



# Importance of Education in Sustainable and Circular Bioeconomy

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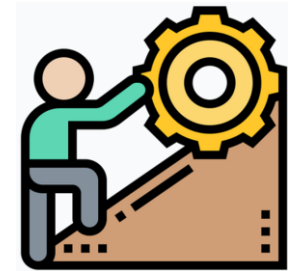
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Future of the Danube region: Green transition and circular bioeconomy  
An event within the framework of the EU Strategy for the Danube Region (EUSDR), Priority Area 8  
Zagreb, September 21, 2023

# Outline



**Idea**



**Challenges**



## The European Green Deal

- ❑ improving the efficient use of resources by switching to a **circular and sustainable bioeconomy**
- ❑ restoration of biological diversity
- ❑ reduction of pollution

## Bioeconomy Strategy

Three major action plans:

- ❑ To develop new technologies and processes for the bioeconomy
- ❑ To develop markets and competitiveness in the bioeconomy
- ❑ To push policymakers and stakeholders to cooperate

**The lack of education and skills in the bioeconomy** is the main risk for the failure of the European Green Deal objectives and related EU strategies.

Therefore, **bioeconomy education** is urgently needed **at all levels of education** and in addition to the education of policy makers and entrepreneurs.



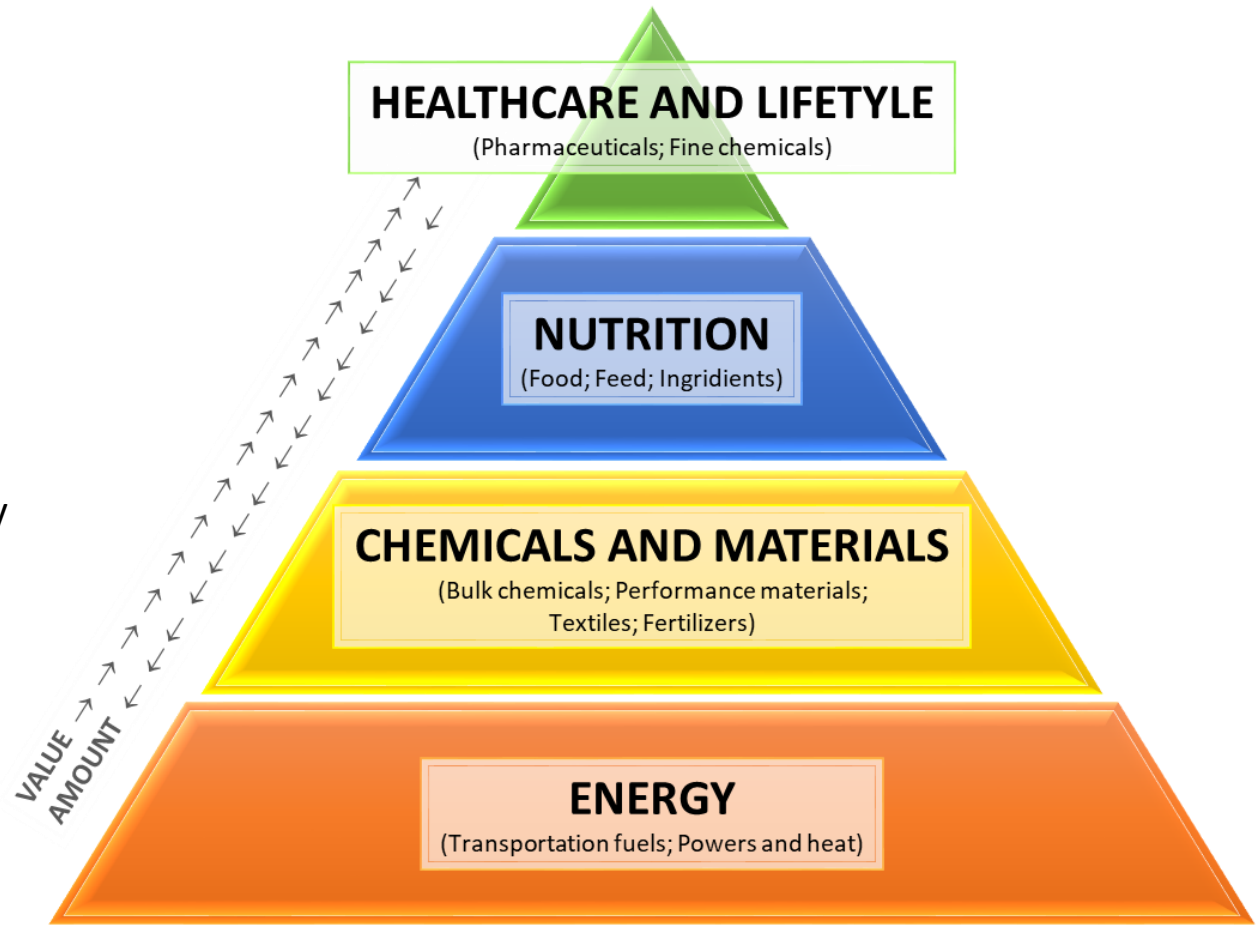
## How to shape education for a sustainable circular bioeconomy?

