Draft UNFC

SPECIFICATION

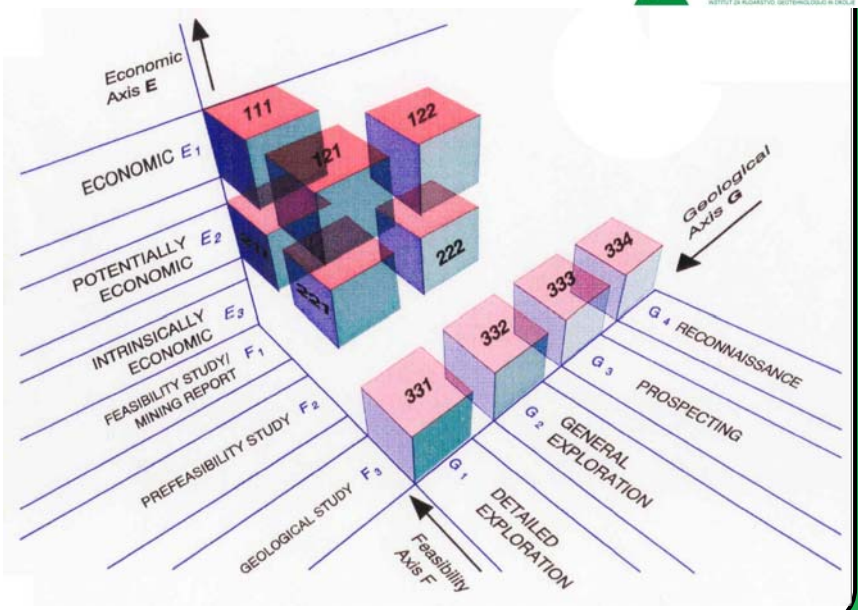
and

GUIDELINES

for the

SOLIDS MINERAL SECTOR

Andrej Šubelj



Who needs Classification

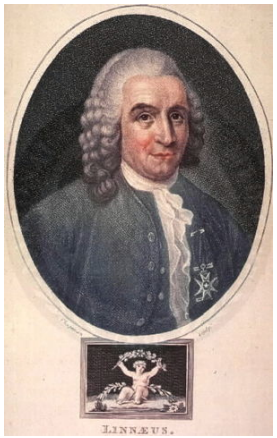
- governments (inventory, SEC)
- financial institutions
- companies
- international organizations (WEC,IAEA, OPEC, IASB, CESR)

Q: what should this type of document consist of ?

A: 1. why is classification model as it is
2. description of classification model
3. how to use the classification
   - procedure of categorization
   - definitions
   - special features
   - items to be addressed in procedure
   - glossary
   - any other aid

1. NATURE

of United Nations Classification for Fossil Energy and Mineral Resources (UNFC)

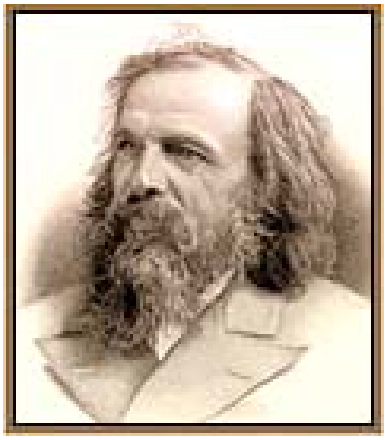


Karl Linnaeus' classification of living things

Systema Naturae
(published 1735)

Karl Linné (1707-1778)

The system is still being developed



Dmitry Ivanovich Mendeleev (1834 – 1907)

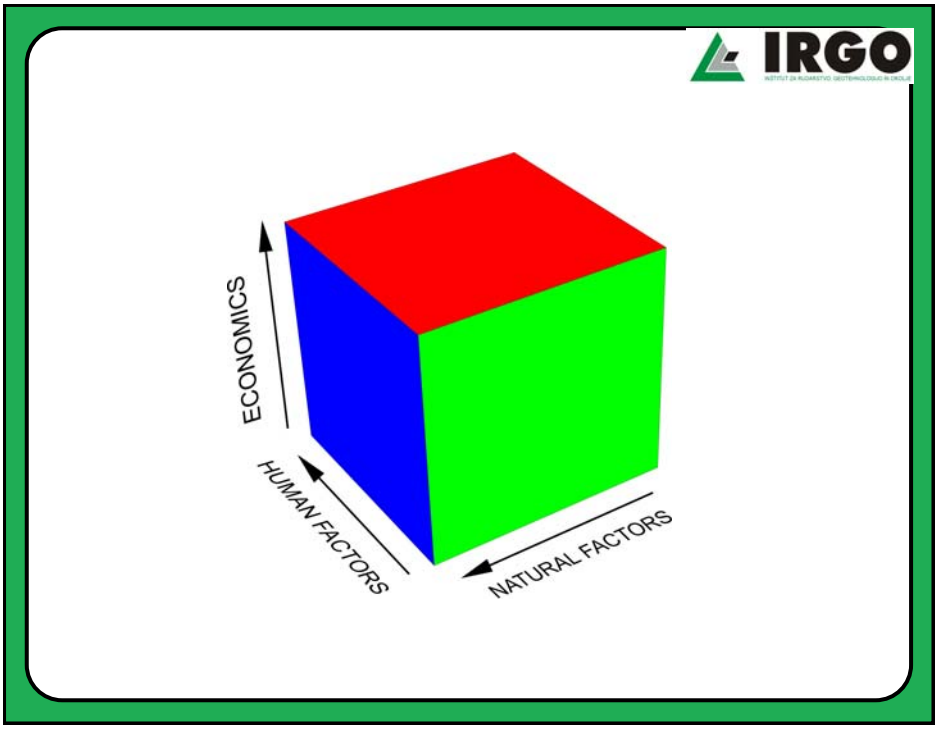
Father of the Periodic Table of Elements

