UNITED NATIONS

ECONOMIC COMMISSION
FOR EUROPE

COMMITTEE ON
SUSTAINABLE ENERGY

ENERGY MIXT
IN POLISH ENERGY SYSTEM

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GENEVE
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WHY COAL IN POLAND?

POLAND HAS ONE OF THE BIGGEST RESSOURCESS OF COAL IN EUROPE (HARD COAL AND LIGNITE)

COAL WARRANTS TO POLAND:

- HIGH LEVEL OF ENERGY SECURITY
- LOWEST COSTS OF ELECTRIC ENERGY PRODUCTION
- LOWEST COSTS OF HEAT PRODUCTION (CHS AND INDIVIDUAL HEATING)
- LOW LEVEL OF ENERGY POVERTY
- COMPETITIVENESS OF ECONOMY (INDUSTRY)

MOREOVER:

- LIMITED POSSIBILITIES OF IMPORTATION OF NATURAL GAS IN RATIONAL PRICES (LNG TERMINAL UNDER BOOT-UP)
- FULL IMPORT DEPENDANCE OF CRUDE OIL AND NUCLEAR FUEL
- LIMITED POSSIBILITIES OF IMPORTATION OF THE ELECTRICAL ENERGY – LACK OF THE TRANSBORDER CONNECTIONS (UNDER CONSTRUCTION)
- LIMITED NATURAL POSSIBILITIES OF THE RENEVABLE ENERGY PRODUCTION (MAX: 15 – 16 %)

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ENERGY SECURITY

POLAND - IMPORT DEPENDANCE BY SOURCES

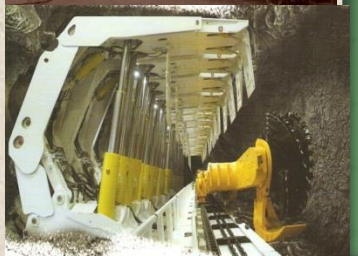
•NATURAL GAS	69,3 %	(9,5 bln m3)
•CRUDE OIL		99,5 %
•NUCLEAR		100 % ??

TOTAL IMPORT ENERGY DEPENDANCE FACTOR (2013)

•POLAND	25,8 %
•DENMARK	12,3%
•CZECH REPUBLIC	27,9%
•UK	46,4%
•FRANCE	47,9%
•FINLAND	48,7%
•AUSTRIA	62,3%
•GERMANY	62,7%
•SPAIN	70,9%
•ITALY	76,9%
•EU 28	53,2%

HARD COAL IN POLAND

- UPPER SILESIA COALFIELD
- LOWER SILESIA COALFIELD
- LUBLIN COALFIELD
- 25 actives coal mines



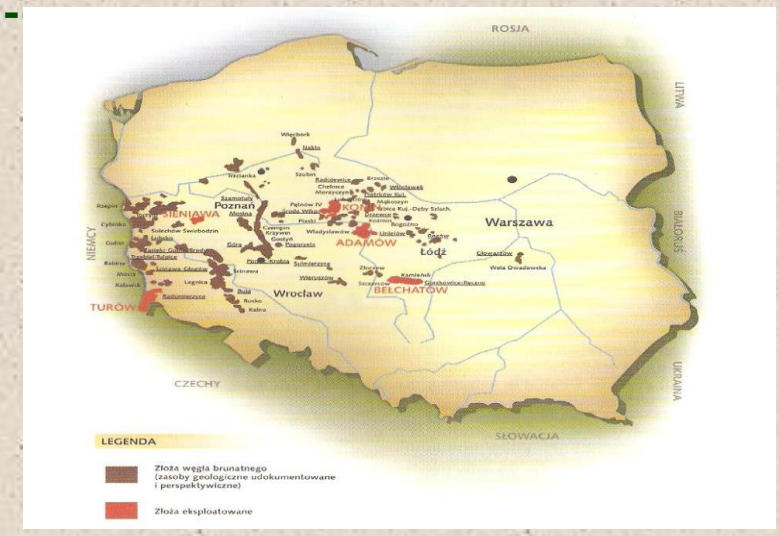
BALANCE RESSOURCES	48,540 BLN T
INDUSTRIAL RESSOURCES	4,178 BLN T
OPERATIONAL RESSOURCES	3,952 BLN T

