



# **Bridging Experience Between KGZ Like Systems and UNFC**

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## **KNOWLEDGE SHARING ON RESOURCE CLASSIFICATION AND ESTIMATION**

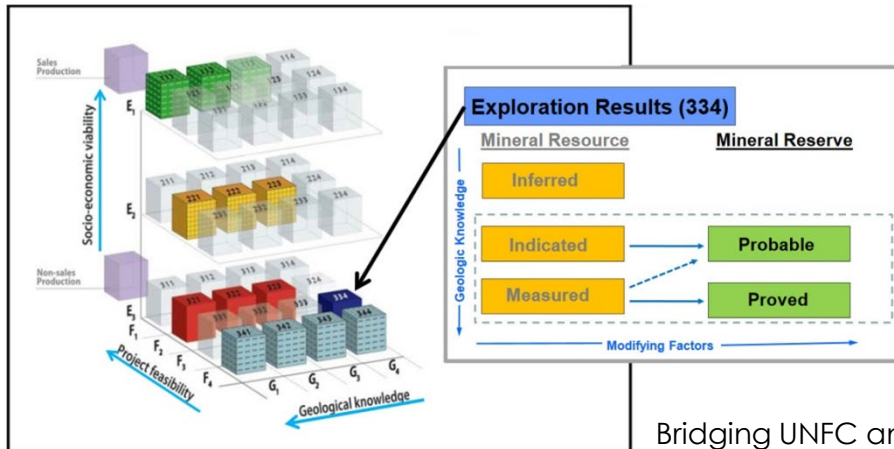
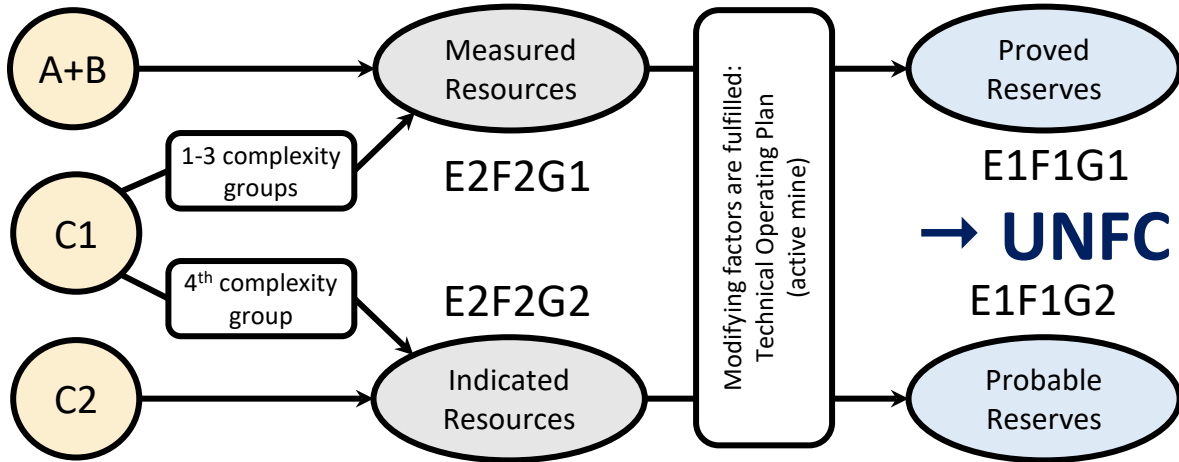
**Tbilisi, Georgia 11-12 October 2023**



