

# INTERNATIONAL VISIONS ON THE USE OF NATURAL RESOURCES IN TERMS OF SUFFICIENCY, IN ROMANIA

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**Abstract:** The paper the use of natural resources in terms of sufficiency is examined, by making operational elements of management and energy diplomacy, published in the early part of the twenty-first century all over the world. In this context, a number of key elements are highlighted for processing dynamic exploitation and enhancement of natural resources in common, sustainable development equation: 1) growth; 2) social progress; and 3) the quality of the environment. The authors consider that this elements should be treated evolving into a strong interdependence. As such, it is important to distinguish clearly the categories of problems: a) physical demands of natural resources; b) restrictive requirements to damage occurring on the natural environment. In this framework, the authors, originally, introduce the concept of "environmental capacity" to be available reagent set operations.

**Keywords:** natural resources, sufficiency, mining, recovery, management, energy diplomacy.

## 1. INTRODUCTION

Acceptance quasi-official definitions of "sustainable development" is marked in 1987 by Brundt- land Commission Report, entitled "Our Common Future", by World Commission on Environment and Development conception.

In essence, the definition shows that sustainable development means "development that solves the needs of the present without compromising the ability of future generations or damage to solve their own needs".

In this context, a number of three main elements are included in dynamic process that jointly equation of sustainable development, namely: 1) economic growth; 2) social progress; and 3) the quality of the environment. They should be treated evolving into a strong interrelationship.

Subject of natural resources to exploitation and physical recovery offer the most significant cause damage to the environment. Sufficiency, ie their determined quantitatively character show that the operation (consumption) lead to failure for future generations, while influencing the quality of the natural environment.

As such, it is important to clearly distinguish the two categories of problems, in:

a) physical requirements of Natural Resources for consumption (operating and recovery) may fall under optimization (generally, aiming at reducing the quantitative extraction, so consumption to ensure a reserve working on longer intervals of time);

b) to restrictive requirements of damage occurring on the natural environment, as the operational exploration and exploitation of natural resources.

Solutions for the two categories above problems must operate conjugated, implicit and explicit depicted. In this framework, we introduce the notion of "environmental capacity" to be reactive available to those transactions.

## 2. IDENTIFICATION OF NATURAL RESOURCES AND RAW MATERIALS

The problem of natural resources is multidimensional: technical, economic, social, environmental, political. These elements are aggregated by juxtaposition becoming techno-economic and economic policy.

The problem of natural resources is proving to be global because the world is an uneven distribution thereof, and is emphasized the competition for scarce raw materials and materials.

They persistently sought new relations between highlighter, evaluation and exploitation of natural resources based on considerations of converting natural mineral potential in actual industrial mineral reserves.

Natural mineral potential in fields should be evaluated for operating and setting the stage for recovery of useful substances. Among potential mineral deposits in situ assessment of natural and identify links to be elucidated by means of analytical research methods, statistical, mathematical and geostatistical.

Basically, if you start evaluation algorithm is weighted at the time of acceptance of the existence of a certain natural mineral potential in deposits by the end analytical and operational inheritance or reach marketable commodity products and menus two alignments of activities (Figure 1):

a) obtaining quantitative and qualitative contour of industrial mineral reserves, and effective transition to exploitation and preparation, and

b) deposits in situ evaluation by analyzing successive transformations of geological reserves of industrial reserves.