Conclusions from the GBS2020 Workshop on Education, training & capacity building

We need to transform and re-skill of European workforce

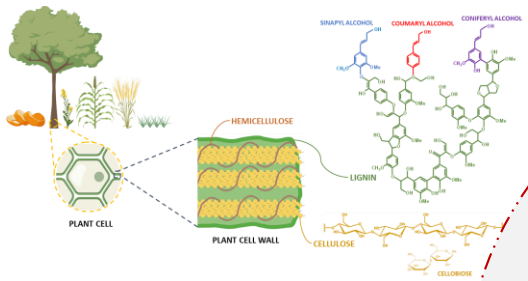


## Bio-based pyramid



### Knowledge and experience:

- Scientific backgrounds
- Cooperation with industry
- **Projects implementation**



# Lignocellulosic residual biomass

- Brewer's spent grain
- Sugar beet pulp
- Grape pomace
- Pumkin oil pomace
- Barley husk
- Various harvest residues
- Corn silage
- ...

Biogas

STRUKTURNI I INVESTICIJSKI  
**FONDOVI**

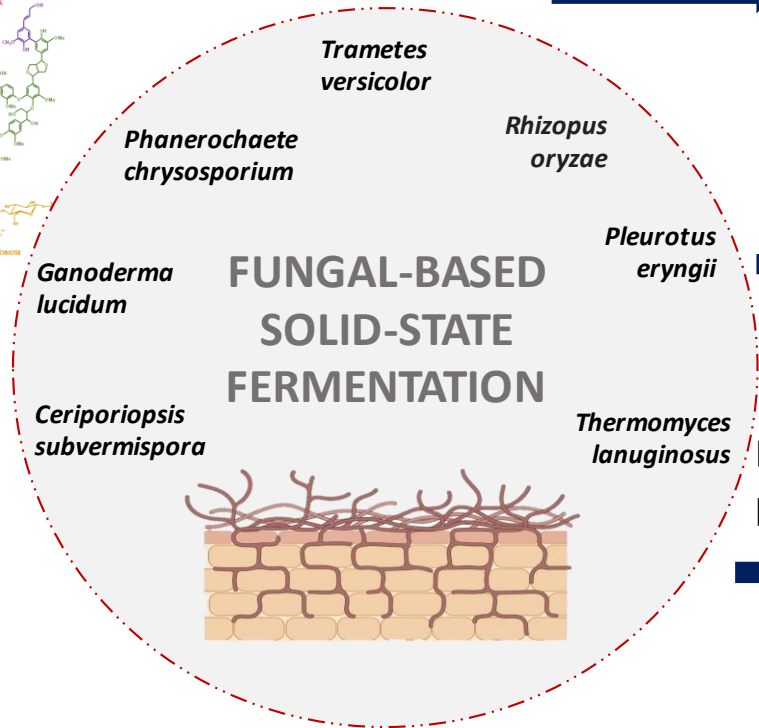
Biofuel production

Biodiesel

**HRZZ**  
Croatian Science Foundation

Isobutanol

Croatian-Chinese bilateral project



Feed production

**Bio4Feed**

STRUKTURNI I INVESTICIJSKI  
**FONDOVI**

Biofertilizer production

Sveučilište Josipa Jurja Strossmayera u Osijeku

**Fakultet agrobiotehničkih znanosti Osijek**

STRUKTURNI I INVESTICIJSKI  
**FONDOVI**

Bioactive isolates production

**POPI**  
WinEco

**HRZZ**  
Croatian Science Foundation

**Primary schools and high schools**

**Higher education - Universities**

**Vocational education and trainings**

**Entrepreneurship education**

## Primary schools and high schools

- ❑ It is crucial to raise a generation that can understand the challenges and embrace the opportunities of a bioeconomy.

### What to teach?

- ❑ Principles of circularity
- ❑ Acting global and local at the same time (**GLOCAL**)
- ❑ Raise interest for bio-based carriers

**To prepare the new generation to be ready for a quickly evolving labour market.**



## Primary schools and high schools



We need to educate teachers!

Is circular and sustainable  
bioeconomy education part  
of national or regional  
education strategies?

## Higher education - Universities

- At universities new curricula are already developed that combine for example **life sciences, engineering and marketing.**



### BIOEAST UniNet

**Prague, December 2022**

Six universities from Central and Eastern Europe signed a memorandum of understanding

1. University of Eastern Finland (**Finland**)
