

Land Market relevance in the conservation of the Port Heritage.

Port Land Conversion towards Urban Uses.

Lorenzo-Almeida, Daniel*; Casanova, Carlota**; Ferré, Ernest*; Domingo, Mamen***
URV*
Lo+Ca studio**
Domingo; Ferré***

1. Introduction and Summary

The purpose of this study is to identify the different phases in the development of port land conversions towards urban uses in the Port of Barcelona. It also focuses in the different administrative approaches within the development stages and the land value relevance in the transformation from port to urban activities.

On the European context, ports present difficulties to expand their operative surface constrained by environmental regulations and technical obstacles. This halt of the seaward expansion has stopped creating port areas in disuse that in earlier days the city would have occupied. City and port's new relationship is thus being redefined to manage land scarcity and common demand in the interfaces.

For this research quantitative and qualitative data have been analyzed. The quantitative data consisted in the land value comparison at both sides of Barcelona interface and its timeline conversion. The qualitative data analysis consists of twenty-one semi structured interviews to port stakeholders involved in the land management.

Different than expected, economic compensations linked to environmental regulations constraints are not discouraging land port enlargement in the Barcelona case. In this scenario, market is shown as a fundamental factor on defining the uses within the Port Vell –the citizen's port-. Port land value and especially its urban area, is encountered higher than Barcelona's housing land value in average. Targeted urban uses within the "citizen's port" have resulted comparatively more profitable than traditional maritime commercial uses. This situation is encouraging port managers towards land conversion after proving that their industrial capacity – through land availability- is ensured.

Further analysis shows a significant correspondence between the port land oversupply, caused by expansions plans, and the urban land conversions. Likewise three different phases have been identified in the Port Vell's. The first stage of development is inspired in the American waterfront models without playing special attention to the location. The second stage appears when the economic feasibility of the project is demonstrated encouraging the intensification of the port uses. The third stage base port development success on its public acceptance. Thus, building the international image of the Port of Barcelona by using the citizen's port, is considered crucial not only for the urban port economic results but also for the business expansion of the maritime area.

The expansion of the port managers' urban role makes them key municipal partners in defining the city waterfronts. Common interests are driving towards a shift from initial commercial and leisure uses towards a cultural-commercial mix of activities which presents less economic risk in the long term. This is an importance cause for port maritime heritage conservation. By facilitating social acceptance of the port-urban development tenants are staying, which satisfies economically the landlord (the port) and the citizen's representatives social aim (municipality).

To conclude, the authors recommend the implementation of new planning development tools that

would facilitate the city-port collaborative environment.

2. Population Growth, Environmentalism and Port Administrative Landscape

Actual scenarios illustrate an exponential population growth mostly focused on urban areas, where today it is concentrated the 53% of the worlds' population (UN 2011). Land consumption in developing countries, over the last century, has increased a 50% and the population has grown a 20%. However, developed urban areas have faced 30% land consumption although its population has only increased a 5 %, just as happened in Europeⁱ. This phenomenon of land consumption and population growth is affecting unequally the territory. Thus, it has a special relevance in coastal areas, where governments have to balance the economic growth interest and the environmental-social sustainability. In this context, Europe and the European Commission –CEE- have a remarkable role leading environmental conservation. European City-ports status quo is being affected to a great extent due the special focus the Birds and Habitats Directives have on wetlands and waterways.

These European Directives halt human development on behalf of environmental sustainability, which consequently modify the Bird's Any-Port Modelⁱⁱ. Thereby, the assumed common process of port land generation and subsequent urban appropriation described in the model is arriving to a turning pointⁱⁱⁱ. This situation is requiring a new common city-port strategy to satisfy their expansionistic requirements from both, cities and ports^{iv}.

But, are these Directives the cause of the model redefinition? As Van-Hooydonk (2009) argues, the European Environmental Directives are just the mirror of the common concern and the social rejection against coastal degradation. Industrial activities, like ports, are considered pollutant and modify the known natural landscape. These activities have been regulated since exists a sound social negative consideration. How are these Directives affecting port growth further than the visible social protests? By the compensation cost imposed for environmental damage. Social rejection and compensation costs, together with the unclarity of the directives, are negative incentives for new port enlargements. As a consequence, less extra port land will be available, which could be destiny for urban uses in the future.

