



International MCDA Workshop on PROMETHEE: Research and Case Studies

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Port Investment And MCDA : **The Likely Contribution Of The PROMETHEE Method** **Case study : Moroccan context**

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Context of PROMETHEE using

Doctorate thesis on the theme of :

The MCDA Contribution to the Port Investment decision making process.

With a case study related to the Moroccan port sector

Results of research : Port investment decision making

Investment

- The realization of a port project produces several effects on the national economy and the political, social and regional environment.

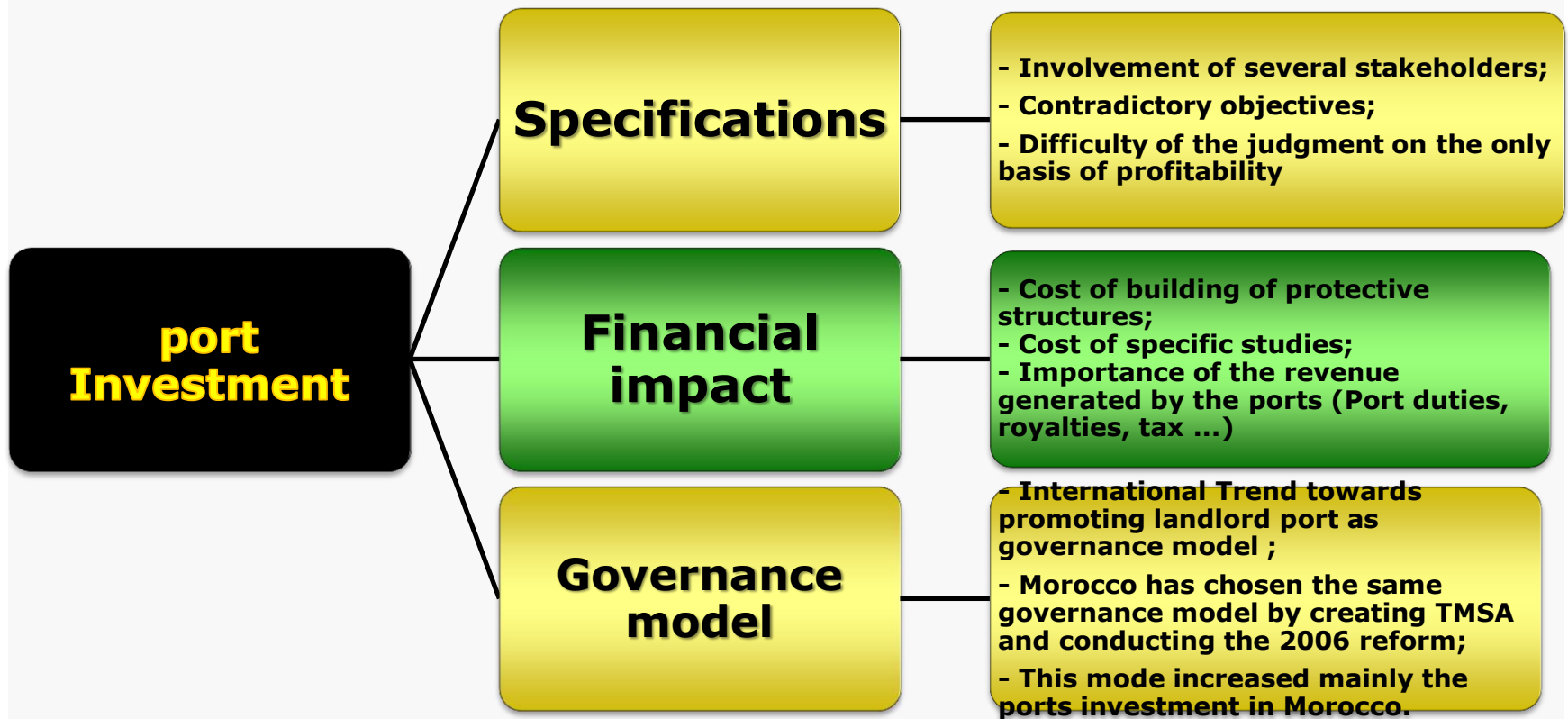
Decision

- The selection process of investment must consider the effects of this kind of projects on all stakeholders.

