

II APEB-NL INTERNATIONAL CONFERENCE

THE DAY AFTER TOMORROW: RE-INVENTING FUTURES

DELFT, 2019

PROCEEDINGS

II APEB-NL INTERNATIONAL CONFERENCE

The day after tomorrow: Re-inventing futures

All papers of this book were reviewed by two independent reviewers. No English-language editing and proofreading were done either by the publisher or by the editors, so the quality of language of papers is under the authors' responsibility.

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Delft, 2019
The Netherlands

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INTRODUCTION

The II APEB-NL International Conference took place in Delft, The Netherlands, on April 13, 2019. The general focus of the conference was *The day after tomorrow: re-inventing futures*. The conference was organized by the APEB-NL, which is a member of the Rede APEBE. The conference was held at the Pulse Building at Delft University of Technology (TU Delft), where participants from different institutions took the opportunity to inspire each other, as well as exchange new ideas and experiences. The success of the conference was due in part to our sponsors and to those institutions giving institutional support, for which we would like to express our thanks.

The conference was inspiring and fruitful: the members of the scientific, program and organizing committees, the referees, session chairs, local organizers, keynote speakers and in fact, all the participants who presented their ideas and results. The accepted abstracts were presented as poster or during short oral presentations. Prizes were given to the best presentations in each category.

We hope that these publications will provide you, the reader, the opportunity to get acquainted in greater detail with the ideas and results of the conference participants and, perhaps, to recall some of the friendly and inspiring atmosphere of the conference.

APEB-NL

PROGRAMME

08h45 – 09h30

Welcome coffee and onsite registration
Pick up conference pack

09h30 – 09h40

Opening Ceremonies
APEB-NL
Latitud

09h45 – 10h30

Dr. Fábio Castro
CEDLA (Amsterdam)
Responsible Research and Innovation in Latin America

10h30 – 10h45

Coffee break, networking and poster section I

10h45 – 11h30

Larissa Terumi Arashiro

Universidad Politecnica de Catalunya and Ghent University

Microalgae for wastewater treatment and resources recovery towards a circular economy

11h35 – 12h20

Dr. Özlem Terzi

Vrij Universiteit Amsterdam

A Split Europe? Serving the Self-Interest or Setting the Global Values

12h20 – 13h20

Lunch

13h20 – 14h05

SCIENCE & TECHNOLOGY

Dr. Anderson Abel de Souza Machado

Leibniz-Institute for Freshwater Ecology and Inland Fisheries

Unravelling how microplastics are polluting our soils

14h10 – 14h55

Alice Wignjosaputro

EURAXESS

Boost your research career with EU funding and tools

14h55 – 15h30

Coffee break, networking and poster section II

15h30 – 16h30

Oral presentations

16h30 – 17h00

Award best oral and poster presentations

Meeting members APEB-NL

17h00 – 18h30

Closing cocktail

KEYNOTES

Responsible Research and Innovation

Dr. Fabio de castro

(CEDLA)

Responsible Research and Innovation (RRI) is a concept developed by the European Union's Framework Programs which takes into account effects and potential impacts on the environment and society. Based on four main dimensions - anticipation, inclusion, reflection and responsiveness - RRI strives for a more robust framework in which ethics, sustainability and societal desirability are central in research and innovation. Despite this improved strategy for research and innovation in the European context, social, political and economic differences across regions reveal limitations for its application in the Latin American context. Moreover, efforts to make the RRI perspective as a global standard for research and innovation fail to take into account the politicized spaces of research and innovation in the 'Global North', and overlook relevant aspects driving RRI-like initiatives in the Global South. In this talk I will discuss the potential and limitation of the RRI perspective to the Latin American context. I will present the current conceptual debate on RRI, and will discuss how it is related to 'RRI-like' initiatives in Latin America.

