

ISSN 1994 2052

Peace and Security Review

Volume 8 ■ Number 17 ■ Second Quarter, 2018

I N S I D E

**“New Trends in Peacekeeping: Fourth
Generation UN Peacekeeping Operations”**
Major General ANM Muniruzzaman (retd)

**The Shift In India’s Foreign Policy:
Reflections From A Political Economy
Perspective**
Mohanan Bhaskaran Pillai

**Water Security in India
Threat Mapping: Impact of Climate Change**
Sourina Bej



Bangladesh Institute of Peace and Security Studies
www.bipss.org.bd

Peace and Security Review

Volume 8 ■ Number 17 ■ Second Quarter, 2018



BIPSS
Towards a Secure World

Bangladesh Institute of Peace and Security Studies
www.bipss.org.bd

Bangladesh Institute of Peace and Security Studies (BIPSS)

House No.: 425, Road No.: 07, DOHS, Baridhara

Dhaka-1212, Bangladesh

Telephone: 8419516-17

Fax: 880-2-8411309

E-mail: info@bipss.org.bd

URL: www.bipss.org.bd

Copyright © Bangladesh Institute of Peace and Security Studies (BIPSS)

No part of this publication may be reproduced or stored, in a retrieval system, or transmitted in any form, or by any means, electronic, mechanical, photocopy, or otherwise, without permission of the Editor of the Journal.

ISSN 1994-2052

Subscription Rates (including air mail charge)

Single Copy: Tk. 500.00/ US\$ 40.00

Annual: Tk. 2000.00/ US\$ 160.00

Bangladesh Institute of Peace and Security Studies (BIPSS)
Produced and Printed by NAM Printers, 1/1 Sheikh Shaheb Bazar Road,
Azimpur, Dhaka-1205, Bangladesh

Contents

<i>Editor's Note</i>	v
"New Trends in Peacekeeping: Fourth Generation UN Peacekeeping Operations" <i>Major General ANM Muniruzzaman (retd)</i>	1
The Shift In India's Foreign Policy: Reflections From A Political Economy Perspective <i>Mohanan Bhaskaran Pillai</i>	23
Water Security in India Threat Mapping: Impact of Climate Change <i>Sourina Bej</i>	44

Editors Note

The latest edition of 'Peace and Security Review' is released in a time when the world is witnessing the transition of world order. The changing patterns in international order reflects with the incidents such as: US coming out from Transpacific Pacific Partnership (TPP) program and UN Human Rights council; UK and it's 'Brexit' deal also facing uncertainty as of the idea 'Breverse' emerging. In security perspectives, the world is facing a continuous climate change threat that is affecting the ecology with the result of water and food insecurity. Different countries are trying to cope up with the transiting phase of the world order by bringing changes in its foreign policies and security policies. This volume focuses on the changing patterns in UN peacekeeping mission to cope up with the world order to bring peace and stability in the world. As a multi dimensional security journal this volume also carried the shifts in India's foreign policy to uphold its importance in world order. A report on water security in the context of India reflects the mirror image of climate change effects in human security aspect.

The First Article titled "New Trends in Peacekeeping: Fourth Generation UN Peacekeeping Operations by Major General ANM Muniruzzaman (ret'd), President Bangladesh Institute of Peace and Security Studies (BIPSS) spotlights the changes in dynamics of UN Peacekeeping missions. As a force of positive change maker the UN Peacekeepers arena of working is also evolving. Not only the political scenario has continued to change in the world but also does the global orders. Such changes have continued to change dynamics of conflict around the world. With changes in time and demand characteristics of UN, peacekeeping has also kept changing ever since 1948 till today which can be characterized as generations of peacekeeping. As the concept of peacekeeping is evolving, fourth generation peacekeeping requires different set of skills and expertise such as robust peacekeeping, peace building or pre-deployment training in multidimensional peacekeeping operations. Despite changing a lot of characteristics from traditional peacekeeping there still remain a lot of challenges in the fourth-generation peacekeeping must be addressed at a time

of technology-based peacekeeping which is causing less boots on the ground.

The Second Article titled “The Shift in India’s Foreign Policy: Reflections from a Political Economy Perspective” by Mohanan Bhaskaran Pillai unveils the shift in India’s foreign policy in a political economy perspective with affiliation with global economy. A major shift occurred in India’s foreign policy in the context of the emergence of a new international economic architecture during 1978-80 periods. India confronted a situation where it had no other option, but to liberalise its economy. The economic reforms initiated by the Narasimha Rao government just in the aftermath of the crumbling down of the bipolar world order led to massive readjustment in India’s foreign policy from nonalignment to multiple engagements. The economy was liberalised and integrated it with the global economy. Since then economics has emerged as the powerful locomotive of India’s foreign policy calculus. The demise of the bipolar world order and the liberalisation, privatisation and globalisation programmes in the economy prompted analysts to think that India abandoned nonalignment once and for all as it had become obsolescent at the strategic juncture of the unipolar moment. In what way the foreign policy of India has got shaped in the context of fast paced integration of the Indian economy with the global economy. What are the implications of Modi Government’s foreign policy style of ‘multivectored alignment’ in the Indo-pacific region? The paper by Mohanan Pillai argues that the dynamics of the international political economy determines the nature and direction of India’s foreign policy.

Third one is a report titled ‘Water Security in India; Threat Mapping: Impact of Climate Change’ prepared by Sourina Bej Research Associate ISSSP, National Institute of Advanced Studies, gives the scenario of water security in the context of India.

Water is an important security concern to high density populace countries of South Asia including India, Pakistan, Bangladesh, Nepal (and China), also account for half the world’s total groundwater use. In spite of being a region surrounded by the Himalayas to the north, sea in the southeast and southwest and having perennial and well-connected inland rivers, South Asia is already a ‘water-stressed’ region. And water has emerged to be a critical driver of conflicts in the region.

Water security is also linked with Human Security as it directly affects the human lives and economy. The report has focuses on a nation-wide projection with possible scenarios of water insecurity in India, based on qualitative understanding of water utilisation and management in the country. In this aspect, the report looks at the impact of climate change on water availability

by answering the basic question: How much role does Climate Change play in causing water security? Or is it merely aggravating an existing peril which is human induced?

The report demonstrates five contributing factors/parameters/issues to water insecurity including: ground water depletion, glacial retreat, rainfall, temperature, national water governance and civil society initiatives such as various water conservation practices.

As the political dymention and security patterns are changing everyday, the world's requirements to bringout new policies and strategies to counter new crisis's such as climate change, terrorism and human security risks are also in a process of continuous change. This volume illustrates on the major shifts and changes related to human security issues in this globalised world.

Major General ANM Muniruzzaman, ndc, psc (Retd.)
Editor

“New Trends in Peacekeeping: Fourth Generation UN Peacekeeping Operations”

*Major General ANM Muniruzzaman (retd)^{*1}*

Abstract

Not only the political scenarios have continued to change in the world but also does the global orders. Such changes have continued to change dynamics of conflict around the world. With changes in time and demand characteristics of UN, peacekeeping has also kept changing ever since 1948 till today which can be characterized as generations of peacekeeping. As the concept of peacekeeping is evolving, fourth generation peacekeeping requires different set of skills and expertise such as robust peacekeeping, peacebuilding or pre-deployment training in multidimensional peacekeeping operations. Despite changing a lot of characteristics from traditional peacekeeping there still remains a lot of challenges in the fourth-generation peacekeeping which must be addressed at a time of technology-based peacekeeping which is causing less boots on the ground. Hence, the main objective of this paper is to show the new trends in fourth generation peacekeeping in terms of peacekeeping operation and academic debates.

Introduction

Peace operations today have become a daily factor of news coverage all over the world and have turned out to be one of the core focuses of academic debates in the discipline of international security. Peacekeeping is one of the well-known activities of United Nation(UN). Today, peace operations are used as a tool of mediation, negotiation and conciliation which are supported by UN charter under conflict resolution.² Peace operations are formed under the principle

^{*1} Major General ANM Muniruzzaman (retd) is the President and CEO of Bangladesh Institute of Peace and Security Studies (BIPSS), a leading strategic and security think tank in South Asia. He is also the Chairman of Global Military Advisory Council on Climate Change (GMACCC). He is an experienced peacekeeper with long field experience and had the distinction of heading the post - election UN stabilisation mission in Cambodia.

² Kenkel, Kai. “Five Generations of Peace Operations: From the “thin Blue Line” to “painting a

on which UN was formed. Article 1 of UN charter explicitly mentions the purpose of UN that it is “to maintain international peace and security, and to that end: to take, and to bring about by peaceful means, and in conformity with the principles of justice and international law, adjustment or settlement of international disputes or situations which might lead to a breach of peace”.³ However, there is no reference regarding UN peacekeeping in the UN charter. The concept of modern day peacekeeping operations are the byproducts of more than fifty years of experience and are evolving accordingly to everyday global political situation. The ongoing changes in post-cold war situation in international politics and security continues to challenge international and regional peace. Hence, mandates in peace operations are also changing to fit accordingly. The aim of this paper is therefore to provide a broader picture of the recent trends regarding the fourth generation UN peacekeeping.

What is peacekeeping

Peacekeeping is one of the effective tools available to UN to help any country transform peace from conflict. Proven over the past two decades peacekeeping operations have provided security, helped establish a political stability and peacebuilding has supported different conflicted countries to make peace like in ‘Côte d’Ivoire’. UN peacekeeping is based on three basic principles viz Consent of the parties, Impartiality, Non-use of force except in self-defense and defense of the mandate.⁴ According to UN, till today, more than 3500 peacekeepers have sacrificed their own valuable life to establish global peace.⁵ Today’s peacekeeping operations are often known as ‘multidimensional peacekeeping’, which are targeted towards political transformation, provide protection to civilians, arrange free and fair elections, promote human rights and international law. Due to incomparable contribution in establishing peace over last sixty years, UN peacekeeping was awarded with Nobel Peace Prize.

The deployment and formation of a new operation is based on a standard, chain-based procedure. At first, when a situation develops into conflict, UN does its initial consultation which is usually through different UN actors or

Country Blue”.” *Revista Brasileira De Politica Internacional* 56, no. 1 (2013): 122-43

3 Malan, Mark. “Peacekeeping in the New Millennium: Towards ‘Fourth Generation’ Peace Operations?” *African Security Review* 7, no. 3 (1998): 13-20

4 Cooper, Andrew F., Jorge Heine, Ramesh Thakur, and Pierre Schori. “UN Peacekeeping.” In *The Oxford Handbook of Modern Diplomacy*, The Oxford Handbook of Modern Diplomacy, Chapter 44. Oxford University Press, 2013.

5 “Our Peacekeepers”. *United Nations Peacekeeping*. <https://peacekeeping.un.org/en/our-peacekeepers>.

regional/intergovernmental bodies. Secondly, when the situation further escalates towards conflict, the secretariat usually carries out a technical assessment of the probable mission. This is proper deep assessment taking account of security, political, humanitarian aspects and the cost of the mission. Along with the deep assessment report, the motion is placed in the UN security council for a resolution, where the resolution determines the mandate and size of the mission accordingly.⁶ Finally, the UN appoints senior officials who do the final planning or coordination (administratively and logistically) before a final deployment. These UN peacekeepers are military, police and civilian personals all working together to defend the complex and multidimensional mandates.

What is peacebuilding

The 2000 report of the Panel on United Nations Peace Operations (also known as the Brahimi Report) defined Peacebuilding as “activities undertaken on the far side of conflict to reassemble the foundations of peace and provide the tools for building on those foundations something that is more than just the absence of war”.⁷ Also, according to Raian Hossain, “The notion of ‘Peacebuilding’ emerged with an understanding to promote sustainable peace by addressing the origin of a violent conflict in order to ensure capacity for maintaining peace and resolving conflicts”.⁸ As dynamics of conflicts have changed from intra-state to inter-state, peacebuilding activities have turned out to be a vital tool in establishing stability and containing conflicts. Peacebuilding activities consist of promoting security, supporting infrastructural development, providing humanitarian assistance, helping in establishing a proper governance system, stabilizing economy, children and gender-based initiatives and maintaining the rule of law.⁹ These Peacebuilding activities have proved to help reduce

6 “Forming a new operation”. *United Nations Peacekeeping*. <https://peacekeeping.un.org/en/forming-new-operation>.

7 Sobu, Laurentiu. “THE BRAHIMI’S REPORT THE UNITED NATIONS AFTER BRAHIMI’S REPORT.” *International Scientific Conference “Strategies XXI”* 1 (2013): 175-82.

8 Hossain, Raian. 2018. “Peace Support Operation in Transition: Fourth generation UN peacekeeping”. *Bipss.org.bd*. http://www.bipss.org.bd/index.php?option=com_content&view=article&id=1071:peace-support-operation-in-transition-fourth-generation-un-peacekeeping&catid=76&Itemid=463

9 Vogel, Birte, Oliver P. Richmond, Roger Mac Ginty, Ioannis Tellidis, and Stefanie Kappler. “Peacebuilding.” *Peace Review* 26, no. 4 (2014): 517-19.

the amount of intrastate conflicts like civil wars and increased international cooperation in tackling a conflict situation. Also, according to Human Security Report 2009/2010, there has been an 'extraordinary decline' in the amount of interstate conflicts and reduced its possibility of recurring.¹⁰ However, peacebuilding activities are often criticized for not providing a durable solution like democratic practice. Hence, often some short time peacebuilding activities cause dissatisfaction and unrest among citizens.

Historical development of UN peacekeeping

United Nations came into being on 24th October 1945 with an aim to be a better arbitrator body to maintain worldwide peace after the failed attempt of the League of Nations¹¹. As the nature of the conflicts are evolving, UN peacekeeping operations have also changed. These changes are also categorized in generations of peacekeeping. Officially, UN peacekeeping came into play after the UN Security Council authorized military observers in the Middle East. The role of the first observer mission known as United Nations Truce Supervision Organization(UNTSO) was to overview the 'armistice agreement' between Israel and the Arab countries regarding the Arab-Israel conflict.¹² UN formed its first Emergency Force after the Suez war and formed a special committee on peacekeeping operations. Ever since then, there have been 71 UN peace missions. With the changes in the socio-political aspects, the general nature of conflicts is also changing.¹³Hence, UN peacekeeping is taking shapes in new dimensions. During the cold war period, the main objective of UN peacekeeping was only to maintain cease-fires and provide traditional security. Some UN missions have failed to protect their cause due to its complexity in the mandate like in Srebrenica, Somalia and Rwanda.¹⁴ Because socio-political contexts have dramatically changed the requirements of establishing peace, operations are no longer confined to a certain time period but rather the factor

10 "PRESS CONFERENCE ON 2009/2010 HUMAN SECURITY REPORT." *States News Service*, 2010.

