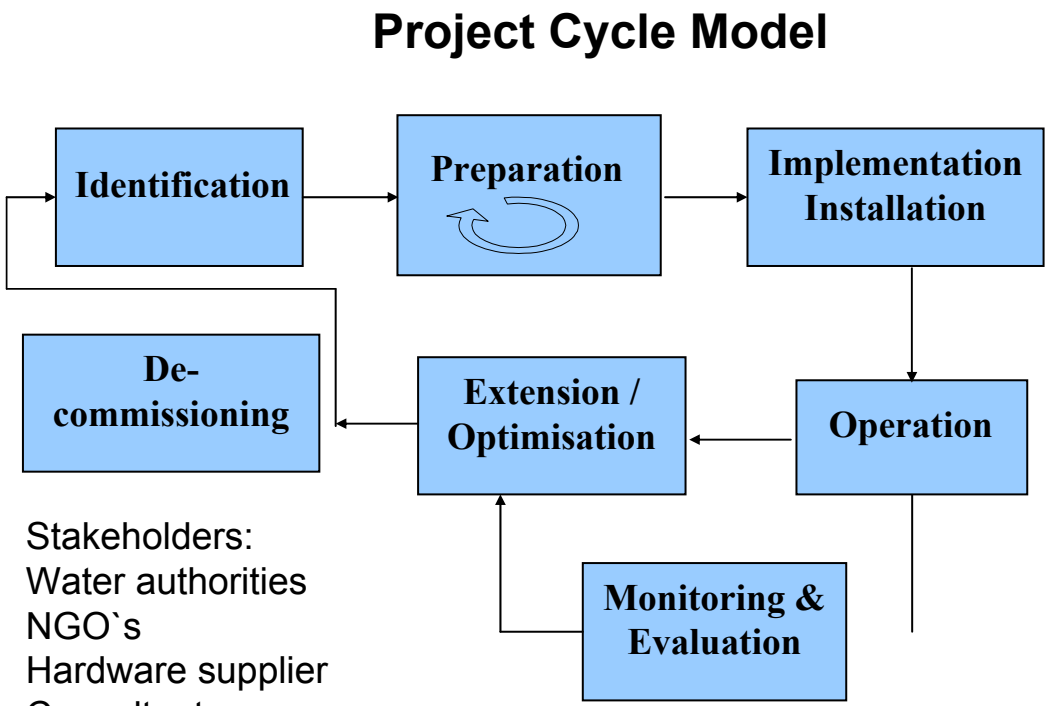
Process cycle model: Field experience in different phases

- each phase includes different tasks with different people
- success of a project is dependent on careful planning and execution of each phase
- the consideration of socio-technical aspects in every phase of the project



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Target Areas for Autonomous Desalination Systems (ADS)

- Pilot installations in Turkey, Egypt, Morocco, Cyprus and Jordan

- South Mediterranean and Middle East Region
  - lowest per capita amount of water supply in the world
  - water supply severely strained in the next 20 years, due to

    e.g. population growth

    e.g. expansion in the economic sectors

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Main lines of action to boost the implementation of ADS:

1. **Identification and quantification of regions**, where decentralised desalination units are a solution for the fresh water supply problem

2. Generating information on market available desalination systems through a **technical study and development of technical concepts** for installing sustainable desalination units in certain areas

3. **Planning, implementation and monitoring of small-scale, stand-alone desalination systems** in the field to achieve detailed results on technical viability, socio-technical and socio-economic concerns

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Main lines of action to boost the implementation of ADS:

4. **Process- oriented actor analysis and masterplans:** Gaining information about actors in the field of water and energy supply, possible investors and the political framework in order to be able to identify potentials and barriers to boost the implementation of decentralised desalination units.
5. **Preparation of tools, data bases, training and awareness raising materials** for supporting the systems designers, installers, operators and final water users in the implementation and sustainable running of decentralised desalination units.
6. **Dissemination of the project results**, the lessons learned and experiences at all levels in order to raise awareness among all relevant stakeholders at local, national and international level.

