

SCIENCE AND THEOLOGY IMPLICATIONS OF THE LAW OF TOLERANCE IN THE ECOLOGICAL CRISIS

Lucica BALINT¹

Abstract. *The scientific development of the last two centuries was based on research that led to the creation of the best living conditions for humans. According to the Law of Tolerance there is an optimum of life that is developed in between established minimum and maximum values of the environmental factors. The results of this increase in the standards of living are in contradiction with its initial purpose. Thus, a decrease in the birth rate has been recorded, certain animal species and plants have gone extinct, the pollution has reached alarming rates, the food resources have been reduced due to weather changes, etc. All these decreases could change their direction by reconsidering the spiritual - christian factor, whose omission in the scientific area led to regrettable mistakes.*

Keywords: ecology, limit, tolerance, spirituality, environment

1. Introduction

The term „ecology” is first introduced in the paper „*Generelle Morphologie der Organismen*”, published in 1866 by german biologist Ernst Haeckel. Ecology becomes a scientific discipline when Ernst Haeckel (1834 – 1919) formulates its first definition, as „the comprehensive science of the relationship of the organism to the environment”, starting from the shared etymological root of the words: *ecology* and *economy* (gr. *Oikos* = home, grange, economy). In the same time frame, another german biologist V. Shelford formulates *the law of tolerance*. The founder of modern ecology is considered Charles Darwin (1809 – 1882) after publishing the work „*The origin of species*” where he makes a connection between the adaption of the organisms to their environment and the process of natural selection.

Later on, the ecology has been defined as „*the science that deals with discovering and studying the correlations between living organisms and their environment*”. Ecology does not study the vital functions of an organism, but the way an entire population behaves, analyzing all supraindividual biological systems, by hierarchic levels of *population* (communities of individuals), *biocenosis* (communities of populations), *ecosystems* (heterogeneous systems of biocenosis and biotope) and *biosphere* (the entire living world).

¹Associate Prof., Ph.D., Eng., Faculty of Metallurgy and Materials Science, University “Dunărea de Jos”, Galați, Romania, (e-mail: lbalint@ugal.ro).

The ecologic systems are driven by some processes governed by laws. Considering that one of the founders of the modern ecology is Charles Darwin, with his well known work *The Origin of Species*, it should be analyzed whether this polemic theory influenced the research in biology, medicine and therefore ecology.

We have chosen for this purpose a law that has been formulated in the beginning of the twentieth century, by evolutionist Shelford, called *the law of tolerance*. This law is interesting because after 100 years we verify by real results the truth expressed regarding living world evolution, whether there was progress regarding selection where the human kind interfered, the mechanisms that influenced the selection process, the factors that detained or eased the selection, as well as other parameters that influenced this process. It could be considered that the timeframe is too short for studying an evolution based on selection, but we must not forget that in the last two hundred years, mankind interfered making massive changes, so that something that fifty years ago would have seemed a science fiction story (genetic biology, in vitro insemination, vital organs transplant etc.) is now daily routine.

2. The law of tolerance

Shelford's law, or the law of tolerance, establishes that an organism will respond to each individual ecological factor, on a scale that varies from a minimum intensity to a maximum, and the domain between these minimum and maximum is the area of tolerance of the organism.

We leave from the premises that every environmental factor has a *limiting potential* when it exceeds certain limits allowed by the survival of certain species. For instance: when the concentration of lead atoms increases, human life degrades in every aspect, lead is considered the limiting factor and the increase of concentration in the organism produces the disease called saturnism.

The significance of environmental factors is not fixed; it can be modified according to the global ecological situation.

Experimental research results have been interpreted via a *tolerance curve*, split into three domains, so that the middle one, that contains the maximum point, is the vital domain, most suited for the perpetuation of the species, the one where all environment conditions are optimal for the analyzed species.

