

Circular Economy and Environmental Protection

Bilingual scientific journal / Kétnyelvű tudományos folyóirat

Körforgásos Gazdaság és Környezetvédelem



*Official Journal of the
Environmental and Process Engineering Research
Group and Institute of Chemistry*

Volume 3, Issue 4, 2019

EDITORIAL INFORMATION

Editor-in-Chief: Mizsey, Peter

Editorial Advisory Board:

Kraslawski, Andrzej

Mika, Laszlo Tamas

Nagy, Tibor

Plesu, Valentin

Reti, Gabor

Stawski, Dawid

Szlavik, Janos

Toth, Andras Jozsef

Valentinyi, Nora

Vatai, Gyula

Viskolcz, Bela

Journal Editor: Racz, Laszlo (sr)

Assistant Editors:

Andre, Anita

Farkas Szoke-Kiss, Anita

Fozer, Daniel

Haaz, Eniko

Publisher:

Environmental and Process Engineering Research Group, and Institute
of Chemistry – Mizsey, Peter

ISSN 2560-1024

Contact, manuscript submission: ceep@envproceng.eu

CONTENTS / TARTALOM

Editorial preface / Szerkesztői előszó.....p. 4

Circular Economy / Körforgásos Gazdaság

**Racz, Laszlo (sr): The European Green Deal, December 2019
.....pp. 5–17.**

It is worth knowing / Információk

Kutatásainkat támogató projektek

- 1. Mizsey Péter: Fluktuáló megújuló energiák tárolása flexibilis módszerekkel: energia és nyersanyagok (OTKA-K 128543)pp. 18–19.**
- 2. Tóth, András József: A körforgásos gazdaság fejlesztése: új fiziko-kémiai módszerek kidolgozása technológiai hulladékvizek kezelésére és azok értékelése (OTKA-FK 131586)pp. 20–21.**

EDITORIAL PREFACE / SZERKESZTŐI ELŐSZÓ

Tisztelt / Kedves Olvasó,

Három a magyar igazság, és ezúttal a mini jubileumi harmadik évfolyamunk utolsó számát tartja/tartod a kezében.

Kiadványunkban hangsúlyt fektettünk és fektetünk arra, hogy a tudományos eredmények gyors publikálása mellett a legújabb, életünket, mindennapjainkat, illetve szakmánkat is érintő eseményekről, politikai döntésekről információt szolgáltatassunk. Ezért ebben a kiadványban az idei „European Green Deal” kezdeményezésről számolunk be, melyet 2019 decemberében fogadtak el az európai országok vezetői. A cikk a korábbi, hasonló nevű U.S.A. környezetvédelmi kezdeményezésekkel összevetve mutatja be az európai környezetvédelmi célokat. Ezek ismeretében büszkén állapíthatjuk meg, hogy az immár három éves kiadványunk címe tökéletesen harmonizál a deklarált európai környezetvédelmi törekvésekkel, nevezetesen a körforgásos gazdaság megvalósítása az egyik fő cél.

Kiadványunk további részében elbűszkélkedünk arról, hogy kutatásunk milyen támogatásokat kapott, nekünk ítélt projekttámogatás formájában.

A 2020-as évek elején kiadványunk „referált folyóirat” kategóriába történő átminősítését kérjük, mivel az elmúlt három évben teljesítettük az ezzel kapcsolatos követelményeket.

Minden kedves Olvasónknak, békés, boldog, áldott Karácsonyt és sikerekben és egészségben gazdag 2020-as esztendőt kívánunk.

Budapest, Miskolc, 2019. december 23.

Mizsey Péter

The European Green Deal, December 2019

Racz, Laszlo (sr)

liracz@gmail.com

Received: 18 December, 2019

Accepted: 21 December, 2019

ABSTRACT

The European Green Deal's communications and policy areas have been published on 11 of December, 2019 by the European Commission. We briefly review the earlier issued US version ('Green New Deal'), then focus on the main targets and policy areas of the European Green Deal. A brief summary of COP 25 is also provided.

ONE ANTECEDENT - THE GREEN NEW DEAL IN THE U.S.A.

Term 'New Deal' has been coined by U.S.A. president Franklin D. Roosevelt during the great depression in the first half of the last century. His 'New Deal' aimed at cutting unemployment, supporting agriculture and manufacturing in the frame of two programmes between 1933 and 1939.

„The Green New Deal was first introduced in the 2016 presidential election by Jill Stein, the candidate for the Green Party. It committed to 100% renewable energy by 2030, costing \$200 billion. It would create a Renewable Energy Administration to create up to 20 million new green-centered jobs. That would cost \$400 billion a year.

It also included free education through college.

It paid for these programs in three ways. First, by cutting the defense budget by 50%. Total U.S. military spending is \$890 per ton carbon fee, generating \$360 billion a year. More progressive taxation on the super wealthy would raise \$130 billion annually. It proposes a 70% tax on income above \$10 million...

