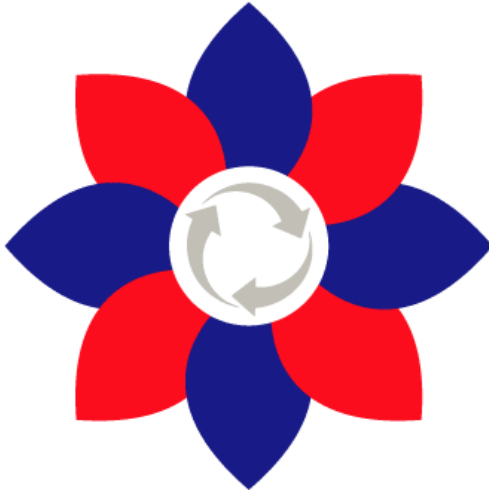




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on Bio-Based Circular Economy



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*Master Program
on Bio-Based Circular Economy*

REPORT for the Interdisciplinary Higher Education for a resilient Circular Economy

*Capacity Building for bioproduct conversion, bioenergy, Waste Recovery,
Reuse, Recycling and Conversion, low carbon solutions, and urban energy
systems*

Discussion Panel/Workshop at CUE2021

Project reference number - 586083-EPP-1-2017-1-IT-EPPKA2-CBHE-JP

Page 1 of 29



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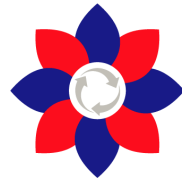
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Summary

Introduction	5
The event: CUE 2021	6
The program	8
The Project BBChina: Higher Education for the Circular Economy; presenter: Leonardo Nibbi; University of Florence, Italy.....	9
Soft Skills for STEM: the BBChina case; presenter: Jelena Mazaj; CESIE, Italy	10
CREEU - China Renewable Energy Education Union; presenter: Jihong Li; North China Electric Power University, China	11
Novamont: creating the new operators for the circular bioeconomy. A company's perspective; presenter: Sara Guerrini; NOVAMONT Research Centre, Italy	13
Challenges in Success of International Collaboration in Education and Research.; presenter: Shashibhushan Biliangadi; IIT Bombay, India	14
Online education - the new normal? Developing and implementing an international online master's program in environmental engineering; presenter: Patrik Klintenberg; School of Business, Society & Engineering, Mälardalen University, Sweden	16
BBChina in the context of Green Engineering Education@ECUST; presenter: Shan-Tung Tu; East China University of Science and Technology, China	17
The Discussion Panel.....	19
Given the high level of interdisciplinarity of the Circular (Bio)economy, which are the topics/fields that are absolutely necessary for a Program?	21
Is the topic bioenergy central in a Program devoted to the Bioeconomy?	22
Legislation and Normative in the field (e.g. Waste Management, Carbon Trade Systems, Incentives) still present large differences at the Global level, in a world that is global in exchanges: how to better deal with this topic in a Program with an international approach?.....	24
Interdisciplinarity needs a flexible approach to the topics: which are the most important soft skills that can help in dealing with the Circular bioeconomy?	25
Should local external stakeholders in the field be involved? If yes, How and Why?	26





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Master Program
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The paper at CUE 2021: “Interdisciplinary Higher Education for a Resilient Circular Economy: the BBChina Project” 27



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Introduction

The global environmental challenges the world is facing need a multi-disciplinary approach. The Net-Zero targets to 2050-2060 set by the major economies are ambitious and anything but easy. Young generations are aware of being the first generation that could face the strongest effects of the climate crisis and, under the global movement “Fridays for Future”, ask the politics to leave the old paths and stand united behind the science.

Greta Thunberg said, “You don’t have to listen to us. But you do have to listen to the united science”.

Apart from acting, rapidly, to start tackling the climate challenge, the “United Science” has the primary role of providing the young generations with the tools to give force to their ideas.

However, how to kindle the fire in the minds of those who will take the burning baton of the climate challenges of the next decades, a baton inherited by their parents?

Circular Economy redefines the growth models, moving towards a sustainable approach decoupling economic activities from the consumption of finite resources. The circular economy is one of the main pillars of the solution, and cities are the environment where it can be best applied.

Starting from the results of the BBChina Project that set up a Master Program on Bio-Based Circular Economy in China, the panel opened the discussion on how to best deal with such an interdisciplinary approach, share and compare experiences, and collect new ideas.

The present report summarises the presentations held, the following panel discussion and the conclusions achieved.





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The event: CUE 2021

CUE2021 stands for the 7th Applied Energy Symposium 2021: Low carbon cities and urban energy systems.

CUE2021 is organized by the international journal, Applied Energy, Advances in Applied Energy, Applied Energy Innovation Institute (AEII) and Mälardalen University, Sweden.

Due to the COVID-19, the event was held in a virtual symposium for sharing the most recent progress of research RD&Ds in urban energy systems.

The conference included keynotes and invited speeches, plenary sessions, oral presentations, poster sessions and discussion panels.