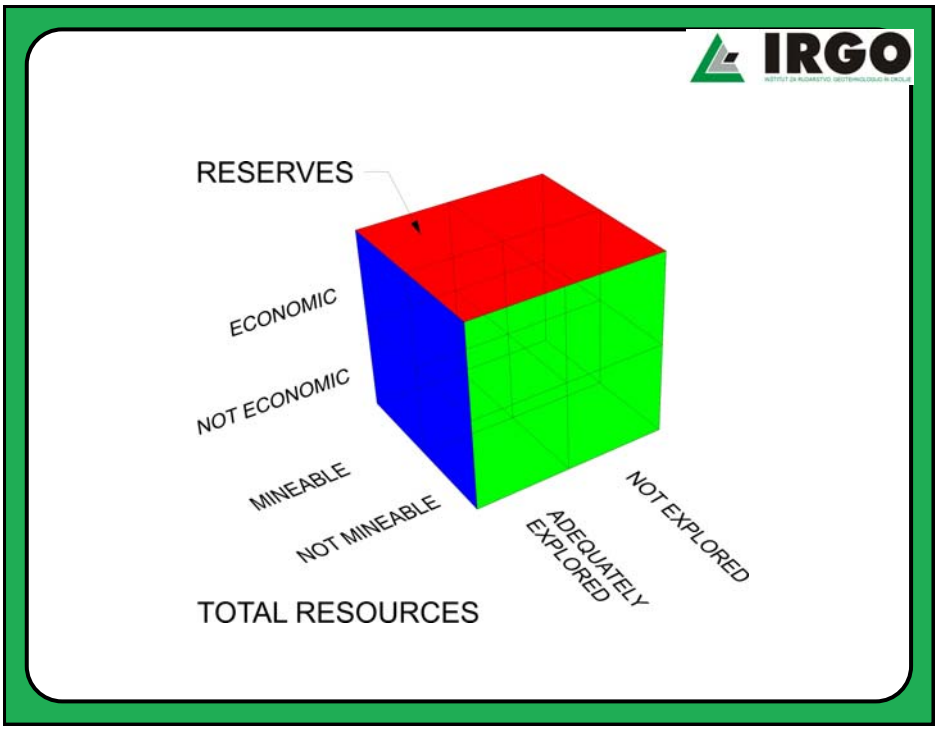
Classification of minerals

- **based on chemical structure**

Classification of stones

- **based on genesis and mineral composition**

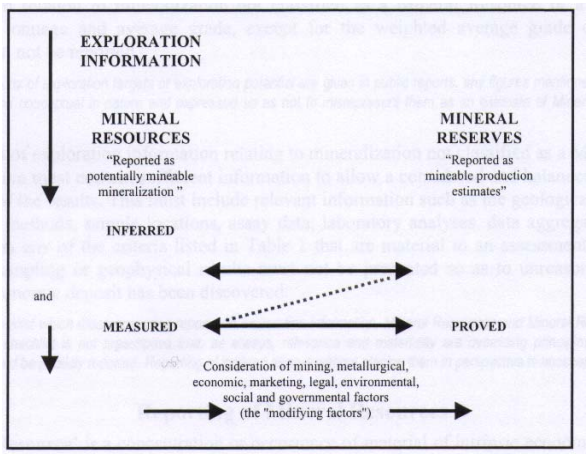

ECONOMICS
HUMAN FACTORS
NATURAL FACTORS

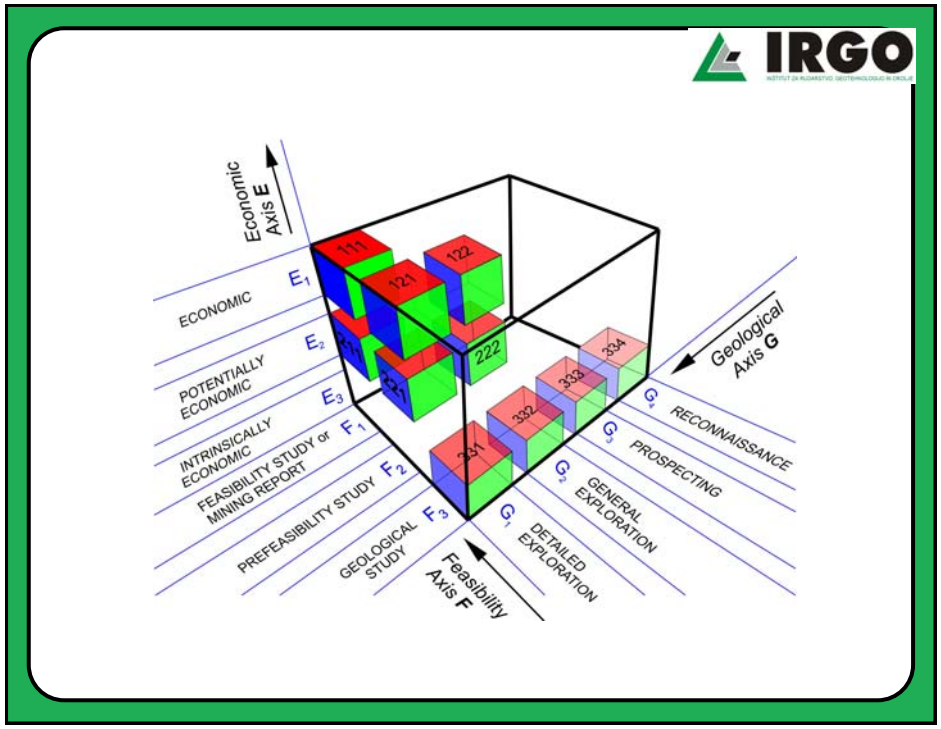

RESERVES
ECONOMIC
NOT ECONOMIC
MINEABLE
NOT MINEABLE
ADEQUATELY EXPLORED
NOT EXPLORED
TOTAL RESOURCES

1. DESCRIPTION

of United Nations Classification for Fossil Energy and Mineral Resources (UNFC)