2. University of Bologna (**Italy**)
3. University of Hohenheim (**Germany**)
4. AgroParisTech, Paris Institute of Technology for Life, Food and Environmental Sciences (**France**)
5. University of Natural Resources and Life Sciences, Vienna (BOKU, **Austria**)
6. Wageningen University and Research (**Netherlands**)

1. MENDELU University (**Czech Republic**)
2. Debrecen University (**Hungary**)
3. Agricultural University Nitra (**Slovakia**)
4. University of Osijek (**Croatia**)
5. Agriculture University Plovdiv (**Bulgaria**)
6. Vytautas Magnus University (**Lithuania**)

## Vocational trainings Entrepreneurship education

- ❑ Vocational training needs to evolve also to match requirements for skills in primary production, manufacture, transport, and other relevant sectors.
- ❑ Development of educational and training content, methods, tools and structures to achieve a mainstreaming of the bioeconomy in education and training. It includes **recommendations to train people to work in the bioeconomy.**

Recomendation for policy  
makers

Recomendation for vocational  
trainings providers

**Europe needs more professionals with  
dedicated entrepreneurship skills to drive  
the transition to a sustainable and circular  
bioeconomy.**

Economy



Biotechnology

Education



Dr. Biljana Kulišić, PhD



Prof. Dr. Emina Berbić-Kolar, dean of the  
Faculty of Education, University of  
Osijek

# Bioeconomy Education at University of Osijek

<b>Study programme:</b>	Sustainable and Circular Bioeconomy 3. – specialist study
<b>Duration:</b>	One year, 60 ECTS
<b>Scientific field:</b>	4. Biotechnical Sciences 4.07. Interdisciplinary Biotechnical Sciences
<b>Leader:</b>	J. J. Strossmayer University of Osijek <b>Faculty of Food Technology Osijek</b>
<b>Partner:</b>	J. J. Strossmayer University of Osijek <b>Faculty of Education</b>
<b>Price:</b>	25 000 HRK // 3,318.40 €



# Sustainable and Circular Bioeconomy

## 3 main courses

Sustainable Development Concept  
Sustainable and Circular Bioeconomy Concept  
Sustainable Development in Education