The background of the event starts from the evidence that cities are rapidly getting on top of the agendas of various initiatives worldwide aimed at decreasing the cost and carbon footprint of energy products, services and activities. The demands and pressure on energy infrastructure and resources oblige city infrastructure and consumers to adapt intelligently to ensure efficient, affordable, and sustainable solutions.

Therefore, developing intelligent energy solutions for resilient urban systems is a global and complex challenge that involves interdisciplinary fields.

With this as the theme of the conference, the CUE2021 aimed to provide a premier international forum for all stakeholders including academia, industry, and policy decision-makers to present and share the latest findings in all aspects across this domain, discussing how smart technologies and services can integrate the production and use of energy to support a more sustainable and resilient urban system.



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CUE 2021 was chosen due to the predominant participation of scholars and professors from the Chinese Universities and Academia, thus facilitating the dissemination of the BBChina project results in the involved Partner Country, i.e. China. In fact, on a total of 130 papers submitted, 87 of these papers (~67% of the total) were from Chinese Universities groups.

For further information, please refer to the conference website at:

www.applied-energy.org/cue2021



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The program

The workshop and panel took place on Monday, September 6, 2021. The program of the presentations is presented in the table below.

CET	CST	Title	Speaker and Affiliation
13:00	19:00	The Project BBChina: Higher Education for the Circular Economy	Leonardo Nibbi; University of Florence, Italy
13:10	19:10	Soft Skills for STEM: the BBChina case	Jelena Mazaj; CESIE, Italy
13:20	19:20	CREEU - China Renewable Energy Education Union	Jihong Li; North China Electric Power University, China
13:30	19:30	Novamont: creating the new operators for the circular bioeconomy. A company's perspective	Sara Guerrini; NOVAMONT Research Centre, Italy
13:40	19:40	Challenges in Success of International Collaboration in Education and Research.	Shashibhushan Biliangadi; IIT Bombay, India
13:50	19:50	Online education - the new normal? Developing and implementing an international online master's program in environmental engineering	Patrik Klintonberg; School of Business, Society & Engineering, Mälardalen University, Sweden
14:00	20:00	BBChina in the context of Green Engineering Education@ECUST	Shan-Tung Tu; East China University of Science and Technology, China

CET = Central Europe Time / CST = China Standard Time (6 hours difference in Summer)

After the presentations the speakers also took part to the discussion panel, together with a representative of each Chinese Universities involved in the BBChina project.



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The Presentation session and the panel was chaired by Leonardo Nibbi, representing the Coordinator, University of Florence. A short summary of each presentation is presented in the following.

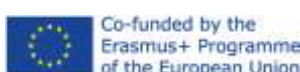
The Project BBChina: Higher Education for the Circular Economy; presenter: Leonardo Nibbi; University of Florence, Italy

DATE	TOPIC	TITLE	PRESENTER
13:00	13:00	The Project BBChina: Higher Education for the Circular Economy	Leonardo Nibbi
13:05	13:10	Soft Skills for STEAM: the BBChina case (Johanna Masi)	Johanna Masi
13:20	13:20	IREELU - China Renewable Energy Education Union	Wenping Li
13:30	13:30	News: creating the new operators for the circular bioeconomy: A company's perspective	Sara Guarniti
13:40	13:40	Challenges in Success of International Collaboration in Education and Research	Shuangshuang Bilangsk
13:50	13:50	Online education - the new normal? Designing and implementing an international online master's program in environmental engineering	Fabrizio Klotzberg
14:00	14:00	BBChina in the context of Green Engineering Education@EUCV	Shan Fang Tu
14:10	14:10	DISCUSSION PANEL	

Figure 1 – Mr Nibbi introducing the workshop and presenting the BBChina Project

M Eng Leonardo Nibbi is currently a contract researcher at the Department of Industrial Engineering of the University of Florence. His experience in the field of renewables started in 1999 and, although initially dedicated to biomass energy supply chain logistics with particular attention to the use of the GIS tool for its correct planning, has extended over the years to wind energy and the other renewables in general. He is presently working on the storage and integration of Variable Renewable Energy into the energy systems.

The presentation aims to introduce the workshop and the following panel, as well as the Project BBChina to the audience. Several slides at the beginning were devoted to presenting the ERASMUS+ Programme and the related funding opportunities. The structure of the project and the structure of the developed Master Program, including its position in the Higher Educational offer of the Chinese Universities was presented in order to ease the following discussion.