11 Ali, Md.Lokman. The changing Nature of United Nations Peacekeeping operations: Challenges for the troops contributing countries. *BUP journal*, no. 6 (2018).

12 Kenkel, Kai. "Five Generations of Peace Operations: From the "thin Blue Line" to "painting a Country Blue"." *Revista Brasileira De Politica Internacional* 56, no. 1 (2013): 122-43

13 Bothe, Michael., and Do rschel, Thomas. *UN Peacekeeping: A Documentary Introduction*. The Hague; Boston: Kluwer Law International, 1999.

14 Malan, Mark. "Peacekeeping in the New Millennium: Towards 'Fourth Generation' Peace Operations?" *African Security Review* 7, no. 3 (1998): 13-20

of 'robust' peacekeeping have become a point. Since 'peacebuilding' is an important aspect in 'multidimensional peacekeeping', therefore the factor of protecting civilians have been a new challenge on recent ongoing missions.

Generations of Peace operation

First generation peace operations: traditional peacekeeping

Peace operations originally are a byproduct of conflict resolution mechanism of League of Nations. Ever since its official beginning till the time of end of cold war, peace operations are known as 'traditional peacekeeping'. The main objective of first generation peacekeeping was to end armed based conflicts and arrange ceasefire. A hallmark activity of traditional peacekeeping was the deployment of Interposition Buffer Force in frontlines which reduced the possibility of sudden and accidental conflict between states. This first-generation peacekeeping often provided the space of finding a peaceful solution to a conflict, a means to monitor borders and certify the demilitarized zones.¹⁵ The traditional mean of peacekeeping was where soldiers were completely unarmed and worked as 'soldier diplomats', hence had strict limitations in engagement with parties involved. During the cold war time there was a 'vertical relationship' between state rights and human rights which are followed in peace operations till this day. According to Bellamy and Willings, the basic three principles of peacekeeping are known as 'Holy Trinity'.¹⁶ Firstly, the consent of the host nation is very important, given that top priority lies in protecting a state's sovereignty. Keeping state sovereignty of the host nation and not getting involved in the conflict is a virtue of UN peacekeeping forces of conflict resolution. Examples of first generation peacekeeping are United Nations Truce Supervision Organization which was deployed in Middle East and United Nations Monitoring and Observation Group in India and Pakistan in Kashmir.¹⁷ First generation peacekeeping is often being accused of freezing the conflict and never helping to reach a final conclusion of the problem like Arab-Israel conflict or Kashmir conflict of India and Pakistan.

15 Modisett, Lawrence. "Blue Helmets: The Strategy of UN Military Operations." *Naval War College Review* 52, no. 2 (1999): 154-55.

16 Bellamy, Alex J, and Paul D Williams. "The West and Contemporary Peace Operations." *Journal of Peace Research* 46, no. 1 (2009): 39-57.

17 Kenkel, Kai. "Five Generations of Peace Operations: From the "thin Blue Line" to "painting a Country Blue"." *Revista Brasileira De Politica Internacional* 56, no. 1 (2013): 122-43

Second generation peacekeeping

By the end of the cold war the total international political scenario had changed which ultimately affected the nature of peace operations. By the end of the cold war, the decolonization process that had started in Africa often created a political vacuum in the political transition requiring international assistance in civil wars. These intrastate wars were often termed as 'new war' where the nature of conflict is no longer between states.¹⁸ Hence there was a shift in perception regarding the concept of peacekeeping from the first-generation peacekeeping. After the cold war, UN Security Council started to approve higher numbers of peacekeeping missions given their responsibility towards the international community. Even though the number of peace operations increased a lot, it became really tough to defend their mandates. One of the differences of second generation from first generation peacekeeping was that instead of 'freezing' the conflict as performed by the latter, the former tried to assist reaching towards peace.¹⁹ To cope with the changing scenarios after the post-cold war, Secretary-General Boutros Boutros-Ghani issued an 'Agenda for Peace' where he called for collective security and a change in dynamics of peace operations. This peacekeeping mission introduced the aspect of civilian and police involvement where use of force was still minimum. Hence, second generation peacekeeping missions consisted a mandate that included arranging free and fair elections, protecting human rights, providing protection to refugees and maintaining law and order of the conflict-prone county.²⁰ This document sets up the five types of activities of UN peacekeeping which are still valid today. Due to the mandate's and organizational failure of UN peacekeepers in Rwanda, Somalia, Bosnia and Srebrenica, the world had to rethink about the role of UN peacekeepers. During second generation peacekeeping, UN embarked on multi-functional and multi-dimensional approach of peacekeeping.

18 Fetherston, A. B. *Towards a Theory of United Nations Peacekeeping*. New York, N.Y. : Basingstoke: St. Martin's Press ; Macmillan, 1994.

19 Ogunnusi, Michael. "UNDERSTANDING PEACEKEEPING." *British Journal of Community Justice* 8, no. 3 (2010): 107-08.

20 Malan, Mark. "Peacekeeping in the New Millennium: Towards 'Fourth Generation' Peace Operations?" *African Security Review* 7, no. 3 (1998): 13-20

Third generation peace operations: Peace enforcement

Third generation peace operations are often known as 'Peace Enforcement' operations, where the peacekeepers had the permission to use force to establish peace. The third-generation peacekeeping mandate wasn't very different than that of second generation peacekeeping but were dispatched under chapter VII of UN charter.²¹ The importance of third generation peacekeeping arose after the three big failures in peacekeeping in the 1990s in Rwanda, Somalia and Bosnia. For example, the situation in Somalia under the second generation gave rise to questions about the consent of peacekeeping in a failed state. Hence, the UN's response to such failure was through the approval of the use of force. The concept of use of force often created a complexity between sovereignty, non-intervention and human rights. These factors with the previous lessons from failed missions made the UN report known as Brahimi Report in 2000. This report contained a detailed 69 recommendations of reformation regarding peace operations.²² The third-generation peacekeeping approved the use of force taking account of the humanitarian factor. Protecting human rights under humanitarian ground became an important aspect in third generation peacekeeping which gave rise to 'humanitarian intervention'.²³ The balance between the factor of non-intervention (breaching state sovereignty) and protecting human rights evolved the concept of 'responsibility to protect' (R2P). Alongside these military interventions, third generation peacekeeping often included the civilian context of restoring peace.²⁴

Fourth- generation peace operations

The evolving fourth generation peacekeeping is the latest edition of UN peacekeeping. The emergence of fourth generation peacekeeping has conjured some special characteristics and features. This section of the paper will

21 Osman, Mohamed Awad. *The United Nations and Peace Enforcement : Wars, Terrorism and Democracy*. Aldershot: Ashgate, 2002.

22 Sobu, Laurentiu. "THE BRAHIMI'S REPORT THE UNITED NATIONS AFTER BRAHIMI'S REPORT." *International Scientific Conference "Strategies XXI" 1* (2013): 175-82.

23 Nasu, Hitoshi. "Operationalizing the Responsibility to Protect in the Context of Civilian Protection by UN Peacekeepers." *International Peacekeeping* 18, no. 4 (2011): 364-78.

24 Bellamy, Alex J., Tim Dunne, and Paul D. Williams. "The R2P, Protection of Civilians, and UN Peacekeeping Operations." In *The Oxford Handbook of the Responsibility to Protect*, The Oxford Handbook of the Responsibility to Protect, Chapter 28. Oxford University Press, 2016

elaborate about these special features and characteristics of 'fourth generation' peacekeeping.

Firstly, fourth generation peacekeeping is also known as 'robust peacekeeping'. Civil wars in the last two decades which had cost uncountable number of casualties had always demanded UN peacekeeping force to respond accordingly and effectively. This necessity brought up the discussion for the need of Robust Peacekeeping. Especially the failure of UN peacekeepers to protect civilians in Rwanda's genocide and the humanitarian crisis in Yugoslavia proved the need for robust peacekeeping. These robust peacekeeping missions do have the permission to use or apply force to enhance civilian tasks.²⁵ One of the main objectives of robust peacekeeping missions is to protect civilians' imminent threats. Hence, fourth generation robust peacekeeping is provided with robust mandates which permits UN peacekeepers to take immediate appropriate measures to safeguard civilians from any kind of threat under chapter VII.²⁶ In robust peacekeeping missions, such consent is not mandatory once it has been authorized by UNSC. Also, in traditional peacekeeping the use of force was only in self-defense, but in fourth generation robust peacekeeping, it is for both self-defense and for the protection of civilians.

Secondly, one of the important aspects of fourth generation peacekeeping is 'peacebuilding'. In the previous generations of peacekeeping it was seen that either peacekeepers had failed to establish peace or peace prevailed as long as peacekeepers stayed in the conflict region. Hence, fourth generation is targeted towards establishing sustainable peace even after withdrawal of peacekeeping forces. Peacebuilding operations aim to achieve their end through a two-tier process of political institutionalization and economic liberalization.²⁷ The process of peacebuilding is done through shaping government institutions or systems like law enforcement, education and/or health care facilities or establishing independent election commissions and judiciary systems, which

25 Tardy, Thierry. "A Critique of Robust Peacekeeping in Contemporary Peace Operations." *International Peacekeeping* 18, no. 2 (2011): 152-67.

26 Nadin, Peter, Patrick Cammaert, and Vesselin Popovski. "Role and Development of Robust Peacekeeping." *Adelphi Papers* 54, no. 449 (2014): 75-102.

27 Hossain, Raian. 2018. "Peace Support Operation in Transition: Fourth generation UN peacekeeping". *Bipss.org.bd*.

http://www.bipss.org.bd/index.php?option=com_content&view=article&id=1071:peace-support-operation-in-transition-fourth-generation-un-peacekeeping&catid=76&Itemid=463

is often known as 'state building'.²⁸ Often such peacebuilding activities are often academically criticized as new form of international intervention and a breach of a states' sovereignty. Though Peacebuilding is designed to resolve the root cause of the conflict and authoritatively try to create a condition for peace, it is often done with force for creating a condition for long lasting peace.

Thirdly, the factor of gender equality is given topmost priority in fourth generation peace operations. Even though women had continued to work as peace agents even in armed conflicts, they have been unrecognized for long. UN peacekeeping organizations are obliged to follow the mandates as per the UN Security Council's (UNSC) resolutions on women, peace and security in all peacekeeping operations. For example, the very first landmark resolution of UNSC resolution 1325 in 2000 recognized the effect of armed conflict on women and children and also the role of women as peace agents, which was followed by further 7 more UNSC resolutions.²⁹ In fourth generation peacekeeping, gender advisors are also deployed in multidimensional peacekeeping operations, so the gender perspective is fully integrated in peacekeeping operations.³⁰ These gender advisors' work in teams so women can voice their needs and are equally prioritized in all functioning components of UN peacekeeping. This is to make sure women have equal opportunities for political participation and are provided with protection from gender-based violations. According to HerveLadsous, head of UN peacekeeping, "Women can and must play a leading role in political participation, conflict resolution and the transition from conflict to peace".³¹ Hence, the factor of gender equality has played a major role in bringing positive impact on environments of peacebuilding and protecting women's rights.

Fourthly, in coping with different difficulties of multidimensional peacekeeping, United Nations has shown greater interest towards regional forces or regional organizations. These include the regional organizations like NATO or Organization for Security and Co-Operation in Europe (OSCE),

28 Brusset, Emery, De Coning, Cedric, Editor, Hughes, Bryn W., Editor, and SpringerLink. *Complexity Thinking for Peacebuilding Practice and Evaluation*. 2016.

29 Athie, Aïssata et al. 2018. "UN Peacekeeping: Where is the Gender Expertise?". *IPI Global Observatory*. <https://theglobalobservatory.org/2017/10/un-peacekeeping-where-is-the-gender-expertise/>.

30 Karim, Sabrina, and Kyle Beardsley. "Explaining Sexual Exploitation and Abuse in Peacekeeping Missions: The Role of Female Peacekeepers and Gender Equality in Contributing Countries." *Journal of Peace Research* 53, no. 1 (2016): 100-15.

31 "Briefing by Under-Secretary-General HervéLadsous to the Security Council on Women, Peace and Security". *United Nations Peacekeeping*. <https://peacekeeping.un.org/en/briefing-under-secretary-general-herve-ladsous-to-security-council-women-peace-and-security>.

OAU and etc.³² For example, if UN is thinking about deployment of any peace operation in any African country, surely any other African country or force of African Union will be most prioritized. The preference toward regional forces or organizations is to make the peacekeepers feel at home with the host country.³³ This also helps to build confidence among them. Also, peacekeepers of the same region or continent will have a greater understanding of the conflict and mostly assist in communicating easily in conflict situations.³⁴

Fifthly, the factor of pre-deployment training and language proficiency is a notable characteristic of fourth generation peacekeeping. As fourth generation peacekeeping consists of robust peacekeeping and peacebuilding activities, UN has made it mandatory that pre-deployment training is provided to peacekeepers.³⁵ Even though there is a factor of regional preference, but South Asian countries still continue to play an important role as the leading troop-contributing countries, where conflicts are more towards Africa. Hence, peacekeepers' pre-deployment training is mandatory as peacekeepers must have minimum knowledge about history of the conflict, language spoken in the host country, geographical idea etc.³⁶ Also, as seen in previous generations, language was one of the most important barriers in establishing effective communication with native locals. The military training received in pre-deployment are also tailor-made according to the weather and region like gaining enough empiricism to operate in forest or hilly areas, which a lot of troop-contributing military was never trained in for their own country. However, DPKO-DFS has failed to provide a global training architecture, or a globally recognized framework for training is not as organized as it should

32 Kenkel, Kai. "Five Generations of Peace Operations: From the "thin Blue Line" to "painting a Country Blue"." *Revista Brasileira De Politica Internacional* 56, no. 1 (2013): 122-43

33 Curran, David, Fraser, Trudy, Editor, Roeder, Larry W., Editor, Zuber, Robert William, Editor, and SpringerLink. *Perspectives on Peacekeeping and Atrocity Prevention : Expanding Stakeholders and Regional Arrangements*. Humanitarian Solutions in the 21st Century. 2015.

