

Energy efficiency  
in action  
with multiple benefits at AB  
Vassilopoulos in Greece



Energy Efficiency Measures at two warehouses

## Multiple Benefits Methodology



**Installation of a PV system on the terrace of the warehouse of the supermarket chain company AB Vasilopoulos in Greece.**

**&**

**Installation of a heat exchanger at a warehouse of the supermarket chain AB Vassilopoulos in Greece.**

OINOFYTA WAREHOUSE – 1st Showcase



[G.Karampatos, AB Vassilopoulos S.A.]

### **Current situation:**

- In total, the company is comprised by 324 stores, 5 Central Warehouses and the Headquarters
- Total annual energy consumption equals 198.4 GWh
- Total GHG emissions equal 172.1 ktonCO<sub>2</sub>
- Cooling systems (typical: 300 and compact:24)
- Number of Employees: 15.386
- Purchased Green Energy from grid 193.9 GWh
- First BREEAM certified green building in Greece in 2010 (“Very Good”).
- An additional “GreenStore” certification.
- Already implemented energy efficiency measures (PV roofs, Low consumption light bulbs, Smart lighting system that automatically adjusts the intensity of the lighting to a predetermined level etc.).
- Electricity Consumption has decreased by more than 29% since 2008.
- GHG emissions have decreased by almost 83% since 2008.
- Annual KPIs for energy management and building management

The company has already reduced its overall energy consumption and its CO<sub>2</sub> footprint significantly during the last decade (2008-2020) i.e. 29% and 83% respectively.

### Current situation at the specific location OINOFYTA:

One of the company's 5 central Warehouses, is located in Oinofyta, Greece. The plot is app. 115.000m<sup>2</sup> and the gross floor area is 30.400m<sup>2</sup>.

The facility has 8 different storage rooms. The only type of energy that the storage unit is consuming is electricity (annually 7,361,556.00 kWh). A natural gas network also exists but is not in use.

### Current situation and weaknesses-challenges:

At the specific warehouse, challenges have mostly to do with the fact that further electricity consumption reduction is sought while the retail company has made huge steps towards this direction already. An additional challenge is the company's ambition for 2025: To inspire customers to make healthier choices, increase product transparency and eliminate waste.



2025 Ambition: "Save for our customers, buy better, operate in a smarter and efficient way".

### Energy-efficiency measure(s) proposed :

EEM1: Installation of a PV system on the terrace of the warehouse at location OINOFYTA

EEM2: Installation of a heat exchanger at the warehouse at location OINOFYTA.

### Energy-efficiency measure(s) - advantages:

• Reduction of electricity consumed.

—————> EEM1: 2,365,223 kWh

EEM2: 163,800 kWh

• Reduction of CO2 emissions.

└───> EEM1: 2337.23 tonnes

EEM2: 161.97 tonnes

### Current situation at the specific location OINOFYTA:

EEM1: The part of the roof examined for a PV system installation, is a cross sectional area of 3025m<sup>2</sup>. The PV system would include 704 panels, placed in 44 rows, with an orientation of  $\gamma = 144^\circ$  and a tilt  $\beta = 38$  (equal to the latitude of the location). Overall 10 inverters would be utilized.

EEM2: Refrigeration is provided by a double stage compression system with ammonia which works at T between  $-10^\circ \text{C}$  and  $-35^\circ \text{C}$ . The upper stage of the ammonia system serves through a heat exchanger a 2nd refrigeration system which has as a working fluid a mixture of water & propylene glycol 35%. The storage unit has also a large industrial craft washer. The washer has an ability of washing 3000 craft hours and the crafts are positioned in two rows while moving in an opposite direction with the pumped water. The heating of the water is achieved by a set of coils that comprise the largest part of the installed power of the washer.

### Current situation and weaknesses-challenges:

EEM1 is a measure needing radical alterations on site, however leads to significant benefits. EEM2 concerns the exploitation of the heat of superheated ammonia, which derives from the compressors of the 2nd stage of the refrigeration circuit, and is discarded unused through the air-cooled condensers in the atmosphere.

