



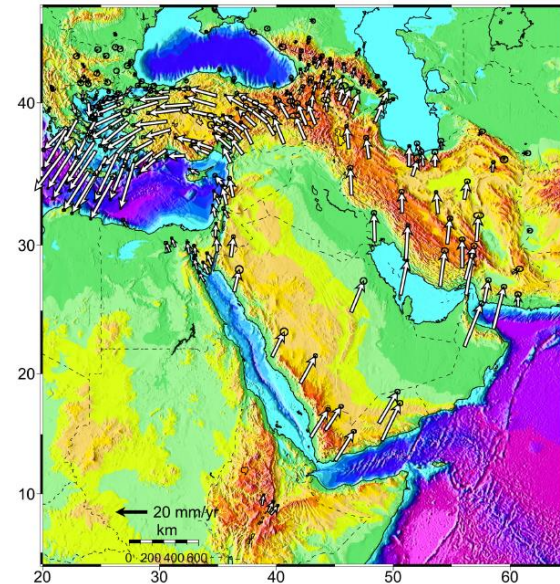
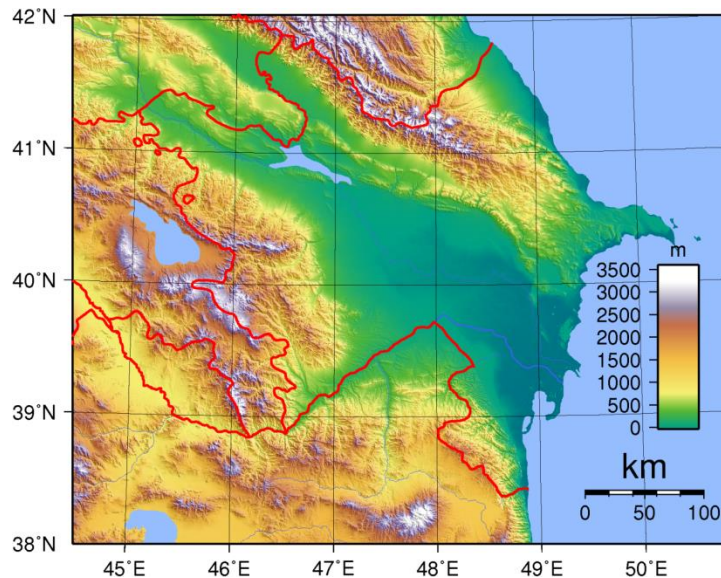
Azerbaijan: Practice and prospects of RES

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Azerbaijan



Located along the Caspian sea.
Total Area: 86,600 sq. km.
Major Geographic Units:
Caucasian Mountains
Kura Araz River Basin
Caspian Region (Absheron Peninsula)

Geology :
Caucasus – Result of northwards motion of Arabian Plate.
Caspian – Remnant of ancient Tethys Ocean.



