Mega Transport Projects: Paradoxes, Paradigms and Propositions

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- **My objective**

- Is ambitious: to change the (your!!) perception of the transport system:

FROM

a collection of different modes, tracks, services and providers, each semi -autonomous with its own objectives, organisation and funding.

TO

- A comprehensive, interrelated infrastructure of tracks, pipes and wires catering for movements over significant distances.
- Those movements are of people, goods, information, energy and waste
- terminals and interfaces within which
  - micro (but costly) distances are covered using micro-modes
  - waiting and storage areas are provided. These are a necessary component of all movement because the modes have disparate rhythms and because supply cannot precisely match demand

- I am asserting this change in perception amounts to a paradigm shift

- It has considerable implications for Mega Transport Projects (MTPs) because they are integral improvements to the transport system as a whole, NOT independent projects.

Proposition #1

- Technical evaluations of Mega Transport Projects (MTPs) are [or should be] a necessary prerequisite before investment is authorised.

Proposition #2

- Technical cases have to be based upon the differences between an unimproved transport system and the same system after improvement.

Proposition #3

- Technical cases depend upon a methodology to predict use travel times and costs

- Those costs must include environmental impacts and their effects upon sustainability

Proposition #4

- Sustainability is complex. As a simplification, the emission of CO_2 may be used as a proxy for the overall effect.

Proposition #5

- Embedded CO_2 is very problematical and is unlikely to sway major decisions. It may be crudely ignored.

CO_2 per provided person- or tonne-kilometre

Assumptions	Car	Diesel bus	Hybrid bus	Tram	Train Class 172	LGV 3.5 tonne	17 tonne 2-axle	44 tonne artic	Loco + 12 wagons	Ship 10000 Containers	Fork lift	Human porter
Purchase price (£)	16,000	192,000	300,000	2,000,000	3,400,000	21,000	55,000	100,000	4,000,000	65,000,000	20,000	0
Interest (per year):	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%
Life (Years)	10	15	15	30	30	5	7	6	25	25	5	20
Fuel (litres or kWh / 100km)	8.5	40	12	500	90.8	12	24	37.2	435	16750	12	0
Fuel (£ / litre or kWh):	1.35	0.912	0.912	0.03	0.5	1.35	1.35	1.35	0.5	0.5	0.5	0.5
Kilometres per year	24000	35000	35000	70000	102000	56000	88000	140000	55000	270000	30000	6000
Mean running speed (km/h)	40	25	25	35	50	66	66	66	55	45	24	3
Mean journey speed (km/h):	30	9	9	20	45	55	55	55	50	40	15	3
Working hours per year	800	3889	3889	3500	2267	1018	1600	2545	1100	6750	2000	2000
Staff cost (£/head/year):	50000	50000	50000	50000	50000	50000	50000	50000	50000	50000	50000	50000
Fixed cost (£ per year)												
Finance (8% interest)	2384	22431	35049	177655	302013	5260	10564	21632	374715	6089121	5009	0
Insurance	700	2000	2000	2000	2000	1000	2000	3500	100000	1000000	1500	0
Licence	245	165	164	0	0	210	650	1200	0	0	0	0
TOTAL	3329	24596	37213	179655	304013	6470	13214	26332	474715	7089121	6509	0
Variable cost (£ per km)												
Fuel	0.115	0.365	0.109	0.150	0.454	0.162	0.324	0.502	2.175	83.750	0.060	0.000
Tyres	0.017	0.017	0.017	0.000	0.000	0.011	0.017	0.036	0.000	0.000	0.036	0.000
Maintenance	0.059	0.075	0.080	0.065	0.833	0.068	0.075	0.012	1.000	1.500	0.012	0.000
TOTAL	0.190	0.457	0.206	0.215	1.287	0.241	0.416	0.550	3.175	85.250	0.108	0.000
Variable cost (£ per hour)												
Wages	0.0	12.5	12.5	25.0	22.1	12.5	12.5	12.5	25.0	90.0	12.5	6.0
O'heads	0.0	12.5	12.5	25.0	22.1	12.5	12.5	12.5	25.0	90.0	12.5	6.0
TOTAL	0.0	25.0	25.0	50.0	44.1	25.0	25.0	25.0	50.0	180.0	25.0	12.0
Capacity												
Places	5	90	90	250	150							
Tonnes	0					1.625	10.5	28	900	267000	3.5	0.05
TOTALS												
£ per year	7883	137806	141660	369705	535321	45420	89822	166996	704340	31321621	59749	24000
£ per life-hour	0.90	15.73	16.17	42.20	61.11	5.18	0.00	0.00	0.00	0.00	0.00	0.00
£ per work-hour	9.85	35.44	36.43	105.63	236.17	44.61	56.14	65.61	640.31	4640.24	29.87	12.00
£ per kilometre	0.3285	3.9373	4.0474	5.2815	5.2482	0.8111	1.0207	1.1928	12.8062	116.0060	1.9916	4.0000
Units(place-km or tonne-km)	120000	3150000	3150000	17500000	15300000	91000	924000	3920000	49500000	7.E+10	105000	300
£ per unit	0.0657	0.0437	0.0450	0.0211	0.0350	0.4991	0.0972	0.0426	0.0142	0.0004	0.5690	80.0000
CO_2 (kg per unit)	0.0541	0.0141	0.0042	0.0089	0.0192	0.2348	0.0727	0.0422	0.0154	0.0020	0.1090	0.0000

