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Create Sustainability Models By Modeling Sustainability With Cyclic Structures And Commutative Diagrams

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Abstract

Purpose: The article presents models of sustainable performance in the approach to environmental, economic, and social balance. The research is also based on the sequential qualitative correlation approach of the Fractal type, for complex phenomena.

Methodology: The article uses the sequential qualitative correlation approach, belonging to the Fractal type, for complex phenomena.

Findings: The article shows how to model persistence using cyclic structures and commutative diagrams, explaining the complex mechanisms that engage and produce equilibrium or disequilibrium. These states are analyzed, controlled, and adjusted through crisis management

Practical implications: The article points out the need for new conceptual frameworks to report corporate performance including risks and uncertainties arising from social and environmental factors.

Social implications: The content of the article presents the sustainability measurement models used to demonstrate the characteristics and potential alternatives in environmental protection.

Originality/value: The article brings a new perspective on the appropriate form of measurement to understand the dynamic and complex mechanism expressing the relationship between human society and the natural environment, ensuring the reliability of sustainability measurement in reporting financial and non-financial information

Keywords: Commutative diagram, sustainable performance, cycles of conceptual modeling, self-stimulating, self-inhibitory

1. Introduction

There are now more modern tools for measuring sustainability that focus on the data and the flow of information or documents represented in the models.

The complex sciences have brought a new perspective on the appropriate form of measurement to understand the dynamic and complex mechanism expressing the relationship between human society and the natural environment, ensuring the reliability of the measurement. sustainability in reporting financial and non-financial information. Each science approaches a different direction to complement the traditional accounting and quantitative approaches to measurement. The view of effectiveness in sustainable development is translated into technological and ecological assessments of economic growth models.

Sustainable development is a controversial concept. In addition to economic aspects, sustainable development also includes social, environmental, and cultural aspects. Sustainability measurement models are used to demonstrate features and potential alternatives in environmental protection. Gam, H. J., Cao, H., Farr, C., & Heine, L. (2009) emphasized the idea that in practice, triple-bottom-line accounting tends to focus on economic concerns with ecological and social benefits justified.

The article presents models of sustainable performance in the approach to environmental, economic, and social balance. The research is also based on the sequential qualitative correlation approach, of the Fractal type, for complex phenomena. Research methodology focuses on tools that demonstrate the complexity and interrelationships between economic, social, and environmental entities. This interaction will give rise to new relationships and new entities. The paper also studies how to model stability by cyclic structures and commutative diagrams explaining the complex mechanisms involved in and generating equilibrium or disequilibrium, analyzed, controlled, and analyzed. control and adjustment through crisis management. The content of the article also points out the need for new conceptual frameworks to report business performance including risks and uncertainties arising from social and environmental factors (Dietz, S., & Neumayer, E. (2007).

2. Literature reviews

Modern measurement models are based on complex sciences that govern the entire process, not individual stages. Sustainability measurement perspectives have also changed, such as structural equation models, which present visions of relationships between variables (more money in the market leads to increased costs, total costs include government costs and non-government costs, etc.)

The pioneer in this field was Georgescu-Roegen, N. (1977), who used models inspired by Ilya Prigogine's theory of dissipative systems. Complex models are often used to understand and predict the behavior of complex systems, such as weather patterns, pollution effects, economic patterns, or problems caused by demographic growth. learn to create. Complex models such as dissipative system theory, cellular automatism theory, fractals, catastrophe theory, and the theory of neural networks (Mock & Wernke, 2011) can all be used to measure sustainability. Reporting to the generative dissipative systems, of fractal type, shows a unique human tendency to react to the natural and social environment.

Fractal modeling allows us to understand hidden linear mechanisms that can directly affect the behavior of complex systems. Persistence modeling, starting with cyclic structures and commutative diagrams, is a contribution to the understanding of the mechanisms that engage each other in cases where equilibrium and disequilibrium are produced. by two connected dissipation systems. This mutual involvement, which generates cycles of self-excitation and self-inhibition, as well as the accumulation of information or matter in the endpoint of the commutative scheme, represents the possibility of deciphering the mechanisms of black box where relational information about two or more actors in any economy or sustainability game is processed. This type of relational approach depends on persistence, hardware condition, and other factors

The reciprocal relationship can be represented as a network. The main economic cycles appear in the early stages of the sustainability model. The second phase analyzes fractal structures and patterns, leading to the identification of new economic cycles and new levels of analysis.

The sustainability model was originally built on the assumption that socioeconomic transformation is very similar to biochemical transformation, as the GAIA theories of the planetary organism state. Researchers are dealing with a multitude of socio-economic and environmental reporting issues known as global performance reporting (Hassel, Nilsson, & Nyquist, 2005). It is assumed that any economic behavior is directly influenced by human thought patterns and mediated by the relationship between man and the natural environment. Keynes addresses the approach of Source – resources, of Sensor – characteristics or values, and of Decision-maker – portfolio, and, also, to the approach of interferences among the economic, human, and natural environments through fractals and dissipative sciences (Colceag, Dascălu, Caraiani, Lungu, & Guşe, 2011).

3. Theoretical framework of research

3.1. Relationships between Source, Sensor, and Decision-Maker in Complex Modeling

To achieve the goal of conceptual modeling of sustainability, research focuses on commutative cycles and diagrams. The approach of successive levels is designed, and repeated in different sizes, building new forms. Figure 1. Primary cycles of conceptual modeling for the sustainable performance show the sustainable development relationship between the factors of resources, market, value, money…The commutative diagram starts from natural resources converted to money for measurement purposes and it leads to the resources mechanisms market.

The main structure underlying the feedback structure includes a Source, a Sensor, and a Decision-maker along with a list of possible relationships between these three components (Raluca Guse, G., Dascalu, C., Caraiani, C., Iuliana Lungu, C., & Colceag, F. (2011).