CRIRSCO template as base of UNFC




IRGO
Economic Axis E
ECONOMIC
E1
POTENTIALLY ECONOMIC
E2
INTRINSICALLY ECONOMIC
E3
FEASIBILITY STUDY or MINING REPORT
F1
PREFEASIBILITY STUDY
F2
GEOLOGICAL STUDY
F3
Feasibility Axis F
DETAILED EXPLORATION
G1
GENERAL EXPLORATION
G2
PROSPECTING
G3
RECONNAISSANCE
G4
Geological Axis G
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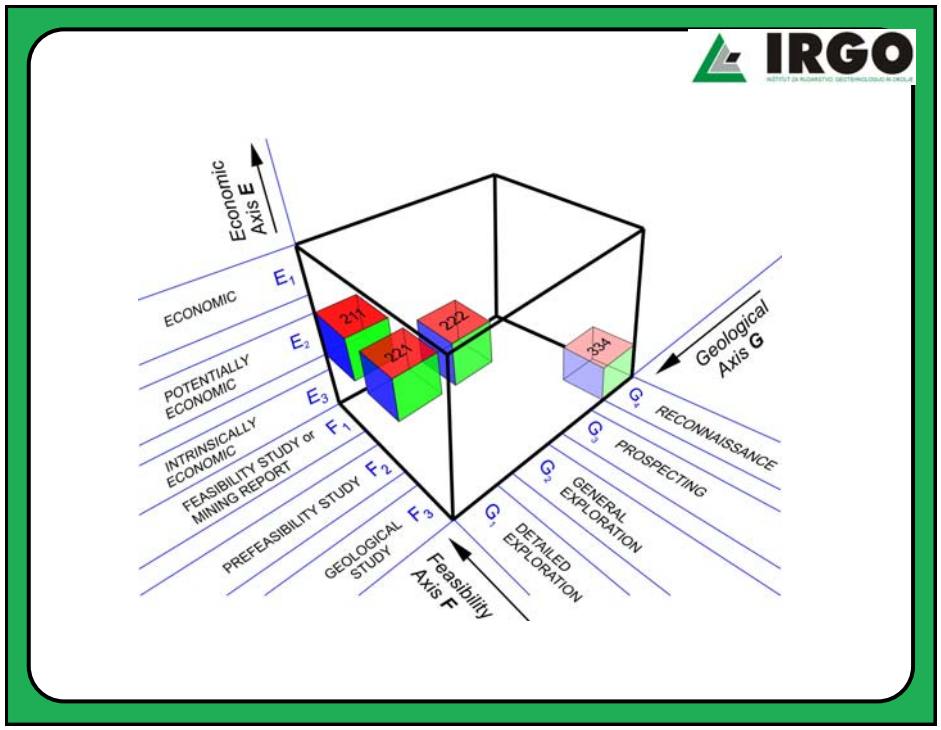
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PROSPECTING
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RECONNAISSANCE
G4
Geological Axis G
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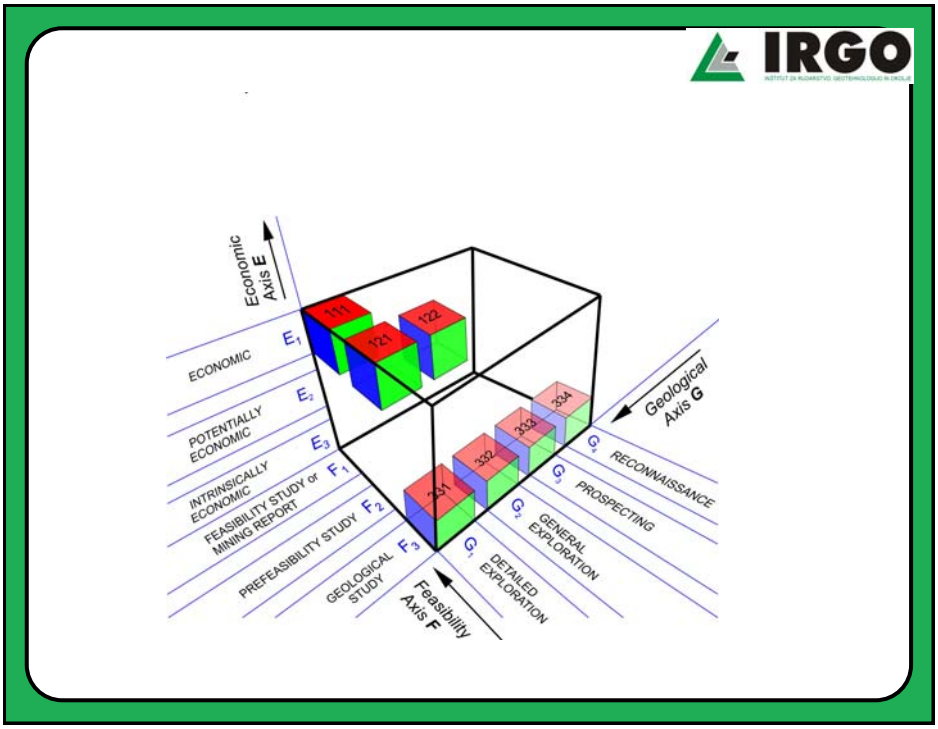
Economic Axis E
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F2
