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Designing and Implementing Monitoring Systems at Natural Marine Parks

Mayotte and Glorieuses Natural Marine Parks - Mayotte

The use of monitoring systems in public organizations, including those directed to environmental protection and sustainable development, has gained momentum for years. This tool is composed with a set of indicators displaying the outcomes or outputs of actions. It aims at ensuring appropriate and timely realization of goals and objectives, and efficient public spending. Natural Marine Parks (NMPs), as public marine protected areas (MPAs), are required to implement monitoring systems. These systems are supposed to help managers to assess and adjust their actions, report on their results to supervising bodies and communicate with the local community. They should help managers to understand the effect of their actions; hence, they will be able to achieve the management plans' objectives on time. Many requirements are associated with this task in order to make it complete, reliable and efficient.

Today, Mayotte and Glorieuses NMPs' managers face the challenge of building their monitoring systems. They need to translate the objectives listed in their management plans into indicators. With all indicators forming a dashboard. Considering the number, variety and wide scope of NMPs' objectives, the limitations in terms of historical data and technical resources locally, and the large surface areas of these two MPAs, this task is very complex.

In order to face this task's complexity and burden, the French Marine Protected Areas Agency (MPAA), the NMPs' supervising body, initiated a research project aimed at building a methodology for designing and implementing monitoring systems. This methodology needs to help managers to tackle difficulties while avoiding the pitfalls of previous NMPs' monitoring system implementations. This thesis will detail the approach adopted and the results obtained. The research approach was to understand precisely the requirements, expectations and difficulties associated with the monitoring system implementation task. Based on this assessment, it was then possible to propose and test methodological tools. This approach led to support Glorieuses NMP's indicator identification process, and to propose specific indicators and data collection processes for Mayotte NMP. It helped building methodological tools applicable to all NMPs.

The initial assessment included the analysis of internal and external documents about indicators and monitoring systems, interviews and contacts with many stakeholders (MPAA, Iroise and Golfe du Lion NMPs) and close work with the Mayotte and Glorieuses NMPs' managers on their respective objectives. This approach aimed at understanding and respecting requirements while adapting to the various challenges that exist: scope, size and gaps of the NMPs' management plans, objectives' ambiguity, local constraints, and inherent limits to indicators and observation.

The main results of this approach are the methodology for building the monitoring system and the actual propositions of indicators for Mayotte NMP. The methodology combines a top-down, a bottom-up and a horizontal approach; these three approaches consist respectively in applying common tools to all objectives, analyzing specifically each objective and optimizing monitoring with shared collection protocols whenever it is possible. The method built is organized in four phases: objective analysis, indicator determination, protocol writing, and dashboard implementation.

Difficulties and limits faced during this research project allowed to reflect on many issues: the tension between organization and action; the actual use and limits of indicators and monitoring systems; the ability to define performance objectives regarding complex environmental and socio-economical systems in data and resource-poor contexts. These issues shed light on the limits to environmental management tools.

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Life cycle assessment of CO2 capture technologies and suggestions for an Eco-label in the CO2 business sector

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This study focused on CO2 capture and utilization (CCU). No standard methodology exists for determining the environmental benefits of CCU. The aim of this study is to define an eco-label in the CO2 sector, in order to foster the development of CCU technologies. Better global environmental awareness and stricter regulations create a demand for

higher environmental performance in all sectors. Eco-labeling has been identified as a suitable marketing strategy in the CO2 business sector and could make CO2-based products more competitive.
In a first step was conducted an analysis of the current CO2 sector. Both conventional and emerging sectors have been analyzed. A classification has been established in order to understand the CO2 business sector and in order to choose most promising CO2 capture and conversion routes. In order to develop an eco-label in the CO2 utilization sector, quantitative evaluation need to be performed in order to determine the environmental load of CO2. In this study, CO2 is considered as a product rather than a waste. Life cycle assessment has been selected for the comparison of CO2 production systems. In order to illustrate the methodology, this study compares various CO2 production systems. A comparative LCA has been conducted on four different CO2 production systems.
Considering the CO2 as a conventional product and allocating a part of the environmental load to the CO2 enables to quantify emission reduction linked to CO2 capture and utilization. This methodology enables to calculate emission reduction of the CO2 emitting source, regardless of the downstream utilization of the captured CO2. In this study, the quantitative emission reduction due to CCU is calculated on the basis of the economic value of the CO2, and is not dependent of the CO2 sequestration time. This study describes the proposed methodology and describes how the LCA results can be used for the construction of an eco-label. In particular, this study highlights the parameters which should not be used as basis for an eco-label. Based on the results of this project, suggestions are given for the development of eco-labels of CO2 and of CO2-based products.

