CHAPTER ONE
INTRODUCTION

The aim of this study is to examine characteristics of biological weapons, as Weapons of Mass Destruction (WMD), and to find answers to the question, whether biological weapons pose a threat strong enough to qualify as WMD? At the same time, this thesis rested upon the basic question: What are the limitations of biological weapons as a weapon of mass destruction?

WMDs are defined as weapons “capable of a high order of destruction” and, of being used in such a manner as to destroy “a large number of people” and these include nuclear, chemical and biological weapons (Department of Defense Dictionary of Military and Associated Terms, 1994: 412). Biological weapons that include living organisms are popularly known as poor man’s WMD and can be produced and delivered to targets with stealth and considerable ease. They are believed to have a low cost of production plus have the same lethality (at least potentially) as nuclear weapons. Given the current political and technical realities and past historical experience, the inclusion of biological weapons into WMD category though warrants attention. By studying the various stages of weaponizing a biological agent—production, delivery and potency, and calibrating the findings with the present debate on WMD, this study attempted to explore various dimensions in the understanding of biological weapon as a WMD.

This research was an attempt to understand the implication of the term WMD and also to problematize biological weapons as WMD. What are those special qualities that make a weapon qualify as a WMD? What factors, historical construction, past experience, practical use or popular theorizing were responsible to evolve the understanding about and the conception of WMD, as it is now? In addition, the study addresses some other issues like the inputs required in terms of (a) raw materials (b) infrastructure and (c) personnel for producing biological weapons, as well as the feasibility of
delivery methods, stability and virulence of biological agents and the vulnerability of people and animate targets in case of a biological weapon attack.

In recent times there has been a proliferation of literature on the theme of biological weapons. Recent events have especially brought back into focus the linkage between terrorism and biological weapons. Moreover, advancements in biotechnology and their potential in the field of weaponry have also become an issue of concern. Two schools have framed discussion on biological weapons as WMD. The first might be called “is not, could be” school. This school deposits little faith in the potency of current biological weapons programme, but highlights the destructive capacity of biological weapons, given the advances in biological sciences and paints a grim future. The second school “is not, cannot be” dismisses the threat of biological weapons as negligible and points to the agency of politics and media for the generating the hype around biological weapons. Scholars like Kathleen C. Bailey, Malcolm Dando, Mark Wheelis and R.A. Zilinskas belong to the first school. Proponents of the second school include Thomas C. Schelling, Ed Regis, Susan Martin, David C. Rapoport, Milton Leitenberg and Cohen Sidel. The second school though relatively new has overwhelmed the first school.

Among the first school, Kathleen C. Bailey points out that factors like the lack of signature of use, slow development of effects, easy delivery and small quantities of the agent make biological weapons the most suitable for covert attacks (emphasis added) (Bailey 1991: 82-95). Further, certain problems with biological weapons like virulence, stability, production and delivery can easily be overcome through the trends in genetic engineering and related fields. In his book, The New Biological Weapon: Threat, Proliferation and Control, Malcolm Dando highlighted the theoretical possibilities of the malign uses that the advances in biotechnology can be put to. New breakthroughs in biotechnology had expanded the definition of traditionally known biological weapons to include new terms like genetically manipulated agents and bioregulators (Dando 2001: 33).

Through recombinant DNA (r-DNA) techniques biological agents could now be tailor made, even to target a specific race (Dando 2001: 30-33). The classical methods, quantities of specific DNA molecules, proteins and other
products can be produced through the use of r-DNA to impart altered characteristics to host organisms (Wheelis 2002: 48-52). Researchers point out, though with not enough certitude, that not only more deadly biological agents can now be generated; the existing ones can be made more lethal. All the characteristics desirable in the bio agent—virulence, stability, and disguised antigen structure and production efficiency may be subject to enhancement (Zilinskas 2000: 11-26).

However, another group of scientists are skeptical of the new discoveries in biological sciences. They point out that only techniques and processes of biological sciences have advanced and it would take many more years even to realize the present possibilities. These proponents of the second school can be traced to Thomas Schelling. Biological weapons are “ridiculous weapons that nobody is interested in having even if the other side is foolish enough to procure them” (Schelling 1984: 253). Reasons like lack of attribution of use, long incubation periods and dependence on environmental conditions make biological weapons excellent killing machines but poor weapons (Regis 2002). Scholars now view biological weapons as weapons of last resort, a strategic deterrent at the most (Martin 2001: 63-98). With no well-documented source of use of biological weapon by a state and only few incidents of bio terrorism, the efficiency of biological weapon is not clearly established (Rapoport 2001: 23-58). A section of medical doctors are also critical and rate biological weapon attack as highly improbable though not zero (Sidel et al. 2001: 716-718). A handful of scholars believe that caveats persist in various stages of the weaponizing process of a biological agent.

The Gilmore Commission, the US Congressional Advisory Panel to assess domestic response capabilities for terrorism involving WMD, reported in 2002, that the technical challenges in producing a biological weapon were not straightforward and simple as often claimed to be. There were problems of personnel, facilities, equipment, finance and testing (Cordesman 2002: 163-168). Even within the US a discussion has emerged on whether the problem of
bioterrorism, given the historical record and current technical and political realities, warrants current levels of investment and attention (Moodie 2000: 38).

**Production, Delivery and Potency**

To first deal with its *production aspects*, even with tremendous theoretical possibilities of producing hazardous biological agents, experts have highlighted major limitations in the actual process, design and concealment of the weaponizing process of biological agent. Technically, the traditional fermentation process remains the backbone of the current advances in biotechnology with the introduction of the use of microbial, animal or plant cells for processing (Smith 1996: 2-14). The design of a biological weapon production facility would be the same as that used for other commercial purposes, containment, purification, sterilization, ventilation, storage, and replication equipment (Madigan et al. 2000: 215-287). The oft-repeated argument about small and obscure production facilities for biological weapons, giving them their insidious and lethal quality, also demands scrutiny. Even if the design of a drug/antibiotic production site and biological weapon production was similar, containment measures for the latter are a crucial and with noticeable difference. David Isenberg observed that the requirement of greater containment measures for weapons could help distinguish between biological weapon production and otherwise (Isenberg 2002).