The aim is to meet the hot water requirements of the Distribution and Maintenance Center. Specifically, the coverage of hot water needs is examined for the crate washers, the cheese storage unit and the restaurant. Overall it is a typical waste heat recovery measure with good prospects for the specific Warehouse.

### Company's activity:

Retail company with 5 major warehouses. The current project concerns the warehouse at location OINOFYTA which is:

- Receiving fresh and frozen foods from producers
- Storing goods before their distribution.
- Acting as a regional distribution center.

### Key customer segments and value proposition(s):

- Super market and affiliate stores are key segments.
- Value propositions:
  - The ability for customers to shop wherever and whenever they want.
  - Make healthier choices easier. Healthy and safe products. Sustainably sourced products.
  - Improved environmental performance (reduced food and plastic waste, reduced emissions).
  - Improvement of social footprint.
  - Healthy and safe place to work at.

Revenues streaming is made through on spot services, product's delivery and on-line services.



## Energy analysis

### Current energy consumption:

- Energy carriers impacted by the project: Electricity.
- Consumption
  - 7,361,556.00 kWh consumed /year

### Future energy consumption (EEM1 implementation - Installation of a PV system)

- Estimated physical savings: 2,362,223.00 kWh/year
- Net metering price: 0.058 €/kWh
- Estimated financial savings: 137,183.00 €/year

## Energy analysis

### Current energy consumption:

- Energy carriers impacted by the project: Electricity
- Consumption
  - 7,361,556.00 kWh consumed /year

### Future energy consumption (EEM2 implementation - Installation of a heat exchanger )

- Estimated physical savings: 163,800.00 kWh/year
- Estimated financial savings: 17,340.00 €/year
- Improvement of total energy consumption: 2,2%

## Operations analysis

Areas affected from the

EEMs:

The roof of the

warehouse's main building

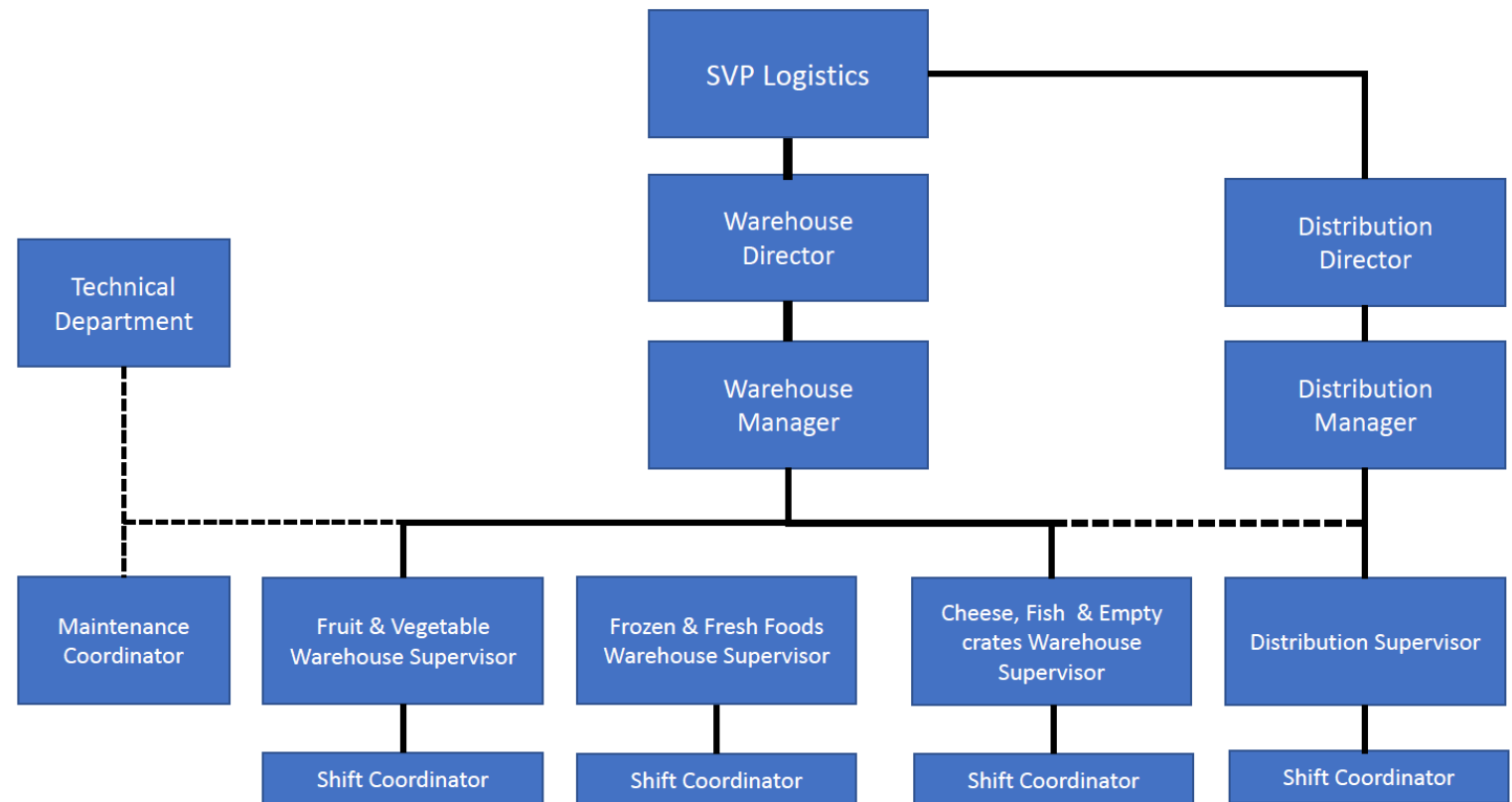
(for EEM1: PV arrays)

