Russian Code

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The Russian Code

- Currently effective in Russia is the Code approved by the Decree of the Ministry of Natural Resources, RF № 278 of 11 December, 2006.
- Full title of the Document:
  - Classification of resources/reserves and prognostic resources of solid minerals

The Russian Code *(continued)*

- **The purpose of the Code** – defining the principles of calculation, assessment and keeping state Inventory of mineral wealth being also the foundation of planning and forecasting.

- Calculation and taking account of reserves/resources, estimation and taking account of undiscovered resources is done in mass measures in compliance with economically justified cut-off parameters, **with no account taken of ore losses and dilution** in mining, concentration and processing minerals.

The Russian Code *(continued)*

Contents of the Russian Code:

I. Generalities.

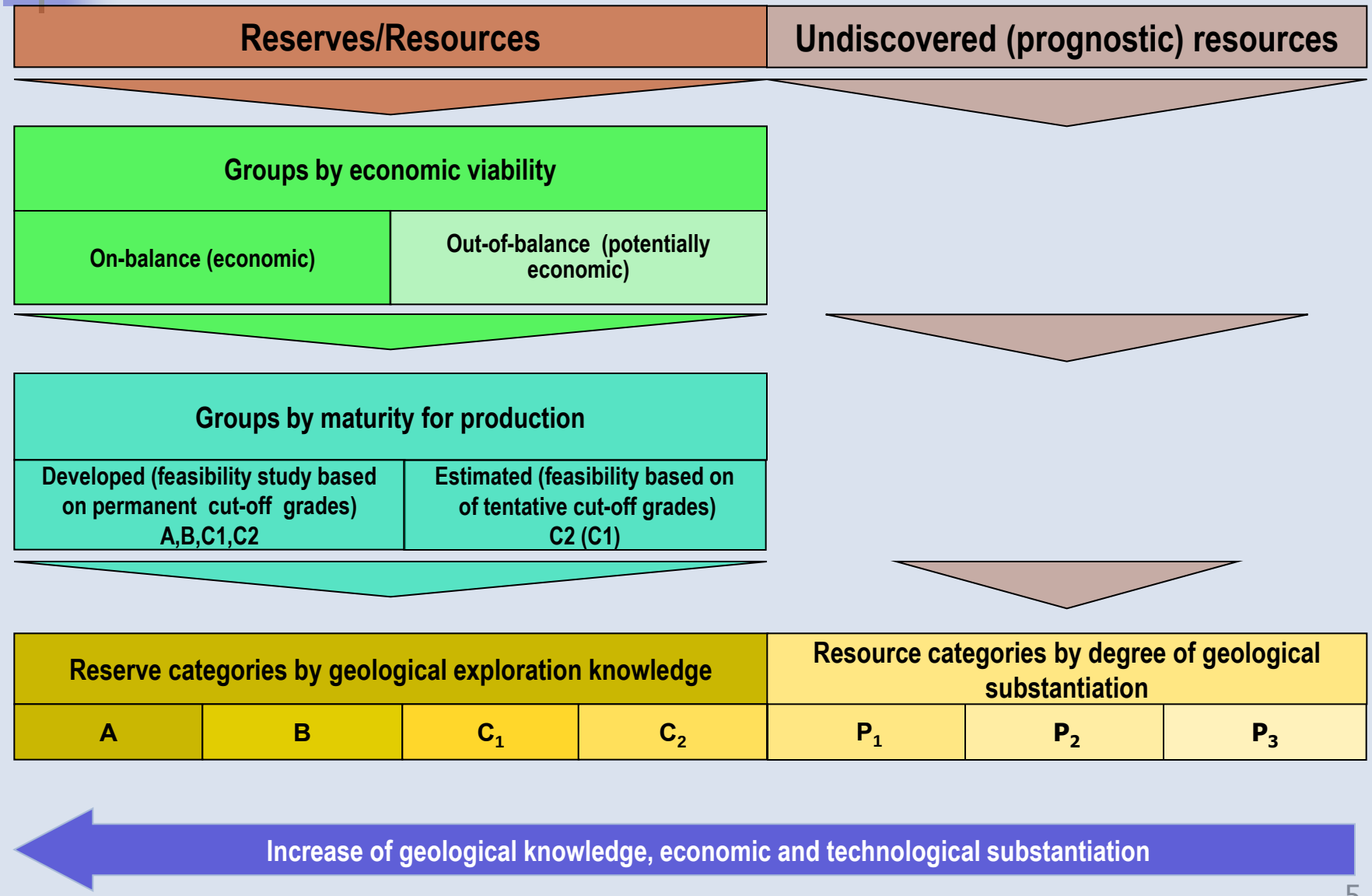
II. Groups of mineral reserves by economic viability.