Microalgae for wastewater treatment and resources recovery towards a circular economy

Larissa Terumi Arashiro

(Universidad Politecnica de Catalunya and Ghent University)

During the past decades, the water crisis has raised global concern. However, the treatment on a global scale is still expensive and energy intensive, whereas energy and components contained in polluted water, such as organic chemicals, nitrogen, phosphorus, mineral salts and metals can be of significant benefit if they are properly harvested. Effective recovery of resources not only minimizes environmental impacts, but also represents an economic benefit and can contribute to minimizing negative impacts and scarcity of natural resources.

In this context, the use of microalgae has been proven to be an effective alternative to combine wastewater treatment and resources recovery. The great advantage of microalgae technologies is that, in addition to treating wastewater, the biomass grown can be reused to recover energy and high-value compounds, generating alternatives for a circular economy. However, technological processes and systems should be improved to efficiently transform wastewater into valuable products. This research project aims to optimize algae-based wastewater treatment systems and identify configurations that would allow sustainable resources recovery options, based on the following objectives:

- 1) Optimize configurations of high rate algal ponds (HRAPs) systems for urban wastewater treatment and explore the energy recovery from the biomass through biogas production.
- 2) Investigate the use of photobioreactors (PBRs) for tertiary treatment and explore the recovery of high-value phycochemicals (e.g. pigments) through various extraction techniques.
- 3) Biogas and high-value compounds recovery technologies will be assessed and compared from a technical, environmental and economic point of view. In particular, a life cycle assessment (LCA) and a life cycle costing (LCC) will be carried out to evaluate the feasibility and sustainability of these alternatives and their combinations.

A split Europe? Serving the self-interest or setting the global values

Dr. Özlem Terzi

(Vrij Universiteit Amsterdam)

Living in one of the most respected member states of the EU as a non-European EU expert is an eye-opening experience. For the 'outsiders', the EU is one of the global forces that shapes the global norms through its influential participation in many international organizations ranging from the G20 to the World Trade Organization (WTO). It is one of the rule setters for international trade, but it is also a civilian power, an influential actor ready to pursue its interest through non-military means and with a perspective that can go beyond the immediate short-term. In its own neighbourhood, it is an actor that speaks for human rights with the loudest voice. In itself, it is a successful peace project that eliminated war among its members for more than six decades now. These same members are the ones that were the parties to the two world wars in the past century. This success is for the current generation of Europeans so natural that they take peace in Europe for granted in a very natural and entitled manner.

This does not mean that the European nation states have integrated with each other in such a way to forgo their national identities and interests. Quite the contrary, they have learned to pursue their interests in such a way that the smaller member states, like the Netherlands, is respected by much bigger members on its issues of vital national interests. As the case of Ireland shows in Brexit negotiations, their interests are better protected by their 'togetherness' towards (even potential) outsiders. This paper will thus focus on both the European states' relations with each other, but also reflect on how they together shape their relations with 'outsiders'.

Unravelling how microplastics are polluting our soils

Dr. Anderson Abel de Souza Machado

(Leibniz-Institute for Freshwater Ecology and Inland Fisheries)

Microplastics (plastics <5mm, including nanoplastics which are <0.1µm) are found globally due to fragmentation of large litter or direct environmental emission. Thus, there is a growing concern on the deleterious effects that such anthropogenic particles may elicit. The bulk of research available focused on impacts on marine or freshwaters, where effects such as pseudo-satiation, biota entanglement, tissue damage, and changes in microbial communities were reported.

However, most of plastics arriving in the oceans were produced, used, and disposed on land. It is within terrestrial systems and soils that microplastics first interact with biota eliciting ecologically relevant impacts. In this presentation, I will report several recent findings from experiments investigating the impacts of micro- and nanoplastics on terrestrial organisms, including (I) a common garden soil experiment with a sand loamy soil exposed to 5 levels of 4 different microplastics, (II) a greenhouse exposure with spring onions (*Allium fistulosum*) exposed to 6 different microplastics, and (III) a climate chamber exposure of lettuce (*Lactuca sativa*) to 6 types of nanoplastics. Such combination allowed empirical evidence for new insights into the potential impacts of microplastics on unique terrestrial system properties, such as the soil biophysical environment, on terrestrial plant traits and chemistry, and terrestrial ecotoxicology.