34 Hossain, Raian. 2018. "Peace Support Operation in Transition: Fourth generation UN peacekeeping". *Bipss.org.bd*.
http://www.bipss.org.bd/index.php?option=com_content&view=article&id=1071:peace-support-operation-in-transition-fourth-generation-un-peacekeeping&catid=76&Itemid=463

35 "ICRC AND PNGDF IN PRE-DEPLOYMENT BRIEFING FOR UN PEACEKEEPING OPERATIONS." *States News Service*, 2016.

36 "Research Guides: DPKO-DFS Core Pre-deployment Training Materials (CPTM 2017) for United Nations Peacekeeping Operations: CPTM Introduction". *Research.un.org*. <http://research.un.org/revisedcptm2017>.

be. Troops-contributing countries are only provided with pre-deployment training materials only.

Sixthly, another significant characteristic of fourth generation peacekeeping is that it is 'hybrid' in nature, meaning that these types of missions deploy troops and police contingent in a mixed command mechanism. In hybrid operations, along with UN peacekeepers, other regional organizations deploy troops in the same mission through different command chains and defend different mandates.³⁷ These hybrid missions tend to be different than third generation peace enforcement by force in that sense that UN peacekeepers work alongside other regional organizations' deployed troops. The emergence of hybrid operations is due to the division of labour in the global system to operate where UN peacekeepers are not the only organizational forces working to establish peace. ³⁸Often, such hybrid operations have turned non-effective as there are sometimes conflicts of interests according to the mandates of UN peacekeepers and other regional organizations. For example, NATO member states often send troops on their own in the name of protecting civilians and defending human rights, such as the intervention in Iraq or had worked in the UN-endorsed International Security Assistance Force in Afghanistan. The example of perfect hybrid operation would be how NATO deployed the Kosovo Protection Force (KFOR) who looked at the security aspect of hybrid mission in Kosovo while OSCE handled the institutional building aspect.³⁹

Seventhly, in keeping up with the technological advancement, fourth generation UN peacekeeping has turned out to be based on modern technology known as 'tech enabled peacekeeping'. As the natures of the conflicts are changing due to use of cell phones, internet and GPS, UN peacekeepers have also made significant progresses in adapting.⁴⁰ Firstly, and most importantly, UN has adopted a strategy for technology and innovation in peacekeeping. This strategy allows technology-rich developed nations to share their

37 Baba, Gürol, and Stephen Slotter. "Successful Peacekeeping by Regional Organizations: Necessarily Hybrid." *Uluslararası Hukuk ve Politika* 10, no. 37 (2014): 1-28.

38 Kenkel, Kai. "Five Generations of Peace Operations: From the "thin Blue Line" to "painting a Country Blue"." *Revista Brasileira De Política Internacional* 56, no. 1 (2013): 122-43

39 Hossain, Raian. 2018. "Peace Support Operation in Transition: Fourth generation UN peacekeeping". *Bipss.org.bd*.
http://www.bipss.org.bd/index.php?option=com_content&view=article&id=1071:peace-support-operation-in-transition-fourth-generation-un-peacekeeping&catid=76&Itemid=463

40 Sarkar, Dibya. "UN Report Focuses on Modern Technology to Improve Peacekeeping Missions." *FierceGovernmentIT* (Newton), 2015.

expertise among troops and police-contributing countries. UN missions use modern day satellite images, drones, GPS, night vision goggles and IT. The use of technology in peacekeeping has allowed general people to contribute in establishing peace. As fourth generation peacekeeping is heavily based on technology, it is often known as 'smart peacekeeping'.⁴¹ These technological advancements in UN peacekeeping have surely reduced the risks of loss of life of the UN peacekeepers. Hence, technological advancement has contributed positively both in headquarters and on field.

Eighthly, in fourth generation peacekeeping there is preponderance to civilian and police peacekeepers. As fourth generation peacekeeping is targeted toward establishing a sustainable peace even after UN troops retreat, there is an increased role of non-military peacebuilding through NGOs and civilian peacekeepers. As military do not always have the expertise in peacebuilding activities and ability to work alongside local administration, the role of civilian peacekeepers is becoming ever important. Also, these civil peacekeepers work in monitoring and maintaining peace after military peacekeepers leave the mission or declare it closed.⁴² Furthermore, certain conflicts are not only in need for troops and require UN police peacekeepers to tackle severe political riots and unrest. UN police peacekeepers help maintaining law and order when they are in need.

Ninthly, another important thing to note in fourth generation peacekeeping is that there tends to be less boot on the ground. Certain military requirements such as intelligence, which was previously gathered manually, is replaced by satellite imaging or technological operation which was done manually can easily be done with help of drones. Also, in fourth generation peacekeeping operations, civilian components will be given more priority. As machines are going to replace humans, a lot of the functions that are classically performed by troops on the ground will be overtaken by the machines.⁴³ There will be a drastic decrease in the number of troops on the ground. This will also affect the numbers of traditionally contributing third-world countries involved in missions.

41 Guin, Subir. "Smart Peacekeeping: Toward Tech- Enabled UN Operations." *Peace Magazine* 32, no. 4 (2016): 30.

42 Reddy, Peter, Ph. D, Reddy, Peter, and Ebooks Corporation. *Peace Operations and Restorative Justice Groundwork for Post-conflict Regeneration*. Justice, International Law and Global Security. Burlington, Vt.: Ashgate, 2012.

43 Johnson, Aaron. 2016. "Robots could eventually replace soldiers in warfare. Is that a good thing?". https://www.washingtonpost.com/news/innovations/wp/2016/10/05/robots-could-eventually-replace-soldiers-in-warfare-is-that-a-good-thing/?utm_term=.1a0c34b70f33.

Tenthly, the nature of logistics provided on the field will be completely redrawn due to the considerations of heavy integration of machines and high-tech equipment.⁴⁴ Due to this, the logistic support will undergo a major change. In many cases the logistic support provided to the troops and field may not be a single country contribution but a multi-country one because some of the high-tech equipment like satellite will be owned by other nations.

This segment of the paper will focus on the Challenges pertaining to Fourth generation UN Peacekeeping.

Expensive

The 4th generation challenges spin off with the expenses on field, given that the present scenario of the operations are equipment-heavy, moreover high-tech. Therefore, the cost of bearing equipment goes very high.⁴⁵ The loops between meeting the ends and utilizing means are going to be an obstruction for the peacekeepers. Overall costings of operations and troops contributing countries are going to be high in the context of requirements. Funding becomes a challenge in this context for the operations, given that the dependency on modern tools and technologies such as drones, satellites, robotics etc require heavy funding and cause the operations to be very expensive.

Modern Technology isn't Tested

Technology that are deployed in the field have not been tested in terms of the nature of operations. High sensitive sensors, for example, satellite imagery, geo-satellites etc have not been verified regarding stability in field during operations.⁴⁶ As the mandates vary, so do the geographical location. However, the equipment and modern-day technology being used in fourth generation peacekeeping tends to be same and is not varied accordingly. Hence, modern day technology must be tested, and their deployment must be approached thoroughly.

44 "United Nations Peacekeeping Missions Military Logistics Unit Manual". *Enopu.edu.uy*. <http://www.enopu.edu.uy/wp-content/uploads/Logistics-Unit-Manual.pdf>.

45 "Where does the \$8bn UN peacekeeping budget go?". *The Guardian*. (2-18). <https://www.theguardian.com/global-development-professionals-network/2016/apr/06/where-does-8bn-un-peacekeeping-budget-go>.

46 "United Nations Peacekeeping Missions Military Logistics Unit Manual". *Enopu.edu.uy*. (20) <http://www.enopu.edu.uy/wp-content/uploads/Logistics-Unit-Manual.pdf>.

1st World Dependency

Since the operations are costly, many of the 3rd world countries will find it difficult to equip the battalions. Furthermore, many of the 3rd world troops have not been exposed to these kinds of operational means. In that circumstance, even if they can master the funds, the battalions are not ready for the utilization of these kinds of equipment. Primarily, dependency will grow on the 1st world nation armies who contain both the technical know-how and financial capabilities to support these operations. However, the major challenge lies within 1st world countries not being troops-contributing countries but the countries who contribute troops do not contain the former two qualities, hence the mismatch is inevitable.

Need for Human Factor for Conflict Mediation

Mediation and resolution of conflict is a human-driven aspect that cannot be solved mechanically. The shift from human dependence to machine dependence is going to impact the ability to negotiate and mediate through human drives. Even though machines have been proven to be more efficient, there are certain complex times which require human decisions.⁴⁷ In fourth generation peacekeeping, as there is a component of peacebuilding, humans still have a greater role in peacekeeping operations.

Impartiality of Regional Troops

In certain operations, local contribution of troops becomes a noteworthy mean. Despite having a lot of advantages of regional force in peacekeeping missions, as they are from same region or continent already have a biased perspective about the conflict. So, often regional preferred peacekeepers are busier defending their own view than that of agreed mandate provided to them. In the African context, it's been seen that regional troops become part of the conflict, such as the case of Central African Republic. In many cases, the required objective impartiality isn't going to be met. Hence, the new set of suggestion that is emerging is that a mix of regional and non-regional peacekeeping force.

⁴⁷ Johnson, Aaron. 2016. "Robots could eventually replace soldiers in warfare. Is that a good thing?". https://www.washingtonpost.com/news/innovations/wp/2016/10/05/robots-could-eventually-replace-soldiers-in-warfare-is-that-a-good-thing/?utm_term=.1a0c34b70f33.

Lack of Coordination between Civil and Military Troops

The operations will be quite heavily dependent on civilians, NGOs and CSOs. As it stands even today, the coherence in understanding the operation between the military and civilian component is not very functional.⁴⁸ As the ratio to this incoherence changes further, to build up the connectedness will be more complex. The nature of the operations of the two components are very different, given that the nature of operations of the military are not quite compatible with the civilian component because they function under different guidelines. The primary difficulty is going to be the operational integration and coherence.

Cyber Security

The placement of high-tech equipment on the field is going to trigger the sensitivity of cyber security such as the usage of satellite-based equipment and sensors and because of this, the operation security can also be jeopardized by cyber threats. Malware and bugs can easily access the high-tech equipment and endanger the operation. With the increase of cyber power on field, another dimension of vulnerability is going to be added during the missions.⁴⁹

Complexity in Intelligence Gathering

A lot of the collection and compilation of the intelligence will be machine-based. Satellite imagery, satellite sensing etc conducts will take over the data collection in this regard. The interface between the procedure of intelligence gathering in a human based and machine based have not been worked out very carefully. Here, another mismatch will sprout for the operations.

Digital Solutions to Analog Problems

The nature of conflict situations is extremely complex, given that the conflict does not reside within a military barrier. The complexities may have social, historical, resource-related, religious, economic, political etc elements in them.

48 Ramarajan, Lakshmi, Katerina Bezrukova, Karen A Jehn, Martin Euwema, and Nicolien Kop. "RELATIONSHIP BETWEEN PEACEKEEPERS AND NGO WORKERS: THE ROLE OF TRAINING AND CONFLICT MANAGEMENT STYLES IN INTERNATIONAL PEACEKEEPING." *International Journal of Conflict Management* 15, no. 2 (2004): 167-91.

49 The UN Takes a Big Step Forward on Cybersecurity | Arms Control Association". *Armscontrol.org*. https://www.armscontrol.org/act/2013_09/The-UN-Takes-a-Big-Step-Forward-on-Cybersecurity.

The combination of all these elements may exist in the conflict. These aren't absolute battle scenarios for the sole implementation of military operation and formula. These turn into complex social scenarios, or a slow-paced analog problem, hence requiring a more analog approach to its mediation than the fast-paced digital solution that the operations usually turn towards. In many cases, therefore, the digital approach to mediation may not work out.

Change in Command Structure

The entire UN command structure has been built on classical peacekeeping. In terms of robust peacebuilding, it becomes a challenge for the 4th generation to gear the issues because the command structure may not be clear to the dynamics of such operations. For the command structure to function flawlessly in this term, it is necessary to undergo a reorientation to the operation and its methods.⁵⁰ The command structure must be introduced to the expertise in conflict environments for robust missions in the required manner.

Logistics

Robust peacebuilding consists of the usage of various complex gadgets and equipment. Another challenge for the operations arises regarding the logistics required to back up these high-tech equipment and resources. Logistic supports in this regard have yet not been built to the required mark.⁵¹ For example, it is very normal for any third-world peacekeeping country to not have the know-how for backing up the satellite maintenance on field. High-tech gear requires a complete reorientation of the very concept of logistic support in the field.

Challenges in Deployment

In operations, deployment on field will be quite a task. Before the 4th generation module, deployment was not as complex given that basic equipment and weapons were in use. However, the introduction of complex instruments on field will bring a change to the face of the operations, hence bringing a change to deployment as well.⁵² Given that many of the conflict prone zones are

50 Slotter, Stephen, and Gürol Baba. "Successful Peacekeeping by Regional Organizations: Necessarily Hybrid." *UluslararasıHukukVePolitika*, no. 37 (2014): 1-28.

51 "The Challenges of Contemporary Peacekeeping." *The Adelphi Papers* 33, no. 281 (1993): 26-50.

52 MunaNdulo. "UNITED NATIONS PEACEKEEPING OPERATIONS AND SECURITY AND RECONSTRUCTION +." *Akron Law Review* 44 (2011): 769-1211.

extremely remote and low tech, it will raise a situation for the peacebuilders to deploy both manpower and equipment strategically to meet the ends of operations.

Gender Heaviness

Operations in 4th generation peacekeeping will contain a gender heaviness in systems. Many conflict-ridden societies are not quite ready for these kinds of gender heavy operations where there will be a preeminent role of female peacekeepers.⁵³ There are many battalions being deployed by the UN consisting women only, and it becomes a challenge for the UN as well if the mental preparedness in the conflict area are not ready completely to accept these gender-heavy deployments.

Is Fifth generation in the horizon?