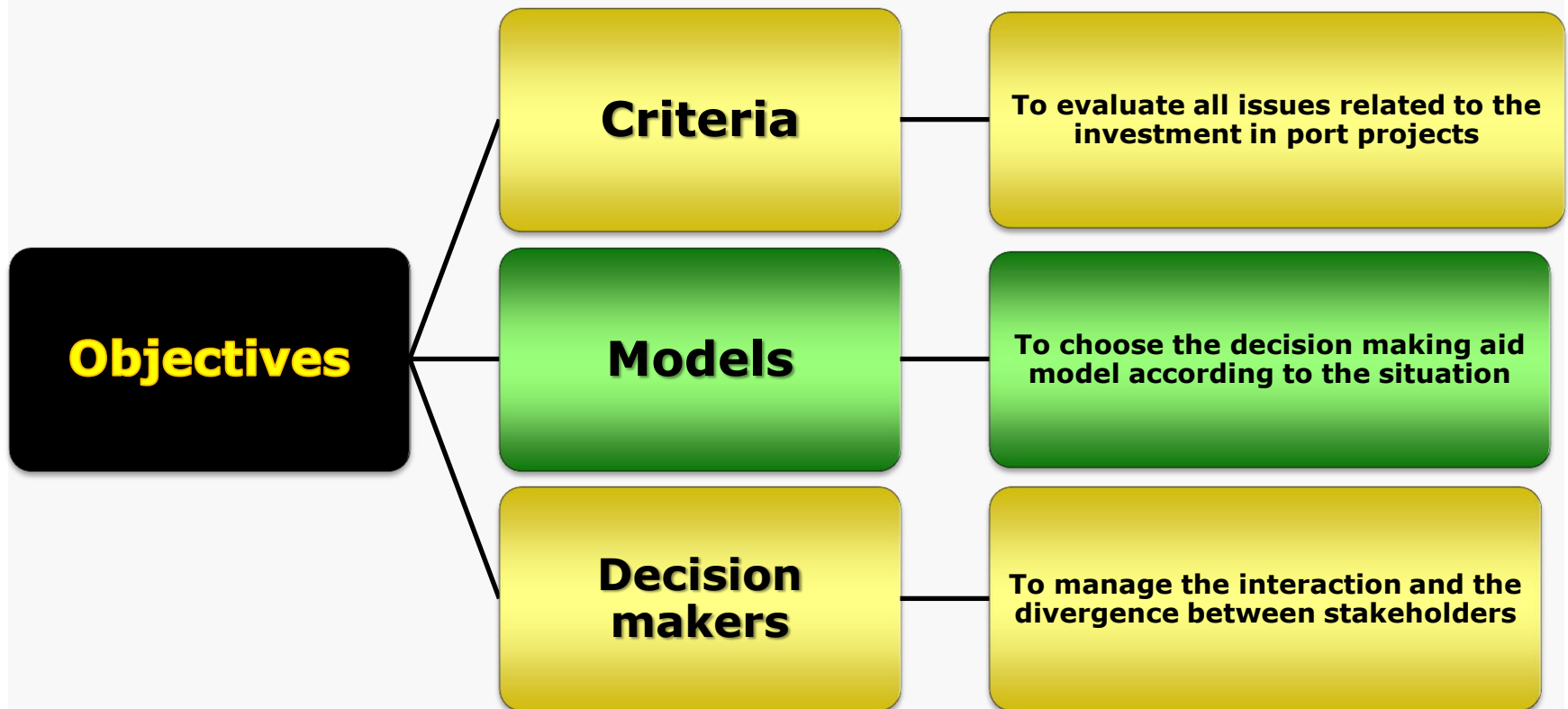
MCDA

- Adoption of multi-criteria approaches as a mean of evaluation and selection can contribute to perform a consensus decision process.