**6 ECTS**

## 24 elective courses

**4 ECTS**

- Sustainability of Food Industry Sector
- Cereals of the future
- Bioproducts in the sustainable development of the bioeconomy
- Biorefinery Concept
- Plant genetic resources and sustainable development
- Ecological food production and processing
- Sustainable and energy efficient construction
- Intangible cultural heritage in the context of sustainable development
- Citizenship, social values and ethics in sustainability education
- Bioethics of sustainable development
- Health and sustainable development
- Nutrition ethics in the context of sustainable development
- Global ecology and new trends in ecology
- Biodiversity conservation and sustainable future
- Sustainable management of water resources
- Sustainable soil management
- Sustainable wastewater management of industries and cities
- Sustainable energy technologies
- Sustainable management and maintenance of energy plants
- Creating a curriculum in the field of sustainable development
- New technologies in sustainable development education
- Preparation and implementation of projects
- Innovations in the bioeconomy
- Digital transformation of a sustainable economy

**Thesis**

**20 ECTS**

# MAIN COURSES

Enablers of sustainability

**How to build sustainable organization?**

**How to measure sustainability? Sustainability indicators**

Sustainable innovation in practice

Natural capital

Value chains

**Transition from linear to circular bioeconomy**

Business models

Risks in transition

**Do we have enough biomass?**

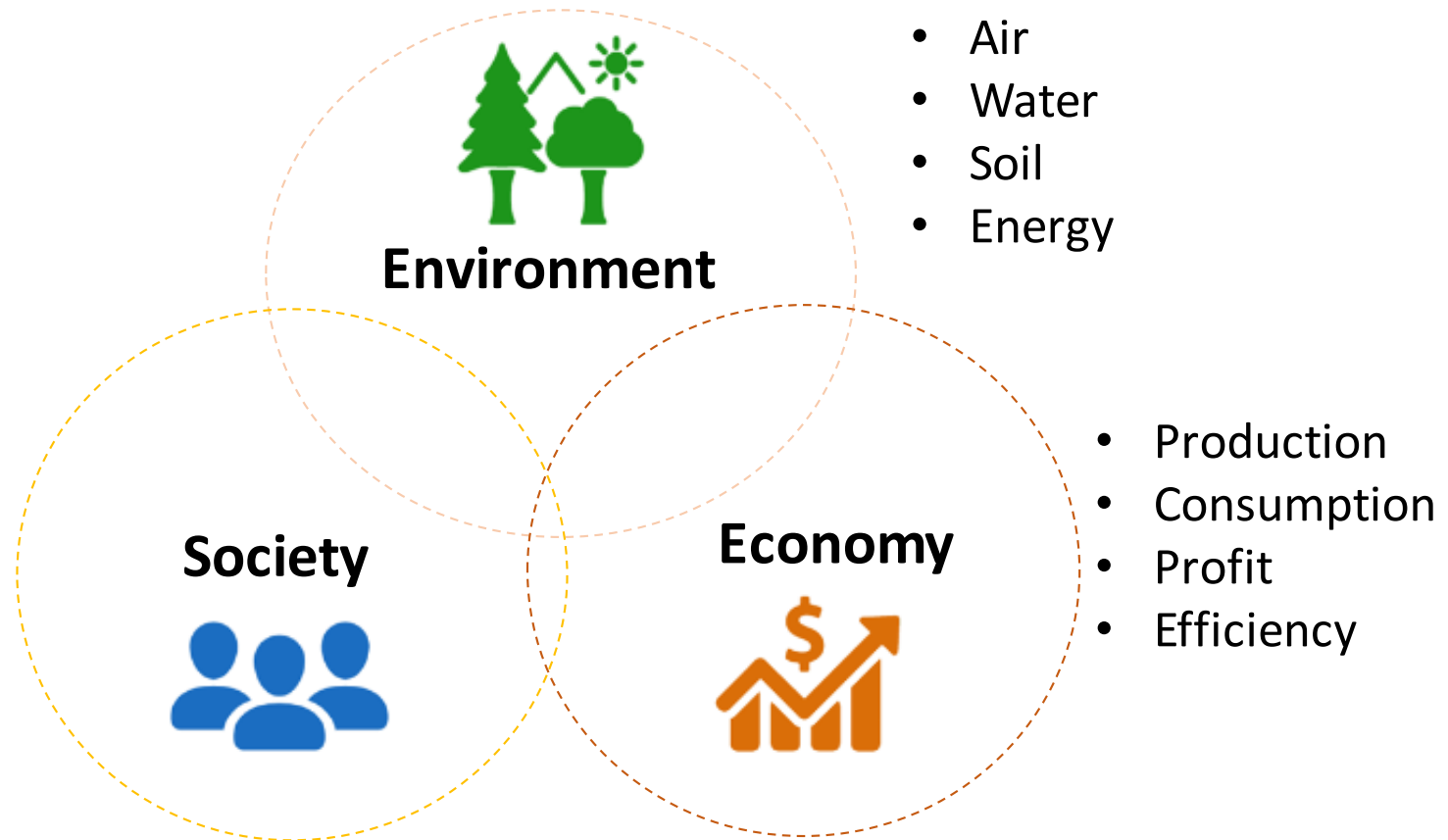
Market identification for bioproducts

**Industrial biotechnology** as a main driver of bioeconomy development

**How to implement**

a sustainable and circular bioeconomy **beyond tertiary education**, including primary and secondary schools, educate educators...

# Elective courses



Interactions: cities,  
households, schools,  
hospital...



# Environment



Climate change

Food loss reduction

CO<sub>2</sub> capture, reduce, trading

Carbon footprint

Plastic / Bioplastic

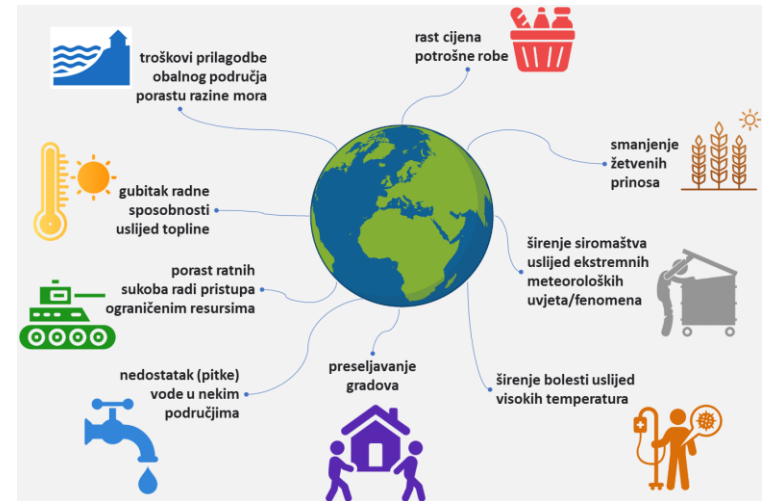
Microplastic in oceans

Biorefineries vs. refineries

Sustainable building

Advanced technologies in waste treatment

Advanced technologies in wastewater treatment



Utjecaj klimatskih promjena

## Society



Implementation of sustainability in organization

Paths towards a climate-neutral and biodiversity-rich society

Engaging youth in bioeconomy

Innovation ecosystems for rural development

Bioethic

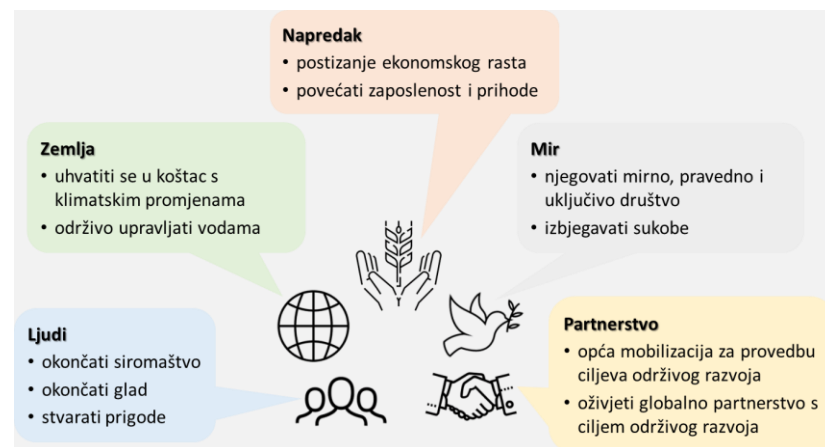
Consumer protection

Innovate thinking

4th industrial revolution

Consumer education

Greenwashing



## Kategorije Ciljeva održivog razvoja

# Economy



New Business Models: Valorization of biological resources: value-added products production, energy, food, materials, ...

