

## **Transformations toward sustainable port cities: dynamics and processes of adaptation in the Marseille area**

**Theme:** *Post-growth economics*

**Subtheme:** *Social metabolism, industrial ecology, and the new industrial revolution*

### **Summary (147 words)**

Ports are strategic areas in terms of consumption, production and storage of material and energy flows. They face endogenous and exogenous issues of evolution. Evolving in a context of permanent uncertainty, they have developed a capacity to adapt through mid-term innovative strategies and actions in economic, social and cultural fields. Today, in the context of post-fossil carbon developments, they are becoming relevant areas for innovation, experimentation and the implementation of new models.

From an international overview to a case study of the Marseille area, this communication aims to highlight the current dynamics and diverse responses proposed by port areas to adapt, which create new dynamics of cooperation between stakeholders, introduce new forms of governance and are based on innovative framework as industrial ecology or the circular economy. Marseille illustrates different stages of development in port industrial systems, from a juvenile phase to a mature phase of sustainability.

### **Extended abstract (949 words)**

Involved in a global highly competitive market (Merk, 2013), nations need to deal with both natural (abundance or lack of natural resources) and structural (level of industrial development, airport or port facilities, etc.) strengths and weaknesses. The strategic positioning of port cities relies on their ability to become major trade corridors for material flows and energy internationally. At a time when more than 80% of the physical worldwide trade of goods is carried by maritime transports, we can easily understand the importance of coastal and river areas, in particular for countries with direct access to the sea. However, if ports are strategic areas, in terms of geopolitics and economy, they are also historical basins of innovation and anticipation, in economic, social, cultural and environmental fields. As interfaces between the sea and the back country (hinterland), ports also play an important role in local development. Locally, ports are one of the pieces in a complex puzzle involving a wide variety of territorial stakeholders, now facing new challenges of sustainability (joint development, energy and scarcity of land resources, pollution management, etc.). These areas feature a high concentration of "heavy" industrial activities (steel, petrochemical, etc.), providing local jobs but also generating pollution. They are also concerned by environmental issues, as the coexistence of spreading urban areas and protected coastal ecosystems (Natura 2000 areas) becomes increasingly difficult. 60% of the population already lives on urbanized coasts, and this proportion is expected to increase dramatically by 2020 (Vallega, 2001). Locally, the development of these productive areas questions the coherence of industrial port areas (Lavaud-Letilleul *et al*, 2013), facing conflicts of land use and limitations of resources that have to be shared between industrial and port activities (logistics, fishing, boating and tourism), on one hand, and urban and agricultural activities, on the other hand. Developments in these areas are also affected by important exogenous factors (strategies of maritime and logistics companies, sectorial restructuring of major steel, metallurgical and energy industries especially in the context of moving towards a low-carbon society). All these factors question a port's short and medium term economic vulnerability. The multiplicity and complexity of the issues illustrate the emblematic and symbolic function taken on by these areas as we engage in ecological and social transitions.

This communication aims to show the current dynamics and the diversity of responses given by port areas in order to adapt to various issues, through new dynamics of cooperation between stakeholders and new forms of governance (Mat and Cerceau, 2012; Cerceau *et al*, 2014). In particular, we use the frameworks of industrial ecology - extrapolating functioning models by analogy with natural ecosystems- , and the circular economy. To achieve sustainability, port areas become places of experimentation and implementation in order to anticipate current geopolitical obstacles in terms of energy and natural resource management. Synergies involving resource issues such as water, waste and energy management are already under way, especially in industry. However, optimization by sector is not adequate, which explains why new forms of synergies are currently based on multi-sector cooperation at the interface of the urban, agricultural and industrial functions of port areas. These new forms of synergies show that we need to develop and deepen collaborative interdisciplinary research. Linking academics and local stakeholders (interrelations) and searching for new synergies between sectors and functions (interactions) requires a new scope of analysis to provide new guidelines for decision makers.