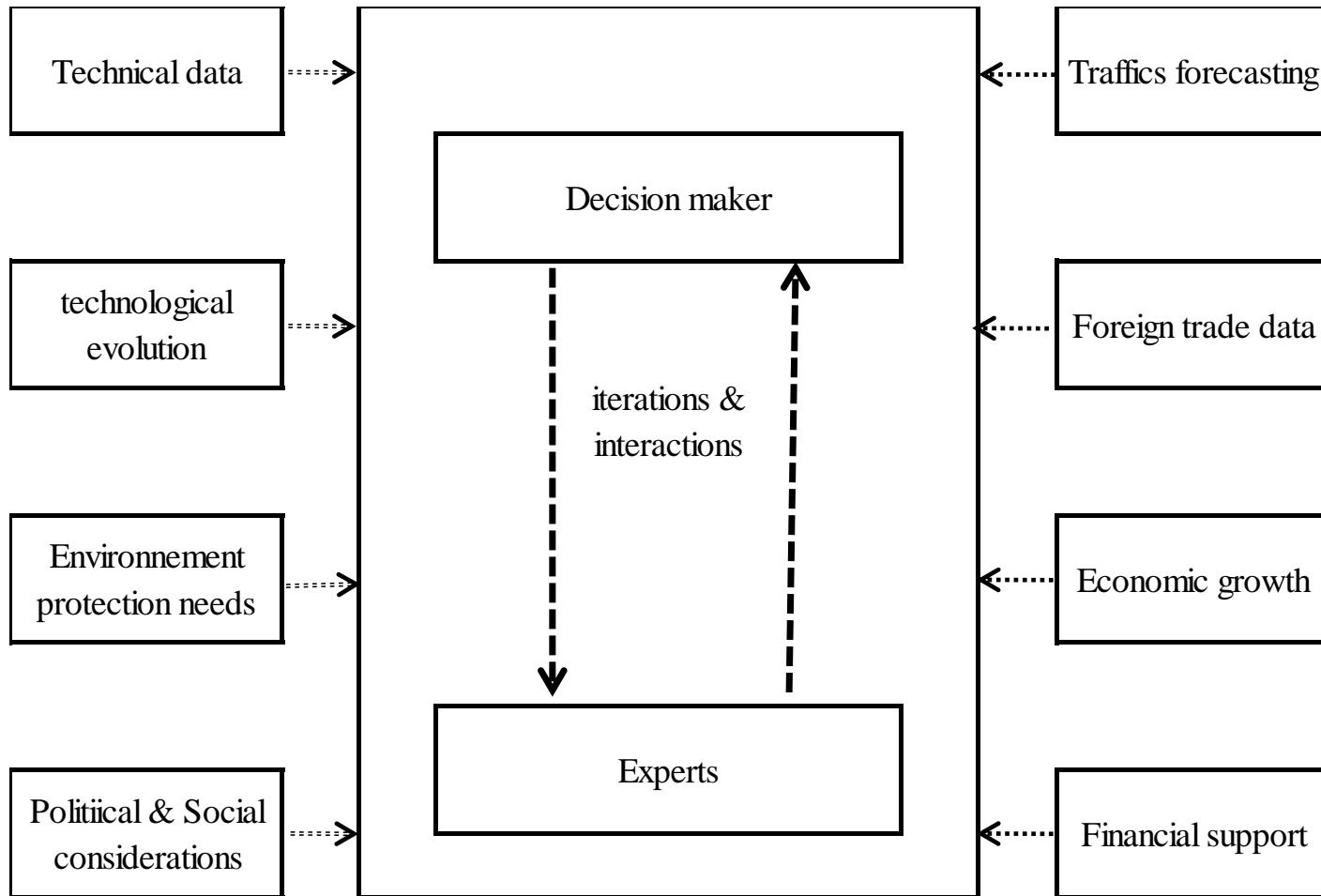
Why MCDA ?



