

Effluent recovery and irrigation Scheme of North Gaza Emergency Sewage Treatment-NGEST - Complementary study for the Green Climate Fund (GCF)



Final report



October 2018

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| Project | Effluent recovery and irrigation Scheme of North Gaza Emergency Sewage Treatment-NGEST - Complementary study for the Green Climate Fund (GCF) |
| BRLi Project reference | a00388\_gaza\_gcf\_indb.docx |
| Version of document | B |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Date of publication | Version | Observation | Compiled by | Verified and validated by |
| 31/07/2018 | A | Draft report | D.Olivier / F. Lataste / B. De Abreu | D. Olivier |
| 15/10/2018 | B | Final report | B. De Abreu | D. Olivier |
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Effluent recovery and irrigation Scheme of North Gaza Emergency Sewage Treatment-NGEST - Complementary study for the Green Climate Fund (GCF)

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Acronyms

AFD Agence Française de Développement

CC Climate Change

GCF Green Climate Fund

GDP Gross Domestic Product

GEF Global Environment Facility

IPCC Intergovernmental Panel on Climate Change

IRR Internal rate of return

NGEST North Gaza Emergency Sewage Treatment

NGO Non-Governmental Organisation

NPV Net present value

NR Natural Resources

NRM Natural Resources Management

OECD The Organisation for Economic Cooperation and Development

VAT Value Added Tax

# Introduction

The Palestinian National Adaptation Plan (NAP) and the initial national communication (INCR) to the United Nations Framework Convention on Climate Change (UNFCCC) in addition to the Palestinian Nationally Determined Contribution (NDC) have identified water and food security as the most vulnerable issues in Palestine, with knock-on implications for all sectors. In Gaza, the population has one of the lowest per capita water availability in the world, with quality far below World Health Organization (WHO) standards.

Food and water insecurity will increase in the baseline scenario with a “climate contribution” to this trend, in terms of acceleration of existing anthropic factors, estimated at 30% (as will be explained further down). The project intends to counterbalance the negative compounding effect of climate change on already degraded resources by delivering infrastructure and innovative hydraulic technology -Managed Aquifer Recharge (MAR)- to create a new non-conventional water resource to be injected in the aquifer and to be reused for agricultural purposes.

The project will increase the resilience of 4,200 farmers and their families, thereby enhancing the livelihood of 23,553 people, including 11,776 women; MAR will alleviate the pressure on the aquifer, thereby improving access to domestic water of 200,000 additional people.

This is a huge paradigm shift for Palestine, where the MAR technology is implemented for the first time and will allow engaging directly with the neuralgic issue of adaptation to climate change in the area, which is the Nexus Food – Water insecurity.

This program will take place in particularly vulnerable areas to climate change: sensitivity to wind and water erosion (and therefore to heavy rainfall), drought and rising temperatures. These areas are also characterized by a strong interdependence between rural populations and natural resources. Some of these include protected areas, while others are neighbouring.

The natural resource management actions carried out by the Program will contribute to reducing the vulnerability of local communities and their adaptation to the adverse impacts of climate change.

Context of this report

AFD has been accredited by the Green Fund (Green Fund) to emerge for its funding to promote mitigation and adaptation to climate change.

The project in question, for the development of the reuse of treated wastewater in Gaza, is currently being studied by the GCF.

Additional elements to be provided to the Fund include the establishment of the economic and financial model of the project, which is the subject of this service.

# Purpose of this report and terms of reference of this study

The purpose of this assignment is to provide the requested elements in the following sections of the Funding Proposal:

* B.1 Description of Financial Elements of the Project: providing an integrated financial model that includes a projection covering the period of financial closing. GCF financing [20 years] with detailed assumptions and rationale; and a critical analysis of critical elements of the project / program;
* F.1. Economic and Financial Analysis: E.6.3.
* E.6.3 Financial viability: The following is a guideline for the future of financial support. Refer to the third bullet in section B.1. (Breakdown of cost estimates) and section D.1. (Value Added of GCF involvement) to make assumptions about the additionality of VC financing.