Moreover, in European Mediterranean countries like Spain, France or Italy, where the devolution of power within the port landscape arrived later than to northern countries, the complex administrative landscape also represents a handicap for land conversions. As an example, Spain's port land use, extension and expansion depend on the agreement among four different administrations: central government (Infrastructure Ministry/Puertos del Estado), Autonomous Communities, local governments and the Port Authorities. Different political parties in the government and different economic interests, as well as a lack of coordination among the different administrative levels, influence in the definition of the ports objectives and consequently in the infrastructure expansion and land conversions^v.

3. Research Objective

The objective of the research is the analysis of the port land conversion processes, with special attention to the interest of private entities and administrations on a higher mixture of urban and port activities.

4. Research Methodology

1.1. Data Collection

Primary and secondary data has been analyzed. The sample for primary data was defined considering the Spanish Port Landscape singularity, grouping interviewees among Administrations (regional, local and Port), Port tenants (citizen's port and industrial port were differentiated) and independent consultants (port engineers and real estate brokers). Secondary data was collected and analyzed to compare urban and port land values and to contrast primary data results. Moreover, port expansions and urban conversion announcements were listed and compared in search for an expected relationship.

1.2. Scope and limitations of the study

Due to the purposive methodology chosen for the sample, there is a possible bias. Nevertheless, the authors paid attention to this by contrasting different opinions from departments and business sectors within the same group of interviewees. Likewise, due to the short time available, the number of interviewees was limited. Despite the small sample, the decision was to consider the maximum number of different stakeholders, to contrast their opinions. This was considered more relevant than the representativeness within each interviewees group.

Conclusions cannot be extended to other situations since this research is a single case study and does not provide the required external validity.

5. The Barcelona Case

Contrary to what was expected, the Port of Barcelona is not considering environmental regulations as a constraint for its expansion plans. No matter that the *Llobregat River Mouth*, the Port natural extension to the South, has been considered a natural protected area included in the EU Bird's Habitat Directive. The present economic context and the technical engineering capacities are allowing the Port of Barcelona to plan its future without land availability uncertainties. This lack of expansion constraint is leading managers to consider the port capacity ensured for at least the next 30-50 years with the current infrastructures.

Backing the Port of Barcelona's considerations, three main factors downplay environmental constraints and support its operational capacity in the future. First, the economic downturn after the 2007 financial crisis, left vacant vast operational areas of the *Moll Prat*. The last port expansion to the south, the largest in the history of the Barcelona Port, was planned under an optimistic scenario far from the present reality. Only considering the current vacant plots is estimated that demand for space for the next 30-50 years will be covered in the port. Second, there is potential for an offshore growing which would ensure land availability in the future, beyond the estimated capacity of *Moll Prat*. Regardless of the extra cost associated with constructing in increasingly deep waters; it is technically admissible and the option has been taken into consideration by the Port Authorities. However, no expansion plans are foreseen due that operative land is still available in the *Moll Prat*. But when market needs it, the most remote dyke, the *Moll Adosat*, will be able to support the next port expansion at a feasible cost. Third, environmental laws are set and judge nationally. Thus, despite general European Environmental Directives, country members within the Union are applying differently the regulations according to their capacities and priorities. In this regard, it is noticeable the low administrative concern about the *Llobregat River Mouth* protection^{vi}. A feasible reason could be the low impact of the environmental compensation in the *Moll Prat* development, 30M€ from a total investment of 1700M€, a 1,7 percent.