Azerbaijan and Global Economy

Energy production

Oil

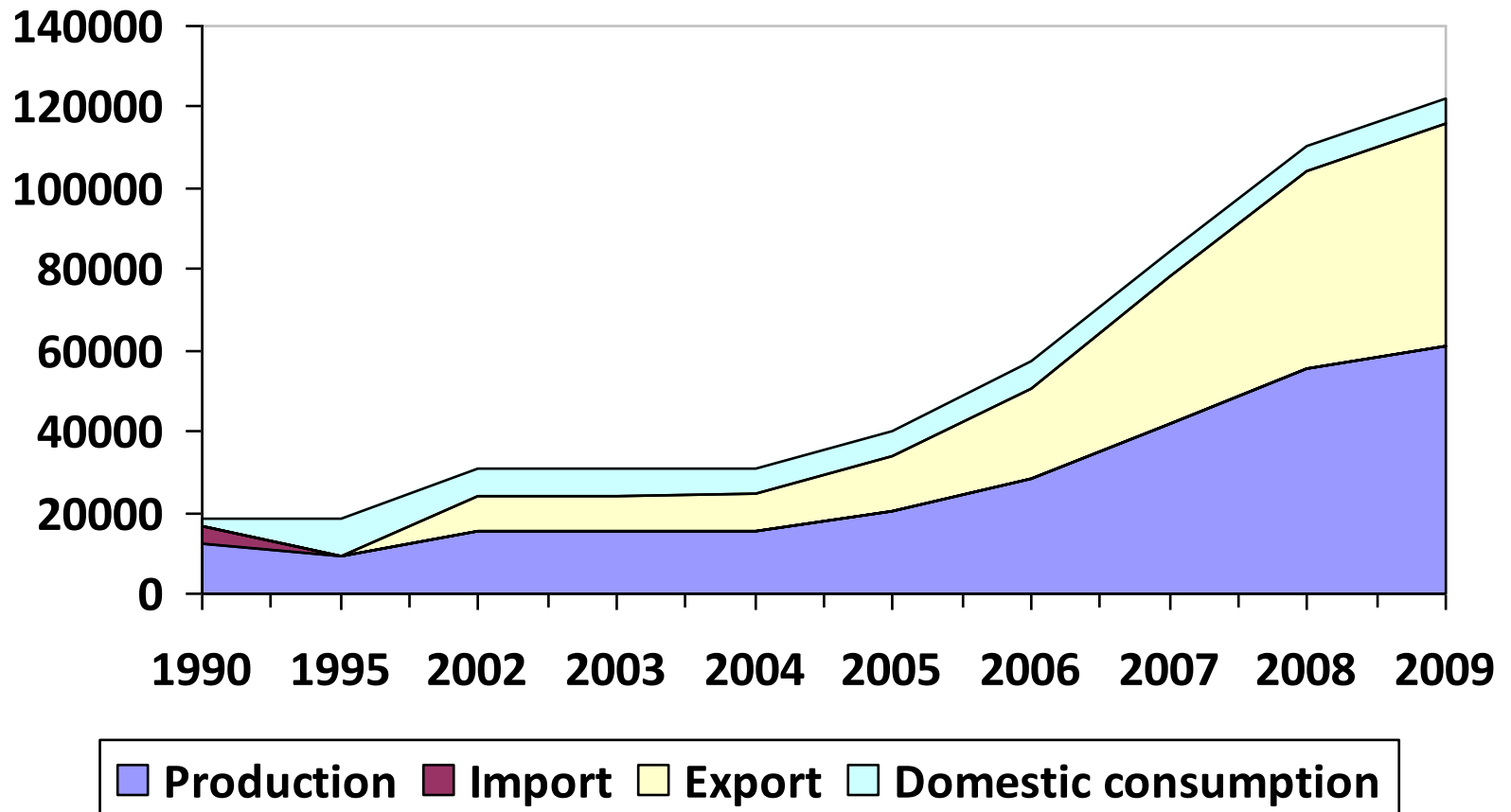
Gas

The Baku-Tbilisi-Ceyhan pipeline





According to experts' forecast Azerbaijan will be one of the hydrocarbon importers by 2025





Environmental challenges

At present, Azerbaijan has serious environmental problems due to intensive development of the region's hydrocarbon resources, increasing amount of consumed fossil fuels and greenhouse gas emissions.

According to calculations, as a result of future developments the amount of hydrocarbons emitted by oil-gas sector will amount to 80-85% of total emissions in the republic. It is expected that compared to 1990 in 2025 the level of hydrocarbon emissions only will be 1,8-2,0 times higher.

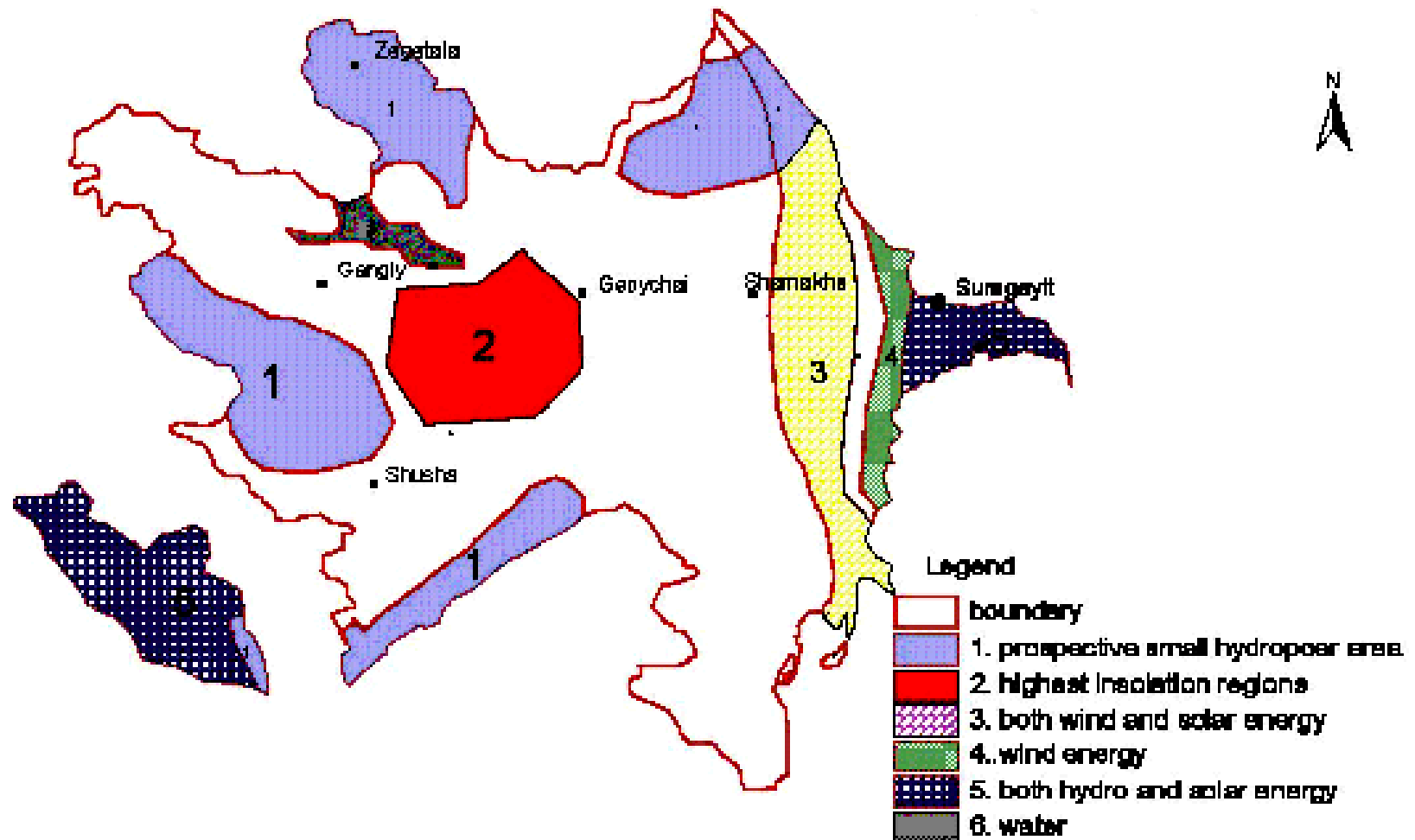


About 25 thousand ha of the Absheron peninsula are occupied by destroyed oil-polluted and bituminous lands.

About 30% of coastal water is polluted complexly. 50, 6 % of rivers with a total length of more than 100 km belongs to the category of polluted rivers.



