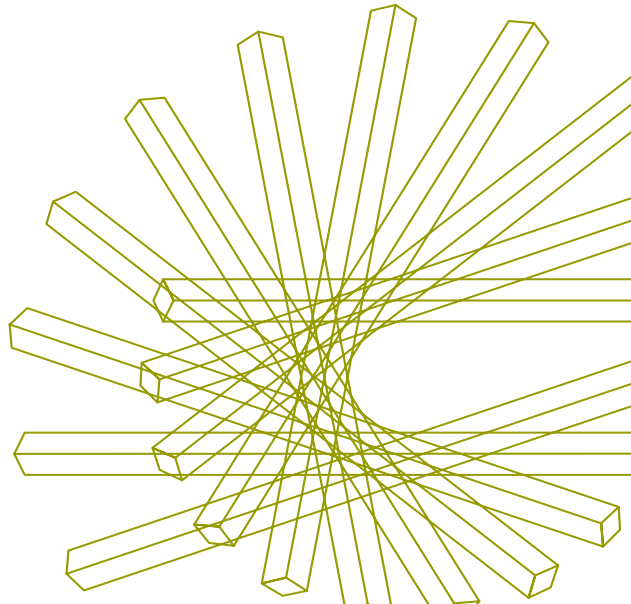
Megaproject

ORESUND LINK (Öresundsbron)

A Megaproject case study compiled by

Marisa Pedro and Miljan Mikic



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MEGAPROJECT Case Study

Case compiled by: Marisa Pedro and Miljan Mikic
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Source: OMEGA Centre, UCL

Basic Project Information

Project Title	ORESUND LINK (Öresundsbron)
Location	DENMARK-SWEDEN (COPENHAGEN-MALMÖ)
Purpose	International transport link Trans-European Network. Cross-border regional development Local airport link
Scope	Transnational Integrated with Trans-European Transport Network (TEN-T)
Total Project Value	4.10bn - tunnels: 0.9bn; marine: 0.33bn; bridges: 1.5bn (in 2010 USD)
Project Status (i.e.. initiation, planning, construction, operation, dismantling)	Planning start date: 1984 Construction start date: 10/1993 Operation start date: 07/2000
Relevant Physical Dimensions (e.g. height, width, volume, length)	TOTAL LENGTH: 74KM RAIL: 42KM ; ROAD: 32KM ; BRIDGE: 7.8KM ; TUNNEL: 4KM ARTIFICIAL ISLAND: 1.3KM2

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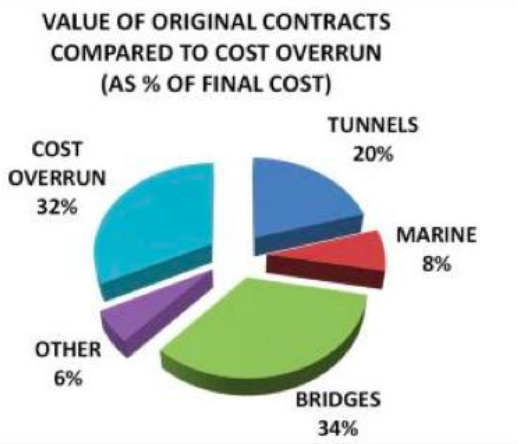
Basic Project Information

Contractual Framework (e.g. fixed price, cost-plus etc.)	FUNDING: 100% PRIVATE



Not clear.
It is firstly said:
The Oresund delegation's 1985 recommendation to fund the project entirely outside of public sector budgets was of fundamental importance to the funding structure. The use of surpluses from road tolls to finance land-based connecting infrastructure, and the payment of fixed fees by the national rail agencies to use the rail tracks, were amongst the issues covered in negotiations between the two governments.