The domains from the left and right of the optimum area for life indicate the presence of environmental factors that are below or above the tolerance limits, and they determine a decrease of the number of individuals, a depreciation of life, a break out from the limits of normality, Figure 1.

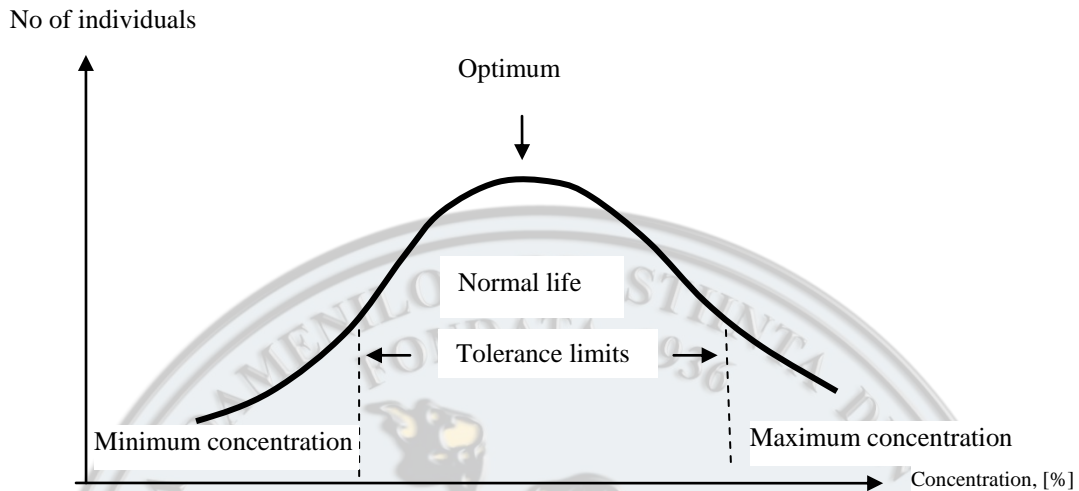


Fig. 1. Theoretical curve of tolerance depending on the concentration of some environmental factors

3. The influence of optimum life conditions over the tolerance limits of life

According to researchers, the environment conditions that are within the well established tolerance limits refer especially to food, climate conditions, individual security, education, legislation etc. During the last hundred years, in the Western area there has been a constant preoccupation for creating better living condition in all domains: biological, social, cultural, economical and even political. It was searching for an easier accommodation of the organism to the hardship of life, by increasing the comfort, creating exceptional conditions for all human activities, while the relationship of man with the environment, or the creation, would regain what it once lost at the expulsion from Heaven, a happy life, a perfect communion with the creation. Thus, certain scientific interest was displayed and certain results in productive individuals selection for animals and improving plant varieties, intensive efforts were made for famine eradication and now, the food is very diverse and rich in vitamins, minerals in sufficient quantities; working and living conditions in closed rooms have been improved by insulation against heat waste to the environment, by creating air conditioning appliances and continuous heating systems etc.; in the external environment, the draught has been ameliorated by irrigation or artificial rains, farming areas have been enlarged by pastures drainage, forest clearance etc; security conditions of individuals have improved by creating some institutional forms of life protection such as: anti drugs agencies, Reeducation Centers for juvenile

delinquency, laws were enforced to stop criminal actions, foundations were set up to protect animals and nature, population education was carefully looked for etc.

Despite all measures taken for consolidating the tolerance limits, statistics show that the evolution of species does not follow the ascendant patterns as it was normal to happen according to our expectations and for which all great efforts were made, quite the contrary, birth rate decreased dramatically from 35,4‰ in 1950 to 13,5‰ in 2006 and a decrease down to 8,6‰ is forecast by 2050

(Figure 2), some animal species are going extinct², delinquency rate has increased, educational level has decreased³.

