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## A Different Perspective on the U.S.-India Nuclear Deal

Peter Custers

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*Peter Custers is author of Capital Accumulation and Women's Labour in Asian Economies (1997) and Questioning Globalized Militarism: Nuclear and Military Production and Critical Economic Theory (2007). This article is a revised text of a lecture given at the Jawaharlal Nehru University, New Delhi, on September 17, 2008.*

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The U.S.-India nuclear deal was initiated through a framework agreement signed by India's Prime Minister Manmohan Singh and U.S. President Bush in July 2005. India, at the instigation of Washington, agreed to separate its civilian and military nuclear production facilities, and place all civilian production facilities under the inspection regime of the International Atomic Energy Agency (IAEA), in return for U.S. economic, technological, and military cooperation. The nuclear deal, which took three years to complete, is officially aimed at promoting India's access to uranium and to civilian nuclear technology, through enlarged importation of both. Whereas nuclear energy contributed a reported 2.5 percent of India's energy requirements in 2007, the deal is expected to boost the contribution of the nuclear sector to India's electricity supply, without reducing India's primary dependence on coal. From its very start, the U.S.-India nuclear deal has generated huge controversies, both in India and internationally. The intent here is to lay bare the implications of the deal for the creation of waste, while putting aside, for the moment, other important controversies associated with the nuclear agreement.

Most of the key objections against the U.S.-India nuclear deal that have been put forward by its progressive opponents in India and internationally have addressed the fact that it legitimizes India's status as a nuclear weapons state, and that it will enable India to expand its production of weapons-grade plutonium. Already, India is estimated to possess a sufficient amount of plutonium for the manufacturing of at least one hundred atomic bombs. Since India has reportedly agreed to place only fourteen out of its twenty-two civilian reactors under the IAEA's inspection regime, it is free to produce in the remaining eight reactors another two hundred kilograms of weapons-grade plutonium per year.<sup>1</sup> Thus, fears that the controversial deal will enhance the danger of a nuclear conflagration in South Asia appear to be well grounded, even if we leave aside all other interrelated objections that have been raised.

In the following, the spotlight will not be put on India's past and future plans for production of weapons-grade plutonium and nuclear bombs, but on two other major questions. For the U.S.-India nuclear deal also needs to be fiercely questioned with regard to its *ostensible* aims, i.e., the vast expansion in the production of nuclear energy. Whereas a more than ten-fold increase in the generation of nuclear energy, as foreseen, may help to overcome India's rapidly growing energy needs, the side effects in terms of generation of nuclear waste are so ponderous that, from this perspective too, implementation of the deal needs to be preempted. Moreover, as reported briefly in India's national press last September, when the signing of the deal was being debated, there is a little-discussed "reverse side" to the deal: the U.S. commercial objectives relating to its arms exports. For Washington is poised to lobby aggressively, so as to capture a larger share of India's

arms imports than it has held up until now.

The conceptual approach, proposed to address these combined issues, is a holistic view on waste. In this view, processes of manufacturing that result in military commodities, i.e., in weaponry, need to be analyzed as processes that result in wastage of economic resources. This, for instance, is the case where economic policymakers deciding to purchase armament systems do not primarily have in mind security considerations, but macroeconomic stimulation of domestic demand for goods. However, this production of *social waste* generally does not stand alone, but needs to be juxtaposed with the generation of non-commodity waste during the same industrial processes. Whereas conventional economics discusses these side effects of industrial manufacturing under the heading of “externalities,” here the term “non-commodity waste” will be used whenever reference is made to the ecologically harmful by-products of industrial manufacturing.<sup>2</sup>

Whereas social waste and non-commodity waste are rarely juxtaposed in public debate, the U.S. nuclear deal and its reverse side offer an occasion to do precisely this. As the below cited data on the generation of waste in the nuclear production chain show, the U.S.-India nuclear deal is bound to result in huge quantities of extremely dangerous waste that cannot be sold on the market, but needs to be put aside, at great risk to humans and to our natural environment. Again, importation of expensive armament systems implies the waste of vast economic resources that could be used toward relieving India's persistent mass poverty, hence should be considered importation of social waste. Moreover, the issues of social and non-commodity waste can also be posed in relation to the manufacturing of weapons-grade plutonium and atomic weapons, where generation of the two forms of waste occurs simultaneously.<sup>3</sup>