As regards their *delivery system*, depending on the motive behind a biological weapon attack, they could be delivered though military and non-military ways. Edward M. Spiers in his book *Weapons of Mass Destruction, Prospects for Proliferation* had delineated the military ways of delivering biological weapons that includes launching aerosolized biological agents through missiles, aerial sprays and artillery (Spiers 2000: 60-89). However, aerosolizing a biological agent and deploying military means, especially through missiles to cause mass destruction would destroy the virulence of the agent. Susan Martin points out that the stress of space flight and the heat encountered upon re-entry would be detrimental (Martin 2001: 55).
In assessing the biological weapon's potency, the specifics of maintaining the potency of a weapon during and after its delivery were widely debated and remained inconclusive as yet. According to World Health Organisation (WHO) sources, a hypothetical dissemination by airplane of 50 kg of anthrax under optimal weather conditions would cause 95,000 dead and 125,000 incapacitated in a medium sized city, such as Boston (Spiers 2000: 85). In a study, Cordesman put the number of dead at 1,400,000 and regarded biological weapons as more hazardous than chemical weapons (Cordesman 2002: 152). Perhaps, the most potent variable of biological weapon utility was at the psychological level of warfare. Unlike other categories of weapons that have military utility at three levels, biological weapons have a 3 + 1 level. This included operational, theater, strategic plus psychological levels of warfare (Koblentz 2003/04: 100). In addition, the delayed effects, uncertainties surrounding the attack and the disproportionate fear that these dreaded weapons evoke could amplify the psychological impact of even a small-scale biological attack (Stern 2002/03: 102-106). These after effects could be more destructive for a country than the actual attack, as it has been stated that one could fight a known enemy but the question about the unknown enemies remains unanswered.

Ambiguities Galore

Biological weapons have been around for more than half a century; ambiguities surrounding the various aspects of biological weapons have been allowed to persist. Threat scenarios based on the potential of developments in biotechnology were primarily hypothetical constructs and revealed futuristic trends. New advancements were the progressions of knowledge and as such were value neutral. Important issues of the intention behind the use, access to new technology and capabilities would be crucial for the translation of the dreaded techniques of the future into deadly weapons of the present. The role of media in our life was no longer peripheral. It played a crucial role in determining and setting ideas and influencing people's perceptions. Biological weapons served the purpose of sensationalistic media reports just right. It had been pointed out that
scholars completely underestimate its effect by ignoring the possibility of biological warfare during plans and exercises or they completely overestimate the biological agents killing ability on the battlefield (Mauroni 2000: 184). Michael Moodie had argued that this inadequacy stems from the fact that most scholars focus on only one dimension of the threat rather than on the full diversity of factors (Moodie 2001: 5-8).

Given the ambiguities regarding biological weapons and the hype generated by various agencies the real assessment of a biological weapon threat was condoned. A rich literature on the history and capability of biological weapons already existed. However, no attempt had been made to apply the technical understanding of weaponizing a biological agent to assess broader security implications and its practical usage as WMD. This study attempted to fill this void by studying the technical realities of producing and using and the potency of biological weapons and calibrating the findings with the current understanding of WMD. Also, rather than a reflection of the true destructiveness of the weapon, a highly politicized discourse had led to the understanding of biological weapons as WMD. Therefore, it was important to disengage biological weapons from other categories of WMD for a better solution to broad security implications.

The method underlying the study has been inductive. Definitions of WMD had been delineated as given in government documents, research papers and media. The incidents of past use of biological weapons were also been taken into account. An important distinction was also been made between the two, biological warfare agent and biological weapon agent (Robinson 2006). Biological weapon agents are the agents that have been banned by the BWC. They include not only animate pathogens but also toxins. For the purpose of this study the four agents that were selected are anthrax, smallpox, plague and tularemia. The agents (biological agents or toxins) were not prohibited, only their use was prohibited. Permitted uses were defined as prophylactic, protective and other peaceful purposes (For details, refer to Annexure 1).

By tabulating select biological agents across the stages, acquisition and verification, production, safety, preparation, delivery, vulnerability, prophylaxis
and detection, the problems and/or incentives of the particular biological agent to be used as a WMD were brought out in the study. Questionnaire based interviews with experts working in biological weaponry were carried out. The study also examined documents and other published secondary sources like books, journals and Internet sources.

Outline of Research

The first chapter probes the formation and the understanding of the term WMD. It traces the issues, parties, people, events, theorizing and public understanding that have calibrated in some way or the other to have a bearing on the evolution of the meaning and understanding of WMD. The chapter also deals with the ongoing debate surrounding WMD and delineates the criterion for a WMD.

The various processes and the advancement therein for producing biological weapons would be examined in the second chapter. This chapter attempts to find the answers to questions like what is the critical significance of the agents under study which makes them suitable for weaponization? What are the various stages in the production of these agents? What limitations exist at each of these stages?

Chapter three pertains to the study of available delivery means and systems for biological weapons. It would examine the suitability of these means in warfare. What are desirable qualities of a biological agent essential to its dissemination? What are the various means of delivering biological weapons? What evidence is provided in history as regards to the availability of desired effects through the use of these means? What are the factors crucial in the delivery of biological weapons?

Technical aspects of potency maintenance and the politics involved in the use of biological weapons would be analyzed in the fourth chapter. What are the qualities that make a thing qualify as a weapon? What is the potency in relation to biological weapons? Is it the number of people killed? This chapter will draw
technical inferences from the earlier chapters, and examine the different facets of biological weapons as WMD.

Chapter five is a chapter based on assessment of the study. It would bring out the findings of the study and lay out future areas of research.

Methods

Knowledge gained for this work has been through formal and informal interviews. The interview format was the semi-structured qualitative interview. The study was based on the understanding of the technical aspects of biological weapon. Since open access to such literature is difficult, the interview was structured to gather views on the various technical aspects. Deciding that candidates should reside in two countries narrowed the population for formal interviews. These countries- Switzerland and the United Kingdom were chosen for practical reasons of field work. No candidate was shown the questions that were going to be asked during the interviews and neither were these questions rigidly adhered to, making the practice of the interviews semi-structured. In order to overcome requests for advance knowledge of interview questions, a carefully worded description of the proposed research was sent to all prospective candidates. This was intended to allow candidates to locate himself within the research project and identify the most likely topics to be covered within the interview and to explain carefully the goals of the research.

Almost all the interviews were tape-recorded. Notes were taken during only two of the interviews, given the limited available time with the candidates. However, given the geographical location of the researcher, the scripts could not be verified with the candidates later.

Formal Interviewing

The fieldwork for this project took place in March-April 2006. Fieldwork in Geneva took place in late-March 2006, with all the candidates residing in Geneva. The UK fieldwork was carried out in late-March and mid-April. The trip
involved a visit to Sussex, Leeds and Bradford. In all, nine formal and four informal interviews were conducted in these places.

