

## Chapter 1

### Introduction

#### 1.1 Background

The review of the history of humans and microorganisms shows a close relationship. The microorganisms have both beneficial and harmful effects on human beings. The relation between them has been highlighted because of their ability to cause disease in humans and even cost their lives. Because of the epidemics and pandemics, millions of people have been forced to lose their lives for ages. During 1918-19, at least 50 million people worldwide lost their lives to the pandemic caused by the H1N1 influenza virus (Centre for Disease Control and Prevention, 2019). Similar epidemics and pandemics have occurred at different times in history.

This ability of the microorganisms to cause disease and impact the lives of humans was also incorporated in warfare. States employed microorganisms as weapons against their target. The history of biological warfare dates back to antiquities. The first noted incident is that of Hittites sending diseased rams (possibly infected with tularemia) to their enemies to weaken them in the 14th century BC (Barras & Greub, 2014). The use of microorganisms in warfare has then been formalized and institutionalized to the development of proper biological weapons which were even used during the Second World War (Frischknecht, 2003).

The use of microorganisms was then initiated by terrorist groups and some illegal non-state actors as a means of war against states. Various incidents of bioterrorism can easily be found even in the present time- one of which is the anthrax letters in the aftermath of the World Trade Centre attack of 9 September 2001, at New York.

Based on these shreds of evidence, it can be seen that a close relationship not only between humans and microorganisms but also between microorganisms and states does exist, the study of which is the scope of this research. In this context, this research tries to identify possible threats to security and classify them to form a framework for these threats. Similarly, this research also tries to find the measures that have been applied at the international arena and by individual states to combat the biological events and their consequences. Finally, this research also aims to find out the security threats to Nepal arising from the biological agents and measures prevalent or applied by Nepal towards achieving biosecurity.

## **1.2 Statement of Problem**

Plenty of incidents relating to biological attacks and outbreaks that have affected the lives of people and the functioning of states are evident. These incidents have been found to emerge from a wide range of sources and presented through various manifestations. Comprehensive and integrated information on the sources and means of the use of the biological agents is lacking. The structured and comprehensive study on the threats and measures taken by states individually and by the international forum collectively is limited. Adding to this, the same information is lacking in the context of Nepal.

## **1.3 Research Question**

Based on the limitation of knowledge in the field, this research tries to find the answers to the following issues which become the research question of this study.

- i. What are biological threats, biosecurity and biodefense and how these threats can be classified?

- ii. How have the states, individually and collectively at international level, prepared themselves against biological threats?
- iii. What are the biological security threats to Nepal and what measures are prevalent against them?

#### **1.4 Objectives of Research**

As this research is focused on a relatively new dimension of security and defense, it aims to assess the concepts of biological threats, biosecurity and biodefense and formulate a framework of classification of biological threats. The research also has the objective to determine the existing measures applied by states individually and at the international level collectively. Also, the research intends to ascertain the biological security threats to Nepal and the measures applied by Nepal to combat biological threats.

#### **1.5 Significance of the Study**

The research will try to collect the information from various incidents occurring from biological agents and then analyze the data to form a clear criterion of identifying the sources of those threats and classify them accordingly thus creating a framework. The research will also uncover the legislative and institutional measures applied by individual states and by international multilateral institutions to combat the biological threat and establish biosecurity. Further, this research will try to identify the biological threats that prevail over Nepal and the initiatives taken by Nepal against such threats.

Based on the scope of the research, it will help to understand the biological threats and their sources leading the concerned authorities and personnel to foresee the threats and act accordingly

both at national level and at international level. The research will also help the policymakers to identify the gaps between the existing biosecurity measures and the threats that can be presented.

For the academic and research purpose, the research will provide a platform for a generalized understanding of the biological threats, biosecurity and biodefense based on which further researches can be conducted. The identification of gaps between the existing security measures and the possibility of events that might occur is one of the primary research actions that can be taken.

## **1.6 Definition of Key Terms**

### **Bio-crime**

Bio-crime is an illegal act aimed at creating casualties, terror, societal disruption, or economic loss, inspired by ideological, religious or political beliefs. It implies the use of a biological agent to kill or make ill a single individual or small group of individuals, motivated by revenge or the desire of monetary gain by extortion, rather than by political, ideological, religious or other belief (Jansen, Breeveld, Grobusch, & Stijnis, 2014). A bio-crime is similar to an assault crime, except, instead of a gun or knife, the weapon is a pathogen or a toxin (Schutzer, Budowle, & Atlas, 2005).

### **Biodefense**

Biodefense refers to the policies, structures, methods, plans, and procedures involved in establishing and executing defensive measures against attacks using biological agents (Bonin, 2007, p. 28)

**Biological threats**

Biological threats refer to those threats that are possessed by biological agents which include bacteria, viruses, fungi or toxins that produce disease and death.

**Biological weapons**

Biological weapons are any agents or vectors that deliver toxins and microorganisms, such as viruses and bacteria, intending to deliberately inflict disease among people, animals, and agriculture for the destruction of crops, temporary creation of discomfort in a small community and kill a large number of people or for other outcomes (Federation of American Scientists, 2007).

**Biosecurity**

National Academies of Science defined biosecurity as “security against the inadvertent, inappropriate, or intentional malicious or malevolent use of potentially dangerous biological agents or biotechnology, including the development, production, stockpiling, or use of biological weapons as well as outbreaks of newly emergent and epidemic disease” (Koblentz, 2010, p. 107).

**Bioterrorism**

Bioterrorism is terrorism involving the intentional release or dissemination of biological agents. According to the US Centers for Disease Control and Prevention, bioterrorism is the deliberate release of viruses, bacteria, toxins or other harmful agents to cause illness or death in people, animal or plants (Centre for Disease Control and Prevention, 2018).

## **Bio-warfare**

Biological warfare has been carried out by nation states that seek to undermine the will and abilities of an opponent to fight back. Thus, they may seek to kill or make ill large numbers of the opponent's armed forces, population, crops and livestock by the release of biological agents (Jansen et al., 2014).

### **1.7 Organization of Thesis**

The thesis has followed the following organization:

Chapter 1: Introduction

Chapter 2: Literature review

Chapter 3: Methodology

Chapter 4: Defense and Security Strategy

4.1: Classical Discourses

4.2: Security Discourses

Chapter 5: Biological Threats

5.1: Biological Security Discourses

5.2: Biological Security Threat

5.3: International Scenarios

Chapter 6: Nepal: Biological Defense and Security Strategy

6.1: Nepal's Biological Security Threats

6.2: Biological Defense and Security Strategy for Nepal

Chapter 7: Summary and Conclusion

## Chapter 2

### Literature Review

#### 2.1 Microorganisms

Microorganisms are tiny organisms that can be viewed through microscopes and include bacteria, viruses and fungi. They are ubiquitous in nature and are in close relationship with human beings. Among these microorganisms are a group that are dangerous to human beings and can cost their lives apart from causing disease. Different agents can be used as agents of biological threats. The bioterrorist agents with the highest priority are the causes of anthrax (*Bacillus anthracis*), botulism (*Clostridium botulinum*), plague (*Yersinia pestis*), smallpox (*variola major*), tularaemia (*Francisella tularensis*) and viral hemorrhagic fevers (filo viruses and arena viruses). There are many other common foods or water-borne agents that could potentially be used in a bioterrorist attack (Das & Kataria, 2010).

The routes of entry of biological weapons into the human body are mainly inhalation, contact (skin / mucous membrane) and the gastrointestinal tract. Methods of delivery could be through bombs delivered by aircraft or use of spray tanks mounted on aircraft/tall buildings. Other methods include delivery by post or by deliberate infiltration of infected animals, vectors and pests through the international border (Das & Kataria, 2010).

#### 2.2 Epidemics and Pandemics

The amount of a particular disease that is naturally present in a community is referred to as the endemic level of the disease. This level is not necessarily the desired level but rather is the observed level. Epidemic refers to an increase, often sudden, in the number of cases of a disease

above the endemic level in that population in that area. Epidemics occur when an agent and susceptible hosts are present in sufficient numbers, and the agent can be effectively transmitted from a source to the susceptible hosts. Outbreak carries the same definition of the epidemic but is often used for a more limited geographic area. Pandemic refers to an epidemic that has spread through many countries or continents, usually affecting a large number of people in general (U.S. Department of Health and Human Services, 2012, p. 72).

Throughout history, nothing has killed more human beings than infectious disease. Over the millennia, epidemics, in particular, have been mass killers on a scale that is beyond imagination. The history of epidemics and pandemics can be drawn back to the distant past. In 430 B. C. smallpox caused by the variola virus killed more than 30,000 people in Athens, Greece, reducing the city's population by at least 20% (CNN, 2016). And the plague of Justinian struck in the 6th Century killed as many as 50 million people, perhaps half the global population at the time. (Walsh, 2020).

In 1334, the Great Plague of London that started in China spread along trade routes, and killed 90,000 residents of Florence, Italy, within first six months (CNN, 2016) and the Black Death of the 14th Century may have killed up to 200 million people. (Walsh, 2020). A smallpox epidemic in 1519 is estimated to have killed between 5 and 8 million of the native population in two years in Mexico (CNN, 2016). Philadelphia was also struck with a yellow fever epidemic in 1793 that killed one-tenth of the city's 45,000-person population (CNN, 2016).

Similarly in the 20th century the largest plague outbreak that occurred in Manchuria between 1910 and 1911 killed approximately 60,000 people and the great flu pandemic of 1918 and 1919 is estimated to have killed between 30 million and 50 million people worldwide (CNN,

2016)– numbers that surpass the death toll of World War One, which was being fought at the same time. The 1918 flu virus infected one in every three people on the planet (Walsh, 2020). The 1968 pandemic was caused by an influenza A (H3N2) virus. The estimated number of deaths was 1 million worldwide (Centre for Disease Control and Prevention, 2019).

The onset of the 21<sup>st</sup> century saw the outbreak of Severe Acute Respiratory Syndrome, (SARS) which was first identified in November 2002 in China. By July 2003 more than 8,000 cases and 774 deaths had been reported. (CNN, 2016). The spring of 2009 also presented the emergence of a novel influenza A (H1N1) virus (Centre for Disease Control and Prevention, 2019) which took the form of a global pandemic. It is estimated that as many as 575,000 people were killed, though only 18,500 deaths were confirmed (CNN, 2016). An epidemic of cholera killed at least 10,000 people in Haiti in 2010 following a deadly earthquake that paralyzed the nation. (CNN, 2016). Similarly in 2012, approximately 122,000 people worldwide died from the measles and in 2014 the epidemic of Ebola hemorrhagic fever in West Africa killed more than 11,300 which was the largest Ebola outbreak on record. (CNN, 2016) .

The comparison on the past and recent disease outbreaks and the epidemics and pandemics hint us on the decreasing rate of fatality and mortality. Reduction in infectious diseases is the best proof that life on this planet is getting better. Antibiotics have played a crucial role in saving the lives of hundreds of millions of people since the discovery of Penicillin in 1928. But the Covid-19 reminds us that infectious diseases have not gone away. The number of new infectious diseases such as SARS, HIV and Covid-19 has increased almost fourfold over the last century (Walsh, 2020) and bacterial resistance to antibiotic drugs is on the increase every year, with physicians claiming that it is one of the biggest challenges to global public health (Walsh, 2020).

Based on these evidences it can be summed up that the threats of the epidemics and pandemics are still prevalent in modern times.

### **2.3 Accidental Release from Biological Warfare Programs**

Laboratory incidents involving dangerous pathogens pose the greatest risk to individual researchers and to the whole community. One of the greatest risks of laboratory accidents was the state-run biological weapons programs that produced large quantities of hazardous pathogens.

In 1971, a field test of variola virus at its BW test site on Vozrozhdeniye Island in the Aral Sea resulted in a small outbreak of smallpox that required extraordinary public health measures to contain it (Koblentz, 2010). In the summer of 1971, the Soviet Union apparently carried out an open-air test of a biological weapon containing a smallpox virus, which caused an outbreak of smallpox that killed three people and called for a massive vaccination campaign to confine it to the port of the Aral Sea in Kazakhstan (Brown, 2002).

During the Cold War, Vozrozhdeniya Island was a top-secret testing ground for deadly Soviet super-pathogens. From the 1970s, the island has been implicated in a number of sinister incidents and smallpox was one of the majors among them (Kassenova, 2020). In 1971, a young scientist Lev Berg fell ill and days later she was diagnosed with smallpox. Although she recovered, the outbreak continued to infect nine more people back in her hometown, three of whom died (Gorvet, 2017).

The island over years flourished into a living nightmare, where anthrax, smallpox and the plague hung in great clouds over the land, and exotic diseases such as tularemia, brucellosis, and

typhus rained down and seeped into the sandy soil. Half a century of open-air testing has left the entire island contaminated – not just at the test site, but all over. Soil samples taken in 1979 revealed that, nearly four decades later, there were still between 3,000 and 45,000 spores per gram of soil (Gorvet, 2017).

Similarly, in April and May 1979, an unusual anthrax epidemic occurred in Sverdlovsk, Union of Soviet Socialist Republics (Meselson, et al., 1994). It was an accident at a military BW which released a plume of *Bacillus anthracis* spores causing an outbreak of inhalation anthrax that killed at least sixty-six individuals (Koblentz, 2010).

Epidemiological data showed that most victims worked or lived in a narrow zone extending from the military facility to the southern city limit. Farther south, livestock died of anthrax along the zone's extended axis. It is concluded that the escape of an aerosol of anthrax pathogen at the military facility caused the outbreak (Meselson, et al., 1994).

The reason behind this was the unintended release of the spores. The filters that prevented the anthrax dust from escaping into the air had to be washed with the drying machines turned off. A subsequent investigation found that the technician had removed the filter, leaving a note to this effect. The notice was not noticed when the computers were turned back on later, and it was a few hours before the mist (Alibek & Handelman, 1999)

## **2.4 Laboratory Accidental Release**

Accidental release of pathogenic microorganisms has the potential to spread to the mass through the laboratory workers. Several incidents of the past have increased concern towards this problem. Reports conveyed that high-security laboratories that handle the most dangerous

viruses and bacteria have reported more than 100 accidents or near-misses to safety regulators in the last five years (The Guardian, 2014).

For the third time in less than a year, an outbreak of severe acute respiratory syndrome (SARS) seems to have originated from a failure in laboratory containment at China's leading SARS research lab, at the Center for Disease Control and Prevention (CDC) in Beijing (Normile, 2004).

The World Health Organization has confirmed that breaches of safety procedures on at least two occasions were the probable cause of the outbreak. The escape of the virus has infected nine people, one of whom died shortly (Parry, 2004).

Similarly, two small outbreaks occurred in Singapore in September and Taiwan in December but did not result in spread beyond the workers who were affected (Parry, 2004).

