

**Forward-looking exploration sheet  
"Ocean and Society 2030"**

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**Social Function « to feed »**

► **Global trends discussed**

- Urban and coastal population growth
- Increasing food consumption
- Increasing dietary risk aversion
- Pressure on arable land (quality)
- Pressure on land resources
- More protein diets
- Growing demand for freshwater resources

► **Variation of these trends by field of maritime activity**

Marine activity field	Foresight element at the crossroad between the social function and field of marine activity
Transport and Ports	<i>Growing imbalances between production capacity and food needs in different parts of the world lead to increased maritime food transport, with increasingly tense flows and complex problems of food logistic in ports.</i>
Tourism and Boating	<i>Recreational fishing is growing (on foot and by boat), with an impact on the fishing economy and increasing pressure on coastal ecosystems.</i>
Cities and Coastal Areas	<i>Urban development in coastal areas, particularly its extension into lagoon areas, reduces productive natural areas and those that could be dedicated to aquaculture.</i>
Fisheries and Aquaculture	<i>Growing world food needs increasingly rely on marine resources, with new feeding practices (marine vegetable proteins, edible algae, krill ...)</i>
Mineral Resources	<i>The sea becomes a source of mineral food additives.</i>
Energy	<i>More frequent couplings among fisheries activities / infrastructures or aquaculture and marine renewable energy appear. Aquaculture techniques are implemented to manufacture biofuel from algae in floating marine park and ashore competing with food production.</i>
Security and Defence	<i>Securing food flows across the sea becomes a major concern, both in terms of transport, storage and distribution (Including vulnerabilities due to a concentration of facilities in port areas) and quality insurance (products sourcing and preservation methods).</i>
Environment and marine Ecosystems	<i>Two major trends combine: on the one hand climate change generates many uncertainties about fisheries resource evolution and impacts on coastal installations; on the other hand, the increasing effects of human activities on the ability of coastal ecosystems to produce food resources in quality and quantity.</i>
Governance	<i>The intensification of marine food extraction and globalization of human activity effects on fisheries resources should lead to better sharing of information about oceans and to agreements for the protection and management of the resource.</i>
Knowledge and know how	<i>The changes in dietary practices, strengthening and diversifying the resources of marine origin lead to explore new fields of knowledge about plant and animal marine food chains, and the impact of their consumption on health.</i>
Cultures and Mental Pictures	<i>The oceans are increasingly seen as the major source of food for tomorrow, but with tensions between followers of large scale ocean exploitation and defenders of limited extraction from natural and preserved ecosystems.</i>

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### Social Function « to make safe »

► **Global trends discussed**

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| <ul style="list-style-type: none"> <li>- Income inequality</li> <li>- Power of the ultra-rich including global companies</li> <li>- Weakening of states (OECD)</li> <li>- Fragmentation of societies</li> <li>- Increasing risk aversion</li> <li>- Temperature and sea level rise</li> </ul> | <ul style="list-style-type: none"> <li>- Natural disasters</li> <li>- International Migration</li> <li>- Impacts of connectivity on lifestyles</li> <li>- Internet addiction, cyber terrorism</li> <li>- Multi-centric world</li> <li>- More nuclear powers</li> </ul> |
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► **Variation of these trends by field of maritime activity**