The map of renewable energy sources of Azerbaijan



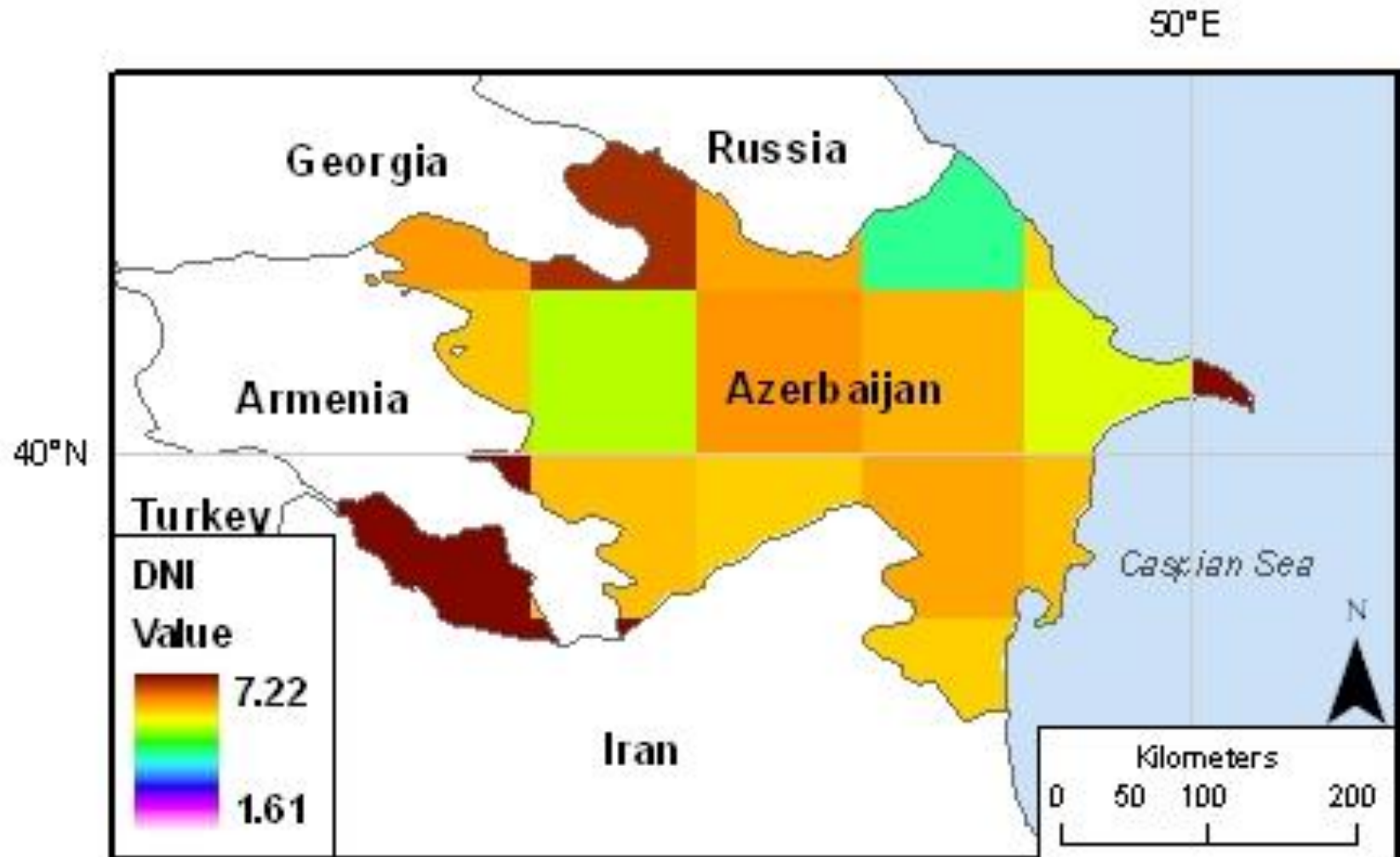


Renewable energy resources of Azerbaijan

- **The number of sunny days-250 per annum: changing from 2210 to 2700 hours and from 865 to 1000 hours in summer and winter periods, respectively. In some regions, the quantity of annual solar radiation is about 4.7 kWh/m²/day. The highest insolation has been observed in Absheron peninsula and Nakhchivan Autonomous Republic.**
- **Wind energy reserve - up to 2.4 billion kWh of electricity**
- **Hydro energy potencial, including 5 billion kWh of small-hydro potential - up to16 billion kWh**
- **Biomass potential -14.400 km of the republic's territory**