In 2007, Foot-and-mouth disease surfaced in England, because of a laboratory leak. The virus affected cattle on a farm about 30 miles southwest of London according to the British officials (Centre for Infectious Disease Research and Policy, 2007).

A faulty drainage pipe was the most likely source of an outbreak. The pipe connected two world-class research facilities on the same Pirbright facility in Surrey. Because of the wearing of pipes, the leakage washed live virus into the environment during the heavy rains in July (Coghlan, 2007).

The official investigation reported lapses in biosecurity measures at the Pirbright site. The drainage was poorly maintained, rarely inspected, and not fully contained and the communication about risk between two facilities rarely took place (Coghlan, 2007).

Pirbright managers were pleaded guilty to eight breaches of safety legislation around foot and mouth experiments (The Guardian, 2014).

The risk associated with the accidental laboratory escape of potential pandemic pathogens has become a concern for the research and policy making communities (Merler, Ajelli, Fumanelli, & Vespignani, 2013).

## **2.5 Bio-warfare**

The transcendence of biological warfare also has historical pertinence seems to be as old as humanity itself. Contagious diseases and other biological weapons as early as the 14th century BC were recognized for their potential impact on the armies or people. The Hittites might have produced the first documented example of biological warfare by sending diseased rams (possibly infected with tularaemia) to their enemies to weaken them. The Greek historian Herodotus reported in the fourth century BC that Scythian archers poisoned their arrows by plunging them into a mixture of decomposing corpses of adders and human blood, which according to our modern interpretation, might have contained *Clostridium perfringens* and *Clostridium tetani*. Historians recorded related accounts of the use of arrows or other vessels contaminated with different products derived from animal parts or plants to target the enemy (Barras & Greub, 2014) .

In the middle ages, an example is offered by the siege of Caffa (now Feodosia in Ukraine/Crimea) in 1346. Caffa was a well-fortified Genoese- controlled seaport and was planned to be attacked by Tartar forces. The attacking Tartar force experienced an epidemic of

plague. However, the Tartars turned their misfortune into an advantage by hurling their deceased's cadavers into the city, thus causing an outbreak of plague in the city (Riedel, 2004).

Similar examples of the middle ages include the Lithuanian army hurling manure made of infected victims into the town of Carolstein (Bohemia) in 1422, Polish army firing saliva from rabid dogs towards their enemies in 1650, British officers distributing blankets from smallpox hospital to Native Americans in 1763 and Confederates selling clothing from yellow fever and smallpox patients to Union troops during the American Civil War in 1863 to name a few (Barras & Greub, 2014).

Following the foundation of microbiology by Louis Pasteur, Robert Koch and their followers at the end of the 19th century, the modern era gave scientists the ability to identify and control many agents of human and animal disease rationally and systematically and allowed scientists to systematically isolate and produce specific pathogens on a large scale and control their dissemination (Barras & Greub, 2014).

Biological weapons were also used during the World War I. The German army was the first to use weapons of mass destruction, both biological and chemical, during the First World War, although their attacks with biological weapons were on a rather small scale and were not particularly successful (Frischknecht, 2003).

There was evidence that nations involved in the First World War, particularly Germany, and also France, developed secret biological warfare programs to infect the enemy, such as animal feed infection with *Bacillus anthracis* or *Burkholderia mallei* (Barras & Greub, 2014). One of the most systematic and ambitious biological warfare programs known to date has also been

developed by the Japanese Government. Inmates were subjected to various kinds of experimentation, including vivisection, weapons tests, and attacks on germs. Human subjects were inoculated with organisms causing cholera, smallpox, botulism, bubonic plague, anthrax, tularaemia, and various venereal diseases, and then left untreated, to study the various effects of the diseases (Barras & Greub, 2014). Unit 731 work has led the Japanese army to conduct large-scale biological weapons experiments, such as the development of bombs used to disperse pathogens, contamination of reservoirs and wells with deadly pathogens, and the dropping of plague-contaminated fleas, contaminated food and clothing by aircraft into areas of China that were not occupied by Japanese soldiers (Riedel, 2004).

Similarly, during the Second World War, the Nazis carried out some work into the effects of various vaccines and drugs on prisoners infected with *Rickettsia prowazekii*, Hepatitis A virus or Plasmodium bacteria, but obviously, they never contemplated using biological weapons during the Second World War. But the US was forced by its allies to undertake biological warfare work, who believed that the Germans might strike with biological weapons. The United States War Research Service was created in 1942 to establish a program of biological warfare. This included the establishment of a laboratory research facility in Maryland (later called Fort Detrick), and numerous manufacturing and testing facilities elsewhere in the country (Barras & Greub, 2014)).

Historically, before World War II, the number of soldiers who suffered from illness greatly outweighed the number who were killed in action. Ninety-five percent of hospital admissions in the United States during the Second World War and 82 percent of hospital admissions in the Korean War were related to the injury of soldiers due to illness and non-battle accidents, rather than fighting battles (Jansen et al., 2014).

During the Korean War (1950–1953), the US program was expanded with the establishment of a new production facility in Pine Bluff, Arkansas. The Soviet Union, China, and North Korea accused the USA of using agents of biological warfare against North Korea. By the late 1960s, the US military had established a biological arsenal that included various biological pathogens, toxins, and pathogens of fungal plants that could be directed against crops to cause crop failure and famine (Barras & Greub, 2014). Similarly, Iraq, under the dictatorship of Saddam Hussein, initiated a biological warfare program to study about *Bacillus anthracis* and various viruses, but these potential weapons were not used during the Gulf War (Riedel, 2004).

Not only the organisms but also the toxins were found to be used during the world wars. Between WW I and II, capsaicin, the pungent element of cayenne pepper and paprika, was studied by the USA in terms of its effectiveness in warfare. Botulinum toxins have been tested by the USA, Canada and Great Britain since the 1930s, particularly during and after the Second World War (Szinicz, 2005).

## **2.6 Bioterrorism**

In addition to the state-sponsored and military-related bio-warfare programs, non-state actors and civilian groups have attempted to develop and use biological weapons (Riedel, 2004). According to the CDC, bioterrorism is defined as the deliberate release of viruses, bacteria or other agents used to cause illness or death in people, and also in animals or plants. Bioterrorism aims to create, inspired by ideological, religious or political beliefs, casualties, terror, societal disruption or economic loss (Jansen et al., 2014).

One such incident of bioterrorism occurred in Oregon. In late September 1984, a total of 751 cases of severe enteritis were reported. On investigation *Salmonella typhimurium* was identified as the causative organism. However, in 1985, the members of the Rajneeshee cult took responsibility of the attack and identified the epidemic as a deliberate biological attack (Riedel, 2004). The members of the cult purposefully contaminated the assorted salad bars with *Salmonella* cultures in order to influence local elections, in a bid for power (Jansen et al., 2014).

In 1995, in a coordinated attack on five Tokyo metro system trains, the Aum Shinrikyo sect disseminated sarin in an effort to start an apocalyptic war from which the sect was meant to emerge as rulers of Japan and possibly even the world. The attack resulted in 12 deaths and at least 1400 people being injured (Jansen et al., 2014). The investigations after this incident disclosed evidence of a rudimentary biological weapons program (Riedel, 2004). An earlier attack in 1994, using sarin in Matsumoto, central Japan, resulted in seven deaths and 200 people being injured (Jansen et al., 2014). Similarly, cult members had attempted to acquire Ebola virus in Zaire during 1992 (Riedel, 2004).

One of the popular biological terror is the ‘anthrax letters’ in autumn of 2001. A series of letters containing anthrax spores were sent by mail to US senators, journalists, and media personnel. Twenty-two people were seriously injured in the process, five of whom died and possibly thousands were infected. It should be noted that while the number of clinical cases may have been low compared with other public health-related diseases, the effect on society was still large. Forensic research ultimately disclosed the involvement of a former US research scientist but his suicide prevented the investigation from satisfactorily ending. To this day, powder letters

are a regular phenomenon worldwide, usually containing hoax materials, but occasionally containing other toxic materials such as ricin (Jansen et al., 2014).

## Chapter 3

### Methodology

#### 3.1 Research Design

This is a qualitative research and is exploratory in nature.

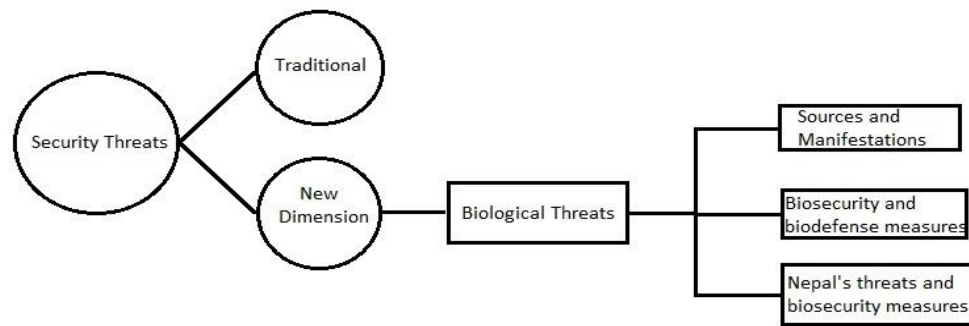
#### 3.2 Sources of Data

The research took data from secondary sources. As the source of data, this research reviewed literatures and books for obtaining the insights on theories and discourses, the past events regarding biological incidents, and initiatives taken by the multilateral institutions and individual states. Similarly, for the initiations taken by Nepal existing policies, acts, regulations and other legal documents were taken as the source of data.

#### 3.3 Data Analysis Methods

The content analysis method was used to summarize and classify the information that had been obtained from various sources.

#### 3.4 Conceptual Framework



## Chapter 4

### Defense and Security Strategy

#### 4.1 Classical Discourses

##### 4.1.1 Realism

Realism in international relations is basically a theory about power politics. According to the realist perspective, the world affairs is hard-headed and devoid of wishful thinking and deluded moralizing, which presents world in 'realistic' perspective. The theory about power politics is based on two core assumptions- human egoism and international anarchy. In other words power politics is nothing but the sum of human ego and international anarchy (Heywood, 2011, p. 55).

The power politics then has its focus on national security and state survival. State security is seen as the priority obligation of every state for its survival. It is understood that there is no alternative but to seek their own protection against others in this self-help world (Baylis, 2008).

Realism can be classified into two distinct schools of thoughts, based on the approaches taken to view world affairs. The first is classical realism, which is a normative approach explaining power politics in terms of human egoism, and second is the structural realism, which is a scientific approach explaining power politics in terms of international anarchy (Heywood, 2011).

##### **Classical Realism**

Classical realism explains power politics as a consequence of human nature- which is presented as something having a negative connotation. Humans are, according to Machiavelli, a Renaissance Italian political theorist, 'insatiable, arrogant, crafty and shifting, and all above all

malignant, iniquitous, violent and savage’ (Heywood, 2011, p. 56). Similarly, Thomas Hobbes, a seventeenth-century English political and legal philosopher, is of the view that humans are driven by non-rational appetites, the strongest of which is the desire for ‘power after power’ (Heywood, 2011, p. 56). Therefore, since the states are composed of and led by humans, their nature is exhibited in state behavior which leads to an inevitable competition and rivalry in international politics.

No any states have a real choice except to operate according to the principles and practices of power politics (Jackson & Sorensen, 2013). This makes survival and security the primary objective of any state. According to the teachings of Machiavelli, the main responsibility of rulers is always to seek advantages and to defend the interests of their states and thus ensure its survival (Jackson & Sorensen, 2013).

The pursuit of national interest is another obligation for every state (Heywood, 2011). States have their own interests and the world is in a flux of these interests (Jackson & Sorensen, 2013). In this context, of achieving national interest that often conflicts with that of others, and security and survival being the primary interest of any state, there emerges a scenario in which security of one becomes a concern of insecurity for other. Thus, the other state then seeks measures to achieve their own security at the expense of their neighbors (Baylis, 2008), which eventually creates a condition of actual or potential war (Jackson & Sorensen, 2013). Thus, international peace is an unachievable goal and moving beyond the essentially violent world is impossible.

## **Structural Realism**

Structural realism views world affairs at the international level. It explains the behavior of states in terms of the structure of the international system, which is essentially anarchic (Heywood, 2011).

Anarchy, according to structural realists, leads states towards tension, conflict and the unavoidable possibility of war (Heywood, 2011) and cooperation is never an option (Baylis, 2008). This is due to two main reasons- the concern on relative gains and the prospect of cheating if they cooperate (Baylis, 2008).

States are primarily concerned about improving their position relative to other states. i.e., making “relative gain” (Heywood, 2011, p. 60). Cooperation between states can benefit both but instead, states become aware of how much they are gaining compared to other states because all states will be attempting to maximize their gains in the mistrustful and competitive international environment (Baylis, 2008). Cooperation thus is never an option and conflict will always have a high probability.

The fear that others will cheat on any agreement reached and attempt to gain advantage over them always pushes back the prospect of cooperation between and among states. This constant competition and lack of trust between states always ensure a probability of conflict in the international arena. Thus, no enduring peace between states can be imagined.

### **Not Only A Theory of War But Also Cooperation As Well**

Though Realism is of the assumption that international relations are necessarily conflictual and the conflicts are ultimately resolved by war (Jackson & Sorensen, 2013), there are theorists who believe that conflict can be averted and states can engage in cooperation for their benefit.

Conflict can be contained by the balance of power (Heywood, 2011). Balance of power, and therefore the prospect of war or peace, is affected by the number of great powers operating within the international system, which can be reflected as polarity (Heywood, Theories of global Politics, 2011). Polarity refers to the existence within a system of one or more significant actors, or 'poles' which affect the behavior of other actors. Neo-realists have generally associated bipolar system with stability and a reduced likelihood of war, while multipolar systems have been associated with instability and a greater likelihood of war (Heywood, 2011).

Some realist theorists believe that cooperation between states occurs. According to Charles Glaser there exists conditions in which adversaries can best achieve their security goals through cooperation policies rather than competitive ones (Baylis, 2008).

These realists reject the competition-bias inherent in the theory. Because international relations are characterized by self-help behavior does not necessarily mean that states are damned to perpetual competition resulting in war. Faced with the uncertainties associated with being involved in the arms race, like that of the 1970s and 1980s, states preferred to cooperate. Also, an argument is that standard structural realism is flawed because of its emphasis on 'relative gains'. States often pursue cooperation precisely because of the dangers of seeking relative advantages. As the security dilemma literature suggests, it is often best in security terms

to accept rough parity rather than seek maximum gains which will spark off another round of the arms race leading to less security for all in the longer run (Baylis, 2008).

Another argument that emphasizes the occurrence of cooperation is that emphasis on cheating is overdone. Cheating is a problem which poses risks, but so does arms racing. Schelling and Halperin in 1961 argued that it cannot be assumed that an agreement that leaves some possibility of cheating is unacceptable to that cheating would necessarily result in strategically important gains. The risks involved in arms control may be preferable to the risks involved in arms racing (Baylis, 2008).