III. Reserve and prognostic resource categories by geological exploration knowledge.

IV. Groups of mineral deposits by geological complexity.

V. Groups of mineral reserves by maturity for production.

The Russian Code *(continued)*

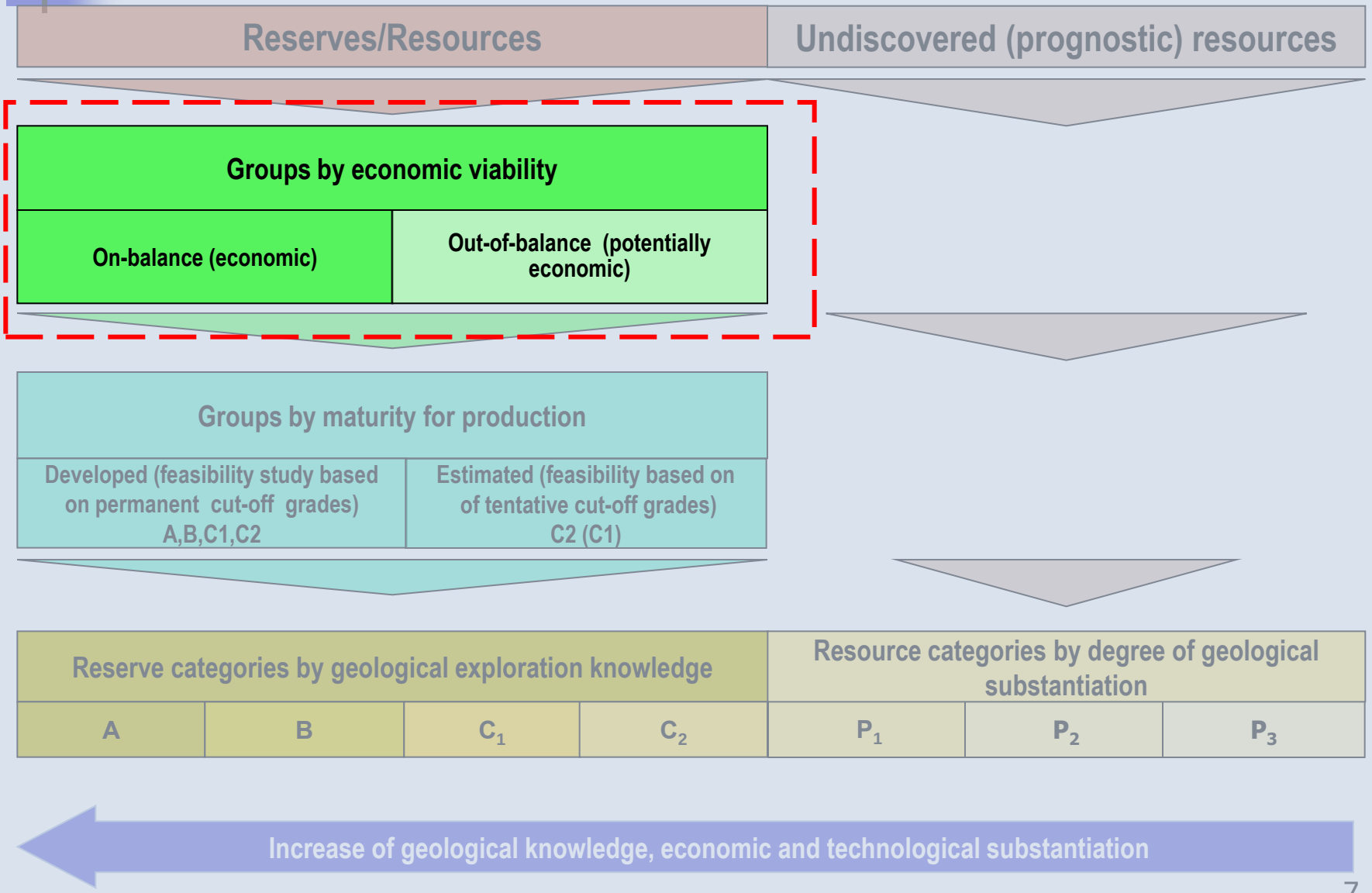


Assessment of undiscovered resources and reserves of mineral deposits by stages of exploration

Increase of geological knowledge, economic & technological substantiation

Stage	Targets of studies/assessment	Kind of geological-economic assessment	Categories	Degree of maturity for production