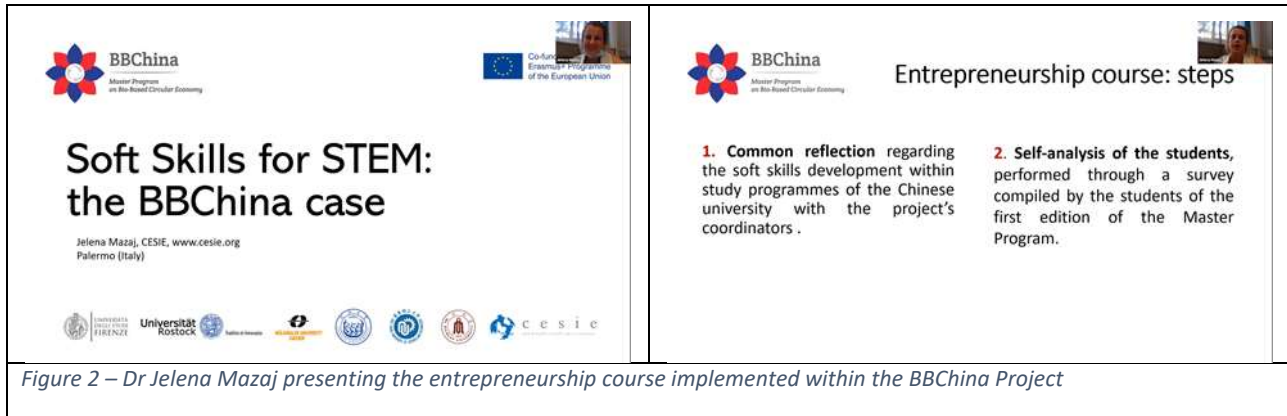
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Soft Skills for STEM: the BBChina case; presenter: Jelena Mazaj; CESIE, Italy

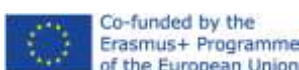


Ms Jelena Mazaj, PhD, is a Researcher and Coordinator of the Higher Education and Research (HE&R) Unit at CESIE. She holds a Master of Knowledge Management, Vilnius Gediminas Technical University (LT), and received her PhD in Economics and Statistics at the University of Palermo (IT). Jelena has over 15 years of professional experience in capacity building and knowledge management for higher education institutions, R&I networks for innovations, RRI and non-formal education. She is a member of Società Italiana di Management, Accademia Italiana di Economia Aziendale and International Sustainable Development Research Society.

Ms Mazaj starts from the fact that entrepreneurship correlates directly with the sustainable development goals, therefore representing social, environmental, and economic spheres between business processes, market transformations, and finally societal development. Entrepreneurship has become an important tool to integrate within the STEM curriculum due to its target on the development of soft and collaborative skills, which spur innovations and employability. These skills make young STEM graduates more business-oriented and active resources, and risks management during the professional pathway.



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The Steps that led to implementing the Entrepreneurship course of the BBChina Program are then presented. The work started with a phase of common reflection regarding the soft skills development within study programmes of the Chinese University with the project's coordinators and a self-analysis performed through a survey compiled by the students of the first edition of the Master Program. The course structure has been then developed by CESIE and discussed with selected teachers of the Chinese Universities that have been trained (Train the trainers activity) for teaching.

[CREEU - China Renewable Energy Education Union; presenter: Jihong Li; North China Electric Power University, China](#)

Ms Li Ji-hong, PhD in Environmental Engineering, Nanjing University, is an Associate professor at the School of New Energy, North China Electric Power University. Deputy Secretary-General of China Renewable Energy and Education Union (CREEU). Since 2013, she has been committed to the construction and development of New Energy Science and Engineering. Her main scientific research interests are high-efficient conversion and utilization of bioenergy. She has presided over 9 scientific and educational research projects separately funded by the Natural Science Foundation of China, the Fundamental Research Funds for the Central Universities, the Ministry of Education and some enterprises. As one of the important authors, she has published five books, among which the Introduction to New Energy was rated as a key high-quality teaching materials for colleges and universities in Beijing by the Beijing Municipal Education Commission.

In her presentation, Prof Li introduces the China Renewable Energy and Education Union (CREEU), which was founded in May 2013 by 22 Chinese universities with new Energy science and engineering majors. As of August 2018, the alliance has a total of 88 member institutions of higher learning, as well as relevant enterprises and publishing institutions engaged in the new energy industry.



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Huazhong University of Science and Technology, Beijing University of Technology, Hohai University, Fujian Normal University, Jiangsu University, Inner Mongolia University of Technology, Yunnan Normal University, Qinghai Normal University and China Water Resources and Hydropower Press are the units of the chairman of the Standing Council of the Alliance.

Figure 3 – Prof Li presentation of the China Renewable Energy and Education Union (CREEU)

The alliance secretariat is at North China Electric Power University. The Alliance takes general Secretary Xi Jinping's directive to promote a revolution in energy production and consumption as its banner; to be guided by the strategic action plan on energy development of the State Council and other relevant departments; with the purpose of promoting the construction of new energy discipline and promoting the development of the industry; it is CREEU mission to improve the training quality of new energy advanced engineering and technical personnel and to support the development of national strategic emerging industries, to achieve the goal of the new energy education industry chain co-prosperity interconnection, to take the joint growth of the alliance members as its own responsibility, to actively build an interactive platform for mutual learning, exchange and cooperation, widely publicize modern educational concepts and technologies, carry out in-depth academic exchange activities, and jointly build an inter-school and inter-school and inter-enterprise education and teaching resource sharing system. The New Energy Professional Alliance holds an annual meeting every year and has held seven sessions so far. CREEU organized



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the implementation of the first set of unified textbooks for the national new energy major, inter-school curriculum co-construction and sharing, as well as teaching competitions and teacher training for young teachers, benefiting more than 60 schools. The completed report on The National New Energy Specialty Construction and The Demand for Talents in the industry, the first in China, and the compilation of the National New Energy Specialty Talent Training Program of Colleges and Universities have played an important reference role and guiding value for the formulation or revision of the professional talent training program of colleges and universities in the alliance.

