

## THE ATOM AND CIVILIZATION

**Ciprian-Beniamin BENEĂ\***

University of Oradea, Faculty of Economics, International Affairs Department,  
1 Universităţii st. 410087, Oradea, Romania, e-mail: [c\\_benea@yahoo.com](mailto:c_benea@yahoo.com)

**Abstract:** At first glance there could be risen the following question: "Which is the connection between atoms and civilization?" A reasonable question taking account the fact that we are used to see in the atom an element with great destructive power, which could be employed by man in order to kill his fellow. And we can argument for this position, because we already had seen the consequences at Hiroshima and Nagasaki's atomic explosions. But if we go deeper in this fantastic endeavor, we can see the benefits humankind could obtain from nuclear energy. The expansion of nuclear energy could help whole humanity to fight climate change, improving in the same time the living standard at global level, and reducing the risks involved by the need to create access to fossil fuels; and all these could take place only as a byproducts of nuclear disarmament. There couldn't be any nuclear expansion without serious nuclear disarmament. And when we link together nuclear disarmament, expansion of nuclear energy and reducing fossil fuel consumption, we can easy observe that all these are very important conditions for creating a peaceful and prosperous world. In this way, the expansion of nuclear energy can give birth to a more peaceful world, where human civilization could flourish in a healthier and more secure environment.

**Key words:** climate change, nuclear energy, nuclear disarmament, energy vulnerability

\* \* \* \* \*

The nuclear is an element which could be placed in the middle of debate regarding climate change, clean energy and energy security, and war. All these points are of the greatest importance for present society, and for the future of mankind. If in the past more importance seems to be attached to energy security and nuclear proliferation, nowadays and in the future the risks given by the very existence of nuclear arms and nuclear materials, the vulnerability of energy supply, and climate change, are and will be of outmost importance.

The atomic science could be linked to the high politics agenda and together they could be placed at the very heart of this debate: the number of nuclear arms could be reduced, and even eliminated, while nuclear energy could be expanded, which would bring great benefits to human civilization.

---

\* Corresponding author

We cannot have a serious debate about civilization without taking into account the existence of a regime of *peace*; peace and civilization are inseparable. If the number of nuclear arms is reduced and if there is any serious possibility to eliminate them altogether, great benefits could be encountered by humanity. The risk of catastrophic war between (or among) nuclear weapons states would be reduced (or would be nil), and the risk of terrorist attack using a nuclear weapon or a nuclear device would be eliminated.

Even if the risk of nuclear attack between nuclear weapons states is reduced in comparison with Cold War era, the risk of a nuclear terrorist attack is very great. This is a huge risk which Western countries face in the beginning of the new millennium.

Reducing the number of nuclear weapons by nuclear weapons states, concomitant with reducing the profile and importance of nuclear weapons in those countries' foreign and military policies could create the important conditions for a lasting global peace. While the risk of nuclear war among them will be reduced, the incentives for other countries in seeking nuclear weapons would be eliminated, and a strong (and real) norm against proliferation would be instituted. The Non-Proliferation Treaty specifies clearly the obligation of nuclear weapons states to initiate negotiations with the aim of reducing and eliminating their nuclear weapons arsenals, but until today this aspect is mainly on paper; and this reality could be taken by potential nuclear proliferators as a reason for their nuclear programs. If the negotiations for nuclear disarmament are taken seriously by nuclear weapons states, and the whole world (politicians and public opinion) is aware of this, than other potential proliferators would easier be stopped in their endeavors. The benefits of this are: reduced risks of nuclear attack between nuclear weapons states, reduced risks of horizontal proliferation to possible new entrants in the nuclear club, reduced risks of nuclear weapons or nuclear material to be diverted to and used by terrorist groups, with devastating consequences near the place of detonation, and at the global level, too.

