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Current Trends in Nuclear Weapon Projects.

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Summary-The recent North Korean announcement regarding the test of a nuclear device caused worldwide reverberations that were out of proportion to the modest size of the artifact. True – as is the case of a minute disturbance to a critically chaotic regime – one cannot dismiss the significant political consequences that might be triggered by this crude device in a tense region of the planet. In particular, that it could give new impetus to a regional nuclear arms race. However, the primary motivation for this note is the fact that this test shows that the manufacture of primitive nuclear devices no longer requires any special technological capability. Another comparable North Korean achievement that fostered a disproportionate political response is its missile program with some degree of success. Catalyzed by the fiascos of the recent NPT review conferences, the North-Korean achievements reinforce a new trend in the acquisition and deployment of small but politically relevant nuclear arsenals. These arsenals can only increase in numbers for they do not require a high-level threshold of developments in the technological sector.

Introduction- The history of the industrial and military applications of nuclear energy can be divided in two distinct periods. The first period starts with the demonstration of the control of nuclear chain reactions in 1942 and ends with the advent of the treaty against nuclear proliferation, NPT. In this period, the acquisition of nuclear technologies and deployment of nuclear arsenals were characterized by the heavy investments of human and financial resources in the Manhattan project in the 2nd World War, and by the US and USSR during the Cold War. After the, NPT, the uranium enrichment and Pu reprocessing were mastered by nations with recognizable scientific tradition but modest economies; some of these nations now have nuclear arsenals. With this millennium we might have reached the threshold of a new period in which the acquisition of nuclear capabilities no longer requires that nations have a robust technological base.

In this note, specific basic human development indicators (HDI) of a group of nations have been selected to highlight this new trend towards the acquisition of nuclear artifacts. In the selection process, nations were chosen either because they possess significant nuclear capabilities or because they did at some time consider nuclear programs. A particular choice of HDI indicators is used to show the abysmal gap between nations with significant nuclear capabilities as opposed to those that have recently acquired some capability.

The chronology of these nuclear achievements shows that the institution of the NPT – in 1968 – was not sufficient to contain the increasing number of nuclear arsenals. The new attempts to secure nuclear capabilities in this new millennium can be associated with the deterioration of international order. The emergence of these nuclear capabilities in recent years also suggests that meaningful initiatives that could lead to better sets of HDI performance of potential candidates, might be required to reverse this trend.

Discussion of the HDI indicators-The data used in this note originate mainly from the following sources: the 2005 Human Development Indicators (HDI) from the Human Development Report Office, the United Nations, and Wikipedia, a free encyclopedia available in the Internet. The list of states related to nuclear capabilities are those given in Wikipedia (http://en.wikipedia.org).

The nations considered in this analysis have one or more of the following attributes: (1) they are nuclear capable or they can start a nuclear program at short notice; (2) they considered nuclear programs in the past; (3) they are currently giving high priority to nuclear programs. Other nations could have been included, in particular: (1) former Soviet nations whose nuclear weapons were eventually transferred to Russia; (2) non-nuclear EU nations with active roles in the NATO's defense system with the nuclear option.

The first Graph and Table 1 show the chronology of the known first nuclear tests with military implications as related to the nations' commitments to human development. Of particular significance in this Graph is the downward trend of the HDI indicator, if one compares those values for nations that acquired nuclear arsenals in the early days of the nuclear era to those of nations that have recently tested nuclear artifacts

The second Graph and Table 1 demonstrate that the manufacturing of atomic bombs in recent years is no longer associated with high-level achievements in research and development (R&D). Again, the wide R&D gap between those nations that were among the first to acquire this technology and those that have done so only recently is fairly clear in the Graph. One should be aware that there exists a distinction between an atomic bomb and a nuclear weapon. However, it has already been proved in practice that the first stages of weaponization can be reached if the former countries are committed to this goal.