On February 7, 2019, Representative Alexandria Ocasio-Cortez, D-N.Y., and Representative Edward Markey, D-Mass., introduced a five-page nonbinding resolution to the House. Sixty House members endorsed the plan. So did four Senate Democrats running for president. That ensures that solutions to climate change will be a major issue in 2020.

„The Green New Deal is a plan to fight climate change. It would reduce greenhouse gas emissions, cutting them in half by 2030. That's what it would take to limit global warming to less than 2.7 degrees Fahrenheit by 2100. It's the Paris Agreement's most ambitious climate goal.

To achieve its goal, the plan calls for the United States to switch to 100% renewable energy by 2030. As of 2018, only 11% of

the nation's energy consumption came from renewables, according to the Energy Information Administration. Another 8% was generated by nuclear power. Although it's not renewable, it also doesn't emit carbon dioxide.

At its core is the recognition that the oil and carbon-based energy system must be changed to reduce further emissions. Technology must be introduced to absorb existing CO₂ levels. Otherwise, scientists warn temperatures could exceed a tipping point that leads to hothouse earth.”

It includes seven goals previously introduced by Ocasio-Cortez:

1. Shift 100% of national power generation to renewable sources.
2. Build a national energy-efficient "smart" grid.
3. Upgrade all buildings to become energy efficient.
4. Decarbonize manufacturing and agricultural industries.
5. Decarbonize, repair, and upgrade the nation's infrastructure, especially transportation.
6. Fund massive investment in the drawdown and capture of greenhouse gases.
7. Adopting these goals would make "green" technology, industry, expertise, products, and services a major U.S. export. As a result, America could become an international leader in helping other countries transition to completely carbon-neutral economies.

The resolution also requires that any new infrastructure spending must address climate change. It wants the government to push for more zero-emissions vehicles and invest in high-speed rail and other public transit...

The Green New Deal funds new jobs, including installing solar panels, retrofitting coastal infrastructure, and manufacturing electric vehicles. It asks for new trade rules to stop "the transfer of jobs and pollution overseas."

It would make universal health care available. It also advocates a universal basic income. This is a government guarantee that each citizen receives a minimum income. It pays enough to cover the cost of living.

Surprisingly, the Green New Deal does not include a carbon tax or a cap and trade program. These programs raise the cost of carbon fuels, like gasoline. That could hurt lower-income families more, especially those in rural areas who rely on an automobile. It was one reason the "yellow vest" protesters in France opposed a gas tax. They felt it was another sign that the very wealthy ignored their needs.

It also does not ban fossil fuels. Similarly, it doesn't exclude nuclear energy and hydropower which are often opposed by environmental groups” (Amadeo, K. (2019)).

In November 2019 „senator Bernie Sanders and Representative Alexandria Ocasio-Cortez unveiled legislation on Thursday that provides \$180 billion over

10 years to cut carbon dioxide emissions from public housing across the country.” „The legislation would create new grant programs through state partnerships to transition housing units to zero-carbon, energy efficient housing. The move would potentially create nearly 250,000 union jobs each year in the U.S. and cut carbon emissions on the scale of taking 1.2 million cars off the road over a 10-year period, according to the press release... Roughly 40% of total U.S. energy consumption comes from residential and commercial buildings” (CNBC (2019)).

AND THE EUROPEAN GREEN DEAL

„The European Green Deal sets out how to make Europe the first climate-neutral continent by 2050, boosting the economy, improving people’s health and quality of life, caring for nature, and leaving no one behind” (EUNeighbours (2019)).

According to an assessment, „unlike the U.S. Democrats’ Green New Deal, the European Union’s version is technically feasible. Because of that, it could do much more to pave the way for future environmental gains.” (ForeignPolicy (2019)).

„Circular economy erected as ‘number one priority’ of European Green Deal. The circular economy, including new waste and recycling laws, will represent “half” of the EU’s effort to achieve net-zero carbon emissions by 2050...” (Euractiv (2019A)).

„The European Commission on 11 December, 2019 presented *The European Green Deal* – a roadmap for making the

EU’s economy sustainable by turning climate and environmental challenges into opportunities across all policy areas and making the transition just and inclusive for all...

The European Green Deal provides a roadmap with actions to boost the efficient use of resources by moving to a clean, circular economy and stop climate change, revert biodiversity loss and cut pollution. It outlines investments needed and financing tools available, and explains how to ensure a just and inclusive transition.

The European Green Deal covers all sectors of the economy, notably transport, energy, agriculture, buildings, and industries such as steel, cement, ICT, textiles and chemicals.