Then, it is said there was initial funding of Consortium by the two Govrnments: Apart from DKK 50m in funding capital for the Oresund Consortium forwarded from SVEDAB and A/S Öresundsförbindelser, there are two main financial sources for the project – the loans taken by the Oresund Consortium, SVEDAB and A/S Öresundsförbindelser and the EU funds from the TEN programme.
The loans of the Oresund Consortium are taken on the national and international finance markets with the two governments acting as guarantors, while SVEDAB and A/S Öresundsförbindelser have lent money directly from the Swedish National Debt Office and Denmark‟s National Bank.
Because the Swedish and Danish states are acting as guarantors for the loans of the Oresund Consortium, the credit ranking of the company is treated as essentially the same as that of the two states, which ensures advantageous deals for the loans.

MEGAPROJECT Internal Stakeholder Identification

(Stakeholders with a direct legally sanctioned relationship with the project)

		Stakeholder Category	Case-Study		Comments (e.g. maturity, previous experiences of stakeholders, skills, influence on project)
Internal	**Supply-Side**	**Client**	Denmark and Sweden Governments / The Oresundbro Consortium (OC)		
		Financiers	The Oresundbro Consortium		
		Sponsors	The Oresundbro Consortium, OC (AS Oresund, Denmark and Svedab AB, Sweden)		Ownership was split equally between the Swedish and Danish states. was responsible for performing the environmental impact assessment (EIA), projecting, financing, negotiating contracts, constructing and operating the fixed link.
		Client's Customers	General public (passengers)		
		Client's Owners	Danish and Swedish Governments		
		Other internal supply-side categories (please specify)	**Category**	**Case-Study**	

MEGAPROJECT Internal Stakeholder Identification

(Stakeholders with a direct legally sanctioned relationship with the project)

		Stakeholder Category	Case-Study		Comments (e.g. maturity, influence on project)
Internal	**Demand Side**)	**Principal Contractor**	Oresund Consortium (SPEs)		was responsible for negotiations with the contractors
		First Tier Contractors	**Consortia:** The Öresund Tunnel Contractors, a consortium consisting of NCC AB (SE), Dumez-GTM SA (F), John Laing Ltd (UK), E. Pihl & Søn (DK), and Boskalis Westminster (NL) And Öresund Marine Joint Venture, a consortium of Per Aarsleff A/S (DK), Ballast Nedam Dredging b.v. (NL) and Great Lakes Dredge & Dock Co (USA).		were responsible for the construction of the artificial island and dredging
			And Sundlink Contractors, a consortium of Skanska AB (SE), Højgaard & Schultz (DK), Monberg & Thorsen (DK), and Hochtief AG (Germany)		Responsible for the construction of the bridges.
		Second Tier Consultants	Consultant VBB VIAK		Conducted investigations covering topics such as sedimentary and mapping of environmentally polluted areas
			Consultants COWI and VKI		Provided investigations and impact analysis regarding marine fauna and flora.
		Professional Services Providers	IVL, the Swedish Environmental Research Institute Swedish national rail administration and Peab AB		Consulting services
		Other internal supply-side categories	Category	Case-Study	

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(Stakeholders with a direct legally sanctioned relationship with the project)

Internal

MAIN CONTRACTS

The bridge:

Aerodynamic studies	Danish Maritime Institute
Consulting engineers	Ove Arup & Partners
	Gimsing& Madsen A/S
	ISC Consulting Engineers A/S
	Setec TPI
Co-contractor	COWI Consulting Engineers and Planners AS
	Hochtief AG
	Højgaard& Schultz a/s
	Monberg & Thorsen
	Skanska AB
	VBB Anlägning
Subcontractor	AlpinTechnik und Ingenieurservice GmbH
Cables	Freyssinet International
Prestressing	Freyssinet International
Stay cable steel supplier	Trenzas y Cables de Acero PSC, S.L.
Bearings	magebasa
Formwork	PERI GmbH
	STREIF Baulogistik GmbH

The tunnel:

Civil engineering	Symonds Group
Co-contractor	Dumez
	E. Pihl & Søn A.S.
	John Laing Construction
	NCC International
	Royal Boskalis Westminster N.V.
Subcontractor	DYWIDAG-Systems International Ltd.
	Mooser-Schwingungstechnik GmbH
Formwork	PERI GmbH

MEGAPROJECT External Stakeholder Identification

(Stakeholders with a direct interest in the project but with no legal contract)

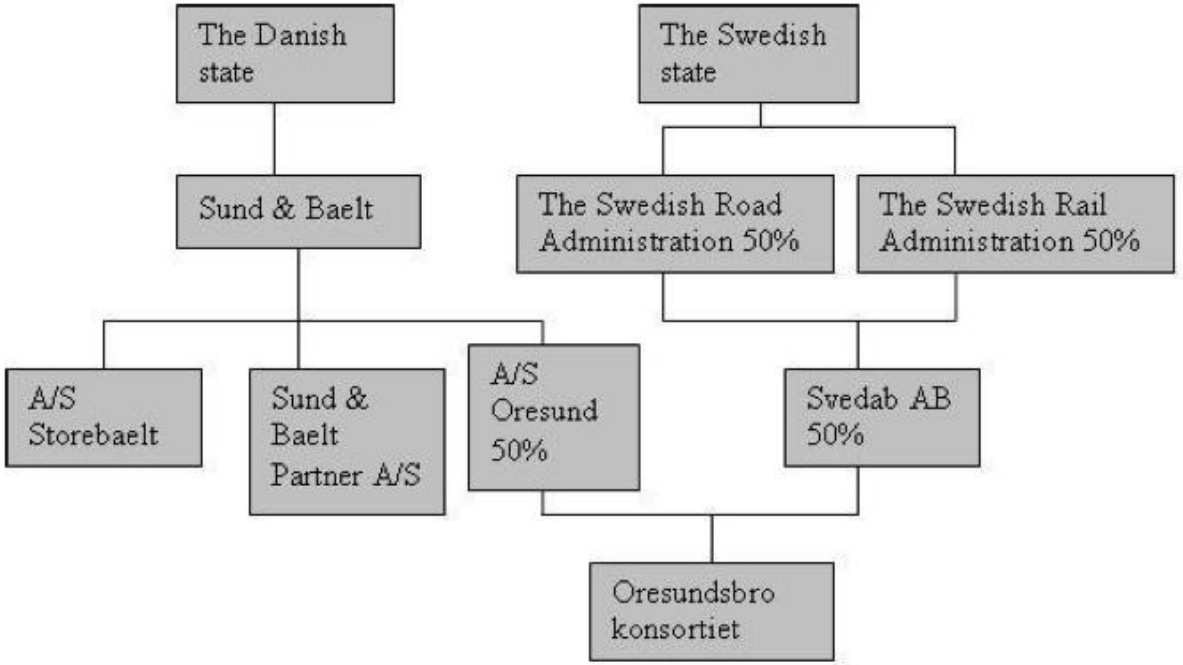
		Stakeholder Category	Case-Study		Comments (e.g. maturity, previous experiences of stakeholders, skills, influence on project)
External	Public	**Regulatory Agencies**	Swedish National Board for Environment Protection (SNBEP)		
		Local Government	The municipalities of Malmö and Copenhagen.		Responsible for planning tasks such as land acquisitions.
		National Government	Department of communications (DOC) and the Ministry of traffic (MOT) in the Swedish and Danish governments. Representatives and officials from the Swedish Road Administration (SRA), the Swedish Rail Administration (SRAIL), the Swedish State Railways (SSR) and their Danish counterparts (DSB) Denmark Parliament (responsible for juridical authority)		responsible for background investigations and reports as well as negotiations below minister level in the early stages of the pre-construction phase.
		Other internal supply-side categories (please specify)	**Category**	**Case-study**	
			The WRC and the SNBEP	were the two main juridical authorities for the Swedish EIA.	