Field of maritime activity	Foresight element <i>at the crossroad between the social function and field of maritime activity</i>
Transport and Ports	<i>Despite great efforts to regulate, control and secure, States are struggling to develop and harmonize best practices (condition of vessels, conditions offered to crews, insurance, geolocation ...) in a world of increasingly fragmented socially and politically. Piracy and illegal traffic grow, while powerful economic actors organize themselves.</i>
Tourism and Boating	<i>Development of cruises and water sports engorge port infrastructure and coastal zones, and multiplies the problems (accidents, ill will, piracy ...). Infrastructure and ostentatious luxury activities (cruises, private floating cities) exacerbate inequalities, generate violence and private protection quick answer. But these activities also create jobs which stabilizes the population.</i>
Cities and Coastal Areas	<i>Coastal settlement goes from best (group, eco-designed and collaborative projects) to worst (privatization of the coastline, illegal constructions), raising tensions. Growing populations of migrants and environmental refugees struggle to find their place. Coastal areas are unevenly prepared for more drastic climatic events.</i>
Fisheries and Aquaculture	<i>Despite the development of means of control (detection / satellite tracking, automatic reporting of catches at sea), illegal fishing continue, endangering some species or taking vital resources for the poorest. Traffic grows (false origin fisheries, aquaculture prohibited medications, species and genes traffic...), requiring new ways of monitoring.</i>
Mineral Resources	<i>Access to deep sea mineral resources is the subject of territorial disputes between States. The exploitation of these resources is itself a source of risk and conflict, because of their impact on ecosystems (pollution, dust diffusion...).</i>
Energy	<i>Energy infrastructures and means of transport are privileged targets of attacks of all kinds, especially at inescapable crossing points. Technological risks or new ecosystem impacts arise due to new practices (Arctic, deep sea layer ...).</i>
Security and Defence	<i>The oceans are a shared space that states are investing to extend their territory security, influence or settlement.</i>
Environment and marine Ecosystems	<i>Means of measuring and monitoring the characteristics and physico-chemical and biological activities of oceans and coastal areas grow, with an increasing contribution to alert networks of civilians and NGOs.</i>
Governance	<i>To improve control of the seas, the intervention rules at sea are reviewed by easing territorial restrictions and other limitations and by developing interstate cooperation.</i>
Knowledge and Know how	<i>Battles for ownership of the living (species, genes, functions ...).</i>
Cultures and mental pictures	<i>The sea is both perceived as an area of freedom, and as a threat.</i>

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**Social Function « to heal »**

► **Global trends discussed**

- Aging
- Overweight (including related diseases) / malnutrition
- Urban pollution
- Health needs and costs
- Emerging diseases and threats

► **Variation of these trends by field of maritime activity**

Field of maritime activity	Foresight element at the crossroad between the social function and field of maritime activity
Transport and Ports	<i>Opened door to the world, the port is a place where pathogens from multiple horizons converge, requiring means of detection, containment and neutralization, but also means of monitoring the spreading within the population.</i>
Tourism and Boating	<i>At sea, the e-medicine techniques (starting with the e-diagnosis) are developed to cope with the increase of health problems in cruises or islands while at land health-tourism activities (sea-water therapy ... ) grow helping skin or overweight treatment.</i>
Cities and Coastal Areas	<i>Urban water sanitation has become a major problem in coastal communities, causing the development of new solutions, including bioremediation.</i>
Fisheries and Aquaculture	<i>The development of food products with therapeutic features intensifies as nutraceuticals, or products suitable for specific diets or survival ration easy to distribute in countries facing starvation issue.</i>
Mineral Resources	<i>The sea becomes a source of mineral food additives.</i>
Energy	<i>The multiplication of production facilities for energy in coastal areas leads to nuisance or affect the health of residents.</i>
Security and Defence	<i>Strengthening of watch and health alert networks, health checks on products from the sea, fight against drug preparations made from marine active ingredients.</i>
Environment and marine Ecosystems	<i>Growth of industries producing bio-healing resources, development of bioremediation processes for decontamination and sanitation.</i>
Governance	<i>Development of international health standards with monitoring of their implementation (especially for coastal pollution), the anticipation of risk and crisis management.</i>
Knowledge and Know how	<i>Development of marine pharmacopoeia</i>
Cultures and Mental Pictures	<i>The image of the sea remains associated with the benefits of sea bathing and generally stays by the sea, the virtues of preparations of seafood, and the intake of marine food. Apart from food, marine pollution is more perceived as an attack on the environment than on health.</i>

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### Social Function « to dwell »

► **Global trends discussed**

- No service zones outside urban areas
- Pressure on land resources
- Diversified and changing family ties
- Technology increase at home (connectivity, robotics)
- Energy efficiency in housing