One of the most important ongoing debate regarding UN peacekeeping is about the emergence of fifth generation UN peacekeeping. The question remains within considering the effect of increase in use of artificial intelligence (AI) in UN peacekeeping. As peacekeeping operations are not confined to the concept of traditional peacekeeping, the increasing use of AI might be an important tool in achieving United Nations' Sustainable Development Goals (SDGs) which are effective enabling tools for peacebuilding. As UN peacekeeping is no longer confined towards traditional peacekeeping, the increasing use of AI would help establish sustainable peace by providing solutions related to poverty, health, education, environment, migration etc.⁵⁴ For example, the use of AI on thorough satellite mapping and data analysis would be quick and efficient without human errors. Also, the increasing use of military robots like drones to driverless tanks and automated machine guns will provide extra added advantage to UN peacekeeping. These might reduce the loss of life of UN peacekeepers in battle fields. UN seeks to formulate a specialized department, 'Artificial Intelligence Advisers', in peacekeeping operations. On the other hand, the excessive use of AI and robots might

⁵³ UNIFIL's Sector East organizes all-female patrol". *United Nations Peacekeeping*. <https://peacekeeping.un.org/en/unifils-sector-east-organizes-all-female-patrol>.

⁵⁴ "UN artificial intelligence summit aims to tackle poverty, humanity's 'grand challenges'". *UN News*.(2017). <https://news.un.org/en/story/2017/06/558962-un-artificial-intelligence-summit-aims-tackle-poverty-humanitys-grand>

replace humans which might place third-world troops-contributing countries at greater risks. According to Prof Noel Sharkey, co-founder of the Foundation for Responsible Robotics, "On one hand, any new legislation must be nuanced so that it doesn't stifle innovation. On the other, it's important to place the responsibility for this technology squarely on the humans behind the robots - and to ensure their accountability".⁵⁵

Recommendations-

- Since fourth generation peacekeeping is bringing in some fundamental changes to the concept of peacekeeping it is recommended that UN should form an expert body to review the whole concept of peace operations and suggest meaningful and sustainable changes.
- All troops contributing countries must be adequately informed and educated to retrain and reequip their troops for this generation of peacekeepers. UN must come up with a concrete pre-deployment global training scheme because standardized peacekeepers aren't still ready enough to adapt to the mechanism of robust peacekeeping and peacebuilding activities.
- The aspect of financing of peacekeeping operations must be taken into consideration as countries which are traditionally troops contributing countries are unable to continue due to increase in cost of peacekeeping operation.
- Fourth generation peacekeeping which is also known as smart peacekeeping will have to bring in a new breed of command, control and communication mechanism. So, many of the traditional aspects of command and control will go through revolutionary changes as we embark on these methods of operations for which a set of concrete restructuring of command system will have to be put in place.
- As the natures of conflicts are changing and there is an increase in the use of AI in peacekeeping operations, the role of humans in conflict mediation should not be overlooked and it is important to have humans behind the robots for decision making.
- It is very important to have a concrete doctrine to let civilian staff,

⁵⁵ New UN agency set to monitor threats from AI and robotics". <https://www.irishtimes.com/news/world/europe/new-un-agency-set-to-monitor-threats-from-ai-and-robotics-1.3237275>.

police and soldiers know about their authority and task which should be carried out in an agreed-upon strategy which will help to curb the problem of deployment in fourth generation peacekeeping.

Conclusion

Fundamental change is taking place in a conflict environment and to cope with this dynamic change the concept and operation of peacekeeping is adopting and changing itself. Living in a complex environment where the nature of the conflict today is over into a complex nature of interplay between society, conflicting parties and the international system. It thus poses new challenges how UN operates in conflict situations. However, there is host of new capacity and capability provided by modern science and technology. The evolving nature of peacekeeping missions particularly in the fourth generation is beginning to take advantage of this capacity which if properly applied can be a force multiplier. The nature of peacekeeping is constantly evolving, and it needs to be studied carefully and analyzed completely.

Bibliography

Ali, Md.Lokman. The changing Nature of United Nations Peacekeeping operations: Challenges for the troops contributing countries. BUP journal, no. 6 (2018).

Athie, Aïssata et al. 2018. "UN Peacekeeping: Where is the Gender Expertise?". *IPi Global Observatory*. <https://theglobalobservatory.org/2017/10/un-peacekeeping-where-is-the-gender-expertise/>.

Baba, Gürol, and Stephen Slotter. "Successful Peacekeeping by Regional Organizations: Necessarily Hybrid." *Uluslararası Hukuk ve Politika* 10, no. 37 (2014): 1-28.

Bellamy, Alex J, and Paul D Williams. "The West and Contemporary Peace Operations." *Journal of Peace Research* 46, no. 1 (2009): 39-57.

Bellamy, Alex J., Tim Dunne, and Paul D. Williams. "The R2P, Protection of Civilians, and UN Peacekeeping

"Briefing by Under-Secretary-General Hervé Ladsous to the Security Council on Women, Peace and Security". *United Nations Peacekeeping*. <https://peacekeeping.un.org/en/briefing-under-secretary-general-herve-ladsous-to-security-council-women-peace-and-security>.

Operations." In *The Oxford Handbook of the Responsibility to Protect*, The Oxford Handbook of the Responsibility to Protect, Chapter 28. Oxford University Press, 2016

Bothe, Michael., and Dörschel, Thomas. *UN Peacekeeping: A Documentary Introduction*. The Hague; Boston: Kluwer Law International, 1999.

Brusset, Emery, De Coning, Cedric, Editor, Hughes, Bryn W., Editor, and SpringerLink. *Complexity Thinking for Peacebuilding Practice and Evaluation*. 2016.

Cooper, Andrew F., Jorge Heine, Ramesh Thakur, and Pierre Schori. "UN Peacekeeping." In *The Oxford Handbook of Modern Diplomacy*, The Oxford Handbook of Modern Diplomacy, Chapter 44. Oxford University Press, 2013.

Curran, David, Fraser, Trudy, Editor, Roeder, Larry W., Editor, Zuber, Robert William, Editor, and SpringerLink. *Perspectives on Peacekeeping and Atrocity Prevention : Expanding Stakeholders and Regional Arrangements*. Humanitarian Solutions in the 21st Century. 2015.

Fetherston, A. B. *Towards a Theory of United Nations Peacekeeping*. New York, N.Y. : Basingstoke: St. Martin's Press ; Macmillan, 1994.

Guin, Subir. "Smart Peacekeeping: Toward Tech- Enabled UN Operations." *Peace Magazine* 32, no. 4 (2016): 30.

Hossain, Raian. 2018. "Peace Support Operation in Transition: Fourth generation UN peacekeeping". *Bipss.org.bd*.

http://www.bipss.org.bd/index.php?option=com_content&view=article&id=1071:peace-support-operation-in-transition-fourth-generation-un-peacekeeping&catid=76&Itemid=463h

"ICRC AND PNGDF IN PRE-DEPLOYMENT BRIEFING FOR UN PEACEKEEPING OPERATIONS." *States News Service*, 2016.

Johnson, Aaron. 2016. "Robots could eventually replace soldiers in warfare. Is that a good thing?". https://www.washingtonpost.com/news/innovations/wp/2016/10/05/robots-could-eventually-replace-soldiers-in-warfare-is-that-a-good-thing/?utm_term=.1a0c34b70f33.

Karim, Sabrina, and Kyle Beardsley. "Explaining Sexual Exploitation and Abuse in Peacekeeping Missions: The Role of Female Peacekeepers and Gender Equality in Contributing Countries." *Journal of Peace Research* 53, no. 1 (2016): 100-15.

Kenkel, Kai. "Five Generations of Peace Operations: From the "thin Blue Line" to "painting a Country Blue"." *Revista Brasileira De Politica Internacional* 56, no. 1 (2013): 122-43

Malan, Mark. "Peacekeeping in the New Millennium: Towards 'Fourth Generation' Peace Operations?" *African Security Review* 7, no. 3 (1998): 13-20

Modisett, Lawrence. "Blue Helmets: The Strategy of UN Military Operations." *Naval War College Review* 52, no. 2 (1999): 154-55.

MunaNdulo. "UNITED NATIONS PEACEKEEPING OPERATIONS AND SECURITY AND RECONSTRUCTION +." *Akron Law Review* 44 (2011): 769-1211.

Nadin, Peter, Patrick Cammaert, and VesselinPopovski. "Role and Development of Robust Peacekeeping." *Adelphi Papers* 54, no. 449 (2014): 75-102.

Nasu, Hitoshi. "Operationalizing the Responsibility to Protect in the Context of Civilian Protection by UN Peacekeepers." *International Peacekeeping* 18, no. 4 (2011): 364-78.

New UN agency set to monitor threats from AI and robotics". <https://www.irishtimes.com/news/world/europe/new-un-agency-set-to-monitor-threats-from-ai-and-robotics-1.3237275>.

Ogunnusi, Michael. "UNDERSTANDING PEACEKEEPING." *British Journal of Community Justice* 8, no. 3 (2010): 107-08.

Osman, Mohamed Awad. *The United Nations and Peace Enforcement : Wars, Terrorism and Democracy*. Aldershot: Ashgate, 2002.

"Our Peacekeepers". *United Nations Peacekeeping*. <https://peacekeeping.un.org/en/our-peacekeepers>.

"PRESS CONFERENCE ON 2009/2010 HUMAN SECURITY REPORT." *States News Service*, 2010.

Ramarajan, Lakshmi, Katerina Bezrukova, Karen A Jehn, Martin Euwema, and Nicolien Kop. "RELATIONSHIP BETWEEN PEACEKEEPERS AND NGO WORKERS: THE ROLE OF TRAINING AND CONFLICT MANAGEMENT STYLES IN INTERNATIONAL PEACEKEEPING." *International Journal of Conflict Management* 15, no. 2 (2004): 167-91.

Reddy, Peter, Ph. D, Reddy, Peter, and Ebooks Corporation. *Peace Operations and Restorative Justice.*

Groundwork for Post-conflict Regeneration. Justice, International Law and Global Security. Burlington, Vt.: Ashgate, 2012.

“Research Guides: DPKO-DFS Core Pre-deployment Training Materials (CPTM 2017) for United Nations Peacekeeping Operations: CPTM Introduction”. *Research.un.org*. <http://research.un.org/revisedcptm2017>.

Sarkar, Dibya. “UN Report Focuses on Modern Technology to Improve Peacekeeping Missions.” *FierceGovernmentIT* (Newton), 2015.

Slotter, Stephen, and Gürol Baba. “Successful Peacekeeping by Regional Organizations: Necessarily Hybrid.” *UluslararasıHukukVePolitika*, no. 37 (2014): 1-28.

Sobu, Laurentiu. “THE BRAHIMI’S REPORT THE UNITED NATIONS AFTER BRAHIMI’S REPORT.” *International Scientific Conference “Strategies XXI”* 1 (2013): 175-82.

Tardy, Thierry. “A Critique of Robust Peacekeeping in Contemporary Peace Operations.” *International Peacekeeping*18, no. 2 (2011): 152-67.

The Challenges of Contemporary Peacekeeping.” *The Adelphi Papers* 33, no. 281 (1993): 26-50.

The UN Takes a Big Step Forward on Cybersecurity | Arms Control Association”. *Armscontrol.org*. https://www.armscontrol.org/act/2013_09/The-UN-Takes-a-Big-Step-Forward-on-Cybersecurity.

“UN artificial intelligence summit aims to tackle poverty, humanity’s ‘grand challenges’”. *UN News*.(2017). <https://news.un.org/en/story/2017/06/558962-un-artificial-intelligence-summit-aims-tackle-poverty-humanitys-grand>

UNIFIL’s Sector East organizes all-female patrol”. *United Nations Peacekeeping*. <https://peacekeeping.un.org/en/unifils-sector-east-organizes-all-female-patrol>.

United Nations Peacekeeping Missions Military Logistics Unit Manual”. *Enopu.edu.uy*. <http://www.enopu.edu.uy/wp-content/uploads/Logistics-Unit-Manual.pdf>.

United Nations Peacekeeping Missions Military Logistics Unit Manual”. *Enopu.edu.uy*. (2017) <http://www.enopu.edu.uy/wp-content/uploads/Logistics-Unit-Manual.pdf>.

Vogel, Birte, Oliver P. Richmond, Roger Mac Ginty, IoannisTellidis, and Stefanie Kappler. “Peacebuilding.” *Peace Review* 26, no. 4 (2014): 517-19.

“Where does the \$8bn UN peacekeeping budget go?”. *The Guardian*. (2-18). <https://www.theguardian.com/global-development-professionals-network/2016/apr/06/where-does-8bn-un-peacekeeping-budget-go>.

The Shift In India's Foreign Policy: Reflections From A Political Economy Perspective

*Mohanan Bhaskaran Pillai*¹

Abstract

A major shift occurred in India's foreign policy in the context of the emergence of a new international economic architecture during 1978-80 periods. India confronted a situation where it had no other option, but to liberalise its economy. The economic reforms initiated by the Narasimha Rao government just in the aftermath of the crumbling down of the bipolar world order led to massive readjustment in India's foreign policy from nonalignment to multiple engagements. The economy was liberalised and integrated it with the global economy. Since then economics has emerged as the powerful locomotive of India's foreign policy calculus. The demise of the bipolar world order and the liberalisation, privatisation and globalisation programmes in the economy prompted analysts to think that India abandoned nonalignment once and for all as it had become obsolescent at the strategic juncture of the unipolar moment. In what way has the foreign policy of India gotten shaped in the context of fast paced integration of the Indian economy with the global economy. What are the implications of Modi Government's foreign policy style of 'multivector alignment' in the Indo-pacific region? This paper argues that the dynamics of the international political economy determines the nature and direction of India's foreign policy.