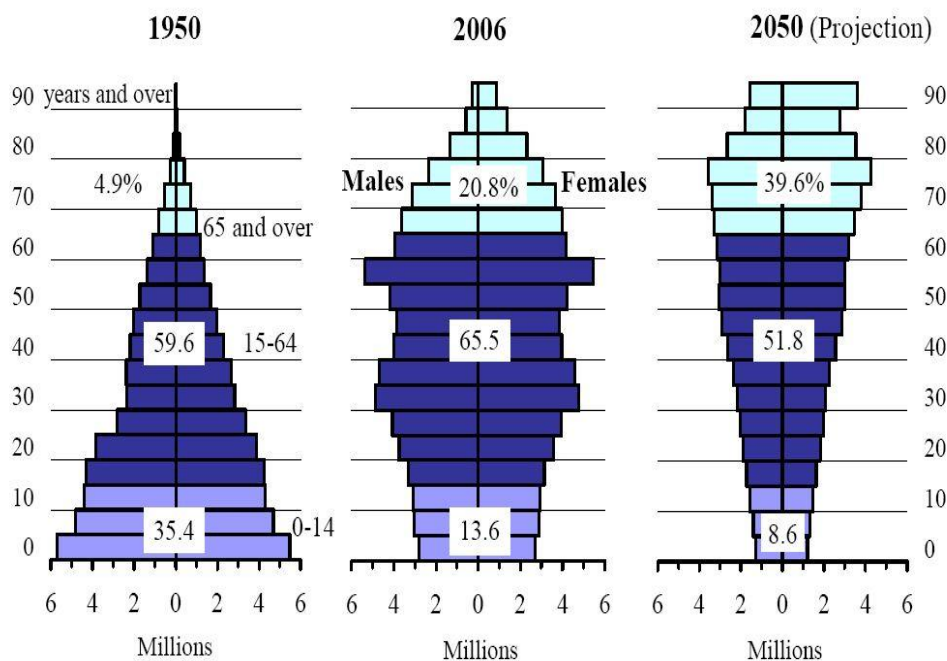


Fig. 2. Decrease of birth rate and ageing population, [4].

² A report made by *World Conservation Union* and quoted by *The Sun* warns that pollution causes the disappearance of three animal species per hour! The authors of the study warned that the climate changes and the lack of serious measures against pollution could drastically reduce the food provisions <http://www.ecomagazin.ro/la-fiecare-ora-dispar-trei-specii-de-animale-sau-plante/> 24 February 2009.

³ One quarter of the pupils in primary schools from Berlin, do not have enough knowledge of reading and writing. These are the results of the latest international test in this area - *Progress in International Reading Literacy Study (PIRLS)*, http://www.dw-world.de/dw/article/0,3957101,00.html?maca=rum-VTPartner_hotnews5-2282-xml-mrss, 24 February 2009.