# Description of the program

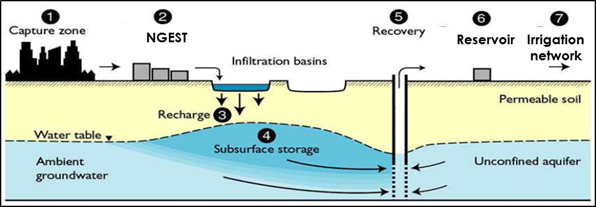
The program aims to bring an additional resource (with regard to the baseline scenario whereby waste water is not treated and becomes a source of pollution for the aquifer) to the water balance in Gaza and, therefore, increase the resilience of its population and reduce the vulnerability of agricultural sector, in the context of climate change.

The project’s goal is to develop an integrated low-carbon water management scheme to reduce the impact of warmer temperatures, decreasing rainfall and increasing aridity due to climate change, and deliver additional amounts of water usable for sustaining agriculture and increasing the resilience of a highly vulnerable population in the Gaza Strip.

The effects and impacts of the project are as follows:

* Reduce the vulnerability of Gaza’s coastal aquifer and secure sustainability of access to domestic and agricultural water;
* Promote climate resilient and water-efficient agriculture;
* Enhance the institutional and operational capabilities for integrated resilient water management.

Figure 1: NGEST program



# Economic and financial evaluation of the Program

## Introduction

The importance of the financial framework necessary for the implementation of the NGEST program and material resources to implement, put the light on the question of economic and financial feasibility of the plan. This feasibility will be assessed through conventional assessment criteria (level of financial and economic profitability) but should also incorporate aspects reflecting the positive impacts of the development plan on natural resources, water accessibility, sanitary issues and condition of living for human beings.

A feasibility study has been realised by Almadina consultants in May, 2017 with AFD.

Our analysis is a process of evaluation in financial and economic terms of the direct and indirect effects of the various projects to protect the natural resource, the aquifer, as the main environmental impact.

Our analysis is based on:

* a With & Without project approach in order to estimate the agricultural net benefits (direct);
* the approach of the externalities of the project I.E the indirect environmental benefits (water aquifer value and CO2/t/eq value) of the project;
* a With / without GCF financing approach to compare both financing scenarios.

A three-step approach have been implemented:

* *Step 1 - Financial analysis:* This analysis assesses the **irrigation direct effects** of the actions that have an exchange value that is to say a market price. The price system adopted at this stage rule out the intervention of the state through the various price adjustment instruments (taxes, subsidies, tariffs ...) and reflects the profitability of the next beneficiary populations.
* *Step 2 - Extended Economic Analysis*: At this level the analysis takes into account some indirect effects of the program, such as the environmental effects. These are **external effects** to the facilities: the impact of the program on the ecosystemic services of the aquifer and the Carbone saved value in long term.
* *Step* 3 – *With / Without GCF Financing*: the financial ratios for the same project have been tested **with and without a GCF financing** amount.

## Step 1: the financial evaluation of the Program

### Basic financial data analysis

The input data for the financial analysis are represented by the total investment cost (of selected facilities) and revenues and expenses recorded in situations with – without the project.

Revenues and expenses are determined through technical and economic specifications established on the basis of the *“Complementary feasibility study for irrigation project, ALMADINA-TIMESIS (may 31th 2017)* and economic data collected on basis of the *“Design criteria and technical report for additional work related to the redesign of recovery Scheme, ALMADINA – TIMESIS, may 2018” and “The funding Proposal, GCF Version 1.1, June 2018”.*

On the future, state revenues will experience increases proportional to those yields while expenses will experience smaller increases. The main data used for the estimation is the profit margin of the culture or activity per ha.

Furthermore, we have considered the implementation schedule of five (5) years for the program and the gradual entry into production of the rural activities and plantations.

### Considered period of the financial prospective

The economic model with and without project is developed on a thirty (30) year period projection and based on the general following assumptions below:

Table 1: General financial and economic assumptions[[1]](#footnote-1)



The execution program is five years, the global duration of the program is 30 years.

