

OCEAN ENERGY AND MARINE BIODIVERSITY AFFECTATIONS: A LIFE CYCLE ASSESSMENT REVIEW

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INTRODUCTION

In Mexico, the electricity generation is dominated by fossil fuels (Santoyo-Castelazo et al., 2011). Since 2014, clean energies have been promoted by law, paying special attention to renewable energies. In this sense, Mexico has set as a goal a minimum share of clean energy in the generation of electric power of 25% by 2018, 30% by 2021 and 35% by 2024. Regarding this, the oceans of the earth represent a vast source of renewable energy with a high potential; even when nowadays represent the smallest contribution of all types of renewable energy worldwide. Sustainable Development Goal (SDG) number 7, is focused on “Ensure access to affordable, reliable, sustainable and modern energy for all”, Because of that, a key element for the success of clean energy technologies are the studies associated with possible environmental impacts. Environmental impacts of new energy sources require to be quantified in order to know how many benefits and constraints these new technologies have for the environment. Life Cycle Assessment (LCA) is a well-known methodology that allows the systematic evaluation of environmental impacts of a process or product throughout the complete lifecycle and includes different impact categories such as climate change, human toxicity and others. Around 12 studies have been published about LCA of different ocean energy technologies. So far, these LCA studies are limited, the majority of the analyses have been developed mainly for wave and tidal energy converters, with a focus on field devices. LCA was originally developed to assess the impacts of land-based activities on mainly terrestrial and freshwater ecosystems. As such, impact indicators for major drivers of marine biodiversity loss are currently lacking. Nevertheless, the affectations into marine biodiversity has not been studied profoundly until recently in the light of SDG 14 focused on the conservation and sustainable use of the oceans (UN, 2015). Some studies (Costello et al., 2010; MEA, 2005) have associated the decline of marine biodiversity with human activities. But also, according to recent studies (Woods & Verones, 2019) LCA is a tool able to accomplish a balance between the use of the marine environment and its conservation. This takes special importance in megadiverse countries like Mexico, surrounded by four seas: Pacific, Gulf of California, Gulf of Mexico and Caribbean. The aim of this paper is to provide an outline of the current state of research in the field of ocean energy and marine biodiversity affectations under the LCA perspective, highlighting areas where research gaps exists and where future research efforts should be directed to. The methodology followed consisted on the review of the state-of-the art of evaluation of marine biodiversity affectation under LCA.

AVAILABLE BACKGROUND INFORMATION & DATA

After a conscious search among indexed journals employing keywords, around 18 papers were selected and divided in two groups: land biodiversity and marine biodiversity evaluation. After this filter, six were for impacts on terrestrial biodiversity (Gabel et al., 2016; Iordan et al., 2018; Knudsen et al., 2017; Lindqvist et al., 2016; Motoshita et al., 2014; Verones et al., 2015, 2017) and 11 for sea or marine impacts, also one was intended to evaluate both types (Verones et al., 2015). The majority of the papers were developed for Europe, and the rest for Asia and Oceania and only one for America. Regarding the papers focused on marine biodiversity eight were dedicated to some type of human activity, from the extraction of marine resources, construction activities and also electricity generation (Dorber et al., 2018, 2019; Farmery et al., 2017; Gracey & Verones, 2016; Hooper et al., 2017; Langlois et al., 2014; Raoux et al., 2017; Woods & Verones, 2019); the rest were focused on specific impacts such as noise and marine biodiversity loss (Middel & Verones, 2017; Woods et al., 2016).

BRIEF STATE OF THE ART

Overall, impacts on biodiversity and the search for mitigation actions has taken more importance, because of the alarming perspectives on biodiversity loss. A quantitative understanding of the impact of industrial activities on the marine environment is thus essential and LCA is able to predict the affectations quantitatively. However, as Woods (2016) pointed, currently there is a lack of impact indicators related with the biodiversity loss. Up to date, there is also an absence of characterisation factors that might allow the damage quantification due to human disturbance to the marine environment. The development of regional characterisation of specific activities it is necessary to achieve the in the first place, the conservation of the marine biodiversity. Also, the achievement of the SDG 7, 14 and also 12, related to Sustainable Production and Consumption can be fulfilled.

SUMMARY

LCA is a tool able to not only evaluate but also predict environmental affectations and its consequences, This, in the context of renewable energies is a key feature that can allow to predict and avoid biodiversity loss and promote the conservation of the marine environment, in a region like Mexico which is megadiverse. Research challenges of particular importance include a robust knowledge of the species dynamic and the spatial regions. Furthermore, a profound information of the types of technologies that are prone to be installed in the selected areas is also necessary.