LIGNITE IN POLAND

- BALANCE RESSOURCES 22,583 BLN T
- INDUSTRIAL RESSOURCES 1,218 BLN T
- OPERATIONAL RESSOURCES 1,140 BLN T

MAIN COALFIELDS:

- ADAMOW
- BELCHATOW
- KONIN
- TUROSZOW
- LUBUSKI REGION
- LEGNICA
- LODZ REGION
- WIELKOPOLSKA REGION



COAL PRODUCTION

HARD COAL

		2011	2012	2013	2014	2016
PRODUCTION	(mln t/y)	75,66	79,23	76,46	72,51	70,3
•STEAM COAL	(mln t/y)	64,23	67,46	64,35	60,22	57,6
TOTAL SALE	(mln t/y)	76,21	71,93	77,49	70,30	73,1
•STEAM COAL	(mln t/y)	64,94	60,53	64,93	57,99	53,4
TOTAL EXPORT	(mln t/y)	5,76	7,40	10,55	8,35	8,9
TOTAL IMPORT	(mln t/y)	11,6	8,8	9,4	9,0	8,3

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REASONS OF THE COAL IMPORTATION

- SHORTAGE OF SOME TYPES OF COAL (coking coal, PCI, low sulphur coal, coal for heating for the households sector - coarse coal, pea coal, anthracite…)

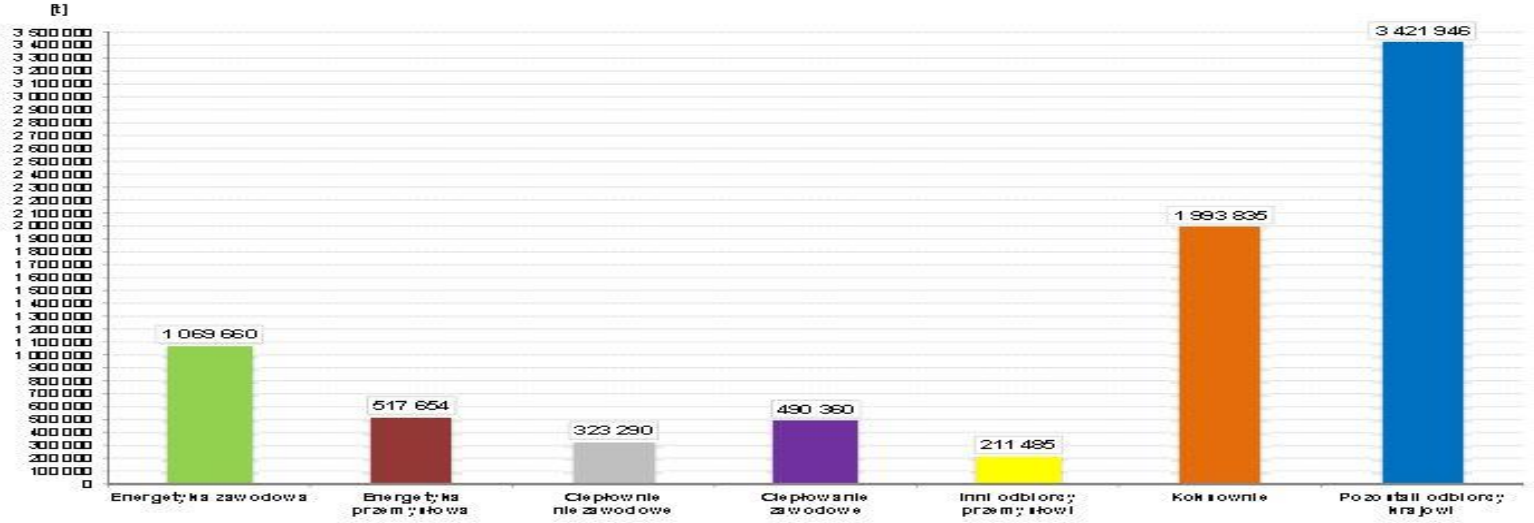
- UNFAIR COMPETETIVENESS

- MINING PROBLEMS - LIMITING PRODUCTION OF POLISH COAL

- PRICE POLICY IN ENERGY SECTOR, WHICH PROVOKE GROWTH OF EXPORTATION OF POLISH COAL AND PROPELLAND THE IMPORTATION OF FOREIGN COAL