To set into legislation the political ambition of being the world’s first climate neutral continent by 2050, the Commission will present within 100 days the first ‘*European Climate Law*’. To reach our climate and environmental ambition, the Commission will also present the *Biodiversity Strategy for 2030*, the *new Industrial Strategy and Circular Economy Action Plan*, the *Farm to Fork Strategy* for sustainable food and proposals for pollution-free Europe. Work will immediately start for upping Europe’s 2030 emissions targets, setting a realistic path to the 2050 goal.

Meeting the objectives of the European Green Deal will require *significant investment*. Achieving the current 2030

climate and energy targets is estimated to require €260 billion of additional annual investment, representing about 1.5% of 2018 GDP. This investment will need the mobilisation of the public and private sectors. The Commission will present in early 2020 a Sustainable Europe Investment Plan to help meet investment needs. At least 25% of the EU's long-term budget should be dedicated to climate action, and the European Investment Bank, Europe's climate bank, will provide further support. For the private sector to contribute to financing the green transition, the Commission will present a Green Financing Strategy in 2020.

Fighting climate change and environmental degradation is a common endeavour but not all regions and Member States start from the same point. A *Just Transition Mechanism* will support those regions that rely heavily on very carbon intensive activities. It will support the citizens most vulnerable to the transition, providing access to reskilling programmes and employment opportunities in new economic sectors.

In March 2020, the Commission will launch a 'Climate Pact' to give citizens a voice and role in designing new actions, sharing information, launching grassroots activities and show-casing solutions that others can follow.

The global challenges of climate change and environmental degradation require a global response. The EU will continue to promote its environmental goals and standards in the UN's Biodiversity and Climate Conventions and reinforce its

green diplomacy. The G7, G20, international conventions, and bilateral relationships will be used to persuade others to step up their efforts. The EU will also use trade policy to ensure sustainability and it will build partnerships with its neighbours in the Balkans and Africa to help them with their own transitions...

The Commission invites the European Parliament and the European Council to endorse the Commission's ambition for Europe's future economy and the environment and to help realise it. The Commission will bring forward the measures announced in the European Green Deal roadmap" (EC (2019A)).

„The Green Deal explains the initiatives that the Commission will present progressively over the next few years. Several of these will come early in 2020:

- A proposal to create a *Just Transition Mechanism*. This will include a Just Transition Fund, as part of the next Multi-annual Financial Framework.
- A Commission proposal to give legal force to the objective to achieve *climate neutrality by 2050* ('*climate law*') that will set the EU onto an irreversible path to climate neutrality.
- A Communication setting out the Commission's views on what the Union should do to *protect and promote its biodiversity* domestically and internationally

ahead of an important international conference of the parties to the UN's Convention on Biodiversity in Kunming (China) in November 2020.

- An action plan to *promote a more circular economy* that will address more sustainable products and accompany the new industrial policy strategy.

The Green Deal Communication will also kick-start analytical work to underpin many follow-up initiatives touching upon most economic sectors. These will be presented progressively and many will need to be developed and presented together because of the strong linkages between them. The most important of these include:

- Proposals to revise upwards the Union's greenhouse gas emissions reduction targets for 2030 ahead of the Conference of the Parties of the UN's Framework Convention on Climate Change in November 2020.
- Proposals to revise, where necessary, the Emissions Trading System for the EU's power sector and industrial installations, *possibly extend European emission trading to road transport, shipping and buildings' emissions* as well as revise the Member States' targets for sectors outside of the Emissions Trading System.
- A strategy for clean and smart mobility that will itself announce a series of actions aimed at reducing

greenhouse gas emissions from land, waterborne and air transport. This will include *measures on cleaner fuels, electrical charging infrastructure, taxation, road pricing and promoting rail freight*. The strategy is planned for the second semester 2020.

- A strategy to tackle chemicals is envisaged in the second semester 2020. This will deliver, together with other initiatives related to air and water pollution, on the 'Zero pollution ambition' displayed in President von der Leyen's Political Guidelines.
- A 'Farm to Fork' strategy to improve the sustainability of the food production and distribution system. A wide-ranging consultation is envisaged initiated by a Commission Communication early in 2020 that will then be followed by specific measures throughout the mandate.
- Strategies and measures to mobilise sustainable public and private investments in greening the economy." (EC (2019B)).
- „Meeting the objectives of the European Green Deal will require significant additional investment" (funding). „The Commission has estimated that achieving the current 2030 climate and energy targets

will require EUR 260 billion of additional annual investment, about 1.5% of 2018 GDP. Both public and private sectors will need to sustain these investment flows over many years.

