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Discussion on new climate issues: Eco-design, circular alternative and Intrusion Prevention System (IPS)

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Abstract---An eco-inclusive environment is about interconnecting public services with the environmental concerns. It is obvious that the urban expansion makes higher demand on a wide range of resources. Predicting the future technological mutations and their environmental impacts are at the core of any impact assessment of a newly-designed product as the evolution waves are becoming shorter with the events of automation and nanotechnologies. The Eco-Design is aiming to contribute in more circular economy which eliminates the "business-as-usual" harming effects. In practice, a greater awareness that the circular economy model must prevail over the classical business as usual model by adopting innovative green design as a starting point. Likewise, a sustainable adaptation to climate change pressures is possible by rethinking the recycling materials' proceeds and mitigating waste. through the upgrading of the existing products.

Keywords---Eco-Design, Circular economy, Business-as-usual, IPS, Climate change.

1. Introduction

Our world needs all our efforts to create a more sustainable an inclusive environment, where public services (education, health care and transportation) are associated in such a way with environmental concerns (degradation, congestion and pollution). The EU's climate and energy targets aim to 20% reduction in greenhouse gas emissions, 20% energy from renewable sources and 20% cut in energy consumption by 2020. By 2050, the objective is 80% reduction in greenhouse gas emissions.

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Moreover, it is obvious that urban expansion makes higher demand on a wide range of resources (water, energy and food … etc.). To address the energy issue, the Eco-Design concept is already acting as a driver in reducing waste of all kinds. This concept is associated with the produced goods and is aiming to contribute in more circular economy which eliminates all kinds of business-as-usual harming effects.

2. Environment and economic circle

Economy circulation is a concept that can be used to minimize the gas leakage of resources, to promote durability and to reduce environmental impacts to favor recycling, recycling and material storage. View all related elements in the economic circuit in the environmental context

a- Reuse: Encourage the reuse of products and materials rather than disposing of them after their first use. This may include repair and refurbishment of products.
b- Recycling: Setting up efficient recycling systems to recover and reuse as many materials as possible. This reduces dependence on virgin resources.
c- Eco-design: Integrate eco-design principles into product development to minimize their environmental impact throughout their life cycle, from design to disposal.
d- Functionality economy: Rather than selling products, this approach aims to provide services. For example, instead of selling light bulbs, a company could offer a lighting service, which encourages sustainability.
e- Ecosystem regeneration: Beyond waste management, this encompasses approaches aimed at restoring and regenerating natural ecosystems, thereby contributing to the overall health of the planet.
f- Resource sharing: Encourage sharing rather than individual ownership of goods, as in the case of cars or tools, thereby reducing the need to produce new goods.
g- Education and awareness: Inform consumers and businesses about the principles of the circular economy, encourage responsible choices and raise awareness of the importance of sustainability.
h- The circular economy aims to create a system where waste is minimized, resources are used efficiently, and environmental impacts are reduced. This approach is part of a more holistic and sustainable vision of economic development.

3. New climate issues

New climate issues are at the heart of global concerns due to the growing impact of human activities on the planet's climate. These issues reflect the need to address urgent challenges related to climate change and environmental sustainability. Here are some of the key issues in this area:

a- Global warming:
Global warming is one of the most pressing issues. Human activities, such as the burning of fossil fuels and deforestation, contribute to increased greenhouse gas emissions, leading to higher global temperatures, extreme weather events and changes in ecosystems.
b- Sea level rise: Global warming causes glaciers and ice caps to melt, which contributes to sea level rise. This has major implications for coastal populations, infrastructure, and biodiversity of wetlands.
c- Extreme weather events: Climate change is intensifying extreme weather events such as storms, floods, droughts and wildfires. These events have serious consequences on communities, agriculture, and the economy.
d- Ecosystem Degradation: Terrestrial and marine ecosystems are undergoing rapid changes due to climate, affecting biodiversity, biogeochemical cycles and ecosystem services. Deforestation, loss of natural habitats, and overexploitation of resources accentuate these pressures.
e- Impacts on agriculture and food security: Climate variations have significant repercussions on agriculture, with changes in rainfall patterns, extreme temperatures and extreme weather events. This can lead to crop losses, migration of growing areas and threats to food security.

f- Water scarcity: Climate change affects the distribution of precipitation, leading to periods of increased drought in some regions and more frequent flooding in others. This intensifies problems of water scarcity, with implications for drinking water supplies, agriculture and industry.
g- Climate migration: Climate change can contribute to the migration of populations due to inhospitable environmental conditions, natural disasters and degradation of livelihoods. This raises complex challenges in terms of security, human rights and the management of migration flows.
h- Energy transition: The need to reduce greenhouse gas emissions is leading to a global energy transition, with a shift towards renewable energy sources and low-carbon technologies. This involves economic, technological and political challenges.
i- Climate Justice: The consequences of climate change are not distributed equitably, with the most vulnerable communities often being hit hardest. Climate justice calls for taking these disparities into account and involving all stakeholders in mitigation and adaptation efforts.