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Partners

AGRICULTURAL UNIVERSITY OF ATHENS
Laboratory of Agribusiness Management

Agriculture University of Athens (**AUA**)

Jordan University of Science and Technology (**JUST**)

Istanbul Technical University (**ITU**)

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Fraunhofer Institute for Solar Energy Systems (**ISE**)

Technological Institute of the Canary Islands (**ITC**)

National Center for Scientific Research (**NCSR**), DEMOKRITOS

Egyptian Energy and Water Association (**EWE**)

FONDATION MARRAKECH 21 (**FM21**)

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Consultant and Donor/ Subcontractors

The Middle East Desalination Research Center (**MEDRC**)

Universidad de Las Palmas de Gran Canaria (**ULPGC**)

Munich, Germany (**WIP**)

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Study

Country
identification + quantification of regions

- Water recources
- Energy recources
- Demography
- Meteorology

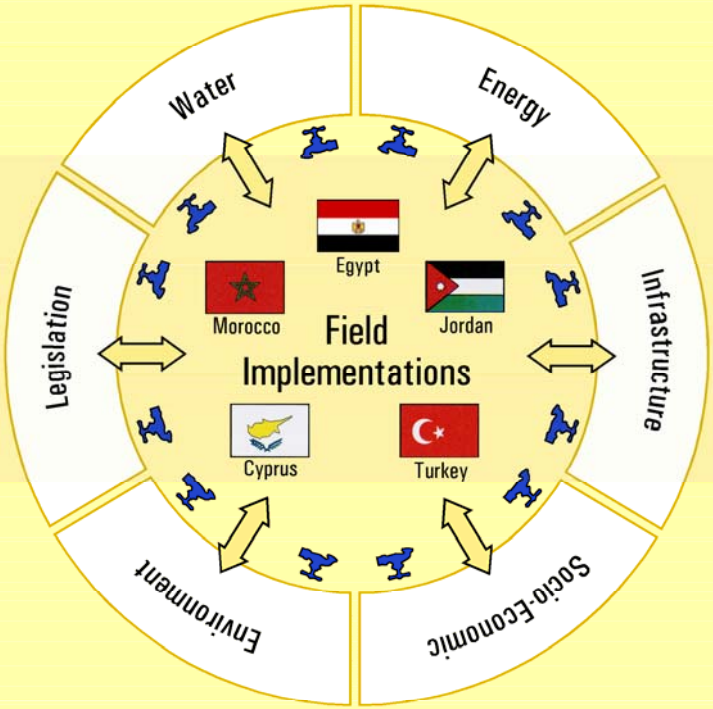
Technology

- Supplier list
- Market available technology
- Energy supply for ADS
- Expert list
- Istalled small-scale ADS

Stakeholder

- Governmental organisation
- Non-governmental organisation
- Large enterprise
- Small an Medium Enterprise (SME)
- University / research institute
- Local authority
- Financial institution (bank etc.)

Implementation



Result

Dissemination Activities

- National workshops (before & after implementation)
- Brochures, leaflets, posters, magazines
- International conferences / scientific papers
  Website: www.adira.info

ADIRA-DB

- ADIRA-DB (database) contains information on all project topics and incorporates numerous links to related sources in the internet
- It is easily accessed by (technical or non-technical) users through user-friendly displays

DST

-Decision Support Tool (DST) software

-Software to identify the most adequate solution under the given framework and site specific conditions

Master Plans

- Analysis of stakeholders in the water sector
- Identification of possible "ADS Operator Groups"
- Analysis of economic and political framework
- Development of master plans addresses policy modules (e.g.: legislative framework, institutional set-up, water pricing schemes, building capacity, raising awareness and mobilising financial recources)

ADIRA-Handbook

- A handbook for training and reference, addressed to researchers, analysts, planners, designers, installers and operators of ADS
- The handbook will serves to assist the user. The planning and implementation phases as well as the operation of ADS will be described in detail

A wide variety of field installations

- Users
- Desalination technology
- System size and design
- Energy source
- Usage / Outcome / Product
- Financing schemes
- Management schemes

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Cyprus - Nikosia and Pafos

Nikosia

Pafos

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Cyprus - Nikosia

- Supply of a sporting club
- It already has a water supply, but faces supply problems during summer
- Number of users will be 150 - 200
  (25 - 30 m^3/day fresh water production)
- Annual average solar radiation: 5.4 kWh/m^2/day
- Brackish groundwater