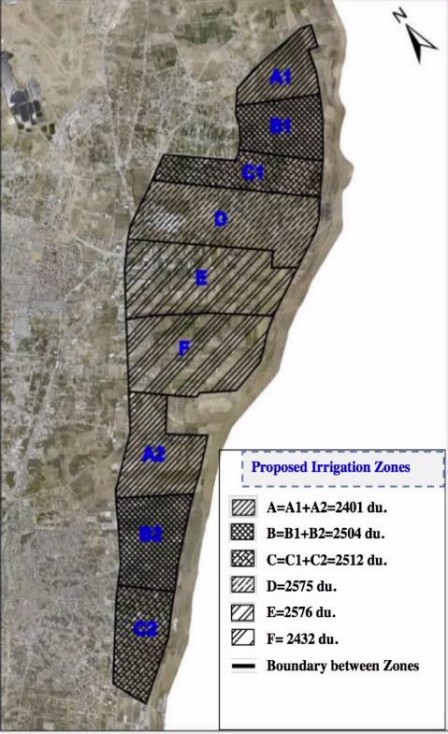
### Considered perimeter of the study

The project aims at supporting farmers in sustainable development of rural territories particularly vulnerable and increase the resilience of the population of Gaza in a context of climate change and aquifer pollution.

The gross agricultural area is approximately 1,570 ha (15,700 du) and it is located at the north-east side of the Gaza Strip adjacent to the eastern border as shown in the following Figure 12. The net irrigated area is approximately 1,260 ha (12,600 du) whereas the remaining 300 ha (3,000 du) of land is for other uses such as industrial and residential areas and roads. For optimizing construction and operation scheduling, the entire project was originally subdivided into two main parts (A and B) relative to their locations with the infiltration basins. Part A extended for about 1,010 ha (10,100 du) and Part B for an additional 500 ha (5,000 du) and were respectively located to the north and to the south of the infiltration basins.

In accordance with irrigation requirements, irrigation was to be carried out on a six-day rotational basis over six zones of almost equal size, i.e. A (A1 and A2), B (B1 and B2), C (C1 and C2), D, E and F, as shown in the following Figure. According to the original design, each day, only one of these six zones would have been irrigated. The original design determined the agricultural land based on cropping patterns, daily and monthly crop water requirements, irrigation methods, and amount of recovered water.

Table 2: Irrigation scheme

The recovery scheme comprises a system of 28 recovery wells and all related connection pipes as well as 15 monitoring wells. There are 28 recovery wells to be constructed across an area extending for approximately 1.3 x 1.3 km2.

### Direct benefits: working assumptions

Basic working assumptions, refer to the current activities on each area, the identified potential activities to be developed, and the yields of different crops and their margins of improvement for the different facilities.

The data used to establish the technical and economic specifications were drawn at the feasibility study of ALMADINA CONSULTANTS and AFD documents.

The following tables show the yields, unit prices, revenues and expenses per ha for the different cultures and retained without planning SWC (situation without project, on year zero called ‘baseline’).

Below, the production significates the turnover and the production margin is the net income or net profit ratio.

#### Crops areas and their evolution

The assumptions are those of the project with an evolution over the four first years and then a stabilization:

Table 3: Crops areas and evolution

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Crop areas (ha) | **Year 1** | **Year 2** | **Year 3** | **Year 4** | **Year 5 to 20** |
| **CITRUS** | 111,6 | 162,9 | 214,2 | 265,5 | 265,5 |
| **OLIVE** | 139,2 | 185,3 | 231,4 | 277,6 | 277,6 |
| **PEACHES** | 65,2 | 71,6 | 78 | 84,5 | 84,5 |
| **GRAINS** | 312,5 | 256,6 | 200,7 | 144,8 | 144,8 |
| **OTHER FRUIT CROPS** | 49,9 | 45,3 | 40,8 | 36,2 | 36,2 |
| **SUMMER VEGETABLES** | 93,8 | 86,7 | 79,5 | 72,4 | 72,4 |
| **WINTER VEGETABLES** | 132,3 | 104,3 | 76,3 | 48,3 | 48,3 |
| **WINTER TOMATO GREENHOUSES** | 18,1 | 24,1 | 30,2 | 36,2 | 36,2 |
| **ALMOND** | 50,6 | 73,9 | 97,3 | 120,7 | 120,7 |
| **ALPHA-ALPHA** | 68,4 | 85,8 | 103,2 | 120,7 | 120,7 |

#### Crops yields and their evolution

The table below presents the increase of yields over years and different crops before reaching the maximum yields expected according to the project feasibility report. There seems to be a mistake about olive expected yield in the feasibility reports estimated at 45kg/du whereas one could expect about 120kg/du.