► **Variation of these trends by field of maritime activity**

Field of maritime activity	Foresight element at the crossroad between the social function and field of maritime activity
Transport and Ports	<i>Segregation between the port area as economic activity, and the port as a dwelling, both being in strong expansion worldwide. Ports move away, become offshore. The historic port is restored for tourism and to improve habitat quality. Large peripheral housing areas develop, with more or less planning control, partly served by the sea for transportation.</i>
Tourism and Boating	<i>Floating tourism infrastructure develops: floating hotels, cruise ships, rental on or under the sea.</i>
Cities and Coastal areas	<i>Building pressure on coastal areas is stronger, increasing segregation in the population. The floating habitat grows widely, either within marinas and well monitored marine zones, or wildly.</i>
Fisheries and Aquaculture	<i>Urban development in coastal areas, particularly its extension into the lake areas, reduces productive natural areas and those that could be dedicated to aquaculture.</i>
Mineral Resources	<i>More intense use of marine building materials (sand extraction, shredded oyster in concrete).</i>
Energy	<i>The development of marine dwelling favors solutions allowing energy autonomy, particularly through renewable energy.</i>
Security and Defence	<i>Rejection of disadvantaged groups in remote settlements without services generates health problems, social tensions, and become lawless areas.</i>
Environment and marine Ecosystems	<i>The massive development of coastal habitat put a strong pressure on ecosystems, through surface taken by buildings, through disruption of animal life, through effluents.</i>
Governance	<i>Watch from authorities and coastal inhabitants help spread information and enforcement for rules, standards and best practices for coastal dwelling and urban flows management.</i>
Knowledge and acquaintances	<i>The symbiosis between the habitat and the sea is an important research topic in the context of research on sustainable ecosystems.</i>
Cultures and Mental Pictures	<i>Living "feet in the sea" or on the seashore remains a widely shared dream, with exotic and social privilege fragrance.</i>

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### Social Function « to produce »

#### ► Global trends discussed

- Aging
- Energy / renewable energy
- Distribution of fossil fuels
- Waste : Increase and diversification
- Employment issue (EU)
- Extension of goods and services
- Technologies (NBIC) and biotechnologies
- Development of robotics
- Scarcity of natural resources
- Distribution of strategic minerals

#### ► Variation of these trends by field of maritime activity

Field of maritime activity	Foresight element at the crossroad between the social function and field of maritime activity
Transport and Ports	<i>Profound renewal of the organization and functioning of the ports: automated handling, interconnected planning, port specializations, new business ... The most powerful global players take control of ports considered as strategic penetration tools. Port employees are largely migrants and operation within harbor areas escapes from the local regulations.</i>
Tourism and Boating	<i>Dwelling, coastal leisure and cruise shipbuilding is rapidly expanding, both for mass and luxury segments, incorporating more comfort, safety and control technologies. Reception facilities / anchoring-tie up spots are developed.</i>
Cities and Coastal areas	<i>A new coastal organization appears, it moves heavy industrial facilities away from residential areas. Tertiary activities grow in coastal cities. More floating infrastructures develop in front of the coastline (floating plants, etc...).</i>
Fisheries and Aquaculture	<i>The downturn in fisheries is offset by an explosion of aquaculture as mass activity (including offshore) and niche, high value activity. New technologies are being developed, both more efficient and more friendly to the environment (recycling of waste), with continuous monitoring of production and environmental impacts. New species are exploited, and traceability of products sold is improved.</i>
Mineral Resources	<i>Extraction activities in deepwater develop, for high-value minerals only, because of operating costs (especially energy). More or less automated platforms are developed, real floating bases integrating treatment / processing plants. At the end, these offshore industrial cities may become independent territories (quasi-states) to evade tax laws and regulatory pressure from States.</i>
Energy	<i>New hydrocarbon fields are made accessible in the deep sea (new technologies) or new zones (Arctic). Marine renewable energies grow, both for power generation (coastal or offshore wind, tidal, etc... ) and for the production of algae-fuel. Energy storage technologies develop: coastal or atolls pump storage power station (PSPS); compressed gas under wind turbines; etc...</i>
Security and Defence	<i>Remote monitoring equipments develop (space, land, underwater ...), as well as autonomous robots or means of action (drones). Energy self sufficiency of all these equipments, at the boundary between civilian and military applications, is a major development. The fight against counterfeiting is increasing.</i>
Environment and marine Ecosystems	<i>Engineering for sustainable industrial installations grows, including all floating installations. Industries, specialized in pollution treatment and bio-remediation, are growing rapidly.</i>
Governance	<i>Increasing involvement of the business community in the governance of the oceans, particularly concerning new offshore practices (responsibility for autonomous vehicles, applicable State law on inhabited floating platforms, etc...), traceability and the fight against counterfeiting.</i>
Knowledge and Know how	<i>Dress a more precise mapping of the seabed and what it holds as animal, vegetable or mineral elements, appear as a major economic issue.</i>
Cultures and Mental Pictures	<i>The sea is seen as a paradise of resources, a new "continent" to colonize at the surface and in the depth</i>