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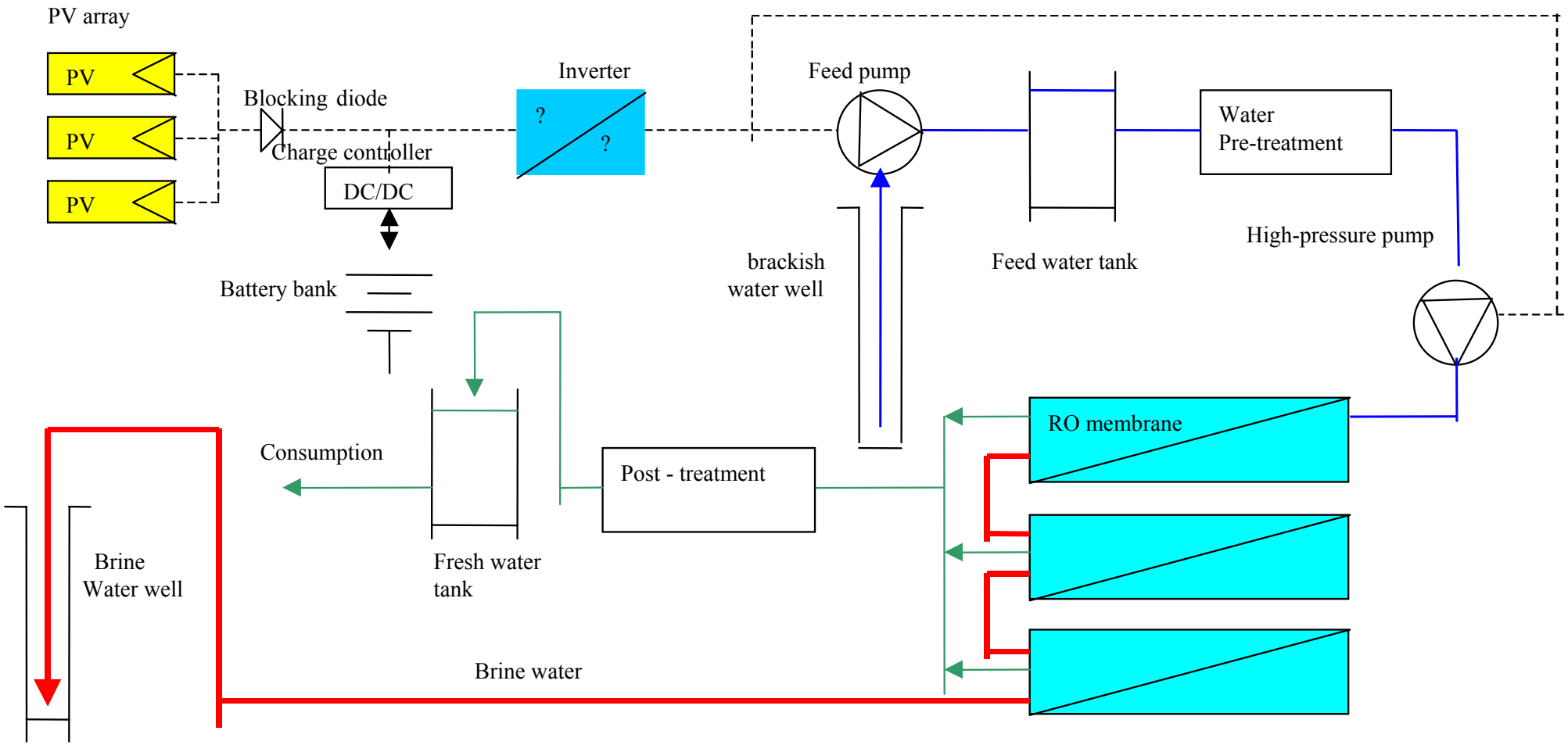
Cyprus - Nikosia



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Cyprus - Nikosia

- PV-RO system
- PV array 8.5 kWp
- PV area required 300 m^2
- Capacity of the battery bank 950 Ah
- Water recovery ratio is 35%
- Expected fresh water production is 25 m^3/day
- 10 m^3 drinking water tank
- PV-batteries

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Egypt - i-Sinai

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Egypt - i-Sinai

- Sea water
- Solar stills
- Wind and PV

Poduction of:

- Drinking water ca.1 m³/d
- Irrigation water ca. 3 m³/d
- Salt
- Electricity

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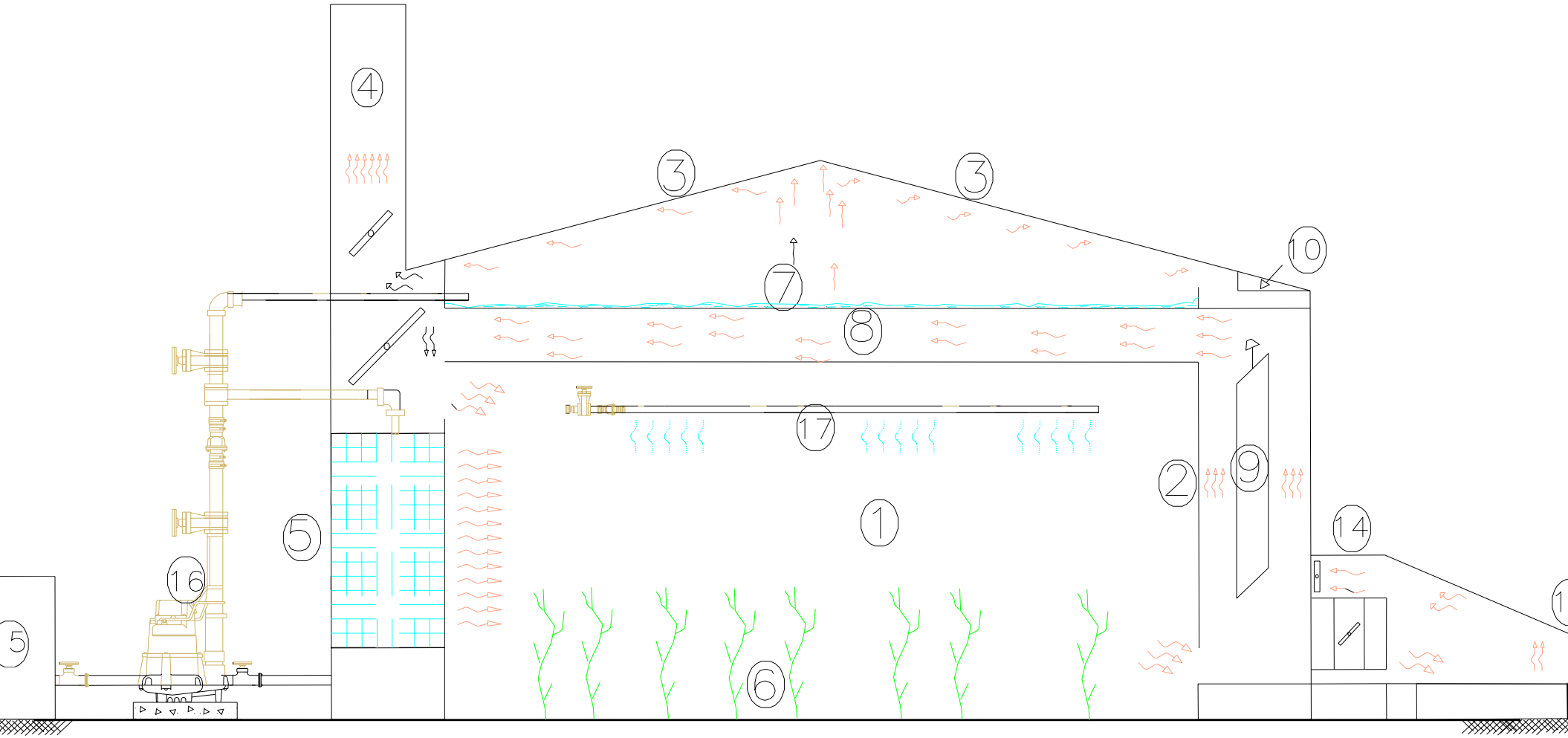
Egypt - Greenhouse with Built-in Roof Still