and

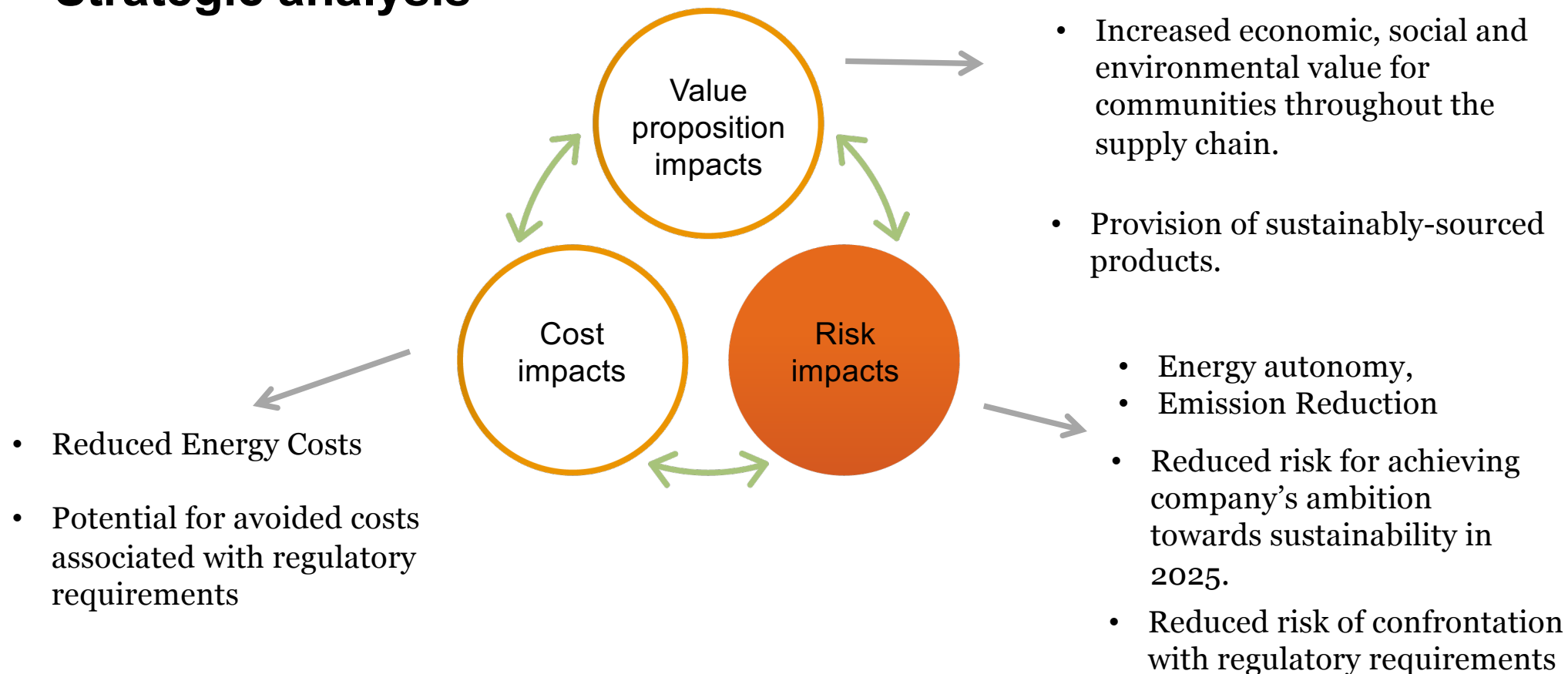
The refrigeration process

(for EEM2: Waste Heat

Utilization)



## Strategic analysis



## Financial analysis – EEM 1 (PV Roof)

### Energy benefits only

- CAPEX: 797,538 €
- NPV: 18,314 €
- IRR: 10,45%
- Simple payback: 4,79 years

### All benefits

- CAPEX: 795,538 €
- NPV: 291,408 €
- IRR: 17,03%
- Simple payback: 3,56 years

**Discount rate:** 10 %

**Investment duration:** 10 years (i.e. the number of years taken into account to compute NPV and IRR)

## Financial analysis – EEM 2 (Heat Exchanger)

### Energy benefits only

- CAPEX: 53,828 €
- NPV: 29,662 €
- IRR: 21,59%
- Simple payback: 3,09 years

### All benefits

- CAPEX: 53,828 €
- NPV: 48,575 €
- IRR: 28,27%
- Simple payback: 2,81 years

**Discount rate:** 10 %

**Investment duration:** 10 years (i.e. the number of years taken into account to compute NPV and IRR)

## Main reasons for the **improvement** of these projects:



[EEM1]: Large Investment and equally significant benefits.

[EEM2]: Typical EEM with good results.  
No major modifications necessary.



Any Questions?



# Replacement of lead-acid batteries of forklifts with lithium-ion batteries at a warehouse of the supermarket chain AB Vassilopoulos



MANDRA WAREHOUSE – 2nd Showcase

[G.Karabatos, AB Vassilopoulos S.A.]

## Current situation:

- In total, the company is comprised by 324 stores, 5 Central Warehouses and the Headquarters
- Total annual energy consumption equals 198.4 GWh
- Total GHG emissions equal 172.1 ktonCO<sub>2</sub>
- Cooling systems (typical : 300 and compact:24)
- Number of Employees: 15.386
- Purchased Green Energy from grid 193.9 GWh
- First BREEAM certified green building in Greece in 2010 (“Very Good”).
- An additional “GreenStore” certification.
- Already implemented energy efficiency measures (PV roofs, Low consumption light bulbs, Smart lighting system that automatically adjusts the intensity of the lighting to a predetermined level etc.).
- Electricity Consumption has decreased by more than 29% since 2008.
- GHG emissions have decreased by almost 83% since 2008.
- Annual KPIs for energy management and building management

The company has already reduced its overall energy consumption and its CO<sub>2</sub> footprint significantly during the last decade (2008-2020) i.e. 29% and 83% respectively.