GEOLOGICAL STUDY
F3
Feasibility Axis F
Geological Axis G
G4 RECONNAISSANCE
G3 PROSPECTING
G2 GENERAL EXPLORATION
G1 DETAILED EXPLORATION
111
121
122
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332
333
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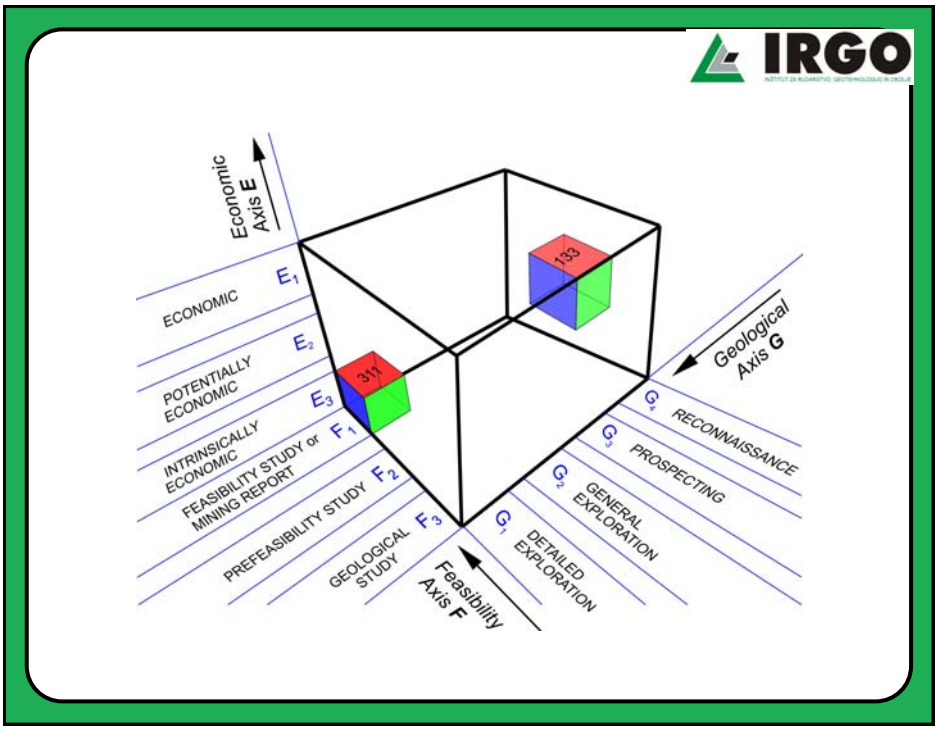
Economic Axis E
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FEASIBILITY STUDY or MINING REPORT
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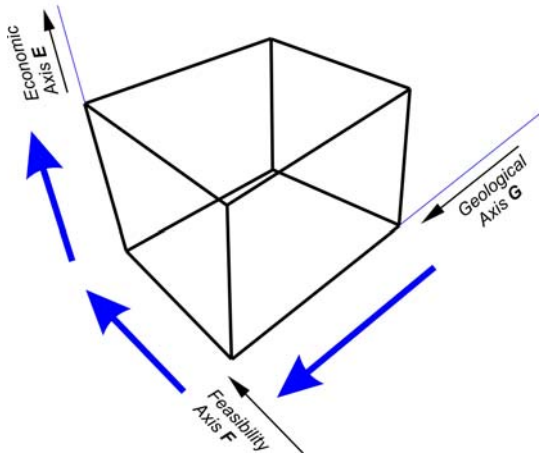
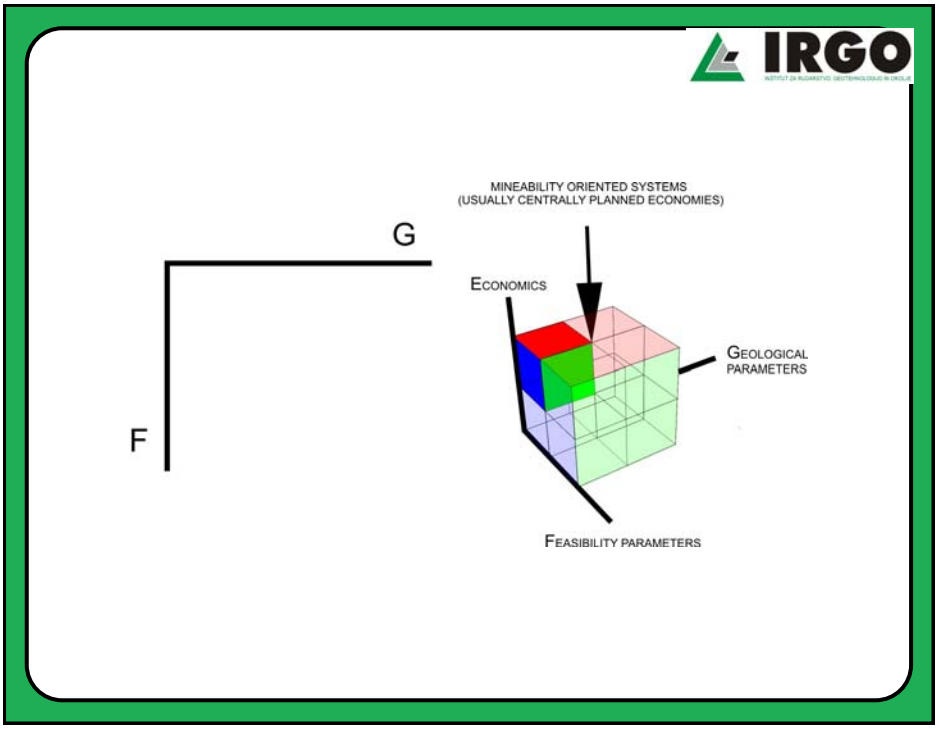
GEOLOGICAL STUDY
F3
Feasibility Axis F
Geological Axis G
G4 RECONNAISSANCE
G3 PROSPECTING
G2 GENERAL EXPLORATION
G1 DETAILED EXPLORATION
133
311