MEGAPROJECT External Stakeholder Identification

(Stakeholders with a direct interest in the project but with no legal contract)

		Stakeholder Category	Case-Study		Comments e.g. maturity, previous experiences of stakeholders, skills, influence on project)
External	Private	**Local residents**			
		Local Landowners			
		Environmentalists	Environmental Protection Act (EPA), the Natural Resources Act (NRA) and the Water Act (WA). Organized Groups.		
		Conservationists			
		Archaeologists	Municipality of Malmö		Carry out extensive archaeological investigations
		Other External Private stakeholders (please specify)	**Category**	**Case-study**	was very active in lobbying for the fixed link.
			Chamber of Commerce and Industry of Southern Sweden	Private regional actor	
			The Swedish Meteorological and Hydrological Institute (SMHI) and the Danish Hydraulic Institute (DHI)	were deeply involved in hydrological investigations	

MEGAPROJECT Stakeholder Relationship Maps



Sweden and Denmark Governments were responsible for investigations, negotiations and signing of agreements.

Swedish road and rail administrations are responsible for maintaining and operating the connecting infrastructure on the Swedish side and the Danish counterparts are responsible for the Danish side.

Key:

Name of Actor - Project Actor

Description of relationship - Project relationship with a contractual basis

Description of relationship - Non-contractual project relationship

Repeat this map for as many project phases as you require

MEGAPROJECT External Stakeholder Attitude Analysis

External Stakeholder	External Stakeholder's Attitude to this Project	External Stakeholder's Influence on project	Impact of Project on External Stakeholder	Phase of Project of Greatest Interest (initiation, planning, construction, operation, dismantling)
Danish policy	Not to allow a link across the Oresund before one had been built across the Great Belt.	Wider political issues influenced the timing of the project. The controversy over environmental impacts delayed the approval process in Sweden.		Initiation/Planning
Swedish National Railway Administration	The fixed link across the Oresund would not imply any strategic improvement unless a promise of a link across the Fehmarn Belt was also discernable somewhere along the line.			Initiation/Planning
Department of finance (DOF)	A principal issue was the pricing mechanisms for road and rail traffic. The Danes were adamant that the pricing mechanism for road traffic should be based on the ferry taxes.	Blocked many proposals and agreement texts.		Initiation/Planning
European Round Table of Industrialists (ERT)		Comprising several important business representatives, argued for a fixed link in its ScanLink proposal.		Initiation/Planning
The organisation Stoppabron (stop the bridge)	They were opposed to the link.			Initiation/Planning

MEGAPROJECT External Stakeholder Attitude Analysis

External Stakeholder	External Stakeholder's Attitude to this Project	External Stakeholder's Influence on project	Impact of Project on External Stakeholder	Phase of Project of Greatest Interest
The social democratic leadership of the Swedish government	Were strong proponents of the combined road and railway link between Copenhagen and Malmö, but there were deep rifts within the party and the issue caused lots of controversy. During the 30th social democratic party congress held in 1987 the issue was hotly contested. Many within the party were highly sceptical toward the alternative favoured by the leadership, a commonly preferred alternative consisting of the railway tunnel between Copenhagen and Malmö.	The referendum regarding the leadership‟s proposal was postponed and an internal study group responsible for further investigations was appointed.		Initiation/Planning
Danish social democrats	Who, although not in government at the time, were seen as crucial actors. Danish social democrats. The general opinion seemed to favour a railway tunnel, but the opinion would however eventually swing in favour of the combined road and railway link after intense pressure from the Swedish delegation.	Unless the Danish social democrats were positive about the project there was no way for the government in power to secure support for the proposal in the Danish parliament.		Initiation/Planning
The Chamber of Commerce and Industry of Southern Sweden		which, together with its Danish counterpart, was very active in lobbying for the fixed link.		Initiation/Planning