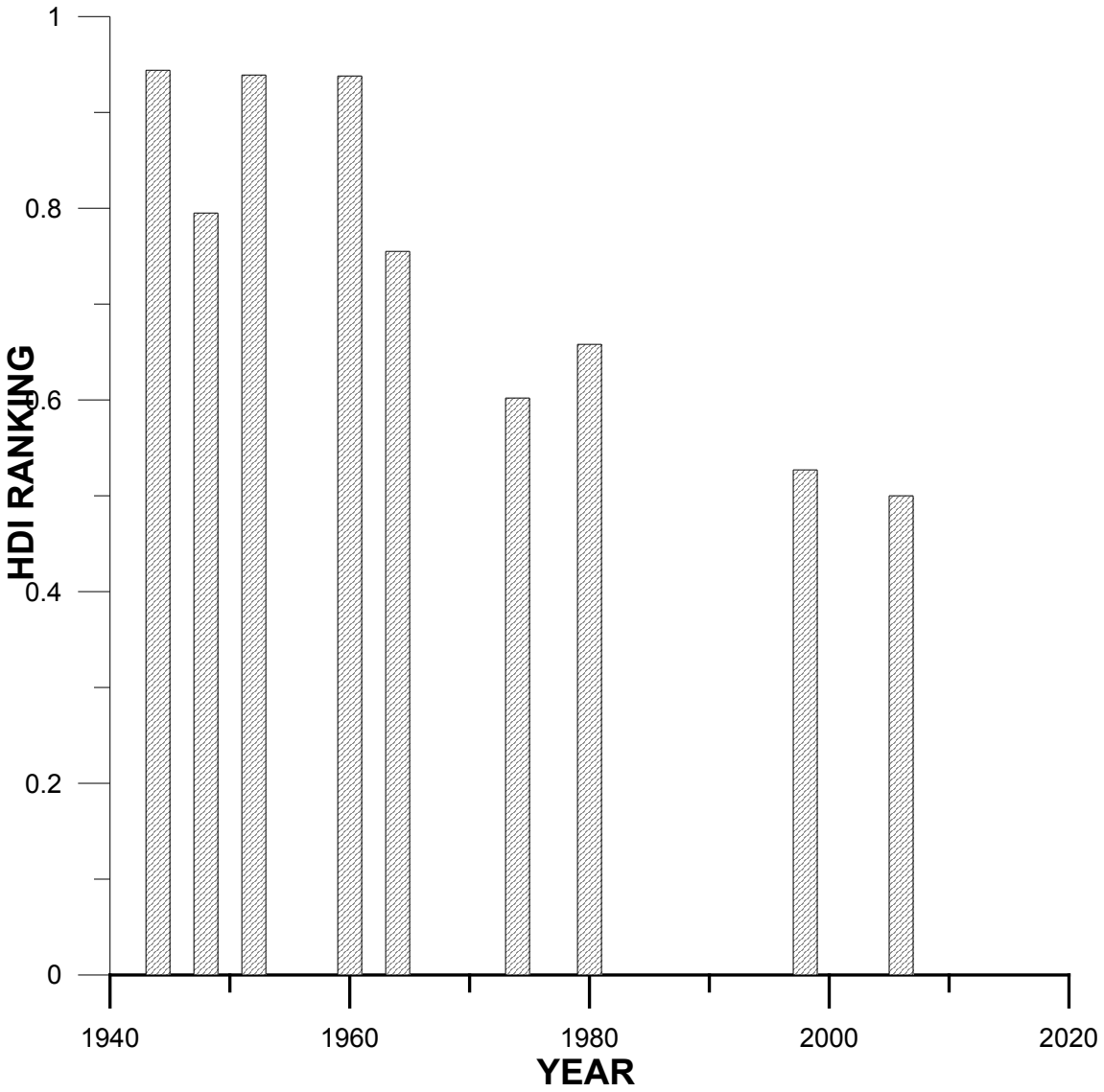
Graph 3 and Table 2 show the R&D commitment against the chronology of nations that: (1) became nuclear capable and can start manufacturing atomic bombs in a short period of time; or (2) are recognized as nations that did have past nuclear programs that could have led to the construction of these artifacts. Also listed in this Graph is the number of nations that have been recognized in recent years as having given priority to these nuclear programs. Note that there is a chronological gap around 1970 which could have been due to the implementation of the NPT – institutionalized in 1968.