- The *Commission will present in early 2020 a Sustainable Europe Investment plan to help close the funding gap*. It will combine dedicated financing to support sustainable investments, and proposals for an improved regulatory framework. At the same time, it will be essential to build up a pipeline of sustainable projects through technical assistance and advisory services to help project promoters. The EU's budget (and its commitment to achieve 25% dedicated to climate action) and the activities of the European Investment Bank will support the Sustainable Europe Investment Plan together with national funding sources.
- The private sector will be incentivised to contribute to financing the green transition. Long-term signals are needed to direct financial and capital flows to green investments. The Commission will present a green financing strategy in the third quarter of 2020 that will focus on a number of actions to promote and mobilise private sustainable finance” (EC (2019B)).

POLICY AREAS OF THE EUROPEAN GREEN DEAL

Clean energy

Presently, „the production and use of energy account for more than 75% of the EU’s greenhouse gas emissions (Source: European Commission, A clean planet for all, November 2018). 18% of the EU’s gross final energy consumption came from renewable sources in 2017 (source: European Commission, Renewable energy progress report, April 2019)”.

„Decarbonising the EU’s energy system is critical to reach our climate objectives. Key principles:

- Prioritise energy efficiency and develop a power sector based largely on renewable sources
- Secure and affordable EU energy supply”
- Create „fully integrated, interconnected and digitalised EU energy market”

Relevant EU energy legislation will be reviewed and where necessary revised by June 2021. EU Member States will then update their national energy and climate plans in 2023, to reflect the new climate ambition. The EU sets target of 50% GHG reduction by 2030 and of zero GHG emissions position by 2050 through the following actions

- Interconnect energy systems and better link/integrate renewable energy sources to the grid
- Promote innovative technologies and modern infrastructure

- Boost energy efficiency and eco-design of products
- Decarbonise the gas sector and promote smart integration across sectors.” (Natural gas is the lower-carbon fossil fuel. Decarbonisation of the gas sector would mean substitution of natural gas for biogas or hydrogen or the use of the carbon capture and storage (CCS) when burning natural gas (Euractiv (2019B)).
- „Empower consumers and help Member States tackle energy poverty
- Increase cross-border and regional cooperation to better share clean energy sources
- Promote EU energy standards and technologies at global level
- Develop the full potential of Europe’s offshore wind energy (EC (2019C)).

Sustainable industry

Presently, „EU’s industry accounts for 20% of the EU’s emissions. More than 90% of biodiversity loss and water stress come from resource extraction and processing. From 1970 to 2017, the annual global extraction of materials tripled and it continues to grow (sources: The International Resource Panel, Global Resources Outlook, 2019; European Commission, EU Climate Action Progress Report 2019). Only 12%of the materials used by EU industry come from recycling (source: Eurostat, 2016 figures)”

„Achieving the EU’s climate and environmental goals requires a new industrial policy based on the circular economy.

In March 2020, the EU will adopt an industrial strategy that will support the green transformation. Industries must be helped to modernise and exploit opportunities domestically and globally. A key aim will be to stimulate the development of new markets for climate neutral and circular products. The decarbonisation and modernisation of energy-intensive industries such as steel and cement is essential. The Commission will make a proposal to support zero carbon steel-making by 2030.

A new circular economy Action Plan will help modernise the EU’s economy The Commission will present a ‘sustainable products’ policy, which will prioritise reducing and reusing materials before recycling them. Minimum requirements will be set to prevent environmentally harmful products from being placed on the EU market. False green claims will be tackled. Efforts will focus first on resource intense sectors such as: textiles, construction, electronics and plastics.

The Commission will propose measures to ensure that all packaging in the EU is reusable or recyclable by 2030. New business models based on renting goods and services will help to shift consumption patterns away from single or limited use products.

Europe needs a digital sector that puts sustainability and green growth at its heart. Digitalisation presents new opportunities for:

- monitoring of air and water pollution,
- monitoring and optimising how energy and natural resources are consumed.

The Commission will explore the benefits for consumers of ‘take-back’ schemes. This will incentivise people to bring back their devices – mobile phones, tablets or chargers for recycling.

The transition is an opportunity to foster sustainable and job-intensive economic activity (EC (2019D)).

Building and renovating

Today,” buildings account for 40% of energy consumed (source: Eurostat, Energy balances 2019 edition, final energy consumption in year 2017)”.

„The current rates of renovation of public and private buildings should at least double”. In order to improve energy performance of buildings

- „Prices of different energy sources should incentivise energy-efficient buildings
- Design of buildings should be in line with the circular economy
- Increased digitalisation” should be applied
- „More climate-proofing of buildings” should be provided, and
- „Strict enforcement of rules on energy performance of buildings” should be implemented.

The Commission will launch a new renovation initiative in 2020, „an open

platform bringing together the buildings and construction sector, architects and engineers and local authorities to:

- Leave no one behind
- Develop innovative financing possibilities
- Promote energy efficiency investments in buildings”, and
- „Pool renovation efforts into large blocks to benefit from economies of scale”...while
- „Leave not one behind” (EC (2019E)).