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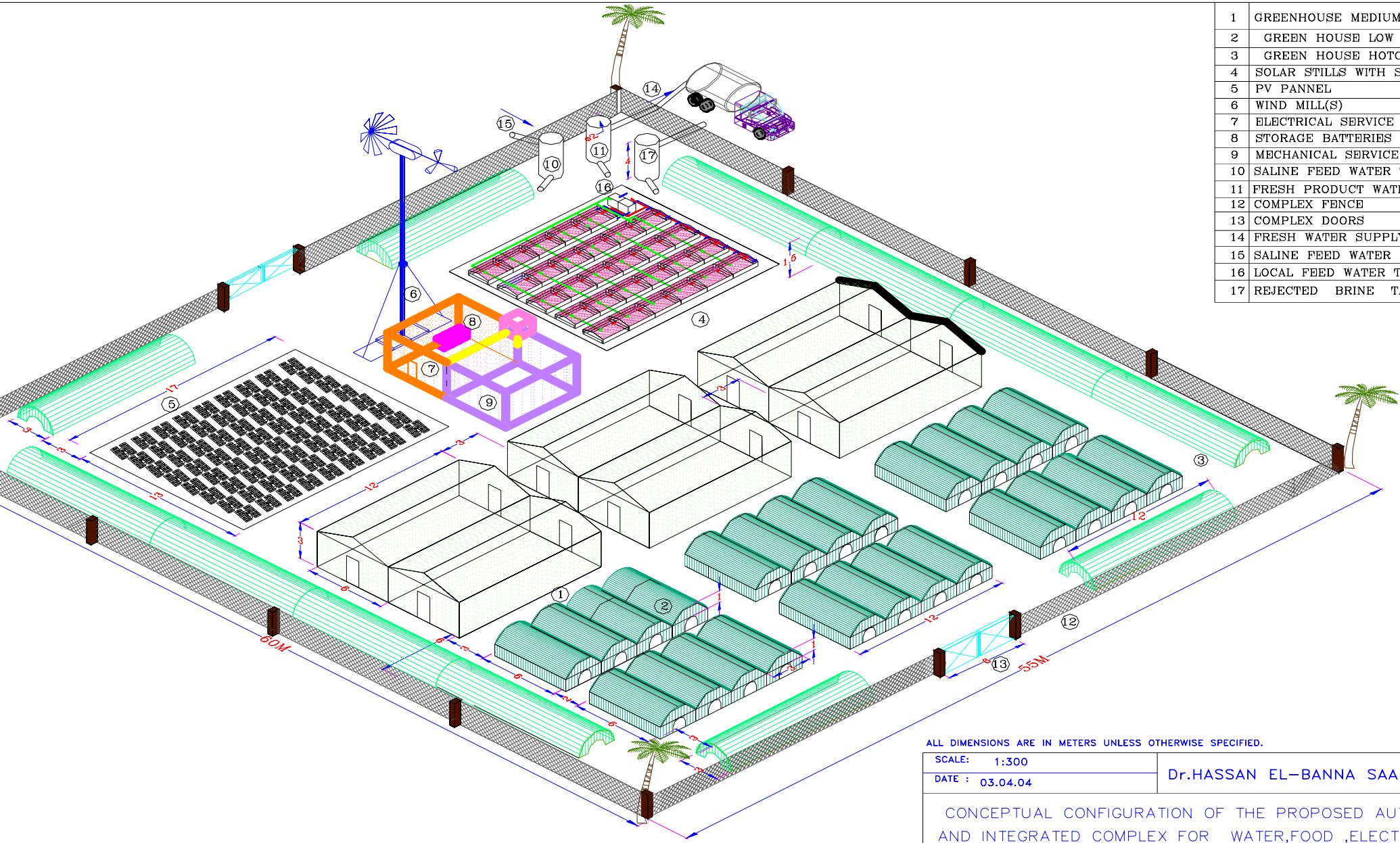


1	GREENHOUSE MEDIUM CO
2	GREEN HOUSE LOW COS
3	GREEN HOUSE HOTCLIMA
4	SOLAR STILLS WITH SALT
5	PV PANNEL
6	WIND MILL(S)
7	ELECTRICAL SERVICE ROO
8	STORAGE BATTERIES
9	MECHANICAL SERVICE RO
10	SALINE FEED WATER TANI
11	FRESH PRODUCT WATER T
12	COMPLEX FENCE
13	COMPLEX DOORS
14	FRESH WATER SUPPLY PI
15	SALINE FEED WATER PIP
16	LOCAL FEED WATER TANK
17	REJECTED BRINE TANK

ALL DIMENSIONS ARE IN METERS UNLESS OTHERWISE SPECIFIED.