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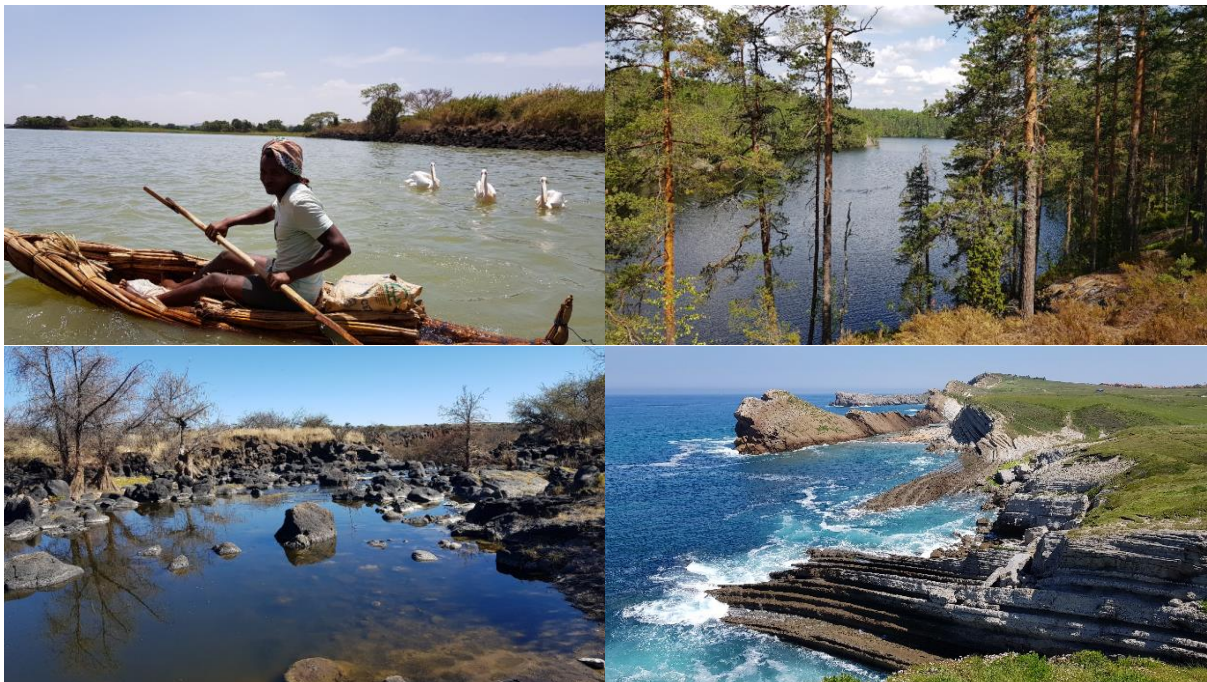
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EXCEED - SWINDON Conference 2019

THE FUTURE OF WATER RESOURCES

October 13th - 16th, Mérida, Mexico



Programme and Book of Abstracts

PROGRAMME

Sunday, 13 th		Arrival	
19:00	-	21:00	Welcome cocktail

Monday, 14 th		Conference Day 1	
08:30	-	09:00	Registration
09:00	-	09:30	Opening Ceremony <ul style="list-style-type: none"> • Norbert Dichtl • Andreas Haarstrick • Rodolfo Silva • Local authority
09:30	-	10:00	Keynote speech <ul style="list-style-type: none"> • Norbert Dichtl
10:00	-	10:10	Break
Session 1: The impact/performance/role of SDGs Chairman: Valeria Chávez			
10:10	-	10:30	Exploring some ocean energy possibilities in Latin America (Jassiel Hernández)
10:30	-	10:50	Water energy nexus in the MENA region (Abbas Al-Omari)
10:50	-	11:10	Ocean energy and marine biodiversity affectations: a life cycle assessment review (Dora Ruiz-Méndez)
11:10	-	11:40	Coffee Break
Session 2: Water-Energy-Nexus (I) Chairman: Dwi Andreas Santosa			
11:40	-	12:00	Wastewater/waste to energy in MENA region: A review for opportunities (Zeinab Abou Elnaga)
12:00	-	12:20	Water-energy nexus in a wastewater treatment plant: Energy efficiency and recovery (Wang Hongtao)
12:20	-	12:40	From wastewater treatment plants to a resources recovery facility (Marcelo Nolasco)
12:40	-	13:00	Seasonal assessment of the energetic potential associated with salinity gradient: Champoton River, Mexico (Gregorio Posada Vanegas)
13:00	-	14:30	Lunch
Session 3: Water, ecosystem and socio-economic integrating aspects (I) Chairman: Germán Rivillas			
14:30	-	14:50	Decolourization and mineralization of acid green 25 dye through single and catalytic ozonation (Liliana Amaral Féris)