Sustainable mobility

“Transport accounts for a quarter of the Union’s greenhouse gas emissions and these continue to grow”. In 2017 shares of GHG emissions by transport modes: road: 71.7%, civil aviation: 13.9%, waterborne transport: 13.4%, railways: 0.5%, others: 0.5%. „The Green Deal seeks a 90% reduction in these emissions by 2050” through

- „Going digital
- Automated mobility and smart traffic management systems will make transport more efficient and cleaner
- Smart applications and ‘Mobility as a Service’ solutions will be developed
- Using different transport modes
- More freight should be transported by rail or water
- And the Single European Sky should significantly (by 10%) reduce aviation emissions at

- zero cost to consumers and companies
- Prices that reflect environmental impact
 - Ending subsidies for fossil fuels
 - Extending emissions trading (ET) to the maritime sector
 - Effective road pricing in the EU
 - Reducing free allowances to airlines under ET
- Boosting supply of sustainable alternative transport fuels: by 2025, about 1 million public recharging and refuelling stations will be needed for the 13 million zero-(ZEVs) and low-emission vehicles (LEV) expected on European roads (2017: 140k charging points and 975k ZEVs&LEVs)
- Reducing pollution
 - Stricter standards on car pollutions
 - Pollution reduction in EU ports
 - Air quality improvement near airports” (EC (2019F)).

Biodiversity

„Ecosystems provide food, fresh water, clean air, and shelter. They mitigate natural disasters, pests and diseases and help regulate the climate.” Actions include the followings:

„The Commission will present a Biodiversity Strategy by March 2020. The EU will propose a global target to protect biodiversity at the UN Biodiversity Conference in October 2020. The Commission will make proposals to green European cities and increase biodiversity in

urban spaces. The farm to fork strategy will work to reduce the use of pesticides and fertilisers in agriculture. The EU will help improve (BBC (2019)). The Commission will prepare a new EU Forest Strategy for planting new trees and restoring damaged or depleted forests. The EU will encourage imports that do not create deforestation abroad to minimise the risk to forests around the world. The blue economy” (i.e. sustainable use of ocean resources) „must play a central role in tackling climate change. We need to make the best use of our marine resources, for example by promoting the use of algae and other new sources of protein” (EC (2019G)).

From farm to fork

„European food must remain safe, nutritious and of high quality. It must be produced with minimum impact on nature.”

„In EU budget of 2021-2027

- 40% of Common Agriculture Policy should contribute to climate action
- 30% of the maritime fisheries fund should contribute to climate objectives.”

„In spring 2020, the Commission will present a Farm to Fork Strategy to:

- Make sure Europeans get affordable and sustainable food
- Tackle climate change
- Protect the environment
- Preserve biodiversity.”

„Farmers and fishermen are key to managing the transition. The European Commission will work with Member States and stakeholders to:

- Ensure the transition is fair and just for everyone working in the European agricultural and maritime sector
- Reduce significantly the dependency, risk and use of chemical pesticides, as well as of fertilisers, antibiotics.”

„Farm to fork will also help combat food fraud by preventing, detecting and fighting it through coordination with Member States and non-EU countries. Imported food products from third countries must comply with the EU’s environmental standards. Farm to Fork will contribute to achieving a circular economy – from production to consumption” through:

- „Better informed citizens
- More efficient food production systems
- Better storage and packaging
- Healthy consumption and” reducing „food loss and waste
- More sustainable processing and farm transport” (EC (2019H)).

Eliminating pollution

„To protect Europe’s citizens and ecosystems, the Commission will adopt the zero-pollution action plan to prevent pollution of air, water and soil”. Clean water movement would include the next actions:

- Preserve biodiversity in our lakes, rivers and wetlands
- Reduce pollution from excess nutrients thanks to the Farm to Fork strategy
- Reduce particularly harmful pollution from micro-plastics and pharmaceuticals.”

Clean air actions cover:

- „Review air quality standards in line with the World Health Organization guidelines.
- Provide support to local authorities to achieve cleaner air for our citizens.”

Industry should „Reduce pollution from large industrial installations” and „Improve prevention of industrial accidents”

In the field of chemicals the next actions should be done:

- „Protect citizens against dangerous chemicals with a new chemical innovation strategy for a toxic-free environment
 - Develop more sustainable alternatives
 - Combine better health protection with increased global competitiveness
- Improve rules on assessment of substances launched on the market” (EC (2019I)).

Funding of the European Green Deal

„A draft €100-billion “Just Transition Mechanism” outlined by the European Commission as part of its Green Deal last week will eventually see the light in January, EU officials have said. The

amount of “fresh money” under the new fund is however expected to be limited.

Work on the detail of the fund has started after EU heads of state and governments “clearly endorsed” the European Green Deal’s “vision and path” at last week’s EU summit, officials said...