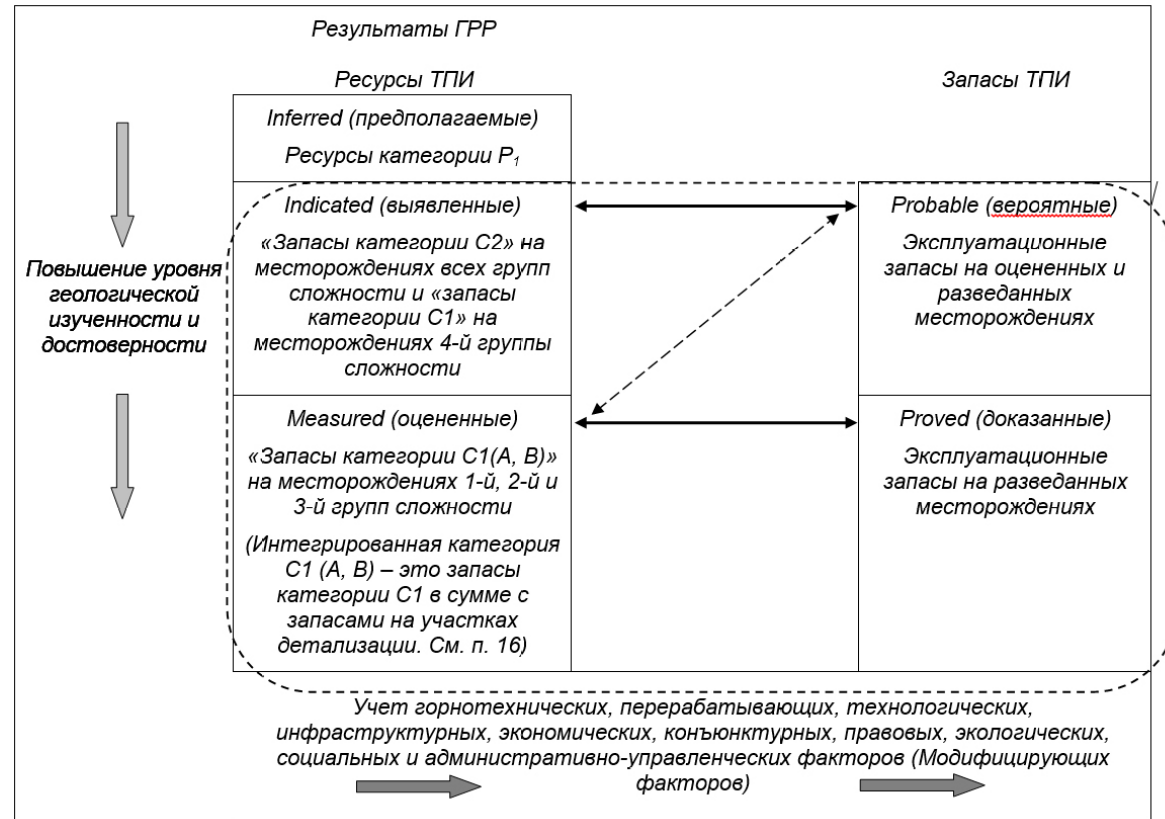
**UNECE**

# Bridging between national (KGZ-based) classification and UNFC

Indirect use of UNFC: national, CRIRSCO to UNFC



Bridging UNFC and CRIRSCO (Bankes, 2013)