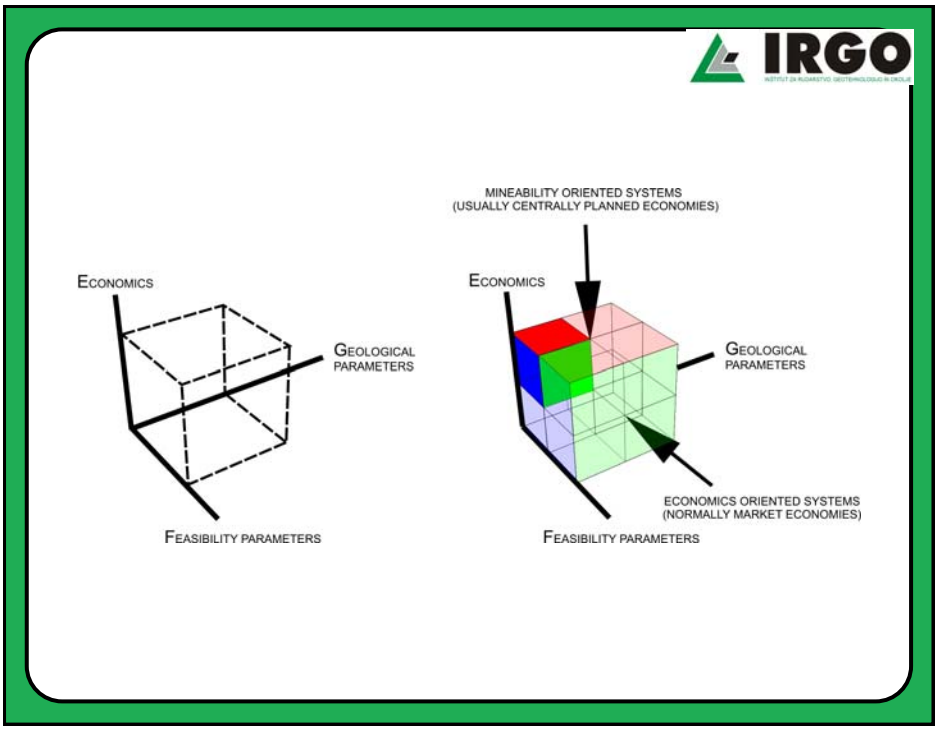
1. HOW TO USE

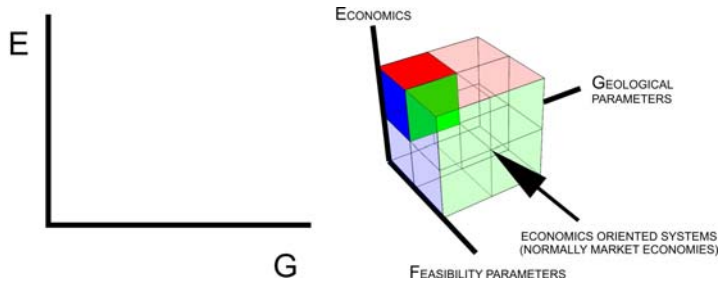
the United Nations Classification for Fossil Energy and Mineral Resources (UNFC)

- procedure of categorization
- special features
- definitions
- items to be addressed in procedure
- glossary
- any other aid

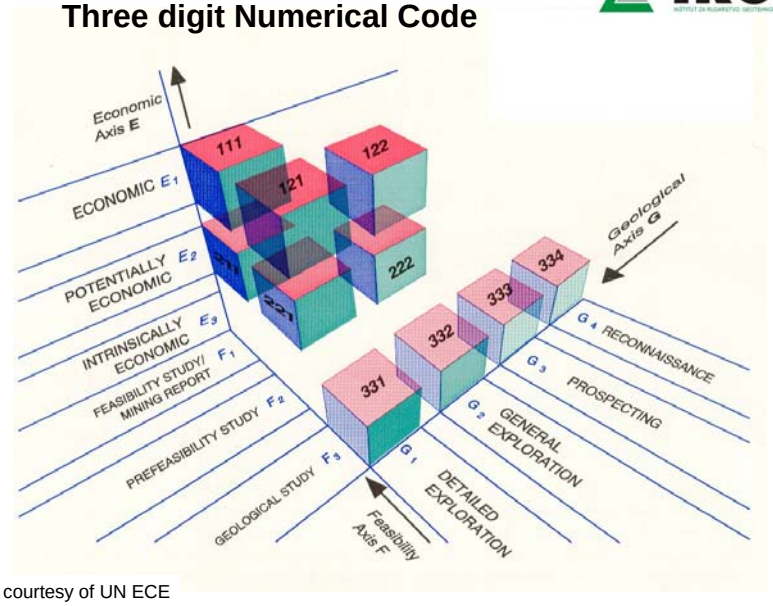



MINEABILITY ORIENTED SYSTEMS
(USUALLY CENTRALLY PLANNED ECONOMIES)
G
F
ECONOMICS
GEOLOGICAL
PARAMETERS
FEASIBILITY PARAMETERS