MEGAPROJECT External Stakeholder Attitude Analysis

External Stakeholder	External Stakeholder's Attitude to this Project	External Stakeholder's Influence on project	Impact of Project on External Stakeholder	Phase of Project of Greatest Interest
The Swedish National Board for Environment Protection (SNBEP)		In 1993, they rejected the application for permission to build and operate the fixed link (from OC) on the following grounds: • the project might harm the ecologically sensitive Baltic Sea; • it might also harm the immediately surrounding sea, which was an important fishing area of national interest; and • it was viewed as counter-productive regarding strategies towards an environmentally adapted transport system.		Initiation/Planning
The municipality of Malmö	The municipal level has a very strong position in the Swedish planning system.	Land use reservations for the link and connecting infrastructure were made as early as the mid-1950s.		

MEGAPROJECT Project Performance

Aspects of Performance Concerned with Doing the Project Right

	Original Targets and changes to targets	Actual Achievements Against Targets
Performance relating to **time**	**Construction start:** Forecast: 1993 Actual: 1995 **Construction completion:** Forecast: 2000 Actual: 2000	Months in planning: 112 Months in construction: 81 **Project completed:** **ON SCHEDULE**

MEGAPROJECT Project Performance

Aspects of Performance Concerned with Doing the Project Right

	Original Targets and changes to targets	Actual Achievements Against Targets
Performance relating to **cost**	The main source of cost overrun is the connecting infrastructure on the Danish side, which was close to **70% higher than the estimates made in 1991**, but the actual coast-to-coast link and the connecting infrastructure on the Swedish side were also subject to substantial cost overruns. **Costs predicted:** **1987:** SEK 9.3bn (EUR 1.74bn in 2007 prices) **1991:** SEK 15.825bn (EUR 2.1bn in 2007 prices) **1997:** DKK 14.75bn (EUR 2.39bn in 2007 prices) **2000:** EUR 3.097bn The escalating costs are attributed to maritime safety efforts, environmental protection and a third category simply labelled "other". Maritime safety efforts account for around 42% of the escalation, while the other two categories account for 34% and 24% respectively.	Costs (in 2010 USD) **Predicted cost: 2.96 bn** **Actual cost:** **Total: 4.10 bn** Tunnels: 0.9BN Marine: 0.33BN Bridges: 1.5BN Project completed: 39% OVER BUDGET

MEGAPROJECT Project Performance

Aspects of Performance Concerned with Doing the Project Right

	Original Targets and changes to targets	Actual Achievements Against Targets
Performance related to achieving **specification**	**Table 5: A summary of some predictions made before and after the completion of the Link**	**FORECAST TRAFFIC (2007):** Road: 15,732 VPD Rail: 28,000 PPD **ACTUAL TRAFFIC (2007):** Road: 18,432 VPD Rail: 26,600 PPD

Year of estimate/ source	Year estimate referring to	Estimate road traffic(AADT) /premises	Estimated train passengers(ADT)	Estimated railway goods	Outcome vs prediction
1985/*Öresundsdelegationen* Cited in Falkemark (1993)	Immediately after opening	6,800, low alternative – same price as the ferry.	n/a	n/a	Above (9,204)
1985/*Öresundsdelegationen* Cited in Falkemark (1993)	Immediately after opening	12,000, high alternative – fee amounting to 50% to price of ferry.	n/a	n/a	below (9,204)
1991/ Transek (1991)	2000	5,700, low alternative – same price as the ferry.	n/a	n/a	above (9,204)
1991/ Transek (1991)	2000	30,700, high alternative – fee a ¼ of the ferry price.	n/a	n/a	below (9,204)
1991/ Prop 1990/91: 158	"Some years after opening".	8,000 – 10 000	18,000 – 20,000	5,000,000 tonnes/year	Road: correct (between 8,000 – 10,000) Rail: Passenger – below (roughly 14,500) Goods – Below (roughly 3,000,000 tonnes/year)