In the common garden experiment, microplastics affected the soil bulk density, water holding capacity, and the functional relationship between the microbial activity and water stable aggregates. The effects can be underestimated if idiosyncrasies of particle type and concentrations are neglected, suggesting that purely qualitative environmental microplastic data are of limited value for the assessment of effects in the soil.

In the greenhouse, significant changes were observed on the growth of spring onions, as well as its composition, above/below biomass, root traits, and soil microbial activities and AMF colonization. The fibers increased below-ground biomass (root and onion bulb), while beads increased 3-fold aboveground biomass and significantly decreased above

ground/ root ratios. Microplastic impacts were dependent on particle type, i.e. microplastic with a structure similar to other natural soil particles eliciting smaller changes. Effects of the tested polyester fibers and polyamide beads on plant traits and their function were the most pronounced. This represents the first assessment of such a diverse array of plant responses to microplastic exposure. Nevertheless, the findings reported here may imply that the pervasive microplastic contamination entails relevant ecophysiological consequences for agroecosystems and the possibly terrestrial biodiversity.

All the nanoplastic types significantly affected plant physiology (i.e. growth and biochemistry), with the magnitude depending on particle properties and exposure concentration. The NH₂ termination with 50 nm triggered the most negative effects. Confocal microscopy confirmed that nanoplastics strongly interacted with the root surfaces. Such whole-plant effects and their association with root fluorescence in the range of nanoplastic dyes suggest that the idea of nanoplastics internalization by plants associated with toxicity is likely to occur.

Microplastics are amongst the most long-lasting contaminants that anthropogenic activities have released in the surface of the planet. Our unprecedented results highlight the potential of microplastics to alter fundamental biophysical properties of the soil environment. These effects seem to be associated with responses on plant traits. The smallest particles tested could also cause significant plant toxicity. If extended to other models and plastic types, the processes unraveled here suggest that microplastics are relevant long-term anthropogenic stressors and drivers of global change in terrestrial ecosystems.

Boost your research career with EU fundings and tools

Alice Wignjosaputro

(EURAXESS)

EURAXESS - Researchers in Motion is a unique pan-European initiative backed by the European Union, member states and associated countries. It supports individual researcher mobility and career development, and contributes to better working conditions for researchers, while enhancing scientific collaboration between Europe and the world.

The EURAXESS portal offers researchers and organisations a world of information at their fingertips: a job and funding database with thousands of vacancies, fellowships and hosting opportunities in all research fields in Europe and other regions of the world as well as a comprehensive collection of practical information on living and working as a researcher in 40 European countries.

In those 40 countries, professionals in over 500 EURAXESS centres are ready to help researchers with free information and practical assistance on mobility-related issues, such as entry conditions/visas, recognition of qualifications, and accommodation. They also provide networking opportunities for researchers and career development support. EURAXESS Worldwide is the international arm of the EURAXESS initiative presenting researchers the chance to interact on a global scale. As a networking and information tool it supports researchers working outside of Europe wishing to connect or stay connected with Europe. Through networking, researchers can strengthen European research and scientific cooperation with the world.

Currently, EURAXESS Worldwide has dedicated teams in ASEAN (focus on Singapore, Thailand, Indonesia, Malaysia, and Vietnam), Latin America and the Caribbean (LAC, focus on Brazil, Argentina, Chile, Mexico, and Colombia), China, India, Japan, Korea, and North America (US and Canada), as well as a website for Australia and New Zealand.

ABSTRACTS

Future energy crops in brazil: an analysis of the impact of climate change on rainfall and agriculture