IMPORT OF COAL
BY CONSUMERS – 2016

(~ 8,3 mln t HC)



CONSUMPTION OF THE COAL IN POLAND

TOTAL COSUMPTION OF (STEAM) HARD COAL 58 - 64 MLN T
TOTAL CONSUMPTION OF LIGNITE 60 – 64 MLN T

EQUIVALENT OF > 58 BLN m3 OF NATURAL GAS

•PROFESSIONAL (PUBLIC) THERMAL PLANTS
ELECTRICITY GENERATION AND HEAT PRODUCTION
(34) 38 – 42 MLN T – HARD COAL
60-64 MLN T – LIGNITE

•INDUSTRIAL AND NON-PROFESSIONAL HP PLANTS
HEAT AND HOT WATER PRODUCTION
FOR INDUSTRY AND CENTRAL HEATING SECTOR
12,5 – 16,5 MLN T - HARD COAL
0,1 MLN T - LIGNITE

•HOUSEHOLDS SECTOR AND SMALL CONSUMERS - HEAT AND H.WATER
(WITHOUT CHS)
11,5 – 12,5 MLN T - HARD COAL

POWER INDUSTRY IN POLAND (2015/2016)

ELECTRICITY GENERATION

•CAPACITY INSTALLED IN POWER PLANTS	39 353 MW
•CAPACITY OF THE BIGGEST THERMAL P P (LIGNITE)	5 420 MW
•ELECTRICITY PRODUCTION	156 657 GWh
•AVERAGE EFFICIENCY OF ELECTRICITY GENERATION	~ 37 %
•ELECTRICITY PRODUCTION IN COGENERATION	approx 15 %
•ELECTRICITY CONSUMPTION PER CAPITA	4 140 kWh
•CO2 EMISSION	316 mill. tonnes

STRUCTURE OF ELECTRICITY GENERATION BY SOURCES

SOURCE	CAPACITY MW	GWh/Y	%
HARD COAL	20 291	89 304	57,0
LIGNITE	9 220	54 212	34,6
NATURAL GAS	927	3 274	2,1
RENEVABLE AND OTHERS	6 394	9 776	6,3

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POWER INDUSTRY IN POLAND (2014/2015)

HEAT GENERATION – DISTRICT HEATIG SYSTEM

CAPACITY INSTALLED IN DHS		56 790 MWt
HEAT PRODUCTION		341 775 TJ/Y
DISTRICT HEATING SYSTEM (HEATING BUILDINGS AND HOT WATER)		217 667 TJ/Y
EFFICIENCY OF HEAT GENERATION	app.	86 % net

STRUCTURE OF HEAT GENERATION BY SOURCES

SOURCE	%
COAL	75,1
NATURAL GAS	8,0
OIL	4,3
RENEWABLE	7,8
OTHERS	4,8

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ENERGY POLICY FOR POLAND
to
2030/2050

(project presented by Minister of Economy in August 2015)

ENERGY POLICY FOR POLAND

EUROPEAN REGULATIONS - CLIMATIC POLICY

- ENERGY-CLIMATIC PACKAGE 3 X 20 (ETS, non-ETS, IED, CCS, REN. - REDUCTION OF CO2 - 20,30,..40%)
- ENERGY ROADMAP 2050 - LOW CARBON EUROPE (80 %)

! ELIMINATION OF FOSSIL FUELS !

POLAND - FORECAST OF THE CO2 EMISSION

YEAR	2015	2020	2030	2050
MT CO_2	316	280,3	186	?