### **The Nuclear Deal: Importation of Nuclear Technology and Importation of U.S. Armament Systems**

As a starting point, I will take two newspaper articles published in the *Times of India* on September 11, 2008. One of these highlighted the business prospects of the U.S.-India nuclear deal in terms of the sale of nuclear production technology and the importation and the construction of nuclear reactors in India. The second article discussed the aspiration of the United States in terms of expanded exports of armament systems to India.

The article on the expansion of nuclear energy production spoke glowingly about the size of business that will be generated, mentioning a figure of \$40 billion worth of orders that Indian and foreign enterprises stand to receive, and hailing the deal as a “project” of great financial significance. Under the deal, a reported *twenty-four* light-water reactors will be imported from abroad and installed along India's coasts. India plans to build twelve more indigenous nuclear plants, consisting of pressurized heavy-water reactors. At no point in the article are the implications of the nuclear deal in terms of generation of additional nuclear waste discussed.<sup>4</sup>

The other article described the secondary objectives of the United States, which traditionally is not a major seller of military hardware to India. The article delineated the huge size of India's overall arms imports, stating that since the Kargil conflict, India spent a “whopping” \$25 billion on imports of weaponry and is “poised” to spend another \$30 billion on such purchases over the next five to six years. Thus, the United States is vying to capture a whole series of arms orders that

India intends to place on the world market. Indian import plans reportedly include \$170 million for the purchase of anti-ship Harpoon missiles, a sizable project for the purchase of multi-role combat aircraft, and purchases of 197 light utility and observation helicopters. A deal mentioned has already been clinched—described as India’s “biggest ever” with the United States—for the purchase of eight Boeing reconnaissance aircraft. At no point in the article is it explained that such lavish spending on arms imports represents a form of *social waste*, and that the same financial resources could well be spent on alleviating the massive poverty that still exists in India.<sup>5</sup>

Officially, of course, the U.S.-India nuclear deal and the listed plans to import armaments are not interconnected issues. The arms purchases do not directly form part of the agreement surrounding importation of nuclear technology. Yet it is probably correct to conclude that the United States hopes to overtake other foreign suppliers of arms to India as a reverse side of the nuclear deal, as was indeed hinted at in the *Times of India*. In any case, juxtaposition of the two issues enables us to look more holistically at the wasteful implications of the Indian government’s behavior than a focus on the U.S.-India nuclear deal alone would allow us to do. Hence, below I will address both the generation of nuclear waste that will occur as a consequence of the nuclear deal, and India’s arms imports, in order to show the full extent of waste creation involved.

### **Generation of Hazardous Waste in Nuclear Production**

I do not possess comprehensive data on the nuclear waste that has been generated by nuclear production thus far in India. Nor am I in a position to give a precise assessment regarding the waste that importation and construction of new reactors will create. However, the experience of nuclear production worldwide is unequivocal: nuclear waste emerges at each and every link in the nuclear production chain, starting from the very first stage, i.e., that of uranium mining and milling, and continuing through to the last stage, where nuclear fuel elements are treated in reprocessing facilities. An important source for my own understanding of these issues is the book *Nuclear Wastelands*, written by a group of scientists led by the U.S.-based Indian academician Arjun Makhijani, which primarily reviews waste generation by nuclear-*military* production facilities.<sup>6</sup> From this and other sources, I have selected three cases of waste generation, namely: the waste tailings that emerge when uranium is mined and milled; depreciated fuel elements that themselves are a form of nuclear waste; and the high-level waste that needs to be put aside when former nuclear fuel elements are reprocessed.