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**Social Function « to transport »**

► **Global trends discussed**

- Increased mobility (people)
- Energy consumption
- Globalized goods and services trade
- Economic concentration around ports
- Less polluting transport

► **Variation of these trends by field of maritime activity**

Field of maritime activity	Foresight element at the crossroad between the social function and field of maritime activity
Transport and Ports	<i>Many changes will impact transport by sea. First, the opening of the Arctic route shortens distance between East and West. Second, new ships will appear, cleaner and more fuel-efficient, optimized by use segment (faster, increased load capacity, etc...). Steering these new ships will be easier (fewer people), they could become automated or remotely controlled. Port facilities will adapt to these new conditions.</i>
Tourism and Boating	<i>Intercity transport by coastal shipping and general transportation by sea become more attractive. This transport mode is a welcome break and change of scenery in a hectic modern life.</i>
Cities and Coastal areas	<i>Passenger and freight terminal develop, well integrated in the urban scheme so that transport by sea (and waterways in general) become an "obvious" transport mode alternative to land transport.</i>
Fisheries and Aquaculture	<i>Floating aquaculture infrastructures are made movable to follow optimal aquaculture water conditions.</i>
Mineral Resources	<i>Larger and larger vessels sail the seas to transport bulky products. The exploitation of deep sea mineral resources requires the development of autonomous device for extraction, but also autonomous transport vehicle to carry the load to the treatment plant or the port.</i>
Energy	<i>Through renewable energy, energy self sufficiency of vessels improve, cleaner and sober engine develop.</i>
Security and Defence	<i>Means of watch and monitoring at sea, including satellite, develop. They aim at traffic control, accident avoidance, improving emergency reaction at sea, thwarting illicit traffic and dealing with piracy.</i>
Environment and marine Ecosystems	<i>Ships equipped with physicochemical or biological measurement sensors are a great way to follow the characteristics of the marine environment.</i>
Governance	<i>Harmonized and increased standards help avoid incidents and major accidents, as well for ship design (double hulls, recycling waste and effluents systems, etc...) as for crew licensing, travel rules at high seas and access to coastal areas.</i>
Knowledge and Know how	<i>The ecosystem impact of new waterways (Arctic in particular) is to study. Conditions for adding numerous automatic vessels to the traditional traffic are also a field of research both in Human and Physical sciences.</i>
Cultures and Mental Pictures	<i>Boat travel implies taking time, in a kind of serenity, away from the hustle of land life. Take your time aboard a boat is a luxury, but affordable luxury even for small purse!</i>



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### Social Function « to entertain »

► **Global trends discussed**

- Growth of tourism / leisure
- Information and communication Technologies (ICT) for tourism
- Impacts of connectivity on lifestyles
- Reorganization of social ties / trust