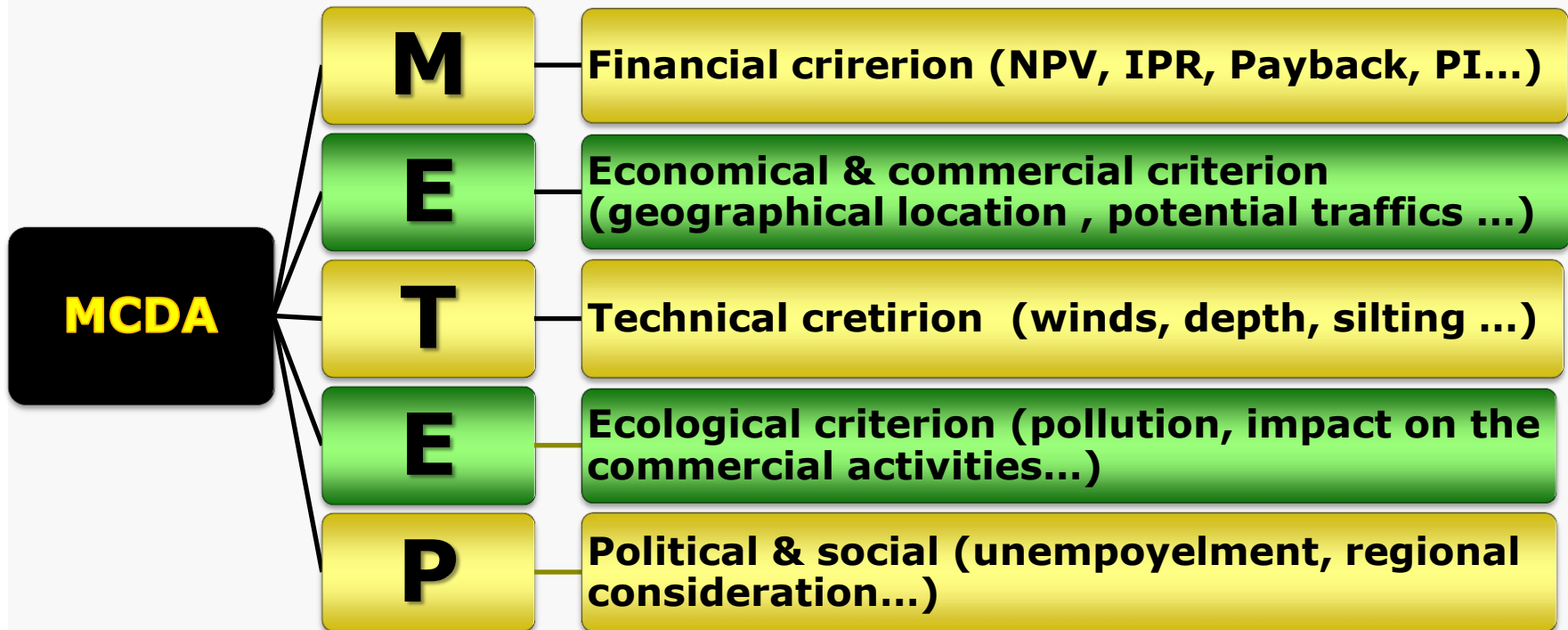
Results of research : Proposal objectives



Results of research : Conceptual model



Results of research : List of criterions



The case study

Choosing the location site of containers port project

- ❖ Strategic importance of this project impacts : political, social, financial, economical and commercial ;
- ❖ Important Financial needs and consequences;
- ❖ Implication of several stakeholders in the same decision making process : Government, regulators, stevedores, maritime transporters...).