ECONOMICS
GEOLOGICAL
PARAMETERS
FEASIBILITY PARAMETERS
MINEABILITY ORIENTED SYSTEMS
(USUALLY CENTRALLY PLANNED ECONOMIES)
ECONOMICS
GEOLOGICAL
PARAMETERS
ECONOMICS ORIENTED SYSTEMS
(NORMALLY MARKET ECONOMIES)
FEASIBILITY PARAMETERS



Three digit Numerical Code



By courtesy of UN ECE

1. TMW* = resource[1)]
2. TMW* = reserve + resource[2)]

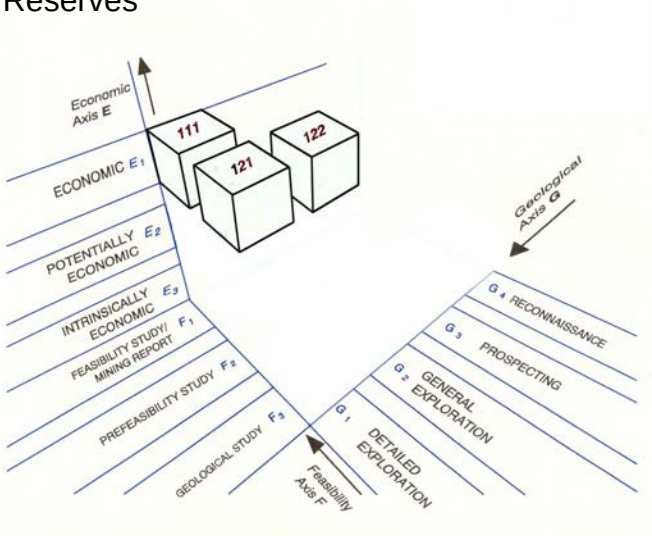
3. resource = reserve + resource

(equation only true for reserve = 0)

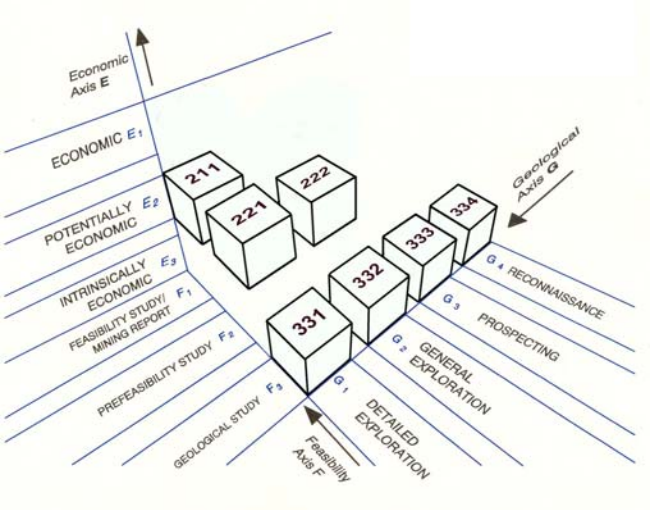
total resource = reserve + remaining/additional resource

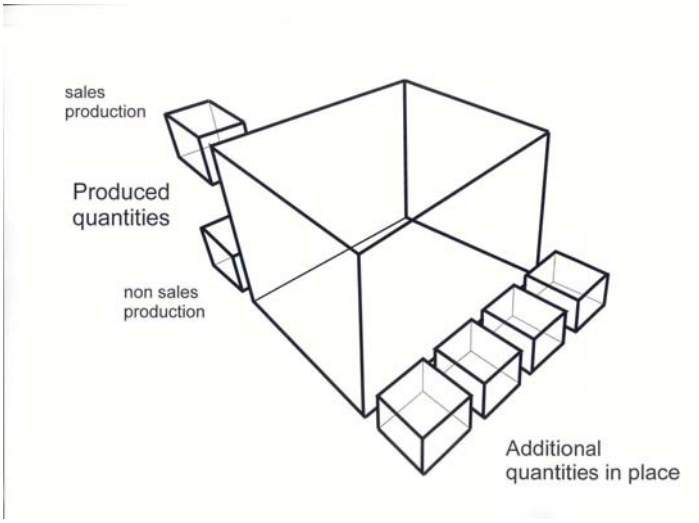
***TMW = total mineral wealth**
1) usual perception, 2) professional expression

Reserves



Remaining or additional resources





Reihen	Gruppe I. - R^2O	Gruppe II. - RO	Gruppe III. - R^2O^3	Gruppe IV. RH^4 RO^2	Gruppe V. RH^3 R^2O^5	Gruppe VI. RH^2 RO^3	Gruppe VII. RH R^2O^7	Gruppe VIII. - RO^4
1	H = 1							
2	Li = 7	Be = 9,4	B = 11	C = 12	N = 14	O = 16	F = 19	
3	Na = 23	Mg = 24	Al = 27,3	Si = 28	P = 31	S = 32	Cl = 35,5	
4	K = 39	Ca = 40	- = 44	Ti = 48	V = 51	Cr = 52	Mn = 55	Fe = 56, Co=59 Ni=59, Cu=63
5	(Cu = 63)	Zn = 65	- = 68	- = 72	As = 75	Se = 78	Br = 80	
6	Rb = 85	Sr = 87	?Yt = 88	Zr = 90	Nb = 94	Mo = 96	- = 100	Ru=104, Rh=104 Pd=106, Ag=108
7	Ag = 108	Cd = 112	In = 113	Sn = 118	Sb = 122	Te = 125	J = 127	
8	Cs = 133	Ba = 137	?Di = 138	?Ce = 140	-	-	-	- - - -
9	(-)	-	-	-	-	-	-	
10	-	-	?Er = 178	?La = 180	Ta = 182	W = 184	-	Os=195, Ir=197, Pt=198, Au=199
11	(Au = 199)	Hg = 200	Tl = 204	Pb = 207	Bi = 208	-	-	
12	-	-	-	Th = 231	-	U = 240	-	- - - -