Outside the Port, Barcelona is geographically constrained and limited in its capacity to accommodate an increasing number of people. The *Blau@ltinea* project^{vii} recently soundly presented by the Municipality of Barcelona showed these demands for space. Nonetheless, the Port seems to be not interested in new land conversions. Meanwhile, the city-port interface remains unsolved and there are inter-administrative planning difficulties to reach common agreements. The underrepresented municipality in the port management board is contingent upon the port initiative, due that they are the land managers and owners^{viii}. Any future port conversions or variations in the border line, which define the city-port interface, is conditional to an administrative coalition of forces and stakeholders' interests.

To shed some light about the different stakeholders' interest on the interface, a land market study has been elaborated to contribute to meet inter-administrative synergies. The reason of elaborating a land market study is that market recognizes interest by given value to the land. Who is willing to pay a higher price?

The Land Market in the interface of the Port of Barcelona.

At the beginning of the *Port Vell's* development, the uncertainty of the project required the Port financial participation to attract reluctant private investment. Today, after almost 30 years of the *Citizen's Port* development, the Port of Barcelona economic results show that the *Port Vell* is

generating higher profit per surface unit than its counterpart, the maritime area. Data obtained from the Port show that economic results rapidly increased after the opening, representing in 2006 –last year referred in the study analyzed- the 10,54% of the port income with only the 6,70% of the total surface (Fig 1)^{ix}. Despite results were even better in 1998 when the margins showed 6 points difference, it has to be considered that after twenty years operating, any important investment has been done to upgrade the area. It is important to notice that by the time the study of fig 1 was completed, the W Hotel operation was not yet concluded.

Equally important in the port land market is the land production cost, an almost exclusive capacity of the ports. This cost is much lower than the urban land market value, around 200€/m² in 2012 currency. Interestingly enough is that models realized for this study show that while the land creation cost since 1966 remains stable in 200€/m², urban land market in Barcelona peaked to 3200€/m² –average- in 2007 (Fig 2). This represents a value difference of sixteen times.

Further, the land market analysis in the city-port interface has shown that port land values are higher than housing urban land values in average. These differences are up to three times when the Port Vell area is compared with urban values (Fig 3). Given that any port use appears lower in value than housing (our urban value comparator), it could be expected a low interest on converting port land to urban uses by port managers^x.

Despite the port urban surface within the port is increasing since its creation, the expansion has not been registered to not make necessary the modification of the original *Port Vell* plan which established an area of 55.6 ha. Even though the urban housing land appears lower in the model, it shows only the global average. Values are peaking based on location and density. To have an idea, the *Port Vell* with its low density has a correspondence in value with the *Eixample*^{xi} a recurrent model of dense urban area, highlighting the importance of the location in the Barcelona land market. Thereby, the *Port Vell* appears as a privileged area with low density but extraordinary high land values by surface unit being a key development in the Port of Barcelona strategies

Although the market's incentives for conversion, the Barcelona port authorities support that the Port aim is not to speculate with the land owned. The Port, as a public institution, is exclusively in charge of the maritime service provision; a public service. Nonetheless, a paradox occurs due the tremendous land market difference, port managers are backing the application of *the highest and best use* principle within the port domain^{xii}. Thus, port managers consulted give support to land conversion toward urban uses (known more profitable) after industrial land provision is ensured; process that happen when exists an extra supply of land.

As a result, it has been found a correspondence among expected port surface growth and land conversions as it can be observed in Fig 4. Further than their public interest on ensuring a maritime service, the higher profitability of the converted land and the additional positive effect of urban activities on port domains by re-launching the port popular image, is backing the land highest and best use and therefore supporting the emergence of future urban port developments.

Historical Conversion Analysis

In this context of urban demand for space and port capacity for supplying well located land close to the urban core, a time line of the land conversion process in Barcelona has been elaborated. It starts in 1966 with the Port General Expansion Plan (Blueprint). At that time, the engineer in charge of the Port infrastructure, Mr. Aurelio Gonzalez Isla, presented a preliminary study to enlarge the operative surface due to the increase on freight trade occurred after 1959^{xiii}. What it is interesting is not only the 2,5 times planned expansion (regarding the initial port size), but the early housing development included in the blueprint. This operation of 34ha might be feasible and attractive even to the original tenants, which would be compensated with better suited operational space in the port enlargement to the south. Despite the interest for widening its commercial activities started early, it was necessary to wait until the Olympics and the empowerment of the leftist party in the municipal government to initiate the process of land conversion toward urban uses. Thus, sixteen years after Mr. Isla's proposal (1982), the Port-City collaboration results in the first document where the future land conversion is registered^{xiv}. Today, the initial 55,6ha designed for the urban port are in expansion, backed by the land owner and the local administration interest.