The case study:

Choosing the location site of containers port project

The decision making situation concern the choice of a location site which will be built as containers port :

Public investment in terms of protection infrastructure, docks, internal roads ...;



The decision maker(s) must choose, according to 19 criterions (4 families of criterions), one site from 6 sites to host this port

The case study:

Choosing the location site of containers port project

Site 1 :

- ✓ Proximity to an industrial area with high potential;
- ✓ Extension of the zone by N +10 may double the needs of port facilities.

Site 2 :

- ✓ Site relatively far from the main centers of commercial activities;
- ✓ The port project will fit into a vision of regional economic development which incorporates incentive measures for investors. This vision will gradually create an important port demand from year N +7

Site 3 :

- ✓ Site which is halfway between two major business centers and economic activities.
- ✓ A commercial effort should be made to secure a place among the existing ports.

Site 4 :

- ✓ This site belongs a high growth economic activity area.
- ✓ Projects in this area have made a real business center and the need to create an adjacent port junction is increasingly urgent.

Site 5 :

- ✓ Site Away from the commercial and industrial.
- ✓ The closest port container is over 600 miles away
- ✓ This site can be a potential transshipment port to West Africa countries.

Site 6 :

- ✓ This site is in full economic and attractive area. It houses the main production centers of products intended for export
- ✓ Existence of adequate port infrastructure in the short term but the projects launched recently suggests that the development of a new port is largely justified.

Why PROMETHEE ?

- ❖ **Valuated Partial aggregation of DM preferences as ranking chosen approach ;**
- ❖ **Existence of software on the method with an updated version;**
- ❖ **Existence of a free version of this software.**

Results of the Financial analysis

Site	NPV : Net present value r = 6% (Millions of Dhs)	IRP: Internal Rate of Profitability	Payback
Site 6	72	7,30%	16
Site 4	58	7,29%	14
Site 3	16	6,24%	16
Site 1	-52	5,03%	17
Site 2	-101	4,08%	19
Site 5	-225	1,97%	22

MCDA - METEP : Performance table of sites

Criterion	Nature	Max / Min	Measurement unit	Site 1	Site 2	Site 3	Site 4	Site 5	Site 6
Technical									
Natural shelter against the sea swell	Qualitative	Max	5 à 1	3	4	5	4	2	5
Natural shelter against the prevailing winds	Qualitative	Max	5 à 1	4	3	5	5	5	4
Draught	Quantitative	Max	depth (m)	15	14	20	13	16	11
Frequency of silting (Annual Dredging)	Quantitative	Max	(1000 m3)	80	50	0	100	40	200
Land availability	Quantitative	Min	Cost (Mdh)	165	0	110	30	0	330
Commercial									
Hinterland potential	Qualitative	Max	5 à 1	3	2	4	3	1	5
Connection with other links in the supply chain	Qualitative	Max	5 à 1	4	5	3	2	2	1
Availability of storage platform	Qualitative	Max	5 à 1	5	4	4	2	3	1
Geographical location and interests of future stevedores	Qualitative	Max	5 à 1	4	2	3	4	1	5
Evolution of traffics	Quantitative	Max	Milions of 20'	11,68	10,16	13,6	11,5	10,85	13,6
Political and social									
Regional importance	Qualitative	Max	5 à 1	3	5	3	4	5	1
Opening the sector to privatization	Qualitative	Max	5 à 1	3	2	4	5	2	2
Unemployment rate	Quantitative	Max	Rate	9%	15%	10%	12%	8%	9%
Indirect jobs creation	Quantitative	Max	Job	100	350	150	180	300	80
Direct jobs creation	Quantitative	Max	Job	50	60	55	70	70	50
Financial									
NPV	Quantitative	Max	Mdh	-52	-101	16	58	-225	72
Internal rate of Profitability	Quantitative	Max	Rate	5,03%	4,08%	6,24%	7,29%	1,97%	7,30%
Pay back	Quantitative	Min	Years	17	19	16	14	22	16
Global Cost	Quantitative	Min	Mdh	652	529	756	487	664	642