Mendeleev Periodic Table of Elements (1869)

The Pictorial Periodic Table

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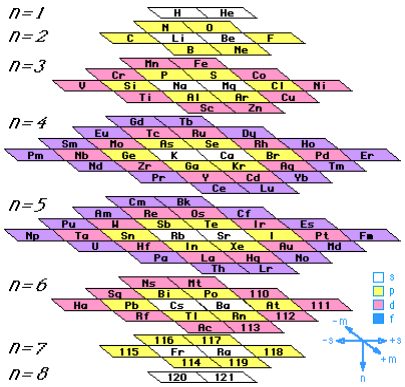
Periodic Table Styles

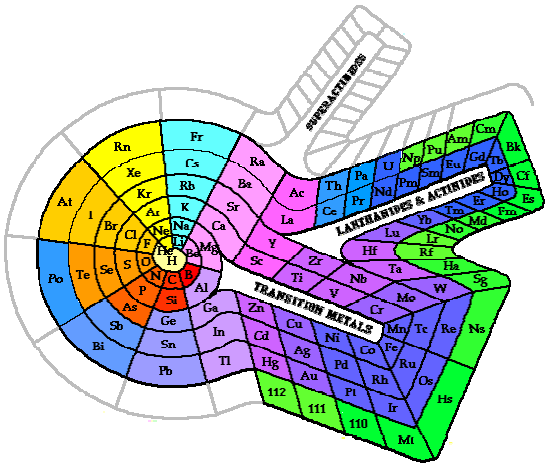
I	II	IIIb	IVb	Vb	VIb	VIIb		VIIIb		Ib	IIb	III	IV	V	VI	VII	0
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
H																	He
Li	Be											B	C	N	O	F	Ne
Na	Mg											Al	Si	P	S	Cl	Ar
K	Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br	Kr
Rb	Sr	Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	In	Sn	Sb	Te	I	Xe
Cs	Ba	La*	Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg	Tl	Pb	Bi	Po	At	Rn
Fr	Ra	Ac**	Rf	Db	Sg	Bh	Hs	Mt	Uun	Uuu	Uub		Uuq		Uuh		Uuo
Lanthanides *			Ce	Pr	Nd	Pm	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb	Lu	
Actinides **			Th	Pa	U	Np	Pu	Am	Cm	Bk	Cf	Es	Fm	Md	No	Lr	

Alternate styles for the Periodic Table:

Stowe Benfey Zmaczynski Giguere Tarantola Filling Mendeleev Modern



Dr Timmothy Stove physicists periodic table



Prof. Theodor Benfey periodic spiral

I	II	IIIb	IVb	Vb	VIb	VIIb	VIIIb			Ib	IIb	III	IV	V	VI	VII	0
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
H																	He
Li	Be											B	C	N	O	F	Ne
Na	Mg											Al	Si	P	S	Cl	Ar
K	Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br	Kr
Rb	Sr	Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	In	Sn	Sb	Te	I	Xe
Cs	Ba	La*	Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg	Tl	Pb	Bi	Po	At	Rn
Fr	Ra	Ac**	Rf	Db	Sg	Bh	Hs	Mt	Uun	Uuu	Uub		Uuq		Uuh		Uuo
Lantharides *			Ce	Pr	Nd	Pm	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb	Lu	
Actinides **			Th	Pa	U	Np	Pu	Am	Cm	Bk	Cf	Es	Fm	Md	No	Lr	

Modern Periodic Table of Elements

Cu - Copper

As the transition metal copper can be found pure in nature, it was known to the ancients. Originally popular for its high malleability, the extremely high electrical conductivity of copper (second only to silver) makes it the conductor of choice for most wires. Our students observe the dehydration of copper sulfate pentahydrate, determine the composition and electrochemistry of copper salts, and may assay copper ore. The chemistry and society class takes a field trip to a copper mine.

Atomic number	-	29	Density	g/mL	8.96
Atomic weight	u	63.546	Melting point	K	1357.6
Bonding radius	A	1.17	Boiling point	K	2836
Atomic radius	A	1.57	Heat of vaporization	kJ/mol	300.3
Ionization Potential	V	7.726	Heat of fusion	kJ/mol	13.05
Electronegativity	-	1.9	Specific heat	J/gK	0.38

The oxide is mildly basic. Crystal are face centered cubic.