The expansion of nuclear energy aiming at reducing energy vulnerability, and carbon emissions couldn't be done in a safely manner without nuclear disarmament. Nuclear renaissance without nuclear disarmament would lead to much more nuclear armed states (or states having latent nuclear capabilities), creating an insecure international environment; this could be a nuclear renaissance where nuclear war is looming. The cure could be much worst than the disease in that case. Nuclear expansion without nuclear disarmament could lead to a more insecure international environment, even to nuclear war.

A nuclear weapons free world would be a world where civilization could flourish in a healthy environment. I refer here to the international political area, and to environment and climate, too. A nuclear weapons free world would be a world in which nuclear energy could be expanded in a safely manner, which means that great problems of humanity could be solved in the same time: the expansion of nuclear energy in a world where there are expected to be over 9 billions of people (in 2050), and the standard of living is expected to grow constantly, especially in the emergent economies, would greatly help a sustainable economy's development.

The expansion of nuclear energy in countries which have already developed peaceful nuclear programs, and the spread of peaceful nuclear energy programs to newcomers will provide some interconnected advantages: the rising of energy demand given by rising population's number and its bettering life conditions will

bring rising of electricity's consumption (globally and per capita), and this demand could be covered by classic fuels, or by clean energy sources; in this category of energy generation sources, nuclear energy is a robust one in some countries, and their model could be taken as a good example by other countries.

The rising the energy production while reducing *pollution* given by electricity generation and by transportation sector is a key-element in preventing the negative consequences which would be brought upon humanity in case she continues to pollute in order to satisfy its energy needs. Burning fossil fuels generates CO<sub>2</sub>, which is the main gas which is collected in the atmosphere, and its rising concentration brings rising temperature at global level, and with it, climate changes, with their unpredictable and dangerous consequences. Reducing fossil fuel consumption while expanding nuclear energy (and other clean energy sources, too) could help mitigate climate change, providing energy supply in a secure manner.

Energy security and political (and even military) vulnerability given by energy dependence could be reduced by nuclear energy expansion; and this is a very important aspect for every state. Energy is an element of utmost importance for each country which wants to sustain and to expand the process of modernization in the society. For this reason foreign policy is connected directly with energy security, and the access to energy resources was and still could be source of great tensions in the international arena. Many times in recent history energy resources were reasons of war, reasons for military and political alliances, or even instruments of political war.

Think about the Hitler's desire to control the Romanian oil fields, or think about the Yom Kippur War (1973), and how the whole world sensed the shock brought by OPEC countries' policy, which had risen oil prices, and reduced oil production as a reaction to Western help given to Israel in that war. Think about the special relation between Riyadh and Washington, which has as key-element American oil companies' access to the rich Saudi oil fields, in exchange for American help given to the House of Saud in military and political fields; or about the special relation between Washington and Tehran during the Shah reign in Iran. And remember the way in which Moscow, through its strong arm Gazprom, using the control over gas deposits and over pipelines which connect gas fields in Russia and Central Asian states to consuming countries in Europe, can engage in political war with them, without fear. If during the Cold War Moscow menaced to use nuclear weapons, but abstained to do it because of the fear of retribution, now it could menace to stop gas deliveries to the same countries which he menaced in that moments with army, without fearing the consequences brought by retribution. In this case energy war could be used with greater success, than could be used nuclear weapons during the Cold War; pipeline politics seems to be stronger than nuclear blackmail.

For this reason, the diversification of energy sources in European countries, both through diversification of gas and oil energy supply sources and routes, and through diversification of energy production sources is a top foreign policy objective for Europeans. But if the diversification of supply could contribute a lot to reducing energy vulnerability in Europe, the expansion of nuclear energy could help both reducing energy vulnerability, and preventing climate change.