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Retail and environment in Brazil: beyond energy efficiency

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Retail is the sale of goods and services from a business organized in a complex supply chain, with many intermediaries, to a final consumer. The business model of these companies is based on the sale of a large amount of goods with a low margin so as to make profit while tackling down prices.
At the world scale, the retail industry tends to turn from traditional small size family owned businesses to high scale stores owned by large multinational companies. The degree of accomplishment of this transformation depends on the country. In Brazil, a developing country, we are in transition between these two situations. Though, the market is dominated by Grupo Pão de Açucar from Brazil, the biggest South American retailer and first private employer of the country, followed by the foreign giants Carrefour and Walmart, attracted by the potential of the Brazilian market.
The retail industry impacts the environment in a wide range of ways that can be split according to where they are located in the supply chain of the product: Upstream (from the supplier to the store): GHG emissions related to transports and resources consumption (materials to build the product, transport it and fuel); Onsite (the store): energy consumption, GHG emissions (refrigerant fluids), waste production, water consumption and land use. ; Downstream (from the store to the consumer): GHG emissions related to transports, waste production related to the end of life of the product and energy and water consumption related to the use of the product.
Retailers don't control equally these three areas, and as a consequence acting on them to reduce their environmental footprint is not equally easy. The upstream phase is indirectly controlled since retailers are in contact with the businesses that supply them. The onsite phase is directly controlled since it belongs to the retailer. Finally, the downstream phase is the hardest to control since it depends mainly on the consumer behavior, who has no direct and clear contact with the retailer.
In Brazil, the cost of energy is already one of the highest in the world. Moreover, the inflationist context is very likely to make this cost rise. Indeed, Brazil energy production is largely dependent on hydro-electricity production, and recent severe episodes of drought as well as political pricing decisions threaten the industry. For a retailer, energy cost ranks second after work-force. The combination of the relative easiness to act and the financial stake justifies the importance of working on energy efficiency.
Energy efficiency consists in maintaining a given service consuming less energy. In a store, it is mainly about automatizing and revitalizing the existing power installations so they can work according to the climatic conditions thanks to the use of sensors and exactly cover the energy needs. However, by focusing on energy efficiency, we only address one of the three phases we highlighted previously. Here in Brazil, some everyday observations suggest that the downstream phase of the supply chain could play a major role in terms of environmental footprint. Indeed, plastic bags are overused, waste management infrastructures are inefficient and, especially in São Paulo, the quality of transports is

poor. Priority is given to transport by car, and public transportation infrastructures are poor. This results in critical, permanent traffic congestions. The carbon footprint assessment performed by some retailers such as Carrefour and Groupe Casino itself confirms this intuition. Indeed, according to these studies, the downstream phase would be responsible of 43 to 57 % of the carbon footprint of retail activities, with customers' transport weighing way more than waste production. In other words, with energy consumption representing 10 % of the carbon footprint and assuming a 25 % reduction in the energy use of the stores, we would reduce the carbon footprint by 2,5 %.
The challenge here is in how to encourage companies in working on the energy issue related to the consumers, which accounts for about half of the problem. Tackling this requires a collaborative approach between all the stakeholders involved that constitute the system in which the store is integrated: the retailer, local authorities, local businesses and the consumers. Indeed, contrary to energy efficiency where the incentive is very clear and strong, reducing the environmental impacts of the downstream phase hardly brings direct financial savings in addition to be out of direct control of the retailer. Retailers can play a role by communicating to their customers about good transportation practices and providing them with recycling points in their stores, but this must be part of a global approach promoted by the global community, for the actions to be eventually effective.

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Renovation versus reconstruction of existing buildings: How to adopt the right strategy?