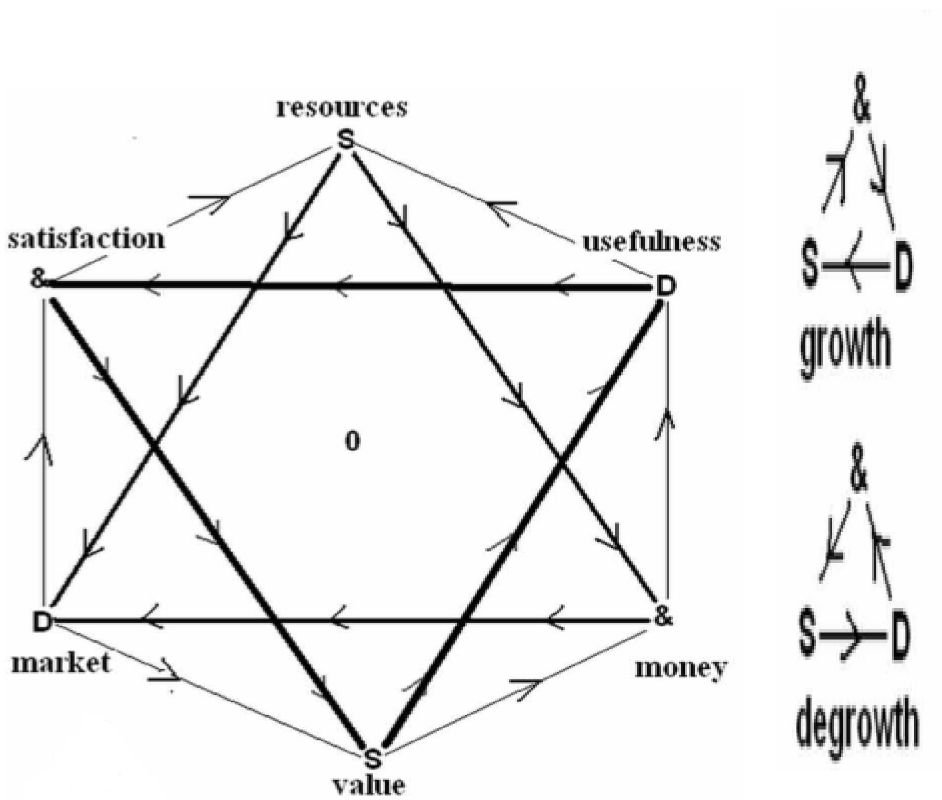

Figure 1. Primary cycles of conceptual modeling for sustainable performance ((Lungu, C. I., Caraiani, C., & Dascalu, C., 2013)

Behaviors are set by arrows indicating the relationship between the Source, Sensor, and Decision-maker, changed by the time factor, each element has the opportunity to self-stimulate and inhibit. Simple schemas corresponding to cycles contain at least three elements such as:
A→ B →C → A →B …
Cycle types can be defined in terms of increasing or decreasing cycles as follows:
• Growth cycle: Source → Sensor →Decision-maker → Source …
• De-growth cycle: Source → Sensor →Decision-maker → Source …

If the starting point is A, B is the intermediate point, through the above relationship we see the relationship between the three factors as:
A→B và B→C ➔ A→C
This sustainability measurement model can be designed by establishing financial and non-financial information as the Source element of the model, and the management decisions as the Decision-maker of the model. The sensor may be represented by social and environmental factors that could influence the measurement and disclosure of sustainable performance. The behavior of cycles may be self-stimulating or self-inhibitory. The case of self-stimulating increases the amplitude, conversely the self-inhibition decreases the amplitude.
This method allows us to qualitatively understand the specific correlation of the Source–Sensor–Decision-maker (SSD) structure, which generates internal or conventional costs. external costs or negative externalities (Pretty, J. N., Brett, C., Gee, D., Hine, R. E., Mason, C. F., Morison, J. I., ... & van der Bijl, G., 2000)

3.2. Methods for designing sustainable models

Sustainable development models are designed to derive from the original ones. Since then, the subfigures (derivative sustainability model) are built based on the following principles (Lungu, C. I., Caraiani, C., & Dascalu, C., 2013):
o Every equilateral triangle in the figure must have self-generated content i.e. any two angles will create the 3rd angle
o The content on the obtuse vertices of any isosceles triangle is produced by the contents of the vertices of
acute angles in that triangle
o The contents of points on the same line in the figure are the logically necessary intermediate steps to get from one point to another
o Evolution vectors going straight through the center of the hexagon show how concepts evolve from sides farther away from the center to ends closer to the center of the hexagon.
Eg:
a) Technological innovation, passive economy, and loss of biodiversity, the two create the third;
b) Mining output is created by renewable resources and development rhythms…

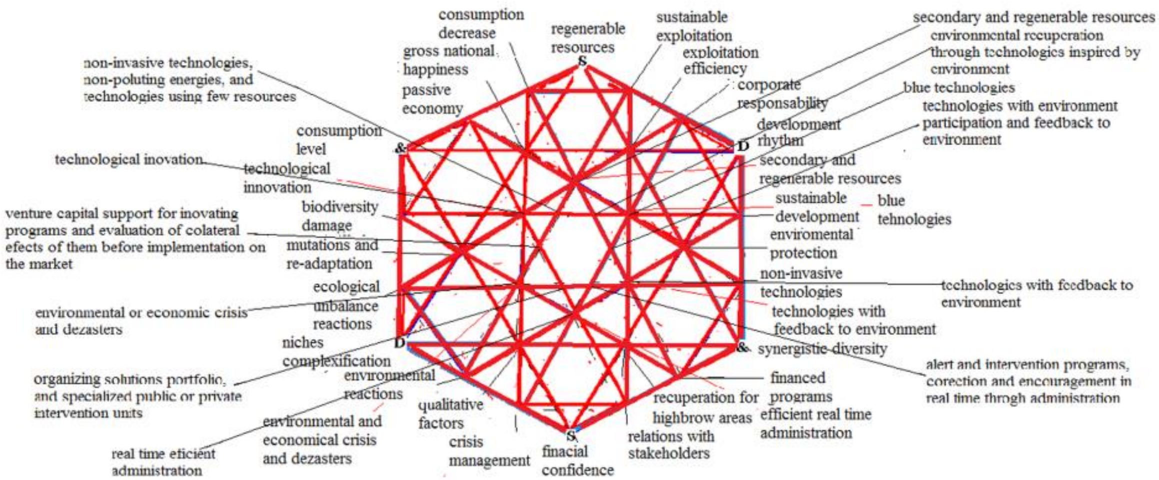

Figure 3. The logical structure of the performance management model

((Lungu, C. I., Caraiani, C., & Dascalu, C., 2013)

The 3D representation of the sustainability model shows that human influence on the environment is local and fades away as it moves away from the central mass. In addition, there are areas where the influence of the environment on human society is not latent, people are completely unprotected from nature. All smaller cubes are crossed out less or completely by the vectors of sustainability policies or whatever other vectors on the bottom four line directions, in other words, the currently linked policies with sustainable development, demonstrating our fragility to the natural environment. Nature can eliminate us at any time by a common disaster or some local disaster if humans do not fulfill their role in the common ecosystem and abuse them.