#### **4.1.2 Liberalism**

Liberalism can be described as a theory of peace. It generally takes a positive view of human nature and believes that humankind likes cooperation and progress (Soltani & Yusoff, 2012). They have great faith in human reason and believe that rational principles can come out of human nature. This good nature of humankind is reflected in behavior of states, as they are composed of and led by humans, thus leading towards security and peace through cooperation.

Above the individual level, liberalism believes that a balance amongst competing interests always prevails among states (Heywood, 2011). States, as well as individuals, may pursue self-interest but a natural equilibrium will tend to assert itself. At a deeper level, competing interests complement one another. A natural or unregulated equilibrium tends to create a balance of interests amongst the states of the world, disposing liberals to believe in the possibility of peace and cooperation (Heywood, 2011).

Some liberal theorists argue the essence of cooperation is grounded in ideas of trade and economic relations. According to these interdependence liberals, economic relations are important in drawing states into a web of interdependence which leads to the realization that the material costs of international conflict are so great that states refrain from attacking other states in order not to obliterate the economic prosperity (Heywood, 2011).

Keohane and Nye coined the term “complex interdependence” for the new form of relation amongst states that evolved in the international arena. Complex interdependence is a relation among states in which relations are not only between and amongst state leaders, as it used to be earlier, but also amongst different actors and citizens on different levels and issues like climate change, development, poverty reduction and human rights (Jackson & Sorensen, 2013; Heywood, 2011). In other words, international relations now focuses on ‘low politics’ of economic and social affairs than ‘high politics’ of security and survival (Jackson & Sorensen, 2013). Because of this dependence of one state on others on these varieties of issues cooperation among states never have any alternatives.

Similarly, some liberals, also called republican liberals, link peace and cooperation among states to the republican (not monarchical) system of governance. Republican liberalism emphasizes that democratic states do not go to war with one another; the approach being termed as democratic peace thesis (Heywood, 2011).

The reason behind democracies being at peace with one another is explained on the base of the existence of democratic political culture. Democratic governments are controlled by their citizens, who will not advocate or support wars with other democracies. Democracies hold common values which lead to the formation of what Kant called a ‘pacific union’. The union is a

bond based on the common moral foundation of all democracies. Peaceful ways of sharing domestic conflict are seen as morally superior to violent behavior, and this attitude is transferred to international relations between democracies (Jackson & Sorensen, 2013).

In addition to these, some liberals, institutional liberals, put forward the role of international institutions in achieving cooperation and peace among states. The international institutions can be an international organization, such as the European Union or a set of rules which governs states action in particular areas such as the Law of the Sea conferences (Jackson & Sorensen, 2013). Institutional liberals believe that international institutions help promote cooperation between states and thereby help alleviate the lack of trust between states and states' fear of each other (Jackson & Sorensen, 2013). According to Keohane and Martin, "institutions can provide information, reduce transaction costs, make commitments more credible, establish focal points for coordination and, in general, facilitate the operation of reciprocity" (Baylis, 2008, p. 499). Thus, international institutions can be the catalysts to lasting cooperation and peace.

### **Not Completely a Theory of Peace**

One noteworthy point is that liberalism is not just a theory of cooperation and peace. It is evident from the ongoing war and conflict that is seen in recent years after the end of the cold war; the examples being wars in Iraq and Afghanistan (Jackson & Sorensen, 2013). It can be explained based on one of the liberal approaches, republican liberalism. Republican liberalism explains peace occurs in the international arena, but only among democracies. There always prevails a chance of conflict between democracies and non-democracies. The reasons behind this may be the security concerns, economic interests, humanitarian principles (Jackson & Sorensen, 2013), or any other hidden internal reasons what so ever.

### 4.1.3 Marxism

Marxism has been viewed as the principal critique of Realism and Liberalism. Unlike Realism that believes states act according to their national interest, Marxism is of the view that attention must be paid to the identity and nature of states and international politics must be understood on the base of dominant structures of the world (Soltani & Yusoff, 2012). Similarly, Marxism argues that capitalism is doomed and communism is destined to replace it (Heywood, 2011).

In general, Marxism views history as being driven by a dialectic process in which internal contradictions within each mode of production lead to social revolution and the construction of a new and higher mode of production. It is because of this, capitalism will be replaced by a classless communist society (Heywood, 2011). For Marx (1973), capitalist development always had a marked transnational character- the desire for profit would drive capitalism to ‘strive to tear down every barrier to intercourse’ and to ‘conquer the whole earth for its market’ (as cited in Heywood, 2011, p. 68). V.I. Lenin focused on Imperialism and depicted it as an economic process, reflecting quest of domestic capitalism to maintain profit through export of surplus capital, which would lead major capitalist powers into conflict with one another resulting into war (Heywood, 2011).

The World-systems theorist, Immanuel Wallerstein (1976) argues that the world politics has experienced two kinds of world systems- world empires and world economies, the main distinction between them being the way of distribution of resources. In the world empire system, the central power decides on how to distribute the resources from the peripheral area to the core area (as cited in Soltani & Yusoff, 2012). Meanwhile, the existence of security in the World-

systems theory is based on the continuity of relations between the peripheral areas and the core areas; the change in way of distribution of resources among them may lead to the threat to the system (Soltani & Yusoff, 2012).

#### **4.1.4 Constructivism**

Constructivism has emerged as one of the post-positivist approaches since the end of the cold war. It challenges the assumptions of rational theories (such as realism and liberalism) and reflective theories (such as Marxism) and attempts to adapt the norms and inter-subjective meanings of reflectivism with the existence of a given reality of rationalism (Soltani & Yusoff, 2012).

According to constructivist writers, the fundamental structures of international politics are social rather than strictly material (Baylis, 2008). The constructivist approach is based on the belief that there is no objective social or political reality independent of our understanding of it (Heywood, 2011). Constructivists do not, therefore, regard the social world in the sense of an external world of concrete objects; instead, it exists as a kind of inter-subjective awareness (Heywood, 2011).

In this context, the elements of international politics like states, territory, security, enemy, friend, threat and similar others are constructed based on the actors' ideas about the world and are "nothing but beliefs" (Soltani & Yusoff, 2012, p. 13). According to Alexander Wendt, in his terms, "Anarchy is what states make of it", the state behavior is determined not by the structure of the international system but by how particular states view anarchy (Heywood, 2011, p. 72). In other words, Wendt believes that anarchy is what states create based on their ideas and suppositions (Soltani & Yusoff, 2012) of the events that took place in the international arena.

Similarly, the security dilemma and wars are the results of predictions that are made by states (Soltani & Yusoff, 2012). Security dilemma, according to Wendt, is a social structure composed of inter-subjective understandings in which states are so distrustful that they make worst-case assumptions about each other's intentions, and, as a result, define their interests in 'self-help' terms (Baylis, 2008).

Likewise, a security community, for constructivists, is a rather different social structure, composed of shared knowledge in which states trust one another to resolve disputes without war (Baylis, 2008). And the policies of reciprocal trust can create the structure of common knowledge in which states will be led towards peaceful security and it will provide security for them (Soltani & Yusoff, 2012).

## **4.2 Security Discourses**

### **4.2.1 Security**

Security in simpler terms has been defined as freedom from danger or harm, the preservation of groups' core values (McDonald, 2012) or the absence of threats (Booth, 1991). In a general sense, security involves a physical condition of being free from danger or harm and the psychological condition of feeling secure (Lo, 2015). Security has been perceived differently based on the factors that are considered essential elements of security. Some equate security in terms of power- the accumulation of which leads to more security, while some take security in terms of emancipation- the provisions of justice, human rights and similar are considered key to security (Williams, 2008). Thus, security can be understood as an absence of something threatening, in negative terms, or involvement of something that is enabling, in positive terms (Williams, 2008).

Due to the varying nature of threats in the international arena and the direct relationship between these threats and security, it is almost impossible to give a fixed definition to security. Security meant different in cold war era than in the post-cold war era and so it does in the present time after the 9/11. Moreover, security is perceived differently in the same era as well depending on the context of the events being held.

Every theory interprets these events based on the perceived threats and referent objects to form a general concept of security, hence giving a wide range of security concepts; some often conflicting or in disagreement with one another.

### **Security for Whom?**

There remains a variety of concepts on what should be the primary focus of security. In other words, it means that for whom the security should be focused on. Is it for the states, or individuals or international community or any other actors or elements?

Historically, the main security concern was state security and all efforts were put to attain security of the state (Williams, 2008). The main interest tended to be on the military capabilities of the state to deal with threats that they face (Baylis, 2008). States were the most important referent objects when security was concerned (Williams, 2008). Similarly, according to some analysts, human beings were on top priority for security because without reference to individual humans security made no sense (Williams, 2008). One of the proponents of individual security, Emma Rothschild, put that in the long sweep of human history, the central focus of security has been the people (Williams, 2008).

The concepts of “international security” has also emerged in the debate of security. Barry Buzan defined security in broader international terms. According to him, security involves states overcoming “excessively self-referenced security policies” and thinking on the security interests of their neighbors (Baylis, 2008, pp. 496-497) thus, focusing on the cooperation among states on security areas.

Another approach has focused on the concept of ‘society’ as the most important referent object for security studies. There are fundamental changes that have been taking place in world politics especially in the aftermath of the Cold War which created new problems of boundaries, minorities, and organizing ideologies causing regional instability. Thus, the focus should be on these ethno-national groups, rather than states (Baylis, 2008).

Similarly, other analysts argue that the stress should be given to global security because of the globalization which brings new risks and dangers such as international terrorism, global warming and similar others (Baylis, 2008). These threats to security are outside the control of nation states and only the focus on global security can deal with these threats.

### **Security for Which Values?**

There are values, regardless of the actors (individuals, states, societies or international system) that are to be taken care of. These values may include personal safety, economic welfare, autonomy, psychological well-being and many others (Baldwin, 1997), without the protection of which no security can be achieved.

Because of the constant change in world events which leads to the change in priority that social actors put on different values, the focus of security from one value to another obviously

changes. Historically, security revolved around national security with much of its focus on military capabilities. The concept of national security included political independence and territory integrity (Baldwin, 1997). But more recently, this has been criticized and the concept of security was expanded to include other considerations. Barry Buzan has added political, economic, societal and environmental values to the traditional military aspect (Baylis, 2008). Thus, different values are depending on the time, space and context which are to be protected for achieving security.

#### **4.2.2 Security as an Essentially Contested Concept**

Essentially contested concept is the one that scholars do not agree on its single definition and its meaning is inherently an issue of dispute. These conditions completely fit on what has been discussed as security. Because a universalized, fixed and static definition of security does not fulfill how different analysts and theories explain security and a question on for whom the security should be a reference on is disputed, security can be considered as an essentially contested concept.

How security is contested can be answered based on two theoretical conceptualizations of security-Realism and Welsh School critical theory. Realism emphasizes on the security of the state in the anarchic world whereas Welsh School defines security in terms of emancipation. Realists consider states as the referent object and all the security concern is towards state security. Similarly, for the proponents of Welsh School, the referent object is human beings and states can only be used as a means for achieving security to human beings (Booth, 1991).

The contestation on security has also come from the fact that towards whom the security should be referent on. The traditional referent object was the state but the recent theoretical advancements focused on various referent objects. The conflicting focus on individuals, society, state and the international system as the ends of security proves the contestation.

Based on how security is perceived and who should be on the reference to receive the focus of security, makes security as an essentially contested concept.

## Chapter 5

### Biological Threats

#### 5.1 Biological Security Discourse

It has become evident that biological incidents, regardless of their origin, project a serious threat towards human life. These biological incidents also have produced a devastating effect on national and international security and the risks from these threats are always a possibility. Therefore, to prevent these incidents from happening, fight back against these incidents and recover towards a normal life needs certain measures. Therefore, these measures to obtain the state of biosecurity from those biological threats is biodefense.

Biosecurity and biodefense are closely related in that biosecurity is the state where the people, nation and the international community is prevented and protected from the biological threats whereas biodefense is the acts taken towards achieving that state. Though the word “defense” is of military origin, a comprehensive and integrated understanding that includes defense for civilians and against attacks not just from other states and non-state actors but also from those of natural emergence are considered as biodefense. Thus, because of this close interrelation, biosecurity and biodefense can be considered similar.

##### 5.1.1 Biosecurity

The international arena has faced different biological incidents at different time periods. It is because of the nature of these incidents, biosecurity discourse has gained respective impetus. Biosecurity, in the pretext of bioterrorism during the 1990s, was defined as “the protection of microbial agents and research-related information from loss, theft, diversion or intentional

misuse” (Koblentz, 2010, p. 107). With the advancements in biological sciences and technologies, biosecurity gained its impetus and started encompassing the measures to prevent from the use of techniques and technologies that can be used to create new pathogenic organisms or biologically active compounds (Koblentz, 2010).

The increase of biological events and consideration of different possibilities that biological threats can occur from various means, National Academies of Science (as cited in Koblentz, 2010, p. 107) defined biosecurity as “security against the inadvertent, inappropriate, or intentional malicious or malevolent use of potentially dangerous biological agents or biotechnology, including the development, production, stockpiling, or use of biological weapons as well as outbreaks of newly emergent and epidemic disease”. This included both deliberate and natural sources of threats by biological agents and biotechnology. This definition of biosecurity, given by the National Academies of Science, encompasses all the means and actors through which biological incidents can occur.

### **5.1.2 Biodefense**

Biodefense refers to the policies, structures, methods, plans, and procedures involved in establishing and executing defensive measures against attacks using biological agents (Bonin, 2007). In other words, biodefense is maintaining biosecurity, or in restoring biosecurity after a natural, accidental, or deliberate outbreak of pathogenic microorganisms and toxins (Bonin, 2007, p. 28). Biodefense involves actions to counter biological threats, reduce risks, and prepare for, respond to, and recover from biological incidents (The White House, 2018).

### 5.1.3 Emergence of Biosecurity

The concept of biosecurity emerged because of the securitization of biological threats. Securitization basically is the process of transforming any issues into the matter of security (Buzan, Wæver, & Wilde, 1998, p. 25). According to Barry Buzan, Colin McInnes and Enemark a threat is securitized when it is successfully portrayed as an existential threat, extreme threat, and threat that evokes disproportionate fear and anxiety, respectively, which requires emergency measures outside of the normal political process (Koblentz, 2010). Until the awake of the twenty-first century, only the threat posed by one state armed with biological weapons towards other states was viewed as an issue of security. But in recent times, because of the emergence of the field of human security, emphasis on non-traditional threats and security of individuals, and a growing acceptance by nations a definition of security beyond military threats, biological threats are considered as security issues (Koblentz, 2010).