14:50	-	15:10	Adsorption of naphtholate-as dye in wastewater of batik industry using green synthesized zn layered hydroxyl salts (Sri Juari Santosa)
15:10	-	15:30	Adsorption of hexavalent chromium in coal beneficiation tailing in fixed bed column (Liliana Amaral Féris)
15:30	-	15:50	Kinetics of the adsorption of anionic and cationic dyes in aqueous solution by low-cost activated carbons prepared from sea cake and cotton cake (Ibrahim Tchakala)
15:50	-	16:10	Distribution of microplastics in water and sediment in a Biosphere Reserve (Cecilia Enriquez)
16:10	-	16:30	Evaluation of microplastics contamination in the margins of the Patos Lagoon in south of Brazil (Eduardo Saldanha Vogelmann)
16:30	-	17:00	Coffee Break
Session 4: Water, ecosystem and socio-economic integrating aspects (II) Chairman: Rodolfo Silva			
17:00	-	17:20	Hydrodynamic modelling of the Huave Lagoon System, Oaxaca (María Fernanda González Amador)
17:20	-	17:40	Impact effects of hard infrastructure in Salamanca Natural Park (Juan Carlos Caez-Perez)
17:40	-	18:00	The decision-making in face to coastal squeeze, analysis between social and economic impacts: Case study of Campeche, Mexico (Debora L. Ramírez-Vargas)
18:00	-	18:30	Keynote speech • Elvis Carissimi
20:00			Dinner

Tuesday, 15th		Conference Day 2	
Session 5: Water, ecosystem and socio-economic integrating aspects (III) Chairman: Arwa Naser Damen Hamaideh			
09:00	-	09:20	Dispersion of submarine groundwater discharges in reef lagoons and associated environmental effects (Arlett Rosado Torres)
09:20	-	09:40	Salt intrusions into a freshwater spring in a tropical coastal lagoon, Yucatán, Mexico (Xaní Malagón)
09:40	-	10:00	Variability of the saline gradient in a hypersaline coastal lagoon (Brenda Natalia Fitch Geymonat)
10:00	-	10:20	Sedimentation and water quality status of lake Tana, the headwaters of the Blue Nile, Ethiopia (Seifu A Tilahun)
10:20	-	10:40	An innovative approach to mitigate risks on the existing iron tailings dams in Brazil (Jose Araruna)

10:40	-	11:00	Urban sustainable water management and water efficiency improvement for buildings – a case study for Istanbul (Ahmet Baban)
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11:00	-	11:30	Coffee Break
Session 6: Water-Energy-Nexus (II) Chairman: Eduardo Saldanha Vogelmann			
11:30	-	11:50	Reverse electro dialysis for energy and water: coupled systems based in salinity gradients (Mateo Roldan-Carvajal)
11:50	-	12:10	Development of graphene oxide membranes for its use in reverse electro dialysis systems (Eddie López Honorato)
12:10	-	12:30	Development of graphene oxide based materials for water treatment (Ana Cecilia Reynosa Martinez)
12:30	-	12:50	Laboratory experiences on marine energy conversion devices for supplying electricity demand of remote coastal communities (Jassiel Hernández)
12:50	-	13:10	Plate type obstacles used for coastal protection and power generation (Luis Eduardo Pérez Paez)
13:10	-	14:40	Lunch
Session 7: Water, ecosystem and socio-economic integrating aspects (IV) Chairman: Thi Thanh Van Ngo			
14:40	-	15:00	Evaluating combinatorial water treatment by locally available materials (Chrispin Kowenje)
15:00	-	15:20	Desalination by capacitive deionization as a tool to provide drinkable water to small communities in the Brazilian semiarid (Luis Augusto Martins Ruotolo)
15:20	-	15:40	Fluoride ions removal from groundwater by alumina adsorption (Elvis Carissimi)
15:40	-	16:00	Bio-refineries: A new concept towards green energy production from agroindustrial wastewater (Víctor Alcaraz)
16:00	-	16:20	The importance of water and nutrients management in paddy fields as an effort to increase crop yields and producing an electrical energy through microbial fuel cells (Dwi Andreas Santosa)
16:20	-	16:50	Coffee Break
16:50	-	17:20	Keynote speech • Klaus Fricke
16:50	-	18:00	Panel discussion Moderators: Edmilson Santos de Lima and Norbert Dichtl
20:00			Gala dinner