

PPP Program Initiative of Ukraine “Resource materials”

Internationalisation of the Ukrainian
National Platform on Advance Materials

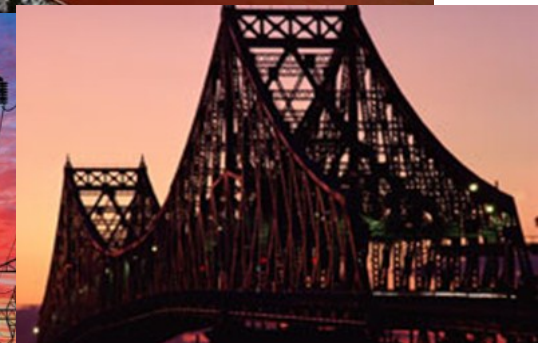
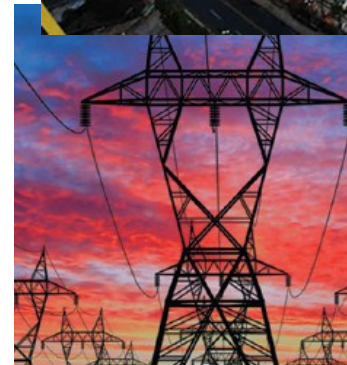
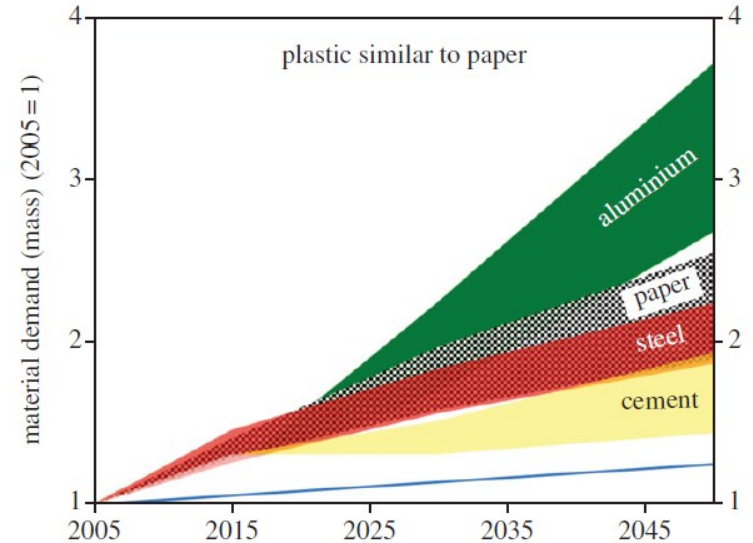
**Prof. Andrey V. Ragulya,
Vice-director of IPMS NAS of Ukraine**

Foreword

- Ukrainian National Technology Platform on Advanced Materials (UNTPAM) had been launched in Ukraine within the FP7 funded project BILAT-UKR*AINA as one of the Pilot activities (2013-2015).
- In 2016 under support of Ministry of Economy and Trade and Ministry of Education and Science of Ukraine, National academy of sciences of Ukraine proposes the Cross-cutting Programme Initiative “Advanced long lasting resource materials for transport, energy, medicine and environment protection – "RESOURCE MATERIALS"” considered
a PPP initiative of the HORIZON 2020 programme of the European Union in the period 2018-2020.

GLOBAL CHALLENGES

- Population is growing in the World and the increase in demand and consumption, mining and processing of material resources is likely to double over the next 40 years.
- Mineral resources are limited, thus ... Mankind is looking for materials that meet the scientific and technical requirements of continuous operation for a long life, long duration determined by reducing their technical, and economic parameters to a critical level, and pollution below acceptable standards, and so on.
- European Safe Life Concept is in the deep contradiction with real aging infrastructure across Europe (including Ukraine). Recently it has been stated in FP7 SafeLifeX project «Extension management of aged infrastructure networks and industrial plants»



4-th Industrial Revolution requires System Approach:

Demographic & Socio Factors: Population is growing in the World to 9 billion people and the increase in demand and consumption of novel materials withstanding longer service under higher loads or speeds.

Technocratic Factors: Human impacts on the environment in terms of production /consumption irreversibly worsen. We need technical merits to prolong further exploitation of obsolete industry, services and infrastructure and better to substitute them by new solutions.