Azerbaijan solar map





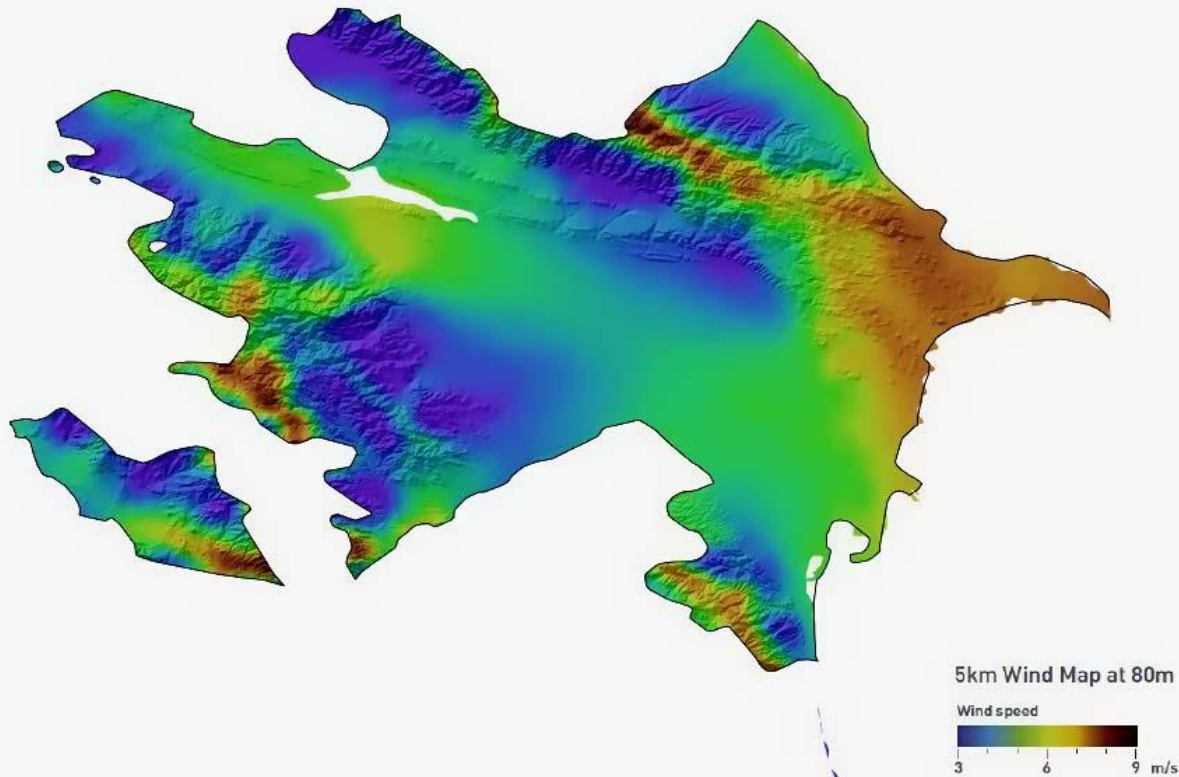
Three locations of intensive solar radiation in Azerbaijan: Pirallahi-Island, Minguechaur and Nakhichevan

Location	Pirallahi-Island	Minguechaur	Nakhichevan
Jan	176	178	221
Feb	228	234	297
Mar	378	361	456
Apr	552	503	565
May	737	667	714
Jun	804	712	812
Jul	801	722	850
Aug	707	632	769
Sep	512	458	609
Oct	403	345	439
Nov	222	196	279
Dec	159	150	193
Yearly	5679	5158	6204



Azerbaijan wind map

Azerbaijan Wind Map
at 80m





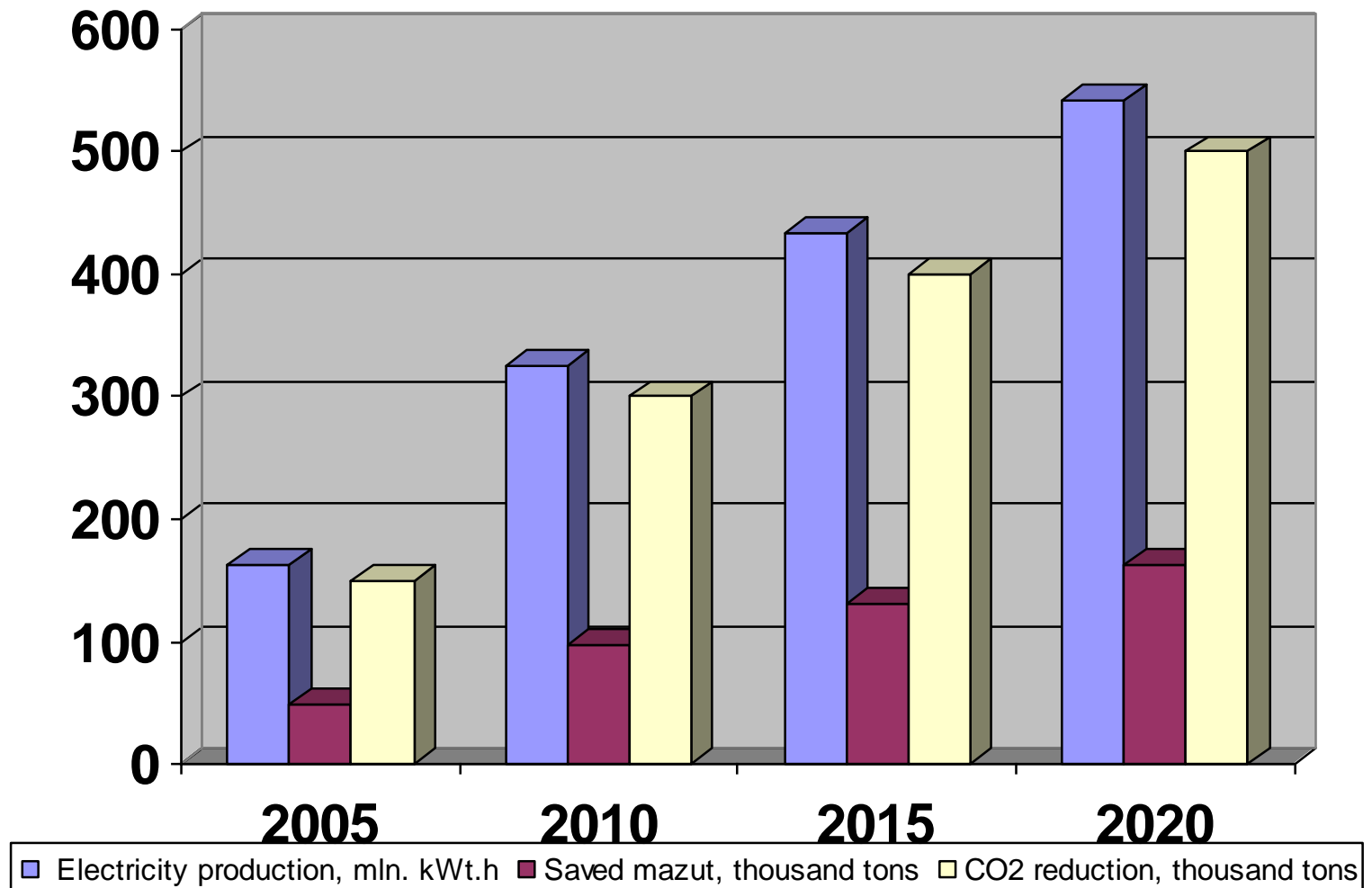
Convenient windy conditions prevail in:

- **Absheron Peninsula (7.9-8.1 m/sec)**
- **Caspian seashore and islands in the north-west of Caspian basin**
- **Ganja-Dashkesen zone**
- **Sharur-Julfa area of the Nakhchevan Autonomous Republic (3-5 m/sec)**

Two wind turbines have already been constructed in Yeni Yashma area of the Absheron peninsula. In addition, a 3.5 MW Pilot Project and a 50 MW wind farm project are being implemented.

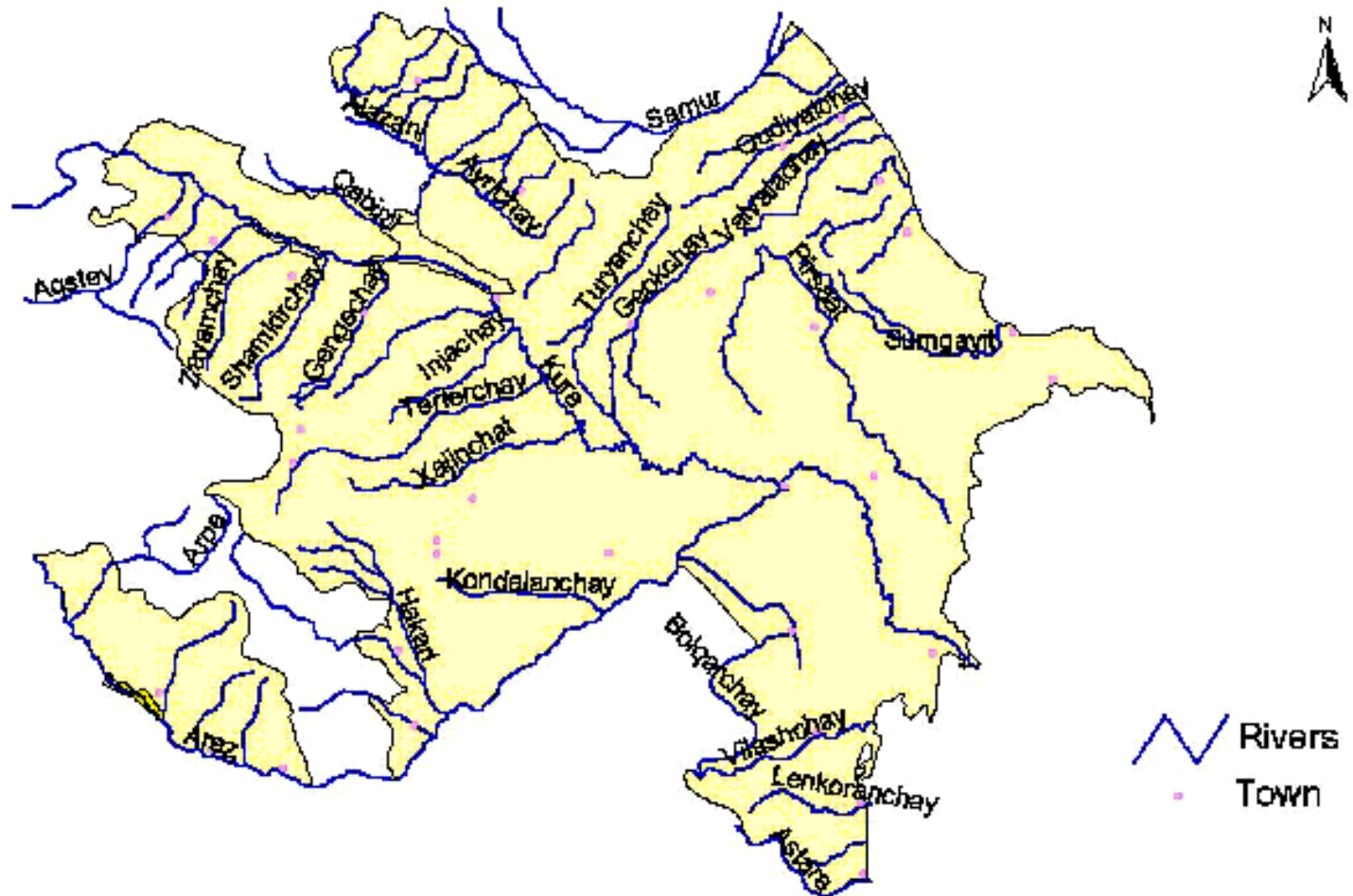


The long term forecast of efficiency of wind energy potential use





Map of Azerbaijan rivers





Overall hydropower potential of Azerbaijan rivers – up to 40 billion kWh.

The technically feasible potential - 16 billion kWh, including 5 billion kWh of small hydropower plants.