The formal interviews took place individually and face-to-face and typically lasted over an hour with the longest lasting two hours. Two candidates expressed that their views were individual and did not reflect the position of the organization they were affiliated with (in both cases the United Nations).

Final Methodological Thoughts

The hypothesis of this study states that the problems associated with the acquisition of raw materials and the containment facilities required for producing biological weapons as also the problems associated with aerosolizing a biological agent to maintain its potency while delivering do not make biological weapons a potent WMD. The process of ‘doing’ the research for this dissertation was inductive. The research variables that were under study were selected in such a way that it led to establish a criterion, on which basis select four biological agents were examined to ascertain their capability for mass destruction.

What is WMD?

The term Weapons of Mass Destruction, ‘WMD’, has implied different understandings as per the political and social contexts of the time. The understanding of WMD has evolved from a term used to describe a Luftwaffe German air force attack on the town of Guernica in 1937 that killed almost 70 percent of the total population, later to describe the bombing of Hiroshima and Nagasaki, to the Cold War understanding, when the phrase WMD had fallen out of use. In the post Cold War restructuring of world politics, the term WMD emerged as a usable tool. During the 1991 Gulf War, it was resurrected and used proliferically by politicians and the media, despite having a fairly antique aura. The subject that was discussed was Iraq and it continued to be used throughout the 1990's regarding the need for continued sanctions and military containment of Iraq. With the 2002 Iraq disarmament crisis and the alleged existence of weapons
of mass destruction in Iraq that became the primary justification for the 2003 invasion of Iraq, the term WMD achieved its climax (Historic use of the term WMD 2005). It appears that the use of the term is generally guided by one’s own specific interests and targets. According to Professor Robinson,

There are three things in the definition of WMD, quality, quantity and the context. The quality is defined in terms of the UN definition. In 1947, the UN commission for Conventional Armaments addressed the definition of WMD, in an effort to distinguish them from other conventional weapons. The definition that was finally accepted in 1948 was to include atomic, radioactive, chemical and biological weapons, and any weapon developed in the future, which have characteristics comparable in destructive effect to those of the atomic bomb, or other weapons mentioned above (Robinson 2006).

The requirement of the US legislation actually put a quantitative element in the definition of WMD. One of the most traditional conception of a high consequence event, that implies to the actual number of injured or dead is represented by the term mass casualties. Currently, the Department of Health and Human Services (HHS), in US defines a mass casualty event to include at least 1,000 injuries and/or deaths (Frerichs et al. 2005). Since, this is one of the only kinds of the definition that puts a numeric ceiling on the understanding of WMD, for the purpose of this research this will be taken as the benchmark.

The purpose of this chapter is to set out the theoretical and conceptual background of the study. The particular aim is to bring together different strands in international relations, social and political contexts in a manner that provides a background for the examination of the evolution of the concept such as WMD.

Theoretical Aspects

In the historical evolution of international relations, it is clear that there exists intermittent phases of war and efforts to reconcile conflict and efforts for cooperation. These events have influenced the thought of international relations with conflict resolution and war or rather the threat of war becoming the primary focus in all theorizing and analysis of the empirical phenomenon. The discipline
of international relations theory has traversed the journey from the idealism of post World War I to the realist thought that followed World War II (Fabri 2000: 289-310).

The school of realism makes a serious case for WMD in international politics. Realism, of course, is bound in the Cold War environment. The most important construct of realism is the understanding that the international system is anarchic. States are assumed to be rational, unitary actors in an anarchical world. The central and convenient assumption of realism is that it describes the world 'as it is' in reality. In the political realist world, nation states are in competition over interests and resources. Their mutual differences are settled by the use of power (Ivie 1996: 55). State becomes the sole unit of analysis, and the pursuit of power governs the interactions between states. In such self-help system states have to ensure their survival.

Realism sets a consequentialist instead of a deontological approach to international politics. Thus, for realism, the first step of any analysis of WMD is to understand the characteristics of WMDs and their consequences. In other words what is the effect of these weapons on international politics (Martin 2004: 38). The answer to this question for a realist will also answer the other question of the "purpose of security" (Martin 2004: 18). WMDs can increase the status of a nation in the international scenario. In order to understand how this influence is exercised, it is important to first understand how states pursue security. From a realist perspective, one finds an environment containing, insecure states, anarchical system and existence of WMD. On a closer look, it is clear that in order to explain the interactions of the three conditions, two different thoughts are visible in the realist school. The "nuclear revolutionists" hold one of thought in the realist school (Martin 2004: 100-101). The other thought is held by a group of scholars, critical of the role nuclear weapons play in international relations.

The nuclear revolutionists believe that nuclear weapons provide defense, deterrence and thus contribute to peace and stability. However, the potential of nuclear weapons to provide for the defense and safety of a country is a function of its demonstrated destructibility. Those states that are under a security threat and
lack resources for a nuclear weapon would resort to the acquisition of “biological weapons as a strategic deterrent” (Martin 2004: 101). This reasoning makes the powerful states fear those developing countries trying to acquire these weapons (see table 1.1). Since by logic and common knowledge biological weapons are taken to be at par with nuclear weapons, for a realist, biological weapons would provide the same benefits as nuclear weapons.

**TABLE 1.1: SCHOOLS OF INTERNATIONAL RELATIONS AND THE ISSUE OF WMD**

<table>
<thead>
<tr>
<th>Theoretical Contentions in International Relations</th>
<th>View of the International System</th>
<th>View of State</th>
<th>View of Security</th>
<th>View of WMD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Realism</td>
<td>“As it is”, Independent, Sovereign, Rational, Solitary</td>
<td>Prime Concern</td>
<td>Enhances security of state</td>
<td></td>
</tr>
<tr>
<td>Liberalism</td>
<td>Co-operation between the states possible under certain conditions</td>
<td>Independent, Sovereign, In a social contract</td>
<td>Collective security</td>
<td>Enhances security of state</td>
</tr>
<tr>
<td>Critical Theory</td>
<td>Questions the way one views the international system</td>
<td>A particularistic and exclusionary institution</td>
<td>Around two questions—Security for whom? Security for what?</td>
<td>Beyond a state-centric approach and the domination of WMD</td>
</tr>
</tbody>
</table>