FINAL REDUCTION TO 2030 - ca 130 MT

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ENERGY POLICY FOR POLAND

PRIMARY DIRECTIONS

- IMPROVEMENT OF THE ENERGY EFFICIENCY
- ENHANCEMENT OF THE SECURITY OF FUELS AND ENERGY SUPPLIES
- DIVERSIFICATION OF THE ELECTRICITY GENERATION STRUCTURE BY INTRODUCING NUCLEAR ENERGY
- DEVELOPMENT OF RENEWABLE ENERGY SOURCES, INCLUDING BIOFUELS
- DEVELOPMENT OF COMPETITIVE FUEL AND ENERGY MARKETS
- REDUCTION OF THE ENVIRONMENTAL IMPACT OF THE POWER INDUSTRY

ENERGY POLICY FOR POLAND

Project presented by Minister of Economy - August, 2015

	PRIMARY ENERGY DEMAND; Mtoe			ELECTRICITY GENERATION; TWh			HEAT GENERATION; PJ		
	2015 %	2030 %	2050 %	2015 %	2030 %	2050 %	2015 %	2030 %	2050 %
HARD COAL	36,8	30,5	27,8	45,8	38,2	33,5	76,8	73,0	71,4
LIGNITE	14,3	8,9	2,4	36,8	18,4	4,6	2	1,2	0,7
OIL	25,3	26,3	24,5	----	-----	-----	1,7	1,5	1,7
GAS	14,1	14,8	17,6	3,6	6,2	9,1	9,2	13,9	14,3
RENEW.	9,2	13,7	15,6	13,0	26	32,8	7,9	7,4	8,8
NU ENERGY	0,0	5,5	11,7	0,0	11,0	19,4	------	------	------
OTHERS	0,3	0,3	0,5	0,8	1,3	0,6	2,4	3,0	3,1
TOTAL	100 % 100,2 Mtoe	100% 102,5 Mtoe	100% 87,9 Mtoe	100% 158,8 TWh	100% 206,8 TWh	100% 222,9 TWh	100% 357,8 PJ	100% 374,7 PJ	100% 309,8 PJ

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MAIN INVESTMENTS IN POWER SECTOR

NEEDS FOR ENERGY SECURITY - 1000 MW / YEAR OF NEW CAPACITY INSTALLED IN THE POWER PLANTS ...?

HARD COAL AND LIGNITE (TO 2020/2030):

- REFURBISHMENT AND REHABILITATION OF EXISTING POWER P.P. (6556 MW, n>36 - 40%)
- BUILDING OF THE NEW HIGH EFFICIENCY POWER GENERATION UNITS (5358 MW - PC/SC, PC/USC, CFBC/SC, CHP/cogeneration) - CCS READY ?

NATURAL GAS

- GAS - STEAM (CHP) UNITS (2200 MW), ...PIPELINES, STORAGE, EXPLORATION

NUCLEAR

- PWR REACTOR (6000 MW)

RENEWABLE

- WIND - FROM 15 000 - 20 000 WIND UNITS (2 MW)