Since the beginning of the planning process with the Port General Expansion Plan elaborated by Mr. Isla and the today's *Port Vell* expected expansion, three historical periods have been defined by the authors of this study. There is a first period characterized by the foreseen plan uncertainty,

which in time goes from the Mr. Isla Plan (1966) to the *Port Vell* opening to the public (1995), considering up to the year 1999 when construction works ended –the *Maremagnum Shopping Center*, probably the most relevant operation, opened in 1996-. Due the lack of similar national experiences, the Port of Barcelona had a hard job on defining the strategy that became later the guideline for the rest of Spanish administrations interested on opening their port urban waterfronts. The Port led the plan and operations, and acted as national pioneers, assuming a high financial risk which was increased during the development process when private investments were reluctant to participate. Given the situation, port managers had not space for trials, applied a model which had been previously successfully tested in Boston and Baltimore^{xv}. This first development is proved short term market driven^{xvi}.

A second stage within the urban port development is established from the recognized success of the port urban experience, after the *Maremagnum Shopping Center* opening (1999), and the W Hotel construction, what we can consider the end of the developmentalist phase. Likewise, the rest of the planned development of *Nova Bocana* which was defined and approved at the same time as the visible hotel is also included, despite the construction of the site has not concluded. During this period, the Port, aware of the economic success of the operation, increased the density in the area to obtain the highest possible profit in negotiation with the local government who by the Port Spanish Law holds a veto power over Port Organization Special Plans^{xvii}. The tension among the Port and the municipality is evident and new developments are contested by a reluctant population which does not want the port in the city closeness and does not recognize the result of the development as own .

The citizens' port is today in a third development period, identified by the port's orientation towards a social comprehensive position. This is result of the awareness of implication of the community acceptance to continue operating in the city outskirts^{xix}. As a consequence, the initial waterfront development model is also questioned by the initial promoters. In this matter, despite the touristic attractiveness of constructions and businesses, these are rarely visited by locals who prefer areas they can identify as city continuity. The IMAX cinema, once a successful entertainment activity, is today under redefinition due the cutback in the number of visitors. The IMAX and the rest of the set of boxes, unconnected from the city's core, are in a fragile relationship with the Barcelona citizens. Result of the principle "*frame follows function*", brought from the American experiences without the attempt of establishing local links, represent a current issue for port managers. The loss of popular interests on the site and the reduction of visitors can result in a business failure with the attached complexity of adapting new uses for such a particular spaces^{xx}. A different and not so specific approach on behalf of the leisure is developed in the *Juan de Borbón Avenue*. This port merged with the pre-existing urban conditions have resulted in success. The consulted port managers affirm that experience has shown that port participation in urban issues improve the final resulting conditions. Likewise port managers consider that neighbor dissatisfaction results in conflict which is reflected in their operations.

6. Conclusions and recommendations

The high land prices within the *Port Vell* are a consequence of two facts. Firstly of the privileged location joined in the city layout and secondly the social acceptance and linked demand. Nevertheless, the privileged market status can be altered. The urban model applied initially for the Citizens' Port development was conceived with a short term perspective. The physical organization and activities chosen for the area had little to do with local traditions and the port industrial history. Cultural heritage is required to establish a close link with the population through communal memories. Long run activities and businesses are the guarantee for the feasibility of the development where the community acceptance is fundamental. Thus, it is necessary a planning reformulation that revalues what is characteristic from the site, which can bring closer the Barcelona population to the Port. The benefit for the Port is on the land value: ensuring the demand on time, will remain the main source of income stable and predictable^{xxi}.