To propose an illustration of these issues, this talk focuses on an emblematic European and Mediterranean port area: Marseille in France. During the last 150 years, its port has become gradually disconnected from its historical site in the heart of the city (Hoyle, 1989; Ducruet, 2008). Meanwhile, new industrial port complexes have been developed further West, positioning Marseille-Fos as a strategic node in southern Europe in terms of energy flow management, mainly fossil fuels (oil, coal, etc.). However, in a context of cyclical or structural crises related to industrial and energy developments, this specialization of activities is now considered to be a real weakness. Aware of its vulnerability and the need for a transition, the industrial port complex of Marseille-Fos has engaged in a strategic approach and adaptation process, relying on both energy transition (new production and distribution of energy, trade flow and sharing of services between local actors), and renewal of the port-city interface (new modes of governance and territorial roots in an context of metropolization). This strategy is based on three main points: 1/ energy efficiency depends mainly on technological responses and research; 2/ the local production of renewable energy aims to mobilize local resources such as solar, wind, geothermal and biomass energy, and; 3/ the implementation of industrial ecology promotes the development of new synergies between port industries and also with the city and the agricultural community. Going beyond the scope of eco-industrial parks (EIPs), our analysis focuses on the changing relationships between stakeholders, the spatialization of port industrial activities, port-urban-agricultural flow exchanges, and port-urban-agricultural resource governance.

The case study of Marseille provides an example of different phases in the socio-ecological evolution of port industrial systems from 1/ a “juvenile” phase, in analogy with natural ecosystems (Clements, 1916, 1936), characterized by the monolithic specialization of spaces, activities and optimization, an exponential growth in the port activity, a spatial and functional disconnection in port-city interface and a strong dependency on exogenous fossil energy, toward 2/ a “mature” phase, characterized by a slowdown in the port exchanges, diversification of activities, and the densification of flow exchanges between different sectors, and globally an increasing level of complexity. Using the resilience and emergency research frameworks, we discuss the main results that illustrate and question future trends, challenges, and conditions of adaptation, robustness, and the transition of industrial port cities.

Acknowledgments: The authors would like to thank the SAN Ouest Provence and AIVP for their active support. They also would like to thank ELSA research group ([www.elsa-lca.org](http://www.elsa-lca.org)) for their precious advice.

Keywords: industrial ecology, circular economy, port areas, resilience, transition, interactions

#### References:

Cerceau, J., Mat, N., Junqua, G., Lin, L., Laforest, V., Gonzalez, C., 2014. Implementing industrial ecology in port cities: international overview of case studies and cross-case analysis. *J. Clean. Prod.* 74, 1-16.

Clements, F.E., 1916, Plant Succession, Carnegie Institute Washington Publication, 242, Washington, DC Connell.

Clements, F.E., 1936, Nature and structure of the climax, J. Ecol. 24, p.252-284.

Ducruet, C., 2008. « Typologie mondiale des relations ville-port », Cybergeog: Eur. J. Geogr. [Online], Space, Society, Territory, document 417, Online since 27 March 2008, connection on 19 June 2013. URL : <http://cybergeog.revues.org/17332> ; DOI : 10.4000/cybergeog.17332

Hoyle, B.S., 1989. The port-city interface: trends, problems and examples. Geoforum 20 (4), 429-435

Lavaud-Letilleul, V. (Coord), 2013. «Développement industrialo-portuaire, enjeux socio-environnementaux et gestion durable des territoires dans les ports de commerce. Réalités françaises, comparaisons internationales ». Programme PISTE (Port – Industrie – Société – Territoire - Environnement). Rapport final.

Mat, N, Cerceau, J., 2012. Les ports à l'heure de l'écologie industrielle. Panorama international des initiatives collaboratives multi-acteurs autour de la gestion des ressources dans les territoires portuaires. Rapport final. Projet co-financé par l'ADEME.

Merk., O. 2013. The competitiveness of global port-cities: synthesis report. OECD. URL: <http://www.oecd.org/gov/regional-policy/Competitiveness-of-Global-Port-Cities-Synthesis-Report.pdf>

Vallega, A., 2001. Urban waterfront facing integrated coastal management. Ocean Coast. Manag. 44, 379-410.