Faced with these challenges, governments, businesses, communities and organizations around the world are seeking to develop policies and initiatives to mitigate the impacts and build resilience to climate change. Global mobilization is crucial to confront these complex challenges and promote a sustainable future.

4. Eco-Design and zero-waste

Any product, good or service is concerned about innovation and hence is object to life cycle duration. The interconnected relations between Eco-Design, Life cycle engineering and product engineering, is the safeguard against unpredictable technologies' mutations. The Eco- Design effects include micro and macro design efforts include micro and macro design efforts, which are green buildings, sustainable transport plans, recycling plants for wastewater in the macro side; whereas the micro side of Eco-Design relates to product engineering through clean-innovation solutions in the conception, use and sustainability of any product. By doing so, there is an inestimable potential which is stemming from smart and clean technologies in optimizing resources' use, minimizing waste and conserving the products.

The heart of any Eco-Design idea is the assessment of costs and benefits which are related to it. In this regard, the costs are the real costs of implementing, processing and using the Eco- Design products and the benefits are calculated in terms of the saved resources and the safeguarded commons. All the actors agree that the Eco- Design permit to facilitate, evaluate and sustain the product's use. As a consequence, there must be a product's life cycle and End-of life's assessments in order to evaluate the environmental impacts.

Predicting the future technological mutations and their potential environmental impacts are at the care of any impact assessment of a newly Eco-Designed product as the evolution waves are becoming shorter with the events of automation and nanotechnologies. Short-time waves mean unprecedented challenges in facing the crisis of commons and also in shifting the growth model from business-as-usual model to a decupled growth model.

An essential issue has to be taken into account. The micro/nano technology will drive the Eco-design efforts over the next decades; but it is posing complex challenges in terms of employment, relocation and recycling the miniature nano-ports. In addition, the miniaturization should be accompanied by smart solutions before the advent of such products to the marketplaces.

LCA and EOL should be considered at the early stages of Eco-Design in order to minimize and eliminate the environmental impacts. Decoupling growth and resources' use is the main objective. Every part is recycled, reassembled and/or remanufactured without any losses. So zero waste along with infinite growth is inspired through the next growth waves.

The management plan of any Eco-friendly firm will continue to support eco-innovation by improving access to finance for Eco-innovative businesses. However, the world will not be able to tackle climate change solely, without the implication of governments, financial institutions, businesses and civil societies in order to overcome the global climate change pressures. The good path will be that firms and governments adhere to the Kyoto's protocol on greenhouse gas emissions.

Actually, the lack of consensus is prevailing among developed and developing countries; but businesses can cope with the Kyoto's protocol and others by adopting a bottom-up approach. If these efforts are made by firms, governments will be obliged to follow because of the complex inter-connectedness in our world.

Environmentally benign manufacturing is proposed. It consists in promoting economic growth along with minimal resources' use and waste. The EBM considers Eco-Design as a pre-step for Eco-friendly products in which the LCA and EOL are per-determined and evaluated precisely.

5. Circular alternative versus business-as-usual

The European resource efficiency platform suggests that the 20 20 20 targets necessitate the mobilization of the public and private actors to guarantee their full implantation. In this line, primary energy consumption has been gradually decreasing by 20% over 2000-2011 and is therefore expected to decrease over the next decade, mainly due the economic crisis and partly because of the effectiveness of the climate actions. The Eco-Design directive and the 7th EAP contribute to energy saving by introducing energy efficient products and new eco- friendly actions, respectively. However, Europe needs to double its efforts by encouraging synergies between institutions, policy-makers and businesses. The objective is to reduce GHG emissions by 2-4% annually, changing the energy-intensive lifestyles and promoting sustainable development. Energy industries, transport and manufacturing are responsible for more than 60% of CO2 emissions, and the high costs of energy will continue to be a structural problem for Europe if no drastic climate measures are taken.