Natural Increase of Population

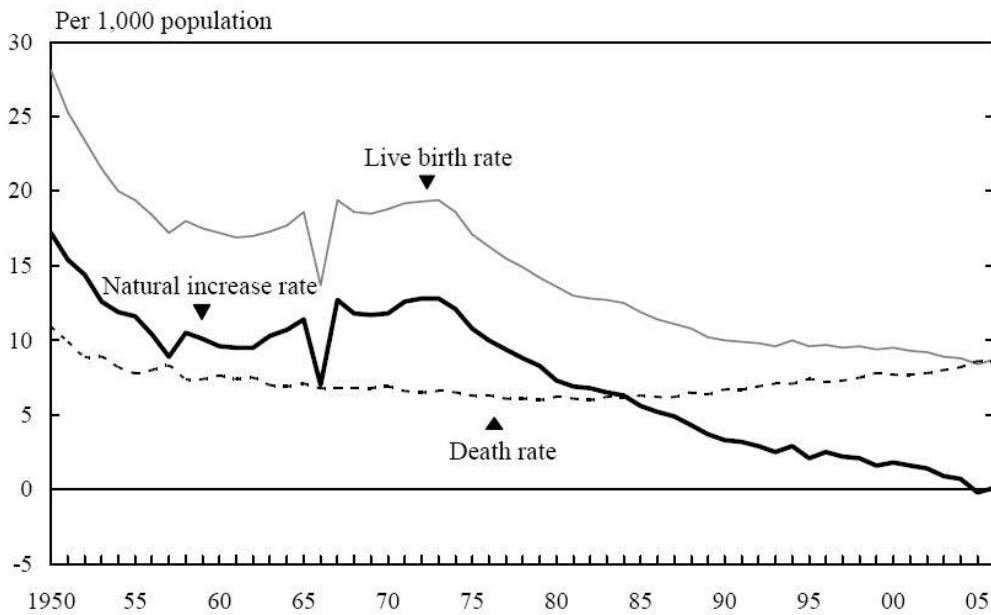


Fig. 3. Rate of natural increase of population, [4].

Proportion of Elderly Population by Country (Aged 65 years and over)

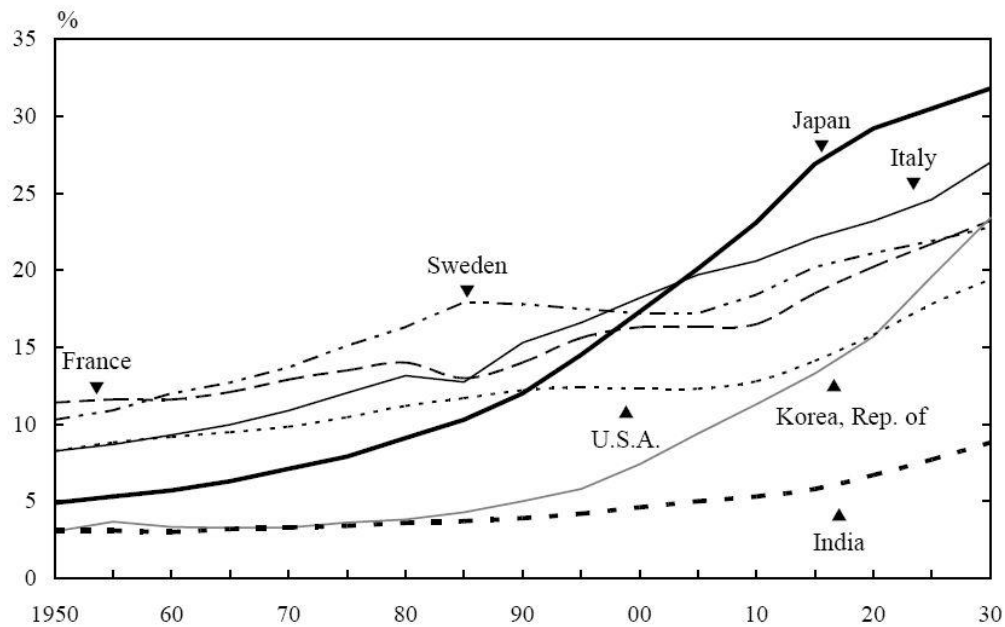


Fig 4. The ageing trend of the population, [4].

We can state that the increase in the standard of living did not match up to the expectations, the birth rate did not increase and mankind's care for animals and nature did not provide for their good living, against what the law of tolerance states, quite the contrary, the perpetuation of all species is declining, and the cause should be investigated through another law that governs from the shadow, as it was cast aside.

Some state that mass increases and increases in biomass are only possible inside certain limit values, in between minimum and maximum concentration of limiting factors, where vital functions are performed in optimal conditions. The tolerance domain exists between these limits, and the amplitude of the environmental factors is specific to each species. Optimum life conditions must be searched out, but not exclusively in the material world but in spirituality as well, because the observations of real life contradict the theory of optimal individual's perpetuation.