Moreover, it is recommended for future urban port developments to formulate clear administrative models for city and port collaboration based on the port land conversion experiences. The existing veto power systems harm the inter-administrative relationships, delaying processes and providing less efficient results. The low representativeness of the municipality in the Port Management Board does not match with the common interest of city and port. Further, it is considered necessary to break with rigid sectorial organization to search for

innovative formulas where different administrations are working together in a collaborative environment. Commonly participated bodies created before the commencement of the plan should help in the definition and result in more efficient processes.

Furthermore, ports operating in a landlord system are used to work in a linear manner, which is difficult to plan and therefore brings uncertainty to the final result. Thus, traditional conceptions say: given the land, is defined the use, followed by the concessionaire, the activity, and rent collection by the port; if finally reaches. A conception shift is needed to link concessionaires, activities, usages and location to ensure the feasibility of the plans and improve the quality of the results.

7. Bibliography

- Aleman, J. 1998, *El Puerto de Barcelona*, Lunwerg Editores ; Port de Barcelona, Barcelona; [Barcelona].
- Bird, J.H. 1971, *Seaports and seaport terminals*, Hutchinson, London.
- Bloom, N.D., 2004, *Merchant of illusion : James Rouse, American's salesman of the businessman's utopia*, Ohio State University Press, Columbus.
- Bruttomesso, R. 2009, "Transformations in the Contemporary Port Landscape: From Negotium to Otium... and back to negotium, again", *Portus*, vol. 18, pp. 10-15.
- Burdett, R., Sudjic, D., London School of Economics and Political Science. & Alfred Herrhausen Gesellschaft für Internationalen Dialog. 2011, *Living in the endless city : the Urban Age project by the London School of Economics and Deutsche Bank's Alfred Herrhausen Society*, Phaidon Press Ltd, London.
- Busquets, J. 2001, "Los frentes de agua españoles", *Portus*, vol. 01, pp. 52-59.
- Caldentey, E. 2008, "20 Years Managing, El Port de Barcelona", *Port 2000*, , 23-27th June, 2008.
- Castillo-Manzano, J. & Fageda, X. forthcoming, *How are investments allocated in a publicly-owned port system? Political factors vs. economic criteria*, UB -Universitat de Barcelona-, Barcelona.
- Castillo-Manzano, J. & Fageda, X. 2011, "Análisis de los Condicionantes Políticos en las Inversiones del Sistema Portuario Español", *IAME 2011 Santiago de Chile*, October 25th-28th, pp. 1.
- Daamen, T. 2007, "Sustainable Development of the European Port-City Interface", *Paper ENHR Conference 2007*, .
- Daamen, T.A. & Vries, I. 2012, "Governing the European port-city interface: institutional impacts on spatial projects between city and port", *Journal of Transport Geography*, , no. 0, pp. 1-10.
- ESPO 2010, *Code of Practice on Societal Integration of Ports*, European Sea Ports Organisation, Treurenberg 6 – B-1000 Brussel.
- FNAU 2011, *Port City Innovation towards integrated Port City projects*, France's national federation of town planning agencies, 1, rue de Narbonne, Paris (France).
- Gonzalez, I. 1967, "Anteproyecto del Plan General del Puerto y su Ampliación", .
- Grossmann, I. 2008, "Perspectives for Hamburg as a port city in the context of a changing global environment", *Geoforum*, vol. 39, no. 6, pp. 2062-2072.
- Lorenzo-Almeida, D. 2012, *City-Port Interface, a Conflict on Urban Activities. Competition for land use resources in Barcelona.*, IHS - International Institute of Urban Management of Erasmus University Rotterdam -, Rotterdam.
- Ministerio de Fomento 2011, *Real Decreto Legislativo 2/2011, de 5 de septiembre, por el que se aprueba el Texto Refundido de la Ley de Puertos del Estado y de la Marina Mercante*, Real Decreto Legislativo edn, Española.
- Port Vell 2008, *El Port Vell de Barcelona Evolution of Port-City Relationship*.
- Saiz, I. 2005, "The Current Role of Urban and Port Planning in Spain", *Portus*, vol. 10, pp. 27-33.
- UN 2011, *SEVEN BILLION AND GROWING: THE ROLE OF POPULATION POLICY IN ACHIEVING SUSTAINABILITY*.