Inclusion of biological threats as a security issue is relatively a recent action. In 2000, for the first time, the Security Council addressed an issue of HIV/AIDS as a threat to international security and approved a resolution stating that the spread of HIV/AIDS can have a devastating impact, and if unchecked, may pose a risk to security (Koblentz, 2010). Similarly, in 2004, in the backdrop of the events as terrorist attacks of 9/11, 2001 anthrax letters, the 2003 US invasion of Iraq and SARS and emergence of H5N1 avian influenza in 2003, the UN's High-Level Panel on Threats called for a greater effort against biological security challenges such as infectious disease and biological terrorism (Koblentz, 2010). Thus, these initiatives started the culture of encompassing biological threats as security threats.

#### **5.1.4 Process**

The process of establishing biosecurity includes the political, strategic, and structural approaches in the assessment of, preparation and prevention from, detection, response to, recovery from and mitigation of risk from biological threats with coordination of diverse sectors (The White House, 2018; Bonin, 2007). In addition to these, it also includes a systematic evaluation of existing policies and applying solutions to the policy gaps seen (Berger, DiEuliis, Meyer, & Rao). The whole process is mentioned below through the classical risk management cycle as below:

#### **Threat Analysis**

Threat analysis involves all activities pertaining to the awareness, assessment, and early detection of potential biological hazards. It helps to identify potential scenarios and to assess the likelihood of their occurring. Threat analysis, as stated by Bonin (2007) and The White House (2018), includes the followings:

- Creating awareness, assessing, and detecting at early phase of potential biological hazards.
- Obtaining information from law-enforcement agencies, intelligence services and medical and scientific communities.
- Anticipating future threats that may occur because of advances in science and technology.
- Sharing intelligence, forecasts and risk assessment information among different countries.

- Establishment of research laboratories to conduct researches on various pathogens in order to assess their impact and the probability of their occurrence (Bonin, 2007; The White House, 2018).

## **Prevention**

Preventive measures aim at restricting access to biological agents, related technologies and know-how, applying safety measures at laboratories handling these agents and strengthening health care and emergency response service. Bonin (2007) puts some of the measures applied in prevention as follows:

- Maintaining arms control and disarmament treaties.
- Framing national export and import control policies to restrict the flow of biological agents and other related technologies.
- Formulating legal framework for the laboratories and their staffs including specification of safe handling requirements, transport of these agents, issuance of permits to handle certain biological agents, restriction of access to potentially dangerous organisms and codes of conduct for scientists (Bonin, 2007).

## **Preparedness**

Preparedness includes planning of procedures and responsibilities and availing the agencies involved in the response with the respective resources. Provisions of cooperation between agencies, containment and response procedure, laboratories and hospitals ready to respond with necessary resources and similar others. Some of the activities under preparedness, as mentioned by Bonin (2007) and The White House (2018), include:

- Procurement of vaccines, drugs, decontamination tools and other essential items and equipment and maintaining them at ready position.
- Preparing response plans for physicians, healthcare workers, police forces, emergency units, and military personnel.
- Preparing for mass casualty management and public communication of the information on the outbreak.
- Developing, updating, and exercising response capabilities (Bonin, 2007; The White House, 2018).

### **Surveillance and Detection**

Surveillance and detection at the initial phase of attack or release of biological agents is a crucial step. It helps to contain the outbreak and prevent from large scale casualties. The effectiveness of response depends on this stage. Bonin (2007) puts some of the measures helpful in surveillance and detection as:

- Continuous monitoring by epidemiological surveillance network of the pattern and scale of spread of infectious diseases and warning the respective agencies if any abnormalities seen.
- Installing biosensors in public places and building to detect the presence of these agents.
- Establishing reference laboratories with necessary information, apparatus, manpower and other resources for prompt identification of the agents (Bonin, 2007).

## **Response and Recovery**

The fast reaction towards biological incident is a key factor in limiting the consequences. The response to biological incidents can be done through information sharing and networking, coordinated operations and investigations and effective public messaging (The White House, 2018). In addition to this, introduction of effective remedial measures is crucial in mitigating the consequences of outbreak. According to Bonin (2007) and The White House (2018) some of the response and recovery measures include:

- Mobilization of healthcare workers, specialized emergency units, police and other agencies as necessary.
- Enforcement of law to make the primary response effective and to maintain system and order as different illegal activities might be conducted taking the advantage of chaotic and panicking situation.
- Activation of concerned agency to identify the source, release area and population that might get affected and to take appropriate measures.
- Arrangement of medical treatment to the exposed individuals, prophylactic treatment of specific segments of population and decontamination of areas and materials that might pose risk to others.
- Measures to address indirect effects like overwhelming numbers of unaffected people seeking care and advice, the repercussions of panic and fear resulting in temporary economic disruptions and shortages in the supply of essential goods.

- Restoration of critical infrastructure services and capability, introduction of long-term mitigation program and minimization of cascading effects elsewhere in the world (Bonin, 2007; The White House, 2018).

### **Communication and Coordination**

In addition to these steps in managing the risks of biological incidents, proper communication of information and coordinated effort from various agencies against these incidents is equally essential. For the dissemination of necessary information and prevention of mass panic appropriate structures are needed to be established (Bonin, 2007). Similarly, a coordinated approach from various sectors of diverse government institutions to act against these incidents is necessary. The government institutions include public health and civil protection sectors, law enforcement and intelligence agencies and the military. Others sectors involved include research institutions, academia, non-governmental agencies and the private sector (Bonin, 2007; The White House, 2018).

### **5.2 Biological Security Threat**

Biological threats refer to those threats that are possessed by biological agents which include bacteria, virus, fungus or toxins that produce disease and death. They can occur from natural processes like epidemics and pandemics or from human activities like accidental release or deliberate misuse of these agents. These threats are among the most serious threats to states and the international community. They have the potential to cost lives, hamper economy and create a massive social disorder in everyday lives when they occur. The basic principle of harm by these threats is to disturb the health of the people by causing sickness, disability and deaths in large

scale. Besides, psychological trauma resulting from such threats overwhelmingly takes over the state and the international community (The White House, 2018).

The biological agents possess specific features that make them more dangerous than other traditional threats like arms and ammunitions. The basics of these features are their omnipresence and invisibility along with their pathogenicity and lethality. The biological agents occurring in one country can spread to many others without the knowledge of anyone making it difficult to control prior to a massive outbreak. In addition, the identification of the source, the control of the spread and cure of the disease is equally difficult.

### **5.2.1 Characteristics**

The biological agents are not visible and only a small quantity of these are initially needed to produce a huge consequence since these agents multiply in the body of the humans and become a source for secondary transmission, thus making dissemination to a larger mass. In February 2003, the SARS virus emerged in rural China and spread to five countries within twenty-four hours and to the other twenty countries within two months (Koblentz, 2010). This process of rapid dissemination has been attributed by global travel which in the present time is the necessity induced by globalization.

Since these agents are ubiquitous in nature and have the natural tendency to emerge, the transmission to humans are rather frequent. Similarly, these agents are also easier to be obtained and manipulated. Any person with knowledge on these agents and availability of general resources can obtain these agents. Having the chances of these agents being misused for harmful purpose the access to these agents by states or by individuals, even the most dangerous

pathogens and toxins cannot be banned outright because of their dual-use nature like the development of vaccines and other medical uses.

Regardless of the nature of transmission, whether the cause being nature or humans, these agents if reach the human population can then spread to a massive population within a short period of time without even being known. In 2003, SARS outbreak caused more than 8000 infections and killed 774 people in 29 countries and in 2009 H1N1 influenza which emerged in North America infected 620,000 people and killed 7,800 people (Koblentz, 2010). Similarly, in April 1979, an accidental release of *Bacillus anthracis* spores at a military biological warfare facility in Sverdlovsk (now Yekaterinburg, Russia) caused an outbreak of inhalation anthrax that killed at least 66 individuals (Koblentz, 2010). Based on scientific calculations by the WHO it was estimated that the release of 50 kg of dried anthrax powder by aerosolization for 2 hours in a city of 500,000 inhabitants could cause 95,000 deaths with 125,000 individuals being incapacitated (Sharma, Mishra, Newaskar, & Khasgiwala, 2016).

The delayed effect shown by these agents also create difficulties in controlling the spread. The release of an agent is not immediately detectable. There are systems that detect biological agents, but most have a delay between acquiring the agent and identifying it. The effects of an attack also are not immediately detectable (Federation of American Scientists, 2007). The relatively long period of time between the introduction of these agents and impact created by it makes it difficult to control these agents (Burnette, Hess, Kozlovac, & Richmond, 2013, pp. 3-14). By the time symptoms are manifested, the infected individual already would have started spreading these agents to many others who are likely to travel different other places and even countries where they start spreading to many others (Ryan, 2016, p. 20). These threats thus are

not constrained by international borders and disease that emerge in one country can soon become a global threat (Her Majesty's Government, 2018).

Apart from the direct health effects of these threats, they have the potential to disturb other aspects of lives. The biological incident could trigger widespread economic, political and social instability as governments lose legitimacy, citizens get frightened, security forces weakened (Koblentz, 2010) and public services disrupted (Her Majesty's Government, 2018). Large parts of the workforce might be absent from work for months, while domestic and foreign trade, travel, and transportation could be reduced or halted, and a wide range of essential commodities, such as food, fuels, and medicines could be in short supply (Bonin, 2007).

### **5.2.2 Comparison with Traditional Forms of Threats**

Among different threats faced by a state or the international community, biological threats are robust to deal with in comparison to the traditional threats. The traditional threats are more or less defined, i.e., a state or its defense and security mechanisms are aware of its opponents whom they are fighting against, what means and resources are deployed, the geographical boundaries that the attack would affect, the population that is affected by the attack. But the case is completely different in terms of biological threats where all of these factors are unknown and the security mechanism has to act with the unknown actors, means, source, the population affected and the geographical area being attacked. The attack and its effects all happen without any backdrop or without any prior information that gives no chances to be prepared against. These make them robust and dangerous threats to deal with.

### **5.2.3 Classification of Threats**

It has been seen that the biological threats can emerge from the nature itself or by the activities of humans. The epidemics and pandemics that occur at certain periods are the examples of what nature can present as threat to human health and lives which ultimately takes the form of security issue for the state. Similarly, human activities include the accidental release of the biological agents used for research and diagnostic purposes and deliberate misuse of these agents.

The biological threats can primarily be classified on this basis. In addition to this, for the classification of threats, the actors that present the threat and the objects who are at risk of the threat are also to be considered. The biological threats can be classified into three classes based on the source and further to different sub-classes based on the actors posing risks and the referent object who are at the risk.

#### **5.2.3.1 Naturally Occurring**

Biological agents are ubiquitous and are in constant interaction with humans. These agents from the environment constantly emerge and reemerge affecting the human population at different period of times. These agents also take the form of epidemics and pandemics. Urbanization, increasing international trade, and increased and faster travel rise the ability of infectious diseases to spread rapidly across the globe (The White House, 2018; Her Majesty's Government, 2018). The most devastating influenza pandemic of 1918–19, is estimated to have killed upwards of 50 million people around the world, more than perished during World War I (Koblentz, 2010). The example of the emergence of disease is the H5N1 avian influenza and

H1N1 swine flu which led to a mild pandemic in 2009–2011 (Ryan, 2016). It is believed that a global influenza pandemic occurs about every 25 years (Bonin, 2007).

### **5.2.3.2 Accidental Release**

#### **Bio-warfare Programs**

One of the risks of accidental release of biological agents from the laboratory has been posed by state-run biological weapons programs that produce large quantities of the dangerous pathogen (Koblentz, 2010). In this case, the state is the source of threat and the individuals and community are those who are at the risk of these threats. In 1971, the field test of Variola virus by the Soviet Union on Vozrozhdeniye Island in the Aral Sea resulted in a small outbreak of small pox that required extraordinary public health measures to contain (Koblentz, 2010).

Similarly, in 1979, an accident at military bioweapon facility in Sverdlovsk (now Yekaterinburg, Russia) released *Bacillus anthracis* spores causing an outbreak of inhalation anthrax that killed at least sixty-six individuals (Koblentz, 2010).

#### **Research and Diagnostic Laboratories**

Laboratories with dangerous pathogens pose the greatest risks to individual researchers and the local community. There remains a chance of lethal laboratory-acquired infections to the members of the laboratory and secondary transmission of the disease from them to individuals outside of the laboratory. Laboratory accident can reintroduce a contagious disease that has already been eradicated or otherwise contained (Koblentz, 2010). Similarly, some laboratories do not have appropriate bio-containment or biosafety protocols, which could accidentally release a pathogen and lead to an outbreak. (The White House, 2018). One of the examples is a foot-and-

mouth disease outbreak at several local farms due to the breach at Pirbright BSL-4 laboratory in the United Kingdom in 2007 (Koblentz, 2010).

### **5.2.3.3 Deliberate Release**

#### **Biological Warfare**

Biological warfare includes the mass production, stockpiling, and use of biological weapons (Burnette et al., 2013). Multiple nations have pursued biological weapons programs (The White House, 2018), which presents a significant risk to the national security and defense of other states. According to a 2005 State Department report, six nations are suspected of developing biological weapons in violation of the BWC: China, Cuba, Iran, North Korea, Russia, and Syria. Iraq had an ambitious biological weapons program that culminated in the deployment of missile warheads and aerial bombs filled with biological warfare agents during the 1991 Persian Gulf War (Koblentz, 2010). Similarly, the Soviet Union, under the Biopreparat program developed a vast biological weapons complex, which included large stockpiles of biological warfare agents, enormous production facilities, and a network of laboratories dedicated to producing biological weapons (Koblentz, 2010). The risk exists that the program was never terminated despite the signing of the BWC (Burnette et al., 2013).

#### **State to Individual**

The risks of use of the biological agents against the internal population also possess a serious threat. Historically, it is seen that states used these agents against rebels and opposition groups as a means of counterinsurgency. In the late 1970s, Rhodesia used biological weapons against rebel groups, and in the 1980s South Africa used them against rebels and anti-apartheid activists

(Koblentz, 2010). Similarly, in 1978 Bulgaria, with Soviet assistance, targeted two dissidents living in the West with assassination by ricin (Koblentz, 2010). The Bulgarian exile named Georgi Markov was attacked using biological weapons. The weapon discharged a tiny pellet into the subcutaneous tissue which made him severely ill and took his life 3 days after. The autopsy revealed a tiny pellet that was cross-drilled as if it was designed to contain another material. It was disclosed in later years that the assassination was carried out by the communist Bulgarian secret service, and the technology to commit the crime was supplied to the Bulgarians by the Soviet Union. A similar case had happened 10 days before the assassination of Markov. An attempt to kill another Bulgarian exile, Vladimir Kostov, had occurred in Paris, France. Kostov was pricked with a sharp object in his back when he was leaving a metro stop in Paris. Two weeks later Kostov was examined by French doctors and found a similar pellet loaded with toxin ricin (Riedel, 2004). The risks of the use of these agents by the state against the internal population is a possibility even in the present context.