Proposition #6

- Project plans should include objectives in the form of the expected changes in performance of the transport system at large.

Proposition #7

- Progress in the delivery of the project should be monitored to sense changes in performance, recognising that these changes may be due to the changing nature of the problem rather than the effectiveness of the project.

Proposition #8

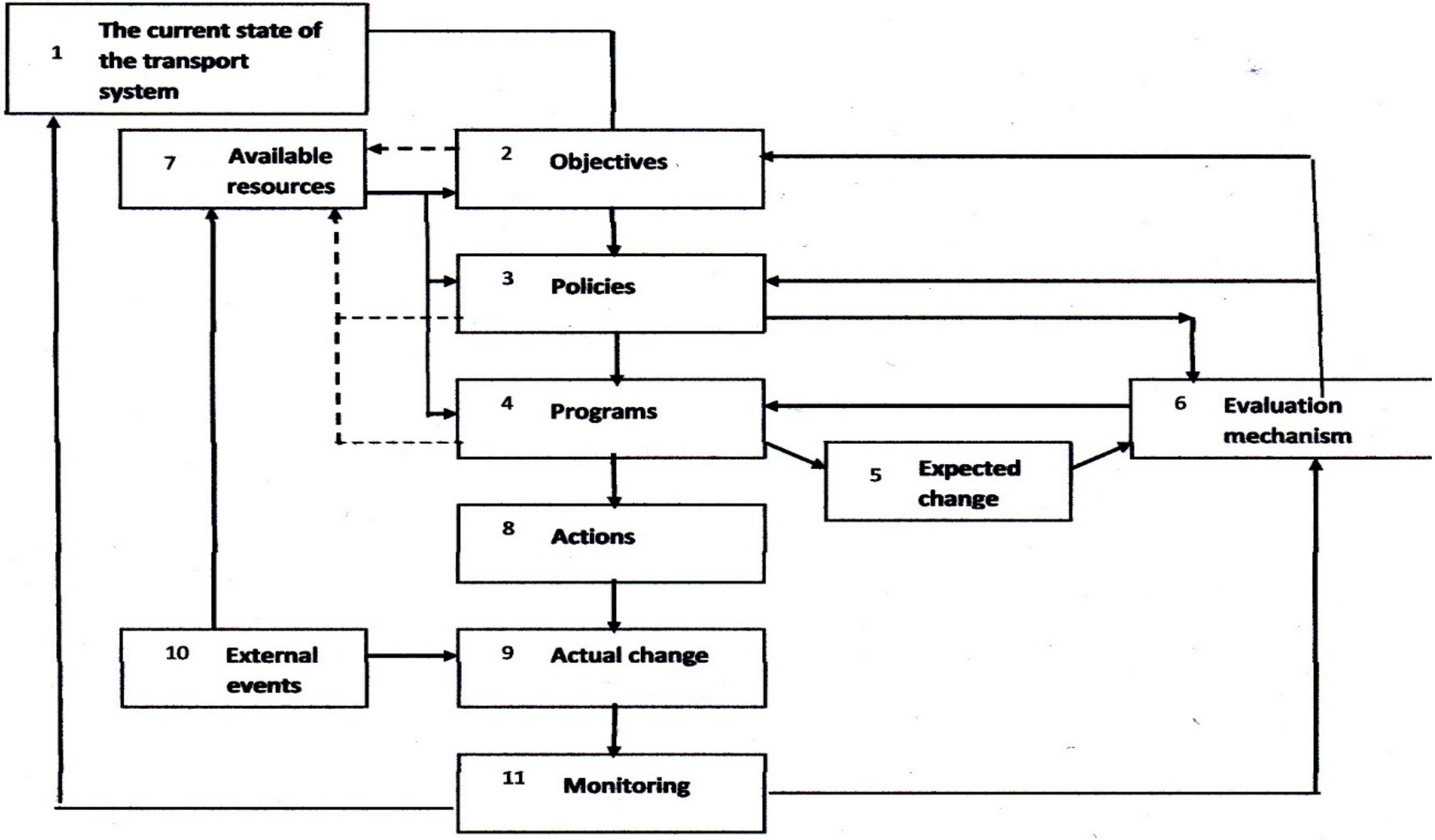
- The project objectives must be flexible, capable of being adjusted to accommodate changes in circumstances.