[1] Material efficiency: A white paper by J.M. Allwood, M.F. Ashby, T.G. Gutowski, E. Worrell
Department of Engineering, University of Cambridge, Trumpington Street, Cambridge CB2 1PZ,
United Kingdom // Resources, Conservation and Recycling 55 (2011) 362–381,

[2] J.M.Allwood, M.F.Ashby Sustainable Materials, 2012 UIT Cambridge Ltd.



Questions from nearest future

- Do we need sustainably operating transport corridors connecting EU with 4Billion Asia ?
- Do we really wish to have safely operating energy conversion and supply system ?
- Do we want to develop fully automated industry facilities operating with minimal human impact ?
- If YES! Which materials all these things are to me made from ?

Sure, not from those kept in gran-dad's backroom.

Definition

- One of the most integrated characteristics of these materials has been and remains a resource of their service under given conditions of exploitation.
- **We define the RESOURCE MATERIALS as reliable smart materials of new generation, which meet the scientifically and technically sound requirements of pre-assigned resource objects of long-lasting continuous operation.**



Challenges specific for Ukraine

Segment of market for **RESOURCE MATERIALS** (other words Smart Specialization) and Strategy of it's development has not been formed yet in the World – thus, Ukraine has a chance to start forming it first through the initiation and implementation of the EU Program in Horizon 2020 overcoming several barriers:

- There are scientists, but scattered...;
- There are plants and enterprises, but each remains de-focused...;
- There are IPRs and technologies, but scattered and non-systematic...;
- There is powerful transit potential, but not used properly...;
- There is an economically justified need for construction of new infrastructure in the segments of transport, energy, industry of Ukraine as a part of the European infrastructure, but ... lacks the support of the Government;
- Transformation requires concentration of resources : power, scientists and industry (Customers, Developers, Manufacturers and End-users) to solve a complex problem - creating the segment of market named “Materials for Infrastructure” (**RESOURCE MATERIALS**) to meet requirements of the Global market and Global Challenges to receive Smart specialization in the EU market!
- Transformation of new Infrastructure, including transit one, to customer of **RESOURCE MATERIALS**.

Great potential of Ukrainian Materials Science & Materials Technologies - DEVELOPING

National Academy of Sciences

2000 DSc., PhD in 12 research institutes:

Frantsevich Institute for Problems in Materials Science
Paton Electric Welding Institute
Institute of Single Crystals
Institute of Scintillating Materials
Bakul Institute of Superhard Materials
Karpenko Physico-Mechanical Institute
Physico-Technological Institute of Metals and Alloys
Kurdyumov Institute of Metal Physics
Galkin Institute of Physics and Engineering
Vernadsky Institute of General and Inorganic Chemistry
Chuiko Institute of Surface Chemistry
Kharkiv Institute of Physics and Engineering