- LNG and OIL TERMINALS

PLANNED CAPITAL COSTS ca 100 BLN EURO

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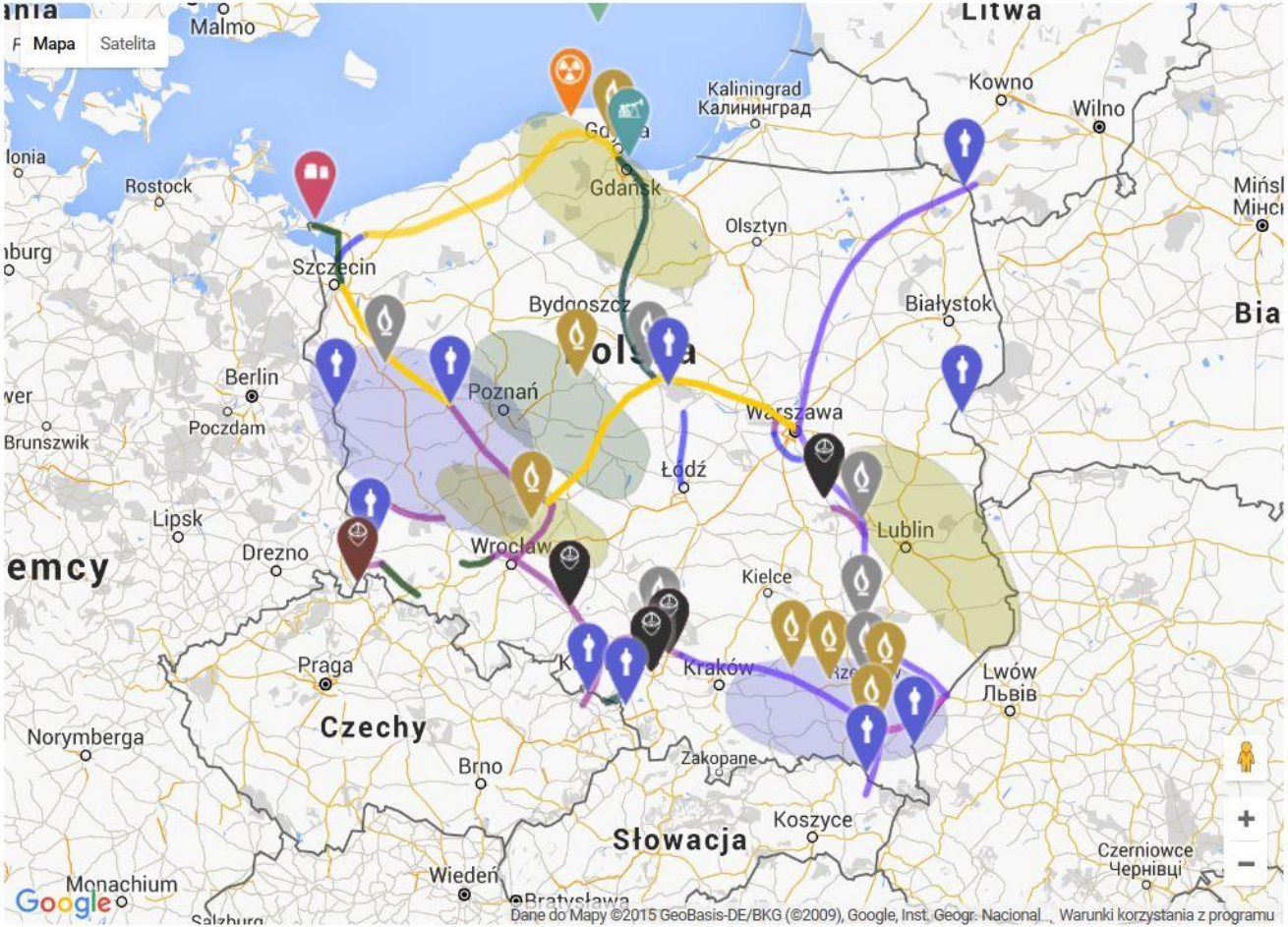
ENERGY-INWESTMENTS IN POLAND to 2030

- Exploration of gas
- Gas pipeline
- Hard Coal Power Plant
- NU Power Plant
- Gas Power Plant
- Lignite Power Plant
- Interconnector
- Storage of gas
- Oil ring
- LNG terminal
- Oil terminal



PLANNED ENERGY-INVESTMENTS
BASING ON HARD COAL AND LIGNITE 2015 - 2019
(ACCORDING to BAT, n > 44 %, CCS READY)

POWER PLANT CAPACITY	INVESTOR (constructor)	CAPACITY OF NEW ENERGY-BLOC MW / (efficiency)	COSTS OF INVESTMENT BLN EURO
OPOLE (2019) 1492 MW (hard coal)	PGE (RAFAKO, POLIMEX, MOSTOSTAL)	**2 x 900 (45,5%)**	2,76
KOZIENICE (2017) 2750 MW (hard coal)	ENEA (HITACHI-POWER POLIMEX-MOSTOSTAL)	**1075 (45,6%)**	1,52
JAWORZNO 3(2019) 1345 MW (hard coal)	TAURON PE	**910 (46%)**	1,29
TURÓW (2019) 1498,8 MW (lignite)	PGE	**460 (n = 44,5 %)**	0,98
ZABRZE (2017) 475 MW (hard coal)	FORTUM POWER AND HEAT	**220/FBC/CHP**	0,25
TYCHY (2016) 290 MW (hard coal)	TAURON PE	**50MWe + 86MWt FBC /CHP**	**0,18**
OSTROŁĘKA 2018 ?		**1000 MW (46 %)**	**1,22**