Linked to this could be brought the example of French nuclear program. With 59 nuclear reactors, and with a totally installed capacity in nuclear power

plants of 63,130 MW, nuclear energy covers 78 % of nuclear electricity demand in France. The Yom Kippur War and its painful consequences for French economy were a strong and painful lesson for Paris in order to move seriously in the direction of nuclear energy's development. Today French nuclear program (which uses, in order to rise the nuclear energy capacity in the long run both enrichment of uranium, and reprocessing of plutonium) is considered the most successful (peaceful) nuclear program in the world. This is a very important aspect, taking into account that this clean energy source could help reducing CO<sub>2</sub> emissions, while reducing energy vulnerability, and improving in the same time the capacity of French railway system to run in the absence of fossil fuels. In case of emergency brought by a sudden shortage of fossil fuels, French economy and society would work quite smoothly, because French railway system would provide the necessary capacity for moving wealth and people. In this case energy security brought by this great French nuclear capacity is direct connected with French transport security, both of them being of the greatest importance for French state, and for creating the prerequisites of an independent foreign policy position for Paris.

Having this successful example, other countries could exploit it in order to reduce emissions, rising energy security, and provide an energy source which could help transportation sector in case of shortage in fossil fuels.

But this example could be used in order to reduce consumption of fossil fuels in transportation sector. The expansion of modern railway system and the expansion of the automobile fleet which will not use any more oil, but electricity, would help both the environment and state independence. In 2006 the transportation sector was responsible for 23 % of CO<sub>2</sub> emissions; and if the world continues the traditional path in transportation sector, this activity would contribute with 20 % rising of CO<sub>2</sub> emission during 2006-2030, pumping in the atmosphere 8,9 Gt CO<sub>2</sub> in 2030.

This is a very good example of how nuclear energy could bring together peace and prosperity in a healthier world. In this way nuclear energy could create the conditions for a better and a more civilized society at global stage.

That for, we can note that the nuclear element could be placed in the middle of the debate regarding the common good, global patrimony, and long run interest. Nuclear energy could have a crucial role in mitigating climate change, in reducing energy vulnerability, and in promoting nuclear disarmament. Nuclear disarmament is a process which is directly linked to nuclear rebirth; there couldn't be nuclear renaissance without nuclear disarmament.

In 1965 President Lyndon B. Johnson received first presidential briefing on the dangers of climate change.<sup>1</sup> A visible effect of climate change was that in 1998, between February and July, the world registered the warmest summer in 20 years.<sup>2</sup>

The role nuclear energy could play in containing climate change is an important one; renewed interest in nuclear energy arises from the desire to find alternatives to expensive oil and natural gas, as well as the perception of nuclear energy as a ready deployable option for making the rapid and dramatic

---

<sup>1</sup> David G. Victor, M. Granger Morgan, Jay Apt, John Steinbruner, and Katherine Ricke, „The Geoengineering Option. A Last Resort Against Global Warming?”, *Foreign Affairs*, vol. 88 no. 2, March/April 2009, p. 66.

<sup>2</sup> Mircea Malița, *Zece mii de culturi, o singura civilizație. Spre geomodernitatea secolului XXI*, București, Editura Nemira, 1998, p. 213.

reductions in carbon dioxide emissions necessary to mitigate climate change.<sup>3</sup> *Energy security* and *climate change* are invariably mentioned as the top reasons for pursuing *nuclear energy* today.<sup>4</sup>

But the expansion of nuclear energy brings into debate the problem of nuclear proliferation, which is connected to the issue of nuclear disarmament.<sup>5</sup> This is due to the fact that the connection between power and weapons is somewhat inevitable, because key technologies in the nuclear sector (uranium enrichment and plutonium reprocessing capabilities) are relevant to both of them.<sup>6</sup>

What is noteworthy to be mentioned is the fact that the decisions key-people make in the coming years regarding arms control and disarmament, the spread of nuclear technology, and the reform of international regimes, will *strongly* determine whether a hopeful or frightening nuclear future emerges just over the horizon.<sup>7</sup>

Nuclear renaissance could only be the result of nuclear disarmament process. It is impossible to have expansion of peaceful nuclear energy without a serious nuclear disarmament process taken seriously by nuclear powers.