Uranium mining is, of course, the first stage in the nuclear production chain. Such mining is also undertaken in India, and would likely be intensified in consequence of the U.S.-India nuclear deal. When uranium ore is mined, uranium is prepared and enriched for use as raw material in making nuclear fuel elements. As a result, a huge amount of hazardous material in the form of mill tailings is left behind—tailings that contain radioactive substances and are therefore hazardous for humans and for nature. Speaking in volume terms, these tailings reportedly constitute 95 percent of all the nuclear waste generated in the nuclear production chain. Among the radioactive substances found in mill tailings are, for instance, radium-226 and thorium-230, the latter of which has a half-life of 76,000 years—meaning that it will take that many years before half of its radioactivity decays. In mining uranium and in creating the tailings, capitalist entrepreneurs are not just burdening our children and grandchildren with the consequences of uranium extraction, but entire future generations, for an indefinite

period of time. The damaging consequences of uranium mining have been well recorded in the United States, where, historically, nuclear production started. Here, tailing dams have turned into slurry after downpours of rain. Between 1955 and 1977, a total of fifteen tailing dams have broken. In one case, the Rio Puerco was flooded with ninety-four million gallons of tailing liquids, resulting in contamination of a long stretch of the river.<sup>7</sup>

Dangerous waste is also produced during the next stage, when nuclear energy is generated in reactors. Surely, the production of nuclear energy can be seen as a contribution to human welfare, *if looked at purely from the perspective of energy generation*. Yet, the hazardous implications from employment of nuclear fuel rods in the reactors are multifarious. A section of the rods needs to be taken out regularly, as the nuclear fuel elements can be utilized for only three years. Now, in the parlance of economic theory, the fuel elements, once taken out, are considered “depreciated means of production.” They are presumed to have lost all the value that has been transferred to the new commodity, the nuclear energy. Yet the fuel elements undoubtedly are a form of hazardous waste. Speaking in quantitative terms, the size of this waste seems small, however the radioactivity contained in the spent fuel elements is truly intense. The radioactive elements present in this nuclear waste include uranium, strontium-90, caesium-137, and plutonium. Of these, plutonium is entirely the outcome of human production; as such, it does not exist in nature. It is known to be the most toxic substance on earth, its half-life being exceedingly long. The half-life of plutonium-239, for instance, is *24,000 years*; that of plutonium-242, as much as *380,000 years*. Even *microgram* quantities of plutonium, when inhaled by humans, are known to result in fatal cancers.<sup>8</sup> Hence, the worldwide expansion in construction and utilization of nuclear reactors is a reason for grave concern. Each additional nuclear reactor generates spent nuclear fuel rods containing different forms of high-level waste.

The third distinct stage in the chain of nuclear production is that of reprocessing. For decades, policymakers in the West have tried to make the public believe that they had solved the issue of spent fuel elements. They argued that these fuel rods can be treated chemically in reprocessing facilities, so as to allow for reuse of the uranium to create fresh plutonium for “productive” ends, in manufacturing new fuel elements. Yet it is here that problems really pile up. At this stage, high-level waste comes into being as a distinct category of waste, since the chemical treatment of the fuel rods not only helps to separate uranium and plutonium, but also results in high-level waste that needs to be put aside. This stage produces uranium-236, as distinguished from uranium-235, incorporated in the fuel elements. Uranium-236 has a half-life of *24.2 million years*. There is also the radioactive element jodium-129, which has a half-life of *15.7 million years*. These are time scales we, as humans, are hardly able to imagine, but that make the consequences of nuclear production that much graver. The high-level liquid waste after chemical treatment of fuel rods is commonly stored in tanks.

The risks involved in such storage can be exemplified through the accidents that have taken place in nuclear-military production facilities, both in the United States and the former Soviet Union. The Hanford nuclear complex is where the United States used to manufacture its military plutonium. Here, high-level waste in liquid form was stored in 117 stainless steel tanks, each containing 500,000 gallons of waste. In 1973, a leak was discovered that had caused massive dissipation of radioactivity into Hanford’s subsoil.<sup>9</sup> But the most dramatic accident