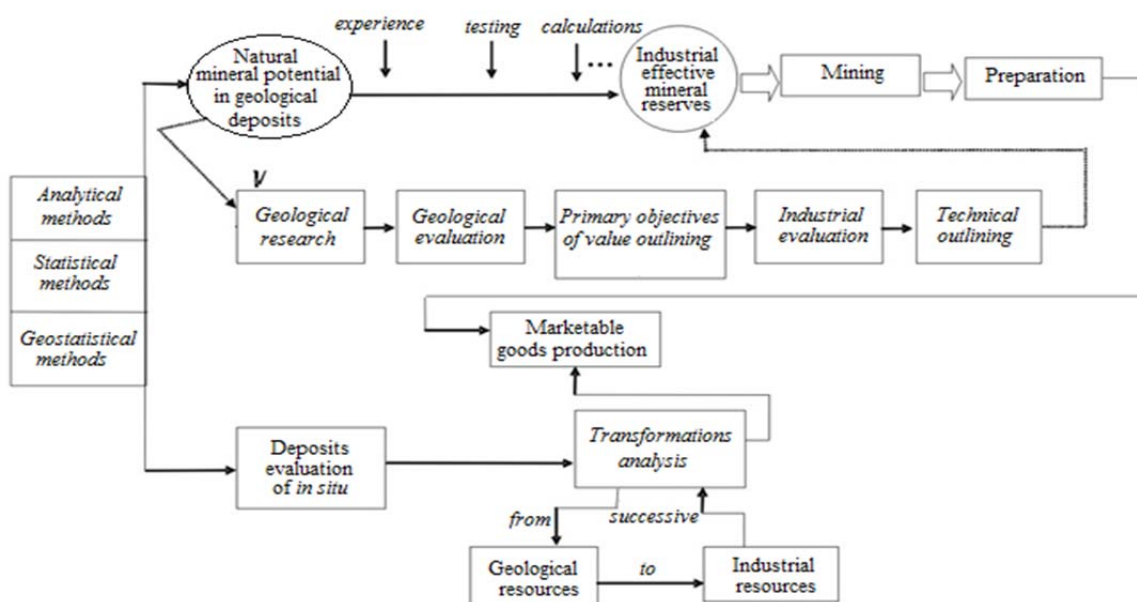


Fig. 1. Algorithm of activities from natural deposits potential marketable commodity products.

From natural mineral potential of deposits and effective industrial mineral reserves occur: (I) Geological research; (II) Geological assessment; (III) Preliminary Shaping objects recovery; (IV) Industrial Assessment; (V) Technical and economic shaping.

The role of economic and technological considerations is essential in shaping wider or reduced accumulation of minerals (Figure 2).

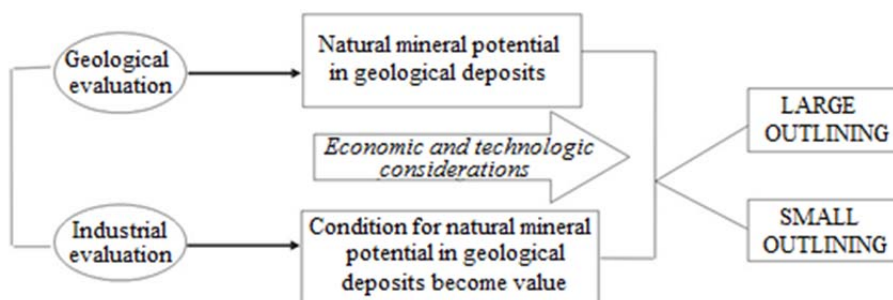


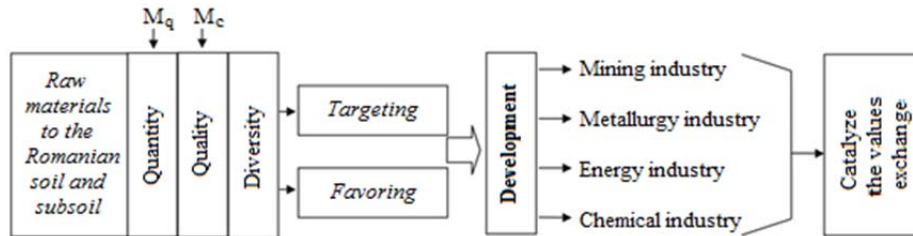
Fig. 2. Economic and technological considerations role in shaping broader or reduced accumulation of useful natural resources.

Between geological and industrial assessing is conditioning occurs or materializes restrictions that do not always work as a naturally occurring mineral potential in deposit, and it is necessarily become to potential geological object of industrial recovery.

The most reliable way of determining the relationship between assessment and recovery is obtained from quantitative and qualitative shaping environments in situ.

The development is favored by the quantity and the quality of natural resources.