MEGAPROJECT Project Performance

Aspects of Performance Concerned with Doing the Project Right

	Original Targets and changes to targets	Actual Achievements Against Targets
Performance related to achieving **specification** **(cont.)**	**Table 5: A summary of some predictions made before and after the completion of the Link**	**FORECAST TRAFFIC (2007):** Road: 15,732 VPD Rail: 28,000 PPD **ACTUAL TRAFFIC (2007):** Road: 18,432 VPD Rail: 26,600 PPD

Year of estimate/ source	Year estimate referring to	Estimate road traffic(AADT) /premises	Estimated train passengers(ADT)	Estimated railway goods	Outcome vs prediction
1999/ The Oresund Consortium (1999)	2000	14,500	24,000	n/a	Below: road (9,204) train (14,668)
1999/ The Oresund Consortium (1999)	2005	16 000	28 000	n/a	Below: Road (13 064) Train (18 129)
2000/ The Oresund Consortium (2008a)	2007 2020	15,732 22,250	n/a	n/a	Above (18,482) n/a
2008/ The Oresund Consortium (2008a) & (2008c) (middle scenario)	2017 2020 2025	39,000 42,889 49,000	n/a n/a 51,000	n/a	n/a
2008/The Oresund Consortium (2008c) (growth scenario)	2017 2025 2031	47,000 56,000 60,000	n/a	n/a	n/a

MEGAPROJECT Project Environment

Legal and Regulatory Environment

Legal and Regulatory Project Environment (regionally, nationally and Europe wide)	The Oresund link was the first infrastructure project in Sweden entirely financed outside the state budget. According to a paragraph in the budgetary law, infrastructure should normally be paid for by state grants using state revenue as the only source of funding. In Sweden the formal procedure implied that the project had to be tested against different legal frameworks in several juridical instances before gaining approval. Georg Andersson, then minister of communications, explained that the environmental inquiry could influence the shape and design of the fixed link, but not the actual building of it. In Denmark a special law is usually passed for large projects. This law, which is formulated by the responsible ministry (in this case the ministry of traffic), regulates the entire project and consists of elements from the legislative framework which are deemed appropriate for the project. The level of user fees for road traffic are regulated by the Oresund Consortium but according to the 1991 agreement between the governments the price for crossing the link must be set using the price of the ferry route between Helsingborg and Elsinore as a point of departure.
Specific Legal and Regulatory events impacting on the project	**1985:** Denmark signed the EC directive regarding environmental impact assessments (EIA). **1991:** The preparations of the law concerning the fixed link a number of environmental investigations were carried out which were presented in the report Miljö Öresund

MEGAPROJECT Project Environment

Political Environment

Political Project Environment	Since the **1950s** a great number of investigations and reports (more or less realistic and/or politically feasible) about the benefits of a fixed link across the Oresund were produced in both Sweden and Denmark. An agreement to build a fixed link was signed by the governments in **1973**, but the energy and economy crisis, as well as Denmark‟s decision to join the EC and increasing environmental awareness meant that the plans came to a halt. Since a fixed link across the Oresund had been a vision backed by the political establishment in Malmö for a much longer time than in Copenhagen the matter of land acquisition differs quite substantially between the two municipalities. In Malmö land for the connecting infrastructure had been reserved since the 1950s. In the 1956 general plan a zone was reserved for the connecting infrastructure (then thought of as a highway).
Specific Political Events impacting on the project	**1987-1991:** The handling of the project was shifted towards the political sphere with the leading politicians in the Swedish and Danish social democratic parties as the main players (Both countries regarded the need to get approval for the project within the social democratic parties. Initially there was widespread resistance to the project amongst the social democrats in both countries.) **1994:** The OC handed over the revised plans and the government gave permission for the project to proceed. The minister of environment stepped down from his post, but the centre party remained in the government and thus a political crisis was averted. Elections were held and the coalition lost power to the social democrats.

