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IYBSSD REPORT ESTONIA

About the IYBSSD2022 in Estonia

The central objective of IYBSSD2022 is to draw attention to the decisive role of basic sciences in securing sustainable development for humanity and achieving the United Nations Sustainable Development Goals.

The basic sciences are crucial not only for other scientific fields but also for the progress of all areas of life. IYBSSD2022 events have a strong educational dimension.

In Estonia, the coordination and facilitation of IYBSSD2022 activities are managed by the Estonian Academy of Sciences.

As part of IYBSSD2022, Estonia hosted five events that brought together entrepreneurs, scientists, thought leaders, and educators to collaborate, exchange insights, and incorporate scientific thinking and approaches into everyday life and activities. The vents mainly focused on problems in Energetics and in particular possibilities of Hydrogen, but also in Science Education.

Most of the events are part of series of conferences that take place in every year or 2. So the end of IYBSSD does not mean the end of putting the Basic Research and UN Sustainable Development Goals into focus in Estonia.

Synopses of some of the IYBSSD2022 events in Estonia:

1. Conference “Estonian Energy Policy: Energy Trilemma Balance”, May 30, 2022

On May 30, 2022, a conference "Estonian Energy Policy: Energy Trilemma Balance" was held at the Estonian Academy of Sciences. The conference aimed to formulate a developmental vision for energy consumers and researchers, aligning with the balancing conditions outlined by the World Energy Council (WEC). Central themes included achieving a sustainable transition and Europe's energy independence, with a focus on the critical prerequisites for these objectives. Additionally, attention was directed toward the imperative of more extensively integrating consumer preferences and possibilities into the evaluation of energy input pricing, supply security, and environmental impacts.

The prerequisite for achieving the green transition and European energy independence involves a transformation of societal attitudes, agreements on educational and research policy objectives, as well as developments in resources and technologies. Current plans to replace fossil fuels in transportation, energy production, and industry are unrealistic due to the lack of commercially viable alternative technologies, and society is unaware of the entire process's cost.

The changes taking place in the energy production structure following the active displacement of fossil fuels have already led to local energy deficit and increased market prices for energy. Because the fuel and electricity prices are no longer affordable for most consumers, they and are no longer competitive as inputs for economic activities. As a result, inflation and the cost of living have increased. The main beneficiaries of this situation are primarily exporting countries (Middle East, USA, Russia), while Europe, as an energy importer, incurs losses.

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The recommendations worked out during the conference have been forwarded to the relevant Estonian ministries, including the Ministry of Economic Affairs and Communications, the Ministry of Finance, and the Ministry of Climate. In the first half of 2024, a convened roundtable for energy consumers will address the imperative of achieving renewable energy coverage for electricity consumption by the year 2030.

Additional information can be found here (in Estonian): Konverents „Eesti energiapoliitika. Energiatrilemma-tasakaal“ – Eesti teaduste akadeemia

2. Conference “Demonstrating the Influence of Science Education in Drawing Young People to Pursue Studies and Careers in Science-related Fields”
   September 29, 2022

On September 29, 2022, an international seminar was conducted at the Estonian Academy of Sciences “Demonstrating the Influence of Science Education in Drawing Young People to Pursue Studies and Careers in Science-related Fields”.

Europe aims to transform into a smart, sustainable, and inclusive economy. The significance of quality education and training cannot be overstated in propelling sustained economic growth and sustainable development. This involves fuelling research and development and tackling challenges related to innovation, productivity, and competitiveness. Nevertheless, in the ever-advancing scientific and technological landscape, Europe is witnessing a decline in its science workforce. Frequently, school science curricula lack systematic organization across various educational levels, emphasizing isolated facts instead of providing students with immersive experiences in the practice of science.

The intended actions assume that research excellence can be achieved and maintained only if research is closely integrated with education. By committing to research-based teaching in preparing and empowering new generations of capable, competent educators, the expert seminar focused on integrating research with teaching and improving the quality of science education within international networks.

Topics discussed:

- Renewal of teacher-scientist concept
- Climate change competencies
- Contemporary research topics in school science programmes
- Essential competencies for a career in the private sector and in industry

In 2024, preparations are underway for a second conference, and the agenda and content for the event are currently in the planning stages.

Additional information can be found here: International expert seminar on ‘Evidence of the Impact of Science Education in Attracting Young People Towards Science Studies and Science-related Careers’ – Science Career Awareness (scicar.eu)

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3. Conference “The 6th Estonian Hydrogen Day: Green Hydrogen & Decarbonisation”
   October 14, 2022

On October 14, 2022, the international conference “The 6th Estonian Hydrogen Day: Green Hydrogen & Decarbonisation” was held at the Chemicum of the University of Tartu.

The aim of Hydrogen Day was to introduce the impending scientific and technical revolution to the Estonian population, encompassing professions in various fields such as transportation, agriculture, chemistry, and metallurgy. Enn Lust, the director of the Institute of Chemistry, and the Academy Member of the Estonian Academy of Sciences highlighted the ongoing fourth scientific and technical revolution, marked by the adoption of renewable energy resources like wind, solar, hydro, and pump-hydro energy.