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Climate change is a topic of extreme importance, and it has been leading to several studies in which consider the possible changes that may happen in the future society and how to overcome those changes. In 2015, 195 countries signed the Paris agreement in which they committed to helping in the reduction of the global temperature. To be able to reach these reduction changes are needed, such as in consumption patterns, deforestation, change in the energy mix. Concerning the energy mix, it changes considerably per country. Brazil is a compelling case, once that more than 40% of it comes from renewables (especially hydro e biomass). However, due to changes in the population patterns in the country, the increase of renewables will be necessary for Brazil, therefore strategies need to be considered. Studies point out that bioenergy is one of the best choices for the country due to its accessibility in the future. Brazilian National reports indicate an increase in the grown of crops by 30% until 2025. However, those account only the land availability and not the possible changes in the climate that may occur in the future. Therefore, the literature shows studies that examine possible changes in the temperature and how it would affect the crops production in Brazil. On the other hand, additional factors are essential for the growth of crops, such as precipitation (used significantly in Brazil once that the crops are mainly rainfed). So, this study aims to estimate the availability of crops in 2050 that can be used as an energy source in Brazil, regarding possible changes in the rainfall patterns due to climate change. For that, it is used the soil water balance method, by means of an excel model that analyzes the availability of water in the soil (ARM) considering for four types of crops (rice, sugarcane, maize, and soybeans), in the five brazilian macro-regions (North, Northeast, Mideast, Southeast and South) and three types of soil (sandy, medium and clay texture). Firstly, two observational analysis (using data from 1997 until 2017) verify the correlation between the ARM and the yields of the four types of crops to check which kind of crop, soil, and region show the most significant correlation. Those analyses point out that the crop that is more affected by the availability of water in the soil (which considers rainfall and temperature patterns) is the soybeans, especially in the South macro-region of Brazil. There is no statistical significance among

types of soil, the other macro-regions or between the other crops (rice, maize, and sugarcane). Also, a future scenario analysis (using the IPCC RCP scenarios 4.5 – moderate and 8.5 – high GHG emissions) extrapolates values for ARM, and by making use of the trends of the observational analyses make projections of soybeans yields by 2050. It verifies that the South region of Brazil will be the most affected by the decrease of availability of water in the soil and it will mainly disturb the growth of the soybeans (leading to a reduction of more than 10 Mt of the production of the southern states of Brazil). In conclusion, there is potential for the use of crops as bioenergy in the future in Brazil when considering the amount of precipitation in the future if considering sugarcane, maize, and rice. On the other hand, soybeans (in the South macro-region of Brazil) may suffer the impacts of climate change. Also, due to possible changes in the precipitation, it might lead to geographical changes in the production of crops, as well as investments in adaptive strategies, such as irrigation.

Language situation and linguistic description of the Nambikwara indigenous languages

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Currently about 180 indigenous languages still exist in Brazil, most of which are spoken in the Amazonian lowland (Seki, 2000). In this talk we will focus on the Nambikwara Indians of north-west Brazil. There are about 15 Nambikwara groups that are divided in two branches, Northern Nambikwara, Southern Nambikwara. Each group has a different language, which functions as an important marker of the ethnic identity of their speakers, despite the fact that the different languages are closely related. The first contacts of the Nambikwara with the 'white society' occurred in the early twentieth century. Since then, their traditional territory has suffered a growing process of invasion and exploitation, resulting in the extinction of a number of groups and their languages and the displacement of other groups to areas populated by other, often rival peoples. The Nambikwára languages in general belong to the polysynthetic type and are known for their phonological and grammatical complexity, especially regarding their elaborate morphology and the intricate phonology and prosody/morphology interaction (Telles, 2002; Eberhard, 2009). Within this language family, most of the languages that belong to the Northern Branch are classified as mixed prosodic system (Kingston 1976; Eberhard, 2009, Telles, 2013, Braga, 2017), while the prosodic system of Southern branch is not yet well discussed in the literature. Among the Northern Nambikwara languages, only the Mamaindê speakers have learned to read and write their language. For the other languages, teaching material still needs to be developed. A fully fledged description of the phonology, morphology, and syntax of the Mamaindê language has become available in a recent doctorate thesis by David Eberhard (2009). Latundê and Lakondê have been studied since the early 2000s, resulting in an elaborate grammatical description of Lakondê and an account of the phonology of Latundê in Telles' doctorate dissertation (2002), as well as a study of the segmental phonology of Lakondê by Braga (2012). The detailed study of Negarotê was started in 2013, a full phonological description, which

became available in 2017 (Braga, 2017). Studies on the Phonology of two Southern Nambikwara languages, Kithaulhu and Sararé, are being developed by Ph.D. candidates in a partnership between UFPE (Brazil) and VU Amsterdam (Netherlands), and must be available on 2020. In this talk, we discuss the condition of the Nambikwara languages, the extent to which they have been able to resist the influence of Portuguese and how the linguists working on these languages have contributed to their preservation.