involving high-level radioactive waste stored in tanks was reported from the former Soviet Union. In 1957, in the military-nuclear Cheliabinsk complex, located in the Ural Mountains, a tank explosion occurred. The U.S.S.R. suppressed the news of the accident in the name of guarding “state secrets,” but Soviet scientists unraveled the accident long before the Gorbachev government instigated an inquiry. Just as in Hanford, the high-level waste from reprocessing in Cheliabinsk was stored in stainless steel tanks, located in a canyon-shaped area eight meters under the soil’s surface. The explosion in Cheliabinsk’s tanks resulted in a massive leakage of radioactivity. A reported 22 million *curies* of radioactivity were released, 2 million *curies* in the form of a plume that reached a height of one kilometer above the Cheliabinsk complex. The explosion and releases of radioactivity destroyed entire ecosystems in the surrounding region. Villages had to be evacuated, rivers and lakes were polluted, and the government was forced to take draconian measures to contain the danger.<sup>10</sup>

Above, I have summarized data on selected aspects of nuclear waste generation and storage, focusing on waste tailings from uranium mining and milling, on the waste represented by spent nuclear fuel elements, and on the high-level waste that is put aside whenever nuclear fuel rods are reprocessed. Surely, given the risks they represent for humans and for nature, there is no way one can belittle the occurrence of multiple wastes in the nuclear production chain. Nor can one deny the validity of posing the consequences of the U.S.-India nuclear deal in these terms.

### **India as Importer of Weapons Systems**

I will now turn to the second form of waste: waste in the social sense of the term. In focusing on the reverse side of the U.S.-India nuclear deal, which is the eagerness of the United States to expand its arms sales to India, it is worth recalling that India today *heads* the list of Southern importers of armament systems, displacing (along with China) the Middle Eastern oil giant Saudi Arabia. This can be illustrated with concrete figures.

According to a report by the U.S.-based Congressional Research Service, in 2005 India ranked first among developing nations weapons purchasers, in terms of the market value of agreements signed to import weaponry. Further, whereas the total value of Southern arms imports in 2005 was \$30 billion, the value of the agreements concluded by India alone was \$5.4 billion, meaning that India was set to swallow fully one-sixth of the total.<sup>11</sup> While these data could be biased, they are, in fact, corroborated by data that have been compiled by the respectable, Stockholm-based peace research institute, SIPRI. In its 2007 annual report, SIPRI offers comprehensive figures for the value of arms imports by individual Southern states over a period of thirty years. Again, India heads the list of these totals. This, of course, does not imply that India has been the leading Southern importer in each and every year. But it does signify that India’s accumulated arms imports have been so big over the last decade as to make up for the comparatively “smaller” size of arms imports in earlier decades.<sup>12</sup>

The role that the transfer of arms between North and South plays in the world economy can be assessed from either a Southern or a Northern perspective. If looked at from a Southern perspective, one has to reflect on India’s arms imports in terms of *disparate exchange*. The term “disparate exchange” expresses the fact that Southern economies, when importing armament systems from the North, are

losers. Whereas Southern economies import military commodities that, from a social point of view, should be considered *waste*, the Northern states, which export the armaments, are benefactors, for they directly or indirectly transfer arms in exchange for raw materials, semi-finished goods, and labor-intensive commodities representing *wealth*. This is indeed a form of international exchange that may be characterized as *disparate* (as opposed to quantitatively *unequal*) exchange, since there is a qualitative difference between the commodities flowing in parallel between Northern and Southern trade “partners.” Although, in certain cases, the inter-linkages between exported and imported goods are explicit (notably in the case of barter agreements where crude oil is exchanged against weaponry), more generally processes of disparate exchange are less easy to pinpoint, i.e., are *indirectly* interlinked.<sup>13</sup>