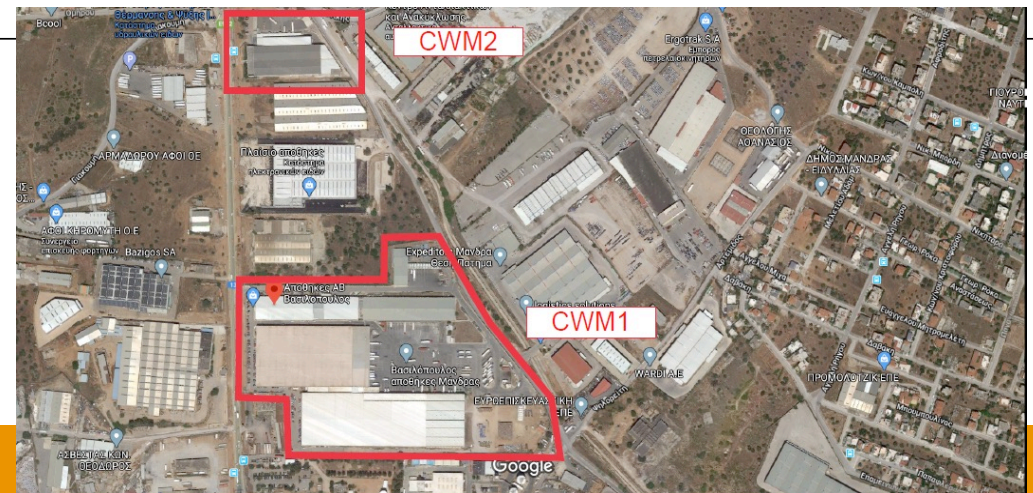
## Current situation at the specific location MANDRA:

One of the company's 5 central Warehouses, is located in Mandra, Greece.

The operation of the facilities concerns the receipt, storage, maintenance, preparation of sandwiches and then the repatriation of the products in the company's stores. The facilities include buildings of different usage in two separate lands of close proximity, Central Warehouses 1 and 2 (CWM1 and CWM2). The total building surfaces of CWM1 is: 46.122,64m<sup>2</sup> and the total area coverage of CWM1 is: 33.127m<sup>2</sup>. The total building surfaces of CWM2 is: 7.814,95m<sup>2</sup> and the total area coverage of CWM2 is: 5.865m<sup>2</sup>. CWM1 warehouse is used for the receipt, storage and distribution to the AB Vassilopoulos stores of non- food products. It also has a battery charging area for forklifts, office spaces and a basement, where it takes place the repair of damaged parts by the company's various stores

## Current situation and weaknesses-challenges:

The challenge at the specific location has deals mostly with the scarcity of energy utilization.



**Energy-efficiency measure proposed :**

Replacement of lead-acid batteries of forklifts with lithium-ion batteries.

**Energy-efficiency measure - advantages:**

- Flexibility in charging
- Flexibility for employees' time schedule
- Increased lifetime
- Reduced maintenance needs.

### Company's activity:

Retail company with 5 major warehouses. The current project concerns the warehouse at location MANDRA which is:

- Receiving fresh and frozen foods from producers
- Storing goods before their distribution.
- Acting as a regional distribution center.

### Key customer segments and value proposition(s):

- Super market and affiliate stores are key segments.
- Value propositions:
  - The ability for customers to shop wherever and whenever they want.
  - Make healthier choices easier. Healthy and safe products. Sustainably sourced products.
  - Improved environmental performance (reduced food and plastic waste, reduced emissions).
  - Improvement of social footprint.
  - Healthy and safe place to work at.

Revenues streaming is made through on spot services, product's delivery and on-line services.

## Energy analysis

### Current energy consumption:

- Energy carriers impacted by the project: Batteries for charging forklifts
- Consumption
  - 900569 kWh consumed per year for charging

### Future energy consumption (after EEM implementation - Replacement of the batteries)

- Estimated physical savings: ~ 94797 kWh/year
- Estimated financial savings: ~ 10428 €/year
- Improvement of total energy consumption: 10,53% for charging
- Improvement of total energy consumption: 2,56%