Novamont: creating the new operators for the circular bioeconomy. A company's perspective; presenter: Sara Guerrini; NOVAMONT Research Centre, Italy

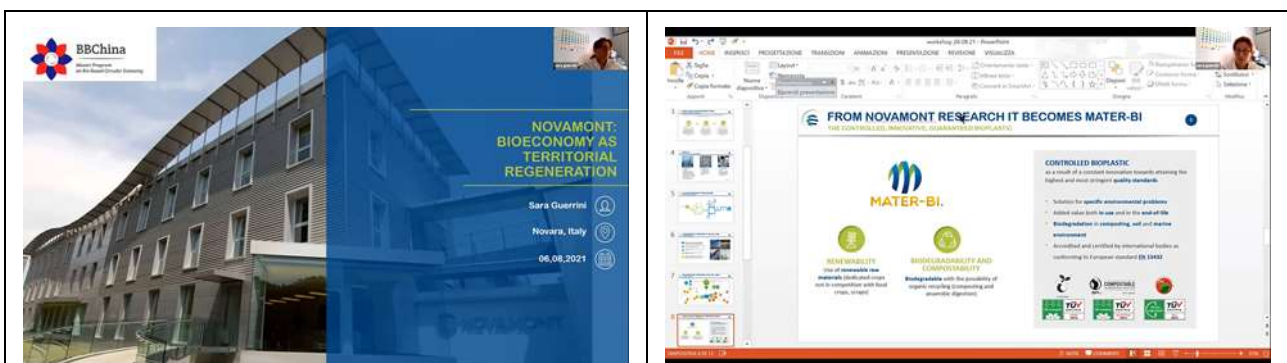


Figure 4 – Some slides from the presentation of Ms Guerrini.

Ms Sara Guerrini is presently Agriculture Public Affairs at NOVAMONT SpA. She is an agronomist active in the sector of bioeconomy and a specialist in the applications of bioplastics for agriculture. Ms Guerrini has strong background knowledge in the area of agriculture and green chemistry, integrated with strong experiences in the area of marketing, commercial and advocacy. Her current interests are related to the optimization of agronomical techniques using biodegradable and compostable materials, evaluating the agronomical and environmental effects.

Ms Guerrini brings a particular added value to the discussion; in fact, she presents the point of view of the industry with a high level of research in the bio-based circular economy, one of the main final objectives of the education and training developed within the BBChina. The presentation firstly introduced the activities of NOVAMONT and their products, and how these products are related to the topics implemented in the BBChina Master Program. After a presentation of the pillars of NOVAMONT development model, and proprietary innovative technologies for the green chemistry, a focus has been devoted to the strong interdisciplinarity of their activity that merges and integrates different sectors and competencies, thus being in line with the issues that are the root of the BBChina project. Then, particular attention was devoted to the role of NOVAMONT as a training centre: from the late '90s, NOVAMONT covered over 417 training programs, from high school to experienced researchers, including several areas of study such as chemistry, biotechnology, agronomy, and material engineering, thus presenting high interdisciplinarity, the same necessary for the activities in the bio-based circular economy. This can therefore help describe which are the skills of the ideal candidate to join the company.

[Challenges in Success of International Collaboration in Education and Research.;](#) presenter: [Shashibhushan Biliangadi;](#) IIT Bombay, India

Shashibhushan Biliangadi is presently MD-CEO at TREE Green Solutions Private Limited, India, and Assistant Professor, KLE Technological University, Karnataka, India. He is an Environmental Engineer with a Multi-disciplinary PhD at IIT Bombay-Monash Research Academy. He completed his M.Tech from IIT Guwahati in Environmental Eng. and B.E from BVBCET Hubli. During M.Tech, he worked on the adsorption process, wherein issues related to uptake potential of absorbent for repeated exposures and displacement of adsorbed metals were studied. During B.E, his work was focused on the Analysis and Design of Unsymmetrical Multi-storied building by considering lateral load, while



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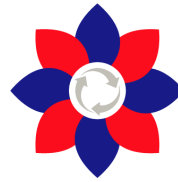
for his PhD, he worked on Building Artificial Soils from Industrial Waste Products for Mine Rehabilitation.



Figure 5 – some passages of Prof Biliangadi presentation

Prof Biliangadi brings to the discussion the example of a successful international collaboration in the Higher Education between Australia and India: the IITB-Monash Research Academy formed between the Indian Institute of Technology Bombay and Monash University, a unique Joint Venture PhD, representing the largest in scale and size among India-Australia Research Collaborations, that already awarded 200 PhD with more than 100 on-going. The main focus of the Multidisciplinary (focusing on industry problems) Program is on Infrastructure Engineering, Clean Energy, and Water issues. The discussion was mainly devoted to presenting the issues of the participation, as a student, in such an interdisciplinary program, focussing on the difficulties to approach such a complex path, but also considering all the positive achievements obtained in terms of global thinking attitude, and of discovering the different approach to balance work and life between the Indian (and Chinese) approach compared with the Australian (and, in general, European) one.