Van-Hooydonk, E. 2009, "Port City Identity and Urban Planning", *Portus*, vol. 18, pp. 16-23.

Wiegmans, B.W. & Louw, E. 2011, "Changing port-city relations at Amsterdam: A new phase at the interface?", *Journal of Transport Geography*, vol. 19, no. 4, pp. 575-583.

8. Biography

Daniel Lorenzo is PhD candidate at URV School of Architecture, where is joining a position at the Urban Department. In year 2011 joined a MSc program in Urban Management and Development at Erasmus University, Institute for Housing and Development Studies. His main focus is on land management, being the purpose of his thesis the market influence over port land conversions.

Carlota Casanova is Master in Arts by the UB and architect by the UPC. She has been visiting professor at the URV Architecture School and assistant professor at the UPC Civil Engineering School. As a student she collaborated with the Urban Department at the UPC Architecture School of Barcelona.

Ernest Ferré is Phd at International University of Catalonia and MBa by the UPC School of Architecture. He is a professor at URV School of Architecture in the Urban Design Department. His main research focus is on metropolitan theories, aesthetics and architectural design. Further, his thesis is a theory of architectural composition base on Le Corbusier works and urban contemporary space conception.

Mamen Domingo has been *gast dozent profesur* at the ETH School of Architecture in Zurich. She is architecture and urban design professor at the UPC School of Architecture. Phd candidate at the UPC School of Architecture, her study is on urban sprawl within the De la Sota works in Spain during the 40's - 50's. Coauthor of *Actividad y Estrategia*, the book has been published by Ed GTA-ETH Editors, Zurich.

Notes

ⁱ See (Burdett et al. 2011)

ⁱⁱ See (Bird 1971)

ⁱⁱⁱ Authors as Daamen and Vries have been working on describing the process in the city-port interface, see (Daamen, Vries 2012, Daamen 2007). Wiegmans, meanwhile is describing the changing port-city relations at Amsterdam (Wiegmans, Louw 2011).

^{iv} It is recommendable to see the *Portus* magazine, published by RETE- Asociación para la Colaboración entre Puertos y Ciudades- www.reteonline.org, where a variety current of city-port cases are studied. Likewise, Grossmann (Grossmann 2008) gives an interesting approach of the Hamburg phenomenon.

^v To see how political parties coincidence affect ports infrastructure developments is recommended the lecture of Castillo-Manzano (Castillo-Manzano, Fageda 2011, Castillo-Manzano, Fageda forthcoming).

^{vi} No concern was identified among the different administrations interviewed. Port managers consider environmental impact assessments an administrative procedure, but no real risk is associated.

^{vii} On April 2012 the Barcelona mayor, Jaume Trias and the Urban Councilor Antoni Vives presented an urban plan advancing the future city growth in the port interface. The plan elaborated within the Urban Agency Barcelona Regional aimed to define the likely urban expansion around the Montjuic Hill. However, the controversy generated assuming that the municipal aim was to push out the Port from its domains and substitute industry by housing has forced the cease of the planning proposal at the present time.

^{viii} Despite the administrative land owner is the Infraestructre Ministry, the everyday manager and the facto landwoner can be considered the Port of Barcelona.

^{ix} See (Caldentey 2008)

^x Housing land market prize has been calculated duet he consideration of the authors of its relevance and the possibility to access to reliable data. We are aware of the different land market prize within the Port area due the different land uses, but through the process is taken into consideration and assumed.

^{xi} The Eixample neighborhood is the most dense are within Barcelona with 33.000 habitants per km2, doubling the Barcelona average and 5 times the Sarria neighborhood density in the upper side of the city.