### **Bioterrorism**

Bioterrorism is the threat or use of biological agents by terrorist groups motivated by political, religious or other ideological objectives. Terrorist may find biological agents to be an alternative to conventional weapons of their relatively low costs, their relative accessibility, and the relative ease in which they could be produced, delivered, and avoid detection (Department of Molecular Virology and Microbiology, n.d.). Bioterrorism has become one of the most feared threats to international security.

Some of the examples of bioterrorism include the anthrax letter attacks in 2001 and the use of biological agents by disciples of Shree Rajneesh in Oregon. Groups such as Japan's Aum

Shinrikyo and al-Qaida have demonstrated an interest in using disease as a weapon to cause mass casualties (Koblentz, 2010).

### **Biocrimes**

A biocrime is the use of biological agents for individual objectives such as revenge or personal gain (Burnette et al., 2013; Koblentz, 2010). Bio criminals pose a threat primarily to individuals or small groups. These people can be anyone having the access to the biological agents and intention of malicious use. In a general understanding, the scientists and other laboratory staffs have easy access to these agents and if develop a purpose of misuse can produce a serious threat to others. Similarly, the availability of the expertise, materials and equipment associated with biological weapons on the internet, in particular the 'dark web', that may not otherwise be readily available creates a chance of use of these agents by an individual with ill-intention (Her Majesty's Government, 2018).

There have been a few cases of biocrimes accomplished through multiple small-scale attacks on discrete groups using crude means of dissemination as opposed to large-scale indiscriminate attacks (Koblentz, 2010). In 2009 a man in Chicago was indicted for illegally obtaining Tetrodotoxin (puffer fish toxin) with the intent of killing his wife and collecting \$20 million in life insurance (Koblentz, 2010).

#### **5.2.4 Factors Contributing to Biological Threats**

It has been clear that biological threats can emerge from the natural process, accidental release or through deliberate misuse by humans. But there are other factors that are conducive to bring the consequences caused by these threats. These factors help increase the risk of threats

and increase the magnitude of consequences brought about. Advances in science and technology and globalization are those chief factors (Koblentz, 2010).

Innovation in biotechnology has introduced the advanced method like gene editing and synthesizing technologies which are capable of creating more virulent strains of biological agents when accidentally released or misused can create more devastating consequence than the natural ones. It is a fact that technology over the past 20 years enabled scientists to engineer pathogens to be qualitatively different from conventional bioweapon agents (Ryan, 2016).

The second factor contributing to increase the magnitude of the effects of biological incidents is the globalization. The globalization has increased travel of people and trade among states chiefly. The world has become smaller than before and this has caused the spread of the agents from one part of the world to the other easier and faster hence resulting in increased consequence of those incidents.

### **5.2.5 Biological Threats as Security Issue**

These organisms affect human health and society and create economic and political annihilation leading to an anomaly in the state affairs. The issue of protection of humans and society, and preservation of economic integrity and political order in addition to the overall security of the state are the chief elements of security aspects of any nation. Since these microorganisms can peril those values which are core elements of security for a state, they are considered security issue for a state.

It is the nature of pathogenic microorganisms to create disease and take the lives of humans. The influenza pandemic of 1918-19 is estimated to have killed more than 50 million people

worldwide, which is more than that were killed in World War I (Koblentz, 2010). The prevalence of such diseases is a natural principle but its spreads to a larger population and an enormous number of people getting affected create a serious concern for the whole state. The protection of the health of individuals is undoubtedly an obligation of any state but when the numbers of such individuals increases pointedly it definitely creates more obligations for taking necessary actions for the protection of other healthy individuals and proper management of those affected as protection of citizens is a chief responsibility of a state.

In case of the deliberate release of microorganisms against any state, which can mostly be done by other states and non-state actors like terrorist groups, it becomes a chief security concern for that state and is a breach in sovereignty. The use of biological agents is just an alternative to the traditional means of warfare for achieving their desired goals. Thus, as the traditional warfare was a security concern for any state, the use of biological weapons also is a security concern for the state as only the means of warfare has changed not the ends. In this context, a state should be secured through any means for the protection of its sovereignty, territorial integrity, populations and other assets.

The microorganisms can even bring trust issues among countries and take the relation of states to a negative turn. The ongoing Corona pandemic can be an example of this as the issue of this virus has escalated the existing negative terms between China and the USA. China blamed the American soldiers for introducing Corona virus when they visited Wuhan in October (Myers, 2020). Similarly, the US President Donald Trump alleged that the virus was originated in Chinese laboratory and frequently termed the virus as “Chinese virus” (BBC, 2020). This exchange of barbed comments has taken the tension between these two states to a fever pitch.

Similarly, a scenario of infringement in the sovereignty of a state remains a possibility in case of failure to contain the spread of disease. It cannot be neglected that as the provision of war on terror was introduced to destroy the groups and forces deemed to be responsible for global terrorism (Heywood, 2011), a new idea might be initiated that gives other states mandate to act in the sovereign land of other states to take actions against the spread. This would be an infringement on the sovereignty of any state as the provision of war on terror was.

The spread of disease in a larger population affects a huge number of individuals disturbing their normal daily lives; the result of which is seen in society as a whole. A huge number of individuals become unavailable either because of being infected or because of being stagnant for the risk of getting infected. Financial, medical, educational and all other spheres of society deviates from normal functioning. Lack of necessary daily supplies like food and disruption in medical services can exemplify how the society dysfunctions.

The daily supplies become limited because of low production resulted from a low number of workforce available, and the inability of transportation of the limited produced goods to the market. The daily supplies being a basic necessity, the unavailability of which creates panic and challenge for all. The situation gets even worse as people get deprived of economic activities. The worst scenario is for the daily wage earners who face a serious challenge for their survival.

Similar is the case with medical services. During the time of an outbreak, two types of medical services are necessary. The first is the medical services against the outbreak disease itself and the second against diseases and illnesses that are routine to normal time. In this situation, medical services become limited as less number of medical manpower become available and the number of people seeking medical advice increases significantly. And this

happens in the backdrop of limited medical resources. Similarly, the routine medical services fall short because of the focus on the response towards the outbreak disease. The inability of the provision of health care in this situation of panic might lead towards a chaotic situation, the control of which becomes a security concern for the state.

The economy is another sector that suffers from the outbreak. It gets affected by two ways- first is the direct impact on the functioning of the financial market and the next is the impact on expenditure arrangement by the state. The financial market can get jeopardized because of a reduction in the production market, decrease in trade activities-both national and international, and dysfunction of other economic sectors like tourism and foreign employment leading towards a declining GDP. Preliminary estimates in 2004 of impacts by avian influenza on South East Asian economies suggested that a single large outbreak could result in a reduction of up to 1.5% of GDP growth (McLeod, Morgan, Prakash, & Hinri). The result of these all is seen in banks and financial institutions which ultimately might lead to a financial crisis.

Similarly, regarding the expenditure of a state, the state faces a pressure in its planned expenditures as it needs to spend a significant proportion of budget in treating and managing the disease and in implementing relieve packages and recovery programs. The cost of the 1997 outbreak in Hong Kong, it is suggested, may have been US\$100s of millions (McLeod et al., nd). Similarly, a study in 1999 suggested that an avian influenza pandemic in the US alone might cause economic losses of \$100 to \$200 billion at 2004 values (McLeod et al., nd). These contingent expenditures distort the planned expenditure modality creating insufficiency or reduction of expenditure allocated for other sectors. This gives a chance of creating a negative impact in those sectors. Thus, the outbreak may threaten the economy of the state.

Finally, these effects mentioned cause a combined effect on governance. The failure in the management of these effects might lead to loss of faith in government actions. As these effects accumulate, people stop following orders of government and government ultimately might lose legitimacy as a failure to take care of its citizens. This might even lead to political unrest and give a chance for groups with illegal motive to become active which in turn creates new problems. A condition of anarchy then may follow as this chain of effects go on.

Having these effects on the state, society and individuals, and on various aspects like health, economy and political order, this attracts a serious action towards security. Thus, the pathogenic microorganisms are a security issue for any state.

### **5.3 International Scenarios**

Having the knowledge on the spread of the biological agents from different means- natural process and human activities, and the actors posing risks and being at the risk, various measures have been established and strengthened to prepare, prevent, detect and respond to the biological threats by the United Nations, regional organizations and the states. These initiatives include those for the natural occurrence of disease or accidental release or deliberate use.

#### **5.3.1 Initiatives at Multilateral Level**

##### **International Health Regulations (2005)**

International Health Regulation (IHR) was adopted by the Fifty-eighth World Health Assembly on 23 May 2005 and entered into force on 15 June 2007. Emergence and re-emergence of diseases and international travel and trade are seen as the major factors contributing to the worldwide spread of diseases and high consequences of biological incidents.

The IHR primarily focuses on these two factors by adopting an effective international system to contain public health threats and respond to unexpected internationally spreading events that occur through international travel and trade and by establishing and strengthening the public health response mechanism that is necessary to provide response to the biological incidents that may arise irrespective of its origin- natural, accidental, deliberate release.

The main purpose and scope of IHR, as mentioned in the second article are “to prevent, protect against, control and provide a public health response to the international spread of disease in ways that are commensurate with and restricted to public health risks, and which avoid unnecessary interference with international traffic and trade” (World Health Organization, 2005, p. 10).

The IHR (2005) contains obligation of states as:

- Related to measures to detect, assess, notify and report events in accordance with the regulations and to respond promptly and effectively to public health risks.
- Related to the obligation, permission or prohibition of certain public health actions in respect of international travelers, goods, cargo and conveyances and the ports, airports and border crossings that they utilize.
- Related to the administration of IHR such as the nomination in each country of a National IHR Focal point and, for WHO, the nomination of WHO IHR Contact Points.
- Related to the management of information and public health response for events which may constitute a "public health emergency of international concern" (World Health Organization, 2007, pp. 11-12) .

Similarly, for guiding the member states in the implementation of the obligations contained in the IHR, “International Health Regulations (2005): Areas of work for implementation” has also been developed to assist countries to work in meeting the obligations of IHR. These areas of work is presented below:

	<b>Area of Work</b>	<b>Goals</b>
<b>GLOBAL PARTNERSHIP</b>		
1	Foster global partnerships	WHO, all countries and all relevant sectors (e.g. health, agriculture, travel, trade, education and defense) are aware of the new rules and collaborate to provide the best available technical support and, where needed, mobilize the necessary resources for effective implementation of IHR (2005).
<b>STRENGTHEN NATIONAL CAPACITY</b>		
2	Strengthen national disease prevention, surveillance, control and response systems	Each country assesses its national resources in disease surveillance and response and develops national action plans to implement and meet IHR (2005) requirements, thus permitting rapid detection and response to the risk of international disease spread.
3	Strengthen public health security in travel and transport	The risk of international spread of disease is minimized through effective permanent public health measures and response capacity at designated airports, ports and ground crossings in all countries.
<b>PREVENT AND RESPOND TO INTERNATIONAL PUBLIC HEALTH EMERGENCIES</b>		

4	Strengthen WHO global alert and response systems	Timely and effective coordinated response to international public health risks and public health emergencies of international concern.
5	Strengthen the management of specific risks	Systematic international and national management of the risks known to threaten international health security, such as influenza, meningitis, yellow fever, SARS, poliomyelitis, food contamination, chemical and radioactive substances.
LEGAL ISSUES AND MONITORING		
6	Sustain rights, obligations and procedures	New legal mechanisms as set out in the Regulations are fully developed, and upheld; all professionals involved in implementing IHR (2005) have a clear understanding of, and sustain, the new rights, obligations and procedures laid out in the Regulations.
7	Conduct studies and monitor progress	Indicators are identified and collected regularly to monitor and evaluate IHR (2005) implementation at national and international level. WHO Secretariat reports on progress to the World Health Assembly. Specific studies are proposed to facilitate and improve implementation of the Regulations.

(World Health Organization, 2007)

### **Biological Weapons Convention, 1972**

The Convention on the Prohibition of the Development, Production and Stockpiling of Bacteriological (Biological) and Toxin Weapons and on Their Destruction, commonly known as

the Biological Weapons Convention (BWC) or Biological and Toxin Weapons Convention (BTWC), was opened for signature in 1972 and entered into force in 1975. It is a multilateral regime and has the objective of general and complete disarmament of the world of biological and toxin weapons (United Nations Office for Disarmament Affairs, 2017). The Convention effectively prohibits the development, production, acquisition, transfer, retention, stockpiling and use of biological and toxin weapons that have no justification for protective, defensive, or other peaceful purposes. It is a key element in the international community's efforts to address the proliferation of weapons of mass destruction. The convention is a supplement to the 1925 Geneva Protocol which only prohibits the use of chemical and biological weapons.

The treaty bans an entire category of weapons, as States Parties to the convention undertook "never in any circumstances to develop, produce, stockpile or otherwise acquire or retain:

1. Microbial or other biological agents, or toxins whatever their origin or method of production, of types and in quantities that have no justification for prophylactic, protective or other peaceful purposes;

2. Weapons, equipment or means of delivery designed to use such agents or toxins for hostile purposes or in armed conflict." (United Nations Office, n.d.)

The text of the Biological Weapons Convention can be summarized as:

- Article I Never under any circumstances to develop, produce, stockpile, acquire or retain biological weapons.
- Article II To destroy or divert to peaceful purposes biological agents, toxins, weapons, equipment and means of delivery prior to joining.

- Article III Not to transfer, or in any way assist, encourage or induce anyone else to acquire or retain biological weapons.
- Article IV To take any national measures necessary to implement the provisions of the BWC domestically.
- Article V To consult bilaterally and multilaterally and cooperate in solving any problems with the implementation of the BWC.
- Article VI To request the UN Security Council to investigate alleged breaches of the BWC and to comply with its subsequent decisions.
- Article VII To assist States which have been exposed to a danger as a result of a violation of the BWC.
- Article X To facilitate the fullest possible exchange of equipment, materials and information for peaceful purposes (United Nations Office for Disarmament Affairs, 2017).

### **Geneva Protocol, 1925**

The Geneva Protocol, also known as ‘Geneva Protocol for the Prohibition of the Use in War of Asphyxiating, Poisonous or Other Gases, and of Bacteriological Methods of Warfare’, prohibits the use of chemical and biological weapons in armed conflict. It was drawn up and signed on 1925 under the auspices of the League of Nations and came into force on 8 February 1928 (United Nations Office for Disarmament Affairs, n.d.). It was a protocol signed at the convention for the Supervision of the International Trade in Arms and Ammunition and in Implements of War, which was not signed (International Committee of the Red Cross, n.d.).