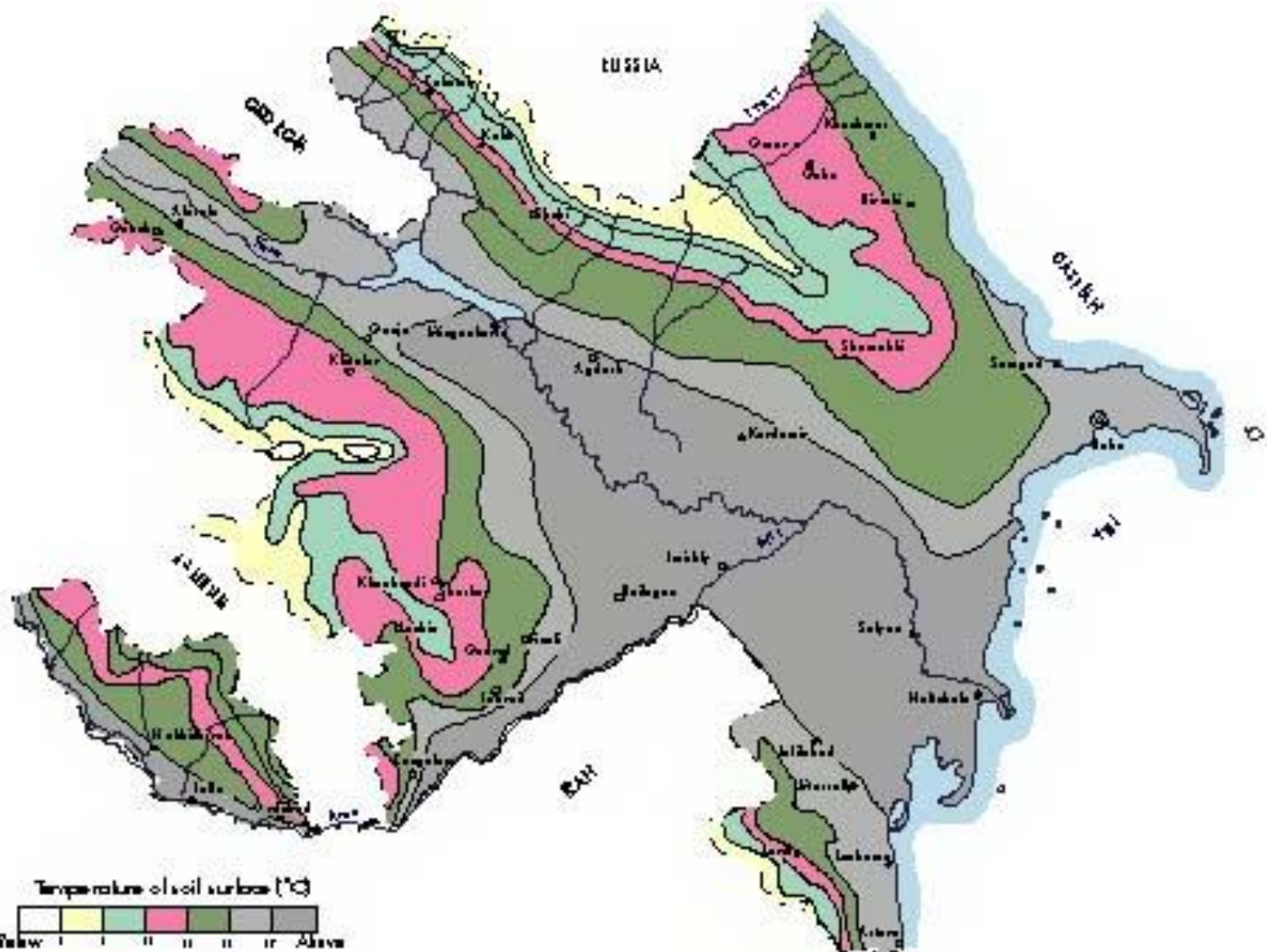
Water resources of Azerbaijan are presented by:

- the lower reaches of the Kura River with its multiple tributaries**
- the Aras River (the Kura tributary), which is on the border a group of creeks inflowing into the Caspian Sea**

It is possible to locate dozens of small hydro power plants on rivers and water facilities and these plants can generate about 3.2 billion kWh annually.



Geothermal resource map of Azerbaijan





There are around 200 grids of mineral water sources in the country and about 1,000 of them are springs including those with hot water.

The locations of high-temperature springs of thermal waters:

- Lesser Caucasus**
- Talish region**
- Great Caucasus.**

Thermal resources with water temperature of 135°C were discovered in the Absheron peninsula.



Bioenergy resource

The sources of biomass in the country:

- combustive industrial wastes**
- wastes of forestry and wood-working**
- agricultural and organic wastes**
- domestic and communal wastes**
- wastes from areas polluted with oil and oil products**



More than 2.0 million tons of solid domestic and production wastes are annually released to waste treatment sites. Utilization of solid domestic and production wastes would partially resolve the problems in heating public buildings in Baku and other large industrial cities.

Azerbaijan government plans construction of a waste incineration plant in Balakhani settlement of Baku.

A number of projects have been developed for biogas production in rural regions. Research into this field has conducted by local specialists. several biogas plants have been installed in the mountainous regions of the republic. But the industry is still remaining in its infancy.



Existing barriers

The main barriers are:

1. Financial

- **Lack of local and foreign investment**
- **Lack of long-term credits**
- **Lack of interest and governmental support of renewable energy development due to favorable status of the power lobby in the country, and the dominance of the oil and gas industry;**
- **High cost of equipment used in renewable energy systems;**



2. Institutional

- Lack of legal and regulatory framework to promote and support technology applications that allow to benefit from renewable energy sources**
- Lack of a comprehensive tariff methodology reflecting a clearly stated strategy on the nature of energy production.**



3. Informational

- Lack of information about technologies and their use**
- Lack of information about advantages (financial, social and environmental) and profitability of renewable energy technologies**
- Lack of reliable information about the reserves of renewable energy resources.**



Policy reforms needed

- **Development and adoption of a legal-regulatory basis according to advanced world practice to involve foreign investment in RES Development**
- **Development and approval of financial schemes of energy efficient and environmental friendly projects**
- **Effective use of priority repayment mechanisms and obtaining of additional investments in the implementation of renewable energy projects**



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- **Implementation of a strategic investment policy including an investment incentive scheme to involve large international investments in RES Development to serve the non-oil-sector with capital and technological knowledge**
 - **Involvement of the private sector in renewable energy infrastructure development**
 - **Development of legal framework conditions for regional and international cooperation on renewable energy development**



IEA: Background Information

In 1990, with support from National Academy of Sciences and State Planning Committee of Azerbaijan Republic, the Scientific-Manufacturing Association "Gunesh" was established by a dedicated resolution of Cabinet of Ministers of Azerbaijan Republic. The mission of the Association was to promote the latest achievements of science and technology in effective utilization of conventional and renewable energy resources while protecting the environment and human health.