High School

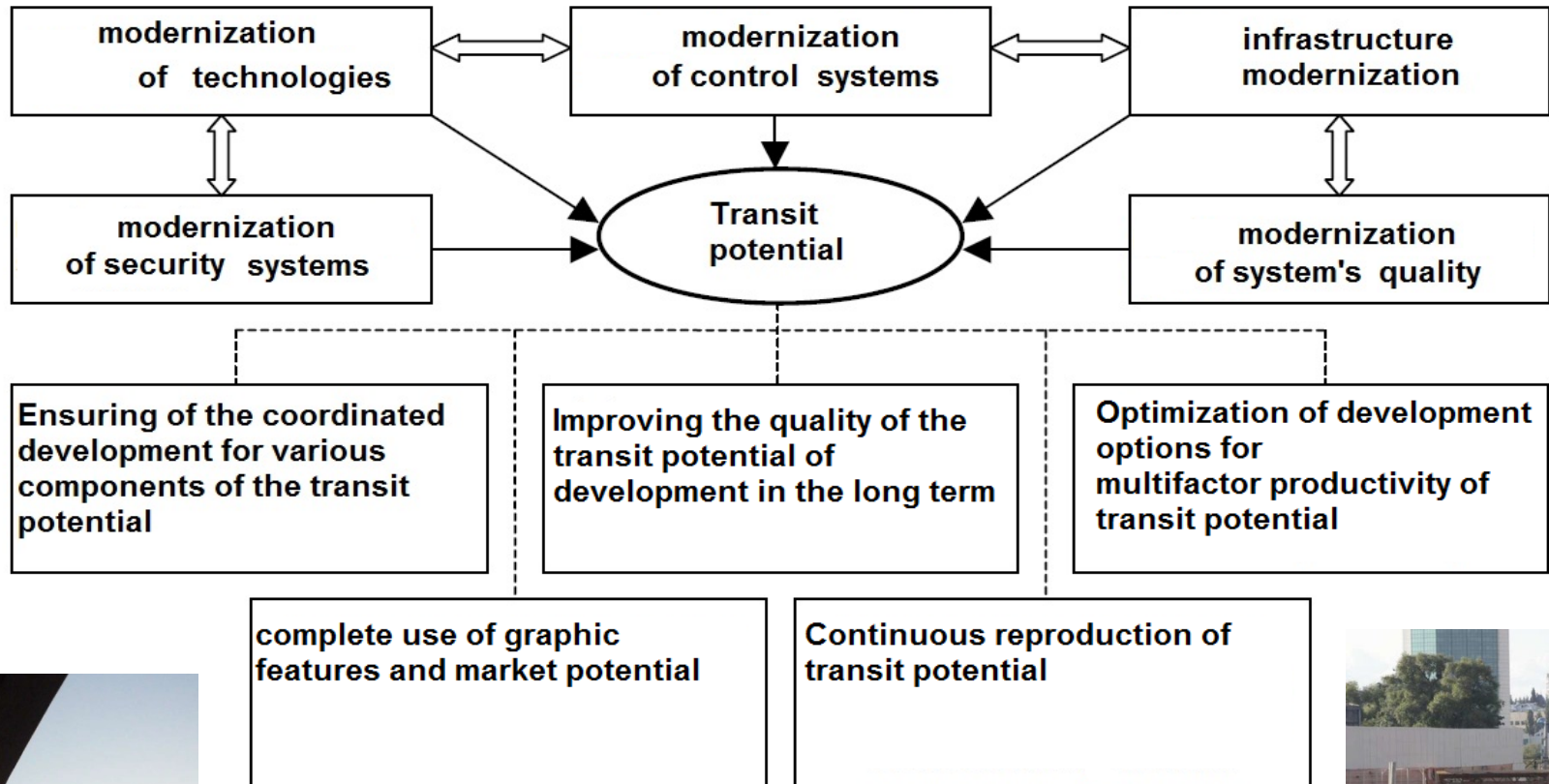
1000 DSc., PhD in 10 universities:

Shevchenko National University (Kiev)
National Technical University (KPI)
Karazin National University (Kharkiv)
National Technical University (Kharkiv Politechnic University)
National University Lvivska Polytechnica
Franko State University (Lviv)
National Aviation University (Kiev)
Donetsk National Technical University
Dnepropetrovsk National University
Kiev National University of Technology and Design
Kramatorsk Technical University

Industrial potential of Ukraine - MANUFACTURING

- Ferrous metals plants, Steel mills;
- GOKs, Processing plants;
- Non-ferrous metals plants;
- Heavy mashinery companies such as Turboatom, NKMP;
- Manufacturers of electrical equipment;
- Enterprises for high-tech ceramics;
- The chemical industry and the production of polymers;
- Manufacturers of vehicles;
- Construction (roads, railways, industrial infrastructure, utility networks);
- Manufacturers of cement and other building materials;
- Antonov Aircraft Company; Motor-Sych, Design Bureau “Progress”
- Design Bureau “Yuzhnoe”;
- Energy Generating companies;
- ENERGOATOM;
- **Totally more than 6 million jobs**