Proposition #9

- This implies that project plans should not be based upon the delivery of a pre-determined ‘end-state’ but should be a process of continuous management fed by error-actuated feedback.

Proposition #10

- Hence the planning process should be based upon a cyclical assessment and adjustment


1 The current state of the transport system
7 Available resources
2 Objectives
3 Policies
4 Programs
5 Expected change
6 Evaluation mechanism
8 Actions
10 External events
9 Actual change
11 Monitoring

Proposition #11

- Projects should be seen as component ways to deliver declared policies, not as objectives in themselves.

Résumé

- The objectives of MTPs should be explicit
- But this must not be seen as a reason for them to be fixed
- On the contrary, objectives should be adjusted to accommodate changing circumstances.
- That shifts project assessment from being confined to an initial assessment to being a continuous process before, during and after delivery
- This emphasis upon objectives and the process of achieving them emphasises the need to see projects as ways to deliver policies, NOT as freestanding issues

Proposition #12

- Capital costs of MTPs should be included in project assessments as amortised charges.

Proposition #13

- The transport system consists of all the means, including pipes and wires, by which people, goods, information, energy and waste may be moved to more appropriate places.

Proposition #14

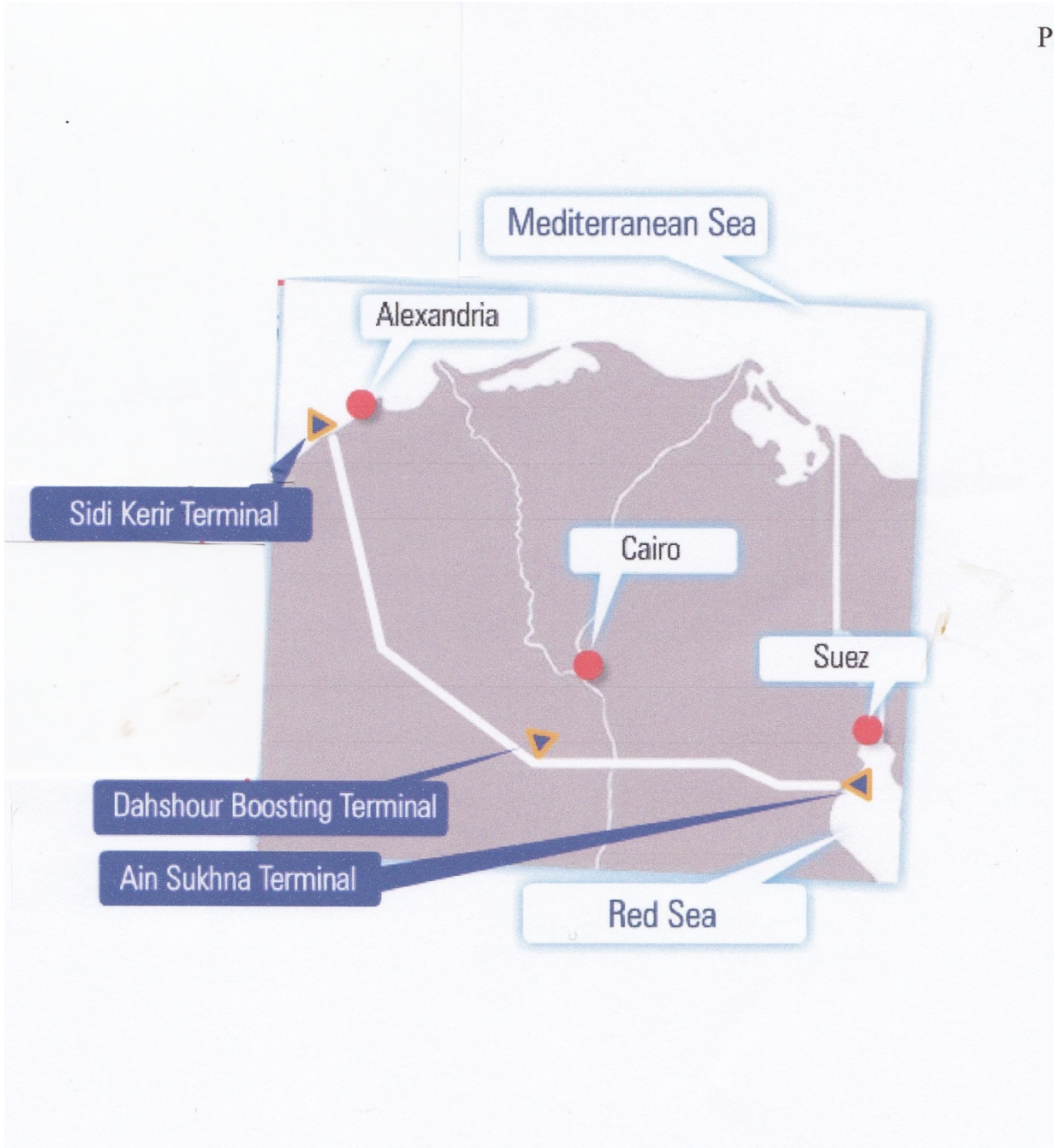
- Transport choices reflect the entire cost from precise journey origin to the precise destination including waits and the use of ancillary micro-modes

Proposition #15

- Interfaces are an integral part of the transport system and may include micro-modes carrying over micro-distances. They and their costs are strong influences upon transport choices.