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Online education - the new normal? Developing and implementing an international online master's program in environmental engineering; presenter: Patrik Klintenberg; School of Business, Society & Engineering, Mälardalen University, Sweden

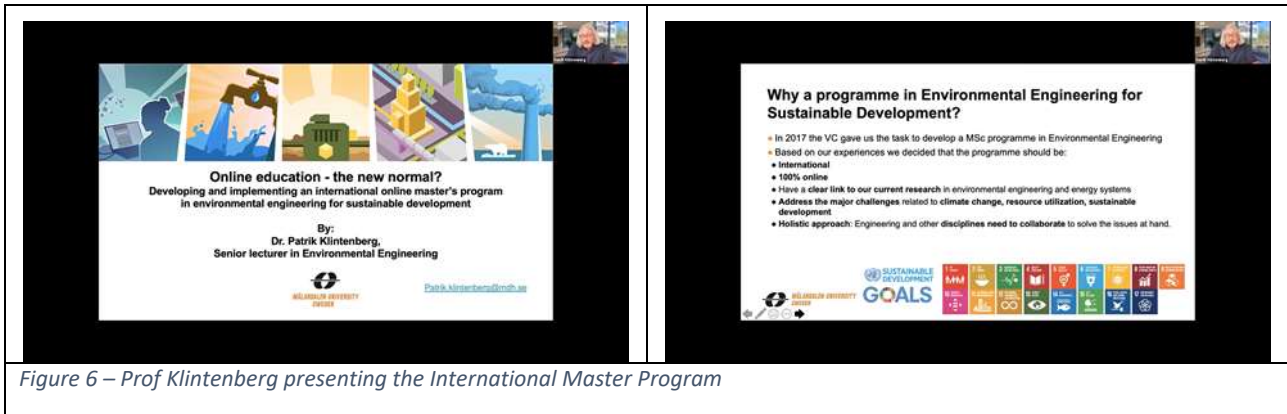


Figure 6 – Prof Klintenberg presenting the International Master Program

Prof Klintenberg is a researcher and senior lecturer in environmental science and environmental engineering at Mälardalen University. Subject representative, Environmental Engineering, leading the development and implementation of online and campus courses, as well as a new international online MSc in Environmental Engineering. The current research focus is on rural energy supply and sustainable development in southern Africa.

Prof Klintenberg starts presenting the background that led to the establishment of such an innovative Program: the environmental issues, including the legislation, are not confined within the national borders, but spread at the global level, thus making it necessary for an international approach. The present technology makes it possible to overcome the barriers of distance using available solutions to move the education and training activities online. These solutions became the only possibility of continuing the learning activities during the present pandemic. After a presentation of the main topics and the courses, it has been presented how the international collaboration was established. Instead of creating new joint courses and programmes, the choice



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was to collaborate within already established courses at the different universities, that has been also partly the approach followed for the implementation of the BBChina Master Program, although in this case several courses were newly developed. Sharing also interested the joint assignments, projects, and thesis, that were carried out by students from the involved universities, while guest lectures and thematic seminars were given and attended by lecturers and students from partner universities. Some key solutions adopted were also put into evidence: students do exams and submissions of assignments at their home university, while no additional administration, a lean approach, aimed at creating win-win for all involved. The programme was just launched in summer 2021 with 39 enrolled students, involving Universities of China, India, Australia, Mozambique, Namibia, South Africa and the USA, together with MDH in Sweden, where the Program is based.

BBChina in the context of Green Engineering Education@ECUST; presenter: Shan-Tung Tu; East China University of Science and Technology, China


 <p>BBChina</p> <p>BBChina in the context of Green Education@ECUST</p> <p>Shan-Tung Tu & Xin-hai Yu East China University of Science and Technology Shanghai, China</p>	<p>BBChina @ECUST</p> <p><i>"I really enjoy the warm and friendly atmosphere at BBCHINA. We had the chance to work with students from different nations. I had a wonderful and happy time in BBCHINA. This is a valuable experience in my life"</i></p> <p>Bai Liu</p> <p><i>"I have gained a lot and learned much about other majors, such as economics, biology, etc. The teachers are very enthusiastic in lecturing. They let us actively participate in classroom learning interactions in various ways and increase our extra knowledge through lectures. In addition, through multiple learning joint training, we have also increased exchange learning opportunities and gained valuable friendship"</i></p> <p>Kun Sun</p> <p><i>"BBChina's curriculum is quite systematic and comprehensive"</i></p> <p>Li Xichen</p>
--	---

Figure 7 – Slides from the presentation of Prof Tu, including some of the presented feedback statements from ECUST students of the BBChina Program (right)

Prof Tu received his PhD degree in 1988 from Nanjing Tech University. He is a Chair professor of Mechanical Engineering, East China University of Science and Technology. Prior to this, he has worked in Nanjing Tech University and East China University of Science and Technology as a





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professor and vice president, and a guest scientist to Royal Institute of Technology, Sweden. He is also a member of the Chinese Academy of Engineering.