The Geneva Protocol prohibits the use of "asphyxiating, poisonous or other gases, and of all analogous liquids, materials or devices" and "bacteriological methods of warfare". The basic essence of the protocol was that the states being party to the earlier treaties that prohibit the use of asphyxiating, poisonous or other gases, and of all analogous liquids, materials or devices also extend their prohibition to the use of bacteriological methods of warfare (United Nations Office for Disarmament Affairs, n.d.). The earlier treaties referred in this protocol that prohibits the use of gases are in particular the Hague Declaration concerning asphyxiating gases of 29 July 1899 and the Treaty of Versailles of 28 June 1919 as well as the other peace treaties of 1919 (International Committee of the Red Cross, n.d.).

The protocol created a milestone regarding the biological and chemical weapons but was confined only to the use of such weapons and not for their production, development, stockpiling and transfer. The shortcomings of this protocol were later filled up by the Biological Weapons Convention and Chemical Weapons Convention.

### **WHO Biosafety Programs**

WHO has initiated various programs to support member states with information, training, and laboratory principles and practices regarding laboratory biosafety. The overall goal of the WHO Biosafety Program is to prevent infections arising from inappropriate handling of pathogenic microorganisms and to advocate for safe storage of valuable biological materials to prevent their loss, theft, or accidental release (Bonin, 2007).

Through the Biosafety Programs, the WHO

- Supports member states in their endeavors towards the development of a biosafety culture.
- Provides biosafety information, trainings and technical assistance to them.
- Produces a variety of guidelines and guidance documents on laboratory biosecurity.
- Promotes the development of national, regional and international regulations, norms and standards for the safe handling of infectious substances.
- Aids in the development of international regulations for transporting infectious substances (Bonin, 2007) .

Some of the recent initiatives taken by WHO regarding biosafety which helps in promoting biosecurity worldwide are as follows:

- Guidance on regulations for the transport of infectious substances 2019–2020
- Biosafety video series
- WHO Global Consultative Meeting on the Safe Shipment of Infectious Substances: 15–16 March 2018
- WHO consultative meeting high/maximum containment (biosafety level 4) laboratories networking: 13-15 December 2017
- Report of an extended meeting of the biosafety advisory group: 13-15 December 2016
- Extended Biosafety Advisory Group meeting, 24-26 November 2014
- Laboratory Biorisk Management: Strategic Framework for Action 2012–2016
- Responsible life sciences research for global health security
- Biorisk Management: Laboratory biosecurity guidance

- Laboratory biosafety manual: Third edition, 2004 (World Health Organization, n.d.)

### **Resolution on Deliberate Use of Biological and Chemical Agents to Cause Harm**

World Health Assembly passed a resolution in May 2002 named “Global public health response to a natural occurrence, accidental release or deliberate use of biological and chemical agents or radio nuclear material that affect health”. WHO developed a strategy to respond to the resolution including four measures. These include providing technical and training assistance to member states on biological and chemical weapons preparedness and response programs, responding to the international release of biological agents through WHO’s global alert and response activities and operational framework for its containment, preparing nations with guidelines on preparedness and response plans, expert network and technical assistance, and preparing against selected disease through establishment of a global network of expert and laboratories and establishing standards and procedures, and disseminating information (Bonin, 2007).

### **WHO Guidance 2004: Public Health Response to Biological and Chemical Weapons**

The WHO’s Guidance on Public Health Response to Biological and Chemical Weapons includes guidelines regarding preparedness for and response to the deliberate use of biological and chemical agents that affect health. The guidance recommends public health authorities to prepare contingency plans for dealing with a deliberate release of biological or chemical agents intended to harm civilian populations. The guidance also urges states to determine the relative priority based on standard risk-analysis principles in comparison with other dangers to public

health in the country concerned. It also mentions on strengthening the public health infrastructure, surveillance and response (Bonin, 2007).

### 5.3.2 Initiatives at National Level

Similar to the initiatives by the United Nations and agencies under it, different states have also introduced various measures to combat the threats from biological agents regardless of their origin-natural, accidental or deliberate release. The states have initiated various measures from the formulation of laws to the establishment of institutions including all the measures to prevent against, protect from, respond to and recover from the biological incidents.

#### 5.3.2.1 Laws and Legislation

The legislative measures applied by some of the selected states are listed in the table below:

Country	Laws and Legislation	Scope
France	French Health Code	Regulates the handling of risks stemming from communicable diseases including preparatory measures, responsibilities, vaccination policy, border controls, etc.
		Regulates the safety and control of biological laboratories
	Decree 94-352 (1994)	Issues provisions for the evaluation and prevention of biological risks for certain establishments.
		Classifies biological agents to four risk groups.

	French Defense Code	Prohibits and penalizes the development, production, acquisition, and possession of biological and toxin agents that are not intended for preventive or protective use, and outlaws any assistance for such activities.
	French Penal Code	Lays out penalties for the diffusion of nuclear, biological, and chemical substances that may be used for destructive devices.
	Act 72-467 (1972)	Prohibits the development, production, acquisition, and possession of biological and toxic weapons.
	Decree 2001-1192 (2001)	Regulates the control of exports, imports, and transfers of dual-use goods and technologies and related authorization requirements.
Germany	Protection against Infections Act 2001	Defines infectious diseases and laboratory-confirmed agents that are notifiable, and provides a statutory basis for monitoring occurrences of such pathogens.
		Obliges the responsible authorities to take measures to prevent or fight infectious diseases.
		Regulates the handling of contagious pathogens, including permit requirements and precautions for laboratories and workers.
		Regulates the handling of biological substances.

	Ordinance on Safety and Health Protection related to Work involving Biological Substances 1999	Classifies biological agents according to four risk groups. Stipulates risk assessments, protective measures and appropriate equipment, provision of information to workers and public authorities, and precautionary health examinations of workers depending on the level of risk.
	War Weapons Control Act 1961	Prohibits to develop, produce, acquire, transfer, import, export, transport, or trade in biological weapons through the territory of Germany, or to exercise actual control over these weapons.
	Foreign Trade and Payments Act 1961	Regulates exports of certain biological materials and dual-use equipment.
	Foreign Trade and Payments Ordinance 1986	Identifies the microorganisms, viruses, and toxins as well as the systems and basic system components that require export licenses.
Russia	Government Resolution No. 303 (2005) on the Division of Authority among Federal Agencies in the Sphere of Biological and Chemical Security	Defines the responsibilities of governmental agencies in the area of biological security and nonproliferation.

	Government Resolution No. 64 (2005)	Establishes a Governmental Commission on Biological and Chemical Security.
	Resolution No. 869 (1992) on the State Registration of Potentially Hazardous Chemical and Biological Substances	Development of a governmental registration system for potentially dangerous chemical and biological substances
	Federal Act No. 52-FZ of 30 March 1992	Regulates provisions on the health and epidemiological wellbeing of the population.
	Decision No. 501 of 4 July 2002	Regulates the licensing of activities connected with the handling of infectious pathogenic agents.
	Sanitary and Epidemiological Regulation, SP 1.2.1318-03, SP 1.3.1285-03, and SP 1.2.036-95	Sets out requirements concerning the handling, storing, and transporting of microorganisms in pathogenic hazard groups I-II; premises and laboratory equipment; work in the laboratories of production departments; action to be taken in dealing with accidents when working with biological materials; genetic engineering; departure procedures for employees of establishments working with bio- logical materials; and requirements for the conduct of sanitary and epidemiological inspections.

	Russian Criminal Code	Outlaws activities to provide any form of support to actors that are reliably believed to be involved in activities connected with the development, acquisition, manufacture, possession, transport, transfer, or use of nuclear, chemical, or biological weapons and their means of delivery.
	Decree No. 1004 of 8 August 2001	Approves a list of human, animal, and plant disease-inducing agents (pathogens), genetically modified microorganisms, toxins, equipment, and technology subject to export controls.
	Decision No. 57 of 22 January 1998	Regulates the strengthening of controls over the export of dual-use goods and services associated with weapons of mass destruction and their delivery systems.
United Kingdom	Anti-terrorism, Crime and Security Act 2001	Places an obligation on managers of laboratories and other premises to notify the authorities about their holdings of specified pathogenic microorganisms and toxins. On request, it also requires that the police be notified about individuals with access to dangerous substances.
		Prohibits transfers of biological agents and toxins as well as assistance for such transfers.

	Public Health (Control of Disease) Act 1984 and Public Health (Infectious Diseases) Regulations 1988	Defines infectious diseases that are notifiable and provide the statutory basis for monitoring them.  Enables the government, among other things, to move people to hospitals for examination or treatment without their consent.
	Control of Substances Hazardous to Health Regulations 2002 (COSHH)	Requires employers to protect employees and provides for risk assessments, prevention and control of exposure, protective measures for persons and facilities, health surveillance, and information and training for workers.  Makes reference to the Approved List of Biological Agents that are classified according to four risk groups (HG-HG4).
	Carriage of Dangerous Goods and Use of Transportable Pressure Equipment Regulations 2004	Deals with the protection of people who are directly or indirectly involved in transporting dangerous goods, including infectious microorganisms.
	Biological Weapons Act 1974	Prohibits the development, production, acquisition, and possession of certain biological agents and toxins as well as biological weapons

	Terrorism Act 2000	Prohibits to provide or receive instructions or training in the use of biological, chemical, or nuclear weapons.
	Export of Goods, Transfer of Technology and Provision of Technical Assistance (Control) Order 2003	Establishes a framework to control exports or transfers of military and dual-use goods, software, and technology, and to control goods, software, and technology related to weapons of mass destruction (WMD) and the provision of WMD-related technical assistance.
United States of America	Public Health Security and Bioterrorism Preparedness and Response Act (2002)	Addresses provisions concerning the control of biological agents and toxins; safety and security measures concerning food, drug, and water supplies; and development of countermeasures against bioterrorism.
	Antiterrorism and Effective Death Penalty Act (1996)	Defines a list of selected infectious agents and requires facility registration, transfer notifications, verification procedures, and agent disposal precautions.  Marks the activities a federal crime to threaten, attempt, or conspire to use a biological weapon, and broadens the definition of biological weapons to include components of infectious substances, toxic materials, and recombinant molecules.

	<p>Hazardous Materials Regulations, 49 CFR Part 171-180</p>	<p>Sets out requirements for the safe transportation of infectious substances, including regulated medical waste, and defines packaging requirements, requirements for the transportation of genetically modified microorganisms, and communication requirements for shipments of certain materials.</p>
	<p>USA Patriot Act (2001)</p>	<p>Prescribes penalties for knowingly possessing biological agents, toxins, or delivery systems, especially in the case of certain restricted persons.</p> <p>Places additional restrictions and penalties on those who are allowed to possess, use, or transfer biological agents and toxins.</p>
	<p>Biological Weapons Anti-Terrorism Act (1990)</p>	<p>Implements the Biological and Toxin Weapons Convention (BTWC) and aims at protecting the US from biological terrorism by prohibiting certain conduct pertaining to biological weapons, including knowingly developing, producing, stockpiling, transferring, acquiring, retaining, or possessing any biological agent, toxin, or delivery system for use as a weapon, or knowingly assisting a foreign state or any organization in this regard.</p>

	Export Administration Act (1979, amended 2001)	Provides the statutory authority for export controls on sensitive dual-use goods and technologies, including such items that can contribute to the proliferation of nuclear, biological, and chemical weaponry.
	Chemical and Biological Weapons Control and Warfare Elimination Act (1991)	Establishes economic and diplomatic sanctions against countries that use chemical or biological weapons in violation of international law. It also imposes sanctions against companies that aid in the proliferation of chemical and biological weapons.

(Bonin, 2007)

### 5.3.2.2 Institutions

Similar to the legislative measures applied, the states have also established different institutions that are needed in the times of biological incidents. The institutions, as needed for this purpose, ranges from security and defense, health, research and institutions related to food, plant and animal. Some of the institutions of the states are as follows:

#### France

Category	Institution	Functions
Public Health	General Directorate of Health	Ensures public health preparedness to limit the consequences of a deliberate, accidental, or natural outbreak of infectious diseases and

		is in charge of communicating related information to the public
	National Institute for Public Health Surveillance	Monitors the health of the population and alerts public authorities in case of emerging public health threats
	Directorate of Hospitalization and Organization of Care	Evaluates and ensures the preparedness of hospitals and other health institutions by elaborating crisis guidelines regarding CBRN threats
	Health Products Safety Agency	Monitors restrictions on the use, production, conversion, application, import, export, possession, transfer, acquisition, and transport of certain pathogens
	Urgent Medical Services	Responsible for emergency medical assistance and ensures an appropriate pre-hospital medical response to major crises
Defense and Security	Directorate of Territorial Surveillance (under National Police)	Acts against the proliferation of weapons of mass destruction in addition to fighting espionage, terrorism and organized crimes

	Central Intervention Detachment	Fights nuclear, biological and chemical risks and in emergency to localizes, examines and neutralizes hazardous CBRN devices
	Central Criminal Investigation Directorate	Coordinates the fight against activities related to the production, storage, trade, or use of illegal arms and hazardous materials, such as biological pathogens or poisonous substances
	Specialized CBRN unit under National Gendarmerie	Fights CBRN terrorism
	French Armed Forces (2nd Dragoons Regiment)	Prevents and handles military or technical incidents involving nuclear, biological, or chemical substances.
	French Armed Forces (1st Medical Regiment)	Maintains CBRN protected field units in order to decontaminate casualties and provide them with urgent medical treatment.
Research	Le Bouchet Research Center	Military's center of expertise for matters concerning the protection of the armed forces against nuclear, radiological, biological, and chemical weapons

	Research Center of the Armed Force's Health Service	Deals with the biological effects of certain agents on humans and treatment of the same
	Institut Pasteur	Conducts research on infectious diseases
	Laboratory Jean Mérieux	Supplies and maintains the necessary infrastructure to be used by various research teams

(Bonin, 2007)

### Germany

Category	Intuition	Functions
Public Health	Robert Koch Institute	Identifies and prevents from attacks involving biological agents or natural disease outbreaks
	Central Commission for Biological Safety under Federal Office of Consumer Protection and Food Safety	Consists of experts in the fields of bacteriology, virology, plant breeding, medicine, and ecology and assesses the safety of GMOs and respective facilities as well as potential risks stemming from a release

Defense and Security	Center for Civil Protection Research/CBRN Protection and Prevention	Development and evaluation of appropriate methods, procedures, and technologies in CBRN protection
	Center for Disaster Medicine	Responsible for the provision of medical support and emergency planning to the population in exceptional emergency situations
	Federal Intelligence Service	Analyzes potential threats, particularly in the field of terrorism and weapons of mass destruction
	Research Institute on Terrorism/Extremism under Federal Criminal Police Office	Advancing relevant knowledge and scientific research on terrorism and extremism in a police context
	NBC Defense Units of the German armed forces (Bundeswehr)	Detects and copes with an attack involving nuclear, biological, or chemical weapons
	Armed Forces Scientific Institute for Protection Technologies and NBC Protection	Development of CBRN detection and early-warning systems