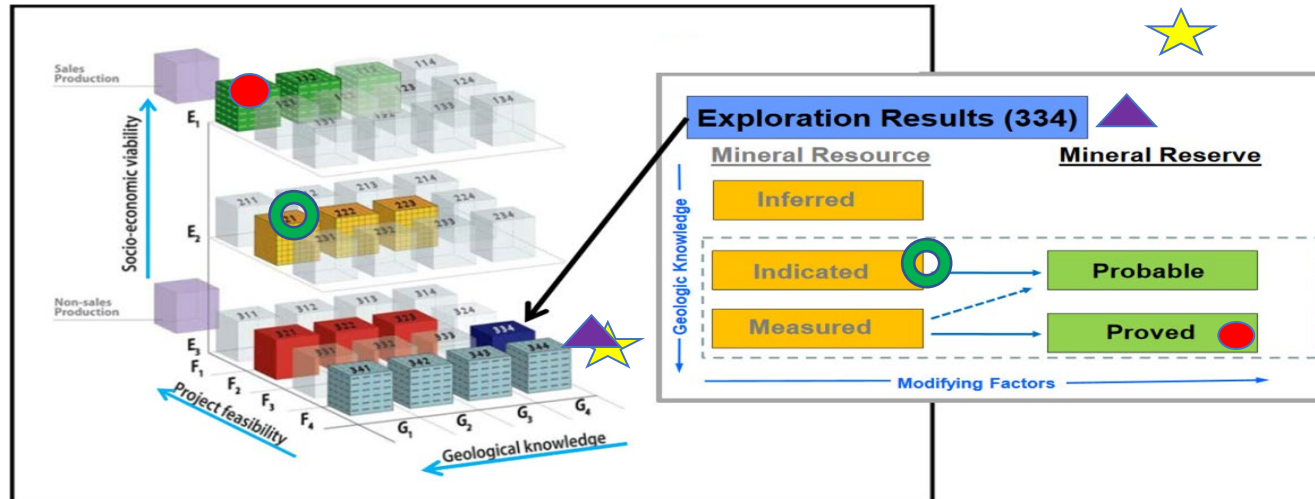
Кодекс НАЭН, издание 2014

# Bridging between national (KGZ-based) classification and UNFC

Coversation with CRIRSCO and direct use of UNFC: **fictive data**



Site ID	Raw material	Status of the mine	Complexity group	Original classification			Conversion via CRIRSCO to UNFC					Direct UNFC
				A+B	C1	C2	Proved Reserves 111	Probable Reserves 112	Measured Resources 221	Indicated Resources 222	Exploration target	Closed mine, 344
Site 1	Brick clay	Active	1	2 100 000	4 300 000	3 460 700	6 400 000	3 460 700	0	0		
Site 2	Sand	Suspended	1	0	167 638	0	0	0	167 638	0		
Site 3	Gravel	Exploration	1	0		4 610 000	0	0			4 610 000	
Site 4	Ore	Closed	2	0	0		0	0	0			543 210



# Bridging between national (KGZ-based) classification and UNFC

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- **Deposit resources** (“geological resources” = anticipated economic resources and anticipated sub-economic resources) – total resources of mineral commodity/commodities within deposit boundaries. The parameter limits that defines a deposit – values of deposit parameters delineating deposit geological boundaries.
- **Anticipated economic resources** (“balance resources”) – deposit resources (or part of a deposit) meeting the parameter limits that defines a deposit.
- **Anticipated sub-economic resources** (“sub-balance resources”) – deposit resources (or part of a deposit) not meeting the parameter limits that defines a deposit.
- **Economic resources in place** (“industrial resources”) – part of anticipated economic resources or anticipated subeconomic resources or – in case of brines, curative and thermal water – exploitable resources, within a designed mining area or detached part of a deposit designed for exploitation, which can be designed for mining according to detailed technical and economic analyses taking into account law requirements, including environmental protection.
- **Sub-economic (marginal) resources** (“not-industrial resources”) – part of anticipated economic resources not-classified as economic resources within an area designed for exploitation, which can be designed for mining as a result of technical or economic or law change requirements, including environmental protection.
- **Extractable resources** – part of economic resources in place which is obtained when reducing economic resources by technical losses. Exploitable resources – crude oil or natural gas resources, which are supposed to be extracted by applying current exploitation technology.

# Bridging between national (KGZ-based) classification and UNFC

Poland



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- **A (measured resources)** – mineral deposit is explored to an extent which allows current planning and carrying out exploitation with a maximum possible rate of resource absorption; delineation of structural and geological features, tectonics, resources on a basis of the opening-up, preparing and mining excavations, type, quality and technological properties of a mineral commodity on a basis of regular excavations sampling and data from the current production is required. The degree of the deposit exploration is sufficient enough to elaborate a mine management plan. The admissible error of average deposit parameters and deposit resources estimation in particular blocks cannot exceed 10%.
- **B (measured resources)** – mineral deposit boundaries are delineated in details on a basis of the specially carried out exploratory excavations or geophysical measurements, delineation of structural and geological features, correlation of strata, main tectonics features has to be unambiguous, quality and technological properties of mineral commodity should be confirmed by sampling results in pilot-scale tests or commercial scale. The degree of deposit exploration is sufficient enough to elaborate a mine management plan. The admissible error of average deposit parameters and deposit resources estimation cannot exceed 20%.
- **C1 (indicated resources)** – mineral deposit boundaries are evaluated on a basis of available data from exploratory excavations, natural outcrops or interpolation or extrapolation of geophysical measurements; a grade of deposit exploration makes it possible to prepare a Prefeasibility study of economic mining, including the detailed delineation of structural and geological features, tectonics and quality of a mineral commodity in a deposit, geological-mining conditions of exploitation, and allows an assessment of the influence of the intended exploitation on environment. The admissible error of average deposit parameters and deposit resources estimation cannot exceed 30%.