METEP :

Illustration of the weighting mechanism

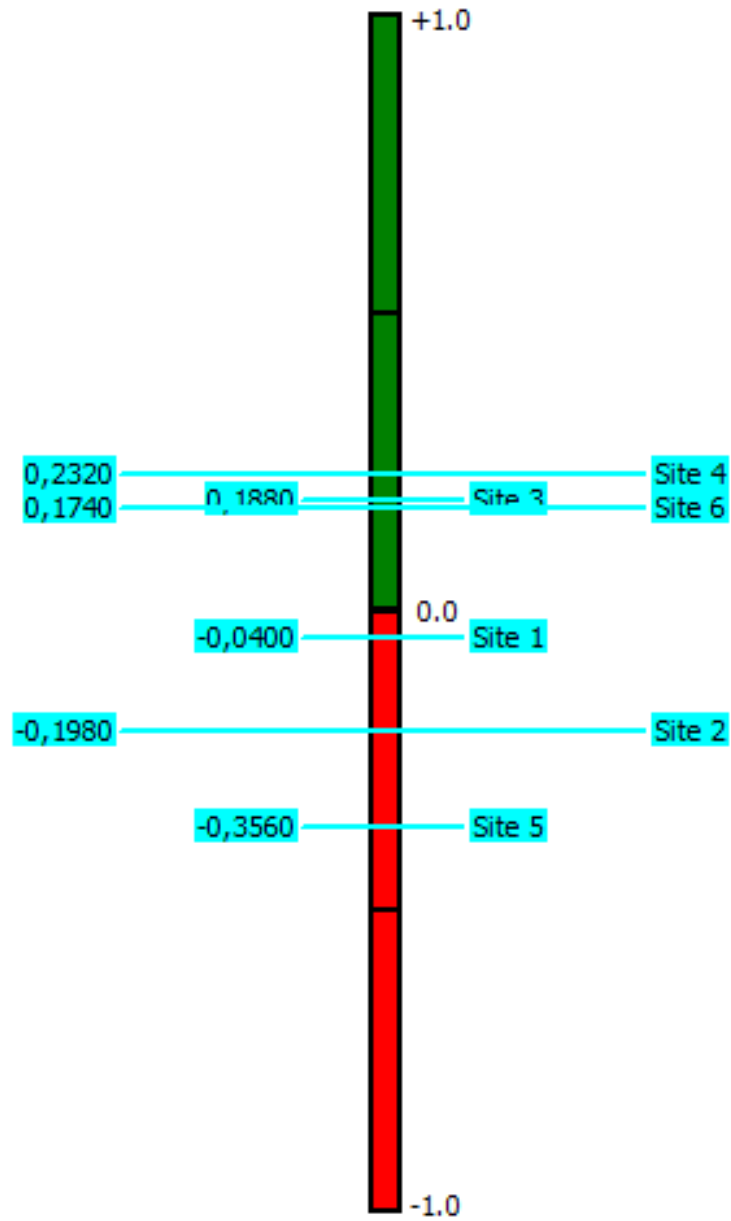
Category	weight
Technical	0,40
Commercial	0,20
Political and social	0,20
Financial	0,20
TOTAL	1,00

Criterion	Weight of the Category	Weight of the Criterion	Criterion ponderation
Technical			
Natural shelter against the sea swell	0,40	0,20	0,080
Natural shelter against the prevailing winds	0,40	0,20	0,080
Draught	0,40	0,15	0,060
Frequency of silting (Annual Dredging)	0,40	0,15	0,060
Land availability	0,40	0,30	0,120
			0,40