Research	Central Institutes of the Medical Service	Conducts biodefense-related research
	Bernhard Nocht Institute	Treatment, diagnosis and research on various infectious diseases
	National Reference Centers and Consultant Laboratories	Surveys important infectious pathogens and provide scientific consultation on the greatest possible spectrum of pathogens
	Fraunhofer Gesellschaft	Contributes to the development of products that are relevant to biodefense

(Bonin, 2007)

## Russia

Category	Institution	Functions
Public Health	Federal Medical-Biological Agency	Contributes to the development of methods and equipment for the identification, detection, prophylaxis, and treatment of pathogens and infectious disease
	Sanitary Epidemiological Service	Monitoring and prevention of infectious diseases
	Federal Agency of Healthcare and Social Development	Responsible for defense against pathogenic organisms and chemicals

Defense and Security	Ministry of Internal Affairs	Provides security in transportation and storage of biological agents
	Federal Security Service	Gather intelligence required to prevent threats of (biological) terrorism
	External Reconnaissance Service	Gathers foreign intelligence international threats, including threats from biological agents and terrorism
	Federal Service of Technical and Export Control	Protects state secrets and classified information on activities related to the biological and chemical security
Research	State Research Center of Virology and Biotechnology	Focuses on the study of infectious pathogens in order to fight diseases and maintain biological security
	Russian Academy of Medical Sciences	Involved in infectious diseases research and vaccine development

(Bonin, 2007)

## United Kingdom

Category	Institution	Functions
Public Health	Health Protection Agency	Provides an integrated approach to protecting UK public health through the provision of support and advice to the National Health Service, local authorities, emergency services, and the Department of Health
	Centre for Infections	Carries out a broad spectrum of work related to the prevention of infectious diseases
	Centre for Emergency Preparedness and Response	Prepares for and coordinates responses to potential healthcare emergencies, including a possible deliberate release of noxious agents
Defense and Security	Security Service (MI5)	Investigates and seeks to disrupt attempts by countries of concern to acquire material, technology, or expertise in the UK that could be relevant to a mass casualty weapons program
	Secret Intelligence Service	Assists the government in responding to current challenges including terrorism and the proliferation of weapons of mass destruction

	National Counter Terrorism Security Office	Coordinates a nationwide network of specialist police advisors who provide protective and counter-terrorism security advice including the biological security
	Police National CBRN Centre	Provides training, equipment, and CBRN support to the national police services
	Joint CBRN Regiment under British Armed Forces	Provides the British armed forces with effective defenses against chemical and biological weapons and nuclear contamination
Research	Defense Science and Technology Laboratory	Detection of chemical and biological agents and advice on contamination and control
	National Institute for Biological Standards and Control	Provides reference standards to control and standardize the quality and safety of vaccines and other biological medicines, testing samples associated with suspected adverse events
	Medical Research Council	Engaged in fundamental medical research involving a range of microbiological, chemical, and radiological agents

(Bonin, 2007)

## United States of America

Category	Institutions	Functions
Public Health	Office of Public Health Emergency Preparedness	Advices on matters related to bioterrorism and other public health emergencies
	Centers for Disease Control and Prevention	Provides a system of health surveillance to monitor and prevent disease outbreaks (including bioterrorism), implements disease prevention strategies, and maintains national health statistics
	National Center for Infectious Diseases	Prevents from illness, disability, and death caused by infectious diseases
	Center for Biologics Evaluation and Research	Works with various government agencies to identify gaps in medical countermeasures
	Office of Science and Engineering Laboratories	Responsible for diagnostic test validation for counterterrorism efforts, such as microarray screening of mutant microorganisms of significance to biodefense research; diagnostic genomic tests for CDC-listed biological threat agents; and evaluation of genetic tests for the detection of chemical toxicants that pose a terrorism threat

Defense and Security	Office of Homeland Security	Implementation of a comprehensive national strategy to be secured from terrorist attacks, including bioterrorism
	Office of the Chief Medical Officer	Works with other federal agencies in completing comprehensive plans for executing Department of Homeland Security responsibilities to prevent and mitigate biological attacks
	Federal Bureau of Investigation	coordinates government's response in the event of a threat involving weapons of mass destruction
	Central Intelligence Agency's	Helps to combat international terrorist threats
	DCI Center for Weapons Intelligence, Nonproliferation, and Arms Control	Provides intelligence support aimed at protecting the US and its interests from all foreign weapons threats
	Office of the Special Assistant for Chemical and Biological Defense and Chemical Demilitarization Programs	Responsible for leading, guiding, and integrating the Department of Defense Chemical and Biological Defense Program

	Chemical and Biological Defense Information Analysis Center	Serves as the focal point for scientific and technical information in support of the Department of Defense's Chemical, Biological, Radiological and Nuclear defense capabilities
	Joint Program Executive Office for Chemical and Biological Defense	Principal advocate and single point of contact for all chemical, biological, nuclear, and radiological detection
	United States Air Force Counter proliferation Center	Assesses nuclear, biological, chemical, and missile (NBC/M) proliferation threats and the means of addressing those threats
Research	United States Army Medical Research Institute for Infectious Diseases	Conducts basic and applied research on biological threats resulting in medical solutions to protect US troops
	National Institutes of Health	Conducts and supports medical research projects in diseases nationwide
	National Institute of Allergy and Infectious Diseases	Conducts and supports research to study the causes of allergic, immunologic, and infectious diseases, and to develop better means of preventing, diagnosing, and treating these illnesses

	Division of Microbiology and Infectious Diseases	Supports extramural research to control and prevent diseases caused by virtually all human infectious agents except HIV
	National Science Advisory Board for Biosecurity	Advises on and recommends specific strategies for the efficient and effective oversight of federally conducted or supported dual-use biological research, taking into consideration both national security concerns and the needs of the research community.
	Nonproliferation and Arms Control Technology Working Group	Ensures effective coordination of research and development in the areas of arms control and nonproliferation and guards against redundant arms control and nonproliferation-related R&D and technology programs within and among departments and agencies.
	Lawrence Livermore National Laboratory	Enhances the nation's health and security through multidisciplinary research in genomics, molecular biochemistry, and biotechnology

(Bonin, 2007)

## Chapter 6

### Nepal: Biological Defense and Security Strategy

#### 6.1 Nepal's Biological Security Threats

It has been seen from past events that certain diseases emerge from nature. Humans have seen the emergence of either a completely new biological agent or of the changed form of the previously prevalent agents. Thirty previously unknown infectious diseases agents have been identified and at least 20 more well-known diseases have emerged in more lethal form since 1973 (Koblentz, 2010). These new and/or modified disease agents can also emerge in Nepal as they have done in different periods throughout the world.

At various times, several diseases have outbreak in Nepal, the etiological and epidemiological cause of which have been unknown and have taken the lives of many people. Similarly, many people have been diseased and dead due to the outbreak of the diseases whose treatment seems easier in the present context. In 2009, the outbreak of diarrhea in Jajarkot district of Nepal infected over 6000 people in 22 out of 30 village development committees (The Himalayan Times, 2009).

Not only the disease that occur within any state exerts a serious threat to the health and lives of people of that state but also the diseases that originate or emerge in other states possess a threat to people of that states. Because of the increase in globalization, the borders have diminished for the spread of diseases and the ease of transfer through people and goods has increased. SARS that emerged in rural China in February 2003 spread to five countries within twenty-four hours and another 20 countries within two months (Koblentz, 2010).

The emergence of any disease within the territory of Nepal or outside of Nepal is always a possibility which possesses a serious threat to the health and lives of the people. Thus, the emergence of any disease in nature is always a biological threat to Nepal.

It has already been known that diagnostic and research laboratories pose a huge risk to the members of the laboratory and from them to the community. In the USA, from 2004 to 2010, 639 reports on the release of laboratory agents were made to the Centers for Disease Control, 11 of which resulted in laboratory-acquired infections although no any fatalities or secondary transmission were resulted (Merler et al., 2013). There are more than 400 clinical laboratories in Nepal (National Public Health Laboratory, n.d.) providing diagnostic services along with many other research laboratories. The chances from these laboratories always prevail of spreading pathogenic organism to the society through workers in such laboratories despite the safety measures applied. This vulnerability of the escape of the biological agents from the laboratory to the public creates a serious threat to the health of Nepalese people and overall security of Nepal.

The possession of biological weapons by one state exerts a substantial risk to the national security of other states. The White House (2018) reports that multiple nations have pursued biological weapons programs (The White House, 2018) and a 2005 State Department report states that six nations are suspected of developing biological weapons (Koblentz, 2010).

Although the Biological Weapons Convention have been signed the chances still exists on the use of such weapons which keeps every state at the state of security dilemma. In this context, every state including Nepal may face the risk of a direct attack by other states through the use of biological agents. Such attacks seem likely to be operated covertly in the backdrop of Biological

Weapons Convention, the verification of which again becomes a rigorous task or even impossible to prove.

Similar is the case with bioterrorism. As terrorism is a security threat to Nepal, so is bioterrorism, both being the same phenomenon with the subtle difference in the use of biological weapons in the latter. The use of biological weapons can be preferred by the terrorist because of their relatively low cost, accessibility, and ease with which they can be produced, delivered and avoid detection (Department of Molecular Virology and Microbiology, n.d.). Some terrorist groups such as Japan's Aum Shinrikyo and al-Qaida have demonstrated an interest in using disease as a weapon to cause mass casualties (Koblentz, 2010).

Not limited to the states and non-state groups exerting threat to the security of the state, even the individuals keep the security at risk through the use of biological agents. The individuals having the access to the biological agents and intention of malicious use for their personal gain can use against other individuals or small groups which ultimately have a high possibility of secondary spread in the mass public. In 2009, four women have been attacked by sharp objects, possibly syringes, within one-and-a-half months in Kathmandu, Nepal (The Himalayan Times, 2019). This so-called 'syringe attack' relates closely to the possibility of use of infectious diseases in the attack which proves that bio-crimes can take place in Nepal.

In addition to these, advancement in biological technology and globalization can increase the biological security threats to Nepal. Since Nepal is also advancing in the field of biotechnology, it can bring higher chances of advanced technologies being used for malicious purpose. Similarly, globalization has eased the transfer of biological agents into Nepal through the higher

rates of mobility of goods and people inside the country, and of its effects, the major of which is the financial crises.

## **6.2 Biological Defense and Security Strategy of Nepal**

As others states, Nepal has also adapted various measures to combat biological threats including legislative formulations and institutional setups.

### **6.2.1 Nepal's Initiation at International Level**

With the aim to control public health threats and to respond to internationally spreading events through international travel and trade, Nepal has adjusted its policies and structured its organizations in line with the provisions of International Health Regulations (2005) since 15 June 2007 (World Health Organization, 2005). Similarly, Nepal is of a strong belief in general and complete disarmament of all weapons of mass destruction including biological, chemical, nuclear and radiological weapons in a time-bound manner. In this regard, Nepal became the 177th member of the Biological Weapons Convention on 4 November 2016 after ratifying the convention through the parliament on 23 October 2016 which was signed on 10 April 1972 (Ministry of Foreign Affairs, 2016). Adding to these, Nepal acceded to the Geneva Protocol, 1925 on 9 May 1969 (Ministry Of Law, Justice and Parliamentary Affairs, 2018).

### **6.2.2 Institutions**

In an effort to combat the biological incidents, a comprehensive action on prevention, protection, response, surveillance and recovery is necessary from a wide range of governmental institutions. These institutions may include those in public health, security and defense, research, animal, plant and environment, economic and import-export institutions. The Ministry of Health

and Population is the apex governmental body responsible for health issues whereas the Ministry of Home Affairs and Ministry of Defense is responsible for security and defense issues.

Similarly, the Ministry of Agriculture and Livestock Development, and Ministry of Forest and Environment are responsible for tasks relating to animals, plants and environment. The Ministry of Finance looks after the economic and financial aspect (Government of Nepal (Business Allocation) Regulation, 2017). There are several agencies and services under the respective ministries working against the biological incidents.

### **6.2.2.1 Public Health**

#### **Ministry of Health and Population**

Ministry of Health and Population is responsible for all the health issues including public health. It is tasked with formulation, implementation, monitoring and evaluation of policies, plans and programs relating to health. Specifically, the ministry is responsible for formulation of policies and standards for prevention and control of communicable and non-communicable diseases, supply and management of vaccines and other urgent medical goods, management of health information system, monitoring of health issues of national and international concern, operation and regulation of national reference laboratory, management of health-related emergencies and epidemics, and delivery of emergency health services (Government of Nepal (Business Allocation) Regulation, 2017) .

Under Ministry of Health and Population are different departments, divisions and institutions working for this cause.

### **Health Emergency and Disaster Management Unit**

It is a unit under the Ministry of Health and Population that works as a secretariat of the ministry at the time of health emergencies and health disasters. It coordinates with institutions working in disaster management under Ministry of Home Affairs to manage the health-related emergencies and disasters and acts as a central contact point between the federal government and state and local governments regarding health emergencies and health disasters (Ministry of Health and Population, n.d.).

### **Department of Health Services**

The overall purpose of the Department of Health Services is to deliver preventive, promotive and curative health services throughout Nepal. It is also responsible to mobilize assistance in the implementation of approved programs by preparing objective projects related to various aspects of public health (infectious disease control, control of AIDS and STDs), and to manage the immediate solution of problems arising from natural disasters and epidemics (Department of Health Services, 2020).

Under the Department of Health Services, is the Epidemiology and Disease Control Division with six sections, among which NTD and Vector Born Disease Control Section, Zoonotic and other Infectious Disease Control Section, Disease Surveillance and Research Section, and Epidemiology and Epidemic Management Section are responsible for prevention and protection of various diseases. The Epidemiology and Disease Control Division is responsible for supporting the Ministry of Health and Population to provide necessary national laws, policy and strategies related to prevention, control and management of vector born and infectious diseases,

and to conduct disease monitoring and research on epidemic and other emergency health management situations (Department of Health Services, 2020).

### **Epidemic and Outbreak Surveillance Program**

Epidemic and Outbreak Surveillance Program is operated through the Epidemiology and Disease Control Division for the surveillance of communicable diseases by collecting information and analyzing data on cases of infectious diseases. It provides relevant information to decision-makers for public health priorities and resource allocation. Some of the activities under the program include Early Warning and Reporting System, Active Surveillance System of Infectious disease and Water Quality Monitoring and Surveillance System (Ministry of Health and Population, n.d.).