Leaders from the 28 EU member states endorsed the Commission’s European Green Deal at a summit” in December 2019, „including a flagship objective to make Europe the first climate neutral continent in the world by 2050.

But Poland abstained, saying it needed more clarity on the new sources of funding available for regions expected to be the most affected by the transition to net-zero emissions” (Euractiv (2019C)).

„The European Union (EU) on Dec. 16 announced an agreement among its member states on rules involving the *financing of green energy projects*. Lawmakers approved a list of technologies and activities that can be classified as green, after disagreement about whether nuclear energy and natural gas should be included... France led a group of nuclear energy proponents in seeking revisions to an earlier version of the financing rule, released Dec. 11, that excluded nuclear power and gas from classification as technologies eligible for the investment program. The EU Parliament and member states had sparred over the recognition of nuclear power, and of natural gas as a “transition” source of energy. France, Britain, and Eastern EU countries – the Czech Republic, Hungary, Poland, Slovakia, Romania, Bulgaria, and Slovenia

–rejected an earlier deal proposed last week that excluded nuclear power and natural gas. Pascal Canfin, a French member of the EU Parliament”, ... chair of „the European Parliament’s environment committee ... noted that the final version of the deal means *both natural gas and nuclear power “are neither included nor excluded in principle” from parts of what’s called a taxonomy list*, which in effect includes the EU’s definitions of sustainable activities for investment purposes. Canfin said *nuclear power and gas can be included if they—along with other activities on the list—comply with a “do no significant harm” principle* (Power (2019)).

CONFERENCE OF THE PARTIES (COP25) MADRID (2 Dec – 13 Dec., 2019)

After the venue change (from Chile to Madrid in Spain) and „two extra days and nights of negotiations, delegates finally agreed a deal that will see new, improved carbon cutting plans on the table by the time of the Glasgow conference next year. All parties will need to address the gap between what the science says is necessary to avoid dangerous climate change, and the current state of play which would see the world go past this threshold in the 2030s... Supported by the European Union and small island states, the push for higher ambition was opposed by a range of countries including the US, Brazil, India and China.

However a compromise was agreed with the richer nations having to show that they have kept their promises on climate change in the years before 2020” (BBC (2019)).

During the COP25 a number of scientists, among them Professor Guus Berkhout of Climate Intelligence Foundation debunked climate alarmists.

Keywords: circular economy, environmental protection, climate change,

REFERENCES

Amadeo, K. (2019), viewed 16 Dec., 2019, <https://www.thebalance.com/green-new-deal-4582071>.

BBC (2019), viewed 18 Dec., 2019, <https://www.bbc.com/news/science-environment-50799905>.

CNBC (2019), viewed 16 Dec., 2019, <https://www.cnbc.com/2019/11/14/sanders-ocasio-cortez-unveil-plan-to-cut-carbon-emissions-from-housing.html>.

EC (2019A), The European Green Deal, viewed 16 Dec., 2019, https://ec.europa.eu/commission/presscorner/detail/en/IP_19_6691.

EC (2019B), The European Green Deal, viewed 16 Dec., 2019, https://ec.europa.eu/commission/presscorner/detail/en/qanda_19_6690.

EC (2019C), The European Green Deal, viewed 16 Dec., 2019, https://ec.europa.eu/commission/presscorner/detail/en/fs_19_6723.

EC (2019D), The European Green Deal, viewed 16 Dec., 2019, https://ec.europa.eu/commission/presscorner/detail/en/fs_19_6724.

EC (2019E), The European Green Deal, viewed 17 Dec., 2019, https://ec.europa.eu/commission/presscorner/detail/en/fs_19_6725.

EC (2019F), The European Green Deal, viewed 16 Dec., 2019, https://ec.europa.eu/commission/presscorner/detail/en/fs_19_6726.

EC (2019G), The European Green Deal, viewed 16 Dec., 2019, https://ec.europa.eu/commission/presscorner/detail/en/fs_19_6728.

EC (2019H), The European Green Deal, viewed 16 Dec., 2019, https://ec.europa.eu/commission/presscorner/detail/en/fs_19_6727.

EC (2019I), The European Green Deal, viewed 16 Dec., 2019, https://ec.europa.eu/commission/presscorner/detail/en/fs_19_6729.

EUNeighbours (2019), viewed 16 Dec., 2019, <https://www.euneighbours.eu/en/east-south/stay-informed/news/european-green-deal-sets-out-how-make-europe-first-climate-neutral>.

Euractiv (2019A), viewed 18 Dec., 2019, <https://www.euractiv.com/section/energy-environment/news/leaked-brussels-draft-proposal-for-a-european-green-deal/>.

Euractiv (2019B), viewed 20 Dec., 2019, <https://www.euractiv.com/section/energy-environment/news/new-gas-possibilities-in->

focus-as-commission-prepares-
decarbonisation-strategy/.