Introduction

The sweeping victory in the May 2014 general elections by the Bharatiya Janata Party (BJP), a cultural nationalist party which considers secularism and pluralism of Indian National Congress (INC) as minority appeasement, gave

¹ Mohanan Bhaskaran Pillai is a Professor; Department of Politics & International Studies, Pondicherry University Puducherry UT-605 014; India. His area of research includes; Political Theory, Research Methodology, South Asian Studies & Development Studies, He can be reached at pillaimb.pol@pondiuni.edu.in .

room for speculations that India's foreign policy and relations would manifest a complete departure from the one followed hitherto by successive congress governments. The speculation was that in tune with the ideology of the ruling party, *Hindutva*, a new policy framework would be constructed as the existing one had had its roots well entrenched in the secular and pluralistic postulates of the INC. The election Manifesto of BJP, the personality style of Narendra Modi, his popularity as the embodiment of Hindu nationalism appeared to be the indelible marks of the shift expected in India's foreign policy and relations. Many analysts have argued that in the aftermath of the demise of the bipolar world order Indian foreign policy has become more realistic in its application and the new initiatives like the Look East (currently Act East) Policy and economic reforms paved the way for the rise of India as one among the three or four major powers of the world. For instance, Devin Hagerty² taking into account the emerging balance of power from a neo-realist perspective argued that India would emerge as a great economic and military power by 2020. According to Harsh V.Pant,³ there are four major influences that have shaped India's foreign policy since the end of cold war viz., 'changing global balance of power, the emerging global order, the challenge of global terrorism and India's pursuit of energy security'. It has been argued that the end of the cold war had signalled the beginning of the foreign policy of India as it was 'free from the structural constraints of a bipolar world order'. He has further written that India already moved away from the periphery of the international system to the centre stage where India could be seen as one among the six members of the new global balance of power. According to Goldman Sachs, the international investment banking corporation, India would emerge as the fourth most important economic and political power by 2040⁴. These kinds of assessment of India's power position could be located on the premise that the idealist overtones of Nehruvian architecture of domestic and foreign policy had been replaced by a realist and pragmatic policy framework as a consequence of the demise of the cold war based bipolar international system. Further, the changes in the global balance of power had determined the trends and shifts in Indian foreign policy. The Indian governments post cold-war policies, right from that of Narasimha Rao down to Manmohan Singh, had been rated as pragmatic and realistic as narrated above. The moot question is whether the Modi government is a complete disconnect with the immediate past in the matter of economic and foreign policy? Or continuity is embedded in the changes that could be gleaned?

Several analysts have expected that the advent of Modi would facilitate the emergence of a truly right wing foreign and domestic policy. For instance, Bharat Karnad⁵ has expected that the advent of Modi 'would root a liberal

right wing Edmund Burke-ian type of conservatism in the country'. However, according to him, 'the BJP regime has not deviated an iota from the Congress government's pusillanimous approach and outlook. India continues to acquiesce in security schemes on terms dictated by extra-territorial powers -- US and China'. Another analyst has written that on several occasions Prime Minister Modi's foreign policy establishment has acted like the Bull in the China shop.⁶ Bhadrakumar has made this comment specifically in the context of the Dharmasala conference of Chinese dissidents. In another article Bhadrakumar has pointed out that there was very little to show by the Modi government as achievement in foreign policy front. Prakash Karat⁷ has written that 'the Bharat Mata which is hailed by the Hindutva forces will soon have to hold the Stars and Stripes in one hand while the other holds *the Bhagwa Jhanda*. Absent will be the tricolour'. In fact, as the leader of the Communist Party of India (Marxist), Karat has articulated the official view of his party.

In Modi Government's foreign policy behaviour one set of commentators has found a definitive departure from the framework of non-alignment as enunciated by Jawarlal Nehru ⁸. On the other hand, a sizeable majority of analysts maintain the view that a certain kind of continuity could be discerned from the pronouncements and actions of Narendra Modi, right from the day of his assuming office as Prime Minister⁹. These arguments of continuity put forward by eminent scholars contradicted with the ideological moorings of the ruling party, and thus it ignited curiosity for further exploration. Does it mean that under Modi's regime, foreign policy of India has not been redrawn to suit the cultural nationalism of BJP? The economic policies of Prime Minister Modi, like the 'make in India' type, indicated that his regime would continue, in a fast-pace, the reforms launched in 1991 by the Congress government of Narasimha Rao, and continued by successor, BJP Prime Minister Atal Bihari Vajpayee and Congress led coalition Governments headed by Manmohan Singh. In other words, Prime Minister Narendra Modi's policy statements and practice have emitted strong signals of deepening further the integration of the Indian economy with the international political economic architecture of 'financialized, generalized, and globalized monopolies'¹⁰. At this juncture, the moot question is whether such a fast-paced mode of integration with the global political economy could help India to achieve the great power status, the core of India's foreign policy objective right from the days of Nehru? In what way the foreign policy of India is being re-shaped in the context of fast-paced integration of the Indian economy with the global political economy? These questions have not received scholarly attention as it deserved. Thus, we have made a modest attempt on that line.

Keeping in mind the above questions, the author has arranged his arguments in five sections. The first section has provided a brief assessment of the political economy of neo-liberalism, mostly informed by the writings of Samir Amin and David Harvey followed, in the second section, by an analysis of the trends and shifts in India's foreign policy. The third section has reported the trends and shifts in India's foreign policy since independence. The author has devoted the fourth section to find out if any Modi Doctrine has surfaced within the span of the past four years of Mod rule. The fifth section reported the author's finding that 'strategic autonomy', as enunciated by Nehru, would continue to have rhetoric value as politico-strategic issues come under the overarching dynamism of international political economy. The last section has offered the author's concluding remarks.

International Political Economy and India: From Liberalism to Neo-liberalism

The immediate post war period witnessed the emergence of a new governance system with the establishment of the UN and the Bretton Woods Institutions. In fact the Bretton Woods twins managed the post-war international economy within the liberal capitalist framework. However, it was noticed that these institutions developed fatigue from the second half of 1970s in managing the complexity of financial flows, investments, communication flows international trade etc. The argument was that, for better performance, capital had to be freed from Keynesian state interventionist clutches. This has led to a renewal of interest in the individualistic philosophy of Frederick Hayek, in the major centres of learning in the United States and United Kingdom. The economists got trained in such US Universities, particularly Chicago, have obtained key positions in the World Bank, IMF and the GATT, as well as in national governments in different countries including the global South. Thus, consent was constructed in favour of neoliberal thinking and practice the world over. 'Neoliberalism in the first instance a theory of political economic practices which proposes that human well-being can best be advanced by liberating individual entrepreneurial freedoms and skills within an institutional framework characterised by strong private property rights, free markets, and free trade. The role of state is to create and preserve an institutional framework appropriate to such practices'¹¹. The IMF- World Bank directives to all the countries have been to implement the policies of deregulation and privatisation. The state has withdrawn from many areas of social security provisions. All states including the social democracies of the West switched

over to neoliberalism, some voluntarily and others as a result of various forms of persuasions and coercive techniques.

Economists trained in neoliberal orthodoxy, Chicago boys as they were fondly called, succeeded in liberating the Bretton Wood institutions from the domineering influence of Keynesianism, and were remodelled in accordance with Frederick Hayek's postulates of the individual's freedom first coupled with the economic ideas of Milton Friedman. The new international economic order thus emerged, controlled by the World Bank, IMF, WTO, Wall Street and the US treasury, advocated structural adjustment and free trade for the Global South and protective measures for western economies. The Bank administered the structural adjustment pill to the Southern Economies as medicine for the illness of their maldevelopment and non-performance.

The revolution in the field of Information and Communication Technologies (ICTs) has emerged as handy tools for exercising control over the Global South and integrating it with the centres of neoliberal economic order. The multilateral lending institutions have advised the Southern economies to replace import substitution industrialisation with industrialisation by invitation. In the place of collective self-reliance, depended growth became the new paradigm. Devaluation of national currencies, foreign direct investments, privatisation of public assets and creation of markets where markets do not exist in areas such as water, land, environment, health care, social security etc., have been promoted under structural adjustment programmes. In this process, concepts like collective self-reliance, new international economic order (NIEO), South-South cooperation, which were so ardently advocated by Indira Gandhi and other leaders from the South were replaced. As Harvey has put it 'Neoliberalism has, in short, become hegemonic as a mode of discourse. It has pervasive effects on ways of thought to the point where it has become incorporated into the common-sense way many of us interpret, live in, and understand the world'¹².

The sole hegemonic power, which presides over and provides politico-military security to the new international economic architecture, evolved strategies for control of the natural resources of the world. Critics expressed the view that US has extended the Monroe Doctrine to the entire planet. The argument has been that the US has developed strategies to have full control over Europe through NATO, to keep former republics of the Soviet Union as hotbeds of tension, to keep Russia always in trouble, to balance China, to subordinate countries like India, Brazil and South Africa, to keep west Asia and Latin America as backyards of the US and to extract the natural resources of the African continent¹³. This political strategy to have control over the planet is

intertwined with monopolistic control over science and technology in general and information technology in particular. Moreover, the developed west has moved on to the stage of post-industrialisation and they were very much keen in relocating polluting industrial units to the Global South. This strategy has been integrated into the new production strategy of decentering. As a result of relocating of manufacturing units to the South, countries like India, China, and Brazil have been facing the problems associated with environmental externalities ever since they opened up their economies for foreign Direct Investment (FDI) and industrialisation by invitation.

The shift in the international political economy that occurred during 1978-80 period, well ahead of the disintegration of the Soviet Union and the collapse of East European regimes which was called the shift from 'Embedded Liberalism'¹⁴ to Neo-liberalism, has stripped capitalism of its liberal façade, and, as a result, the welfare states in the west and the mixed economy pattern of governance as it was found in India faded into oblivion to pave the way for the thunderous entry of techno-capitalism which is dominated and guided by finance capital¹⁵.

In fact, the Rajiv Gandhi regime had noticed this massive shift in the international political economy. It is worth mentioning here that in a modest way Rajiv Gandhi introduced reforms in the latter half of 1980s to harmonise with the changes in the international political economy. However, the collapse of the Soviet Union had sent shock waves to the Indian political and policy establishment and had thrown the country into the vortex of an unimaginable kind of distress as the country's foreign economic relations were predominantly with the Soviet Union on the platform of the Rupee- Rouble arrangement. India confronted a situation where it had no other option, but to introduce economic reforms, popularly called Liberalisation, Privatisation and Globalisation (LPG) to get integrated with the international economic architecture. Thus, with the introduction of LPG in 1991 its foreign economic policy also underwent drastic reorientation with the announcement of the Look East Policy (LEP). In fact, LEP was India's gateway to get integrated to the new international economy controlled by the US. Under the leadership of Prime Minister Narasimha Rao and Finance Minister Manmohan Singh, the economic reforms were initiated and the LEP was announced as its foreign policy plank. United Progressive Alliance (UPA) I&II under the premiership of Manmohan Singh further liberalised the economy and integrated it with the global economy. The non-congress governments that came to power in-between, including that of A B Vajpayee, continued the same policy with minor changes here and there in the operational side. However, due to the

constraints imposed by coalition politics as also the pressure exerted by other social formations and leftist political parties, full integration did not take place at the desired level 2014. By and large there emerged a political consensus in favour of integrating the Indian economy with the international political economy. The lone voice of dissent was that of the left.

India's Foreign Policy Strategy: Trends and Shifts

India's foreign policy had drawn heavily from the lessons and experiences of the freedom movement. In other words, the nationalist desires and aspirations that got gradually crystallised during the course of the freedom movement laid the philosophical foundations of India's foreign policy. This aspect could be very well noticed from the ambitions of the nation to carve out a niche among the league of the great powers of the world. The civilization legacy of India, size, culture, history, and geography and, above all, domestic and international political economy had greatly influenced Nehru while charting the path of non-alignment for the new born nation. The Hindu cultural ethos, Jainist, Buddhist thought systems, form the inner core of Nehru's vision for India's foreign and strategic policy, which received the supplementary nourishments from the Islamic, Christian values and modern western rationality and the ethos of representative democracy. Gandhi's pacifist approach, rooted in the Teachings of Gita, Jainism and Buddhism, had also influenced Nehru. The plural and secular democratic approach to foreign and strategic policy maintained unstinting faith in democratic institutions and international organizations in conflict transformations. The core values of this stream of thought could be noticed as strategic autonomy and faith in regional and international organizations ability to mitigate conflicts. The *mandala* concept of concentric circles as codified by Kautilya in *Arthashastra* had also influenced Nehru's views on nonalignment and its core value, strategic autonomy.

Notwithstanding the shift in emphasis at the operational level in accordance with the changes in the domestic and international milieu, the Nehruvian framework of nonalignment was followed by successive Prime Ministers of both Congress and non-Congress governments. It has to be underlined that nonalignment emphasised political and strategic autonomy along with a self-reliant growth path guided by the mixed economy policy framework without challenging the basic tenets of liberal capitalism, the international political economy of the post-war period. Nehru's attempt was to industrialise a dependent agrarian economy, left behind by the retreating British colonialism, with the support of borrowed technology and domestic capital. Since domestic

capital was so fragile at that point of time, the Indian state had offered protection to the domestic capital from the possible onslaughts of international capital. Before the reforms in the economy in 1991, capital flows to India composed of aid flows, deposits of non-resident Indians and a little bit of borrowings for commercial purposes. Direct foreign investments were restricted. In Indian companies' foreign equity holdings were also not allowed. Nehru emphasised the importance of the creation of a strong public sector for the economic growth and development of the country. A state centred economic system with emphasis on five- year plans to improve living conditions of common man was put in place by Nehru. A development strategy was crafted with a view to ensure the growth of the economy in a planned self-reliant fashion. Private sector investment was restricted to the government identified high priority areas. Effective measures were put in place to control monopoly formation and concentration of economic power. Needless to say, the state steered the commanding heights of the economy, introduced steep marginal taxes for individuals and corporations with a view to ensure resources for economic planning to create a nation based on the precepts of social justice. Since Nehru designed his populist national model of economic growth strategy and the international engagement mechanism within the domain of liberal capitalism, Nehru and subsequently his daughter Indira Gandhi could not effectively tackle certain vestiges of colonialism effectively. This is evident from the fact that he could not pay much attention to the redistribution of wealth, despite the rhetoric of socialism because of the active presence of certain structures inherited from the dependent agrarian economy of the past. As a result, Nehru and the Indian National Congress could not take up seriously agrarian reforms to transform inherited structures. Because of this, poverty continued as a major social evil in India even after seventy years from the date of the attainment of freedom from colonial clutches. However, it is noteworthy, Nehru and Indira Gandhi very efficiently leveraged the flexibility of liberal capitalism and the bipolar division of international political order for promoting industrialisation of the country by import substituting strategies and tactics. The leverage of equidistance internationally and the mixed economy platform domestically for economic growth prevented in a substantial way the expansion of dependent peripheral capitalism, despite the active presence of inherited structures from the colonial past.