Prof Tu is directly involved, as ECUST, in the implementation of the BBChina project and closes the presentation session showing the point of view on how the program relates to the wider topic of the Green Education and Training in Chinese HEIs, by presenting the experience at ECUST. Prof Tu first of all frames the Green Engineering issue in the wider context of the Green Development, SDGs, and National Strategies, with particular attention to what is happening in the EU and, most of all, the Chinese national development strategy, also considering the new 14th Five Year Plan issued at the end of 2020. In this scenario, the importance of Higher Education is fundamental to achieve the ambitious goals for a decarbonised future, passing through their different roles, including the 12 principles of green engineering as stated by Anastas and Zimmermann in 2003, here listed by Prof Tu, the goals, and the definition. After presenting how ECUST deals with Green Engineering and how the pandemic was managed to avoid any discontinuity in the educational activities, Prof Tu presents the role of ECUST in the BBChina Project and how it was implemented in the University. As a conclusion of his presentation, Prof Tu also shows some examples of very positive feedback from some students of the first BBChina edition, in the form of declarations released from them.

The presentation of Prof Tu closes the first part of the Workshop that rapidly move to the Panel Discussion.



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The Discussion Panel

Following the presentations, whose scope was also that of preparing the ground, a panel discussion started, chaired by the Coordinator, Leonardo Nibbi. The presenters were included in the panellists' list together with a representative of each Chinese University involved in the project:

- Shashibhushan Biliangadi; *IIT Bombay, India*
- Sara Guerrini; *NOVAMONT Research Centre, Italy*
- Patrik Klintonberg; *Mälardalen University, Sweden*
- Jihong Li; *North China Electric Power University and CREEU, China*
- Jelena Mazaj; *CESIE, Italy*
- Shan-Tung Tu; *East China University of Science and Technology, China*
- Ying Xu; *Sichuan University, China*
- Xinhai Yu; *East China University of Science and Technology, China*
- Hua Zhang; *Tongji University, China*
- Leonardo Nibbi; *University of Florence, Italy (Chair)*

Prof Kedir Bushira from the Namibia University of Science and Technology who was invited and present in the program had to cancel his participation.

The panel was developed following five questions that were asked to the Panellists. The questions, and the related discussions, are presented in the following. At the opening of the panel, an introduction to the definitions related to the Bio-Based Circular Economy was presented, for the





attendants that were not fully involved in the topic, being the topic of the Conference also beyond the specific issues discussed in the panel.

In particular:

- **Circular Economy** is “an economic system aimed at eliminating waste and ensuring the continual use of resources, through reuse, sharing, repair, refurbishment, remanufacturing and recycling to create a closed-loop system, minimising the use of resource inputs and reducing the creation of waste, pollution and carbon emissions”.
- **Bioeconomy** (or bio-based economy) is “the production of renewable biological resources on land and water, and the conversion of these resources and waste streams into value-added products, such as food, feed, bio-based products and bioenergy”.

Capacity Building in the field of Circular (Bio)-Economy involves several different scientific and technical fields: from agro-forestry to chemistry, from engineering to economy, from natural sciences to legislation. It is then important to discuss how to deal with such a large spectrum of topics.

Based on the experience in the field of each panellist, the discussion was open with the aim to try to give an answer to five questions about how to best implement Capacity Building in Higher Education in the field of Circular Bioeconomy. The round of questions and answers is summarised in the following. It is important to notice that some panellists, due to their specific background and expertise, did not answer to all the questions.





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Given the high level of interdisciplinarity of the Circular (Bio)economy, which are the topics/fields that are absolutely necessary for a Program?

Prof Biliangadi (IIT Bombay) notices that in the programs presented some topics are missing that are very important for an international program with international candidates, such as the topics related to policies, including bio-industrial ecology and eco-industrial networking, in order to close the circular economy loop, as seen from an entrepreneurship point of view. Ms Guerrini (NOVAMONT) states that there are some areas when as a company they have to deal with biocircular economy such as chemistry, agronomy, biotechnology, and engineering are fundamental topics but, agreeing with Prof Biliangadi, the environmental profile is also important, so ecology and environmental impact are also fundamental. Furthermore, a deep knowledge of normative and legislation is important, also how to implement them, because it happens that although the technology is advanced, their implementation can be stopped by policies that are not adequate. Prof Klintenberg (Mälardalen University) agrees with the previous interventions, but it is necessary to start with a holistic approach, such as climate change and mitigation of impacts never forgetting the sustainable development, to have very clear the boundaries where we must stay within. Prof Li (CREEU) states that a program on circular bioeconomy needs for sure the topics of biology, chemistry, thermal science, and economics. From the industrial point of view, the utilisation of biomass resources has three major processes: first is the biomass production and logistic chain, the second is processing and conversion of the material, and the third is the business and application of products. Prof Tu (ECUST) says that we must allow the students to get the whole picture, not only “the root of the tree but also see the forest”. Prof Xu (Sichuan University) says that the topic of how to connect biomass products to the market is very important, so the connection between the technology, the product and the market. Circular means that only one topic is not enough to deal