Conclusions-There is no clear reason to explain the absence of nuclear tests by other nations during the 1980's and 1990's (see Graph 3). During that period, one perhaps could recall the intense negotiations of the NPT review conferences in the United Nations. At that time, most of the NPT members did focus their political initiative on the implementation of Articles IV and VI of the NPT[1], and their coalitions were important players at the UN general assemblies. These were the times when the debate in the plenary sessions of the UN highlighted the importance of the NPT and of the conventions on chemical and biological weapons.

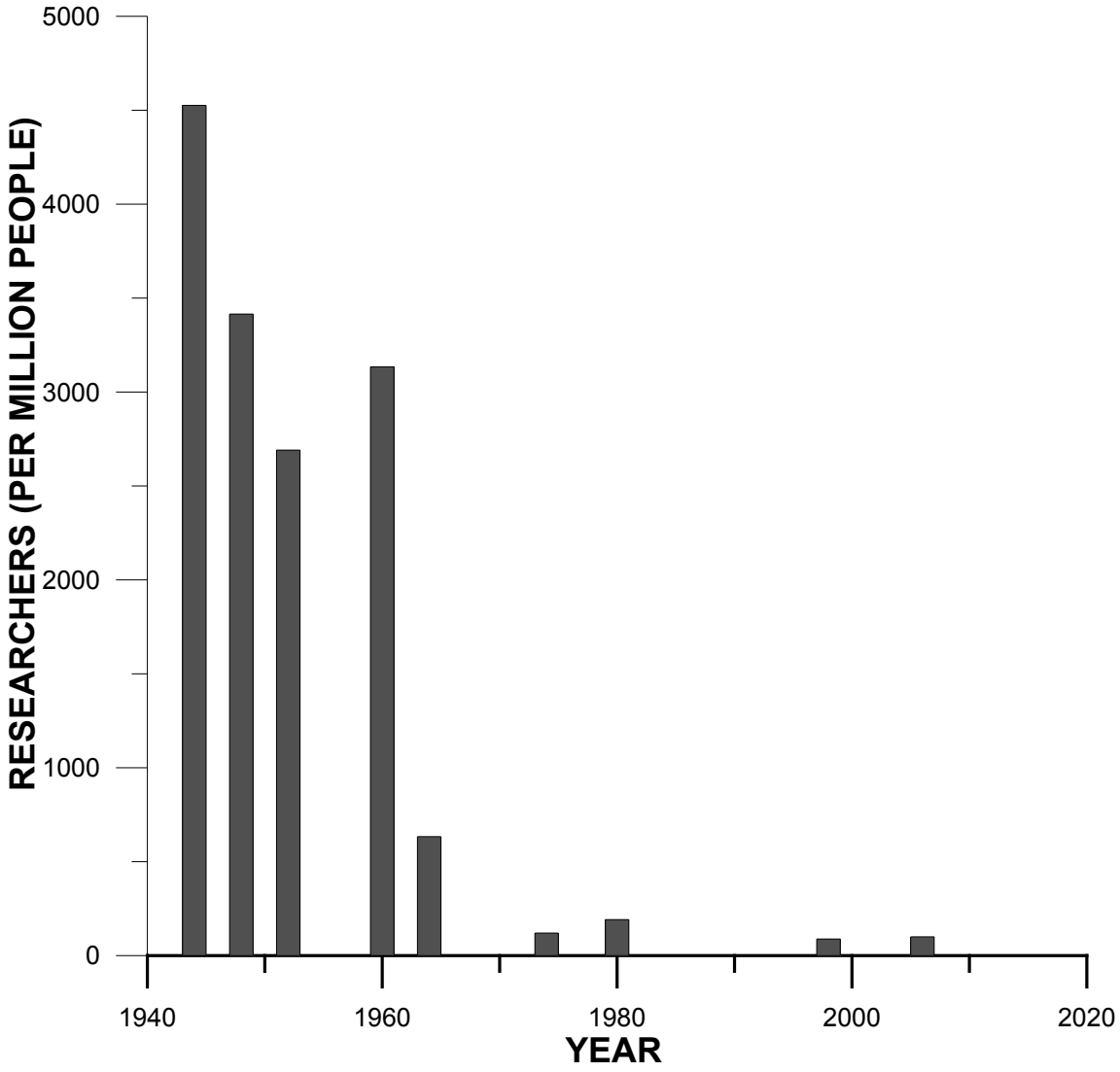
It must be acknowledged that at present there are no major impediments to acquire the basic know-how to process spent nuclear fuel and to manufacture crude weapons; the