To highlight the imperialist nature of this trading mechanism, it needs to be stated that it was historically instituted by the United States. For, when OPEC’s oil-exporting countries decided in the 1970s to take their fate in their own hands by insisting on the right to fix the international price of crude oil, the United States immediately tried to take advantage of the changing situation. It knew, of course, that increased prices of oil would, *inter alia*, result in additional dollar incomes for members of OPEC.<sup>14</sup> Hence, it feverishly worked to channel such Southern income toward additional Southern imports of weapon systems from the United States and other Northern arms exporters—with success.<sup>15</sup> Leading oil exporters, such as Saudi Arabia and Iran, were, in the 1970s, easily deluded into buying fighter planes and other expensive weaponry. These Middle Eastern countries then headed the list of Southern importers of weapons systems. Today, India has emerged as a leading Southern arms importer and the United States is eager to expand its arms sales to India, at the expense of the country’s traditional suppliers of arms.<sup>16</sup> And, whereas it needs to be assessed whether the exports of social waste from the United States to India will be undertaken at the expense of wealth belonging to India’s own population or at the expense of wealth belonging to the people of India and other Southern states combined, the arms transfers are bound to represent further cases of disparate exchange.

India’s massive imports of armament systems can, however, also be analyzed from a Northern perspective. Here, we need to highlight the fact that the hegemonic power in the world system, ever since the days of British imperialism, has used its leverage to export weaponry as a part of macroeconomic policymaking. This is especially true for the present declining hegemonic power, the United States. Since the 1960s, the United States has used its exports of armament systems as a replacement mechanism, a supplement to ensure that U.S. armament corporations are at all times supplied with orders sufficient in amounts to protect their production capacity and guarantee accumulation. For instance, when the U.S. government, at the end of the 1980s, needed partly to scale down the size of its orders toward monopoly corporations based in the U.S. military sector, it heavily pushed military corporations into expanding their exports. It even employed the Gulf War, staged in 1991, toward this end.

Moreover, the U.S. Pentagon, itself, embraces the economic logic behind armament exports. This is evident, for instance, from statements contained in its Annual Industrial Capability Report to the U.S. Congress in 2006. As the report states, “Defense exports play an important economic role in strengthening the U.S. defense industrial base”; “about 20 percent of U.S. weapons systems items are

exported”; and “sales to foreign customers have frequently been critical to keeping entire production lines open.”<sup>17</sup> Hence, it is difficult to interpret these sales as simply necessitated by U.S. “security”—when the Department Of Defense itself admits to the U.S. Congress that armament systems exports represent a leverage for macroeconomic policymaking. The combined historical evidence for the past several decades indicates that military exports play an active role toward helping to solve dilemmas in connection with the U.S. business cycle.

### **Juxtaposing Social Waste and Non-Commodity Waste**

In conclusion, the U.S.-India nuclear deal should be analyzed in terms of wasteful implications in two ways. If looked at strictly from a perspective of expanded production of nuclear energy in India, as is the official line of the Indian government, the deal already needs to be severely criticized, for it will undoubtedly result in vastly increased generation of nuclear waste, which, from the standpoint of critical economic theory, is to be considered *non-commodity waste*. I have not presented specific data on the waste that India’s own nuclear energy production has generated in the past, but have concentrated on international data regarding the generation of waste at three stages in the nuclear production chain: the stage of uranium mining and milling; the stage of production in nuclear reactors; and the stage of reprocessing of nuclear fuel elements. These data unequivocally show that, in assessing the implications of the U.S.-India nuclear deal, the issue of nuclear waste needs to be taken on board.

Yet, if we are to assess the full extent of waste generation implied by the U.S.-India nuclear deal, we also need to reflect on the *reverse side* of the deal. There needs to be, it seems, greater awareness of the fact that the United States does not just intend to use the deal to promote the export of nuclear production technology toward India. The United States is also keenly interested in greatly expanding its sales of armaments to India, in view of the fact that India, along with China, is one of the global South’s leading arms importers, and because of the enhanced role given to India as a sub-imperial power within the context of overall U.S. imperial strategy. Here again, my data regarding the loss of wealth implied by these deals for India and the South are incomplete and need to be expanded. Thus, further research on Indian armament imports should demonstrate how they express *disparate exchange*. They may lead to loss of wealth for the people of India alone—or ultimately to replication of disparate exchange via parallel exports of conventional arms by India to other countries of the global South. Such research would have to focus on the precise way in which foreign currency for payment of these imports is generated. For a holistic assessment of the U.S.-India nuclear deal and other U.S.-India arms deals, we need to address both non-commodity waste and social waste: the two sides of a socially irrational and ecologically destructive strategic relationship.