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PLANNED ENERGY-INVESTMENTS 2015 - 2030
BASING ON GAS AND NU ENERGY

POWER PLANT	CAPACITY OF NEW ENERGY-BLOCK MW / TECHNOLOGY	COSTS OF INWESTMENT BLN EURO
STALOWA WOLA HP PLANT Gas (2016)	450 MWe + 240 MWt CHP	0,36
TAURON - ŁAGISZA Gas (2018)	413 MWe /CCGT n=58%	0,36
ORLEN - WŁOCŁAWEK Gas (2015)	473 MWe/CCGT	0,34
ORLEN - PŁOCK Gas	596 MWe/CCGT	0,4
GORZÓW HP PLANT Local gas	138 MW	0,165
PGE - NU P.P - Choczewo/Żarnowiec 2025-2030	6000 MW PWR REACTOR	~20

CCS/CCU IN POLISH ENERGY SECTOR

TECHNICAL AND PUBLIC CONDITIONS

- WE HAVE KNOW HOW IN CAPTURING THE CO_2

- WE HAVE KNOW HOW IN TRANSPORT AND STORAGE THE CO_2

BAT:

- WE HAVE LIMITED POSSIBILITIES OF CO_2 STORAGE (geological conditions and surface infrastructure)) - MOREOVER WE HAVE TO TRANSPORT CO_2 minimum 60 – 200 km FROM ENERGY SOURCE

- WE HAVE NOT PUBLIC ACCEPTANCE FOR TRANSPORT AND STORAGE OF CO_2

CCS/CCU IN POLISH ENERGY SECTOR

POLISH ENERGY AND COAL SECTOR PARTICIPATE IN MANY INTERNATIONAL PROJECTS
OF CLEAN COAL TECHNOLOGIES – REDUCTION OF CO2 EMISSION
AND UTILIZATION OF CO_2
ia.:

- CARBON FUEL CELLS
- GASIFICATION OF COAL – PRODUCTION OF ENERGY AND CHEMICALS
- METHANATION OF CO_2 BY H_2 AND PRODUCTION OF FUELS
- PHOTOSYNTHESIS INVERSE

IMPLEMENTATION OF EU CLIMATIC POLICY IN POLAND

PLANNED ECOLOGICAL EFFECT TO 2030

REDUCTION OF 130 MLN TONNES OF CO_2 =
EQUIVALENT OF 0,013 ppm =
EQUIVALENT OF 6 DAYS ELECTRICITY PRODUCTION IN CHINA

- **TOTAL COST 100 (265 BLN) EURO TO 2030**
  it is minimum 30 Euro/MWh

SLIGHT ECOLOGICAL EFFECT - INADEQUATE TO CARRIED COSTS
POLAND EMIT ~ 0,9 % OF THE TOTAL WORLD CO_2 EMISSION

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MAIN THREATS

- COSTS OF INWESTMENTS IN ENERGY SECTOR minimum 100 BLN EURO (400 BLN PLN)
- DOUBLE GROWTH OF THE ELECTRIC ENERGY PRICES AND QUADRUPLE GROWTH OF COSTS OF THE HEATING OF HOUSES – ENERGY POVERTY - RISE OF PARTICIPATION OF COSTS OF ENERGY IN THE HOUSEHOLDS BUDGET FROM 12 % TODAY TO 20 % IN THE FORESEEABLE FUTURE
  IN MANY EU COUNTRIES > 10 % = LEVEL OF ENERGY (FUEL) POVERTY
- SIGNIFICANT GROWTH OF THE ENERGY DEPENDENCY - EXPENSIVE RENEVABLE ENERGY - WITHOUD SUBSIDIZING
- WEAKNESS OF ECONOMY AND SIGNIFICANT DECREASE OF THE INDUSTRY COMPETITIVENESS
- CARBON LEAKAGE – INFLUENCE ON GDP & EMPLOYMENT REDUCTION (MIN. 0,8 MLN OF WORKPLACES CONNECTED ONLY WITH MINING SECTOR)
- LOSS OF THE GDP: FOR 503 BLN PLN / Y
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THANK YOU

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