^{xii} A highest and Best Use Real Estate common definition is the "reasonably probable and legal use of vacant land or an improved property that is physically possible, legally permissible, appropriately supported, financially feasible, and that results in the highest value" (Rabiansky, 2007)

^{xiii} See (Gonzalez 1967)

^{xiv} For a Port Historical analysis see (Alemany 1998), (Caldentey 2008)

^{xv} See (Bloom 2004, Busquets 2001)

^{xvi} See (Bruttomesso 2009)

xvii Port Urban Uses and Space Delimitation plans are defined by the port authorities without local government participation, but in those areas where edification is needed, a second spatial plan is accomplished. Different than the first, the Port Organization Special Plans requires of local administration participation by approving and informing the plan. For further information see the Spanish Port Law 2011 (Ministerio de Fomento 2011). Likewise, despite terminology has been modified with later port laws Saíz (Saíz 2005) is giving a synthetic picture of the problem. To see the Port 2000, (Port Vell managers) approach is recommended (Port Vell 2008)

^{xviii} A good explanation of the port tendency shift base on popular environmentalist awareness is given by Van-Hooydonk (Van-Hooydonk 2009)

xix See (ESPO 2010, FNAU 2011)

xx It has to be taken into consideration that concession periods are limited in time and tenants have calculate their investment for an specific activity. To modify the activity developed does not extend the concession period and as a consequence the investment that has to be realized for the renovation could be a handicap.

^{xxi} Land revenues are the 47% of the port revenues by 2011, an increase of 19 points from 1979 (Lorenzo-Almeida 2012). Moreover it is clear the importance of the land tax within the port environment since they operate in a landlord model.

Image Captions

Fig 1, Port Vell Economic Result Comparative.