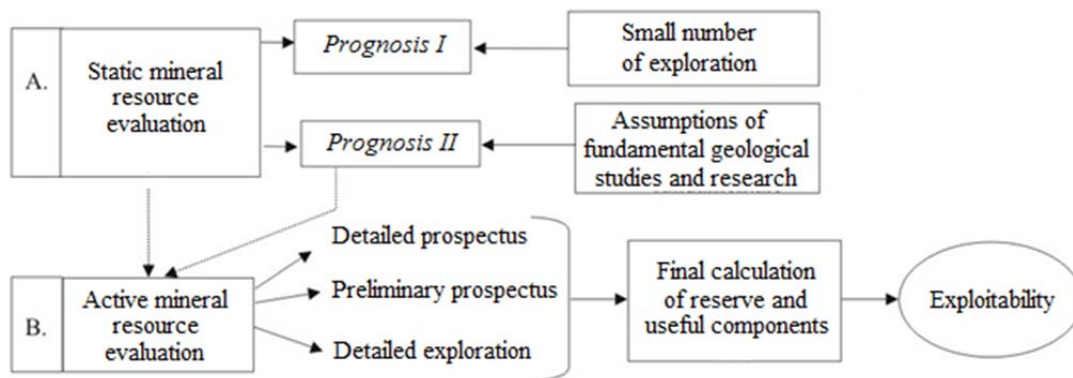
By extension, quantitative and qualitative metallogeny means to support the development factor (Figure 3).



**Fig. 3.** Quantitative and qualitative role of metallogeny in directing and encouraging the development issues:  $M_q$ = quantitative metallogeny;  $M_c$  = quality metallurgy.

Romania subsoil mineral raw materials, for example, are characterized by: 1) the amount; 2) quality and 3) diversity. It directs important the development, strengthening exchanges of flow between economic branches and industries.

Therefore, it is critical importance in the field when strategies provide action steps to transition from static mineral resource assessment category of mineral resources assets, that can be included in the proceedings of development (Figure 4).



**Fig. 4.** Steps and actions to switch from latent to the evaluation of mineral resources assets.

In this context, a country is rich in natural resources than another, to the extent that the physical volume is absolutely completely finished their greater in comparable terms.

Safe natural resources, absolute are rare increasingly. Virtually, every type of resource through the process of inevitably quantitative reduction, it is embedded in goods and services. The embedding is operationalized by specific technology, which in over time turn undergoes changes, innovative falling.

In line with the above general trend, there is need for formalization of specific types of resources management and transformation.

At institutional level, organizations stating productive economic process management emerged and exploitation of the main planetary resources (eg OPEC for oil, ECSC for coal and steel, the EU Common Policy fisheries etc.).

Earth, forest areas, materials, energy etc. are frequently found in modeling sectoral focus.

Also, it is record the practical decoupling tendency of material consumption from economic growth.

In this context, there is another continues trend in the growth of energy consumption.

In the next 30 years, according to the European Commission, forecast energy consumption will be 30% higher in OECD countries and by more than 70% globally on the planet. It is tendency to decouple energy consumption from economic growth.

Physical space (land surfaces) is the key-resource. Extended surfaces with infrastructure in the last 20 years is more than 20%, which is more pronounced than population growth (6%).

The trend of loss of bio-productivity and demand for buildings located on large areas, units, or intended for decentralization of transport infrastructure investment led to this type of resource fragmentation, and is key that accredited conclusion that space is not used yet with expected efficiency.

It manifests requirement that non-renewable resources to enter on the overall scope and intensity volume reduction operation, although it is projected that consumption a certain level of growth.

Reserves of fossil fuels in relation to the current rate of exploitation and consumption closely with geological evidence of new deposits provide the global, planetary resources valuable for at least another 200 years.

In the field it is possible to increase the production of oil from 45 million to 75 million barrels, but the natural decline in this type of resource is greater than that of others.

World vision of exploration companies is in the aggregate system and have already extractive reserves/resources covering geological averaged by practical needs, effective operation for the next 20-40 years (Table 1)..

*Table1. Production situation and prospects for the exploitation of ferrous and nonferrous minerals in the World and in the EU (2012)*

Resource	Production 2000 [10 <sup>3</sup> tonne]		World resources [10 <sup>3</sup> tone]	Resources/production in next years
	World	UE		
Iron	535.000	13.000	71.000.000	133
Zinc	8.040	560	190.000	24
Lead	3.020	201	64.000	21
Copper	12.600	182	340.000	27
Nickel	1.120	17	49.000	44
Tin	198	3	9.600	49
Silver	18	0,5	280	16

In particular, tend to reduce the amount of damage to non-renewable resources is based on: 1) the efficient use thereof, respectively; 2) the emphasis on their recycling.

Also, are considered new progress in technology use of natural resources (eg, cogeneration and clean combustion of coal) or introduction of substituents (substitutes) in production flows.

On the other hand, in every region, including in the EU, is important to maintain the security of resources relative to their sufficiency.