In 1994, the International Ecoenergy Academy (IEA) was founded on the basis of Scientific-Manufacturing Association "Gunesh".

The National Academy of Sciences of Azerbaijan Republic, Association "Gunesh", Clean Energy Research Institute of USA, Russian Academy of Architecture and Construction, Russian Association ABOK are the co-founders of the IEA.



The main activity areas include:

- 1. Research into fundamental problems of renewable and environmentally clean energy development and application**
- 2. Research and monitoring of environmental impacts of oil field developments upon the ecosystem of Caspian Sea and Absheron peninsula, to ensure the sustainable development of the Caspian region**
- 3. Research of environmental problems associated with contamination of the air, water and land resources caused by anthropogenous factors**
- 4. Promotion of the development and application of modern environmental standards in partnership with relevant governmental agencies**
- 5. Dissemination of knowledge on modern concepts of sustainability and achieving of ecological balance on the global scale, through organization of joint seminars and training courses in cooperation with national and international partners**
- 6. Development and implementation of academic projects in the filed of environmental protection and energy security.**



The main projects developed for RES use:

Basics of Azerbaijan Energy Development for Period through 2010

- **Application of Solar Collectors in Power Supply**
- **Feasibility Study of Wind-Electric Conversion Systems for Offshore Oil Platforms in Azerbaijan (in cooperation with TrentoUniversity, Italy)**
- **Automated Energy Supply, Conditioning and Regular Microclimate Controlling Systems**
- **Hydro-Hydrogen Pilot Project for Guba-Khachmaz Region, Azerbaijan Republic (in cooperation with UNIDO-ICHET)**
- **Use of Hybrid Alternative Energy Systems in Mountainous Khinalig Village, Guba region, Azerbaijan**



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Engineering Report



HYDRO HYDROGEN PILOT PROJECT FOR NIYAZOBA, KUBA-KHACHMAS, AZERBAIJAN

**Prepared by
Prof. Fegan Aliyev**

**Project director
prepared for
UNIDO-ICHET**

**(United Nations Industrial Development Organization-
International Centre for Hydrogen Energy Technologies)**

November 2005



The main advantages derivable from the project:

The combustion of H₂ used as fuel will contribute to reducing the amount of GHG, mainly CO₂

- **The hydrogen produced in Niyazoba may be used for many commercial purposes including: commercial fixation of nitrogen from the air to produce ammonia for fertilizer; methanol production, hydrodealkylation, hydrocracking, hydrodesulphurization, metallic ore reduction and superconductivity study, etc.**
- **It will provide large employment opportunities in rural Azerbaijan**
- **Hydro-electric plants do not emit any of the standard atmospheric pollutants such as carbon dioxide produced by fossil fuel power plants.**



Project: Hybrid renewable energy system for mountainous Khinalig village



**INTERNATIONAL
ECOENERGY AKADEMY**

PROJECT

**CREATION OF HYBRID
RENEWABLE ENERGY SYSTEMS
FOR
ELECTRICITY AND GAS SUPPLY
PURPOSES IN KHINALIG VILLAGE
OF QUBA DISTRICT
OF AZERBAIJAN**