Table 4: Crops yields and their evolution

|  | | **CITRUS** | **OLIVE** | **PEACHES** | **GRAINS** | **OTHER FRUIT CROPS** | **SUMMER VEG.** | **WINTER VEG.** | **WINTER TOMATO GREEN- -HOUSES** | **ALMOND** | **ALPHA-ALPHA** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Yield max.** | **Kg/du** | 1800 | 45 | 1100 | 450 | 750 | 5000 | 3000 | 7000 | 180 | 180 |
| **t/ha** | 18 | 0,45 | 11 | 4,5 | 7,5 | 50 | 30 | 70 | 1,8 | 1,8 |
| **year 1** | | 0% | 0% | 0% | 100% | 100% | 100% | 100% | 100% | 0% | 100% |
| **year 2** | | 0% | 0% | 0% | 100% | 100% | 100% | 100% | 100% | 0% | 100% |
| **year 3** | | 0% | 0% | 20% | 100% | 100% | 100% | 100% | 100% | 20% | 100% |
| **year 4** | | 0% | 10% | 40% | 100% | 100% | 100% | 100% | 100% | 40% | 100% |
| **year 5** | | 20% | 20% | 70% | 100% | 100% | 100% | 100% | 100% | 70% | 100% |
| **year 6** | | 30% | 40% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% |
| **year 7** | | 40% | 60% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% |
| **year 8** | | 50% | 80% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% |
| **year 9** | | 60% | 90% | 100% | 100% | 100% | 100% | 100% | 100% | 100% | 100% |
| **year 10** | | 70% | 100% | 98% | 100% | 100% | 100% | 100% | 100% | 100% | 100% |
| **year 11** | | 80% | 100% | 96% | 100% | 100% | 100% | 100% | 100% | 100% | 100% |
| **year 12** | | 85% | 100% | 94% | 100% | 100% | 100% | 100% | 100% | 100% | 100% |
| **year 13** | | 90% | 100% | 92% | 100% | 100% | 100% | 100% | 100% | 100% | 100% |
| **year 14** | | 95% | 100% | 90% | 100% | 100% | 100% | 100% | 100% | 100% | 100% |
| **year 15** | | 100% | 100% | 88% | 100% | 100% | 100% | 100% | 100% | 100% | 100% |
| **year 16** | | 100% | 100% | 86% | 100% | 100% | 100% | 100% | 100% | 100% | 100% |
| **year 17** | | 100% | 100% | 84% | 100% | 100% | 100% | 100% | 100% | 100% | 100% |
| **year 18** | | 100% | 100% | 82% | 100% | 100% | 100% | 100% | 100% | 100% | 100% |
| **year 19** | | 100% | 100% | 80% | 100% | 100% | 100% | 100% | 100% | 100% | 100% |
| **year 20** | | 100% | 100% | 78% | 100% | 100% | 100% | 100% | 100% | 100% | 100% |

Fruit trees usually needs between 3 and 5 years before starting to product. Their lifetime are usually between 30 and 50 years except for peaches that is about 20 years and Olive trees which can exceed 150 years. Almond and Peaches reach their maximum yield over 6 years, Olive over 10 years and Citrus over 15 years. Peaches yield starts to decrease over 10 years whereas other fruit trees maintain their maximum yield over the end of the project timescale.

The net margins of each crop after project is based on those of the feasibility report (Output 5: slide: 35).