Hospital mortality rate as a measure of quality of care: main limitations reported in the literature

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Hospital mortality rate is an indicator that has been widely used in many countries to assess the quality of care. Differences in gross hospital mortality rates may be due to case differences, since hospitals serving the sicker population show higher mortality rates. However, there is a clear need in the literature to improve the investigation of the causes of variation in the hospital mortality rate and its relationship with quality of care. This study aims to identify the main limitations of the use of hospital mortality rate as a quality measure, reported in the literature. This is a review study from published and indexed articles. We selected studies on hospital mortality rate that could report limitations of its use as a quality of care measure. We sought to obtain information representative of these main limitations that relate mortality rates to quality of care. The present work is based on a series of publications on the subject between the years 2013 and 2017. The research was carried out in the PubMed database and we used the term Mesh with the following keywords: ("Hospital Mortality" [Mesh]) and "Readmission Patient" [Mesh]) and "Quality Indicators, Health Care" [Mesh]. We applied the following inclusion criteria: access to the full text, study with humans, publication in the last 5 years. We found 36 studies that met the requirements. All abstracts were read and 23 articles were chosen because they were more important for the purpose of the present study. Elected publications were read in full, most of them feature characteristics of cohort studies and used administrative databases as a source of information. We show that the main limitations reported in the current literature regarding the use of the hospital mortality rate as a quality of care measure, are related to: **1.**Lack of risk adjustment in the entry and re-entry rates; **2.**Use of the re-entry rate as a quality measure without considering the combination of cases; **3.**Underestimation of the associations between the competitive risk of death within 30 days after discharge, specific patients and readmissions; **4.**Difficulty of risk adjustment due to unavailability of information about pharmacological therapy in the hospital; **5.**Poor quality administrative database. In this study, we also observed that the use of the hospital mortality rate should not be considered a safe measure of quality of care when focused only on hospitalization events.

Sustainability strategies for the glass research

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Glass provides beauty and transparency for buildings. Furthermore, the recyclability and reduction of energy consumption are strong features of glass in relation to other building materials, for example, concrete. Although glass is not as strong as other materials, advancements in science and technology have supported its architectural importance. It is these advancements that have helped to overcome the major drawback of glass, strength. Despite the advancements in the strength of glass, few improvements have been made in the composition of the architectural glass. Many technological advancements were already developed, mainly during the end of the twentieth century, in order to achieve the conception of the all-glass building. New adhesives and glass fins boosted this desire to become reality. Issues from contemporary society bring new demands for glass. Now, in the twenty-first century, the challenge is to create the all-glass building as sustainable as possible. Industrial waste management is an urgent issue in a society that witnesses a growing industrial production. The priority waste management efforts are related to a reduction in the quantities of production waste created. They then concern to the recovery of production waste internally, followed by the development of external recovery industries like reuse and recycling. Glass research focused on issues of practical relevance is a key to face this challenge. This research can demand more funding, but can also create a high impact in the long-term. For this reason, optimization of equipment, furnace and processes, development of innovative glass compositions containing industrial waste, lighter glasses, recycling strategies and others, are fields that should receive more attention.