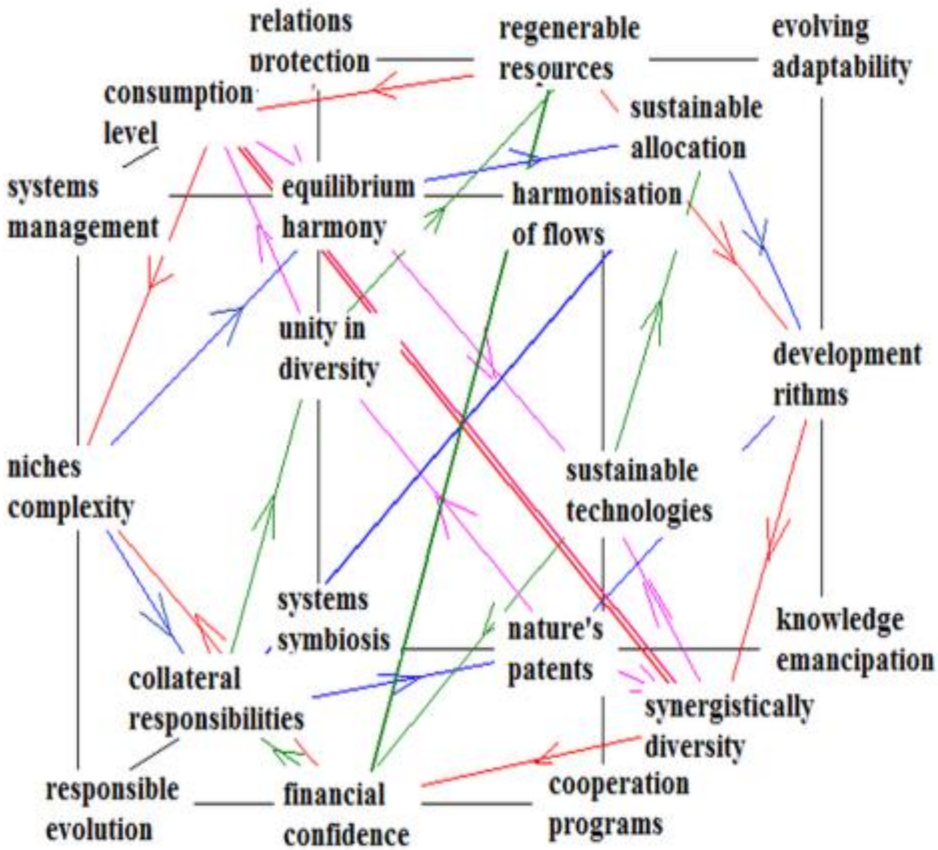

Figure 4. Relationships of 3D fractal sustainability

((Lungu, C. I., Caraiani, C., & Dascalu, C., 2013)

Some directions need to be followed to prevent disasters from becoming a reality. These directions are also marked by the 3D fractal model and can be seen in Figure 4:

- The management of systems may be performed ←→ protection of relationships exist;
- Flow harmonization may be performed ←→ evolutive adaptation may be performed;
- Responsible evolution may be performed ←→ systems symbiosis is performed;
- Self-help programs may be performed ←→ knowledge emancipation is performed;
- Protection of relationships may be performed ←→ evolution adaptation is performed;
- Systems management may be performed ←→ flow harmonization is performed;

- Systems symbiosis may be performed ←→ reaching knowledge emancipation…

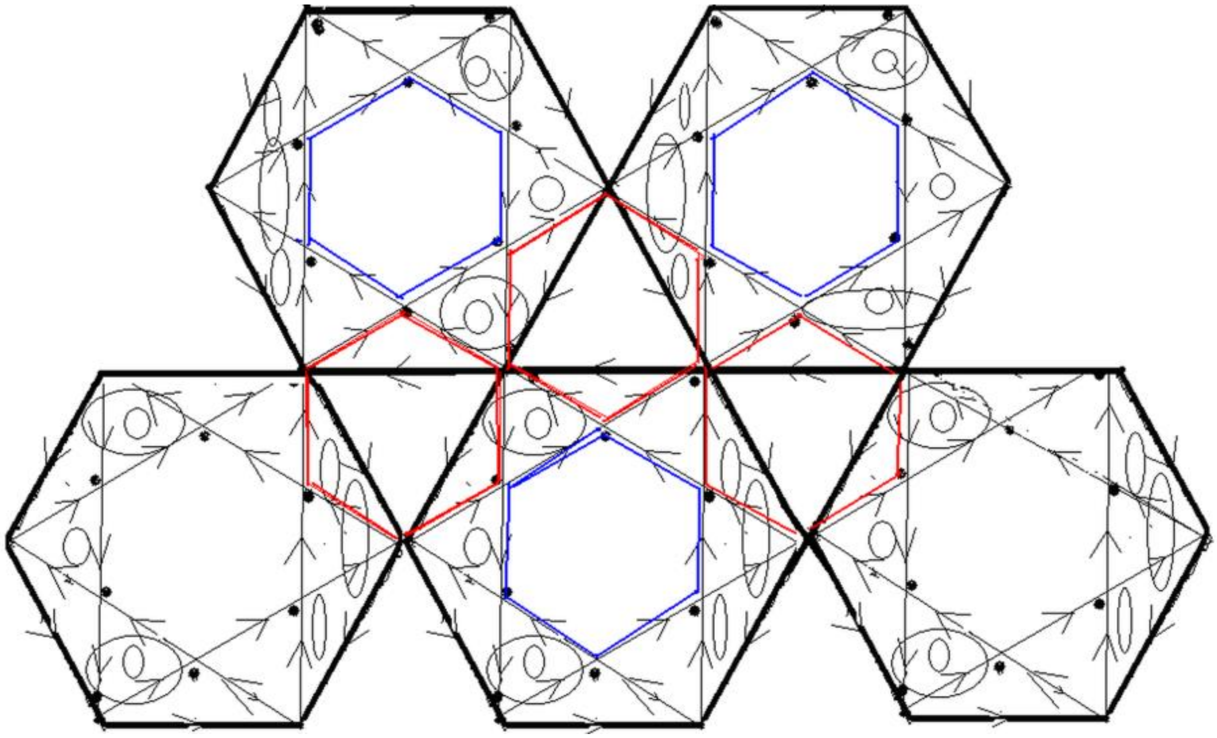

Figure 5 - 12 derivative sustainable development models

((Lungu, C. I., Caraiani, C., & Dascalu, C., 2013)

Above are 12 types of sustainable development policies most safely in 12 areas. These models relate globalization to the culture of all cultures, demonstrating the ability to coordinate actions for the benefit of the globe, including the ecosystem. These models allow for cultural coexistence without conflict but also address global problems through locally discovered and promptly implemented solutions. By extending this network model to the 3D model, the conditions for the global organizational process can be created, with the principle of not destroying the environment, culture, people, and technological economy of the country. relevant countries.