Table 5: Nets margins for each crop

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Net margin ILS/du | Net margin €/ha | Net margin ILS/t | Net margin €/t |
| CITRUS | 863 | 2 036 € | 479 | 115 € |
| OLIVE | 301 | 710 € | 6 689 | 1 610 € |
| PEACHES | 1222 | 2 883 € | 1 111 | 267 € |
| GRAINS | -472 | - 1 114 € | - 1 049 | - 252 € |
| OTHER FRUIT CROPS | 794 | 1 873 € | 1 059 | 255 € |
| SUMMER VEGETABLES | 1742 | 4 110 € | 348 | 84 € |
| WINTER VEGETABLES | 1742 | 4 110 € | 581 | 140 € |
| WINTER TOMATO GREENHOUSES | 7815 | 18 439 € | 1 116 | 269 € |
| ALMOND | 256 | 604 € | 1 422 | 342 € |
| ALPHA-ALPHA | 439 | 1 036 € | 2 439 | 587 € |

*PS: differences and gaps have been noticed between those net margins and those of the output 6 Annexe 5, because of different production costs.*

The benefits for farming sector without project are those of the current situation broadcasted over 30 years with constant yields and areas and valorised with current net margins when we get the information or with actualised net margins based on AFD studies.

* Exploited areas and/or units are increasing for each zone in project situation and are constant or decreasing in situation without project.
* Some activities only exist in project situation and do not develop into without the project.

## Farm level investments and O&M costs

The farm level investments are integrated to the direct benefit evaluation on the 5 years of the implementation of the program. The costs are decreasing after the 2 first years of big investment:



**The O&M costs** for farm level represent 2% of the investments costs per year per crop and are included after year 3 of the implementation program.

## Step 2: the extended economic analysis

### Indirect benefits: working assumptions

This analysis integrates the indirect benefits related to **environmental externalities** and ecosystem services.

The extended economic evaluations is to assess externalities actions corresponding to the indirect impacts of the project. The effects to be evaluated in the context of this analysis are:

* In situation without project :
* the costs of degradation of the aquifer and its impact on water pricing on legal market and parallel market
* valuing the losses of the total economic value of the aquifer and the access to available water for human beings
* valuing the losses of carbon sequestration,
* In situation with project:
* the environmental value of the aquifer available for domestic and agricultural use
* the watershed preservation
* maintain or increasing the total economic benefit of water accessibility for people through the water pricing on the free and legal market
* valuing the increase of carbon sequestration.

The economic model integrates the environmental monetisation of the ecosystem services of the aquifer through the price of the access to domestic water for human beings, with and without project in order to identify the net green benefit or ‘net environmental and life benefit” of the project.

#### What are environmental benefits?

The economic valuation takes into account indirect costs and benefits, which include environmental benefits of the project. Indeed, the Water and Soil Conservation projects allows to maintain or even to develop natural areas, in a context of climate change. The environmental benefits are thus the avoided costs of the status quo, situation that would lead to the diminution of natural areas due to climate change effects. This chapter presents the valuation of these benefits.

Ecosystem goods and services are the benefits societies derive, directly or indirectly from ecosystem functions. These goods and services, as they are not – for the most part – exchanged on commercial markets, do not have a market price and need to be valued in order to be taken into account in policy decisions.

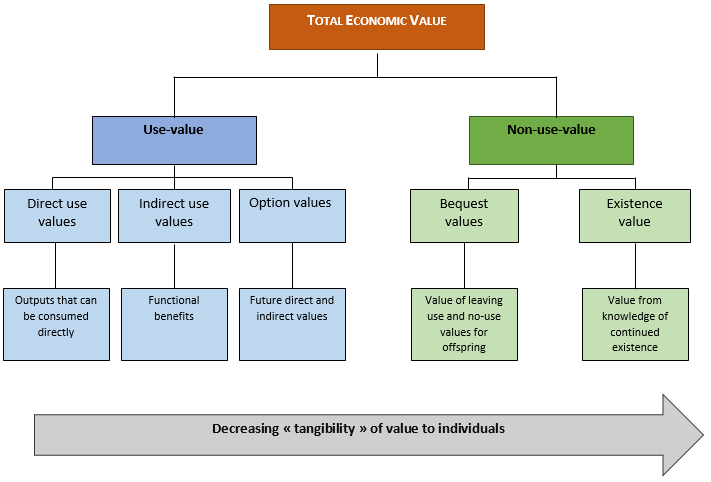
The *Millennium Ecosystem Assessment* distinguishes four kinds of eco systemic services:

* Provisioning services are natural resources that are marketable goods. For example: food, fuel, building materials, fiber, medicinal plants, etc.
* Regulating services are benefits from regulating functions of ecosystems. For example: water purification, food control, climate stabilization, pollination, etc.
* Cultural services are non-material benefits obtained from ecosystem via spiritual enrichment, esthetical experiences, meditation, creation, etc. For example: educational value, recreational and touristic use, esthetical value, patrimonial value, etc.
* Supporting services are different from the first three above, as they are necessary for the provision of all the other eco systemic services. They play a role on the long run. For example: primary production, soil formation, water circuit, bio-geo-chemical cycles, atmospheric oxygen production, etc.

In order to value these services, another typology classify them by the manner society “consumes” them It distinguishes:

* use value (that can be direct and indirect) that concerns current, planned or optional consumption,
* non-use value that concerns the value people attribute to the use of others (current generation or future generation) and existence value (knowledge of continued existence of resource)

Table 6: The total economic value of ecosystems (adapted from Munasinghe 1992)



#### Evaluation of the environmental benefits of a project

The environmental benefits of the project are estimated according to the following formula:

**Unit value of the ecosystem x (surface of the ecosystem with project – surface of the ecosystem without project)**

The table below shows the main assumptions and data based evaluation of environmental externalities:

Table 7: Working assumptions about water aquifer monetization

|  |  |  |
| --- | --- | --- |
| Item | Value assumption | Comment /source |
| Water price rate (domestic) €/m3 (2011) | 5,63€ | Funding proposal |
| Water price in parallel water market €/m3 | 7€ | Funding proposal |
| Price irrigation water (2017) | 0,3589€/m3 without project  0,15075€/m3 with project | Source : Almadina report “proposed water tariff” feasibility study |
| Loss of water without project per year | 5%/year of the 13Mm3 reuse water generated by the project on the aquifer | Funding proposal |
| Quantity of usable available water with the project on aquifer | 26 Mm3 | Funding proposal H.1.2 |

Table 8: Other assumptions for indirect benefits evaluation



### Investment costs

The intended structure of the project is based on three components (the logical framework of the project being currently defined by the feasibility study launched by the AFD in May 2018):

* Component 1. Production of additional quantities of water for agricultural use
* Activity 1.1 An additional water resource is created by infiltration of treated waste water
* Activity 1.2 Water – Energy Nexus, development of renewable low-emission energy solutions
* Component 2. Development of irrigation systems, increase water use efficiency and enhance climate resilient agriculture
* Activity 2.1 An improved water service for irrigation is brought to 4 200 farmers serving 1 500 ha
* Activity 2.2. Increased climate resilience of agriculture, adaptation of cropping systems
* Component 3. Management of the water cycle and capacity building of agents

The capital expenses of the program are described on the table below, for each output and component:

Table 9: Capital expenses of the Program



The total amount invested in the program is valued at 37 M euros in the model divided between the AFD financing and the GCF financing. The execution of the program runs over five years.

Table 10: Investments by components schedule



### The financing plan

NGEST infrastructures will be funded by a grant by the AFD and the Green Climate Fund.

AFD will bring grant of 13 M€ (65%) and will seek to implement a GCF 24 M€ (35%) Grant (or equivalent in USD).

The grants will be allocated for all the issues included the technical assistance and technical and economic advice to farmers and will contribute to the consultation and mediation costs.

The assumptions made in the financial and economic model are presented below:

Table 11: Financing conditions (scenario 1)



Our economic model compares two different financing conditions with two scenarios:

* Scenario 1: the program with an AFD and GCF financing as described above;
* Scenario 2: the program without the GCF financing (65% reduction of the project).

## Results of the economic and financial analysis

### Definitions

**Net present value (NPV)** is the difference between the [present value](http://www.investopedia.com/terms/p/presentvalue.asp) of cash inflows and the present value of cash outflows. NPV compares the value of a dollar today to the value of that same dollar in the future, taking inflation and returns into account. NPV analysis is sensitive to the reliability of future cash inflows that an investment or project will yield and is used in capital budgeting to assess the profitability of an investment or project.