# Bridging between national (KGZ-based) classification and UNFC

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- **C2 (inferred resources)** – mineral deposit boundaries are evaluated on a basis of available data from isolated excavations, natural outcrops, interpolation or extrapolation of geophysical measurements; main structural and geological features and tectonics are identified; geological-mining conditions of exploitation are preliminary evaluated; quality of a mineral commodity is evaluated on a basis of regular sampling in the full range of commodity usage. The admissible error of average deposit parameters and deposit resources estimation cannot exceed 40%.
- **D (inferred resources)** – mineral deposit boundaries, geological features and anticipated resources are evaluated on a basis of available geological data, in particular from isolated excavations or natural outcrops, geological interpretation of geophysical measurements. The admissible error of average deposit parameters and deposit resources estimation may exceed 40%.
- Elaboration of guidelines for transferring Polish mineral volume categorization into international CRIRSCO resource/reserve reporting standard and “resources” and “reserves” classes is advisable (Nieć and Sobczyk 2013). Poland does not have resources reporting standards for investment and financing, but companies commonly use JORC Code for such purposes.



# Bridging between national (KGZ-based) classification and UNFC

Poland



- Code of mineral resources reporting since 1952, updated few times (Krzysztof et al., 2015)
- It is used for resources evaluation only. The resources/reserves volumes – depending on reliability and accuracy of geological data – are classified in Poland into five categories: A, B, C1, C2 and D, and according to technical recoverability as well as supposed economic value are divided into “balance” resources (“zasoby bilansowe”, supposed technically and economically mineable) and “out of balance” resources (subeconomic), reported in Geological documentation of mineral deposit.
- The distinction of resources and reserves, as presented e.g. in JORC Code or CRIRSCO template - was not formally defined. In the Polish classification system, the “industrial reserve base” (“zasoby przemysłowe”) and predicted recoverable – “operational” – reserves (“zasoby operatywne”) are distinguished within the balance resources. The “industrial reserve base” is a part of resources being considered as suitable for mining through defined technology and in predictable economic conditions.
- The predicted recoverable reserves are – in general - calculated as a part of industrial reserve base, taking into account expected recovery coefficient on the basis of former mining experience and data. The both “reserve base” and predicted recoverable reserves are presented in the “Deposit development plan”, that has features of prefeasibility study (Nieć 2010). The Polish classification system can be compared with other ones through UNFC.

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# Bridging between national (KGZ-based) classification and UNFC

## Illustration of using UNFC in Poland

Table 6.2.4. Resources of selected mineral raw materials in Poland in comparison with UNFC-2009 – as of 31 XII 2015 (according to “The balance...” as of 31 XII 2015 and the System of management and protection of mineral resources in Poland MIDAS)

[Mt]; silver – [kt]; high nitrogenous natural gas, natural gas, coal bed methane – [bnm<sup>3</sup>], peat – [Mm<sup>3</sup>]; natural gas and crude oil – anticipated economic and anticipated sub-economic resources within exploitable resources). All explanations are given below the table