### **Disaster Management Program**

The Disaster Management Program operates under Epidemiology and Disease Control Division and works to enhance the capacities of the health sector in emergency preparedness and response by focusing on disaster preparedness, disaster risk reduction and response through expediting the process of health sector contingency planning, strengthening the mechanism for multi-sectorial coordination and collaboration in relation with health sector disaster management. It also prepares hospitals for emergency disaster preparedness and stockpiling supplies, medicines, surgical kits and others at provincial levels (Ministry of Health and Population, n.d.).

### **National Public Health Laboratory**

National Public Health Laboratory is a national reference laboratory under the Department of Health Services and has the primary goal to address the diagnostic needs to emerging and re-

emerging diseases. It has the mandate for organizational and administrative responsibilities for health laboratory services (public health and clinical diagnosis) in both public and private sectors throughout the country. The functions of the laboratory include networking, licensing, monitoring, supervising, capacity strengthening, conducting research activities and providing external quality assessment services of laboratories (National Public Health Laboratory, n.d.).

### **Sukraraj Tropical and Infectious Disease Hospital**

Sukraraj Tropical and Infectious Disease Hospital, under Ministry of Health and Population, is the only infectious and tropical disease hospital of Nepal providing services in managing different tropical and infectious diseases (Sukraraj Tropical and Infectious Disease Hospital, n.d.).

#### **6.2.2.2 Security and Defense**

##### **Ministry of Home Affairs**

The Ministry of Home Affairs deals with matters related to national and international security. One of its main functions is to prepare and implement provisions regarding security policy, including those at the time of various disasters and adverse conditions. It is tasked with formulation, implementation and regulation of national policy, rules and standards regarding disaster management. It is also responsible for the prevention and control of various organized crimes and terrorist activities (Government of Nepal (Business Allocation) Regulation, 2017).

Disaster Risk Reduction and Management Act, 2074 (2017) has classified epidemics and biological attacks as non-natural disasters which gives the Ministry of Home Affairs its mandate in establishing biosecurity in the country. Under the Ministry of Home Affairs, operate different

divisions and sections that act in the field management of disaster, including epidemic and biological attack.

Disaster and Conflict Management Division is solely responsible for all the activities relating to disaster management. Under it are Disaster Study Risk Reduction and Compensation Section, NEOC-Disaster Precaution and Action Section and relief and Data Management Section, assisting the division in its functions (Ministry of Home Affairs, n.d.).

### **National Council for Disaster Risk Reduction and Management**

National Council for Disaster Risk Reduction and Management under the chairmanship of the Prime Minister is an apex body in order to manage and reduce disaster risk. An executive committee under the Minister of Home Affairs and an expert team are tasked to implement the policies and plans formulated by the council. Further, the National Disaster Risk Reduction and Management Authority has been provisioned by the Disaster Risk Reduction and Management Act, 2074 (2017) to work as per the decree of the council.

### **National Emergency Operation Centre (NEOC)**

National Emergency Operation Centre (NEOC) is a coordination and communication point for disaster information across Nepal, including government agencies and other response and recovery stakeholders. It aims at strengthening the effectiveness of national and district emergency operation facilities and information systems. Further, NEOC has its role in preparing against the disaster, keeping agencies and authorities alert for an imminent emergency, leading coordination and communication during response and coordinating early recovery efforts (National Emergency Operation Center, n.d.; Nepal, Khanal, & Pangali Sharma, 2018). Also, as

a part of the Ministry of Home Affairs' strategy to further develop emergency and preparedness response capacity District Emergency Operation Centers in different districts are established.

### **Nepal Police**

Nepal Police is responsible for investigating crimes and for the maintenance of public order. The duties of Nepal Police, according to Nepal Police Act, 2012 (1955) are to collect information regarding activities which are likely to affect law and order, to prevent crimes, and protect people from unnecessary harassments, to trace out criminals and cause them to be punished according to the law and to arrest persons who must be arrested according to the law. These functions of the Nepal Police fall relevant to the illegal activities conducted through the use of biological agents.

Under Nepal Police is Disaster Management Division responsible for preparedness and response to any emergency or disaster (including epidemics and biological incidents) for the protection of life and property. Disaster Management Division coordinates and collaborates with stakeholders, conducts preventive and mitigating activities, operates preparedness and capacity building programs, and responds in case of disaster. It also drafts plans, policies and recommendations in this regard and conducts training and simulation exercises for skill development and capacity enhancement. The division is planning further to uplift the rescue capacity in the field of CBRN specifically (Nepal Police, n.d.)

### **Armed Police Force, Nepal**

Armed Police Force, Nepal works under the Ministry of Home Affairs and has the role in controlling ongoing or would be armed conflict, separatist activities, terrorist activities and riots

within the country. Also, APF works against the external invasion under the Nepal Army.

Regarding the biological incidents, APF contributes its service in epidemic relief activities through the Disaster Management Division (Armed Police Force Nepal, n.d.)

### **Ministry of Defense**

Ministry of Defense deals with matters of national and international security. Its task is to formulate and implement policies, rules, standards, plans and strategies regarding national security and defense (Government of Nepal (Business Allocation) Regulation, 2017; Ministry of Defense, n.d.). Further, it is tasked with the collection, analysis, communication, networking, operation and management of information regarding strategic security (Ministry of Defense, n.d.). In the context of biological incidents through biological warfare between states or terrorist activities, the role of the Ministry of Defense is directly attracted.

### **Nepal Army**

Nepal Army is established under the Ministry of Defense with the sole purpose of protection and defense of independence, sovereignty, territorial integrity and national unity of Nepal (Army Act, 2006). At the time of peace, Nepal Army provides various resources and services to support the people in case of critical situations, such as disasters and natural catastrophes. Nepal Army has its mandate in the case of bioterrorism or when Nepal faces biological attack from other states as its sole purpose of defending the nation. Similarly, Nepal Army is an inseparable agency in disaster relief operations (Nepali Army, n.d.).

Nepal Army also performs the duties designated to it by the government regarding special humanitarian issues. In the recent Corona virus crisis, Nepal Army was given the mandate in

managing the Nepalese citizens who are repatriated to Nepal from foreign countries, through Covid-19 Crisis Management Centre (CCMC). Nepal Army has chiefly focused itself in formulation of plans to repatriate Nepalese citizens abroad and in their management. Various holding centers have been constructed, proper setups have been established at airport, and people have been safely transferred from the airport to the holding and quarantine centers, under the programs of CCMC.

The doctors and other medical staffs from Nepal Army have also actively participated in management of the Corona virus. A total of 2290 Nepal Army personnel have been deployed at quarantine facilities and isolation wards. Also, Nepal Army is helping in spraying disinfectants, collection of swab specimens and management of dead bodies during this crisis.

### **6.2.2.3 Animal, Plant, Food and Environment**

#### **Ministry of Agriculture and Livestock Development**

Ministry of Agriculture and Livestock Development is responsible for the formulation and implementation of policies, rules and standards regarding agriculture, agricultural biodiversity and biotechnology, food security and food quality, and quarantine for food, animals and plants. Specifically, the ministry is tasked for the control of diseases and epidemics in agricultural and livestock products (Government of Nepal (Business Allocation) Regulation, 2017).

Through the divisions under the ministry, namely Agriculture Development Division, Food Security and Food Technology Division, Livestock and Fishery Development Division and Animal Health Division, the tasks of preparing and implementing policies, rules and strategies regarding control of emerging diseases and epidemics in animals are performed by the ministry.

The divisions are also responsible for research and protection of animal health. Besides, analysis, monitoring and projection of food security are the tasks of the divisions (Ministry of Agriculture and Livestock Development, n.d.).

### **Department of Livestock Services**

Operating under the Ministry of Agriculture and Livestock Development, the Department of Livestock Services works to regulate on quality of animals, animal products and animal production inputs, and to prevent the entry of animal diseases from animal, animal products and animal production inputs. The department also updates animal quarantine procedures as per the standard sanitary and phytosanitary measures of the World Trade Organization. Through these functions of controlling diseases in animals, the Department of Livestock Services aims to protect the public health of Nepalese people (Department of Livestock Services, n.d.).

### **Department of Food Technology and Quality Control**

The Department of Food Technology and Quality Control comes under the Ministry of Agriculture and Livestock Development and is responsible for safeguarding and protecting the health of consumers by assuring the quality maintained in food products by implementing updated food and feed acts and regulations. The department also aids in research and development in the field of food science and technology. Export and import certification of food and food products and laboratory analysis of food and feed for their microbiology quality conducted by the department ensures the safety of public health from food-related biological agents (Department of Food Technology and Quality Control, n.d.).

Six Food Technology and Quality Control Offices, 12 Food Import Export Quality Certification Offices, and 24 Food Technology and Quality Control Divisions Offices (Department of Food Technology and Quality Control, n.d.) helps in discharging the field level duties of the department.

### **Animal Quarantine Office**

The Animal Quarantine Office operates under the Department of Livestock Services and has the major responsibility to inspect the animals and their products that enters the border for safeguarding the country against infectious diseases. The country is kept in a top watch against the entry of trans-boundary animal diseases, highly pathogenic influenza and other highly pathogenic emerging and re-emerging infectious diseases (Animal Quarantine Office, n.d.).

### **Plant Quarantine and Pesticides Management Center**

Plant Quarantine and Pesticides Management Center operates under the Ministry of Agriculture and Livestock Development and has a major task to regulate the potential risk on plant health arising from the international trade of the plants and plant products. It is also responsible for establishment and management of plant quarantine check posts which helps to control the entry of harmful pathogens if present in the plant or plant products imported (Plant Quarantine and Pesticide Management Centre, n.d.).

#### 6.2.2.4 Economy

##### Ministry of Finance

Ministry of Finance is responsible for formulation and implementation of economic and financial policy, and for handling financial aspects of funding and the distribution of resources to the appropriate agencies (Government of Nepal (Business Allocation) Regulation, 2017).

Through the annual budget, the ministry has allocated necessary funds in the prevention, control, response and recovery of epidemics and other emerging diseases.

##### Department of Customs

Department of Customs operates under the Ministry of Finance and has the responsibility to collect revenues at borders (Department of Customs, n.d.). At the same time, it ensures national security through the scrutiny of goods that are being imported to the country. The Department of Customs is thus responsible for the implementation of the government's policy concerning import controls of goods that are restricted by laws and other governmental agencies at times.

#### 6.2.3 Laws and Legislation

The Constitution of Nepal, 2072 (2015) and following acts and regulations under it are devoted in ensuring biosecurity and biodefense in Nepal.

Laws and Legislation	Scope
Constitution of Nepal, 2072 (2015)	Envision the possibility of emergency in regard to sovereignty, territorial integrity and security of some parts

	of Nepal by epidemic and establishes the provision of declaring state of emergency in such conditions.
Infectious Disease Act, 2020 (1964)	Provisions for the root out or prevention of any infectious disease which spreads or is likely to spread throughout Nepal or any part of Nepal.
Small pox Control Act, 2020 (1964)	Implemented to control the spread of small pox through mandatory immunization during the 60s.
Animal Health and Livestock Services Act, 2055 (1999)	Provisions to establish quarantine check posts for inspection of animals, animal products or animal production inputs before importing.
	Provisions on restriction on import of those products found with certain diseases prescribed by Government of Nepal.
	Restriction on the movement and transport of animals from certain place of Nepal where there is outbreak of contagious disease in animals to other places of Nepal.
Plant Protection Act, 2064 (2007)	Provisions on taking entry permit to import any plants, plants product and other related items.
National Health Laboratory Policy, 2069 (2012)	Operate laboratories through formulation of standard operating procedures regarding sample collection, testing, storing and transfer.

	Development and implementation of internal quality control measures.
	Include in National Public Health Laboratory Directives of measures regarding safe handling and destruction of infectious materials for biosafety, biosecurity and environment protection.
	Protection and storage of microorganisms.
Organized Crimes Prevention Act, 2070 (2014)	Prohibit the production, distribution, stockpiling, transfer, import and export, sale and use of toxic substances or knowingly help in those activities.
Immunization Act, 2072 (2015)	Provisions on prevention, control, elimination and eradication of vaccine preventable disease.
Criminal (Code) Act, 2074 (2017)	Prohibit the spread of infectious disease that can hamper lives of others, including HIV and Hepatitis B Virus.
	Prohibit the creation, production, purchase, sale, acquisition, transfer, retention, stockpiling, import and export of nuclear, chemical, biological and toxic weapons and investment in and management of such activities.
Disaster Risk Reduction and Management Act, 2074 (2017)	Envision epidemic and biological attacks as non-natural disaster.
	Manage and coordinate activities regarding disaster management for the protection of life and property, natural

	and cultural heritages and of physical infrastructures during natural and non-natural disasters.
Local Governance Operation Act, 2074 (2017)	Delegation of authority to local government regarding disaster management.
Public Health Service Act, 2075 (2018)	Disseminate information, prevention and treatment of highly infectious diseases.

## Chapter 7

### Summary and Conclusion

The biological threats are the threats that are possessed by biological agents that produce disease in and death of humans. They can occur from natural processes or human activities. To provide security against such threats, the concepts of biosecurity and biodefense emerged. Biosecurity and biodefense are closely related in that biosecurity is the state where the people, nation and the international community is prevented and protected from the biological threats whereas biodefense is the action taken towards achieving that state.

Biosecurity is the “security against the inadvertent, inappropriate, or intentional malicious or malevolent use of potentially dangerous biological agents or biotechnology, including the development, production, stockpiling, or use of biological weapons as well as outbreaks of newly emergent and epidemic disease” (Koblentz, 2010, p. 107), whereas biodefense refers to the “policies, structures, methods, plans, and procedures involved in establishing and executing defensive measures against attacks using biological agents” (Bonin, 2007, p. 28).

These threats are found to be put forth from three main means- natural occurrence, accidental release and deliberate use. In addition, the actors that present the threat and the objects who are at risk of the threat are also considered, taking into account the states, non-state actors and individuals. Based on these two criteria, biological threats are classified as epidemics and pandemics, bio-warfare programs and medical laboratories, and bio-warfare between states, bioterrorism and bio-crimes.

Combating against these threats, various initiatives have been taken by states individually and collectively. International Health Regulations (2005), Biological Weapons Convention and WHO Biosafety Programs among others are some of the collective initiatives whereas formulation and implementation of laws and other legal documents, and institutionalization of various agencies in the field of public health, defense and security, research, animal, plant, food and environment, and economy are some of the individual steps taken by states.

Similar results are found to be aligned with that of Nepal as it faces biological security threats from similar sources in its own political and geographical context. Similar legal and institutional set-ups have also been set up by Nepal.

These findings will give a complete insight into the biological threats thus helping concerned authorities to foresee the situation and act accordingly to identify the gaps between the existing biosecurity measures and the threats that can be presented. The research will also form a base for further studies to be conducted in this field.

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