The other mainstream international relations theory, liberalism signifies normative and prescriptive ideas. The normative point was progressed further with liberal institutionalism. Liberals believe that the negative aspects of anarchy can be alleviated by the creation of international institutions. In such condition all the interacting units, i.e., states benefit as in non-zero sum games. However, liberals are skeptical of the success of international measures in the area of security. The reason given is that since security issues are conflictual and cooperation in this area may lead to sub-optimal results (Krasner 1984: 1-21). Thus, regimes, the classical case of liberal institutionalism will have a role in an issue area that is cooperative.
Critical theorists deal with the ontological and epistemic issues of international relations. Thereby, in the process, questioning the understanding of the subject itself. They are concerned with the conditions of emancipation from the present dominant structures and the building of a new order. Whereas the dominant strands in international relations identify the importance of the 'state', it is the interaction between the state and the issue that is a determinant that explains the future course of that issue. The constructivist understanding of security is different from the traditional understanding of the same (Buzan et al. 1998: 21). The constructivists view the two processes of securitization and politicization as different. The difference between the two is in the role of the state while handling the two issues. In the former, the state deals with and the issue, and it is a subject of public debates and decision. Any issue is politicized when the “issue is a part of public policy, requires government decision and resource allocations, or rarely, some other form of communal governance” (Buzan et al. 1998: 21).

For them securitization is an “intersubjective process” (Buzan et al. 1998: 204). This process will frame the issue as a special kind of politics or above politics. As per the actual practice, security becomes a ‘performative speech act’ (Buzan et al. 1998: 204). It is “a social quality, which the political actor such as intelligence agencies, government officials, and international organizations, inject into issues by publicly portraying them as existential threats” (Buzan et al. 1998: 204). According to them, in order to study securitization one has to study the power politics of a concept. “The use of a specific conceptualization is always a choice, it is politics; it is not possible to decide by investigating the threat scientifically” (Buzan et al. 1998: 31). The constructivists approach security from a speech act perspective. The success of the securitization process will be decided by the audience of the security speech act. Thus, security (as with all politics) ‘rests among the subjects’ (Buzan et al. 1998: 31).

Various agencies have influenced the process of securitization (threat-defense) for WMD. The body politic with policy making as its agenda can be safely thought as working under the wraps, or behind the scenes. The media whether print, electronic or as in popular writing being the front face for the body
The collusion between the media and the people in power has been used to exploit motives of both the partners. Media becomes one of the factors that are essential to the securitization (speech act) of an issue. It becomes the logical end of the thinking and action that is usually initiated in the body politic. In order to understand securitization of WMD, it is important to delineate the roles of these agencies.

“Context can potentially refer to a number of different things including intentions, motivations, the societal environment in which a text was produced, a cultural community, modes of discourse, and the body of an individual’s work” (LaCapra 1980). For the purpose of this study, a careful observation of the political and social environment was imperative, because here are the places where the historical analysis of ideas finds meaning. This kind of study has special relevance to politics, because this is one place where words are created, propagated and strengthened not because of what they mean or should mean but because of the reason that these words get camouflaged for vested interests, gains, and policy benefits. All the three contexts—political, social and cultural contribute significantly in the evolution of the term. It appears clearly that though the construction of a term is political, its meaning is reinforced through the social and cultural processes.

Origin of the term “WMD”

According to the classical view, categories should be clearly defined, mutually exclusive and collectively exhaustive. This way, any entity of the given classification, universe belongs to one and only one, of the proposed categories (Categorization 2006). According to the Aristotelian view, categories were discrete entities characterized by a set of properties which are shared by their members. These are assumed to establish the conditions which are both necessary and sufficient to capture meaning.1 Aristotle advanced the view that every good

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1 The two prototypical concept structures are (1) necessary and satisfying conditions and (2) family resemblance (Gary Goertz 2006: 35). A key difference between the two is that one has necessary condition while the other has none. The family resemblance approach allows for the
definition has two good parts. First it found out the object in question to a class or group whose general characteristics matches with the object's. Second, it indicated wherein the object differs from all other members in its class (Durant 1961: 59).

The ontological theory expounded by the concept focuses on the internal structure of concept and its constituent parts. This analysis is related to the question of how the object as a whole interacts in a causal way with its environment (Durant 1961: 28). Context in this study means the political and socio-cultural environment. The selection of these two environments has been based on the ideas of Quentin Skinner.²

The analysis of concept involves ascertaining characteristics of a phenomenon that have central causal powers. The next section evolves a discourse on the ways the term WMD has interacted in a causal way with its environment.

**Political Context**

In contrast to popular belief, the origin of the term “WMD” had no connection with nuclear weapons. The term weapons of mass destruction was first used in the *London Times* in 1937 (Mallon 2005). It has been widely claimed that British newspapers were the first to describe bomber aircraft as “WMD” in 1937, when the Nazi Luftwaffe was flattening towns during the Spanish Civil War (WMD: Words of mass dissemination 2006: 3). It was used to describe a Luftwaffe German air force attack on the town of Guernica, Spain. The day was April 26, 1937. In the afternoon, for about three hours planes from the Condor absence of a given characteristic to be compensated by the presence of another (Gary Goertz 2006: 35). To say that Q is necessary for P is to say that P cannot be true unless Q is true, or that whenever (wherever, etc.) P is true, so is Q. To say that Q is sufficient for P is to say that Q being true forces P to be true, or whenever Q occurs, P occurs.

Legion dropped 100,000 pounds (almost 91 million kilograms) of bombs on the city and killed citizens in the street by machine guns. According to the Republican sources, 1,500 people were dead. This was almost 70 percent of the total population of the town of Guernica. The only military target in town, a bridge, was unharmed. A London Times correspondent noted that "the object of the bombardment was seemingly the demoralization of the civilian population and the destruction of the cradle of the Basque race" (Spanish Civil War 2005: 2). The purpose of the bombing at Guernica was to test the effect of a new military tactic blanket-bombing of a civilian population to demoralize the enemy. The London Times report of the bombing of Guernica referred to the devastation caused by blanket bombing. Although the phrase "Weapons of Mass Destruction" was used to describe the massive amount of damage by conventional bombs.

This act of massive devastation was unprecedented in human history till that time and tremendously influenced contemporary artists. Picasso's widely acclaimed and critically appreciated 'Guernica', was an artist's outburst to the horrendous crimes committed at the Spanish town of the same name. The artist's impression made it clear that mass destruction meant killing of innocent, hapless victims. The victims had no control on the events that wreaked havoc. Any destruction can only be termed mass, once it targets and the results are not limited. Mass destruction in this sense, does not distinguish between civilians and troops fighting in a war. This point was proven once again when nuclear weapons were used in 1945. These weapons killed 100,000 innocent civilians and generations of the natives were to be categorically effected.