3.3. Sustainable economic vector models

Today's society uses an unsustainable economic model, which leads to the depletion of natural resources. The model is based on the principles of a market economy that meets human needs without considering the needs of the ecosystem and restores renewable resources, producing nothing but loss. balance and pollution. An operating model that pursues profit without responsibility for the environment. From there, it is necessary to study asymptotic models of sustainability based on fractal development. This type of model allows to development of a sustainable model across different domains and subsystems, where all goods are consumed by generated internal cycles without exhausting external resources.

In this study, the question is whether this model can move from a semi-sustainable model to a sustainable model. There are several studies such as Dawe, N. K., & Ryan, K. L. (2003) that show the ability to switch from a market model to a sustainable model by changing the direction of 12 vectors in the model (highlighted in red). and keep the direction of 10 vectors (highlighted in blue). The general model obtained is oblique symmetry. As the analysis shows, transitions from economic vectors to new or classical economic circuits will allow less risk to a sustainable economic model.

From the elements of the resource organization circuit, development and consumption circuit, and non-invasive innovative technologies, we can build 3 sustainable development models as follows:

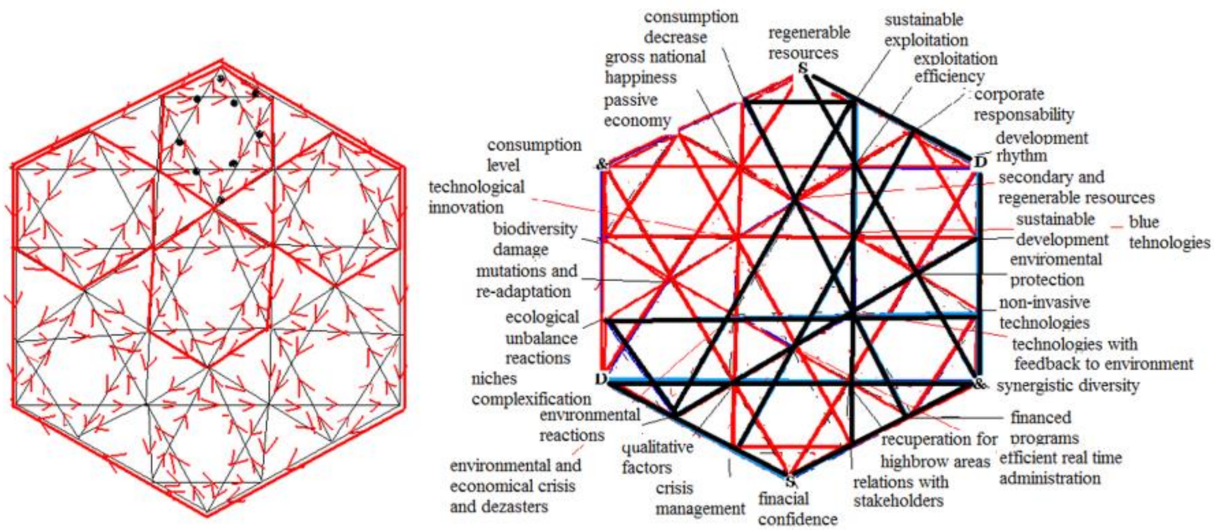

Figure 6. Sustainability recovery circuit 1 (resources organization circuit)

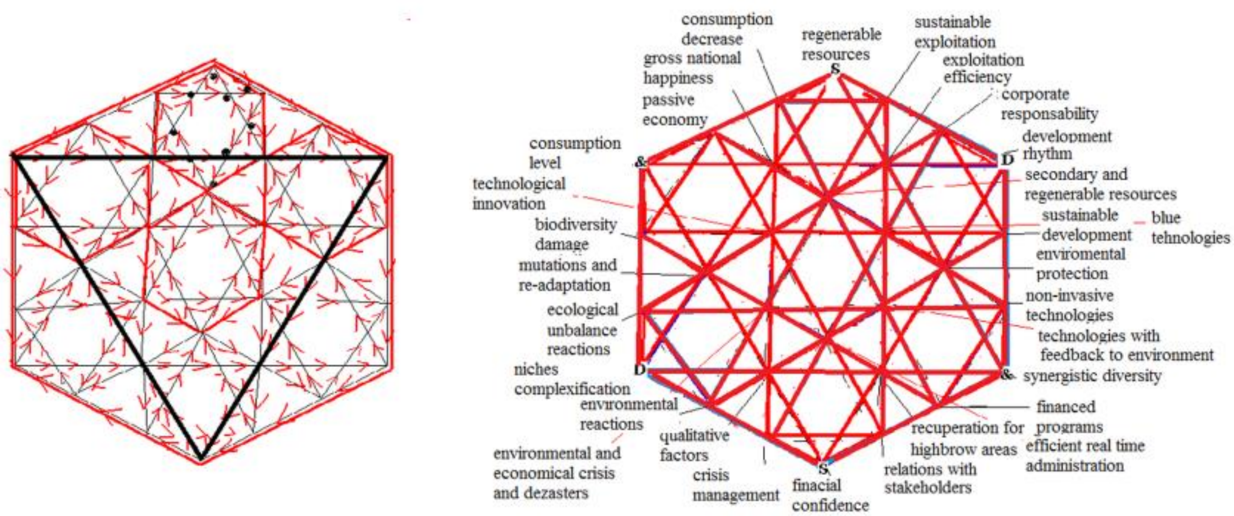

Figure 7. Sustainability recovery circuit 2 (Development and consumption circuit) (Dawe, N. K., & Ryan, K. L. (2003)