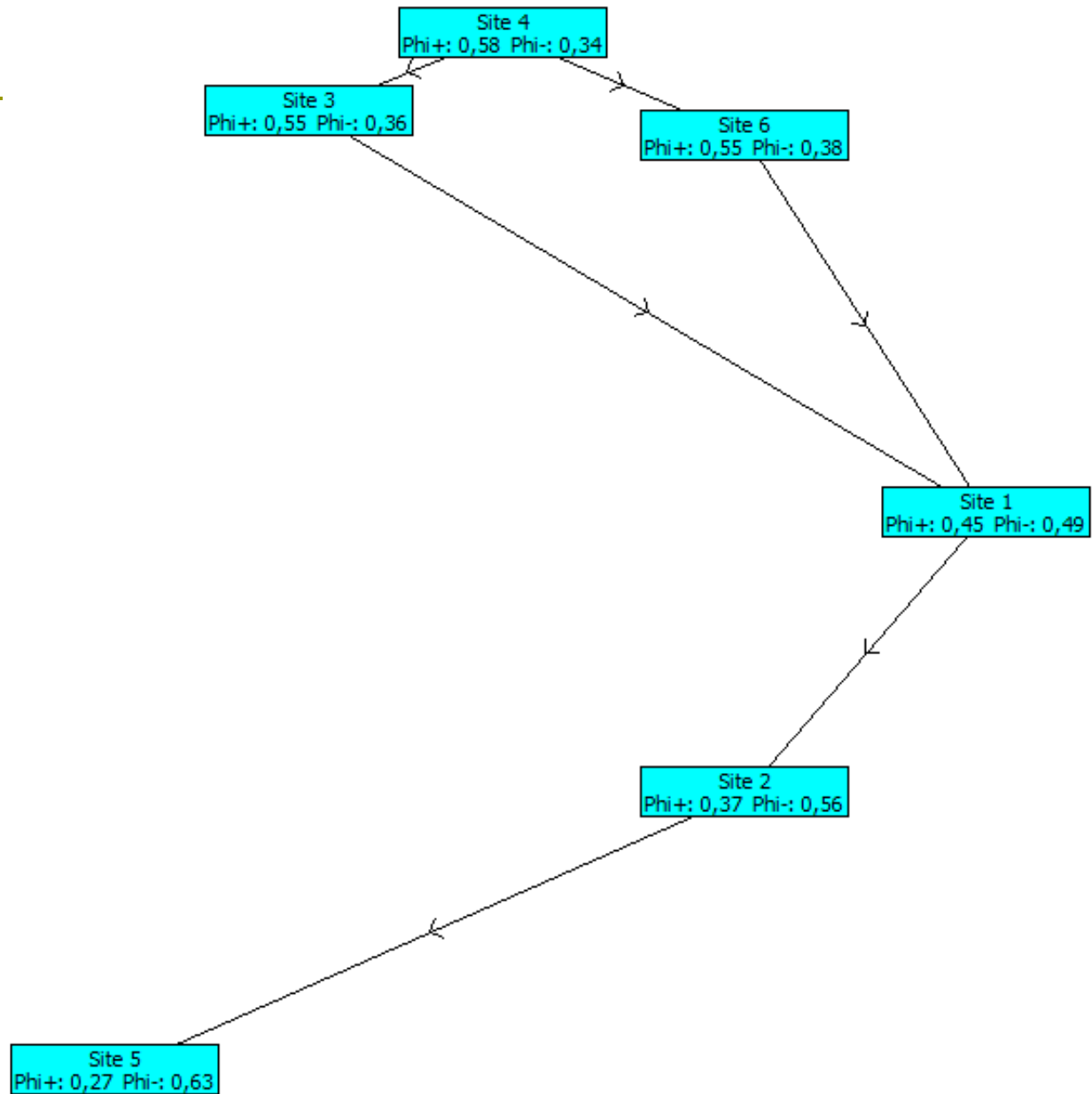
PROMETHEE hypothesis

- Measurement Scale of qualitative criteria includes 5 positions ;
- All criteria are regular: $p = q = 0$

PROMETHEE Ranking



PROMETHEE Graph



Action profil : site 4 vs site 6