Fig 2, Port of Barcelona Land Creation Cost

Fig 3, Land Market in the Barcelona City-Port interface

Fig 4, Barcelona Land Conversion Timeline

Fig.1

Relative Income Analysis Port Vell/Barcelona Port Authority

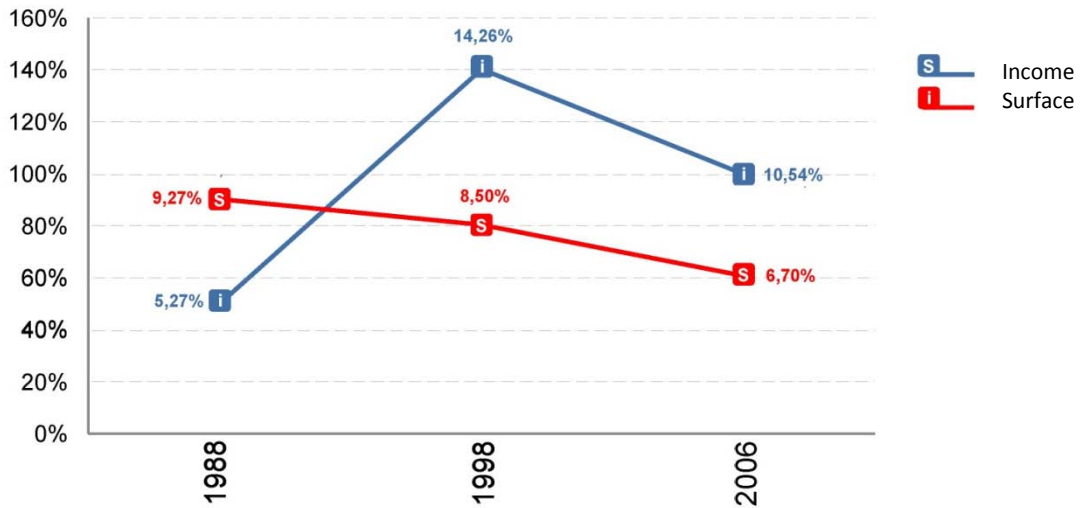


Fig.2

Port Land Extension Cost in Barcelona

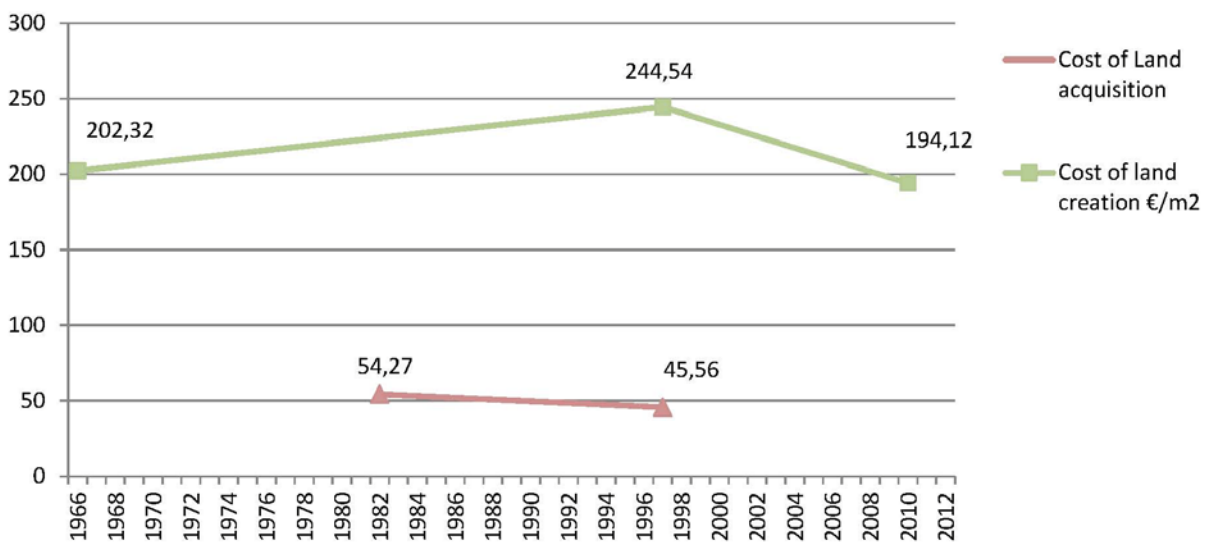


Fig.3

Barcelona City/Port Land Market

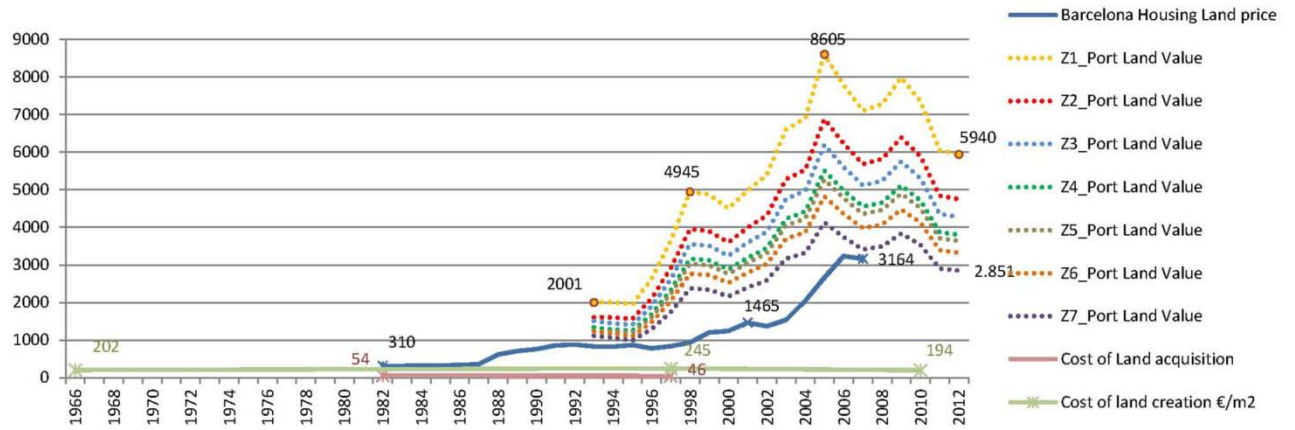


Fig.4

City-Port Timeline