Resource recovery

Optimization of supply chain

Food and energy security

High risk investments in knowledge transfer

Marketing: AIDA

Genuine progress indicator

From ESG to SDG

The ReSOLVE framework

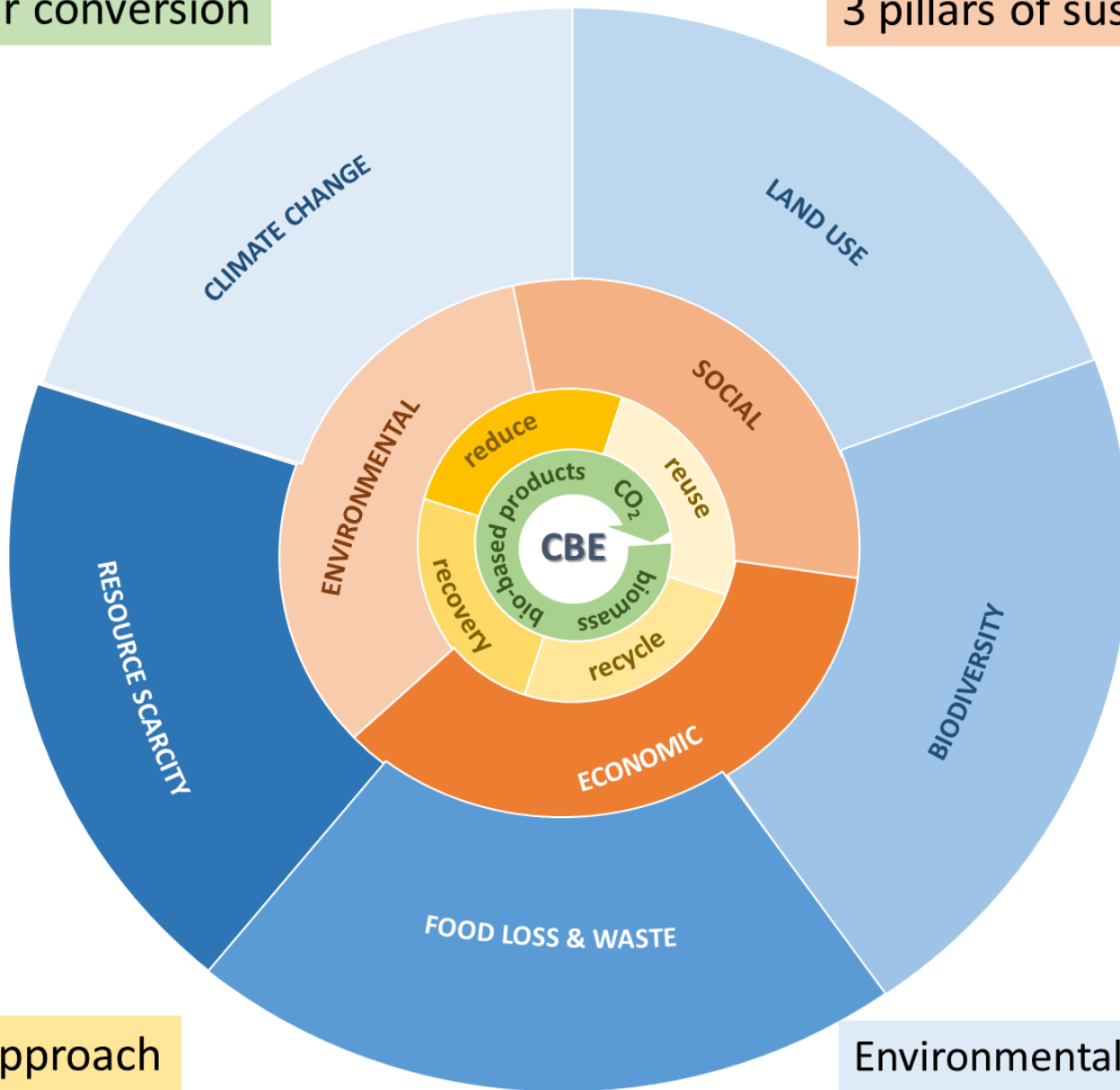
Bioeconomy strategies

ESG ESG - općenito	SDG SDG - specifično
 <p>Environment</p>	
 <p>Society</p>	
 <p>Governance</p>	