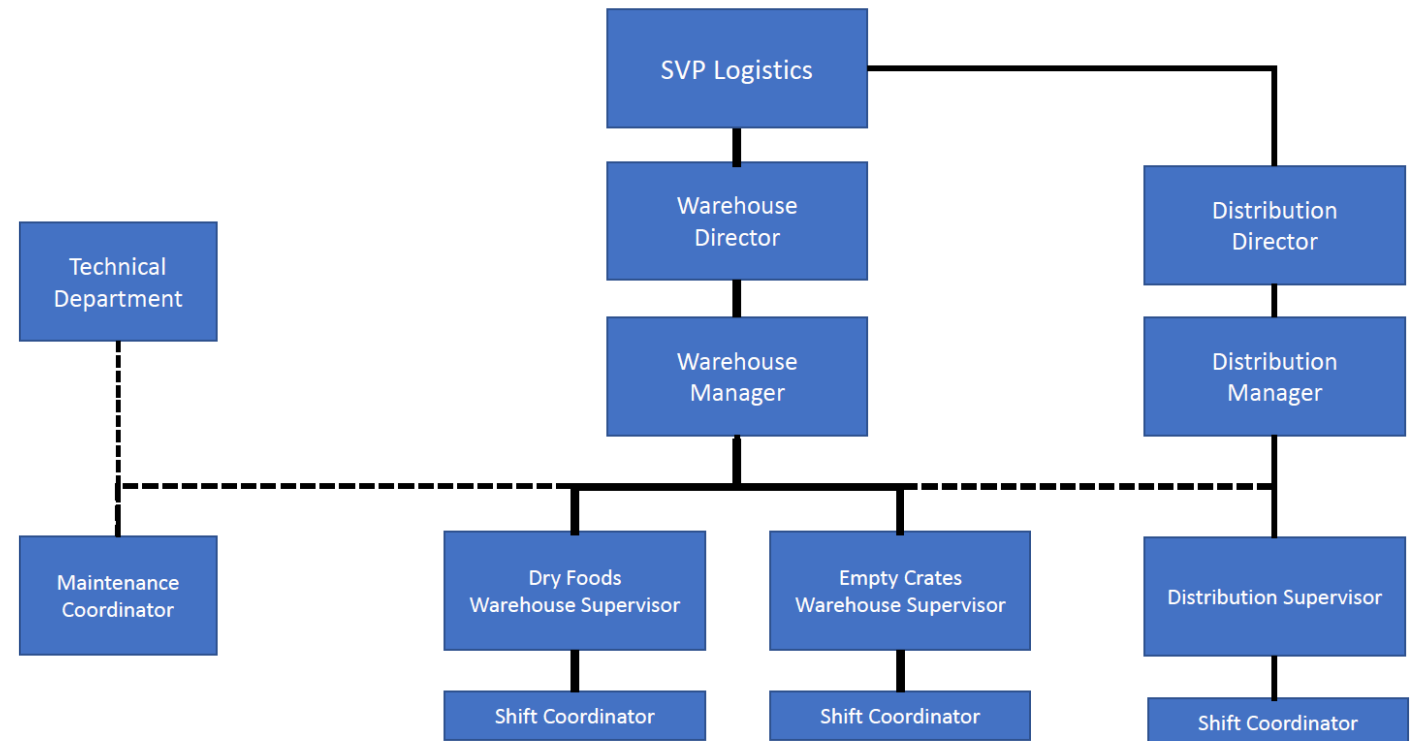
## Operations analysis

The EEM is applied on the internal transportation procedure.