The economic system erected by Nehru started receiving the signals of change right from the beginning of 1980s. Since then the government has become more private capital friendly. The Indian big business was allowed to invest in areas so far reserved exclusively for the public sector. The Monopolies and Restrictive Trade Practices Act, 1969 (The MRTP Act) was diluted to

facilitate the expansion of big business in areas like drug manufacturing, chemicals cement, ceramic etc., and direct taxes were progressively reduced for the corporations. The reduction in tax collection and expenditure on social welfare programmes led to higher budgetary deficits. In Ahmed's words, 'India's command economy had developed through reliance on high taxes on big business, essentially dependent on a particular circulatory logic of capital, revenue and expenditure. Taxes attained constituted revenue that was reinvested in productive assets in the public realm and in the social welfare programme. Policy changes in the early 1980s, without a corresponding strategy to raise revenue from alternative sources led to higher budgetary deficits, and these were instrumental in producing the economic crisis'¹⁶. During the same period changes in the approach to FDI were introduced. Accordingly, Export Processing Zones (EPZ) were established in Noida, Falta, Cochin and Chennai¹⁷

The disintegration of the Soviet Union decisively altered the world market and severely affected the Indian economy in several ways. The Soviet Union was India's major supplier of defense related equipments and armaments. Moreover, one fourth of India's exports had been to the Soviet Union and to the Eastern European regimes. India's export growth declined due to the breakup of the Soviet Union and the restructuring of Eastern Europe. Another important aspect of the bilateral trade between the Soviet Union and India was the use of Rupee and Rubble as exchange currencies. The new Russia that came into existence after the collapse of the Soviet Union demanded debt payment in US dollars and that too contributed to the crisis in India's foreign exchange reserve.

Further, the military intervention of the US in the wake of Iraq's attack on Kuwait had seriously affected India's economy in three ways. Firstly, the gulf crisis contributed to a sharp increase in petroleum prices. According to Ahmed 'oil prices exacerbated India's economic problems into a crisis'¹⁸. Secondly, West Asia was a major destination of India's exports. Due to the war torn condition, the loss of exports for India had amounted approximately to USD 280 million. Thirdly, India had to immediately repatriate and rehabilitate Indian workers from the affected zones in the Gulf region. The non-resident Indian's remittances had always been a boost to India's foreign exchange reserves. Due to the war remittances from the Gulf dried up. Ahmed had further argued that the political instability and the assassination of Rajiv Gandhi on 21 May 1991 in the midst of an election campaign 'was a massive collective shock for India, producing public disorientation, and laying the foundation for rolling out of the shock doctrine by IMF and World Bank suggested New Economic Policies'¹⁹. It has been well documented that in the depth of such collective

shocks, multilateral lending agencies administered the bitter pills of structural adjustment. Normally, populations stunned by a series of devastating crises would not oppose such intervention. Thus Indians, at a time when they were reeling under collective shock, had been made the subject of neoliberal transformation²⁰.

The prescriptions, from the IMF and the World Bank to Narasimha Rao government, to reform the economy, just in the aftermath of the crumbling down of the bipolar world order led to massive readjustment in India's foreign economic and strategic policy. For the first time since independence, India opened diplomatic relations with Israel and initiated the Look East Policy (LEP) with a noticeable strategic overtone. It is appropriate here to take cognizance of the offer of Condolesa Rice, the then US Secretary of State, to India that the US would facilitate the fulfilment of India's ambition to obtain great power status on condition of abandoning nonalignment and getting onto the bandwagon with the US. Strategic partnership with the US has taken to new heights by signing the nuclear accord during Manmohan Singh's period. In the matter of relations with India's immediate neighbours in South Asia, Vajpayee and Manmohan Singh, while operating from within the framework of neo-liberalism, followed some kind of a middle path between Indira Gandhi's doctrine of 'hegemonic interventionism' and Gujral's doctrine of 'restraint magnanimity'.

As has been noted elsewhere, the economic reforms administered on India just in the aftermath of the dissolution of the bipolar world order led to massive readjustment in India's foreign policy strategy. Since then, economics has emerged as the powerful locomotive of foreign policy calculus. The demise of the bipolar world order and the liberalisation, privatisation and globalisation programmes in the economy prompted Analysts to argue that India abandoned nonalignment once and for all as that policy had become obsolescent at the strategic juncture of the rise of unipolar world order. India embraced liberalisation, privatisation and globalisation (LPG) in the beginning of 1990s under the dual leadership of Narasimha Rao as Prime Minister and Manmohan Singh as Finance Minister. In 1991 we introduced a new industrial policy to attract foreign direct investment with a view to obtain higher technology, to increase exports and to broad base the production system²¹.

The reforms were taken forward by successive Prime Ministers. In a phased manner, privatisation and liberalisation of the economy had been taken forward by UPA I and II coalitions of Prime Minister Manmohan Singh and the non-Congress governments that came to power during the Congress interregnum. Acceptance of the international trade regime under the WTO

umbrella, export oriented industrialisation, FDI and devaluing of the currency quite often fulfilled the requirements to get integrated to the reigning international economic architecture. In this process, the abandonment of the Nehruvian framework of mixed economy and Indira Gandhi's passion for a new international economic order through South-South cooperation by the successive leaderships of the Congress party is part of the logical progression from liberalism to neoliberalism.

The announcement of the 'Look East Policy (LEP) and attempts to be closer with the US could be seen as Indian efforts to adjust themselves to the international political economy of neo-liberalism and in political terms, from a bipolar world order to a 'Unipolar moment'. The LEP succeeded in rehabilitating the Indian economy with the international political economy. Also LEP replaced self-reliant economic strategy of Nehru-Indira period with comprehensive economic cooperation with East Asia in trade, services and investment. "The initiation of LEP represented a reorientation of India's foreign economic policy strategy after the cold war. The LEP signalled the end of India's previous pursuit of self-reliant economic development, and the start of an era in which India strived to take advantage of new opportunities from international trade and investment. The LEP also sent strong signals that East Asia could be integral to India's economic opening. The region would no longer be overlooked, as it had been by India's previous foreign economic policy, but would now be regarded as a source of new business opportunity and inspiration for economic development" (AUSAID working paper 2006). Thus the initiation of LEP keeping the ASEAN as the fulcrum of India's engagement with the East signalled the process of integration of India with the global governance architecture of techno-capitalism.

The Modi Doctrine

Prime Minister Narendra Modi, has not come across any major hurdle in his resolve to integrate the Indian economy fully into the global economy as his government has not been crippled by the pulls and pressures of coalition politics which prevented previous UPA governments and non-congress governments from deepening further the process of full integration. Unlike the Nehruvians, the Hindu nationalist party pronounced, according to its proponents, a more pragmatic foreign policy and security strategy. The cultural nourishment for this tradition derived from the core of Hinduism, as pronounced by M.S.Golwalkar and other Hindu Nationalist leaders. Opponents of the BJP regime criticised that BJP's foreign policy strategy was exclusionary and based on a selective reading of Indian History. The ideologues of the evolving

Hindu nationalist foreign policy and strategic culture believed in hard core realism and advocated the projection of India's military power beyond its borders, what was popularly articulated as muscular foreign policy. Instead of strategic autonomy this school has advocated alignment with the US and other major powers to achieve the national goal of great power status. To Hindu nationalists, pre-emptive strikes were not anathema and they advocated the replacement of defensive strategy with offensive advancements. The Hindu Nationalists ideologues did not accept the plurality of the Congress Party as they project India as the land of Hindus. Minorities would have to accept the primacy of *Hindutua*. Once the primacy of *Hindutua* got accepted by minorities, they could receive acceptance for their religious traditions and way of life. In the backdrop of the political philosophy of the ruling party, we have to evaluate the foreign policy initiatives of Prime Minister Modi.

The national executive of BJP in its meeting held in April 2015 formulated the basic principles of foreign policy to be followed by the Modi government. The national executive led by Modi enunciated the five basic pillars of BJP's foreign policy as: *Samman*(dignity and honour), *Samvad*(engagement, dialogue), *Samriddhi*(shared prosperity), *Suraksha*(regional and global security *Sanskriti evam Sabhyata*(cultural and civilizational linkages)²². In the above formulation there was nothing to conform muscularity in foreign policy as expected by many. In fact, right from Indira Gandhi down to Rajiv Gandhi congress prime ministers were more muscular in their foreign policy behaviour than Narendra Modi.

Prime Minister Narendra Modi in November 2014 at the 12th ASEAN-India summit and the 9th East Asia Summit in Myanmar rechristened the ongoing engagement of India in East Asia as Act East Policy (AEP). On 7th February 2015, while addressing the Heads of Indian Mission from across the world he had said that the present global environment represented a rare opportunity, when the world was keen to embrace India, and India was moving forward with confidence. He urged them to use this unique opportunity to help India position itself in a leading role, rather than just a balancing force, globally. Urging them to shed old mindsets, the Prime Minister said they should be quick to adapt to changing global situations.

From the above it is very clear that Mody has grasped properly a gradual but definite shift in international political order from that of the 'unipolar moment' to a certain kind of multi-polarity-the gradual, but definitive assertiveness of other Centres of capital accumulation. Since the integration of India with the international political economy has been completed by enhancing FDI in the retail sector, demonetisation and switching over to Goods and Services

Tax(GST), Modi's has been trying, it seems, to facilitate India's domestic capital to grab the economic opportunities available in a globalised world. A new FDI policy has been announced by the Modi government on June 20, 2016 with a view to facilitate ease of doing business and attract investment. The amendments were announced to strengthen Modi's make in India programme, which has been introduced to strengthen the manufacturing sector.

Of late, the perception is that a Modi Doctrine is in the making. It seems that Prime Minister Modi's Act East Policy has manifested a departure from the strategy of creating sphere of influence in its immediate neighbourhood based on the concentric circle formula of the nonalignment era. India's eastward focus attempted to establish strategic partnership with major powers in the East for economic growth opportunities and strategic cooperation. Several observers and analysts have noticed in Narendra Modi's approach a complete shift from non-alignment to 'multi- vectored engagement' to take advantages of full integration with the international political economy.

At the dawn of independence, non- alignment approach facilitated liberal capitalist economic development with socialist flavours on an upward trajectory. Narasimha Rao's LEP rehabilitated India into the orbit of neoliberal political economic architecture. Modi's Act East is designed to take India into the league of leading centres of capital accumulation in a multi-polar political-economic system.

Craving for great power status: A constant element

From the above, it could be gleaned that the ambitious project of great power status is a fairly constant element in the foreign and strategic policy of India right from the days of Nehru. This is in fact a civilization legacy, very well ingrained in the collective psyche of Indians. The most important aspect of India's aspirations to be a great power is that the game was played in the lap of political economy of capitalism despite the rhetoric of socialism during the Nehru-Indira period. Thus, the natural course of action is that, India adjusted and remodelled its politico-strategic calculations in accordance with the shifts in the international political economy. Such an adjustment or remodelling started unfolding during the time of Rajeev Gandhi government and continued with the initiation of the LPG reforms in India. However weak central governments crippled by coalition's pressures could not facilitate the expansion of dependent peripheral capitalism in India as envisaged. In the last general election we witnessed the collapse of the Congress system and the definitive victory of the Hindu nationalist BJP under the strong leadership of

Narendra Modi. As anticipated BJP's Hindu nationalism in alliance with the Indian business class completed the process of integration.

Modi's continuous interactions in the last four years with the leaders from the neighbourhood, the Japanese Prime minister, the Chinese President and, above all, with the President Barak Obama and later with President Donald Trump highlighted the primacy of economics in India's foreign policy and relations. It is worth mentioning here that the strategic partnership agreements with the US, Japan, South Korea and Australia and also the naval exercises with these countries have created the impression that along with the integration of the economy with the international political economy India has become part of US strategies to balance China. To make it known that India still maintained its strategic autonomy, immediately after signing the agreement with the US President Obama, Prime Minister Modi asked his external affairs Minister to go to China to prepare the ground for his visit to that country in May, 2015. Recently on conclusion of the Quadrilateral, India hosted in Delhi the trilateral summit meeting of India, China and Russia. In October 2016, the news headlines were the takeover of India's second biggest oil firm Essar by Russia's state controlled oil major Rosneft. The USD 13 billion all-cash investment has been reported as the largest ever inflow of FDI²³.

India's Commerce Minister Suresh Prabhu and his Chinese counterpart Zhong Shan co-chaired the 11th meeting of India-China Joint Group on Economic Relations, Trade, Science and Technology. Hong said that a free trade agreement (FTA) between India and China could be negotiated. He has pointed out that China continued as India's largest trading partner. The bilateral trade reached \$84.4 billion registering a growth of 20.3% from the previous year. China's import from India also increased by 40%. This has helped India to ease in bilateral trade imbalances substantially. In the 11th JEC meeting, both the countries arrived at consensus on a series of issues. Firstly, synergy between China's Belt and Road Initiative and India's development strategies, including the '15 year development agenda', 'Make in India' and 'Digital India' would be promoted jointly. Secondly, India's trade imbalance with China would be addressed by promoting Indian exports to China. Thirdly, a special working group would be set up to develop a road map for developing two-way trade²⁴.

This policy approach has been evaluated as a hedging strategy: 'hedging is a term derived from economic theory whereby actors invest in diverse policies to insure against failures. Hedging includes external security cooperation with third countries through the formation of so-called partnerships but, importantly, also entails integration and cooperation mechanisms with the country that forms the object of future uncertainty. In other words hedging

combines balancing as well as engagement strategies'²⁶. The hedging strategy has given enough room for those commentators who think that there is a continuity in India's foreign policy strategy as is evident from the attempt to maintain autonomous relationship with both the US and China. Interestingly, there is enough stuff available for the other group to substantiate that Modi has brought in a total departure from the Nehruvian framework of India's foreign policy.