Euractiv (2019C), viewed 16 Dec., 2019,
<https://www.euractiv.com/section/energy-environment/news/eu-confident-e100bn-green-transition-fund-will-see-the-light/>.

ForeignPolicy (2019), viewed 18 Dec., 2019,
<https://foreignpolicy.com/2019/12/17/united-states-democrats-green-new-deal-eu-europe-technically-feasible-environment-progress/>.

Power (2019), viewed 22 Dec., 2019,
<https://www.powermag.com/eu-finalizes-green-deal-for-clean-energy-investment/?pagenum=1>.

Kutatásainkat támogató projektek

1. Fluktuáló megújuló energiák tárolása flexibilis módszerekkel: energia és nyersanyagok (OTKA-K 128543)

A projekt témaválasztásának indoklása

Az emberiség jövőjének legégetőbb technikai/technológiai problémák a következők:

- a globális felmelegedés,
- szén-dioxid emisszió csökkentése,
- megújuló energiák mind elterjedtebb alkalmazása,
- megújuló energia megbízható és nagy volumenű tárolása,
- megújuló nyersanyagok gyártása,
- az energia és a nyersanyagellátás biztonsága.

Projektünk ezekre az egymással összefüggő kérdésekre keresi a választ, és belátható, hogy szinte valamennyi problémát megoldhatjuk, ha egy új platform molekulát definiálunk, a szén-dioxidot.

A megújuló alapú elektromos energia tárolásának legnagyobb léptékű megoldása, amikor szintetizáljuk elektrolízissel nyert hidrogénből és szén-dioxidból metánt vagy metanolt vagy a hidrogént tekintjük energiahordozó molekulának. Mindegyik megoldást vizsgáljuk rendszertechnikai eszközökkel és megállapítjuk előnyeiket és hátrányaikat. Metán és metanol esetében vizsgáljuk a nyersanyag-előállítási lehetőségeket és hatásukat az energiatárolásra.

Az energiatároláshoz a szén-dioxidot hatékonyan kell leválasztani a füstgázokból. 2018-ban záruló OTKA 112699 számú projektünk ezzel

foglalkozott, és eredményeit hasznosítjuk jelen projektünkben.

A szén-dioxid különböző formájú redukcióit kísérletileg vizsgáljuk, hogy az optimális reakciókörülményeket meghatározzuk. Ezek az energiatárolási körfolyamat alap pillérei. Ide soroljuk sikeres elektrokémiai és alga alapú szén-dioxid átalakítási kísérleteink folytatását is.

Sok kutató szerint az energiaintegráció szisztematikus alkalmazásában még óriási kiaknázatlan potenciál van. Valamennyi fejlesztésünket, kutatási eredményünket vizsgáljuk a környezetközpontú tervezés minősítésének eszközeivel.

A kutatás főbb tématerületei

1. Energiatárolás

A kutatás fontos témája, hogy megállapítsuk a megújuló villamos energia nagy volumenű, hatékony, gazdaságos és környezet-orientált tárolásának körülményeit. Ennek az alapkérdésnek a megválaszolása számos egyéb kérdésre/problémára is választ ad. Az energiatárolás nagy volumenben is alkalmazható hatékony megoldására azért van elengedhetetlenül szükség, mert az energia termelése fluktuál, függ az időjárási körülményektől és ezért nem adaptálható a fogyasztáshoz.

megoldható. Ugyanis a tervezett szén-dioxid és hidrogén reakciójával előállított energiahordozó molekula, pl. metán, metanol, szénhidrogének, alkalmas arra, hogy abból megújuló nyersanyagot készítsünk. Ez a folyamat kihat az energiatárolásra és vissza.

3. Az energiatároláshoz szükséges alapanyagok hatékony, környezetközpontú előállítása.

Amíg a reakcióhoz szükséges hidrogént megújuló elektromos áram felhasználásával végzett elektrolízisből nyerjük, addig a szén-dioxidot füstgázokból választjuk le. A leválasztásnak szintén hatékonynak kell lennie, mert az kihat az egész folyamat jellemzőire.

4. Elektrokémiai vizsgálatok.

A kutatás alapkérdése az is, hogy elektrokémiai úton sikerül-e hatékonyan átalakítani a szén-dioxidot energiahordozó molekulává. Az algákkal megkötött szén-dioxidot termikusan konvertáljuk magas

hidrogéntartalmú gázzá, melyhez vannak biztató előkísérletek.

5. Energiaintegráció

Az energiahatékonyság javításához és a környezeti emisszió csökkentéséhez az is jelentősen hozzájárul, hogy energiatárolási megoldásokkal, hogyan tudjuk csökkenteni az energia felhasználását.