4. Christian spirituality is an important factor of life

In the following I will present a few spiritual drawbacks of the world we are living in today and whose original „beauty” given at creation, has been damaged precisely by the one who has been gifted with reasoning, will, sense and has been set by the Creator to master it: man.

The law of tolerance is an incomplete law that in its actual presentation does not bring enough arguments to justify its theory. As the man is both body and soul, on the tolerance curve we should have a resultant between matter and spirit. What is missing, from a Christian point of view, is a theological analysis. In its currently proposed shape, the law cannot be applied because not just man, but all living organisms have been created by God, perfectly fit to their environmental conditions. What we need to be concerned with is accepting the environment conditions, harmony and love for the entire creation, we should not impose ourselves certain existence limits, because God created us after Its face and similarity, to be content at peace with ourselves so that inner peace can be reflected over the ambient environment creating a life specific harmony. If each of us accepts the life style given by the Creator, then we would always be at a maximum of the tolerance factors, which can vary not just from one domain, but on the entire abscissa, or from our birth until our death. There are many examples of people that have broken the tolerance limits and of people that were far from reaching it. The former would constantly and directly ask help from the Creator, making this relationship an essential condition for survival, tolerance and a life in love and charisma⁴.

⁴ SF. IOAN GURA DE AUR in the work: *“Omili la facere”* says the first revealed words of St. Scriptures invite us to a life that combines the material with the spiritual world: “In the beginning God made heaven and

There have been studies and research for various species under certain conditions of life and different from those that are accustomed to and for which they have been created, in particular environmental conditions and extremes, for purely scientific purposes, to satisfy some curiosity, bringing answers to various questions, but which can deviate from the truth by the generalization of particular ideas about organisms adaptation and their natural selection.⁵

Specialists say that *the same environmental factor may trigger under the same conditions, different reactions to coexistent species*. We accept this assertion only considering the contemporary reasoning, but not too long ago it was not so.

The only plausible explanation for inadaptability to environmental change is not exceeding the *limit of tolerance*, but that *human intervention in the modification of environmental factors went beyond the limits of tolerability*.

The law of organism's tolerance to environmental factors omitted a very important factor, which is not in any demonstration of systemic interaction, and which has a spiritual connotation. We support this allegation taking cancer for example, a disease that is alarmingly affecting mankind in recent years and at early ages. One of the researchers of this disease is medical doctor, Otto Warburg, considered the greatest biochemist of the twentieth century, who found the answer to the problem of cancer illness, namely pressure and low oxygen concentration in the human cell that promotes cancer development⁶. Very important is the finding that pollution, the preservatives and other chemical elements in concentrations above permissible quotas have side effects, and that the resistance to the development of human cell cancer is very high.

There are also people who get sick while living in optimal material conditions. Do anchorites have exceptional living conditions? They live to a great age without having concerns about the amount of calcium, iron and oxygen in the body.

earth (Fac. 1.1).” This statement suggests that they were created by God and not at random, were brought from nothingness to existence and thus the beginnings world people that could not imagine anything spiritually, could straighten their thoughts towards the creation ‘s Creator, vol 1, Ed Bible Institute and the mission of the Romanian Orthodox Church, Bucharest, 2003, p. 16.

⁵ SF. VASILE CEL MARE explains in paper "*Omili la Hexaemeron*" explains that preservation of species in the same form from creation until the end of the world: "The beings, moved by a single command, equally cross the creation, subjected to birth and death, and keep the perpetuation of species until the end, by the similarity of individuals forming the species. The horse breeds horse, so does the lion, the eagle, and each being keeps its species by continuous births until the end of the world "; Soφia Publishing House, Bucharest, 2004, p. 202.

⁶ PROF. BRIAN SCOTT PESKIN, „*Essential fatty acids, oxygenation and prevention of cancer*”, <http://www.brianpeskin.com>, 16.05.2007.