Raw material	National classification								UNFC-2009						
	Deposits licensed for mining					Deposits beyond concession areas			Deposits licensed for mining					Deposits beyond concession areas	
	Anticipated economic resources (in Polish “bilansowe”), including: Economic resources + Sub-economic resources					Anticipated sub-economic resources (in Polish “pozabilansowe”)	Anticipated economic resources (in Polish “bilansowe”)	Anticipated sub-economic resources (in Polish “nieprzebilansowe”)	Extractable resources 11x 12x	Economic resources 21x	Anticipated economic resources 22x	Sub-economic resources and losses 31x 32x	Anticipated sub-economic resources 32x	Anticipated economic resources 23x	Anticipated sub-economic resources 33x
	Economic resources (in Polish “przemysłowe”): extractable resources + losses		Sub-economic resources (in Polish “nieprzemysłowe”)	Extractable resources (in Polish “operacyjne”)	Losses (in Polish “straty”)										
High nitrogen. natural gas	11,506.75	920.65				920.65	–	10,586.10	–	3.30	–	920.65	0.00	0.00	10,586.10
Natural gas	101,679.10	51,006.78	51,006.78	–	117,675.06	663.04	20,775.83	1,421.68	51,006.78	0.00	50,672.32	117,675.06	**–	21,140.92	1,557.66
Crude oil	22.26	14.07	14.07	–	82.41	0.01	0.51	0.33	14.07	0.00	8.19	82.41	**–	0.56	0.39
Coal bed methane	36,413.05	5,214.78	5,214.78	–	10,922.10	380.22	51,254.93	10,521.29	5,214.78	0.00	20,276.17	10,922.10	380.22	51,254.93	10,521.29
Cu and Ag ores	1,389.12	1,162.24	871.68	290.56	228.35	1.81	563.15	782.18	871.68	0.00	0.00	518.91	1.81	563.15	782.18
Ag	81.95	69.15	51.86	17.29	12.84	0.06	24.42	41.10	51.86	0.00	0.00	30.13	0.06	24.42	41.10
Cu	27.18	22.77	17.08	5.69	4.42	0.02	8.14	12.96	17.08	0.00	0.00	10.11	0.02	8.14	12.96
Zn and Pb ores	13.94	5.53	4.15	1.38	8.41	7.17	69.88	9.43	4.15	0.00	0.00	9.79	7.17	69.88	9.43
Pb	0.22	0.10	0.08	0.02	0.12	0.13	1.20	0.15	0.08	0.00	0.00	0.14	0.13	1.20	0.15
Zn	0.55	0.23	0.17	0.06	0.32	0.24	3.02	0.41	0.17	0.00	0.00	0.38	0.24	3.02	0.41
Hard coal	21,107.05	3,561.47	2,493.03	1,068.44	13,546.79	6,862.85	31,199.31	8,935.43	2,493.03	0.00	3,998.79	14,615.23	6,862.85	31,199.31	8,935.43
Lignite	1,418.70	1,112.23	1,001.01	111.22	288.83	48.31	22,081.18	3,447.62	1,001.01	0.00	17.64	400.05	48.31	22,081.18	3,447.62
Rock salt	15,112.70	1,735.79	607.53	1,128.26	10,710.99	–	70,077.82	–	607.53	0.00	2,665.92	11,839.25	–	70,077.82	–
Sulfur	19.81	19.44	9.72	9.72	0.29	0.66	262.75	–	9.72	0.00	0.08	10.01	0.66	262.75	–
Diatomaceous rock	0.64	0.20	0.15	0.05	0.44	–	–	–	0.15	0.00	0.00	0.49	–	–	–
Bentonites	0.49	0.34	0.26	0.08	–	–	2.33	0.25	0.26	0.00	0.15	0.95	–	2.33	0.25

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High nitrogen. natural gas							920.65	0.00	0.00	10,586.10	–	3.30	–		
Natural gas							51,006.78	0.00	50,672.32	117,675.06	**–	21,140.92	1,557.66		
Crude oil							14.07	0.00	8.19	82.41	**–	0.56	0.39		
Coal bed methane							5,214.78	0.00	20,276.17	10,922.10	380.22	51,254.93	10,521.29		
Cu and Ag ores							871.68	0.00	0.00	518.91	1.81	563.15	782.18		
Ag							51.86		0.00	30.13	0.06	24.42	41.10		
Cu							17.08		0.00	10.11	0.02	8.14	12.96		
Zn and Pb ores							4.15	0.00	0.00	9.79	7.17	69.88	9.43		
Pb							0.08		0.00	0.14	0.13	1.20	0.15		
Zn							0.17		0.00	0.38	0.24	3.02	0.41		
Hard coal							2,493.03	0.00	3,998.79	14,615.23	6,862.85	31,199.31	8,935.43		
Lignite							1,001.01	0.00	17.64	400.05	48.31	22,081.18	3,447.62		
Rock salt							607.53	0.00	2,665.92	11,839.25	–	70,077.82	–		
Sulfur							9.72	0.00	0.08	10.01	0.66	262.75	–		
Diatomaceous rock							0.15	0.00	0.00	0.49	–	–	–		
Bentonites	0.49	0.34	0.26	0.08	–	–	2.33	0.25	0.26	0.00	0.15	0.95	–	2.33	0.25



**Thank you!**

Zoltán Horváth  
Supervisory Authority of Regulatory Affairs  
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**KNOWLEDGE SHARING ON RESOURCE  
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