### **Notes**

1. See, e.g., Praful Bidwai, “Manmohan’s False Nuclear Move,” July 19, 2008, [www.cndp.org](http://www.cndp.org); also Zia Mian and M. V. Ramana, “Going MAD: Ten Years of the Bomb in South Asia,” July 29, 2008, [www.cndp.org](http://www.cndp.org). [Go back](#)
2. A precursor of the concept of non-commodity waste is the term “discommodities” coined by the marginalist Jevons, but largely ignored by other economists of his time and subsequently. See W. Stanley Jevons, *The Theory of Political Economy* (London:

Macmillan and Co., 1879) 62. [Go back](#)

3. For a full discussion, see Peter Custers, *Questioning Globalized Militarism: Nuclear and Military Production and Critical Economic Theory* (New Delhi: Tulika Publishers, 2007). [Go back](#)
4. Srinivas Laxman, "N-Trade: It's a \$40 Billion Opportunity," *Times of India*, September 11, 2008, 15. For other estimates regarding the business prospects of the deal, see J. Sri Raman, "How India's 'Waiver' Has Won," September 9, 2008, [www.cndp.org](http://www.cndp.org). [Go back](#)
5. Rajat Pandit, "In Defence, U.S. Wants to be India's Partner No.1," *Times of India*, September 11, 2008, 13. [Go back](#)
6. Arjun Makhijani, Howard Hu and Katherine Yih, eds., *Nuclear Wastelands* (Cambridge: MIT Press, 1995). [Go back](#)
7. Katherine Yih, Albert Donnay, Annalee Yassi, A. James Ruttenber, and Scott Saleska, "Uranium Mining and Milling for Military Purposes," in Makhijani et al., *Nuclear Wastelands*, 121. [Go back](#)
8. For details on the health and environmental hazards of plutonium production and use, see Frank Barnaby, "Nuclear Legacy," Cornerhouse Briefing Paper No. 2 (Dorset: The Corner House, November 1997). [Go back](#)
9. On the leakages of nuclear waste at the Hanford complex, see, e.g., Makhijani and Scott Saleska, "The Production of Nuclear Weapons and Environmental Hazards," in Makhijani et al., *Nuclear Wastelands*, 44. [Go back](#)
10. On the Cheliabinsk catastrophe, see, e.g., Zhores Medvedev, *Nuclear Disaster in the Urals* (London: Vintage Books, 1980); also Makhijani et al., *Nuclear Wastelands*, 335. [Go back](#)
11. Richard Grimmett, "Conventional Arms Transfers to Developing Nations, 1998-2005," *Congressional Research Service*, Library of Congress (October 23, 2006). [Go back](#)
12. For SIPRI's most recent data, see Paul Holtom, Mark Bromley, and Pieter D. Wezeman, "International Arms Transfers," *SIPRI Yearbook 2008* (Stockholm: 2008), 293. [Go back](#)
13. An exposition regarding the trading mechanism of disparate exchange between North and South is provided in Custers, *Questioning Globalized Militarism*, 309. [Go back](#)
14. For the views of U.S. State Department officials regarding the implications of the historical price increases decided upon by OPEC in 1973, see Pierre Terzian, *OPEC: The Inside Story* (London: Zed Books, 1985). [Go back](#)
15. See, e.g., Anthony Sampson, *The Arms Bazaar* (London: Hodder & Stoughton, 1977); and Russell Warren Howe, *Weapons: The Shattering Truth About the International Game of Power, Money and Arms* (London: Abacus, 1980). [Go back](#)
16. For India's primary dependence on arms supplies from Russia, see, e.g., Paul Holtom, Mark Bromley, and Pieter D. Wezeman, "International Arms Transfers," *SIPRI Yearbook 2008*, 300. [Go back](#)
17. Office of the Undersecretary of Defense, *Annual Industrial*

*Capability Report* (Washington, D.C.: A.I.C.R., February 2006).  
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