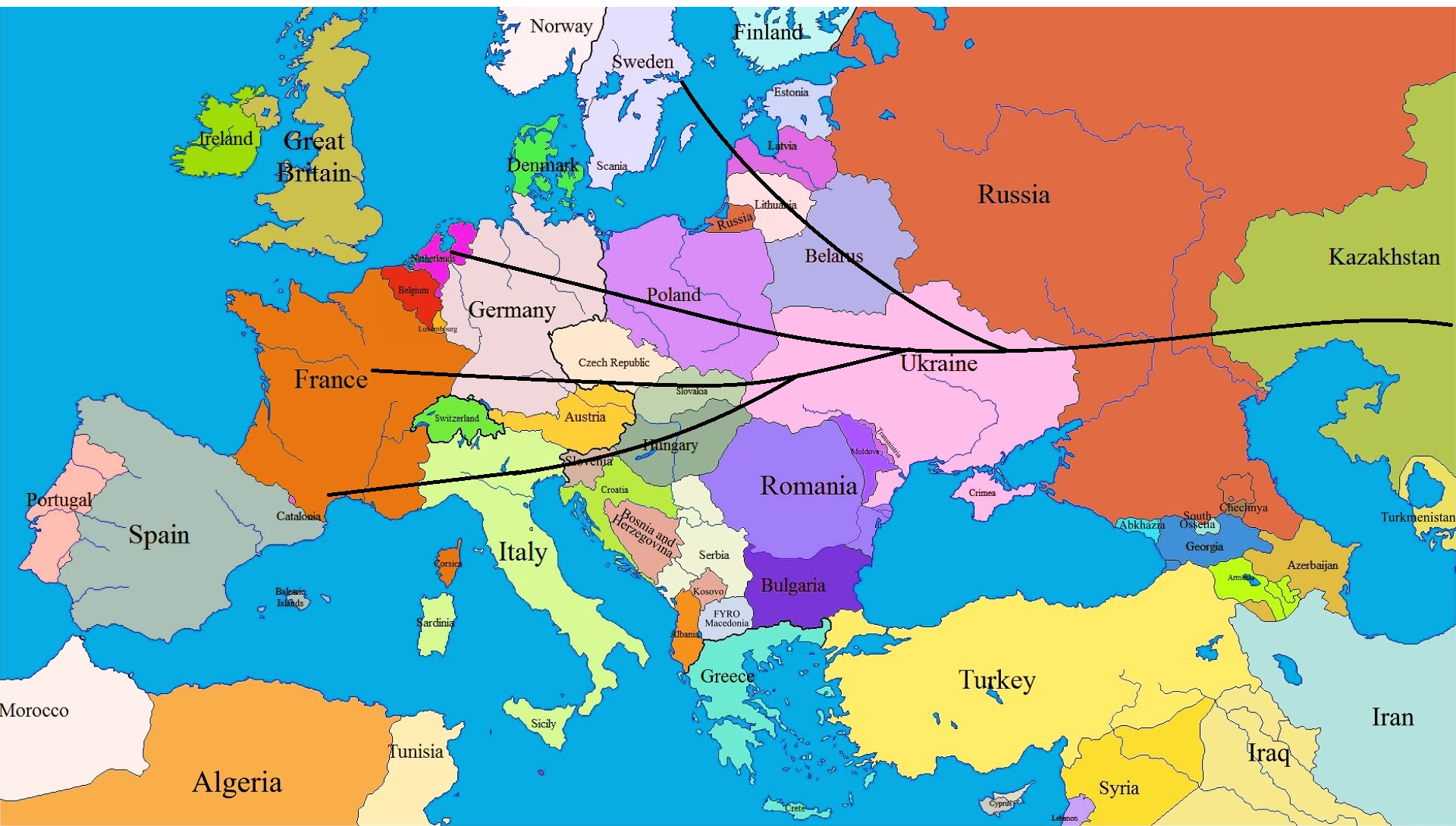
Transit potential of infrastructure in Ukraine - the largest segment of Resource Materials consumption



Transit infrastructure of Ukraine

- **Ukraine is working over strengthening the position of a transit country.**
- **Ukrainian transit with powerful function is an important factor in the economic development of the EU and strengthening geo-economic and geopolitical position of the EU in the world.**
- **Ukraine is an important transit link in the organization charts in Eurasia, creation and development of international transport corridors.**
- Transportation and road complex country significantly out of date, and must be reconstructed to meet international and European standards.
- Realization of transit potential is closely linked to the operation of international transport corridors.
- Development of Ukrainian infrastructure can not be considered separately from the process of its economic integration in the EU.
- The technical state of vehicles and infrastructure, the level of provision of infrastructure, energy supply and other technical resources and transit consumption depends on the **RESOURCE MATERIALS OF EXTENDED OPERATION IN INFRASTRUCTURE.**
- Based on the systematic theoretical and empirical data it should be defined the objectives for development a dominant strategy: to ensure a high level of functioning of the transport sector; a competitive feasibility of transit (based on international agreements and standards); improve the economic efficiency of the transit sector; adherence to standards of national security, protection of national interests and economic independency of Ukraine.