Also, it is to be noticed that here that India is part of multilateral interaction with its membership in groupings like BRICS (Brazil, Russia, India, China, South Africa) to strengthen collective relationships. This grouping's political interaction is intended to alter the shape of the international financial system and the global economy. One of the objectives of the grouping is democratization of international financial institutions. The joint declaration at the first summit meeting held in Russia focus on global food security. The BRICS countries supported the adoption of a wide range of mid- to long-term measures in order to provide for a solution to the issue of food security.

The post-cold war international power structure is symptomatic of the overarching politico-military dominance of the US which turned out to be the protective shield of the international political economy managed by Wall Street, WTO, IMF and World Bank complex. The US initiatives to curb international terrorism and actions against state sponsored terrorism suited to New Delhi's official positions on India's strategic objectives that were reformulated in the aftermath of the collapse of the Soviet Union. In official parlance, India's relations with the United States have acquired remarkable maturity and dynamism in the post-cold war period. Many developments created a favourable atmosphere for such a transformation, including the end of the Cold War. The US perception of India's emergence as a dynamic economic force has been the driver of the above said maturity in India's relations with the US.

Of late, India-US relations have moved beyond that of bilateral partnership to global partnership, which was anchored not only on common values but also common interests of the dominant sections. The strategic dimension of India's relationship with the US underlined their common interest in combating terrorism, the proliferation of weapons of mass destruction and enhancing global peace. There has been a convergence of views on strategic and security issues which extended to cooperation in defense, science and technology, health, trade, space, energy and environment. It is worth noting that the US counted India on its side in the execution its strategy to balance China in the Indo-Pacific region.

On several counts the US' rebalancing strategy in the Indo-Pacific region found a kind of strategic convergence with India's LEP/AEP to cement further its relations with the countries of South East and North East Asia in the context of the disappearance of India's all weather friend, the Soviet Union from the political map of the planet. More than an external economic policy or a political slogan, the LEP/AEP was a strategic shift in India's vision of the world and its place in the evolving global political economy. It was also a manifestation of India's belief that developments in East Asia are of direct consequence to its security and development. Therefore, India wanted to have had active engagement in East Asia; and that has a strong economic foundation and a cooperative paradigm of positive inter-connectedness of security interests. The LEP/AEP represented a reorientation of India's foreign economic policy in the aftermath of the demise of the Soviet Union and it signalled the end of the era of self-reliant growth strategy formulated by Nehru and ardently adhered to by his daughter Indira Gandhi.

Concluding Observations

The foreign policy behaviour of Prime Minister Narendra Modi government with its *Sangh Parivar* background, on the surface, appeared to be a clear departure from the policy framework of the previous congress governments. But in actuality nothing of that sort has happened. Modi has been trying ever since he assumed office in 2014 to complete the process of integration of Indian economy with the international political economy in tune with the precepts of neoliberalism which was initiated by Congress Government of Narasimha Rao and followed by the subsequent Prime Ministers on a slow pace. Modi's predecessors could not put the integration process on the fast track due to the pulls and pressures of coalition politics. There is a similarity in aspirations of both the Congress and BJP to make India visible in the world as a great power. It is worth remembering that the Nehruvian framework of nonalignment did not attempt to de-link from the liberal capitalist world order. Instead, the flexibility that was embedded in liberal capitalism was leveraged by the Congress Governments of Nehru and Indira Gandhi to fulfil the objective of import substitution industrialisation, the dominant paradigm of development during that period. Since the social structure of accumulation in contemporary capitalism of monopolies is totally different from that of embedded liberalism, such leverage was hardly available for the post reform governments in India; and LEP functioned as the gateway for India's integration with the neoliberal world order. Narasimha Rao managed the switch over to the LPG with ease at the historic juncture of 'unipolar moment'. Governments of Vajpayee and

Manmohan Singh could not tune the Indian economy fully in accordance with the requirements of reigning international economic architecture because of weakness imposed by political coalition and the stiff resistance offered by certain social formations in general and left political parties in particular. Even then both of them promoted free-market economy to the extent possible. Modi sensed the diminishing role of the 'unipolar moment' and the emergence of a multi-polar world order where EU and Japan are other prominent Centres of capitalist accumulation.

From the above, it could be gleaned that the craving for great power status, the quintessence of nonalignment, is a fairly constant element in the foreign policy strategy of India right from the days of Nehru. This is, in fact, a civilizational legacy, very well ingrained in the collective psyche of Indians. Therefore, the natural course of action is that, India has to adjust and remodel its politico-strategic calculations in accordance with the shifts in the international political economy. Such an adjustment or remodelling started concretised with the initiation of LPG reforms in India. However, weak central governments enslaved by constant pulls and pressures of coalition politics could not facilitate the expansion of the market economy in India as envisaged. In the last general election we witnessed the collapse of the Congress system and the definitive victory for the Hindu nationalist BJP under the strong leadership of Narendra Modi. This has given Modi to take necessary policy initiatives at the domestic and international front to integrate the Indian economy fully with that of the global economy and to play the game of divergence and convergence with China in the multi-polar world order. The moot question is whether a subordinate role in the periphery of techno-capitalism would help India to attain its long cherished ambition of great power status.

References

1. *Revised version of the author's presentation at the 59th Annual Convention of International Studies Association (ISA) held at Hilton Square in San Francisco during April 4-7, 2018.*
2. T.Hagerty, Devin. "India and the Global Balance of Power:A Neorealist Snapshot." In *Indian Foreign Policy in a Unipolar World*, by Harsh V.Pant, 23-42. New Delhi: Routledge, 2009.
3. Pant, Harsh V. *Indian Foreign Policy in a Unipolar World*. New Delhi: Routledge, 2009.
4. Ibid
5. Karnard, Bharat. "India's Foreign Policy:The foreign Hand." *Open Magazine*, March 29, 2016.
6. M.K, Bhadrakumar. "The Geopolitics of Ash Carter's India Visit." *Punchline*, 5 15, 2016.
7. Karat, Prakash. "Bharat Matha with Stars and Stripes." *The Citizen*, April 8, 2016.
8. C, Raja Mohan. *Modi's American Engagement:Discarding the defensive mindset*. Singapore: Institute of South Asian Studies,National University of Singapore, 2015; Chellani, Brahma. "Doctrine of Graduated escalation." *The Hindu*, October 15, 2014.
9. George, Varghese. "Modi meets the world." *The Hindu*, November 6, 2014; Grare, Frederic. "Lens on Modi." *Indian Express*, September 29, 2014.;Hall, Ian. "Is a "Modi Doctrine"emerging in Indian foreign Policy? ." *Australian Journal of International affairs*, 2015: 1-6.
10. Amin, Samir. *Beyond US Hegemony? Assessing the prospects for a Multipolar World*. London: Zed Books, 2006.
11. Harvey, David. *A brief history of Neoliberalism*. Oxford: Oxford University Press, 2007:2
12. Ibid.
13. Amin,Samir. *Ending the crisis of Capitalism or Ending Capitalism?* Cape Town: Pambazuka Press , 2011.
14. Harvey,David. *Seventeen Contradictions and the end of Capitalism*. London : Profile Books, 2014.
15. —. *The Enigma of Capital*. London: Profile Books, 2011; Amin,Samir. *Ending the crisis of Capitalism or Ending Capitalism?* Cape Town: Pambazuka Press , 2011
16. Ahmed, Waquar. "The political economy and geopolitical context of India's economic crisis,1990-91." *Singapore Journal of Tropical Geography*, 2014: 179-196.

17. Marc Lombard and Annick Lombard. "A comparative analysis of the effects of foreign direct investment on China's and India's Economic Development in recent years." *Economic Papers*, 2011: 522-529.
18. Ahmed, Waquar. "The political economy and geopolitical context of India's economic crisis,1990-91." *Singapore Journal of Tropical Geography*, 2014: 179-196,p.187.
19. Ibid,p.188
20. Ibid,p.191
21. Marc Lombard and Annick Lombard. "A comparative analysis of the effects of foreign direct investment on China's and India's Economic Development in recent years." *Economic Papers*, 2011: 522-529
22. Basur, Rajesh. "Modi's foreign policy fundamentals:a trajectory unchanged." *International Affairs*, 2017: 7-26,p.11.
23. Ghosh, Sambit Basu and Sourabh. "FDI in India:Understanding the implications for Growth and Job creation." *Journal of Management & Public Policy*, 2017: 5-16.
24. Haidar, Suhasini. "India,China plan FTA breakthrough." *The Hindu*, March 27, 2018: 11.
25. Gaens&Ruohomaki, "FIIA Briefing Paper 222,June2017.

Bibliography

Jaffrelot, C. "A Modi Doctrine?" *Indian Express*, November 20, 2014.

Amin, Samir. *Beyond US Hegemony? Assessing the prospects for a Multipolar World*. London: Zed Books, 2006.

Bajpai, Kanti. "Narendra Modi's Pakistan and China policy: assertive bilateral diplomacy, active coalition diplomacy." *International Affairs*, 2017: 69-91.

Baru, Sanjaya. "Strategic Consequences of India's Economic Performance." *Economic and Political Weekly*, 2002: 2583-2592.

C, Raja Mohan. *Modi's American Engagement: Discarding the defensive mindset*. Singapore: Institute of South Asian Studies, National University of Singapore, 2015.

Chacko, Priya. "The new Geo-Economics of a "Rising" India: State transformation and the recasting of Foreign Policy." *Journal of Contemporary Asia*, 2015: 326-344.

Chellani, Brahma. "Doctrine of Graduated escalation." *The Hindu*, October 15, 2014.

Das, Gurucharan. *India Unbound*. New Delhi: Penguin Books, 2002.

David M. Kotz and Terrence McDonough. "Global Neoliberalism and the Contemporary Social Structure of Accumulation." In *Understanding Contemporary Capitalism: Social Structure of Accumulation Theory for the Twenty-First Century*, by Terrence Mc Donough, David M. Kotz and Michael Reich (eds), 1-30. Cambridge: Cambridge University Press, 2007.

De, Uptal Kumar. "India's Look East for Integration with East Asia: Step towards Progress." *Journal of International Economics*, 2014: 105-121.

George, Varghese. "Modi meets the world." *The Hindu*, November 6, 2014.

Grare, Frederic. "Lens on Modi." *Indian Express*, September 29, 2014.

Hall, Ian. "Is a "Modi Doctrine" emerging in Indian foreign Policy? ." *Australian Journal of International affairs*, 2015: 1-6.

Harvey, David. *A brief history of Neoliberalism*. Oxford: Oxford University Press, 2007.

Hoogvelt, Ankie. *Globalisation and the Post colonial world*. London: Palgrave Macmillan, 2001.

Jenkins, Rob. "India's states and the making of Foreign Economic Policy: The limits of the Constituent Diplomacy Paradigm." *The Journal of Federalism*, 2003: 63-81.

John, Doyle. "How prospects for global economic growth influence India's foreign Policy." *Strategy and Leadership*, 2014: 1-5.

Karat, Prakash. "Bharat Matha with Stars and Stripes." *The Citizen*, April 8, 2016.

Karnard, Bharat. "India's Foreign Policy: The foreign Hand." *Open Magazine*, March 29, 2016.

Kugelman, Michael. "India's Foreign -Policy Fog." *Wilson Quarterly*, 2012: 20-22.

Lee, Lavina. "India as Nation of Consequence in Asia: The potential and Limitations of India's Act East Policy." *The Journal of East Asian Affairs*, 2015: 67-104.

M.K, Bhadrakumar. "The Geopolitics of Ash Carter's India Visit." *Punchline*, 5 15, 2016.

Miller, Raymond C. *International Political Economy*. Oxon: Routledge, 2008.

Pant, Harsh V. *Indian Foreign Policy in a Unipolar World*. New Delhi: Routledge, 2009.

Sahoo, Niranjana. *Decoding Modi's Foreign Policy*. New Delhi: Carnegie Endowment for international Peace, 2014.

Sikri, Rajiv. "India's look east Policy." *Asia-Pacific Review*, 2009: 131-145.

Srinivasan, K. "India's national security: shifting paradigms and emerging frontiers." In *India's National Security :Concerns and Strategies*, by Mohanam B Pillai. New Delhi: New Century Publications, 2013.

T.Hagerty, Devin. "India and the Global Balance of Power: A Neorealist Snapshot." In *Indian Foreign Policy in a Unipolar World*, by Harsh V.Pant, 23-42. New Delhi: Routledge, 2009.

Vaydyanathan Shivakumar and Jose Ernesto Rangel Delgado. "Look east Policy of India: The myths and realities." *Tercera Epoca*, 2011: 107-132.

Water Security in India Threat Mapping: Impact of Climate Change

*Sourina Bej*¹

Abstract

Water has been a much discussed topic in India in recent years. Starting from the government's decision on inter-river linking, construction of dams to localised state conflicts over sharing, water touches a chord across religion both ethnically and politically. Hence if water becomes skewed owing to continuous lack of rainfall and simultaneous exploitation for human consumption, it could soon attain a national narrative that would have a bearing on the national economy, agricultural output, religious tourism (given that river is the religious lifeline of the country) subaltern conflicts and much more. The report illustrates five contributing factors/parameters/ issues to water insecurity such as: ground water depletion, glacial retreat, rainfall, temperature fluctuation, national water governance and civil society initiatives such as various water conservation practices. The issues were then studied in each ecological zone to understand the broader link between the causes of water scarcity and climatic variability. Following this, a table is compiled to measure each parameter as a step to under the vulnerability. It is based on this the following projections are being made in two subdivisions: Regions and Issues. In India, the 'scarcity' dilemma with regard to water security lies in inefficient water distribution/management and climate change is a mere catalyst to the existing peril. The data analysed gives us a picture that the climatic changes affecting South Asia is in line congruent with the global climate change conditions.

Keywords: Water, Security, India, Human security, Environment.

Water Security in India: Threat Scenarios

With the third consecutive year of severe summer, season of drought in Central India, late monsoons, flood in northern *Shiwalik* belt and less winter months,

*1 Sourina Bej is Research Associate in the ISSSP at National Institute of Advanced Studies, Bangalore, India. She can be reached at: sourinabej92@gmail.com.

climatic changes in India are much graver a problem than acted upon. Further severe are its impact on food and water availability. Water has been a much discussed topic in India. Starting from the government's decision on inter-river linking, construction of dams to localised state conflicts over sharing, water touches a chord across religion, ethnicity and polity. Hence if water becomes skewed owing to continuous rain failures and simultaneous exploitation for human consumption, it could soon attain a national narrative that would have a bearing on the national economy, agricultural output, religious tourism (given that river is the religious lifeline of the country) subaltern conflicts and much more.