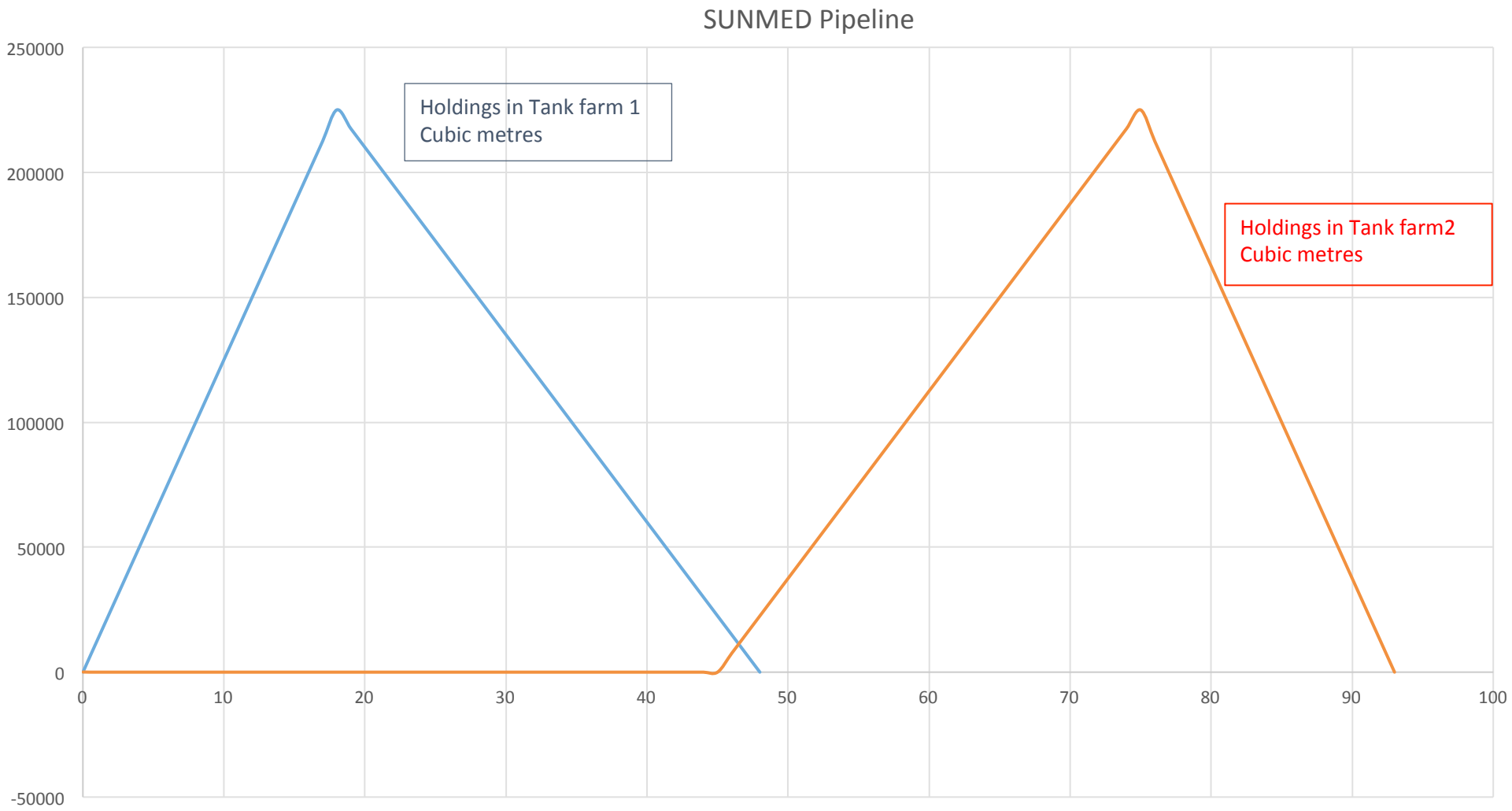
Proposition #16

- The storage of goods is an integral part of transportation. It may be necessary to match intermittent supply with fluctuating demand and / or to sort and re-assemble consignments. In any event, the need to place good in store and retrieve them is likely to require shifts over micro-distances by micro-modes.


Mediterranean Sea
Alexandria
Sidi Kerir Terminal
Cairo
Suez
Dahshour Boosting Terminal
Ain Sukhna Terminal
Red Sea

Simple Rhythms

Equipment	Tanker	Hi-speed pumps	SUMED pipeline	Hi-speed pumps	Tanker
From	Oil field	Ship at jetty	Tank farm 1	Tank farm 2	Jetty
To	Jetty	Tank farm 1	Tank farm 2	Ship at jetty	Refineries
Time taken to deliver (hours)	Instantaneous	18	48	18	Instantaneous
Rate (cu.m./hr)		20000	7500	20000	
Throughput (cu.m.)	360000	360000	360000	360000	360000


SUNMED Pipeline
250000
200000
150000
100000
50000
0
-50000
0
10
20
30
40
50
60
70
80
90
100
Holdings in Tank farm 1
Cubic metres
Holdings in Tank farm2
Cubic metres

Proposition #17

- Waiting is inherently necessary at the interfaces between modes with disparate rhythms and the transport system must include buffer stores to accommodate it.

Proposition #18

- Modelling movement should be based upon door-to-door travel time including micro-distances by micro-modes [not forgetting stages by foot], and waits in buffer stores

Proposition #19

- The travel time budgets containing the travel time details should be extended to include dwell-times at destinations so accounting for the complete 24 hours/person/day

Proposition #20

- The propensity to develop (or re-develop) land is a reflection of the service levels for the movement of people, goods, information, energy and waste. The transport system must therefore mime the cable, pipe and road infrastructure together with the services they provide.

Proposition #21

- Choices of location and travel are not based upon optimal decisions but the meeting of perceived standards

The end

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- Planning Sustainable Transport (Routledge 2013)