1. Regional geological studies	Metallogenic zones, basins, ore regions & fields	-	P_3, P_2	-
2. Prospecting	Ore fields & occurrences	Technical-economic justification	P_1	-
3. Estimation of mineral deposits	Mineral deposits	Feasibility study of tentative cut-off grades	C_2 (C_1)	Estimated
4. Development of mineral deposits	Mineral deposits, ore accumulations, ore bodies	Feasibility study of permanent cut-off grades	A, B, C_1,C_2	Developed

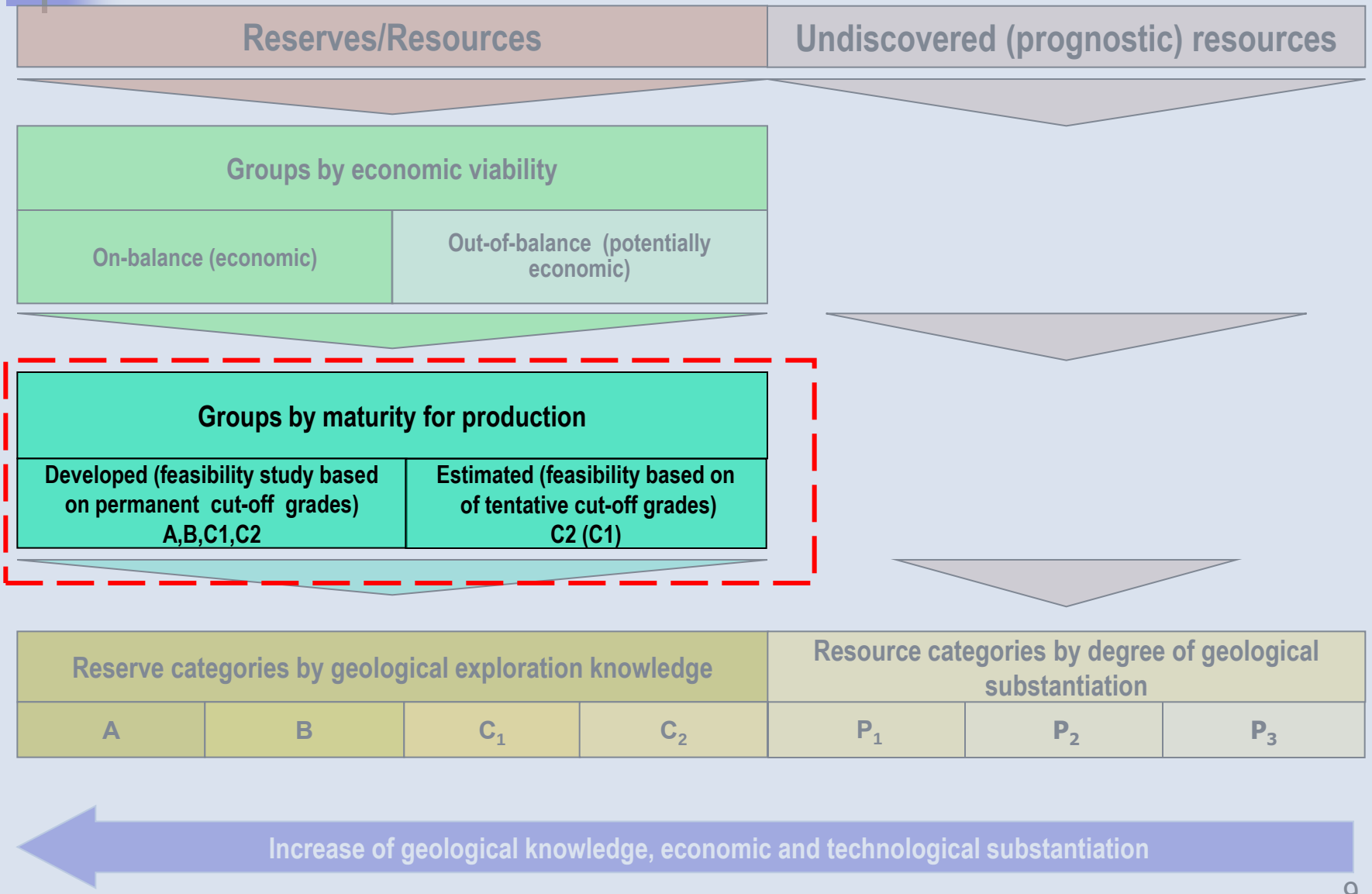
The Russian Code. Groups of reserves by economic viability.