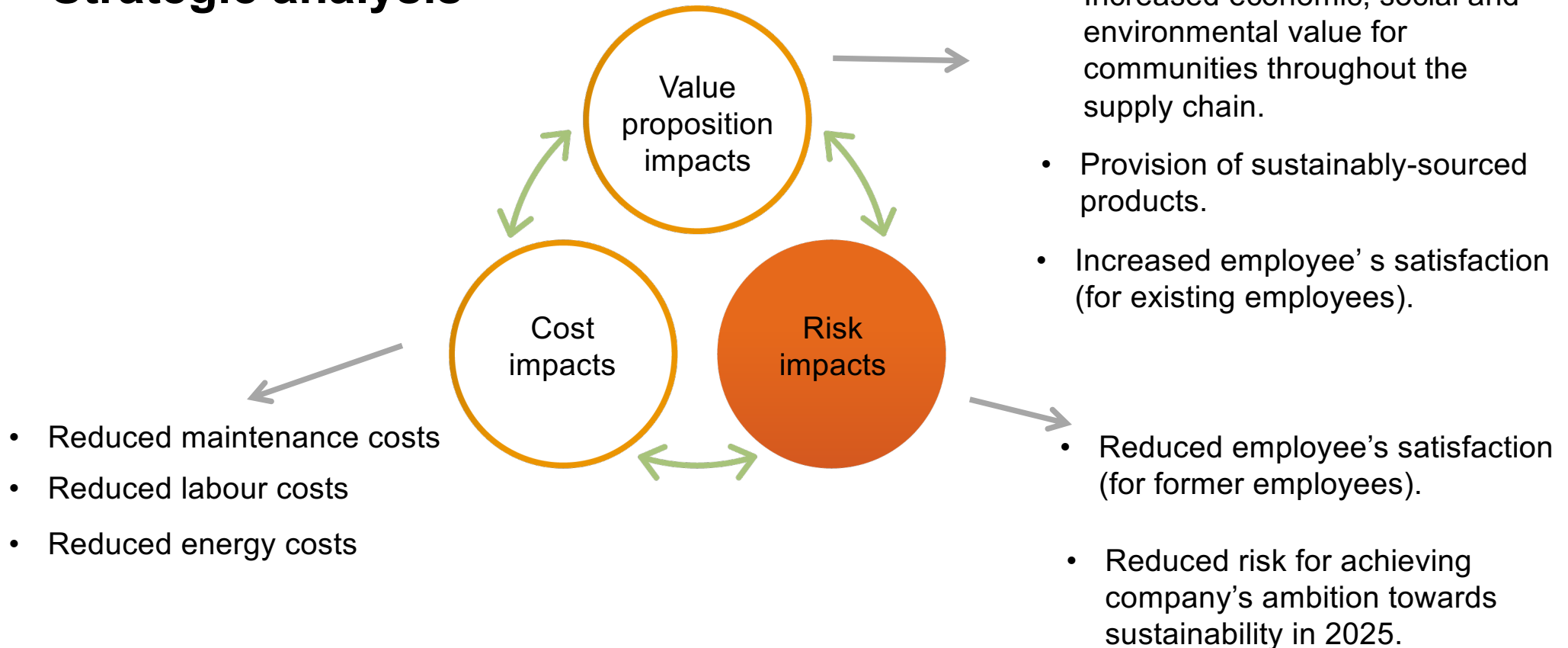
Forklifts are used for

- (i) loading and unloading procedures of trucks on ramps,
- (ii) transporting products from unloading areas to appropriate shelves for storage and then to collect the products from the shelves for loading on the company's trucks.

- iii) placing products transferred from order collection machines to high shelves, as well as the reverse process.



## Strategic analysis





## Financial analysis – EEM (Replacement of batteries)

### Energy benefits only

- CAPEX: 700,427 €
- NPV: 11.864,08 €
- IRR: 10,4%
- Simple payback: 9,90 years

### All benefits

- CAPEX: 700,427 €
- NPV: 340.011,24 €
- IRR: 20,4%
- Simple payback: 5,78 years

**Discount rate:** 10 %

**Investment duration:** 10 years (i.e. the number of years taken into account to compute NPV and IRR)

## Reasons for the **improvement** of this project:

- Time and space saving.
  - Reduced maintenance and supervision requirements.
  - Increased lifetime and narrowed time of non-operation.
-

## Further **EEM examined**: Upgrade of the artificial lighting

- The examined measure concerns the replacement of the fluorescent luminaires with new LED luminaires of reduced power technology.
- The annual energy savings could be equal to 123.856 kWh whereas a subsequent annual saving of 122,5 tons of CO<sub>2</sub> emissions is estimated.

## Financial analysis – EEM (Upgrade of the artificial lighting )

### Energy benefits only

- CAPEX: 106,970 €
- NPV: 5.944,77 €
- IRR: 11,3%
- Simple payback: 9,68 years

### All benefits

- CAPEX: 106,970 €
- NPV: 20.245,70 €
- IRR: 14,2%
- Simple payback: 7,83 years

**Discount rate:** 10 %

**Investment duration:** 10 years (i.e. the number of years taken into account to compute NPV and IRR)

Any Questions?

Thank you for your attention

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