Alternative solutions do exist. Among them, the circular economy which is representing a climate paradigm that concerns the combination of resources' use, Eco-Design and green solutions in the conception, management, manufacturing and delivering of products. The neuralgic point is the continuous innovation along the value chain of any product. Moreover, specific monitoring systems have to be installed with the purpose of quantify, assessing and ratifying the planned innovative Eco-Design.

In practice, a greater awareness that the circular economy model must prevail over the classical business as usual model by adopting innovative green design as a starting point. Likewise, a sustainable adaptation to climate change pressures by is possible by rethinking the recycling materials' proceeds and mitigating waste through the upgrading of the existing products. The final goal is to ensure longer life cycles and recyclable products after their EOL.

The public and private investments are vital in boosting the circular economy and even long-term solutions are needed to deal with the climatic challenges. This complexity can be attributed to the interdependent trade-offs among public and private actors from a financial point of view. Besides this, the European commission is working on a public-private partnership (PPP) to avoid the financing barriers, taxation concerns and public procurement procedures.

At this moment, the great aspirations are still pending and no significant advances are recorded. The circular economy brings stakeholders together with consumers and SMES by combining the promising eco-benefits with the win-win solutions. This passes throughout eco-design, production, distribution and consumption phases in which the circular model improves the living standards within

the limits of our globe. Otherwise, many initiatives are being launched by the EC. Among them, the single market for green products and the gathering of all the stakeholders under the ECO-Innovation Action plan and the Green Action plan for SMES , … etc.

Nothing should be thrown away land-filled or lost. The concretization of this goal passes through categorical determination to set up waste measurements and after that unifying the targets among member states in order to constrict the recycled materials and waste. The key point is about recycling the municipal waste in all the MS at high percentages and gradual a recycling targets over the next two decades. Henceforward, the promotion of a secondary raw materials' market once the recycled materials and waste has attained the same percentages across MS. However, a periodic solution consists in transporting the waste and materials to the leading countries in the recycling activities.

The main issue concerns the differences across the national-waste legislations that have to be homogenized to guarantee a better management of the waste by diminishing the costs of transportations and eliminating gradually land-filling and/or incineration. The second issue is about standardizing data-collection methods and reporting. By achieving a standardized waste data, efficiency in the shipments' treatment, better management of waste and exact benchmarking are ensured all over the MS.

After standardizing data-collection and hence ensuring the reliability of the reported records, there must be a targeted waste reduction in the different sectors. Actually, the waste-reduction targets are promising if we consider the resource-efficiency's opportunities in the building sector (70% by 2020), the marine litter (30% by 2020), the food waste and the plastic waste. However, serious challenges are facing MS in the monitoring of the food and plastic wastes, and the illegal shipments of raw-materials, plastic and phosphorus's treatment are still unsolved.

6. Industrial-Product-Services as a new business model

No limits to growth and eco-innovation technologies, that's the circular alterative as imagined and treated by the Accenture's research. The circular economy resembles more to the last passage rather than as an alternative to the classical growth model which is no more sustainable for future generations. We must not settle for some success in derisory sectors; but a paradigm shift must be established in our lifestyles, industries, ecosystems and development models over the next decade or it will be too late for our progeny's survival.

Instead of being satisfied with Nike's eco-innovative technology or other leading eco-friendly solution, the industrial sector has to adopt a fully-fledged circular alternative to overcome raw materials' scarcity and harming wastes. In reality, the added value and circular value recuperation stem from five main sources. At first, the circular alternatives consider that lasting resources have the potential to regenerate 40% of value if renewable and regenerative sources of energy are used throughout the growth process.

The multi-use of the products is also beneficial to the society by 10% in the case where there exists alternatives for the swapping and convertibility of the used products. Furthermore, long life cycles and up-gradable products have the potential to recover 30% of the value simply by extending the products' EOL. Additionally, a full- interconnectedness of the value chain at each level permits to recycle and reuse the all eco-efficient materials and products.