NPV is calculated using the following formula:

|  |
| --- |
| http://i.investopedia.com/inv/articles/site/Corpfin63.jpg |

If the NPV of a prospective project is positive, the project should be accepted. However, if NPV is negative, the project should probably be rejected because cash flows will also be negative.

**Internal rate of return (IRR)** is the [discount rate](http://www.investopedia.com/terms/d/discountrate.asp) often used in capital budgeting that makes the net present value of all cash flows from a particular project equal to zero. Generally speaking, the higher a project's internal rate of return, the more desirable it is to undertake the project. As such, IRR can be used to rank several prospective projects a firm is considering. Assuming all other factors are equal among the various projects, the project with the highest IRR would probably be considered the best and undertaken first.

### Presentation of the results

The economic and financial indicators used on the analysis are the internal rate return (IRR) and the net present value (NPV). The economic model evaluates:

* The IRR and the NPV of the project with the green climate fund financing;
* The IRR and the NPV of the project without the GCF Financing.

For each scenario 3 indicators are compared:

* the IRR and the NPV of the project with direct benefits,
* the IRR and the NPV of the project with direct and indirect benefits, and with environmental benefits (externalities);

Table 12: Scenarios tested with the model

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | IRR | NPV | IRR | NPV |
|  | IRR | NPV | IRR | NPV |
| Direct benefits of the project | x | x | x | x |
| Direct & indirect benefits of the project | x | x | x | x |
| Direct, indirect and environmental benefits of the project | x | x | x | x |

The results of the economic and financial evaluation for the 30 year period projection are presented below.

Table 13: The direct and green indirect benefits of the project (30 years)



**Scenario 1: with AFD and GCF financing**

* The direct benefits (incomes for local farmers) of the project represent an internal rate of return of 3% (NPV : 703 K euros);
* The IRR of the direct and indirect benefits of the project (quantity and pricing benefits of irrigation water available) is non monetizable at this scale in terms of rate of return because of the very high value in long term scope of the available water in Gaza context. The NPV is 1.5 billion euros.
* The IRR and NPV that integrate the externalities or environmental benefits include the main items below:
* Aquifer availability and viability;
* Aquifer depollution;
* Access to domestic water for people and human beings (200 000 people);
* Carbon benefits in t/Co2 estimated value for future generations

As the NGEST program generates 13.3 Mm3 available recharging the aquifer, we estimated the creation of REUSE non-conventional water generates a water pricing in €/m3 lower than the situation without project (no project means no water available and means people buying it on parallel markets more expensive).

The direct benefit of this aquifer recharge is to have water accessibility at a lower price than the “without project” situation (5.63 €/m3 versus 7€/m3 (2018) for the 13.3 Mm3 generated).

The indirect and environmental benefit of this recharge is the available aquifer. The value of the available aquifer, regardless of uses, is a value in itself as a deliverer of ecosystem services. We estimate that the project enables to recharge the aquifer to 26 Mm3 (see funding proposal H1.2), on viable water available for many uses (domestic, irrigation etc.) but also as an underground aquifer.

This item represents the environmental and health actualized benefits for the future of the project. In comparison with direct agricultural benefits they are so high that we cannot calculate a financial ratio IRR to evaluate the benefit that it represents for each scenario.

**Scenario 2: without GCF financing**

The second scenario “without GCF financing” represents a reduction of the capital expenses essentially on the “soft” operations.

Without GCF financing:

* 50% of the area to be irrigated will still be equipped, because financed by the AFD,
* 50% of the recovery wells (15 wells) will be in operation as built by the World Bank.
* The other 14 wells that will not be built will not be able to mobilize all 13.3 Mm3 / year and therefore reduce the "green benefits" of the project, the assumption used in the economic model is 50% of water mobilisation (13.3 Mm3/year x 50%) without GCF financing.
* The photovoltaic park will not be built, implying an increase in the cost of water for the farms that will be served by the network. The nexus component will not be part of the project. The Carbon benefit is excluded of the economic model as an indirect environmental benefit.
* There is no delivery of the recovery scheme, so that the benefit in water pricing is not so high that in previous scenario.
* The outputs of the project will not be capitalized,
* The gender will not be introduced in the governance and there will not be a gender responsive approach to agricultural resilience,
* Capacities of quality control of the process will not be strengthened,

That is why all those health, human and environmental indirect benefits of the project cannot be evaluated on the economic model for the scenario “without GCF financing”.