Out of the horrors sprang many humanitarian initiatives. The first scientists to take action were those involved with the atomic bomb. The efforts of Leo Szilard and James Franck, as the chairman of the committee of atomic scientists, to abolish war and prevent the use of new weapons took place before the nuclear bombings at Hiroshima and Nagasaki. The Emergency Committee of Atomic Scientists (the Einstein Committee), with Albert Einstein, Harold Urey and seven other scientists was constituted in 1946. This committee carried on educational campaigns to emphasizing the role of law and order in preventing future wars and
the use of WMDs. The Mainau Declaration, a statement issued by 52 nobel laureates on 15 July 1955, urged the nation states to renounce force as a final resort of policy (Pauling 1972: 273-274). Albert Einstein and Bertrand Russell, leading thinkers of the times, declared their vision for the future of humanity in a manifesto. On 9 July 1955, Bertrand Russell issued the Russell-Einstein Manifesto, in London. This proposal urged the leaders of the world to seek peaceful solutions to international conflict. The manifesto used the term WMD, to describe the dangers posed by nuclear weapons (Nye 2004: 38). This manifesto also laid the foundation for Pugwash Conferences that have been working to ensure a safe living of the world (Russell-Einstein Manifesto 2005). Thus it seems that WMD has been coined to signify the killing of innocent civilians, rather than out of technical merits.

According to some sources the first official use of the term Weapons of Mass Destruction was in a communiqué issued by US President Harry Truman, British Prime Minister, Clement Atlee and Canadian Prime Minister Mackenzie King on November 15, 1945, about two months after the nuclear bombings at Hiroshima and Nagasaki (Safire 1998: 22). Vannevar Bush, President Roosevelt’s science advisor, and a Massachusetts Institute of Technology engineer, claimed that he had authored the phrase. Vannevar refuted the oft-sighted Russian link with the origin of the term WMD. He stated that the analogous Russian term ‘oruzhiye massovovo porazheniya’ meant any heavy attack from the air.

The phrase was repeated in a resolution of the UN General Assembly, dated 24 January 1946. It called for the elimination of all weapons “adaptable to mass destruction”. In 1946, after the bombing of Hiroshima and Nagasaki, the United Nations issued its first resolution. It was to create the Atomic Energy Commission (predecessor of the International Atomic Energy Agency (IAEA)), and used the wording: “...atomic weapons and of all other weapons adaptable to mass destruction” (Historic use of the term WMD 2005).

The General Assembly resolution of 14 December 1946 referred to the elimination of “all other major weapons adaptable now or in the future to mass destruction” (The Problem of Chemical and Biological Warfare 1971: 193). In
1947, the UN commission for Conventional Armaments addressed the definition of weapons of mass destruction in an effort to distinguish WMD from other conventional weapons. The definition that was finally accepted in UN in 1948, included ‘atomic, radioactive, chemical and biological weapons, and any weapon developed in the future, which have characteristics comparable in destructive effect to those of the atomic bomb, or other weapons mentioned above’ (The Problem of Chemical and Biological Warfare 1971: 193).

However, according to the UN documents on the subject reveals that the notion of WMD including nuclear, biological and chemical weapons was not unanimous in the UN Commission. UK, Australia and Ukraine questioned the framing of the definition, whereas the former USSR voted against the definition adopted by the Commission (The Problem of Chemical and Biological Warfare 1971: 193). Note that till then the understanding that the potential of a weapon to cause destruction is one of the key attribute towards it being a WMD was already established. By then, the actual destruction of the nuclear bomb had already been demonstrated, whereas no concrete proof existed of a chemical, biological or radiological weapon in either World War.

Politically, during the period the world was facing a bipolar situation. Therefore, nuclear bombing of Hiroshima and Nagasaki further deepened the ideological divide. This bombing revealed the divide between the technological and military capabilities of the two blocs, the Soviet Union and US. Soviet Union was desperate to acquire this new technology to stay in competition. Whereas the ‘US wanted the bomb as a legitimate weapon to help win war and shape post war international relations by influencing Soviet behavior’ (Blacker and Duffy 1984: 30). Resultantly arms control effort after 1945, became propaganda laden (Russet 1983: 170).

After 1950’s more modest and realistic arms control efforts were evident. The reason for this was the change in arms control theory. This change has been attributed to three factors (Larsen and Rattaray 1990: 1-56).

First, greater stress was laid on co-operative security arrangements. Second, the emergence of military leaders and theorists ‘who favored a revisionist
outlook' and lastly the launch of Soviet Union satellite, Sputnik revolutionized US thinking (Larsen and Rattaray 1990: 1-56). The vulnerability of nuclear deterrence to technology threats was now accepted. These efforts culminated in the following- the Antarctic Treaty (1959), Partial Test Ban Treaty (1963), Outer Space Treaty (1967) and Nuclear Non-Proliferation Treaty (1970).

Given the number of multilateral arms control treaties during the times, the term weapons of mass destruction became a jargon term of the arms control community in the 1960s. Chemical and biological weapons received renewed focus in the heightened arms control atmosphere of the 1960s and 1970s. In 1968 a nerve gas leak killed six thousand sheep in Utah. With the use of defoliants and tear gas by US during the Vietnam War (1961–1973), voices were raised among the general public, concerning the urgent need to address the issue of possible health hazards caused by the release of chemical and biological agents. Domestic threat and growing public concern were influential in President Nixon’s decision to unilaterally renounce biological weapons in 1969.

Eventually, an international group of experts was commissioned by the UN General Assembly as the Conference of the Committee on Disarmament (CCD) to study chemical weapons and biological weapons. During these negotiations the military utility of biological weapons was not credibly established. Agreement on restraining biological weapons could have been based on the premise that “only insignificant and ineffective weapons can be restrained” (Richard M. Price 1994: 4). In addition, it was realized that the imperative of large scale testing for biological weapons would render their inspection useless. In time, a Biological and Toxin Weapons Convention (BTWC), prohibiting the production and storage of biological toxins and calling for the destruction of biological weapons stocks was signed in 1972. The Biological and Toxin Weapons Convention of 1972 explicitly includes biological and chemical weapons within the WMD framework:

“Convinced of the importance and urgency of eliminating from the arsenals of States, through effective measures, such dangerous weapons of mass destruction as those using chemical or bacteriological (biological) agents” (Text
of the BTWC 1972). The expanded definition is also supported by UN Resolution 687, 1991, and the Chemical Weapons Convention (CWC), 1993.