[1] **Article IV**, on the right of all the Parties to the Treaty to develop research, production and use of nuclear energy for peaceful purposes; and **Article VI** on the negotiations of effective measures to nuclear disarmament.

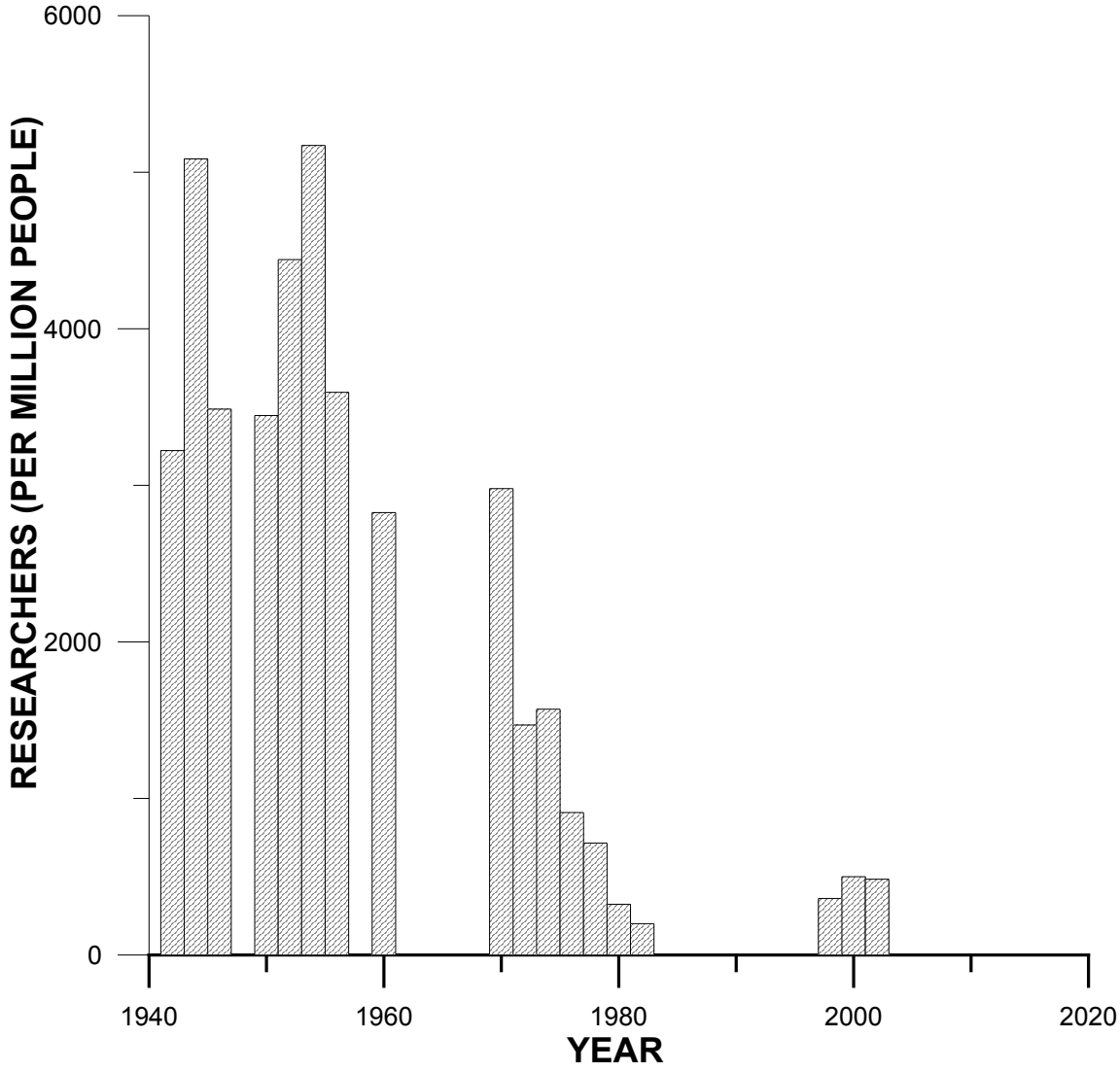
only requirements being that of becoming national priorities. This implies that the political motivations for these goals need be averted. This could take place only with the return of international order backed by the legitimacy of the forum of the nations.