Micromorphological and ultrastructural description of squirrel monkeys (*Saimiri collinsi* Osgood, 1916) sperm

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The squirrel monkey *Saimiri collinsi*, a neotropical primate endemic from Amazon-Brazil, is an animal model in reproductive research for conservation the genus *Saimiri* listed as vulnerable (*S. oerstedii* and *S. vanzollini*) and threatened (*S. ustus*) to extinction. We aimed to describe the micromorphological and ultrastructural characteristics *S. collinsi* sperm using a scanning (SEM) and transmission (TEM) electron microscopy. Semen collections of five adult *S. collinsi* were carried out at the National Primate Center (Ananindeua, PA, Brazil). Semen were collected by electroejaculation, the sample (liquid fraction) were centrifuged, and supernatant was discarded. The pellet was washed in sodium cacodylate and fixed in Karnovsky. For SEM, sperm sample were placed in a coated cover slip with poly-D-lysine, air-dried and dehydrated in a series of acetone solution. Afterwards, the samples were dried by the critical point method and then attached to supports using aluminum stubs with carbon tape. The samples were covered with a thin (20 nm) layer of gold. And for TEM, the sperm sample were washed in cacodylated buffer, post-fixed with osmium tetroxide and washed in cacodylated buffer with potassium ferrocyanide. The contracting block was performed with uranyl acetate in acetone, and the sample were dehydrated in series of acetone solution. The samples were infiltrated with epoxy resina and the polymerization was performed. Semi-thin cuts (70 nm) were obtained in ultramicrotome with glass cutters and contrasted with uranyl acetate. The SEM images revealed that the head of *S. collinsi* sperm is paddle-shaped flattened with a uniform thickness throughout, and the insertion of the tail is lateral. The squirrel monkeys' sperm presents a total length of 71.73 ± 0.71 μm . The TEM images showed the sperm presents a flattened head in a longitudinal cut, which is larger at the base, narrowing as it goes to the tip of the head. The separation of the nuclear, and internal and external acrosomal membranes could be discerned, as well as the plasmalemma. There was observation of a crosssection of the tail, containing the axoneme with a set of nine dense external fibers, surrounded by a mitochondrial ring. The first spiral of the mitochondria in the neck region could also be visualized. The present study provide information about the characteristics of squirrel monkeys sperm, which can be used to develop of reproductive biotechnology, serving as a database, and consequently contributing to the conservation of neotropical primates.

Testing a game intervention to change local civil servants' willingness to engage in open data policies

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The opening of governmental data is embraced by government to increase transparency and strengthen civic participation. Despite the many efforts from different governments around the globe, a lot of data is not opened. This can be attributed to barriers which can be grouped into: (1) infrastructure and digitalization referring to the basic conditions for public administrations to produce, register and make data accessible; (2) capacity building for properly skilled personnel and operational requisites in order to publish data in such a way it can be found, accessed and used by the public and; (3) behaviours and the often risk-averse culture from public service agents (politicians, decision-makers and civil servants) that can make it difficult for open data policies to be adopted. For the last group of behavioural barriers, particularly related to public policy operators and inspired by mobile entertainment game designs, a Role Playing version (prototype) is developed and its effect evaluated. In this game, 4 civil servants play different roles to deliver services to citizens. While the service is delivered, datasets related to that policy are produced. These datasets are stored and, in between rounds (representing weeks), the players need to label them in terms of privacy and security sensibility. Pre and post surveys are being applied in order to capture the effects of this quasi-experiment with two treatments. The research aims at using this game to analyse its effects on civil servants' behaviour and compare the outcomes with alternative approaches (passive interventions such as texts or videos).

What's next? An Analysis of Groningen's plans, ambitions and challenges to figure as a healthy city in the 21st century

Lara Caldas Fernandes da Silveira*

Based on master thesis submitted to the University of Groningen, the Netherlands

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The problems of urbanization have been increasingly discussed as cities have become the home of 55% of the world's population. Historically, many large urban centers became the epitome of public health issues which eventually led to mass depopulation. To maintain themselves, cities must tackle issues such as sustainability, quality of life, wellbeing, an aging population and growth all at the same time. In the Netherlands, one of the most densely populated countries in the European Union, specific urban policy is being created at the municipal level to shape the "city of the future". In Groningen, the focus of my case study, the local government is dealing with two main aspirations: economic growth and fostering a healthy urban environment for all its inhabitants. Is it possible to conciliate urban growth and a healthy cities agenda? This study uses the city of Groningen as an analytical model to identify the challenges, advancements and contradictions that a medium-sized city may face when striving to maintain its regional influence and build resilience to the urban problems of the 21st century. A comparison was drawn between Groningen's municipal plan for the next twenty years, the ongoing urban developments, available census data, and the current state of research. The paper found that Groningen city is young and international, but largely due to the university's presence and the city, while investing heavily in branding, is failing to retain its highly qualified, international population. On the other hand, the over-65 population is increasing rapidly, with not enough measures in place to guarantee their representativity and wellbeing. Groningen wants to develop the city around relevant urban subjects like density, identity and sustainability, but there is conflict between each set of goals. The municipal plan is closer to an urban branding document, missing the mark to create real actionable policy. In conclusion, there is a persistent gap between the discourse, intention and urban action. This research intends to contribute to the ongoing discussion of how to identify these gaps and bring stakeholders together to work towards building healthy urban centers of the future.