Subdividing reserves by economic viability

Reserves	Conditions of defining
On-balance (economic)	Economic efficiency of recovery by up-to-date technical & technological level of mining development is proved by technical and economic feasibility calculations with rational use of subsoil and environmental requirements taken into account.
Out-of-balance (potentially economic)	Mining in present day conditions is not feasible for various reasons. Economic, technological, geotechnical and other prerequisits are available for the reserve to be used in the near prospective. The possibility of extraction and storing for further use is proved.

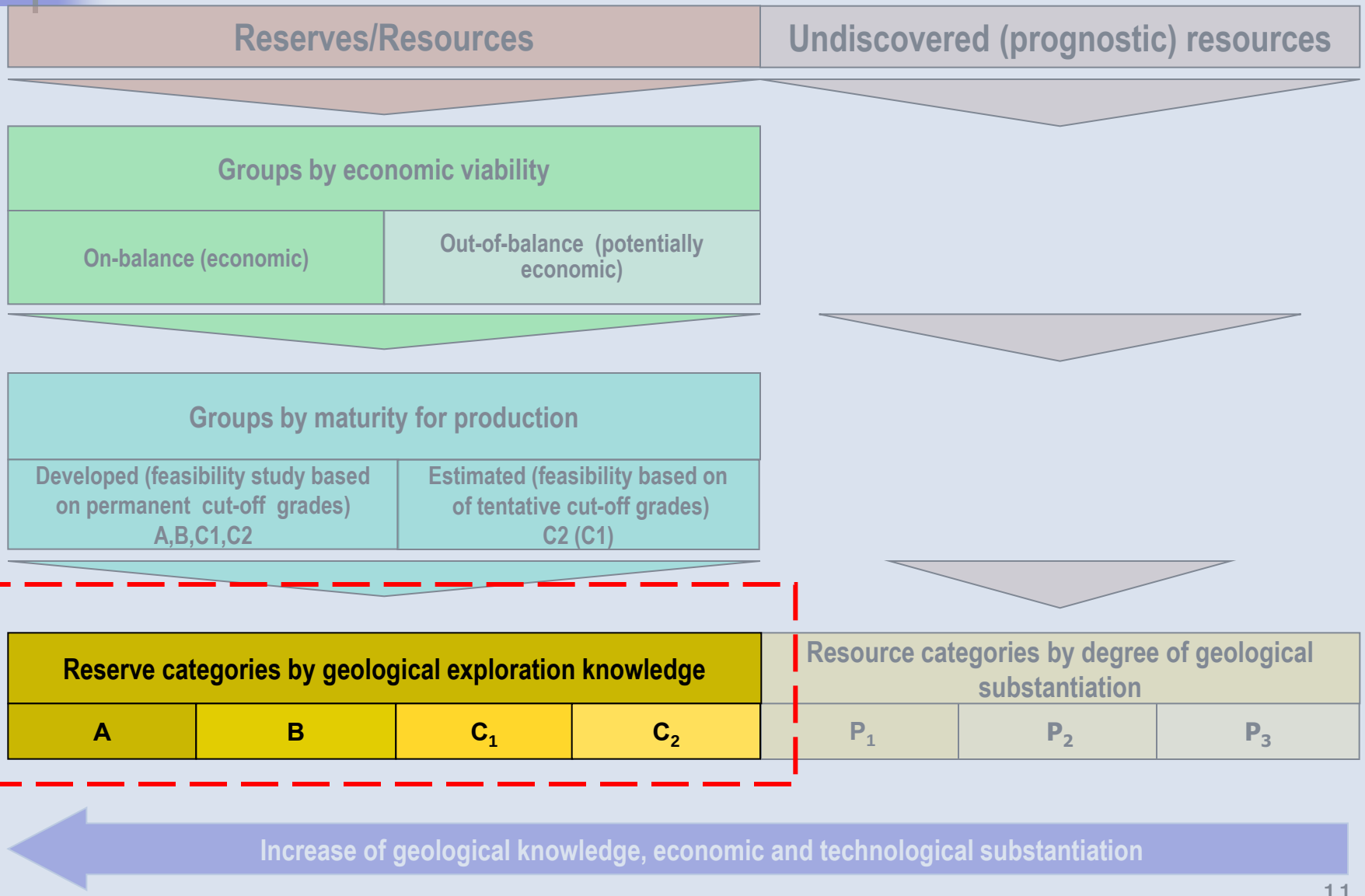
The Russian Code. Groups of reserves by degree of maturity for production