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Throughout its life cycle, from the production phase to the final phase, building needs huge amounts of materials and consumes a lot of energy. Thus, degrading the planet by the GHG emitted, the depletion of raw materials used and the big volumes of waste generated that need to be treated.
This paper discusses whether refurbishment or demolition and reconstruction of existing buildings is the right strategy to adopt to meet environmental standards set by governments and how to improve the existing assessment tools to put in place such a project. In this document several solutions for renovation are also proposed and examples of implemented actions in different European countries are compared. Finally, a section concerning the current situation of China is presented as this country is the biggest energy consumer for the building sector in the world

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Supporting decision making for sustainable urban water management: Perspectives for Veolia

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Climate change and urbanisation are adding significant pressures on cities, requiring new ways of approaching resource management and urban planning. Decision-makers face a global water crisis, challenging conventional practices for water collection, treatment and supply. As part of now widely accepted sustainability principles, there has been a paradigm shift towards Integrated Urban Water Management (IUWM) in the last decade. Offering a more adapted technological and institutional framework for cities, this strategy has however been slow to produce concrete results. Highly dependent on information, policy-makers have therefore increasingly sought the help of systems based on computational and modeling advances capable of filling that gap.
Cities are more complex environments than ever. The value of Decision-Support Systems (DSS) capable of anticipating future policy outcomes is therefore increasing. A simple Integrated Water Supply Model was developed as part of a Franco-Singaporean project to deliver a DSS for a pilot neighbourhood in the Asian city-state. A set of 21-year simulations showed that potable water savings of up to 53.6 % were achievable by installing local water reuse and harvesting systems in buildings as well as by consuming water more efficiently. While allowing the highest water savings, greywater reuse led to a 23.3 % increase in energy consumption over the study period and therefore greater greenhouse gas emissions. Combining water demand management in an integrated strategy reduces relative savings from greywater reuse by 25 % but counteracts environmental impacts. A cost analysis however highlighted the financial

challenge for decentralised water production with payback periods of over 20 years. A client-suggested initiative of reusing flushed out water from roof tanks in particular was shown to be highly inefficient. Lack of data and institutional fragmentation remain important hurdles for DSS development and carrying out IUWM in general. A systemic approach, going beyond the borders of the water sector, can ensure stakeholder engagement and the implementation of reproducible strategies.

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Turning Climate Change into a Business Opportunity The example of Suez Environnement

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The recent publication of the 5th Assessment Report of the Intergovernmental Panel on Climate Change has confirmed the urgency to mitigate greenhouse gas emissions, and to adapt to the effects of climate disturbances. A number of studies have recently examined consequences of climate change for business daily operations and concluded on the necessity to anticipate climate-related risks and vulnerabilities as well as to enhance capacity building as regards adaptation. Other research topics have analyzed climate stakes as part of companies' corporate social responsibility strategies. This research was conducted in the light of the fruitful debate on climate that is taking place between civil society leaders and public authorities in the framework of the United Nations Framework Convention on Climate Change.

In December 2015, a universal agreement should be reached between the 192 Parties to the Convention, aiming for setting-up a framework for monitoring, reporting and reducing greenhouse gases emissions in order to limit global warming to 2°C by the end of the century. This new agreement should integrate the principle of differentiated responsibilities between developed and developing countries, but should also consider private sector's role in the implementation of mitigation and adaptation solutions. That is why public authorities have launched a positive agenda for climate to foster stakeholders' initiatives in several transverse fields amongst which mitigation, adaptation, climate finance, energy, transportation or sustainable cities. In this context, this paper aims at examining the potential for turning climate change into a business opportunity within the waste and water management industry. It is based on a thorough analysis of Suez Environnement's climate strategy, a world-leading player in the multi-utilities sector. First, a Climate SWOT will evaluate climate-related risks and opportunities in the view of the Group's carbon profile and of its climate strategy. Then, the current business offer of Suez Environnement will be examined through the lens of climate change by measuring products and services' mitigation and adaptation benefits and by organizing them into a positive agenda.

The second part of this research aims at articulating these climate solutions into an innovative business offer and updating their marketing mix: product, promotion, place and price. The results show a great potential for using climate change as leverage for scaling-up the commercial offer related to sustainable urban management and industrial symbiosis, notably in Asia. We identified a key success factor for entering the climate solutions marketplace: conciliating mitigation and adaptation through circular economy of water, waste and energy. Nevertheless, this business model is exposed to several difficulties among which: the lack of appropriate revenue creation mechanisms specifically as regards carbon pricing, and the weak integration of avoided emissions from circular economy in greenhouse gas emissions accounting.