There is a regime which provides the framework for both nuclear energy expansion and nuclear disarmament (the connection between articles IV and VI of the Non-Proliferation Treaty). The treaty was signed in 1968 and entered into force in 1970 and this treaty could be considered one of the most successful security pacts in history.<sup>8</sup> All member states pledged to provide the necessary means for nuclear energy expansion and cooperation, while abstaining from obtaining nuclear weapons; in the same time, nuclear armed states pledged to follow concrete steps in good faith for their nuclear disarmament.<sup>9</sup>

Now why nuclear energy could help mitigating climate change?

Many countries around the world are taking a fresh look at nuclear power. Severe disruption on the Earth's climate brought about by continued increases in greenhouse gas emissions, especially due to burning fossil fuels pushes the countries to reconsider the nuclear option with great emphasis. This is because nuclear power occupies a special position in the debate regarding climate change, nuclear energy being the only clean energy source that is already contributing to world energy supplies on a large scale, "being in the same time expandable on a large scale with few inherent limits."<sup>10</sup> In most countries, climate change is the principal driver for renewed interest in nuclear energy.

The climate scientists concluded that the worst risks of climate change could be avoided if the atmospheric concentration of CO<sub>2</sub> could be kept below 550 ppm (twice the preindustrial level). Now there are about 450 ppm CO<sub>2</sub> emissions equivalent, and the rising of the CO<sub>2</sub> concentration takes place at a rate of 2-3 ppm yearly.<sup>11</sup>

---

<sup>3</sup> Sharon Squassoni, *Nuclear Energy. Rebirth or Resuscitation?*, Washington DC, Carnegie Endowment for International Peace, 2009, p. 1.

<sup>4</sup> *ibidem*, p. 1.

<sup>5</sup> Steven E. Miller & Scott D. Sagan, "Nuclear power without nuclear proliferation?", *Daedalus*, Fall 2009, p. 15.

<sup>6</sup> *ibidem*, p. 13.

<sup>7</sup> *ibidem*, p. 17.

<sup>8</sup> Joseph Cirincione, *Bomb Scare. The History and Future of Nuclear Weapons*, New York, Columbia University Press. 2007, p. 128.

<sup>9</sup> NPT, article 6.

<sup>10</sup> Richard K. Lester & Robert Rosner, "The growth of nuclear power: drivers & constraints", *Daedalus*, Fall 2009, p. 19.

<sup>11</sup> *ibidem*, p. 22.

Most policy debates are focused on CO<sub>2</sub> stabilization targets in the range of 450 and 550 ppm. It is noteworthy to be mentioned that even the upper limit of this range will be difficult to achieve, because the world relies now for its energy needs on fossil fuels in proportion of 87%.<sup>12</sup> This is the civilization of gas and oil. Under “business as usual” conditions (following the current path) the energy-related CO<sub>2</sub> emissions could increase three times by 2100, meaning that in the atmosphere there will be between 700-900 ppm CO<sub>2</sub>.

Stabilizing CO<sub>2</sub> emissions in the range of 450-550 ppm requires that there be taken measures regarding wide de-carbonization on energy sector, coupled with urgent measures regarding rising energy efficiency.<sup>13</sup>

If nuclear power would contribute with 25% reduction of CO<sub>2</sub> emissions, there should be added in 2050 an installed nuclear capacity of 700-900 GWe.<sup>14</sup> Taking account of the fact that until 2050 a great part of nuclear capacity installed before would arrive at its end life, the rise of nuclear capacity worldwide should be quite three times as bigger than before. It could be mentioned that today there are 436 nuclear reactors in the world, spreading across 30 countries, with an installed capacity of 370 GWe., covering about 16 % of world electricity needs. Taking account of trends in economic area, and in social area, too, the conclusion is that a *new* group of countries relying heavily on nuclear power will *need* to be added to those already using this kind of energy.<sup>15</sup>

There are needed to be taken simultaneously four steps:

- 1) the development of new peaceful programs in Japan, South Korea, and other advanced economies in East Asia;
- 2) reversal of past trends in Europe, and a renew on nuclear power in EU countries, especially in Germany, Italy, UK;
- 3) a major expansion of nuclear power in USA and Canada;
- 4) expanding nuclear power in the emergent countries (China, India, Brazil, Vietnam, Indonesia, Mexico, Nigeria, South Africa).