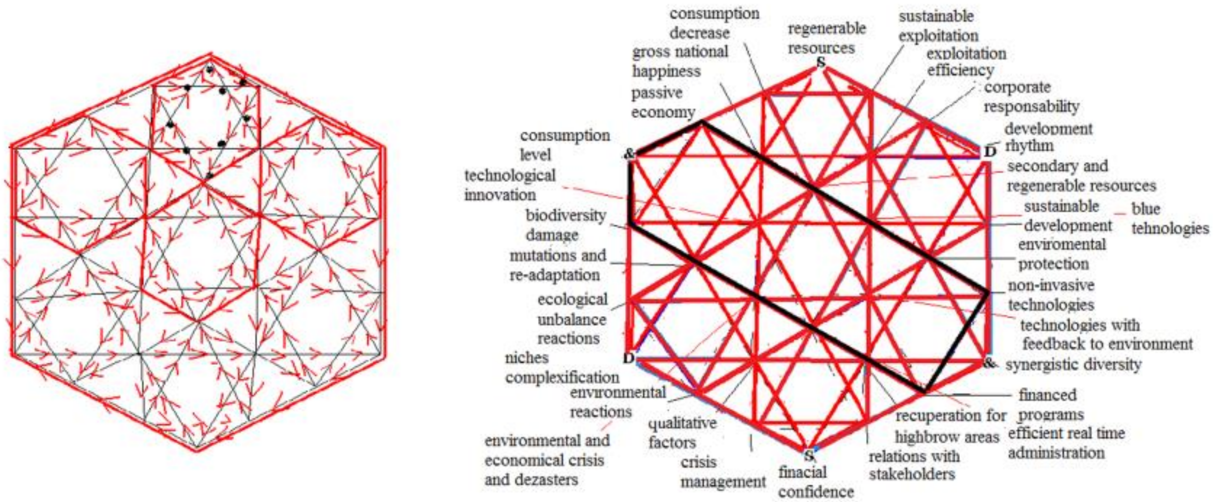

Figure 8. Sustainability recovery circuit 3 (non-invasive innovative technologies)

(Dawe, N. K., & Ryan, K. L. (2003)

From the above models, it is necessary to determine the model of using resources with minimal impact on the environment to maintain sustainable development.

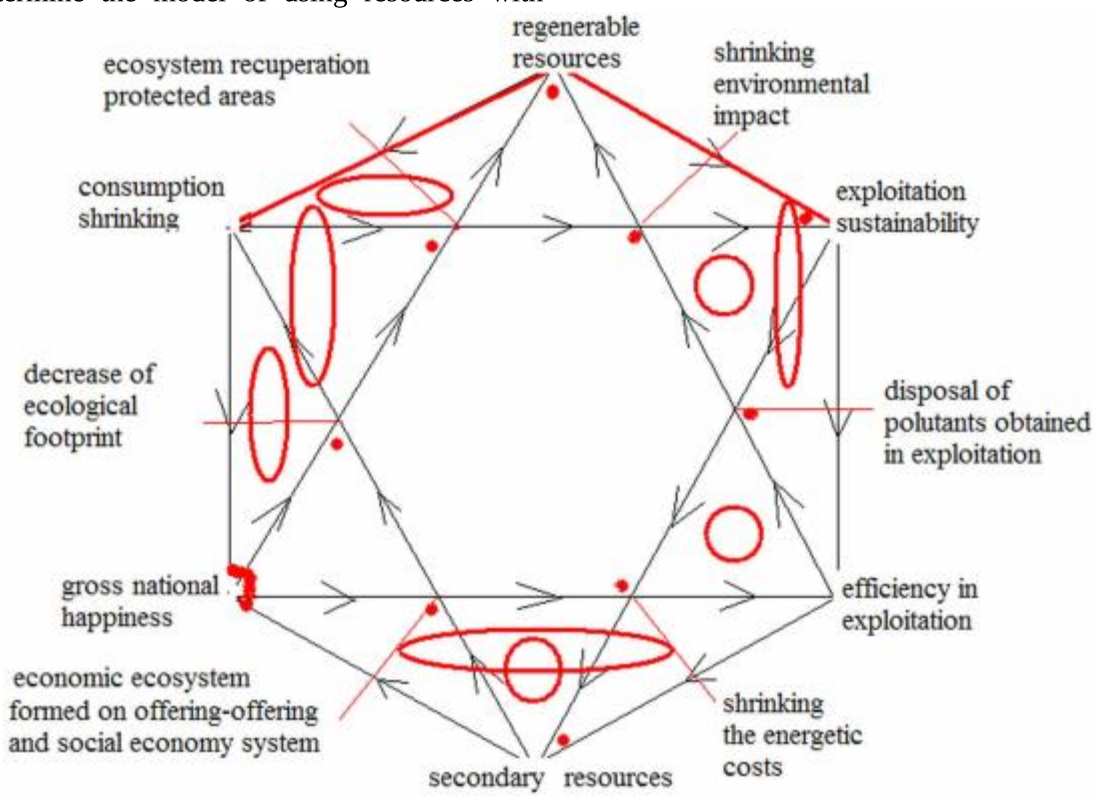

Figure 9. Sectoral programs use resources with minimum impact on the environment (Kernel, P., 2005)

We can analyze the model in Figure 9 as follows:
a) Reduction of consumption → sustainability of exploitation → passing to secondary and renewable resources → stabilize low consumption;
b) Secondary and renewable resources → avoid natural or economic crises and disasters → strengthen technologies with environmental feedback → reinforce exploitation of renewable and secondary resources;
c) Control reactions of ecological unbalance → avoid crises and natural disasters → environment reactions are controlled → avoid undesirable ecological unbalances;
d) Environmental feedback technologies → environmentally non-invasive technologies → → biodiversity synergistic recovery → environmentally funded programs → improving environmental feedback technologies.
Corporate responsibility → conditioning development rhythms → sustainable development → noninvasive technologies → recovery policies for synergistic diversity → funded programs → involving the stakeholders → financial trust → crisis management measures → real-time effective management → blue technologies → corporate responsibility.