Their inner peace, kindness, their innocence, should tell us more about the tolerance limits of life. Another contemporary condition is *stress*, which is not due to maximum permissible concentrations of certain material factors, because it is manifested by mental disorder (Gr. psyche = soul), in other words, the condition of the spiritual structure specific to people. For all sufferings of the body, medicine found the drug for relieving pain, not the same thing happened for the suffering soul. Remedies for the soul cannot be found in pharmacies. In this case there is no minimum limit because it is a non sense, and regarding the maximum there is a saying that holds a great truth: "May God not give the man all he can endure"⁷.

One of the main properties of biological systems is that the components depend on each other when it comes to their operation and evolution. Their composition is complex, such *systems* consist of *subsystems* that have different functions, subsystems consist of *systemic components* and they also include *systemic elements* or fundamental parts of systems. The character of a whole of the system is the result of the interaction of all its component elements. *Interaction is a fundamental principle of operating within an ecological system and of systems in between them, it is a unification factor of diversity*, it is a natural relationship that Christians spiritually receive, as the presence of God in the world and of the world in God.

Living conditions may not exceed limits of normality as we are created for a normal world, and the limits of life are birth and death that man cannot make illusions that he can control, and temporal distance between birth and death is not determined by the concentration of chemical elements or physical factors, as it is well known that in a family where all members feed and live under the same conditions, not all suffer from the same disease and do not die all at the same time, which means that there is something else that differentiates them and that something is spiritual life, the private, individual and special relationship with God.

The capacity to adapt is a meaningless concept, God created the world perfectly adapted to all environmental conditions. Take for example the fact that there are Eskimos living in igloos in polar areas and people living at the Equator under severe conditions given by high temperatures. It cannot be stated that there are more species of humans that they have adapted by their own power that the fittest has succeeded, but that they are born and live until

⁷ SF. GRIGORE of Nyssa in the paper "*Despre facerea omului*" gives the answer to the question: why are there wrong interpretations? "As long as the soul is dwelling in well, he will not have bodily relation but when the connection to good is lost, that moment it begins to slide to the life here on earth, and ends up limiting itself to the body" PSB 30, p.75.

they die perfectly adapted to the biotope in which they were born, unless they abusively interfere by changing its parameters.

Assuming, by “*reductio ad absurdum*”⁸, that man evolved from organisms both bodily and spiritually inferior, we find that there are aspects that show the contrary, for example:

a) St. Basil the Great says that: “*The love between parents and offspring is unconquerable at animals*”⁹ so if man had such a descent, most certainly there would not have been a quarter of a million abortions a year in Romania¹⁰ and 9000 children abandoned in maternities¹¹;

b) People are destroying their lives by slipping into intemperance: consumption of drugs, alcohol and immoral acts. Animals, however, normally care for their lives, without being trained by someone and watching them “*we will urge either to guard ourselves and take care of the salvation of our souls, either punish ourselves even more at seeing that we do not even reach the level of animals*”¹².

God has not left on earth extreme conditions to verify our physical abilities, because He knows exactly how He made us, what we need and what is our mission. We are not in an experimental program of survival or selection by extermination, so that we would perpetuate to powerful individuals and species, nor should we have such views because they bring much confusion in our lives. Environmental conditions are well tolerated by the body and certainly the Creator had in mind all possible variations of interactions, gave good solutions for each individual, irrespective of the belonging kingdom.

The Holy Bible notifies us about something that cannot be found in contemporary ecology. Namely that there are conditions in which human immorality does multiply and develop, which has a surprising capacity for adaptation and spreading in humans, that triggered divine anger, materialized in Noah’s time through the Flood, destruction by fire of Sodom and Gomorrah, etc., when no false questions aroused regarding the maladjustment to water and fire according to the law of tolerance, but *the alienation from the Divine Law*.

⁸ Theorem in mathematical logic.

⁹ SF. VASILE CEL MARE, *Omilii to Hexaïmeron*, Editura Σοφία, Bucharest, 2004, p. 208.