Transit corridors of New Silk Way



Advanced Long-Lasting RESOURCE Materials for Transport, Energy, Medicine and Environment Protection

Cross-Cutting Program Initiative
**“RESOURCE MATERIALS” in the framework of
Public - Private Partnership (PPP)
in the period 2018-2022**

The proposition of the Materials research community of UKRAINE

Interests of Ukraine

- Innovative and integrated Science and Education ...
- **New infrastructure of industry, transport, energy, which is constructed from materials made in Ukraine;**
- Reconstructed industry;
- Changing the structure of the industry;
- The new infrastructure of cities, villages, industrial and transport hubs;
- **Participation in transit Megaproject "New Silk Road" between China and the EU;**
- Create a new transport infrastructure that meets the standards of China's high-speed and EC (electric vehicles, high-speed trains, highways, etc.);
- **The Energy Strategy coordinated with the EU;**
- New energy-generating capacity, energy-accumulating systems, energy-converting systems, improving energy consumption;
- The new system of environmental protection and recycling

Interest of EU in PPP «Resource Materials»

- New segments of materials, technologies and services.
- At least - in Ukraine. As a maximum - New Silk Road
- Infrastructure development EU
- Competitive materials and technologies outside the EU
- Technology and construction of a new level
- Highly skilled jobs in the EU
- New jobs in the EU, developing countries and in Ukraine
- Reducing the social tensions caused by migration
- Reducing the probability of industrial accidents in the EU, developing countries and on the borders of the EU

Purpose of PPP Resource Materials:

The overall objective of the program is creating new materials segment, critical products and components of products that have increased life service infrastructure energy, transportation, medicine and environmental protection through the implementation of the results of systematic research, implementation of production technologies and subsequent commercialization.

- **The segment of materials for infrastructure that is of €2-3 trillion cost.**

Connections with PPP Resource Materials

Public Private Partnerships	EU (H2020)	Private Partners
Innovative Medicines Initiative 2 (IMI2)	1 638	1 425
Fuel Cells and Hydrogen 2 (FCH2)	665	380
Clean Sky 2 (CS2)	1 755	2 194
Electronic component and systems (ECSEL)	1 185 (+1170 from MSs)	1 657
Bio-based Industries (BBI)	975	2 730
Shift2Rail (S2R)	450	470
European ATM system (SESAR)	585	1 000
RESOURCE MATERIALS	1 000	1 000



SUSTAINABLE DEVELOPMENT GOALS

17 GOALS TO TRANSFORM OUR WORLD

Goal 9: Build resilient infrastructure, promote sustainable industrialization and foster innovation

- Investments in infrastructure – transport, irrigation, energy and information and communication technology – are crucial to achieving sustainable development and empowering communities in many countries.
- **Without technology and innovation, industrialization will not happen, and without industrialization, development will not happen**
- **90 trillion will be invested into infrastructure worldwide for 15 years** that is \$ 6.7 trillion annually in accordance to report *“Driving Sustainable Development Through Better Infrastructure: Key Elements of a Transformation Program (Global Economy & Development”*, Working paper 91, July 2015 under Ed. Lord Stern).
- All the above is a prerequisite for public-private partnership that can be implemented under the PPP program of interdisciplinary initiative "Resource Materials" under Horizon 2020.
- **Development, manufacture and commercialization of resource materials could be part of SMART SPECIALIZATIONS for UKRAINE in EU**

What do we need from EU now

- Information on stakeholders for PPP Initiative Resource Materials :
 - developers
 - manufacturers
 - consumers, end users
- Information on EU markets as for obsolete infrastructure as for novel one
- Consultations and Partnership on promotion of PPP Initiative Resource Materials in Horizon 2020