At the current pace, scientists expects an increased climate pressures and serious disasters by 2050. The business-as-usual model is facing the dilemma of higher raw-material prices and their unsustainable uses. In this regard, decoupling growth from fossil energy and metals is pressing and if

nothing is done, we need 4 planets to satisfy our needs by 2050. Alternatively, a 1% enhancement in energy-efficiency worth €23 billion and 200.000 jobs.
LCE is the focal point for each eco-innovative technology which can ensure "cradle -to- cradle" products and have the potential to contribute in the shift from long-distance development models to producer-customer ones. These micro-models are more feasible as all the necessary eco-facts and impacts are tangible at the local sphere; whereas products' extended life cycles necessitate interdependent business models at regional, national and international levels.

The key idea in the circular alternative business is the avoidance of virgin resources' use and every-product is reused, remanufactured, re-upgrade or recycled within the value chain. Constructing such a circular alternative passes through the elaboration of 5 business models. Firstly, decoupling efforts start with renewable, green and/or recyclable resources such as solar energy, bio-fuels, greenhouse gasses' catchment etc. Cradle to cradle solutions are initiated to eliminate waste and ensure the recycling and/or the up-cycling of any product.

After dealing with circular supplies and resources' recovery, B2B's segment is sought to innovate in eco- designed products with sound LCE, LCA, EoL's estimates. The miniaturization and nano technologies are coming into play as the alternative solution to replace and remanufacture all the products' parts. In this regard, automation is requested to provide eco-miniature parts or recyclable-micro parts that can be reintegrated into the manufacturing-chain.

Life cycles' extension is also dependent upon taking advantage from the digital techs. The collaboration between over and under-capacities is not (not yet) an "acquis". Firms are still privileging their own interests by outsourcing their assembly parts' production to other basic-manufacturers. No cooperative collaboration is envisaged in a near future. However, the absence of co-eco-tuning agreements can be substituted by a paradigm shift from the product as a finality to the notion of an eco-service. The functionality of the later notion is dependent upon inter-connected value, manufacture, recycling and return chains of each segmented business. Colossal investments in human capital, technologies and intra-firm platforms are essential to realize these eco-services' processes.

At the micro-level, the circular firms are opting for the digital technologies to shape the eco-friendly products' objectives; while others are working on the engineering solutions to cope with their eco-challenges. The hybrid techs are bestowed important roles in solving and facilitating the impediments which are facing the implementation of many circular alternatives. For example, the technological advances in digitals mean up-to- date-information availability and sharing, traceability and tractability. The real-time information combined with the eco-recycling plants weed-out wastes and controls for sustainable eco-designed products.

The macro-level initiatives are solicited from government, policymakers and taxation organs. These decisional players have the legal power to incentivize the circular alternatives at national and regional levels by enacting laws, directives and policies to boost, protect and enable the paradigm shift towards zero-waste business models. In the long term, international cooperation is essential to our survival.

Providing services is dominating in the recorded GDP's of the developed countries and there is a prevailing automation in which machines are taking over. Consequently, the Industrial Product Systems IPS are being conceptualized to include other actors with redefined roles. The industrial product service systems consist in a new era in doing business by introducing a steady-state connection between the product and its provided service. These IPS connect the service provider with different customers' suggestions and preferences. For this reason, the pre-commercialization of a product has to be reviewed under business-to-business applications. In this line, the distinction is made between the original equipment manufacturers OEMs and the services' suppliers; whereas the customers and the society stands on the other side on the value chain.

All the stakeholders will benefit from the IPS if conception, eco-design, manufacturing, adaptability, sustainability, eco-efficiency and durability are treated simultaneously. The paradigm shifting idea consists in providing long-term services' usability instead of marketing a given product for a certain time span.

Extended products' longevity and functionality will impulse the original services and hence enhance competitiveness among the OEMs to better products' re-upgrading and re-manufacturing without waste. The beneficial externalities stem from the eco-innovation and continues upgrading of the products. By following this path, OEMs will become service-providers and their profits will increase after passing the first-mover's obstacles. On the economic side, jobs will be protected and new ones will be at disposal along with the eco- innovative waves in each product.

The few businesses that have adopted the IPS are combining high technology products with high after-sale services. These services encompass monitoring, spare parts, service-contracts "services-insurances" and uninterrupted maintenance. However, OEMs have not yet solved the sustainability issue of their products and no outsourcing of services has been given to other IPS.

Future IPS are going to be more customer-specific services and adapted to fit a variety of customer-requests. This adapted IPS make the IPS providers responsible for the conception and marketing of the provided service. As a result, new binding contracts have to be established in order to manage both the financial and technical risks, the sustainability and the time-availability issues.