Historical consciousness: education and archeology

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The crisis of historical consciousness in Brazil, reflecting centuries of a scrapping of the teaching of history, must be combated through an alliance of forces between the teacher and the school institution. Therefore, one of the alternatives to innovate teaching would be to approach the content with the student, as proposed by Vigostky. Thus, the use of Role-playing game (RPG) instruments such as the "historical character cards" promoted by the History Teaching and Learning Laboratory (LEAH) of the Federal University of Ceará (UFC), promote the approximation with the student and provides a picture of the level of prior knowledge of the student to the teacher. In addition to this abstract approach, archeology could provide considerable support for teaching, given that it has a particular connection to the subject of RPG through the practice of historical reenactment. With this notion, the dynamics within the classroom would be much more effective at the moment when the students would work with the understanding of the material culture and with the historical patrimony. Classes in which the student would not follow the subject studied only by the book or the picture, but also having contact with materials of the time, or reenacted and even making a piece of some material of some time, such as a garment.

Production of continuous natural fibers reinforced wood plastic composites by an extrusion process

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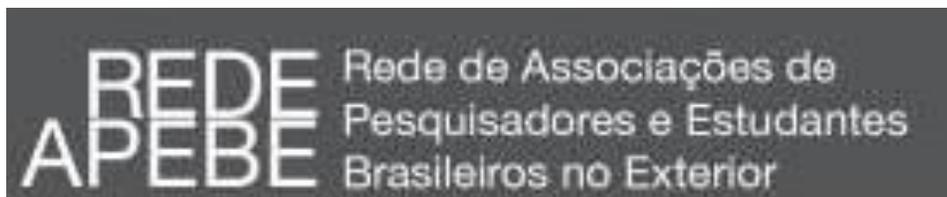
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Wood plastic composites (WPC) are composites obtained from the mechanical mixture of a polymer matrix and wood fibers as filler. Their development highlights an option to replace natural wood in some construction applications. Furthermore, WPC stands out for the potential attainment from renewable sources and the possible reuse of post-consumer products in their manufacturing. The replacement of oil-based matrices by biodegradable bioplastics, such as polylactic acid (PLA), leads to biomass originated product. However, wood filler insertion in plastics profiles results in a decrease on tensile and flexural strengths which might follow sudden failure. Improvements in tensile strength can be achieved by ensuring a better bond between the polymer matrix and the filler, while flexural strength improvement has been achieved with the insertion of continuous fibers in the axial section of composite profiles[1]. Although synthetic fibers have been used as continuous WPC reinforcement by extruders resulting in good mechanical performance, they are denser and less environmentally friendly compared to natural ones. Natural fibers are less dense, exhibit great specific tensile strength, besides they come from renewable sources[2]. In contrast, some disadvantages are transferred to the general characteristics of the composite, such as moisture absorption, non-homogeneous characteristics and sensitivity to high temperatures[3]. Therefore, the objective of this work is to improve the mechanical characteristics of WPC and to make them more environmentally friendly by applying PLA in the presence of maleic anhydride as a coupling agent. Alkali treatment is expected to increase the surface area of the filler for more efficient interaction with the polymer. The insertion of continuous fibers into the polymer matrix will be performed through die extruder designed especially for such application. It is desired to extend WPC application after better mechanical performance achievement.

References

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