Subdividing reserves by degree of maturity for production

Groups of reserves	Conditions of defining	
Developed	**Reserves: quality, metallurgy, hydrological and geotechnical conditions of exploitation are studied:**	- by drill holes and underground workings with completeness sufficient for elaborating technical-economic study of bringing them into production.
Estimated		- to the extent sufficient to justify further development studies and trial commercial recovery.

The Russian Code. Categories of reserves by degree of geological knowledge.



Subdividing reserves by degree of geological knowledge

- Defining reserves in A, B, C1 и C2 categories is carried out by degree of detail and assurance of studying:
  - shape,
  - size,
  - bedding conditions,
  - regular features of internal structure,
  - natural varieties,
  - technological types and other characteristics of mineral bodies.
- “A” category is distinguished by the highest level of confidence, C2 by the lowest one.

Grouping mineral deposits by complexity

№	Properties	Description of properties of subdividing reserves by geological complexity groups			
		Group I	Group II	Group III	Group IV
1.	Size and shape features	Large, medium size, bedded, stratiform, lenticular	Large, medium size, bedded, stratiform, lenticular, stockworks, pipes	Medium- and small-size, stratiform, lenticular, stockworks, lodes, pipes	Small, more seldom medium-size, lenses, pipes
2.	Variability of thickness and	Steady	Variable	Very variable	Sharply variable
	internal structure	Simple	Complicated	Very complicated	Extraordinarily complicated
3.	Bedding disturbances by tectonics	Not disturbed, weakly disturbed	Disturbed	Intensively disturbed	Intensively disturbed
4.	Uniformity of distribution of valuable components	Even	Uneven	Very uneven	Discontinuous, nest-like

Quantitative characteristics of variability of main properties of mineral bodies

Groups of deposits	Measures of variability of development targets			
	Shape			Grade
	K_r	q	V_m, %	V_c, %
1st	0,9–1,0	0,8–0,9	< 40	< 40
2nd	0,7–0,9	0,6–0,8	40–100	40–100
3rd	0,4–0,7	0,4–0,6	100–150	100–150
4th	< 0,4	< 0,4	> 150	> 150

- K_r - Ore content ratio
- q - Index of complexity
- V_m - Thickness variation ratio
- V_c - Grade variation ratio (in ore intersections)

Generalized information on exploration workings grid densities applied in development of tungsten (W) deposits