with the issue. Prof Yu (ECUST) says that it is important to teach how to evaluate the bioenergy roots balancing the economic aspects and evaluate the different technologies based on their aspects. Furthermore, it is important to teach how to establish bioeconomy depending on the different levels of each different country, such as the difference between developed and developing countries that present different scenarios. Prof Zhang (Tongji University) states that waste management is important, with particular attention to topics like plastic waste prevention and management, and waste reduction strategies. Furthermore, also biomass utilisation must be considered, and carbon-neutral/peak emission calculation and reduction is presently a very important issue in China. Mr Nibbi (University of Florence) puts in evidence that most of the answers focus on the link with the business, a result with which he fully agrees.

[Is the topic bioenergy central in a Program devoted to the Bioeconomy?](#)

Prof Biliangadi (IIT Bombay) says there are too many fields in the bioeconomy. Ms Guerrini (NOVAMONT) says that the topic is absolutely central; from the experience in their company, although for them the issue is not really central, they always take into account the bioenergy aspect when developing new products and technologies. For Prof Klintenberg (Mälardalen University) bioenergy must remain a central topic, although there is presently a strong competition on the biomass final use, apart from energy conversion. Prof Li (CREEU) doesn't think that in a program targeting bioeconomy, bioenergy should be a central topic because there are too many other utilisations for biomass such as biobased products. The energy role of biomass, compared with solar and wind, is limited and the role of biomass is more important for new materials. The solar conversion efficiency of PV is much higher than that of photosynthesis. For this reason, the energy use of biomass should be on cascade, first to meet the needs of humans and animals (food and feed), then high-value products such as biobased materials. Therefore, biobased products are a





topic more important than bioenergy. Mr Nibbi (University of Florence) comments on this reminding that, although limited in quantities, the role of biomass as a storable and schedulable energy source is important in the role of balancing the variable renewable energy production. He agrees that, from an economic point of view, biobased materials are more important than bioenergy. Prof Tu (ECUST) agrees with Mr Nibbi, and he believes that bioenergy will be more and more central because of its contribution to carbon neutrality, although it is evident that from the economic point of view the utilisation of biomass for advanced biobased materials (including biomedicines etc.) is more important. Prof Tu brings as an example a colleague who works on algae for energy use, but to get to the economics it was necessary to go back to the first use as a nutrient. Prof Xu (Sichuan University) states that the ultimate goal of a circular economy is sustainability, and energy is only one of the goals. It means that there are many ways to solve the problem of energy sustainability, such as wind energy and solar energy. More attention should be paid to the characteristics of the Biological circular economy itself, even if other methods cannot be replaced. According to the current status of bioenergy development, poor economic performance is a relatively common phenomenon. Once other forms of alternative energy appear, the motivation of enterprises to develop bioenergy will decrease significantly. In addition, many vehicles have begun to use electricity as an energy source, thus leaving away space for biofuels. For example, in China, the penetration rate of electric vehicles is getting higher and higher. Perhaps one day in the future, the proportion of fuel vehicles will be reduced to a very low level. Therefore, whether it is possible to consider biomass other than bioenergy as the central issue? For example, in addition to providing energy, ordinary petroleum is also raw material for many petrochemical products. When petroleum resources are depleted, other forms of energy sources other than bioenergy cannot solve the problem of petrochemical raw materials. Related to the specific Chinese scenario, Prof Yu (ECUST) is not sure whether bioenergy will be able to play a major role in the future energy system,



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Master Program
on Bio-Based Circular Economy

competing with solar, wind, and nuclear energy. Although bioenergy could give an important contribution to carbon neutrality, it is a long way to go and more efforts must be put into the topic, including biomass waste energy use. Prof Zhang (Tongji University) states that bioenergy and bio-based materials are both central to the bioeconomy topic.

Legislation and Normative in the field (e.g. Waste Management, Carbon Trade Systems, Incentives) still present large differences at the Global level, in a world that is global in exchanges: how to better deal with this topic in a Program with an international approach?

Prof Biliangadi (IIT Bombay) since the global issue involves different states and laws, and the bioeconomy cannot neglect trade and commerce, when we talk about different trade, tariffs, we should think beyond such issues. Ms Guerrini (NOVAMONT) states that this is a very difficult question. She refers to the European Bioeconomy Strategy that was recently reviewed, so in Europe member states are more or less aligned on these issues. Furthermore, several countries worldwide have bioeconomy strategies, the hope is for a future alignment of these. This is not a real answer to the question, nevertheless, is a hope for future development. Mr Nibbi (University of Florence) comments with the example of waste management whose rules, when moving out of Europe, can be very different, therefore making it difficult to summarise and teach them in a comprehensive way, internationally. Prof Klintenberg (Mälardalen University) says that from the educational point of view we should teach the students what the directives are, why we have, for example, the Carbon Trade System, and then look at local cases on how these directives are implemented. We must focus on practical examples. Therefore, see the guiding structure, the philosophy that is behind the different implementations at the national and regional level. Prof Tu (ECUST) says that the target is to teach the students how to work together on the topic with the aim of harmonising the issue, rather than concentrating on the single legislation. Prof Xu (Sichuan University) thinks that all