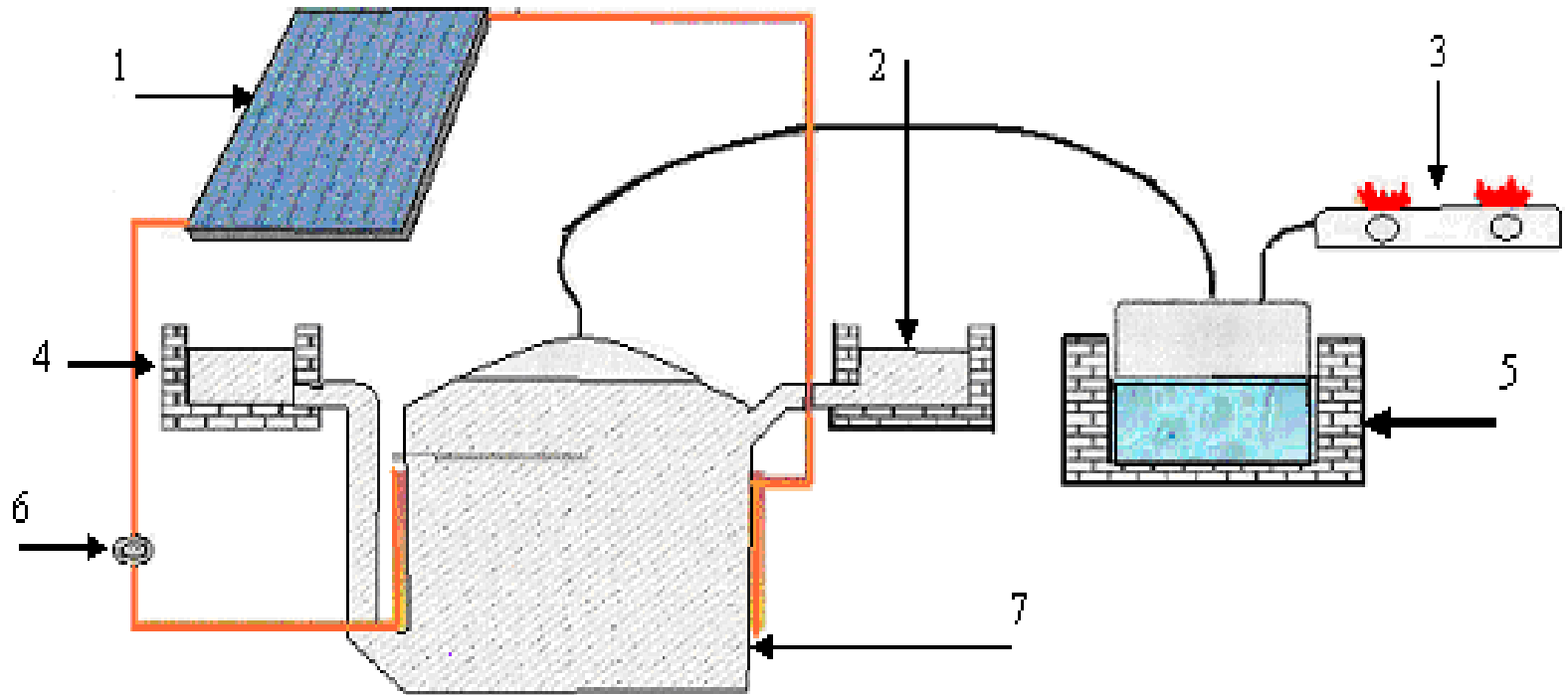
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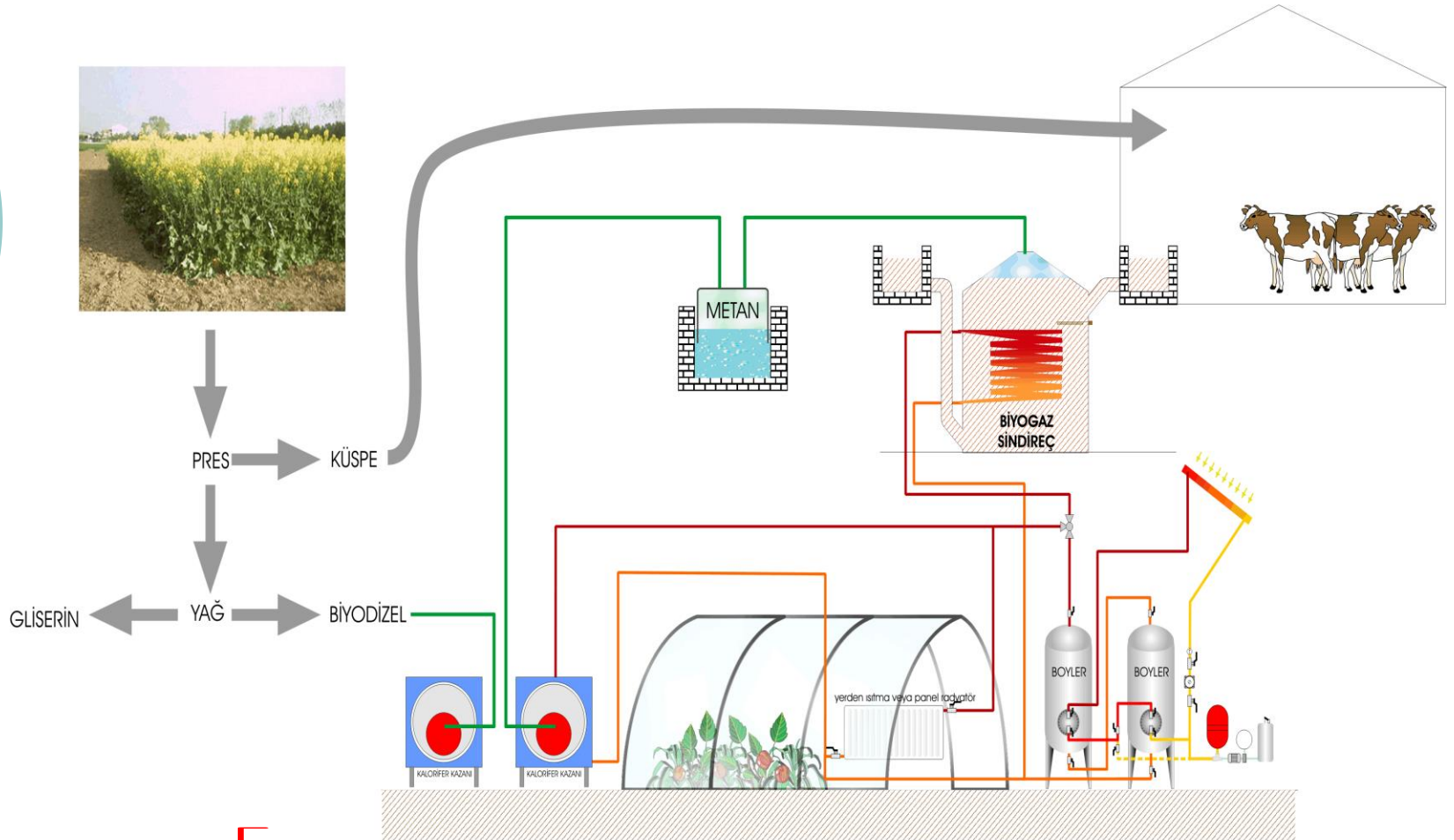


Hybrid solar-biomass system



Block –scheme of working model of biogas production system (1 – solar collector , 2 - 4 - biomass reservoir, 3 – gas appliance, 5 – gas storage container , 6 – liquid pump, 7 – biogaz production tank)

Biogaz-biodizel-solar system



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**THANKS A LOT
FOR YOUR ATTENTION**