It is estimated that in the next 20-30 years, EU energy demand can be satisfied only by calling, by at least 70% of imports.

With respect to natural resource management, literature and research in the field show that content is found formalization manifestation of type 1) different, 2) diversified 3) nonconjugated 4) trends tangent in practical short and medium term.

### 3. SECURITY OF ENERGY FROM NATURAL RESOURCES IN ROMANIA AND EUROPE

Future growth of the Europe, which is found Romania, is certainly characterized by energy dependence. Researching the conceptual relations in the field, it is considered that the perspective of 2030, it is practically impossible to ensure self-sufficiency of Europe's energy resources, the most favorable recommendation being the operationalization of failure to reduce the risks associated with energy resources for necessary substance (Figure 5).

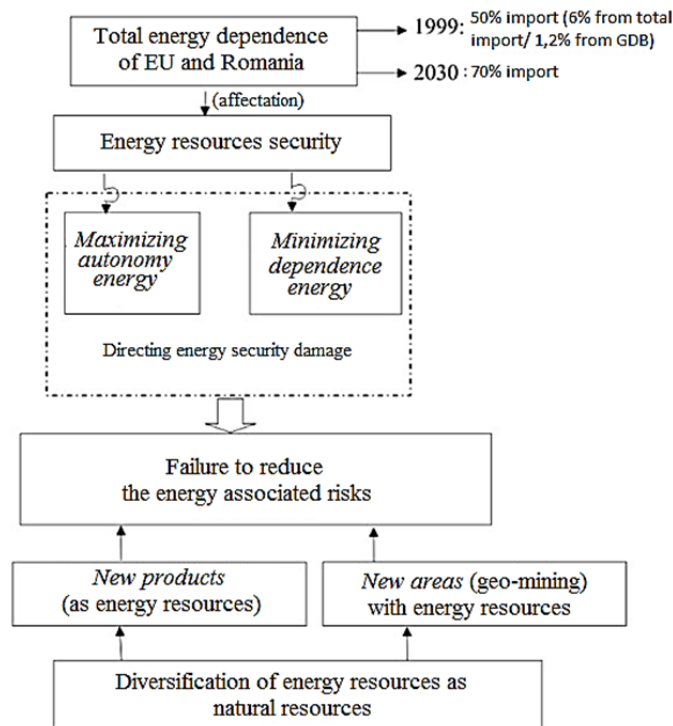


Fig. 5. Concept failure to reduce the risks associated with energy resources, natural resources, in the United Europe 2030.

Since 1986, the annual absolute rate of growth of energy in EU consumption was between 1-2%. In the medium term (2016), is projected to increase in absolute value rate to 3-6%, due to modernization projects of member countries.

It turns so that the European Union is manifested based economy intensive energy.

Measures of transition to the European economy based on services have helped reduce oil reproductive dependence 16%, but consumption was structural redistributed on natural gas and electricity.

For United Europe, comprising approx. 30 countries for the years 2030, shows the primacy of energy consumption in the tertiary sector and the household.

In 2030 in the structure of projected to produce fuel energy is recognized limitation of natural energy resources of the Community, namely the uncertainty of developments in the domestic production of hydrocarbons.

Oil reserves are irregularly distributed deposits in the world, and the EU is not significant holding such resources (only 4.4% of the world are found in the North Sea area, or the area is in exhaustion). Currently, the cost of a barrel of oil extraction in Europe is 7-11 USD, compared with 1-3 USD in the Middle East.

Natural gas reserves of the European Union represents only 2% of the world, which at the current rate of extraction provides local production for more than 20 years.

In absolute values, solid fuel reserves in the world are 4-5 times higher than those of oil, the insurers for at least 200 years.

Approx. 80% of fossil fuels in the EU are in the category of solid fuels (coal), but their quality is variable and high extraction costs. In the area of coal production is 5% of the total extraction of the world.

European Coal cost price is higher than 3-4 times the international market price (150 USD / tce to 40 USD / tce). Therefore, measures aimed at restructuring the coal industry European technological exploitation corrective efforts to achieve competitiveness in the field.

In the field of uranium, the EU has only 2% of world reserves, which are about 2.5 million tons for consumption insurers for 40 years at the current rate of demand.

European reserves are exhausted; in France, Portugal and Romania uranium mines entering the gradual closure and rehabilitation process.