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Greening Chinese Chemical Industrial Park: A case study of circular economy deployment in Shanghai Chemical Industrial Park

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Since 1978, the Chinese economy has increased at an unprecedented pace, achieving a GDP average annual growth of 9.9% owing to its two main economic engine, i.e. industrialization and urbanization. As a result, more than 600 million Chinese transitioned out of poverty from 1981 to 2009. However, this remarkable development has been notably realized through heavy industries such as metallurgy, chemical and petrochemical and cement, resulting in resources depletion and environmental pollution. Consequently, the last decade has been the scene of many serious environmental and health

problems. Also, as the world leader of greenhouse gases emissions since 2007, China now has a global responsibility to mitigate climate change. Certainly, the challenge is immense, but not insurmountable as the main origins of problems have been identified and converge to industry, energy sources and efficiency. Industrial ecology is a potential game changer as it relies on a holistic approach, which conciliates environmental preservation with economic growth. Through cleaner production, industrial symbiosis and circular economy tools, industrial ecology could bring an "all-in-one solution" to its environmental concerns and most importantly in a cost-effective manner. In the last decade in China, multitudes of Eco-Industrial Parks (EIP) have been developed in a view of demonstrating industrial ecology concept.
This manuscript is dedicated to an in-depth investigation of a sector specific Eco-Industrial Park, namely Shanghai Chemical Industrial Park (SCIP), and its co-benefits evaluation with Shanghai Municipality. First, a glimpse of Chinese background and concerns is given in section 1. Then, industrial ecology approach in SCIP and associated benefits are uncovered and successively compared to National chemical sector and other chemical industrial parks as well as Eco-Industrial Parks in section 2. Subsequently, opportunities for improvement in SCIP at each level of industrial ecology: Firm, inter-firm and regional through cleaner production, industrial symbiosis and circular economy are explored in section 3. Finally, conclusions and recommendations are proposed, where a circular economy roadmap between SCIP and Shanghai is given in section 4.
Although significant efforts are still needed, SCIP has the potential to facilitate eco-industrial development via establishing trans-boundary industrial symbiosis and circular economy system between SCIP and Shanghai City, owing to its sound strategy, management and infrastructure features. The eco-industrial development practice in SCIP will have positive policy implication for other chemical industrial park to facilitate the co-benefits of industrialization and urbanization.

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Prospect of development for energy efficiency through energy performance contracting

GREENYELLOW Paris

One of the tools chosen by Europe to tackle the challenges of energy efficiency and the goals in energy savings is the Energy Performance Contracting (EPC). An Energy Service Company (ESCO) invests on energy efficiency actions to achieve savings shared with the client. The mechanism based on a guarantee of performance takes most of the risk from the client, preserving his investment capital. The ESCO Green Yellow implements EPC at a large scale on supermarkets of the Casino Group and has developed a process to reach between 25 to 30% energy savings with a set of actions regarding refrigeration, HVAC piloting and remodeling of the lighting system. These EPC proved to be a cost-effective way to reduce GHG emissions and a profitable activity. The object of the study is offer a clear definition of the economics of EPC and of the process used by Green Yellow, to identify the barriers and advantages of to reach European objectives and conquer new markets.
The most important identified barriers to EPC are linked to the transaction costs, influenced by the contract complexity, the asset specificity and the information gap between parties. Developing in foreign countries being a widespread strategy, it is interesting to study the potential of implementing EPC in China considering the amount of savings to be made and emissions to avoid. In China most ESCO are small companies lacking technical protocols and financial capacities. Foreign ESCO present advantages to enter the energy services market on their investment capacity, their technical experience and their references.

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Water Reuse as a Solution to Water Scarcity : Risk Assessment of Treated Wastewater