¹⁰ LICA MANOLACHE, EMILIAN ISAILA, „Evenimentul zilei”, <http://www.hotnews.ro/stiri-arhiva-1236726-sfert-milion-avorturi.htm>, Mars 16, 2005.

¹¹ CORINA SCARLAT, „Ziua”, <http://www.9am.ro/stiri-revista-presei/Social/3005/9000-de-copii-abandonati-anual-in-spitale.html>, January 21, 2005.

¹² SF. VASILE CEL MARE, *Omilii to Hexaïmeron*, p. 205.

God made the matter, the plants and the living beings and crowned Its creation with Its most valuable achievement *man*. But what amazes most is that the matter that has no life, reason nor feelings completely obeys its Creator's power¹³.

The opposite, i.e. disobedience, will get us out of the tolerance limits of a normal life. If our will puts itself against the will of God, if we allow destructive actions, the rest of creation, which remains faithful to Him, will fight against us and all that we build will be destroyed because we put ourselves in opposition to all creation. An believed more and more in his own forces, he attributed his achievements to his power only, he has created a world consistent with his wishes and thus we ended up in the world today, to be accustomed to a way of life that is out of normality, out of Divine *tolerance limits* and we are no longer accommodated with the lifestyle brought by the Son of God, Jesus Christ¹⁴. In our consciousness, the belief that we are artisans of this world is increasingly reinforced. We brought life up to date by bringing *top technologies*. But even the invention of a man is also a discovery made by God out of His infinite wisdom, mercy and love, and offered as a gift to the one that is keen to find answers to the knowledge of a truth that may be a phenomenon or any other thing.

Conclusions

1. Increasing prosperity and living standards have not increased the birth rate, nor man's care of animals and plant varieties has provided the proper functioning of their lives, the perpetuation of all species is declining, and the cause must be sought in a different kind of law that governs it, in an influence that has been overlooked and that is of spiritual nature.
2. Living conditions may not exceed limits for normality because we are created by God for a normal world, life limits are independent of the concentration of the substances, and they are birth and death, which man cannot control.
3. Temporal distance between birth and death is not dependent of the concentration of chemical elements or physical factors, as it is well known that in a family where all members feed and live under the same

¹³ SF. IOAN GURA DE AUR in "*Omilii la facere*" is shivered of the "untold power" of the Creator," that is beyond any human mind and invites us to unconditional obedience: "in order to know the great listening of nature and the overwhelming power of the Creator. He only said and it was done" vol 1, p. 36.

¹⁴ The Saint Apostle Paul said with regret that people „*honoured the creation and have served it instead of the Creator*" (Romans 1, 25).

conditions, not all suffer from the same disease and nor do they all die at the same time.

4. *The capacity to adapt* is nonsense because God created the world perfectly adaptable to environmental conditions.
5. There is, however, something that differentiates people, among them and from the rest of the creation. That something is related to spiritual life, the private, individual and special relationship with God, which has a positive effect if it refers to the virtues and a negative effect if it refers malice, intemperance and sins.
6. The law of tolerance is an incomplete law. Man is formed of body and soul, and the tolerance curve must have a resultant between matter and spirit.
7. The concentration of certain substances recorded increases over the admitted quotas. The reason: the existence of this parameter that has escaped the attention of researchers, that brings tolerance limits, but they are brought in thought and behavior; otherwise, we allow immorality, which has the power to modify physical and chemical existential parameters and to make irreversible transformation.
8. World cannot exist if deprived or isolated from deity.
9. There are many examples in which people have exceeded the tolerance levels for minimum and maximum, and others who were far from reaching the threshold. However, the former were directly asking Creator's help, making this relationship a prerequisite for survival, tolerance and living in love and grace.
10. Theology and ecology are scientific fields imbedded and inseparable, and if there are gaps in the interpretation of phenomena, it is because it did not consider the spiritual factor, or the inseparability of the Creator from the creation.