Renewable energy resources are abundant, but they (hydropower, biomass) were less important role in the European structure of production and consumption.

Practical trend analyzes lead to the conclusion that the next stage (2030), the European Union will mark the high dependence on all forms of energy, provided by imports (90% oil, 70% natural gas and 100% for coal) .

Expanding dependence is supported practical formulas objectives, action competitive in pricing for coal, oil and natural gas, the market and cartels play decisive roles.

It is estimated that EU dependencies prediction interval 2030 will manifest in relation to the Middle East for 55% of oil, and the Russian Federation to 42% for natural gas.

#### **4. SUFFICIENCY OF NATURAL RESOURCES IN ROMANIA**

Sufficiency of natural resources, is apparently related to costs. What can be compared to a price (P) returns the set of elements - resources M (Er), characterized by a cost (C) is always less than the price charged.

Such a vision of the sufficiency of natural resources is characterized by operational relativity. Sufficiency (S) belongs to the area of distribution (D).

It is quite noticeable that in a country like Romania, natural resources are finite complete physical volume absolute peak  $V_f [M (E^i)]$ .

The physical volume is completely finished in absolutely natural resources, that varies from country to country and reaches a certain limit formalized the global existence.

Never touch the operating status and total recovery of natural resources completely finished. Instead, it is possible, in turn, certain types of resources to reach exhaustion. Of the identified physical distribution of natural resources is achieved, allocation, and assignation destinations for consumption.

Individual or collective makers, owners and institutions resort to the use of natural resources through decisions, voting, auctions, tenders and demand, balanced or unbalanced shares (symmetric and asymmetric allocations), decisions by associations, committees, and reîmproprietăriri allotment or allocation subjective supported by circumstances and favors. This determines the sufficiency formalization volume and quality of natural resources.

In addition to full expression in the absolute volume finite natural resources, determining the sufficiency of fundamental, basic, it appears that different economic systems affect consideration or reconsideration conceptual adequacy themselves.

Thus, centralized industrialized society, the sufficiency of natural resources is apparently offset by the allocation or distribution strictly controlled administratively imposed for consumption, or recovery. In this context, perspective, efficiency, productivity and environmental problems are found in the background.

In decentralized capitalist industrial society, based on competition and competitiveness, the sufficiency of natural resources is offset by allocation or distribution by searching based on self-sufficiency of the sub-system. Quality, cost, efficiency, productivity, and enhancing environmental issues in closed complete cycles are at the forefront of action.

It is true that in the latter case the manifestation of the sufficiency of natural resources is recorded depersonalization local development interests and intentions in that it essentially relates to the operation and recovery of capital flows and resources are placed only on alignments operational efficiency.

Market prices for certain resources, it is possible to adjust the level and content sufficiency. Instead, outside markets, sufficiency decreases as presence, as far as absolutely complete finite volume of existing natural resources is approved and becomes physically reserved / preserved potential use in future stages.

Animals, plants, human activities etc. are generally characterized by a certain existential sufficiency and action.

Sufficiency is found in individuals, organizational, governmental, regional and global levels.

Sufficient conditions are: a) absolute and b) relative. Typically, the overall vision, strategy developers sufficiency raises concerns long-term and very long.

However, not to be confused with sufficiency dimensional and qualitative limitation of resources, whereas technical progress and new technological knowledge contributes to the quasi-

permanent reunification grades and resources by attracting new types and kinds of resources / reserves circuits production and reproduction.

As such it is of interest to formalize conceptual - shaping the sufficiency of natural resources.

Sufficiency of natural resources requires effective search process variations, alternatives or solutions to ensure the required assortments consumption in terms of quantity and quality.

In a system of values is manifested economic requirements (production) and cerințecomerciale (market). The actual values are subject to allocation restrictions influenced by technical, technological, efficiency, etc. ( $r_1, r_2, \dots, r_n$ ).

This complex process of identifying and exploiting natural resources in the area occurs successively shaped economic sufficiency and environmental requirements.

From there completely finished in absolute physical volume of natural resources in Romania is possible in relation to the set of elements - resources, their distribution area, the operating cost and the selling price to the consumer-recovery to formalize the optimal sufficiency ( $S_{\text{optim}}$ ) by following model:

$$\left\{ \begin{array}{l} \mathcal{M}(E_r) = \{E_r^i\} \\ S \in D \\ (C \leq P \\ V_f[\mathcal{M}(E_r^i)] \neq +\infty \end{array} \right\} \rightarrow S_{\text{optim}} \quad (1)$$

However, it is inferred that if the set of finite elements complete resource absolute physical volume is high quantity (dimensional) final cost-recovery operation can be typically lower than price possible sequences practiced in marketing.