Graph 1: Chronology of the known tests of nuclear artifacts, as related to nations HDI ranking in 2000.



Graph 2: Chronology of atomic bomb tests as related to those nations' commitments to research and development (R&D).



Graph 3: R&D commitment in nations that: (1) are nuclear capable and could start manufacturing atomic bombs in a short period of time; or (2) are recognized as nations that did possess nuclear programs in the past that could have led to the construction of these artifacts. Also listed in this Graph is the number of nations that have been recognized in recent years as having given priority to these nuclear programs.

NATIONS	HDI RANKING	PROJECT DATE [#]	HDI (2003)	RESEARCHERS IN R&D (PER MILLION PEOPLE)
United States	**10**	**1945**	**0.944**	**4,526**
USSR (Russia)	**62**	**1949**	**0.795**	**3,415**
United Kingdom	**15**	**1952**	**0.939**	**2,691**
France	**16**	**1960**	**0.938**	**3134**
China	**85**	**1964**	**0.755**	**633**
India	**127**	**1974**	**0.602**	**120**
South Africa	**120**	**1980**	**0.658**	**192**
Pakistan	**135**	**1998**	**0.527**	**88**
North Korea	**Not available**	**2006**	**0.500[#]**	**100 [#]**

Table 1. Human development indicator (HDI), researchers in R&D and the chronology of nuclear tests. Note that when not in the public domain, the dates of these projects are only tentative ones.

Observations:

(#) Author's estimate

NATIONS	HDI RANKING	PROJECT DATE [#]	RESEARCHERS IN R&D (PER MILLION OF PEOPLE)
Norway *	**1**	**1950**	**4,442**
Australia *	**3**	**1950**	**3,446**
Canada *	**3**	**1945**	**3,487**
Sweden *	**6**	**1950-1960**	**5,171**
Switzerland *	**7**	**1950-1960**	**3,594**
Japan [+]	**11**	**1940**	**5,085**
Netherlands *	**12**	**1950-1960**	**2,826**
Germany [+]	**20**	**1940**	**3,222**
Israel [&]	**23**	**1975**	**1,570**
South Korea [+]	**28**	**1970**	**2,979**
Argentina [+]	**34**	**1970**	**715**
Poland [+]	**36**	**1970-1980**	**1,469**
Libya [+]	**58**	**2000**	**361**
Brazil **	**63**	**1980**	**324**
Romania [+]	**64**	**1980**	**910**
Saudi Arabia [+]	**77**	**2000**	**500 #**
Iran **	**99**	**2000**	**484**
Egypt [+]	**119**	**1950-1960**	**200 #**
Iraq [+]	**Not ranked**	**1980**	**200 #**

Table 2. The nations' ranking in technology. The chosen parameter – taken from HDI 2005 – is the number of researchers per million people of each nation.

Observations:

(#) Author's estimate;

(+) States that formerly possessed nuclear projects

(*) States that can achieve nuclear capability;

(&) Suspected nuclear states;

(**) States now engaged in acquiring nuclear capability;