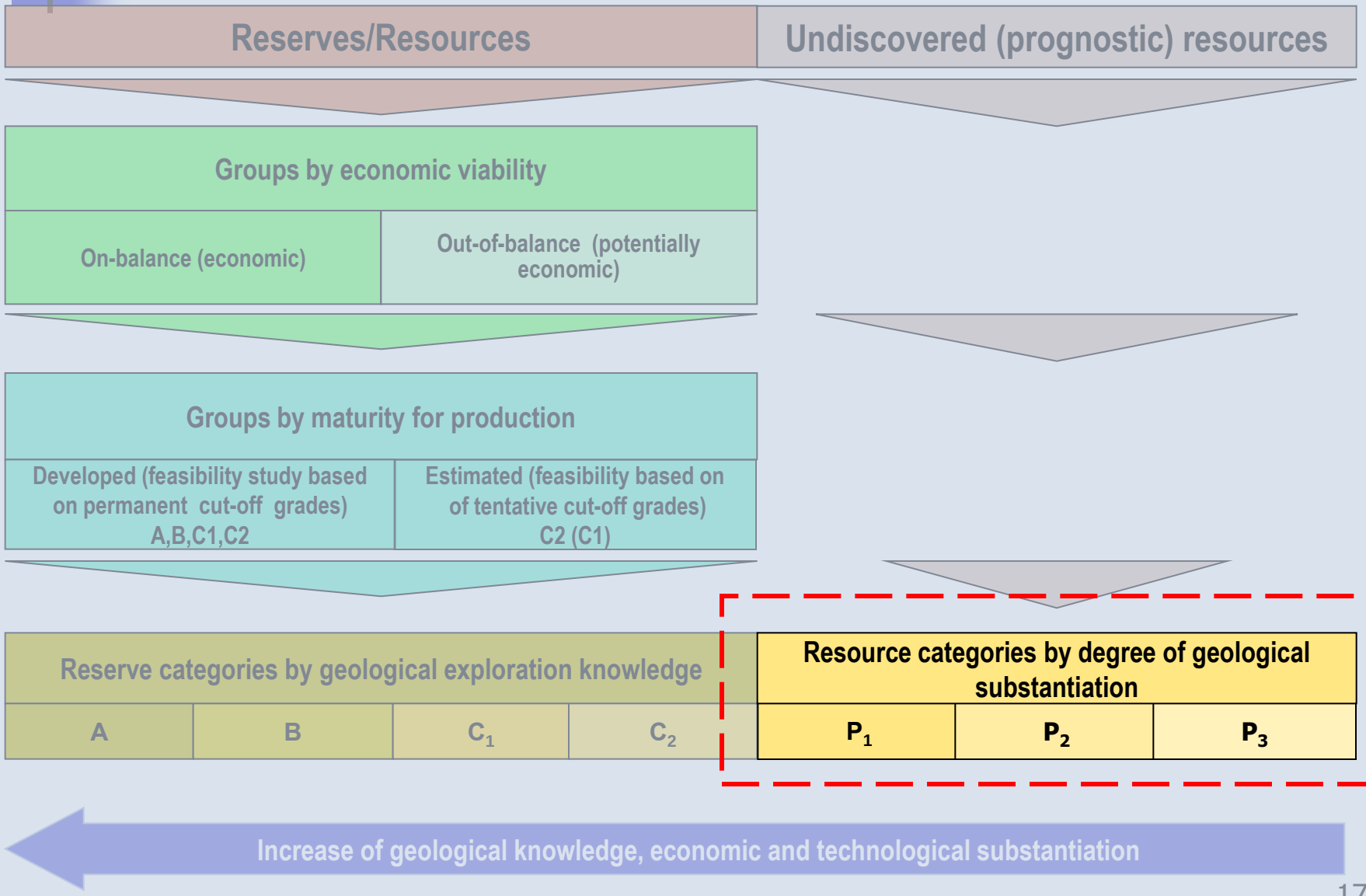
- Grouping mineral deposits by complexity groups is often used at early exploration stages for choosing parameters of exploration grids and qualifying mineral reserves by exploration results.