The above analytical framework can identify sufficiency maximum ( $S_{\text{max}}$ ) and minimum (or failure) ( $S_{\text{min}} = I_s$ ), the prices of operational ( $P_{\text{op}}$ ) and non-operational ( $P_{\text{n-op}}$ ), and minimum total cost ( $C_{\text{min}}$ ) and maximum ( $C_{\text{max}}$ ), as follows:

$$\left\{ \begin{array}{l} V_f[\mathcal{M}(E_r^i)] \rightarrow \text{MAX} \rightarrow C_{\text{min}} \rightarrow P_{\text{op}} \rightarrow S_{\text{max}} \\ V_f[\mathcal{M}(E_r^i)] \rightarrow \text{MIN} \rightarrow C_{\text{min}} \equiv C_{\text{max}} \rightarrow P_{\text{n-op}} \rightarrow S_{\text{min}} \equiv I_s \end{array} \right. \quad (2)$$

Environmental economic accounts is usually circumvented in costs or prices practiced in the market segments for natural resources and this was likely to be called "theft of efficiency".

This happens because they are manifested conditions blur remoteness of decision-making on real and accurate calculation of total effects produced on the environment by operating activities.

The conflict between values and consumption of natural resources exploitation system persists because "economic" is still in conventional manner, placed in front of the "environment" in place that both find themselves interconnected articulated in the flow of production and reproduction.

Wrongly, persist thesis that "environment" causes "failure" of natural resources or formalize a sufficiency called them.

## 5. CONCLUSIONS

Sufficiency of natural resources in Romania resulting from physical reality geological and ecosystem. It states that the sufficiency of natural resources is characterized by operational relativity.

It is first introduced in the literature the concept of natural resources completely finished in absolute physical volume.

There never reach a state of total resource exploration and exploitation completely finished.

Formalization sufficiency is achieved volume and quality of natural resources. Always show basic fundamental sufficiency and search by self-sufficiency of the sub-system.

It is useful conceptual-modeling formalization of the sufficiency of natural resources and the identification zone defaults and the ratio of total operating cost-recovery and full-size finite resources in absolute volume.

Maximum and minimum sufficiency (or insufficiency) are correlative with prices and costs of production and reproduction processes, which involve natural resources for planned changes.

Prediction ensure sufficiency of natural resources is not always fully substantiated, if renewable resources.

Although quantitative assist in decoupling material consumption (which remains constant or decreasing) in relation to quasi-continuous growth can be concluded that the scope of environmental impacts are increasing damage curves.

However, between curves impact and growth curve is recorded decoupling or gaps.

Practical scenarios in the world in natural resources shows that on average it is possible to increase the economic efficiency of energy use by at least 1% per year.

Continue degradation, respectively, the bio-productivity soils and damaging human health record not expected to impact decreases.

Ensuring security in the context of resource adequacy requirement strengthen their natural cycles induce embedded natural resources.

All items above conclusion, it is necessary to find articulated and interconnected management or management strategies in the field.

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## VIZIUNI INTERNAȚIONALE ȘI ABORDAREA UTILIZĂRII RESURSELOR NATURALE ÎN CONDIȚII DE SUFICIENȚĂ ÎN ROMÂNIA

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**Rezumat:** În lucrare se recurge la examinarea folosirii resurselor naturale în condiții de suficiență, prin operaționalizarea elementelor de management și diplomație energetică, apărută în prima parte a secolului XXI în plan global. În context, sunt evidențiate un număr de elemente principale de procesare dinamică a exploatării și valorificării resurselor naturale în comun, în ecuația dezvoltării durabile, și anume: 1) creșterea economică; 2) progresul social; și 3) calitatea mediului înconjurător. Autorii considera ca acestea trebuie tratate evolutiv, într-o puternică interdependență. Ca atare, este importantă delimitarea categoriilor de probleme în: a) cerințe fizice de resurse naturale; b) cerințe restrictive față de afectările ce se produc asupra mediului natural. În acest cadru, în mod original se introduce noțiunea de „capacitate a mediului”, de a fi reactiv disponibil la operațiunile menționate.