6. A kutatás alapkérdéseire adott válaszaink környezeti hatásait elemezzük.

Az elemzésben az életciklus elemzést (LCA) és a PESTLE (Political, Economic, Social, Technological, Legal, Ethical/Environmental) analysis módszereit alkalmazzuk. Az MCDA (Multi Criteria Decision Analysis) eszközei is alkalmazásra kerülnek.

Mizsey Péter

2. A körforgásos gazdaság fejlesztése: új fiziko-kémiai módszerek kidolgozása technológiai hulladékvizek kezelésére és azok értékelése (OTKA-FK 131586)

A Nemzeti Hulladékgazdálkodási Terv és a 'Vegyipari szennyvíztisztítás és hulladékgáz kezelés' BREF-dokumentum előírja a Fluktuáló megújuló energiák tárolása flexibilis módszerekkel: energia és nyersanyagoktechnológiai hulladékvizek és hulladék oldószerek KOI-értékének csökkentését és az újrahasznosítási arány növelését, az eredeti, vagy más technológiába történő újra felhasználást. Manapság a kezelés egyre fontosabb, mert a kemikáliák ára megnövekedett és a szennyezések szabályozásai szigorodtak.

A finomkémiai iparban, különösen a gyógyszergyári szektorban nagy mennyiségű technológiai hulladékvíz és használt oldószer keletkezik. Elsősorban azért, mert a termelési technológiákban sok az oldási és extrakciós lépés, másrészt sokszor az újrahasználat nem lehetséges. Utóbbinak számos oka lehet, például a szabályozások nem engedik, másrésztől a leggyakoribb ok az, hogy még nem fejlesztették ki a megfelelő regenerálási technológiát.

A desztillációs és a membrános műveleteket érdemes fejleszteni a vegyipari szektor technológiai hulladékvizeinek kezelésére, mert ezek a leginkább preferált eljárások a gyakorlati alkalmazás terén. Két elválasztási eljárás továbbfejlesztése jelenti a program célját. Ez a membrános eljárások és az extraktív heteroazeotróp desztilláció (EHAD), verifikált fázis egyensúlyokkal és folyamat modellekkel.

Három fő területre lehet osztani a projektben kitűzött feladatokat: membrános és desztillációs eljárások összehasonlító értékelése (1), desztillációs (2), illetve membrános eljárások (3) továbbfejlesztése.

1. Membránműveletek és desztillációs elválasztás összehasonlítása

Több mennyiség ismert a membrános eljárások, különösen a pervaporáció hatékonyságának leírására. Ezek segítségével azonban a desztillációs elválasztás és a pervaporáció összehasonlítása nem lehetséges. Az y - x gőz-folyadék egyensúlyi (VLE) diagramot választottuk az összehasonlítás alapjának. Egy új leíró eljárást vizsgálunk meg, a VLE-adatok iterációján alapuló ún. Membrane Flash Index-et (MFLI).

2. Desztillációs eljárások fejlesztése

Sok esetben elmondható, hogy a desztillációs vizsgálatoknál nincs pontos egyezés a kísérleti eredmények és a szimulációs adatok között. Ez többnyire a pontatlan gőz-folyadék egyensúlyi adatok miatt van. A kutatás célja több két-/három-/négykomponensű elegy elválasztásának professzionális folyamatszimulátor környezetben történő validálása.

Az extraktív heteroazeotróp desztilláció olyan elválasztási eljárás, amely alkalmasnak bizonyult erősen nem-ideális folyadékelegyek elválasztására, illetve

gazdaságosabb megoldás, mint a hagyományos desztillációs elválasztások. Az eljárás kombinálja a heteroazeotróp és extraktív desztilláció előnyeit. A kutatás célja az, hogy megvizsgáljuk az eljárások szabályozhatósági tulajdonságát, irányíthatóságát.

3. Membrános eljárások fejlesztése

A pervaporációs modellek pontossága sok esetben nem megfelelő, ezért a további fejlesztésére van szükség. Membrán transzport modellt fejlesztünk tovább kísérleti adatokból és statisztikai úton meghatározott paramétereiből, növelve annak pontosságát.

Tóth András József

Közös köszönetnyilvánítás

A kutatómunka az Innovációs és Technológiai Minisztérium ÚNKP-19-4-BME-416 kódszámú Új Nemzeti Kiválóság Program, a Bolyai János Kutatási Ösztöndíj, a TUDFO/51757/2019-ITM kódszámú Tématerületi Kiválósági Program, az 112699-es, az 128543-as és az 131586-os számú OTKA pályázatok támogatásával készül. A kutatómunka az Európai Unió és a magyar állam támogatásával, az Európai Regionális Fejlesztési Alap társfinanszírozásával, a GINOP-2.3.4-15-2016-00004 projekt keretében valósul meg, a felsőoktatás és az ipar együttműködésének elősegítése céljából.