Electron config. [Ar] $3d^{10}$ $4s^1$

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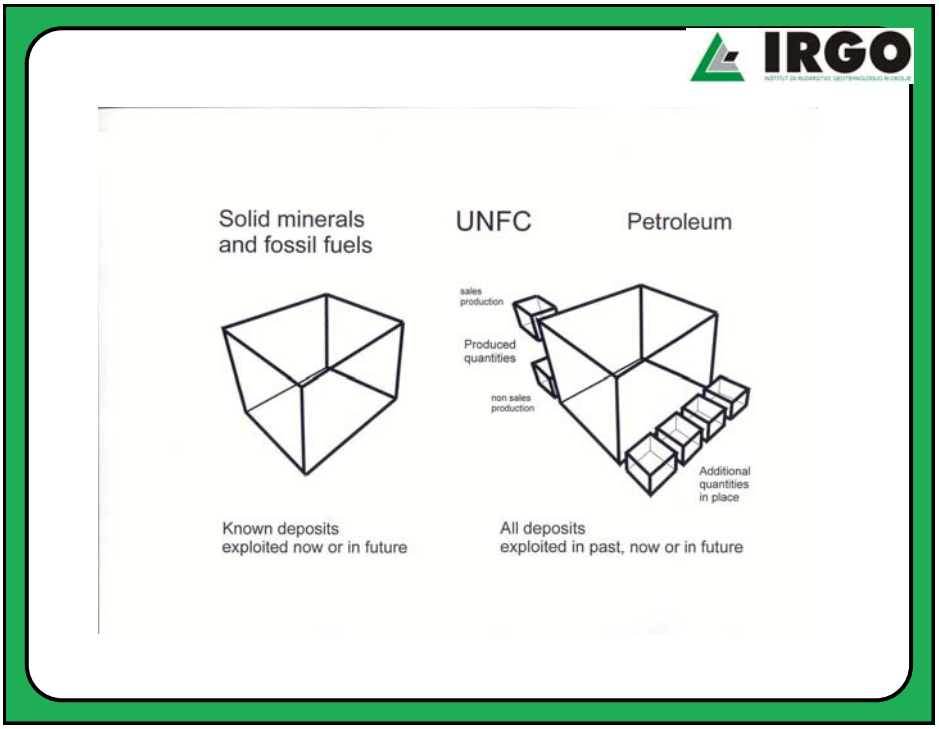
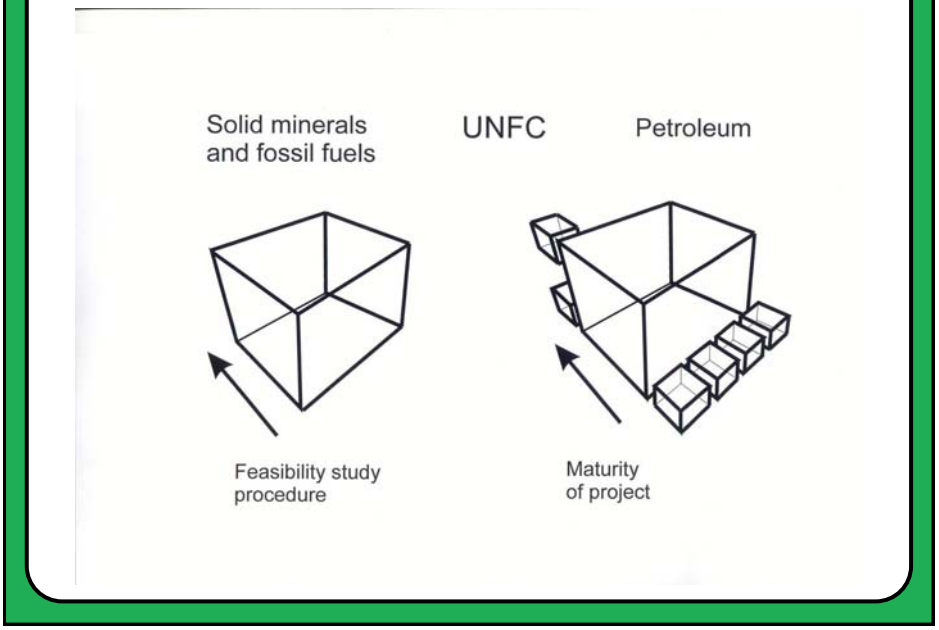
Isotopes of Cu: Click mass number for decay process, product for element page.

055 200 nsec EC,13.700 MeV Ni-55 54.955076	056 200 nsec EC/Cp,15.300 Ni-56/Co-55 55.950561	057 199.4 msec EC,9.770 MeV Ni-57 56.949214	058 3.204 sec EC,9.560 MeV Ni-58 57.944540	059 81.5 sec EC,4.600 MeV Ni-59 58.939503	060 23.7 min EC,6.127 MeV Ni-60 59.937357	061 3.333 hr EC,2.237 MeV Ni-61 60.933461
062 9.74 min EC,3.948 MeV Ni-62 61.932586	063 69.17% Stable 62.929600	064 12.700 hr B-,EC,1.675 Zn-64/Ni-64 63.929767	065 30.83% Stable 64.927793	066 5.099 min B-,2.642 MeV Zn-66 65.928973	067 61.83 hr B-,0.559 MeV Zn-67 66.927730	068 31.1 sec B-,4.460 MeV Zn-68 67.929639
069 2.85 min B-,2.675 MeV Zn-69 68.929425	070 4.5 sec B-,5.799 MeV Zn-70 69.932409	071 19.5 sec B-,4.560 MeV Zn-71 70.932624	072 6.6 sec B-,3.220 MeV Zn-72 71.935804	073 3.9 sec B-,5.300 MeV Zn-73 72.936448	074 1.594 sec B-,2.900 MeV Zn-74 73.940006	075 1.224 sec B-,n,7.900 Zn-73/Zn-74 74.941384
076 0.641 sec B-/B-n,11.300 Zn-76/Zn-75 75.945591	077 0.469 sec B-,9.500 MeV Zn-77 76.947289	078 0.342 sec B-,12.400 MeV Zn-78 77.951797	079 188 msec B-/B-n,10.700 Zn-79/Zn-78 78.954139	MASS #bound. Half-life Particle, Energy Decay Product(s) Isotopic Mass		

Updated by ch on 2/6/99. This is not a publication of Phoenix College.

Periodic table data for copper


Solid minerals
and fossil fuels
UNFC
Petroleum
sales production
Produced quantities
non sales production
Additional quantities in place
Known deposits
exploited now or in future
All deposits
exploited in past, now or in future


Solid minerals
and fossil fuels
UNFC
Petroleum
Feasibility study
procedure
Maturity
of project