Serious challenges are facing the IPS, especially the uncertainties which are linked to supply and demand sides. OEMs and customers may also suffer from result-oriented businesses. As a consequence, customers and OEMs have to share the eventual risks. These risks (losses) are considered as costs for the OEMs and need to be predicted, forecasted, then minimized and hence classified in a specialized-legally case. To do so, empirical and managing methods are the most accurate to avoid the operating and service-providing costs gradually.

Before the arrival of an IPS to the marketplace, the design phase is primordial in reducing maintainability and usability problems by bridging the conception phase with the service-providing phase. Once the later inter- connection is implemented, the operating risks (costs) are monitored and simultaneously treated within a legal business contract.

Sharing information regarding the products' adaptability, usability and functional sustainability is still not coherent among OEMs, IPS suppliers and customers. Product-Service-Systems require feedbacks from customers at pre-determined periods of utilization and a real-time exchange about the eventual technical impediments. This requirement is still pending since no post-sale management platforms are established by the PSS suppliers.

Once the feedbacks are shared, they are classified and used as historical datasets. After these data-collection's procedures, empirics and algorithms are implemented to assess and predict the products' reliability and their technical life cycles are better monitored and extended to a maximum of efficiency and performance. However, information exchange and all the services behind it are operating independently of the production phase. Anticipation is the watchword for inter-dependent Product-Services-Information management plan in each business entity.

Implementing IPS brings competitive and technological advantages. By adopting an IPS, customers are situated in a high competitive positioning along with quality, time-precision and better IPS's technicality. The resources' use are minimized to the lowest levels and the products are enjoying long life cycles.

A well designed IPS is about selling adaptability and re-upgradability over the technological waves and thus opening new business opportunities and new market places. At term, an integrated IPS will enable customers to have their specific service-oriented system. Furthermore, a unified management of conception, manufacturing, information-sharing and real-time services, is the key for a circular business model in which life cycles are extremely long and profitable to customers, IPS providers and OEMs.

The technical, managerial and legal boundaries are encountering the take-off of many IPS. The production phase has to consider the managerial aspects, such as the customers' perceptions, the future technological innovations, the services' adaptability and their embracement by the society. In reality, value and management chains are not yet inter-connected and data sharing is the workhorse as it must be in a co-operative IPS business models. Future is still unclear because of the divergent regulatory frameworks in each country; while the world is suffering from conflicting interests among nations, firms, business models…etc. Exchanging and sharing service-oriented experiences are not sufficient and full co-operation in risk management plans is pressing.

7- Conclusion

Developed countries' citizens are living in a world where there is an increased urbanization, higher living standards along with climate change pressures. Floods and droughts are forecasted to be more frequent and intense due to the global warming. Our urban environment is suffering from intensive floods, extreme heat- waves and droughts which are disturbing the water cycle. Those adverse effects are however accompanied by losses in biodiversity and ecosystem services.

The interconnectedness of energy and water has not to be verified. The extraction of fossil fuels is becoming more costly and takes a lot of water. In addition, electricity generation requires even more water. Consequently, EU's Vision of the 2050 roadmap considers that water, food and energy should be treated all together as a unified entity which comprises trade-offs and nexuses. However, the industrial developments in China, Brazil and India are expected to increase their demand for energy by 60% and the global energy demand will increase by 30% in 2040 compared to 2010; while the OECD countries' energy demand is expected to be flat.

There must paradigm shifting in lifestyles through the combination of water and green solutions in the conception, construction and management of the urban environments. The Blue and green solutions complete each other to improve the living standards within the limits of our globe. The worldwide energy outlook argues that long-term solutions are needed to overcome global climate change pressures.

Green infrastructures can generate multiple benefits, such as healthy ecosystems, clean air and water, social benefits through ecological corridors and biodiversity protection. It seems that GIs promote "win-win" or at least "small loss-big gain" solutions. These projects are part of the EU's 2020 strategy and are implemented to induce sustainable urban development, integrated transport and energy solutions, efficient water management pants and green growth.

A wide range of solutions can be envisaged to fill the gaps. The concretization of these solutions passes through green infrastructures which provide a better adaptation to the climate change pressures and challenges. Encouraging synergies and trade-offs among policies, practices and eco-services is the vital solution to bring substantial co-benefits and "win-win" positions for eco-planners of the cities, eco-designers of the products, managers and developers of innovative solutions, start-ups and young entrepreneurs, professionals, governments and people

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