In this way nuclear energy could play a significant role in containing climate change, with the condition that nuclear energy would be expanded to new countries where there are no nuclear reactors today.

Anyway, the expansion of nuclear power to newcomers could take place only as a byproduct of nuclear disarmament process.<sup>16</sup> For nuclear power expansion, there needs to take place a halting of spent-fuel reprocessing to separate plutonium, as well as multinational ownership and control of uranium enrichment facilities.<sup>17</sup>

Serious reduction of CO<sub>2</sub> emissions could take place as a result of rising efficiency of energy consumption, the expansion of clean energy sources, and an accelerated electrification of economy, in order to reduce the dispersions from *transportation* and *space heating*, this meaning that there will be a demand rising for electric power. Taking account of rising population's number, the improvement of its living standard, the demand for energy will rise in the same time; in 2050, there is expected to be 50,000 TWh consumption of electricity

<sup>12</sup> Mircea Malița, *Mintea cea socotitoare*, București, Editura Academiei Române, 2009, p. 296.

<sup>13</sup> Richard K. Lester & Robert Rosner, *op. cit.*, p. 23.

<sup>14</sup> *ibidem*, p. 24.

<sup>15</sup> *ibidem*, p. 25.

<sup>16</sup> Robert H. Socolow & Alexander Glaser, „Balancing risks: nuclear energy & climate change”, *Daedalus*, Fall 2009, p. 31.

<sup>17</sup> *ibidem*, p. 31.

yearly, two and a half times of today consumption. If nuclear power could be expanded to attain 2,500 GEw installed capacity in 2050, than it could contribute with a quarter of the energy needs; and if there could take place a significant rising in energy efficiency using, than in 2050 nuclear power could contribute with *half* of electricity needs.<sup>18</sup>

It could be observed that this would be a very different world from the one which we are used to leave in; it would be a world where energy could be provided in a clean manner to a more numerous and prosperous humanity. It would be a world where nuclear will not menace human race and the life on the Earth, but would provide the framework for a sustainable development in a safer and better international environment. Rising the nuclear energy supply would help to reduce, and even to eliminate energy vulnerability, reducing the states' incentives for waging war in order to provide access to fossil fuel resources.

Nuclear energy could bring together a safer world, a more peaceful international society, and a more sustainable world economy. This could be a world in which peace, civilization, and development could be interconnected, for the benefit of the whole humanity, and for its prosperous future.

## REFERENCES

- CIRINCIONE, J., (2007), *Bomb Scare. The Hisstory and Future of Nuclear Weapons*, New York, Columbia University Press;
- LESTER, R.K., ROSNER, R., (2009), „The growth of nuclear power: drivers & constraints”, *Daedalus*;
- MALIȚA, M., (2009), *Mintea cea socotitoare*, Editura Academiei Române, București;
- MALITA, M., (1998), *Zece mii de culturi, o singura civilizație. Spre geomodernitatea secolului XXI*, Editura Nemira, București;
- MILLER, S.E., SAGAN, S.D., (2009), *Nuclear power without nuclear proliferation?*, *Daedalus*;
- SOCOLOW, R.H., GLASER, A., (Fall 2009), *Balancing risks: nuclear energy & climate change*, *Daedalus*;
- SQUASSONI, Sharon, (2009), *Nuclear Energy. Rebirth or Resuscitaion?*, Washington DC, Carnegie Endowment for International Peace;
- VICTOR, D.G., MORGAN, M.G., APT, J., STEINBRUNER, J., RICKE, Katherine, (March/April 2009) *The Geoengineering Option. A Last Resort Against Global Warming?*, *Foreign Affairs*, vol. 88 no. 2;
- \*\*\* (1968), Non-Proliferation Treaty.

Submitted:  
January 25, 2011

Revised:  
April 29, 2011

Accepted:  
May 9, 2011

Published online:  
May 10, 2011

---

<sup>18</sup> *ibidem*, p. 33.