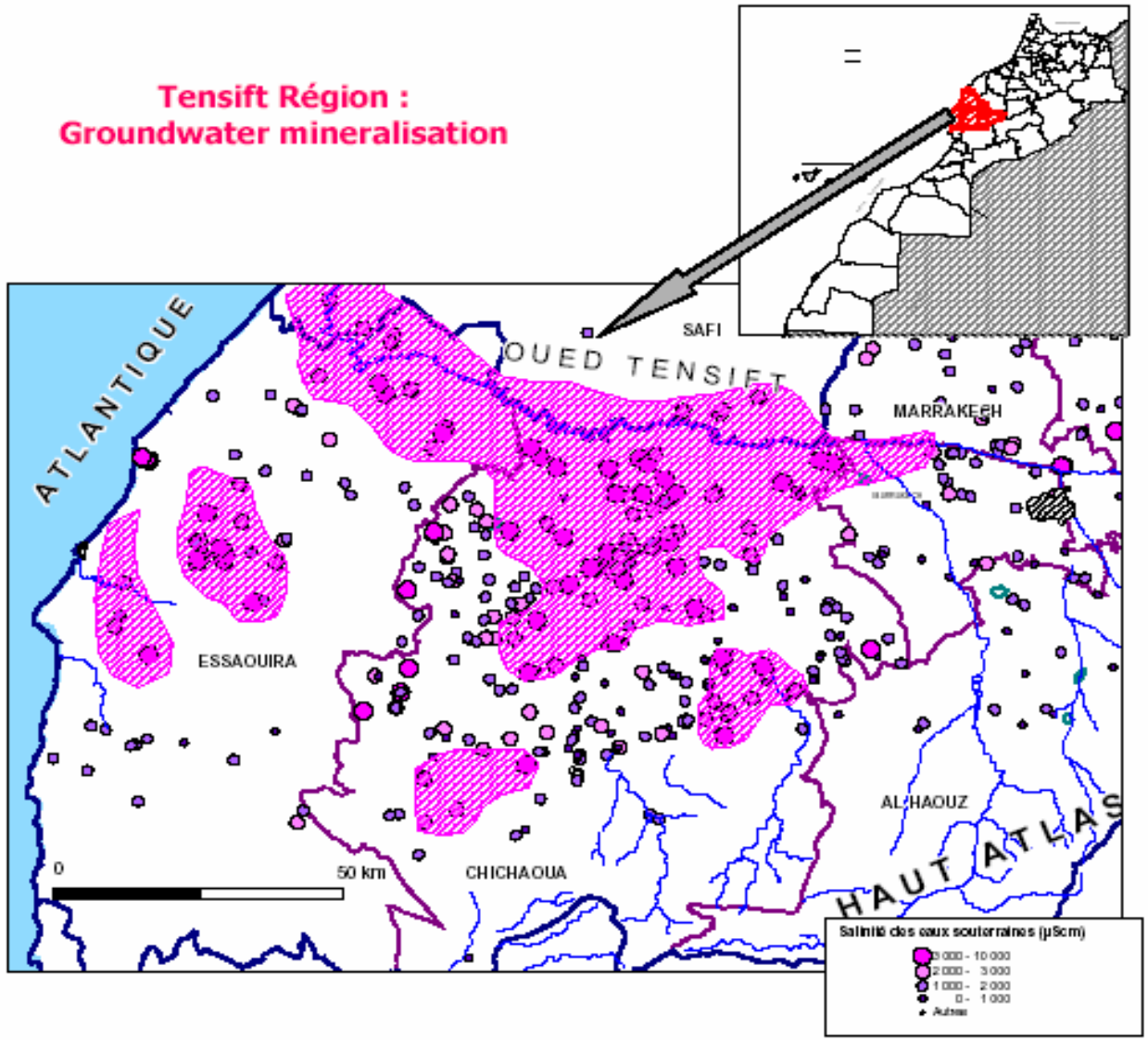
SCALE: 1:300	Dr.HASSAN EL-BANNA SAAD F
DATE : 03.04.04	

CONCEPTUAL CONFIGURATION OF THE PROPOSED AUTON
AND INTEGRATED COMPLEX FOR WATER,FOOD ,ELECTRIC
AND SALT PRODUCTIONS.

APPD. BY:		DRAWN BY:	DRG. NO.:


2004/ 4/ 6

Morocco - Tensift



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Morocco - Tensift

Description of the site:

- Name of the village: BOUJRAIN
- Rural Community: Abadou
- Circle: Ait Ourir
- Province: Al Haouz
- Location of the village is located 80 km east from Marrakech

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Morocco - Tensift

- **Infrastructure:**
  village connected to grid but the brackish water source (well) site is not.

- **Demography:**
  Number of households: 100
  Population: 577

- **Water consumption:**
  Human: 25 to 30 liters/day/Inhab.
  Livestock: 30 to 35 liters/day/Inhab.

- **Water demand:**
  35 m³/d

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Morocco - Tensift

Characteristics of the water point:

-Water source: well

-Total depth: 150 m

-Water level/ground: 7 m

-Measured flow rate : 8 l/s

-TDS: 6 g/l

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General results

- Field experience in all project phases
- Technical knowledge about sustainable ADS concepts
- Social-technical implementation strategies
- Know-how transfer to other regions and countries

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Specific outcomes

- Handbook
- Decision Support Tool
- Database
- Economical and legal masterplans for target countries
- Training materials
- Dissemination material
- Workshops
- active expert network

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Thank you for your attention!

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