From ESG to SDG

Circular conversion

3 pillars of sustainability



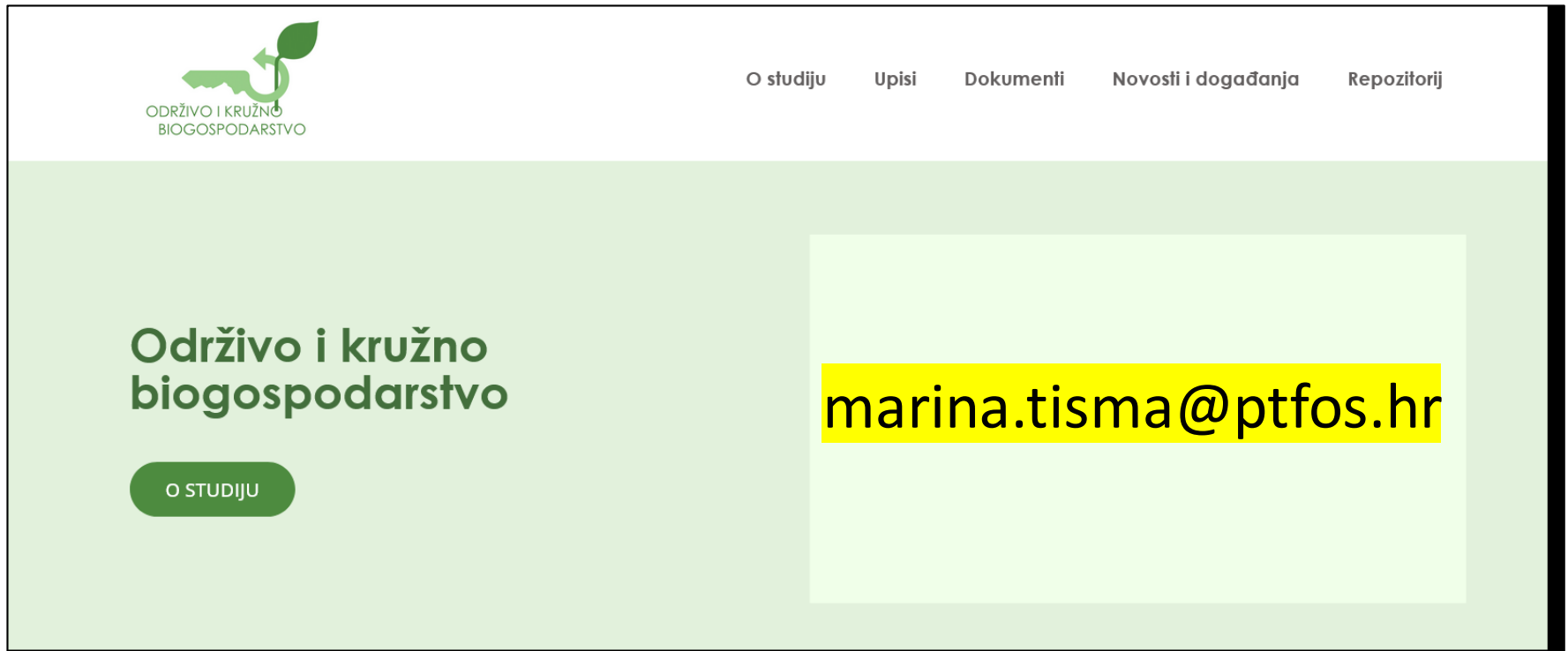
4 R's approach

Environmental challenges

<http://www.ptfos.unios.hr/biogospodarstvo/>

## Natječaj za upis 2. generacije studentata:

**11./2023.**



*Thank you very much!*