Here is below the program with the only irrigation activities and components that still remain without GCF financing:



This diminution of scale generates a diminution of the direct benefits and costs, but also and mostly of the indirect benefits.

* The direct benefits represent an IRR of -4% (NPV : - 7.5 k€)
* On this model, the direct water pricing benefits are not as high as in scenario 1 because we cannot save the same volume of reuse water and because we have no NEXUS component in the project.
* The indirect benefits (CO2 t Eq reduction) are also reduced to 0% of the scenario1 because we have no photovoltaic component in the project.
* The value of the water table is lower because the quantity saved is less but also because the volume does not generate a gain on the tariff as important as in the previous scenario.
* The environmental and health benefits for the future actualized: they are so high that we cannot calculate a financial ratio to evaluate the loss that it represents without the project and without the GCF financing. The NPV represents – 7 MEUR but has no real signification.
* The indirect benefits, without GCF financing, are very lower than on the scenario 1 “with AFD and GCF” financing: NPV is 1.5 M€ versus 0.4 M€ for indirect and environmental benefits of the project.

### Interpretation of the results

The project has two types of benefits, at two different scales. First, it brings direct economic benefits to farmers and farm workers at the local scale. Second it brings high indirect benefits for the environment and the whole population of northern Gaza. This second type of benefits is not evaluable by this kind of financial ratios. The calculation of environmental benefits related to the preservation of the ground water and especially to the accessibility for human beings to more clean water generates orders of magnitude so high that the economic calculation of the IRR and NPV are indeed not possible. Especially in the Gaza’s geopolitical context.

Without GCF financing there is no sustainable project. With AFD and GCF financing, there can be a sustainable agricultural project but above all, access to clean water for thousands of human lives, allowing agriculture but also access to domestic water and a health impact that exceeds the economic value and financial project. The value of the aquifer as a resource is also a big part of the indirect value of the project for exosystemic service and human being in geopolitical Gaza situation.

### Comparative synthesis

The conclusions and comparative analysis of each scenario is presented below:

Table 14: comparative conclusions synthesis of the two 'with and without' GCF scenarios

| WITH GCF financing scenario | WITHOUT GCF financing scenario |
| --- | --- |
| Economic co-benefits | |
| * Job creation and income generation for the actions in support to regional economic development / support to farms | This project benefit will be reduced as only 50% of the wells will be put in place. moreover, the actions related to the support of capacities, knowledge and governance but also related to gender and young people will be almost non-existent in this scenario |
| * Improvement of agricultural production systems and management of energy performance (NEXUS) | There will be no profit on this theme because there will be no implementation of the photovoltaic project |
| * Enhancement and rationalization of agricultural production | On a limited scale, with fewer resources. No water quality management. |
| * Support to local value chains | No resources on this item. |
| * Additional profits for farmers due to more intensive and sustainable use of water, land and agricultural practices. | On a limited scale, with fewer resources |
| Social co-benefits | |
| •    Development of local governance of common resources ; | No financing for this benefit item |
| •    At the local level, support to farms will target small and medium farms, some of which are in a precarious situation. | No financing for this benefit item. No psychological support actions. |
| •    Gender-sensitive development impact: local consultation and community engagement is an opportunity to enhance women participation in the public debate. | No financing for this benefit item |
| •    Youth people development for which activities were especially dedicated and also development of their involvement in the consultation and collective meetings around the project, a major challenge our awareness of future generations. | No financing for this item |
| Environmental co-benefits: | |
| •    Sustainable management and regeneration of natural water resource through a non-conventional water is a key element of the project. | Lower regeneration of natural water resource through less non-conventional water, lower sustainable management. |

As we have seen above in the analysis of rates of return, the environmental benefits are the major value of the project. So these are long-term benefits to future generations in addition to short-term benefits to local populations.



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   https://fr.tradingeconomics.com/palestine/indicators [↑](#footnote-ref-1)