4. Recommendations on new sustainable development models

4.1. Model quasi-sustainability for secondary and renewable technologies

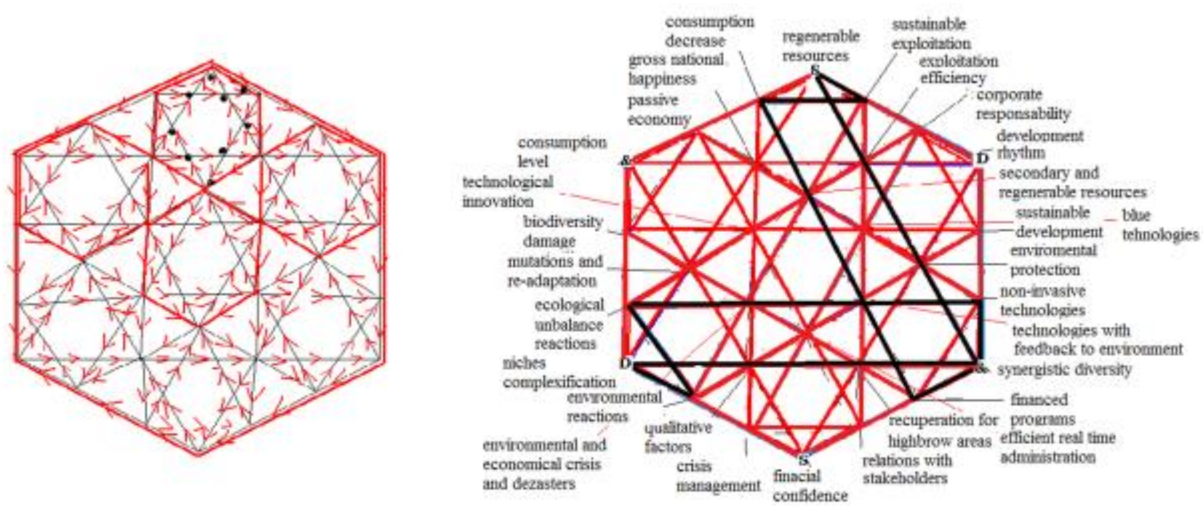

Figure 10. Model quasi-sustainability for secondary and renewable technologies

From circuit 1 we can expand to the quasi-sustainability model for secondary and renewable technologies.
Funded programs → non-invasive technologies → passing to active environmental protection → blue passive energy technologies are introduced on a wide level → priority use of secondary and renewable resources are exploited → passing to energy passive secondary technologies → power consumption levels are adjusted → permanent actions against biodiversity destruction → changes and readjustments are controlled → management methods of crises and natural or economic disasters are designed → affected areas are recovered → non-invasive technologies are strengthened.
This circuit also contains certain sub-circuits:
a) Yield of exploitation → priority use of renewable resources → consumption reduction → exploitation sustainability is strengthened in an infinite loop → secondary and renewable resources;
b) Environment feedback technologies → non-invasive technologies → synergic diversity is

strengthened → specially funded programs are designed → environmental feedback technologies are designed;
c) Environment reactions → ecologic unbalance to be solved → crises and natural disasters to be managed and solved → instability and environment reactions decrease;
d) Environment reactions → complexity of niches → necessary introduction of quality factors and quality indicators analysis → recovery of affected areas → recovery of synergistic diversity → strengthening environment protection → passing to renewable resources → improve the yield of exploitation and decrease exploited areas. This last circuit is opened, being determined by the circuit (c) and determining circuit (a).

Protection and improvement of synergistic diversity is wished for → passing to funded programs → passing to environmental feedback technologies → secondary and renewable resources are exploited → consumption reduction is required → sustainable exploitation is required → renewable or secondary resources are exploited with priority → crisis and disaster management methods are designed → environment reactions are considered → actions against ecological unbalance reactions → the technology
necessary for crisis and disaster management is strengthened → environmental feedback technologies are used with priority → non-invasive technologies are required → the synergistic diversity is strengthened through concrete measures of protection and recovery.

4.2. Model ecological quasi-sustainability linked to the governing act

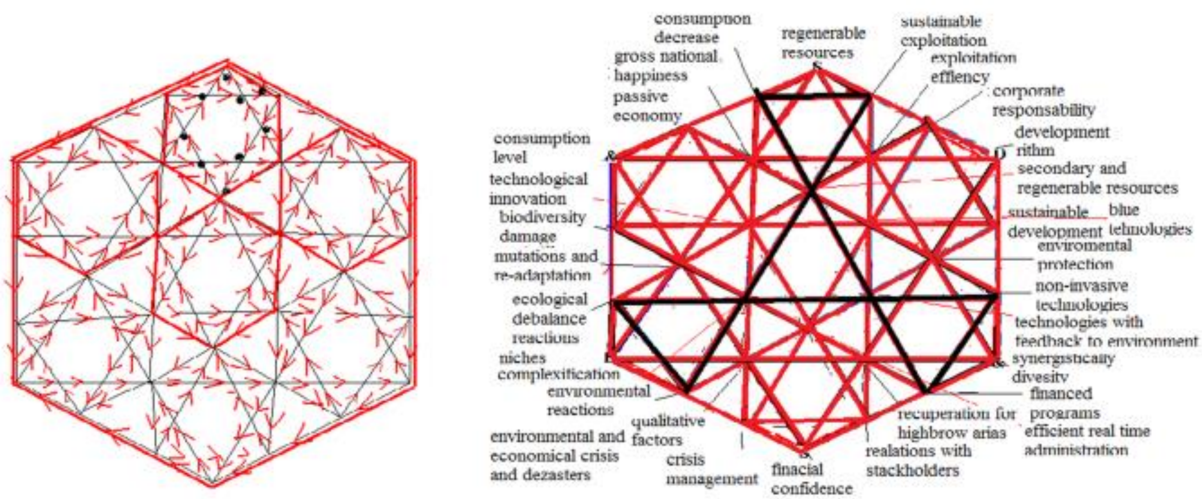

Figure 11. Model ecological quasi-sustainability linked to the governing act

4.3. Model regulating quasi-sustainability of sustainable development linked to the governing act

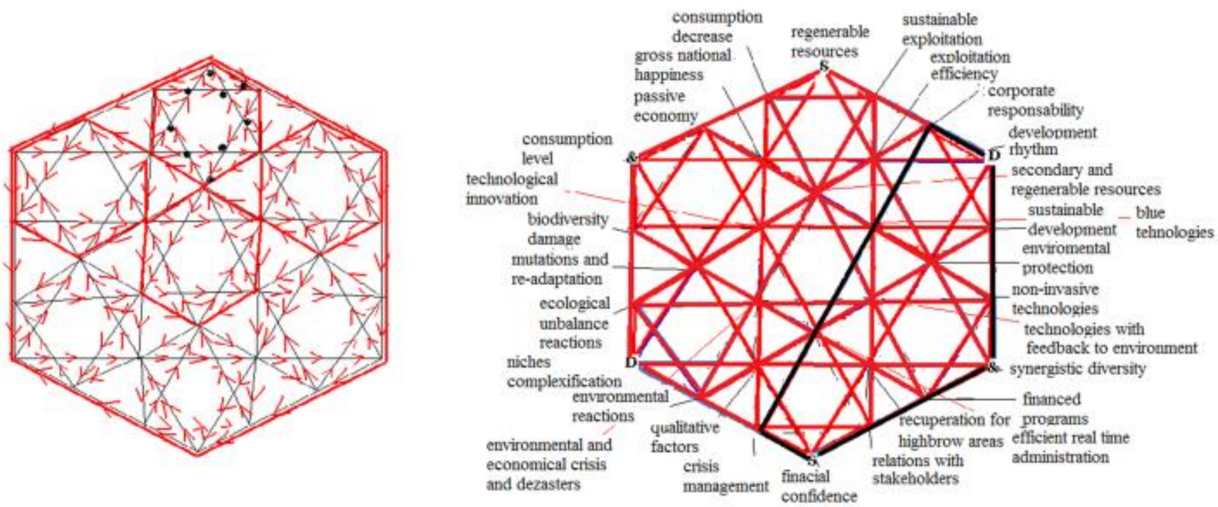

Figure 12. Model regulating quasi-sustainability of sustainable development linked to the governing act