Group	Characteristics of ore bodies	Type of workings	Spacing between ore intersections in exploration workings for reserve categories, m					
			A		B		C1	
			On strike	On dip	On strike	On dip	On strike	On dip
1st	Large stockworks of simple shape and structure with relatively uniform distribution of WO_3	Adits, drifts	–	60–80	–	–	–	–
		Orts, crosscuts	50–60	–	–	–	–	–
		Rises	100–120	–	–	–	–	–
		Drill holes	–	–	100–120	100–120	120–200	120–200
2nd	Large stockworks, skarn bodies of complicated morphology or with uneven distribution of WO_3	Adits, drifts	–	–	–	60–80	–	–
		Orts, crosscuts	–	–	50–60	–	–	–
		Rises	–	–	100-120	–	–	–
		Drill holes	–	–	50–60	50–60	100–120	100–120
	Large lodes or mineralized zones predominantly steeply dipping with unsteady thickness and uneven distribution of WO_3	Adits, drifts	–	–	–	60–80	–	–
		Orts, crosscuts	–	–	20–30	–	–	–
		Rises	–	–	100–120	–	–	–
		Drill holes	–	–	60–80	40–50	100–120	60–80
3rd	Medium size lodes, complex stratiform, lens-shaped and lenticular skarn accumulations with unsteady thickness and very uneven distribution of WO_3	Adits, drifts	–	–	–	–	–	40–60
		Orts, crosscuts	–	–	–	–	10–20	–
		Rises	–	–	–	–	60–120	–
		Drill holes	–	–	–	–	60–80	40–50

Generalized information on exploration workings grid densities applied in development of deposits of radioactive metals

Groups	Mineral body types	Types of workings	Spacing between ore intersections in exploration workings for reserve categories, m.			
			B		C_1	
			On strike	On dip	On strike	On dip
2nd	Bedded, lens-shaped on a plan, with steady thickness and continuously low grades.	Drill holes	200–100	50–25	200–100	100–50
	Large, steeply dipping, high continuity lodes with uneven grade distribution.	Drifts	–	120–60	–	–
		Orts	25–10	25–10	–	–
		Rises	120	–	–	–
		Drill holes	–	–	200–100	100–50
3rd	Veinlike and stockworks, steeply dipping, of medium continuity and very uneven grade distribution.	Drifts	–	–	–	60–80
		Orts	–	–	50–25	25–10
		Rises	–	–	40–60	–
		Drill holes			50–25	25–10
	Stratiform, of medium and high continuity and uneven grade distribution.	Drifts	–	–	–	60–120
		Orts	–	–	50–25	50–25
		Drill holes	–	–	100–50	50–25
	Stratiform, ribbon-like, of high continuity on a plan and low in vertical section, with relatively uniform grade distribution.	Drill holes	–	–	200–100	50–25
4th	Vein- and pipe-like bodies of low continuity with extraordinarily uneven grade distribution.	Drifts	–	–	–	40–60
		Orts	–	–	25–10	25–10
		Rises	–	–	40–60	–

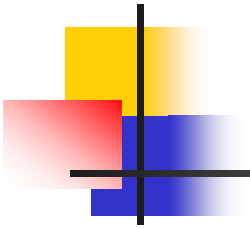
The Russian Code. Resource categories by degree of geological substantiation.



Classification of resources by degree of geological knowledge

When defining resource categories the following factors are taken into consideration:

Main factors of distinguishing resource categories		
P_1	**P_2**	**P_3**
Possibility of expanding boundaries of mineralization beyond the limits of C2 reserves or identifying new ore bodies in occurrences, deposits explored and under exploration by geological, geophysical and geochemical data, on materials obtained in structural and appraisal drill holes.	Possibility of discovery of new deposits in a basin, ore region, knot, ore field by data of large scale surveying and prospecting on mineral occurrences, geophysical and geochemical anomalies.	Potential of discoveries of mineral deposits based on favorable geological and paleogeological prerequisites by data of geological/ geophysical and mapping surveying, interpretation of space images, analysis of results obtained by geophysical and geochemical investigations.



Thank you!