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Due to the limited water resouce on the earth and incresing world's population, we are faced with water crisis nowadays, and the serious water pollution issue worse the current situation. Many solutions have been come up with, such as water diversion, seawater desalination and water reuse. There are many water reuse applications all over the world because of

the benefits of water reuse, compared with water diversion and seawater desalination, such as richer wastewater resource and lower reclaimed water price. However, there might exist potential risk in the reclaimed water, if the microorganism are not removed efficiently.
The water reuse project I was involved is mainly regarding the microorganism risk assessment of the reclaimed water. The main goals of the project are the analysis of potential microorganism risk of reclaimed water and the determiantion of the acceptable microorganism concentration. Quantitative risk assessment method, which is a formalised specialist method for calculating individual, environmental, employee and public risk levels for comparison with regulatory risk criteria, is adopted to make the risk assessment of reclaimed water. Average method and monte carlo method are also taken into account for each risk assessment process.
It turns out that the effluent from the first treatment process, which is sand filtration and ultraviolet disinfection, could not be usd for agriculture, afforest, landscape and groundwater, and that the effluent from the second treatment process, which is ultra filtration and tank, could be used for afforest only. The exposure dose is one key parameter in the process of risk analysis, which should be obtained based on the specific situation. Compared with reclaimed water standard from USA, China and WHO, the calculated acceptable microorganism concentration is closer to the value of USA Standard, which means that the acceptable microrganism concentration is achievable in real lif. The method I proposed in the papar could also be used for making new reclaimed water standard.

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Sustainable Management of Bio-solid from Waste Water Treatment Plants: A Chinese Case

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Bio-solid, referring to sewage bio-solid, is the byproduct of waste water treatment. The purpose of this study is to provide sustainable management strategy for the selected city's bio-solid treatment under its fast urbanization and economic development. According to the development plan of selected city, the sewage bio-solid production is expect to reach 1000 tons per day in 2020 with the expansion and upgrading of waste water treatment plants in downtown area, compared with 600 tons per day currently. This phenomenon indicates that the overall sewage bio-solid production in the selected city will increase significantly, which is putting tremendous pressure on the sewage bio-solid treatment sector. At present, unstable bio-solid source, irrational choice of treatment and disposal technologies, absence of treatment fee and low public acceptance for bio-solid products are major obstacles for the sewage bio-solid treatment and disposal industry. In order to provide a guidance for bio-solid treatment and disposal of the selected city, applicable pathways are assessed with material flow analysis tools under 3E framework (Environment-Energy-Economy) along the processing life cycle. The aim is to find a suitable roadmap for the growth of bio-solid industry as well as improving the environmental quality, energy benefits and economic growth in the selected city.

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Assessment standard for energy performance of public buildings in Beijing

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Considering about energy supply capacity and social development, China's future total energy consumption will be controlled within 4 billion tce to ensure national energy security. Based on energy structure characteristics, China's future building energy consumption is supposed to be restricted within 1 billion tce.
GB50189-2005 at national level and DB11/687-2009 with Beijing City scale are design standard for energy efficiency of public buildings. They both set thermal envelope design in architecture and heating, air conditioning and ventilation systems in equipment as the most significant points in energy-saving design. They both run the energy efficient ideas in the whole processes of one public building project. Source control and energy recycle in initial design and construction, and operating monitoring during employing are two main energy-saving thoughts all through the two standard

documents. These two standards encourage developing key technologies of equipment, design and application, in order to improve heat preservation and reduce heat demands, in order to improve efficiency of heat source and in order to reduce public building energy consumption eventually. Reasonable and energy-saving design of plumbing systems and electricity also matters a lot in the whole design and operation of one public building energy efficiency design project.

Assessment standard for energy performance of public buildings almost covers all the requirements in DB11/687-2009, including planning and architecture, HVAC, water supply and drainage and building electricity. It is based on Beijing local energy efficient design standards for public buildings. With attention on comfort level public buildings provide with, indoor environment including thermal, humidity, lighting and air quality, is also put forward in this assessment. The assessment standard can be applied for assessing energy-saving design and operation level with 6 indicators. To encourage innovation, the final scores will include pluses of promotion and innovation. The total scores are produced by weighted average algorithm.

Targeted objects of Assessment standard for energy performance of public buildings is new-built and re-built public buildings located in Beijing. Planning and architecture, HVAC and equipment are three important key points during public building energy efficient assessment. Weight distribution vary based on 6 indicators' characteristics and public building types accordingly. Control and scoring items play different roles in the development of public building industry. They would regulate mandatory stipulations of public buildings and encourage or guide innovation of new materials and products in the whole construction industry.

HVAC is to produce energy, planning and architecture is to reserve energy, and building electricity, water supply and drainage and indoor environment are responsible to consume energy. Assessment standard for energy performance of public buildings is qualified to assess every step in public building energy efficient design and operation. The assessment standard is practical, scientific, and encouraging.