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Master Program
on Bio-Based Circular Economy

legislation and normative in the field are not the aim, but they should be the tools to help to achieve the final goals. So, in the program, the better way to deal with this topic is to try to understand each other and focus our attention on how to achieve the targets. Prof Yu (ECUST) says that the issue is very political. To answer this question, we should consider the development and the history of carbon emissions and the different legislation development level of different countries. Prof Zhang (Tongji University) agrees that there are large differences at the global level, such as those between developed and developing countries. However, in China the issue of carbon emissions has become more and more important in the last years, and the topic is more and more taught and discussed with students, and the way is to present the main framework and ideas behind legislation and then see the scenarios at a local level (e.g. the China Case).

[Interdisciplinarity needs a flexible approach to the topics: which are the most important soft skills that can help in dealing with the Circular bioeconomy?](#)

Prof Biliangadi (IIT Bombay) thinks that we should go beyond technical and management skills and consider teamwork, flexibility, and reliability as the three soft skills that should be taught to both students and, also, professors. Prof Klintenberg (Mälardalen University) states that transdisciplinary collaboration and the ability to listen and understand local contexts, needs and requirements, therefore the ability to “think out of the box”. Ms Mazaj (CESIE) points out that we are talking about very long collaborative projects and stakeholders coming from inside and outside organisations and Academia that must work together to stimulate approaches like change-makers, collaboration, and open-mindedness. Prof Tu (ECUST) thinks that is very important for students of engineering to know more about society and the world in general. Prof Xu (Sichuan University) states that for individuals, communication, cooperation, and an open and inclusive attitude are the most important soft skills. For the organizers, they can try to organize comprehensive teams to carry out circular bio economy-



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related innovation and entrepreneurship competition, and students from different fields form a team. Under the guidance of professional teachers, taking the opportunity of formulating an entrepreneurship plan can effectively cultivate the above soft skills. Prof Yu (ECUST) says that the most important soft skill for students is a critical spirit. Prof Zhang (Tongji University) put the focus on the knowledge of the internet tools and the potential of Artificial Intelligence.

Should local external stakeholders in the field be involved? If yes, How and Why?

Prof Biliangadi (IIT Bombay) thinks that yes, they should be involved, as well as what thinks Prof Klintonberg (Mälardalen University) and Ms Mazaj (CESIE), being important to get in contact with local actors and also policymakers.

The panel closes, being it gone well beyond what was scheduled, after about 50 minutes of questions and answers.





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The paper at CUE 2021: “Interdisciplinary Higher Education for a Resilient Circular Economy: the BBChina Project”

Within the CUE2021 conference, the project BBChina and its results were presented during Session 7 “Climate change and policy options”, chaired by Tong Xu, University of Cambridge, and Rui Zhu, The Hong Kong Polytechnic University on September 8, 2021.

The title of the oral presentation was “Interdisciplinary Higher Education for a Resilient Circular Economy: the BBChina Project”.

The oral presentation was held by the project coordinator, Mr Leonardo Nibbi, who first presented the ERASMUS+ Programme, then went through the path that led to the development of the BBChina Master Program, including a description of the partnership and the Program structure. Furthermore, the Entrepreneurship Course development and topics have also been presented.

A wider description of the action will be made available in the Conference proceedings, through the paper, authored by Leonardo Nibbi and Jelena Mazaj.



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Conclusions

The presentations gave a wide overview of the issues related to Capacity Building in the field of the BioBased Circular Economy.

The Panel composition was able to represent the main actors of the capacity building chain, thus including the Higher Education, the entrepreneurs, and the large company.

The discussion confirmed the high level of interdisciplinarity of the Biobased circular economy issues, and most of them are covered by the BBChina program. Particular attention is given to a holistic approach, necessary to deal with Circular Economy, including also the topic of the market and the international legislation and normative, because any technological development is then subdued to the legislation and market to be adopted on a large scale. Particular attention has been devoted to the issue on how to teach the legislation topics on a global scale and, in general, the proposed guidelines focus more on the common and general background, and philosophy behind the environmental legislation rather than on the single legislation, in order to prepare the student to deal with more than one single country aspect. The discussion also confirms, although not encountering the full agreement on this, the importance of the topic bioenergy when implementing Capacity Building actions in the field of Biobased Circular economy. It is, in any case, pointed out that, since the energy use of the biomass is not the most important one, in a Circular Economy approach, the role of bioenergy is presently less important than some years ago. Soft skills are important to foster a holistic approach, and the ability to work in a team thinking “out of the box” is seen as crucial for building the new generation of experts in the field. The connection with the labour market through stricter cooperation with non-academic stakeholders is also confirmed as important.



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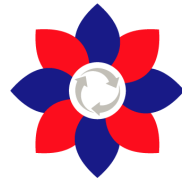


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In addition to the Panel event, the presentation of the paper within the Conference gave an additional possibility to disseminate the BBChina results within the audience.



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