The separation of biological and chemical weapons at this stage proved less fruitful for restraining the proliferation of chemical weapons. It was only after a protracted twenty-five years of negotiations that a convention, CWC, of unlimited duration requiring all stockpiles of chemical weapons to be destroyed, came into force in 1997.

Under the provisions of the BTWC and CWC the entire category of weapons are banned. No such treaty pertaining to nuclear weapons exists so far. The agreements involving nuclear weapons have focused fundamentally on the norms to ban deployments in new environments and restrict specified new developments. The linkage of ‘power’ with nuclear weapons can explain this. This linkage is based on the demonstrated destructiveness of nuclear weapons.

With the end of the Cold War, the fear of asymmetric threats once again shifted the focus from nuclear weapons to chemical and biological weapons in the US. The threat of proliferation of WMD in the Third World countries came under the spotlight. In order to control this new and emerging threat, some of the Third World Countries were demonized as “rogues” or “outlaws” by strategists. Thus the rogue doctrine, which specifies the characterization of hostile (or seemingly hostile) Third World states with large military forces and nascent WMD capabilities, bent on sabotaging the prevailing world order’ (Klare 1995: 26).

The official Pentagon list of rogues consisted of the four, North Korea, Iran, Iraq, Libya and Syria in the 90s. The number was reduced to three, in 2002 including North Korea, Iraq and Iran in the axis of evil. Other possible reasons for the new focus on chemical and biological weapons include the rise of terrorist groups that may be more likely to use WMD and the military’s need for a threat to justify its budgets especially in the case of US (Martin 2005: 18).

The emphasis that has been put on the issue of biological weapons is evident in the works of scholars. They point out that one of the important reasons will be the efforts to stop the spread of WMD and their means of delivery (Nye 2004: 39). Biological weapons came into focus again after the Persian Gulf War
(1980-1988). This war ended with the UN Security Council Resolution 687, in the year 1991. According to its provisions, the Iraqi declarations of its WMD programme were to be verified, by UN Special Commission (UNSCOM) for biological and chemical weapons and International Atomic Energy Agency (IAEA) for nuclear weapons. The large nuclear infrastructure of Iraq was destroyed by the IAEA by 1998. However, Iraq was still suspected of maintaining an active biological weapons programme in violation of the ceasefire agreement it signed with the UN Security Council (Blix 2004: 30). The September 11, 2001 terrorist attacks in the US changed the policy towards Iraq from “a policy of containment to a belligerent approach”, which led to the second Persian Gulf war in 2003 (Freedman 2004: 18).

In 2002, the UN Security Council passed Resolution 1441 on Iraq. United Nations Security Council Resolution 1441 is a resolution, passed unanimously on November 8, 2002, offering Iraq “a final opportunity to comply with its disarmament obligations” that had been set out in several previous resolutions (United Nations Security Council Resolution 1441 2002). Before the year 2002, the UN had passed sixteen resolutions on Iraq. The seventeenth resolution on Iraq was the UNSCR 1441, dated 8 November 2002. In 2003, the US, UK, and Spanish governments proposed another resolution, which they called the “eighteenth resolution” and popularly called as the “second resolution”. The sponsors withdrew the resolution in the absence of majority support.

On the basis of evidence drawn from satellite images, military communications and computer-generated images depicting mobile biological weapon production systems Colin Powell, the US Secretary of State presented a case for military intervention in Iraq on 5 February 2003. The evidence of mobile weapon systems was questioned by weapon experts like Hans Blix. Even the government did not regard the evidence as indisputable. According to U.S. Secretary of Defense Donald Rumsfeld argued that if the US waited for a “smoking gun, it would be too late” (United Nations Security Council Resolution 1441 2002). On the Iraqi side, their government continued to claim that they had
no weapons of mass destruction and were fully cooperating with UN Resolution 1441.

UN Chief Inspector Hans Blix presented a report to the UN Security Council on 14 February. In this report it was stated the Iraqis were now more proactive in their cooperation. In addition, arguments proposed by Mr. Powell were contradicted, in particular the credibility of the interpretations of satellite images. It was reported that no early warnings of the inspectors was given to the Iraqis (Briefings on Iraq Inspections 2003).

However, in an interview to the *Time* magazine, Mr. Blix expressed his doubts over Iraq's claims to have destroyed its stockpiles of anthrax and VX nerve agent. Blix said "it is a bit odd that Iraq, with one of the best-organized regimes in the Arab world, would claim to have no records of the destruction of these illegal substances. I don't see that they have acquired any credibility"(The UN Security Council and the Iraq war 2006).

As regards to the evidence of an Iraqi WMD programme Mr. Blix said, "There has to be solid evidence of everything, and if there is not evidence, or you can't find it, I simply say, 'Sorry, I don't find any evidence,' and I cannot guarantee or recommend any confidence"(The UN Security Council and the Iraq War 2006).

In a speech to the UN General Assembly on 9 December 2002, George W. Bush stated that Iraq was expanding and improving facilities that were used for the production of biological weapons (Weapons of Mass Destruction Quotes 2006). The US government announced in March 2003 that "diplomacy has failed" and that it would proceed with a "coalition of the willing" to rid Iraq of its alleged weapons of mass destruction"(The UN Security Council and the Iraq War 2006). In his State of Union address, on 28 January 2003, the US President Bush made it clear that credible sources had proven the existence of an Iraqi biological weapons programme. To quote, "from three Iraqi defectors we know that Iraq, in the late 1990s, had several mobile biological weapons labs" (Weapons of Mass Destruction Quotes 2006).
According to experts, the US led attack on Iraq on 20 March 2003 was based on the suspicion of Iraq’s WMD capabilities, particularly biological weapons and the willingness of terrorist organisations to procure them from a defiant Iraq and use against US (Freedman 2004: 18). Eventually the war started without a further resolution, which was seen by many governments throughout the world as a breaking of international law (The UN Security Council and the Iraq War 2006).

**Revival of the WMD Debate**

The term WMD received a renewed focus after the September 11 terrorist attacks on the US mainland. This seemed to especially reinforce links between terrorism and WMD, thereby reopening the debate on the potential of biological weapons as WMD. Therein, several legal mechanisms were evolved to prevent the WMD or technologies thereof falling in the hands of unwarranted groups or peoples. The US President, the US Central Intelligence Agency, the US Department of Defense, and the US General Accounting Office have used the NBC definition in official documents (Current definitions Section From the 2000 Presidential Documents 2005). All these definitions are different. Other documents expand the definition of WMD to include radiological or conventional weapons (Definitions US 2005). According to the Title 50 of the US Constitution the definition of WMD is (Title 50, Chapter 40, US Constitution 2005)-

(1) The term “weapon of mass destruction” means any weapon or device that is intended, or has the capability, to cause death or serious bodily injury to a significant number of people through the release, dissemination, or impact of—

(A) Toxic or poisonous chemicals or their precursors;

(B) A disease organism; or

(C) Radiation or radioactivity.