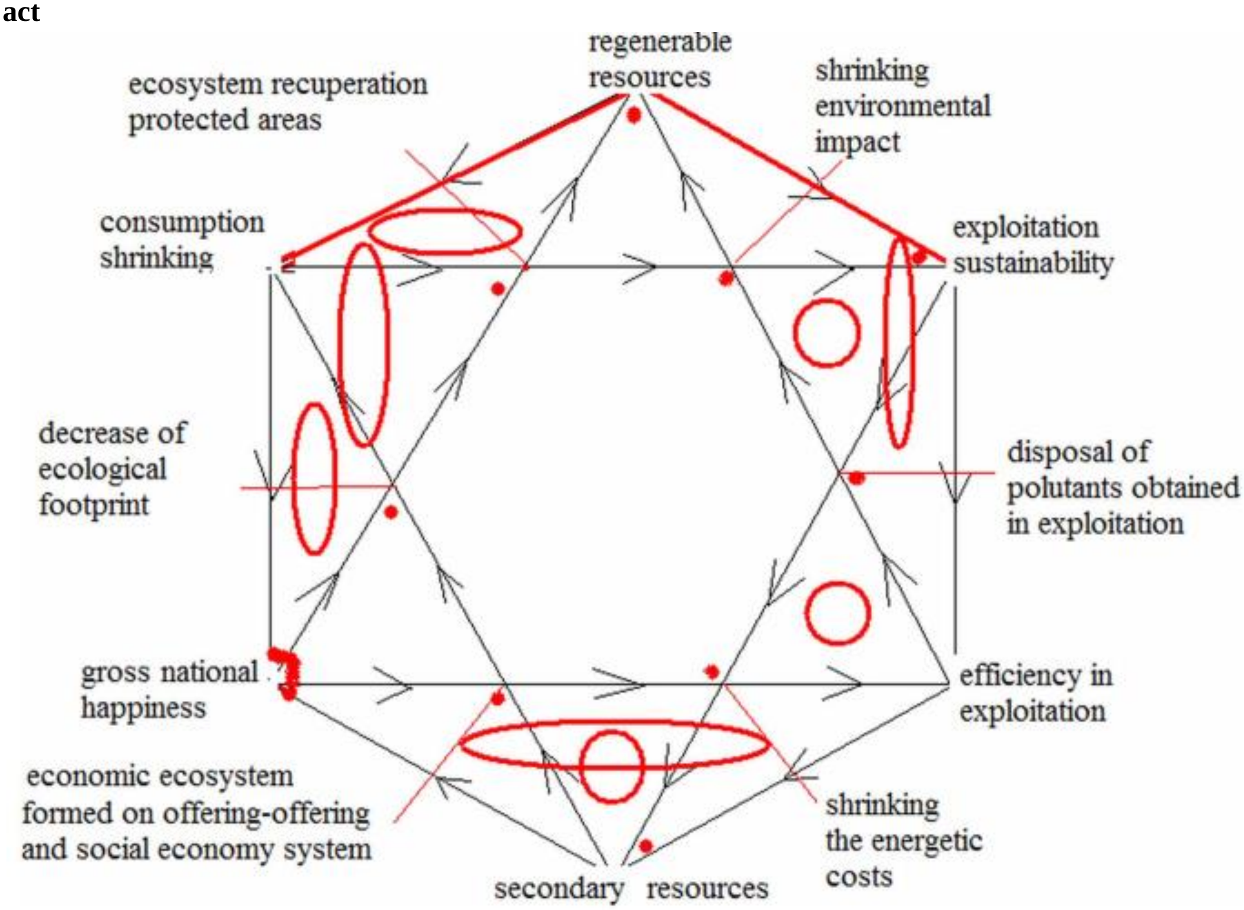

Figure 12a. Sectoral programs use resources with minimum impact on the environment

This circuit also contains sub-circuits:
a) Reduction of consumption → sustainability of exploitation → passing to secondary and renewable resources → stabilize low consumption;

b) Secondary and renewable resources → avoid natural or economic crises and disasters → strengthen technologies with environmental feedback → reinforce exploitation of renewable and secondary resources;
c) Control reactions of ecological unbalance → avoid crises and natural disasters → environment reactions are controlled → avoid undesirable ecological unbalances;
d) Environmental feedback technologies → environmentally non-invasive technologies → → biodiversity synergistic recovery → environmentally funded programs → improving environmental feedback technologies.

Corporate responsibility → conditioning development rhythms → sustainable development → noninvasive technologies → recovery policies for synergistic diversity → funded programs → involving the stakeholders → financial trust → crisis management measures → real-time effective management → blue technologies → corporate responsibility. Sectoral programs to be developed based on the sustainability model will be sustainable and will support each other. These programs require specific education and scientific research with technology.