► **Variation of these trends by field of maritime activity**

Field of maritime activity	Foresight element at the crossroad between the social function and field of maritime activity
Transport and Ports	<i>Ports are places of life that attract shoppers. Tourism aboard mixed cargo-passenger vessels grows, for the exotic cruise and because of moderate prices. Ship automation and reduced crew may induce the development of low cost tourism involved in the life tasks of the vessels.</i>
Tourism and Boating	<i>Boating grows leading to marinas and tourist spots congestion. Virtual tourism is also developing with sightseeing and cultural aim (virtual tours) or technical (driving simulators for boats for example).</i>
Cities and Coastal areas	<i>Tourism development in the ports supports downtown historic centers revival, pushing the underprivileged classes in the outskirts. Recreational amenities (hotels, casinos, diving ...), floating or reclaimed from the sea, develop. They can turn into stateless "offshore cities" evading State tax systems.</i>
Fisheries and Aquaculture	<i>Recreational fishing is growing (on foot and by boat), with an impact on the fishing economy and an increasing pressure on coastal ecosystems. Offshore tourism develops (educational visits to aquaculture facilities, for example).</i>
Mineral Resources	<i>Activities of collecting shells, stones and other marine minerals grow, leading to activities such as local trade or e-commerce.</i>
Energy	<i>Industrial tourism for renewable energy grows, with visits to experimental or production facilities.</i>
Security and Defense	<i>Observation, measurement and warning networks will rely more often on the work of enthusiasts who follow directly what is happening on the spot or use and disseminate monitoring data accessible via the Internet.</i>
Environment and marine Ecosystems	<i>Involvement of local people increases the awareness about ecosystems behavior and their weaknesses. Cleanup campaigns, volunteer-based, draw more and more citizens. Contests of ideas related to coastal and marine eco-development multiply.</i>
Governance	<i>Through NGOs, citizens of the world are involved in the governance of oceans. They make proposals to define rules or put pressure to enforce existing rules.</i>
Knowledge and acquaintances	<i>Development of Marine Protected Areas and coastal eco-parks allow fascinating encounters with the living world. Computer applications including mobile and games disseminate knowledge on marine ecosystems.</i>
Cultures and Mental Pictures	<i>The sea have always fascinated people and inspired artists. The sea is an endless source of inspiration for different forms of art (literature, theater, painting, photography ...).</i>

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### Social Function « to learn and communicate »

► **Global trends discussed**

- Increase of the educational level and disparities
- Better access of technology, particularly ICT
- Place of ICT in learning technologies

► **Variation of these trends by field of maritime activity**

Field of maritime activity	Foresight element at the crossroad between the social function and field of maritime activity
Transport and Ports	<i>Maritime transport being global, it mixes a labor force from various nationalities which is a powerful way for learning languages and promoting intercultural exchanges. The ports themselves are places of intense cultural mixing.</i>
Tourism and Boating	<i>Tourism is "increased" through mobile applications providing explanations anywhere in the world, and easing intercultural exchange through simultaneous translation software. E-diagnostics and e-medicine develop for yachting.</i>
Cities and Coastal areas	<i>Large seaside growing cities are increasingly complex, both rich and vulnerable. The development of Internet applications "increasing" the city in harmony with the sea allows people to avoid bad practices and keep them informed.</i>
Fisheries and Aquaculture	<i>Online teaching is growing for maritime professions requiring increasing scientific and technical knowledge due to the sophistication of the vessels and their responsibility.</i>
Mineral Resources	<i>A better understanding of the abundance or scarcity of mineral resources and their location allows us to better understand geostrategic issues, the positions of States regarding their rights at sea. It also raises questions about the necessity or not of some mineral use.</i>
Energy	<i>A better understanding of "energy is life" can help understand the link between the biological energy uptake, use and transfer and social use, including improving energy efficiency in society and developing new energy sources.</i>
Security and Defense	<i>The development of information and communication meets the growing need for safety at sea. Real time public information about what happens in the marine environment grows.</i>
Environment and marine Ecosystems	<i>Powerful observation, measurement and warning networks grow, feeding databases (big data) to better understand ecosystems dynamics and to anticipate problems. This work is more often based on interactions between experts and passionate people who follow directly what is happening on the spot and use/disseminate monitoring data accessible via the Internet.</i>
Governance	<i>Information, relationship and direct expression opportunities through internet allow to discuss issues about ocean governance, to better take into account historical and cultural contexts, and built collective solutions among stakeholders with multiple or conflicting interests.</i>
Knowledge and Know how	<i>Deep sea marine ecosystem is a wide area of new knowledge accessible by underwater robotics. Various forms of E-learning offer many possibilities. For example, the use of simulation tools to understand issues and test possible solutions allow to explore a wide range of complex cases encountered at sea.</i>
Cultures and Mental Pictures	<i>The oceans, which cover 70% of the earth's surface, allow a growing proportion of mankind to experience similar life by the sea. It lead them to ask themselves the same questions about future developments, seashore is a privileged space to build a widely shared "citizens of the world" identity.</i>