The US military refers to WMD as: “weapons that are capable of a high order of destruction and/or of being used in such a manner as to destroy large numbers of people. Weapons of mass destruction can be high explosives or nuclear, biological, chemical, and radiological weapons, but exclude the means of
transporting or propelling the weapon where such means is a separable and
divisible part of the weapon”. The US FBI also considers conventional weapons
(i.e. bombs) as WMD: “A weapon crosses the WMD threshold when the
consequences of its release overwhelm local responders” (Title 50, Chapter 40,

Instead, international law has been used with respect to the specific
categories of weapons within WMD, and not to WMD as a whole. The Advisory
Opinion of the International Court of Justice of 8 July 1996 thus provided an
authoritative judicial decision as regards to the use (or the threatened use) of
nuclear weapons (International Law 2005). In its 8 July 1996 Advisory Opinion,
the Court decided unanimously that any threat of the use of force, or the use of
force, by means of nuclear weapons that was contrary to Article 2, paragraph 4 of
the United Nations Charter or that failed to meet all the requirements of Article 51
would be unlawful. The Court also decided that “the threat or use of nuclear
weapons would generally be contrary to the rules of international law applicable
in armed conflict, and would violate the principles and rules of humanitarian
law”(International Law 2005).

The United Nations prefers a wider definition of WMD than the NBC trio­
including radiological weapons. In 1948, the United Nations Commission for
Conventional Arms defined WMD “to include atomic explosives, radioactive
material weapons, lethal biological and chemical weapons, and any weapons
developed in the future which have characteristics comparable in destructive
effect to those of atomic bombs or other weapons mentioned above”(The United

Gustavo Bell Lemus, the Vice President of Colombia, called small arms
WMD because bullet fatalities “dwarf that of all other weapons systems- and in
most years greatly exceed the toll of the atomic bombs that devastated Hiroshima
and Nagasaki” (WMD: Words of mass dissemination 2006: 3). For Gert G.
Harigel, a chemical weapons expert only nuclear weapons are true weapons of
mass destruction, because “only nuclear weapons are completely indiscriminate
by their explosive power, heat radiation and radioactivity, and only they should
therefore be called a weapon of mass destruction”. He prefers to call chemical and biological weapons “weapons of terror” when aimed against civilians and “weapons of intimidation” for soldiers (WMD: Words of mass dissemination 2006: 3). An additional condition often implicitly applied to WMD is that the use of the weapons must be strategic. In other words, they would be designed to have consequences far outweighing the size and effectiveness of the weapons themselves.

The debate on biological weapons as WMD has been revived since. It is pointed out that, in order to achieve certain gains and policy objectives, the perceived threats of biological weapons are highlighted, rather than the real ones. Alternatives like Weapons of Mass Casualty; Weapons of Mass Dissemination are now being suggested to justify the inclusion of biological weapons in the category of WMD (Croddy et al. 2002: 12). Given that the differential treatment meted out to the term WMD, no clear definition, and no standard mode of operation on its basis, the term is politically laden. At the societal level the term WMD has become a catch phrase in security discourses.

Socio-Cultural Context

It has been widely acknowledged that every major advance in technology over the last 200 years had featured in fiction before it became a fact. To sample, as early as 1898, in his work the War of the Worlds, H. G. Wells described the idea of biological warfare when terrestrial microbes kill the Martians (Datta 2005: 36). WMD and their related impacts had been part of the popular culture since the beginning of the Cold War, both political commentary and humorous comment.

Nuclear weapons have been a central theme of movies since The Day the Earth Stood Still (1951). Two of the most famous movies on the issue are Stanley Kubrick’s Dr. Strangelove, a black satire on nuclear deterrence theory (1964) and Fail-safe (1964). Biological weapons have featured in Big Jim McLain (1952) Twelve Monkeys (1995). The movie Smallpox (2002), directed by Daniel Percival, described a major bioterror attack on a Western city (Schollmeyer 2005: 43-45). Wartime cinema was critically influenced by the two World Wars and the
Cold War (Shaw 2005: 162-182). Films of that era were based on the three themes, “to show to the west how the easterns lived, to evoke in people feelings about nuclear war and implications of nuclear science for the world” (Shaw 2005: 163). Since the introduction of television in 60s, this media was considered more accessible, inexpensive and effective for immediate and cheap propaganda (Shaw 2005: 164).

The science fiction genre was concerned with the effects of science or technology on society or individuals. Biological weapons formed a popular subject for constructing themes around the political and military stories in popular writings of Tom Clancy, Richard Preston.

Given its prolific use, the term WMD was voted by the American Dialect Society as the word of the year in 2002. In the following year Lake Superior State University added WMD to its list of “misused, overused and generally uselessness” words. The influence of the term is evident as; “Weapons of Mass Destruction” was also the name of rapper Xzibit's 2004 album (Weapons of mass destruction 2005). During the 2003 Iraq War, a parody based on Internet Explorer's “404 File Not Found” message was created. This parody made fun at the state of international affairs. For quite some time it was the number one hit for the search engine Google search “weapons of mass destruction”. After the Iraq invasion and the lack of any evidence to its WMD programme, the term WMD entered the arena of jokes and humour. The Iraq invasion also raised serious concern regarding US foreign policy. The events in Iraq, “the build up to the war, the shock and awe campaign, the ground combat, the post-victory insurgency, capture of Saddam Hussein, the hunt for banned weapons, had dramatically demonstrated the need for greater public understanding of the role that WMD plays in the formulation of and rhetorical justifications for US security policy” (Moeller 2005).

**Conclusion**

This study has structured a conceptual understanding of WMD by using Aristotelian logic of necessary and sufficient conditions. The search for the
limiting conditions of this concept reveals the trend, wherein the coinage of the
term WMD in the political context gradually seeps into the social life. An
examination of these conditions sets a criterion that does not qualify biological
weapons as WMD. Therefore, it appears the reasons of clubbing biological
weapons as WMD would go beyond the logic of necessary and sufficient
conditions. There would be challenges at all the levels of the weaponization
process, from acquiring the agent to storing it. Essentially, an advanced country
would have all the resources at its disposal to pursue a biological weapons
programme. Pursuing such a programme even at the crude level was not feasible
for less developed or developing countries.