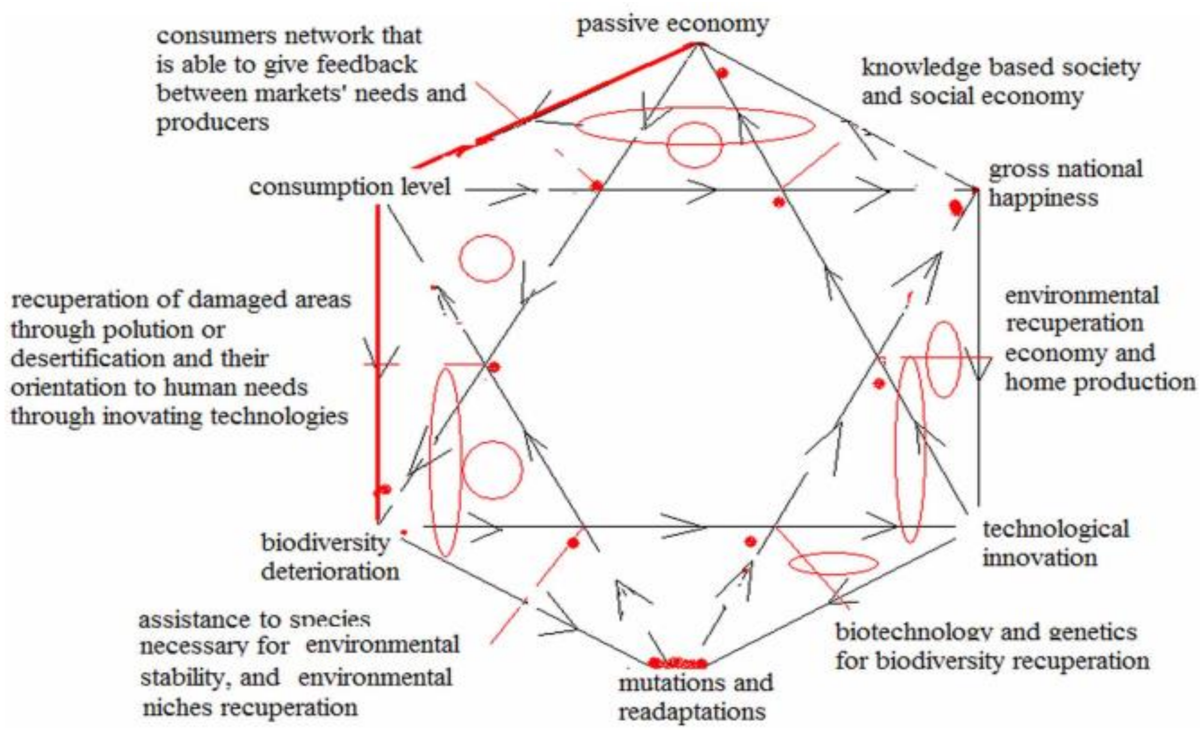

Figure 12b. Model using technologies innovations and initiatives of organizations and innovative medium and small enterprises through social economy

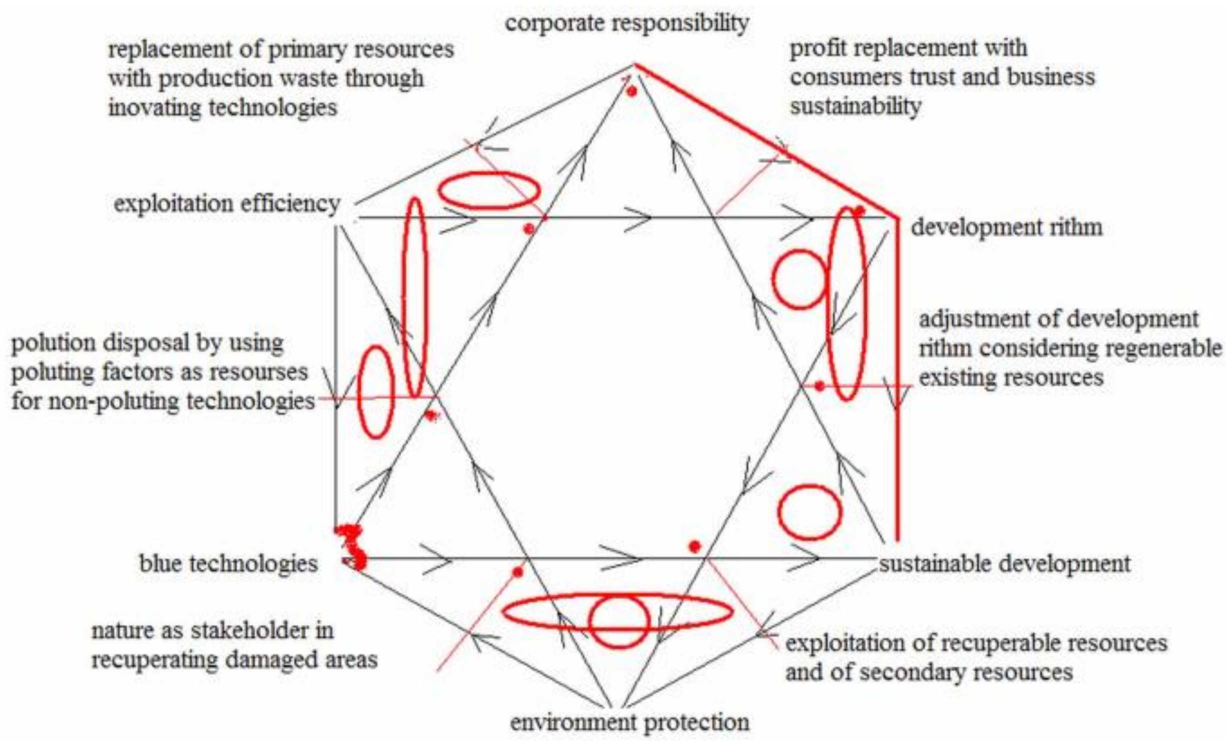

Figure 12c. Sustainable use programs of primary, secondary, or renewable resources

5. Conclusion

The lifecycle approach to environmental accounting requires a strong combination of quantity
value to environmental impulses. The quantity lifecycle and the environmental accounting system are characterized by the factors “source”, “sensor”, and “decision-maker”. The quantity impact on the environment is generated by combining 2 of the 3 factors above. Each indicator of each intersection model between the lifecycle and the environmental accounting system is presented both qualitatively and quantitatively.

Quantity characterizations are suited for equation modeling. In terms of the number or weight of factors changes in the equation will cause a change in the direction of the arrow in a cycle or a commutative diagram. In each of these changes, sustainability will also change. In the case of a change towards risks such as fire, explosion, and damage, the sustainability model will allow a transition to a sustainable state. In the case of unsustainability triggered by external objective issues, adjustment points are required to stabilize the situation. If directions are changed, reactions on the items generated by the initial basic structure may be estimated, allowing for prospective analysis.

In each case, S (source) represents the usable features, & (sensor) represents the measurement of parameters, and D (decision-maker) represents the list of solutions on a given topic. By applying a whole set of commutation cycles and diagrams, sustainability models can be tailored to the characteristics of the business. With the goal of sustainable development, long-term strategies to create value are not only related to financial issues but must ensure the principle of balance. Sustainable development needs to be done for the whole production process of products, both qualitative and quantitative issues. This tendency is progressively increasing as the actual crises become more acute and the presence of economic and accounting predictions no longer provide timely previsions, responding to phenomena evolution.

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