MEGAPROJECT Project Environment

Economic Environment

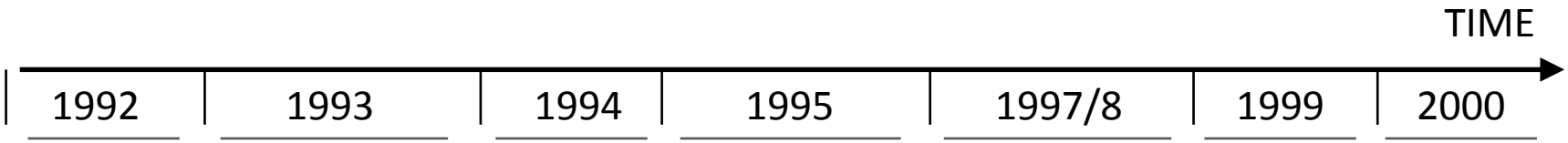
Economic Project Environment	The combined road and railway link was recommended by the OD on it was the best solution from an economic viewpoint given the evaluation of traffic volumes at the time. Despite the fact that it is common practice in Sweden to use socio-economic cost-benefit analysis as a basis for decisions regarding infrastructure investments, this was never the case for the Oresund link. The analyses that were carried out focused on economic profitability, since this was a prerequisite given the loan-based financing of the project. The funding structure based on user fees for road traffic as the main source of financing meant that the volume of road traffic and the price level of user fees in relation to the construction cost became the ultimate criteria for appraisals.
Specific Economic Events impacting on the project	**1985:** Regarding financing it was agreed that the project had to be financed outside the state budgets and to be profitable on business economic (rather than socio economic) terms. **1989:** A report was presented and two premises were guiding: the condition that no state budget grants should be used (business economic profitability); and that the structure of the link should not affect the water flow in the Sound. **1991:** The agreement between the Swedish and Danish governments is signed. The chosen alternative of a combined road and railway link between Sweden is viewed as the best alternative from an economic perspective. The agreement also states that the connecting infrastructure should be funded by revenues from the coast-to-coast section of the link.

MEGAPROJECT Project Key Events and Activities Timeline

TIME

	1973	1984	1985	1986	1987	1990	1991
Events and activities relating to project stakeholders	**CONCEPTION:** Swedish-Danish governments agree to build fixed link	**CONTEXT:** European round table perceived as lobbying for road link **INCEPTION:** Oresund delegation appointed	**CONCEPTION:** Delegation proposes Helsingborg-Helsingør Railway Tunnel & Malmö-Copenhagen Road Bridge. State funding ruled out	**CONTEX:** Great belt bridge decision breaks Danish domestic policy block on other fixed links	**CONCEPTION:** Delegation recommends combined road/rail bridge but continues to consider rail tunnel option	**INCEPTION**: Swedish parliament supports combined bridge option, Danish leaders follow suit **INCEPTION:** Negotiations on funding structure	**INCEPTION:** Two governments sign binding agreement. Construction to start in 1993 and finish in 2000
Events and activities relating to project management							
Events and activities relating to project performance							
Events and activities relating to project environment							

MEGAPROJECT Project Key Events and Activities Timeline



	1992	1993	1994	1995	1997/8	1999	2000
Events and activities relating to project stakeholders	**INCEPTION:** Oresundbro Consortium formed, applies for planning permission	**DELAY:** Permission refused by Swedish National Board, finally granted by water rights court but conditional on redesign	**INCEPTION:** Redesign approved by Swedish Government				
Events and activities relating to project management							
Events and activities relating to project performance		**CONSTRUCTION:** Danish Land Infrastructure works in preparation		**CONSTRUCTION:** Construction starts. OC contracts with three consortia	**CONSTRUCTION:** **1997:** First tunnel section in place **1998:** First bridge section in place	**DELIVERY:** First car drives through tunnel	**DELIVERY:** Handover and inauguration
Events and activities relating to project environment		The finished structure did not affect the water flow between the North and Baltic Seas – Zero impact “solution“					