Whenever one observes a word or a phrase being used, one cannot stop
noticing the journey the word has traveled from its origin. During the journey of
the word, it gets de-contextualized and implies something more and else than it
was intended for. At times, the understanding of the word becomes different from
the time of its construction. The situation becomes more complicated when the
word becomes the central core of an important discourse and also when the word
and the discourse cease to have separate identities. By tracing the origin and the
process of evolution of the word, one could pull out the threads of the
construction and better understand the question of “why” the word was
understood now as it is. One of the important steps in understanding the process
was to first trace the path of formation of the present status and understanding and
the origin of the word and to later fill in the gaps.

Through this exposition the threads of what process and determining factors
went into the construction of a particular word could be delineated. In a sense, it
explained how the journey from the initial stage when ideas take a practical shape
(wrap in words) to the end is achieved. In relation to the term WMD two instances
merit particular importance. The first was the *Luftwaffe* German air force attack
on the town of Guernica, Spain in 1937 and the second was the nuclear bombing
of Hiroshima and Nagasaki in 1945. The term denoted the killing of innocent
civilians in large numbers.
Thus any destruction can only be termed mass, when the victims and results are not limited. Mass destruction in this sense, does not necessarily distinguish between civilians and troops fighting in a war. Though WMD was invariably linked to the killing of innocent civilians, it involved killing people that were not directly involved and did not share the responsibility of the combat (unlike the soldiers). Another aspect was killing spontaneously (Schelling 1973: 20). Obviously mass destruction could only be carried out when the target was not prepared to face/combat the threat and therefore succumbs to the attack. The basis for the use of the term mass destruction was not only the scale of death and destruction unleashed once this weapon was used but also the intention behind its use.

In the earlier sections, the necessary and sufficient conditions for structuring 'WMD' were delineated. It appeared that the necessary condition for a weapon to qualify as a WMD would be its ability to kill. The analysis of sufficient conditions would reveal several possible conditions. Out of them, three can be identified. These would be the speed of destruction, the quantity of the weapon required and the scale of destruction.

The concept of WMD is thus, the ability of a weapon to cause massive destruction at a high speed, with the ratio of the agent used to the scale of destruction being significantly low.

It implies that the attachment of the term "mass destruction" was done to provide a distinct identity to a category of weapons. Mass is boundless, unfinished, and infinite in the most basic sense of defying comprehension and resisting interpretation. No word existed in itself but was dialectically constituted by its difference from its wider linguistic context, how it differed from other terms. "Just as mass itself seems to escape positive definition, so words gain their meanings from a curious process of deferral and continuous motion in a space that resists precise location" (Cooper 2001: 17).

However the gradation of mass per se was not delimited or defined in any formal text or treaty. How much destruction would be mass destruction? Another question is, is the difficulty to quantify? The number of casualties is traditionally
the most important characteristic that the US government considered when assessing the biological weapons threat. Because of this, the other three characteristics (physical damage, economic impact, and social disintegration) were often not given appropriate weight in determining high consequence events. Further complicating the matter is the fact that while mass casualties have been defined with a threshold of 1,000 injured and/or killed (given by the Department of Health and Human Services (HHS), US), no such threshold had been identified for either physical damage or economic impact. Finally, social disintegration was difficult to measure. While there might be characteristics that could be identified early in an attack (e.g., running from an attack site), long-term consequences to social order may not be readily identifiable and/or may be more difficult to predict than the other characteristics.

When WMD first took on particular significance was when people started to organize their life in relation to the concept of WMD. According to Professor Robinson,

One way it started to happen when people found themselves at the receiving end in a war of very destructive methods. The first recorded use of the term mass destruction was by the Archbishop Lang of Canterbury or York, England, as a response to the Spanish Civil War. From the point of view of making a statement about inequity of attacking civilians had a practical value, then one gets along to various other stages and there comes a moment when the term gets formalized in the international discourse. That is when the UN in its earliest years, decides to use the expression, organizing itself to consider the system from the regulation of the armaments. One of the first steps in organizing themselves for the UN was to differentiate between WMD and other types of weapons. This was a qualitative distinction (Robinson 2006).

The term WMD then disappeared during the Cold War. “As far as rhetoric of the period is considered WMD, if you are in the east, you berated people in the western bloc for depending upon notions of nuclear deterrence. The people in the east were vulnerable to that dreadful WMD. The east criticized the west for the nuclear doctrine” (Robinson 2006). By the end of the Cold War, the term had acquired a different sort of meaning. After the Second World War, chemical and biological weapons were classed together with nuclear weapons as ‘weapons of
mass destruction’. Once taken to refer almost exclusively to nuclear weapons, the WMD label in 1990s applied to chemical and biological weapons (Mueller and Mueller 2000: 163).

There was no international treaty that brings out the definition of WMD. However, there are international agreements and treaties for each of the three categories of WMD. The generally accepted definition of WMD is that of nuclear, biological or chemical weapons (NBC). The terms Atomic, Biological and Chemical (ABC) weapon, and then Nuclear, Biological and Chemical (NBC) weapon were introduced over time. Given this criterion it is clear biological weapons do not qualify as WMD. The reasons being thereof, there were theoretical possibilities of the possible use of biological weapons producing mass casualties. However, several limitations persisted regarding their use and obtaining the desired effects. Biological weapon agents are disease-causing agents, and therefore, there would be several days, weeks before the disease appears in the target population.

Even when there was a delay in detecting the disease, several passive and active measures like availability of gas masks, clothing etc were available for protection. In addition, the possible effects of chemical and biological were subject to a high degree of uncertainty and unpredictability, given the complex and extremely variable meteorological, physiological, epidemiological, and ecological and other factors (Health Aspects of Chemical and Biological Weapons 1970). “Anthrax is not contagious and several kinds of measures like vaccination etc are available. Plague could be managed by the same approach to any other epidemic” (Coupland 2006). Amongst the classic biological warfare agents, anthrax is non-contagious, thus huge quantities of this agent would be required to infect a large population.

Given the disparities that exist amongst the various aspects of biological agents, it is important to delineate the technical factors that would have determined the categorization of biological weapons as WMD. In the subsequent chapters, this study brings out the significance of the role of technical aspects of
biological weapons and the political factors that were crucial in categorizing biological weapons as a WMD.