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### Social Function « to last »

#### ► Global trends discussed

- Increase in greenhouse gas emissions
- Temperature and sea level rise
- Ocean acidification
- Deforestation
- Loss of biodiversity
- Sanitation
- Pollution of air, water, soil

#### ► Variation of these trends by field of maritime activity

Field of maritime activity	Foresight element at the crossroad between the social function and field of maritime activity
Transport and Ports	Development of multiple preventive regulations (safety, sobriety, cleanliness, etc.) and means of enforcement both for ships and ports. Development or transformation of port facilities to anticipate expected effects of climate; route adaptation (Arctic route, avoiding areas of cyclones, etc...) to the new climatic conditions. Port labeling offer a guarantee of sustainability.
Tourism and Boating	The development of tourism and nautical activities put a pressure on coastal and marine ecosystems requiring a strengthening of regulations, but also education and accountability actions. The onset or migration of undesirable or dangerous species (algae, jellyfish, sharks, etc...) changes the attractiveness of certain historical spots. Tourism moves generally northward.
Cities and Coastal areas	Coastal cities as the coastline in general are facing multiple constraints : rising sea levels and coastal erosion, repeated climatic events, concentration of terrestrial or marine pollution. Land planning is adjusted accordingly.
Fisheries and Aquaculture	New risks arise related to the massive aquaculture: loss of biodiversity (monoculture), emergence of new diseases, unexpected effects of new species. Strict standards apply to aquaculture facilities to minimize these risks.
Mineral resources	Mineral collection or mining in coastal areas (especially sand) and deepwater (cobalt crusts and others) induce local changes whose effects disseminate at long distances (transport by currents, plumes of dust) and must be controlled.
Energy	New hydrocarbon fields are made accessible in the deep sea (new technologies) or new zones (Arctic). Marine renewable energies grow, both for power generation (coastal or offshore wind, tidal, etc...) and for the production of algae-fuel. Energy storage technologies develop: coastal or atolls pump storage power station (PSPS); compressed gas under wind turbines; etc...
Security and Defense	A framework for international cooperation is developed to ensure the overall safety on the planet. Its policy scope extends from the effects of climate change (sea level rise, sanitation issues in some areas, new areas of drought), to resulting tensions (migration, illegal actions for survival), and to control and prevention in all forms of human activity.
Environment and marine Ecosystems	A better understanding of marine ecosystem dynamic and functioning can reduce the impact of human activity (pollution, mechanical effects ...) and help exploit new resources of biological origin (materials, energy ...). All human activities become eco-planned.
Governance	A systemic framework for global governance is in place, it allows a better consistency between segmented regulations (and not just those directly related to the sea). Global measures are studied to limit the causes and effects of climate change (e.g. geo-engineering solutions).
Knowledge and Know how	Enhanced international cooperation is developed to improve the knowledge about the long term effects of climate change in the marine sphere, including the ability of the oceans to act as regulators, or on the contrary to amplify the effects of phenomena by cascade.
Cultures and Mental Pictures	The sea is the symbol of duration, of endlessness starting every day with a sunrise over oceans that has not changed since the dawn of time.