Estonia, the European Union, the United States, and Japan have jointly escalated efforts to implement hydrogen technology in the transportation sector. Approval has been granted for three Estonian IPCEI projects (Elcogen, Skeleton, Stargate Hydrogen), securing combined funding from the Estonian government.

A joint Hydrogen Valley project for Estonia and Northern Europe has been compiled, submitted and is currently under analysis within the EU. The objective of the Hydrogen Valley project is to participate in the coordinated development of hydrogen infrastructure along with the Netherlands, Denmark, and Northern Germany. This allows for the planning of on-site hydrogen production in offshore wind farms and its transportation through pipelines or specialized vessels, known as the Hydrogen Backbone pipeline, as well as the development of a high-tech, pan-European transportation network (TEN-T), the transition of Rail Baltic and other low-traffic railway branches to hydrogen fuel.

Hydrogen is a highly environmentally friendly energy carrier when harnessed through environmentally conscious methods. In Estonia and Northern Europe, the natural conditions for electrolytic hydrogen production using wind power are highly favourable. Estonia boasts the ability to generate solar power for eight months in a year, providing a valuable resource for hydrogen production to compensate for electricity gaps during periods of low wind and sunlight. The combined potential of these sources can meet up to 90% of the energy demand. The remaining 10% is the maximum amount that would need to be stored to ensure continuous and clean electricity supply. Primary consumption devices have been developed and now require accelerated production and deployment for effective collection and conversion of wind and solar energy into electricity. Consequently, there is an urgent need for investment in these initiatives.

Additional information can be found here (in Estonian):

- Vesinikupäev 2022 – Eesti Vesinikuühing (h2est.ee)
- Kuues vesinikupäev Chemicumis (youtube.com)
- Vesinikutehnoloogia sillutab teed puhtamasse tulevikku, Tartu Ülikool

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4. Conference „ the 7th Hydrogen Day: „Hydrogen and Modern Energy Technology“,
   October 6, 2023

On October 6, 2023, „the 7th Hydrogen Day: Hydrogen and Modern Energy Technology," was hosted at the Chemicum of the University of Tartu. The event featured an overview of the current state of hydrogen technology development and existing solutions in both Estonia's private and public sectors, as well as in the Baltic States. Additionally, the event highlighted the production capacity of green hydrogen and outlined prospects for infrastructure development.

Hydrogen-based energy technologies play a significant role in the comprehensive suite of renewable energy solutions in Europe. With the support of the European Union, hydrogen solutions are making their way to everyday use in vehicles, buses, trains, and ships. Hydrogen technology holds a crucial position in Estonia's transition to a climate-neutral economy. Both the private and public sectors express interest in advancing developments in this field.

In Estonia, a challenge arises from the restricted production and storage of renewable energy, impeding the development of a green hydrogen supply chain. To overcome these hurdles, it is vital for both nations and energy companies to invest in the creation of new wind and solar parks.

Additional information can be found here (in Estonian):

- Vesinikupäeval tutvustatakse vesinikutehnoloogia värskemaid arengusuundi Eestis ja maailmas | Tartu Ülikool
- Seitsmes vesinikupäev | Tartu Ülikool (ut.ee)
- UTTV (recording of the conference)

5. Summer School 2022 of the Graduate School of Functional Materials And Technologies (GSFMT): “Modern Technologies for Green Future” was held in Pärnu on July 5–7, 2022

Program of the international Summer School can be found here:

Graduate School of Functional Materials and Technologies (GSFMT)

In addition Academy Member Jüri Engelbrecht delivered a presentation at the Conference “Basic Sciences and Sustainable Development”, September 20–22, 2022, Belgrade

On September 20–22, 2022, Academy Member Jüri Engelbrecht represented the Estonian Academy of Sciences at the IYBSSD2022 World Conference on Basic Sciences and Sustainable Development in Belgrade. He delivered a presentation and moderated two of the Conference sections.

In his talk Jüri Engelbrecht discussed the transmission of signals in nerves and the modelling of associated processes (including classical, dynamic, and thermodynamic modelling). He underscored the importance of adopting a broader perspective, termed the "ensemble of waves," to comprehensively understand phenomena occurring in nerves. The developed mathematical model represents an effort to integrate all measurable effects of nerve signal propagation into a cohesive system, emphasizing the crucial role of fundamental

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sciences in developing coherent models. This approach is interdisciplinary, intersecting physiology, physics, and mathematics, and emphasizes the influence of physics in shaping signals within nerves. In other words, such an approach is an example for analysing complex processes in Nature.

The co-authors of the presentation were Kert Tamm and Tanel Peets from the Institute of Cybernetics, School of Science, Tallinn University of Technology, Estonia.

Additional information about the talk can be found here: World Conference on Basic Sciences and Sustainable Development – World Academy of Art and Science