This report is an attempt to give a nation-wide projection on possible scenarios of water insecurity in India based on qualitative understanding of water utilisation and management in the country. In this aspect, the report looks at the impact of climate change on water availability by answering the basic question: How much role does Climate Change play in causing water security? Or is it merely aggravating an existing peril which is human induced?

The report has divided India into 20 agro-ecological zones². Five contributing factors/parameters/issues to water insecurity have been identified: ground water depletion, glacial retreat, rainfall, temperature, national water governance and civil society initiatives such as various water conservation practices. The issues were then studied in each ecological zone to understand the broad link between the causes of water scarcity and climatic variability. Following this, a table is compiled to measure each parameter as a step to under the vulnerability. It is based on this the following projections are being made in two subdivisions: Regions and Issues.

Region-wise threat projections:

- The Deccan plateau region of Maharashtra Andhra Pradesh, Telangana and Eastern Coastal Plains of Northern Tamil Nadu is a critical water scarce zone. With departure from normal rain, 34 districts of Maharashtra, especially Marathwada and Vidarbha region is facing drought with has also seen high rates of farmer suicides.
- The Western Plain and Kutch peninsula which has an arid climate has prolonged and continuous water scarcity problems. States of Haryana

2 *The agro-ecological zones are by the National Bureau of Soil Survey & Land Use Planning. It is based on the growing period that takes into account effective rainfall, soil groups and delineated boundaries adjusted to district boundaries with a minimal number of regions.*

and Punjab, considered the rice bowl of India, is heavily dependent on groundwater for its consumption. In addition less rain and dry winters have affected the water table with little chance of water level recharge. Hence better water management could be done by using the open source river water with canal or and tank based irrigation. Poor water quality is also a major environmental issue in India as most of its river networks, lakes and surface water are polluted. As a result, more than 100 million Indians live in areas where water is severely polluted. In the same zone, states like Rajasthan and Gujarat has combated the issue of water scarcity with rain water harvesting methods.

- Another zone of water scarcity is the Northern Plains of the state of Bihar. The region is prone to extreme climate of drought, downpour (flash floods) and long winters. This calls for an effective disaster management and early warning system in place which the region lacks hence water utilisation and management becomes critical at the times of disaster.
- With warming of the Deccan plateau, the Central Highlands is the next zone who could bear the impact of water scarcity. Central Highlands is the zone adjacent to the Deccan Plateau. With water slowly become an issue in the central Deccan States, the highlands will feel the pinch of less rain. Hence if caution and efficient water management is not done, it could soon become problematic.
- The region of Western Himalayas and Northeast can be seen as a region with low water scarcity problems. Largely credited to a lifestyle revolving around environment and ingrained water conservation practiced by the people.
- The eastern Coastal Plains similar to the Northern plains is also disaster prone. Frequent cyclones, sea level rise, tidal erosion and simultaneous over use of groundwater has led to salinity intrusion which has extended up to 30 to 40km inland. The salinity rates of wells have increased after tsunami on 26th December 2004. Hence water scarcity in this region is different from the rest of the country. The per capita availability of water in the zone has not reduced rather it is the per capita availability of usable water that has reduced significantly.

Issue-wise projections:

- **Groundwater:** With over half of Indian population dependent on

groundwater for water consumption, recharging of water level is the most critical for water security. The zone of Deccan Plateau is critical will very low underground water level going beyond 40bgml. In Maharashtra, over drilling of borewells to the depth more than 1000ft has led to groundwater shortage. In addition, severe heat wave incident has turned the cotton belt into a drought prone region. Similarly, a critical underground water scarcity can be observed in Tamil Nadu. This eastern coastal region state has come to face the water problem due to unchecked urbanisation and encroachments on

wetland areas, lack of timely de-silting of water reservoirs and no flood zone planning. In the western plain of Haryana and Punjab, dependency on groundwater is optimum and there has been a 8ms water level fall in the last 5 years. Punjab extracts 145 per cent water from ground against an average 100 per cent recharge and Haryana extracts 109 per cent. In Central highlands, 48% of the wells show a decline in water level. In the Northern Plains, the decadal mean of groundwater fluctuation doesn't indicate abrupt drop. But being a disaster prone zone, groundwater utilisation becomes problematic. In winter months the western Himalayan states of Jammu and Kashmir faces acute to less rainfall. In addition to that, 50 water bodies in Jammu have been encroached upon to build tourist hotels. This will go on to affect the groundwater level. The problem isn't acute not but it might be visible with gradual temperature rise and change in weather patterns. In the Kutch peninsula, ground water level has remained close to 2 to 40bgml. Fresh water availability is less because it is in the shallow levels and saline tracts.

- **Rainfall:** There has been a uniform shift in the rainfall pattern with late monsoon onset, erratic rain and extreme downpour (resulting in floods) being the norm. The Deccan plateau has experienced a departure of normal monsoon rainfall trend, as per the IMD and few regions in the region have received deficient rainfall with negative departure of -42%. On the other hand the northern plains have seen rainfall on an increasing trend. The number of rainy days has increased but so has the intensity of rain. This has run the risk of mountain floods. Given that they are tourist spots, it will run the risk of being more disaster prone. In Rajasthan and Gujarat, there is an increase in decadal rain but simultaneous increase in temperature. This rainfall anomaly has different impact in different region. Because both the open and underground water sources are rain fed, this erratic pattern has affected the freshwater availability.

- **Temperature:** Like erratic rain, even the increase in temperature is a uniform phenomenon in the country. The Western Himalayan states have witnessed a rise above normal by 1C. In Central Highlands and Deccan region, the number of hot days and with it the heat waves have increased. In the north eastern region, temperature rise has been felt in terms of warmer winter months. Temperature may not have a direct bearing on water security but it's impact on the rain pattern has left a bearing on the water resources.
- **Glacial Retreat:** A 21% de-glaciations has been recorded in Jammu and Kashmir. Similarly, the Northern Plains is a frequent victim of floods due to river water overflowing. The Gangotri glacial (source of Ganga) have retreated by over 3 kilometres since 1817. Though a three-kilometre retreat over two centuries might seem negligible but the rate of retreat has increased sharply since 1971. Due to temperature rise, small lakes have formed on top of the glacier which in turn has led to the flooding of lower riparian plains.
- **National Governance and civil society initiatives:** It has been observed that most of the state sponsored schemes meant for water conservation have not incurred lasting positive results. From water conference, *Paani Bachao Abhiyan*, *Atal Talab Yojna*, to 100 ponds restoration scheme in the Deccan region lacked the intended reach and is marred in corruption. It is only the north eastern region and the Kutch peninsula that the use of check dams, mud dams has successfully helped in reviving the river. Secondly, dependency on the Narmada canal than groundwater has incurred positive result to combat water scarcity in the zone.

Threat Map: Assessing impact of Climate Change on Water Security

Zones	States	Ground-water Depletion ³	Rainfall ⁴	Temp ⁵	Glacial Retreat ⁶	National and civil society initiatives ⁷	Impact of Climate Change ⁸
Western Himalayas	J&K, Himachal Pradesh	High	Normal to deficit	Increase	High	Isolated	Medium
Western Plains and Kutch	Gujarat, Rajasthan, Haryana, Punjab	Medium to High	Deficit	Increase		Effective	Medium to High
Deccan Plateau	Andhra Pradesh, Karnataka	High	High Deficit	High Increase		Isolated	High

Deccan Plateau	Maharashtra	High	High deficit	High Increase	-	Ineffective	High
Northern Plains	Bihar	Medium	Heavy	High	Visible	(No Data)	High
Central Highlands	Madhya Pradesh, Uttar Pradesh	Medium	Deficit	Increase		Ineffective	High
Eastern Ghats	Tamil Nadu, Kerala	High	Deficit	Increase		Nil	High
Eastern Coastal Plains	Odisha	Medium	Deficit	Increase		Effective	Medium
Western Coastal Plains	Goa	High	Deficit	Increase		Nil	Medium
Bengal and Assam Plains	West Bengal, Assam	Medium	Heavy	Increase		Isolated	High
North Eastern Hills	Arunachal Pradesh, Sikkim, Meghalaya, Manipur, Tripura, Nagaland, Mizoram	Depletion	Heavy	Increase		Isolated	Low to Medium
Islands	Andaman and Nicobar Islands	Medium	Normal	Increase			(No trends due to lack of data)

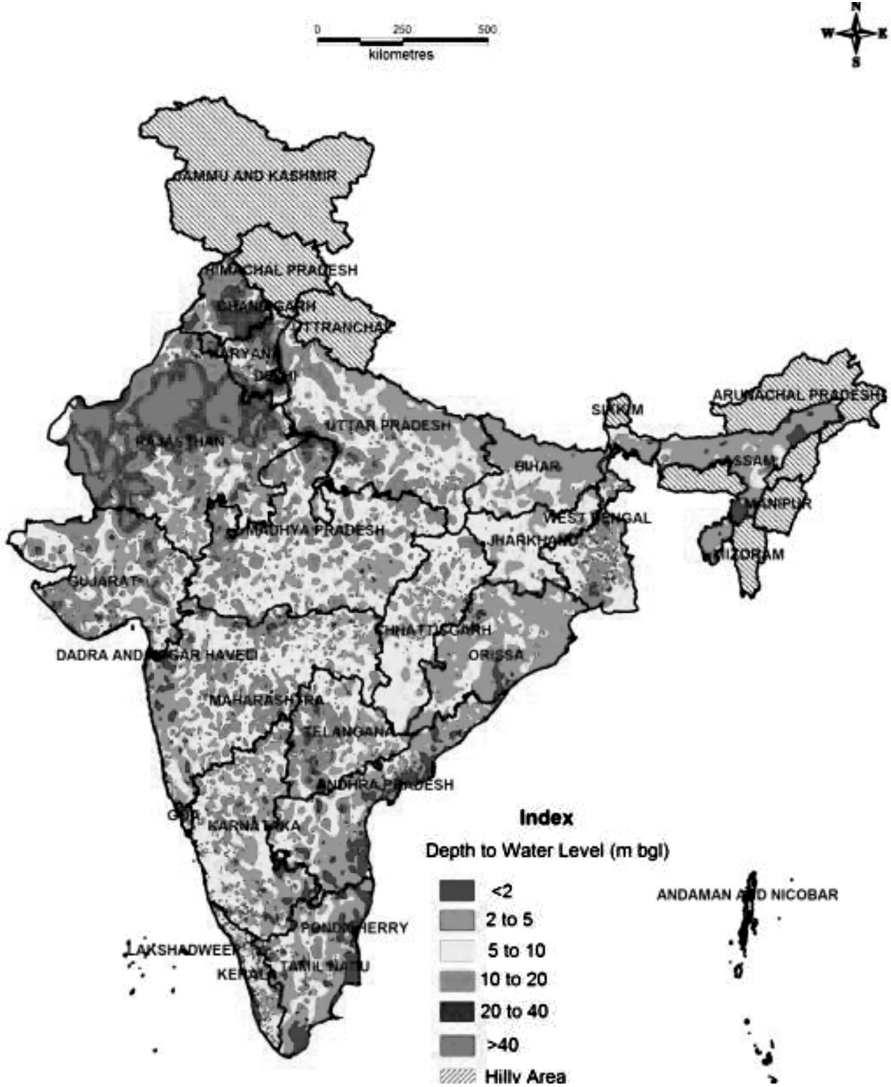
- 3 The high limit indicates water level below 40mbgl, medium indicates water level within 30 to 10mbgl and low indicates water level within 5 to 2mbgl. Data from 2016 Water Level Map by Central Groundwater Board.
- 4 The high deficit limit indicates rainfall within -3.0 mm/yr, deficit indicates rain below 0 to -3.00 mm/yr and normal to heavy is rainfall above 3.6mm/yr. Data from Annual rainfall trends (IMD) map for 1951-2011.
- 5 Increase indicate temperature rise above 1 degree Celsius and high increase is temperature above 3 degree Celsius. Data is from Annual Mean Temperature trends map (IMD) for 1951-2010.
- 6 Glacial retreat parameter has been further explained in the individual zones where the event is visible.
- 7 Refer to the water conservation practices to combat water scarcity.
- 8 High impact indicates zones where water scarcity is linked to climate change (by more than 50%), medium indicates water scarcity is linked to climate change (by 50%) and low indicates water scarcity is linked to climate change (by less than 50%) This is based on the subjective understanding.

Introduction

Water security is broadly defined as the capacity of a nation to guarantee the availability of quality water in a sustainable fashion. In this respect, water becomes an important security concern to high population density countries of South Asia. India, Pakistan, Bangladesh, Nepal (and China) account for half the world's total groundwater use. In spite of being a region surrounded by the Himalayas to the north, sea in the southeast and southwest and having perennial and well-connected inland rivers, South Asia is already a 'water-stressed' region. Because of this, water has emerged to be a critical driver of conflicts in the region. The report by the Asian Development Bank titled '*Asian Water Development Outlook 2013*' has labelled India's water security outlook for 2013 as "hazardous." India received the lowest water security index rating of 1 (on a scale of 5) by the report, along with countries like Bangladesh, Cambodia, Kiribati and Pakistan.

The issue of water security in India is lopsided. Water security in India can be understood by analysing the utilisation of the different types of water, namely, blue water (surface and ground water), green water (soil moisture) and grey water (waste water). Firstly, India suffers from an absolute water shortage. This means there is not enough 'safe' water to satisfy the rapidly increasing population of middle class. The total amount of usable water (both open source and groundwater) has been estimated to be between 700 to 1,200 billion cubic meters (bcm).⁹ With a population of 1.2 billion (according to the 2011 census) India has only 1,000 cubic meters of water per person. In addition to this, around 60 per cent of Northern India's irrigated agriculture is dependent on ground water, as is 85 per cent of the region's drinking water. The World Bank predicts that India has only 20 years before its aquifers will reach the "critical condition" – when demand will outstrip supply.

9 *The figure is based on a report (2013) by The National Bureau of Asian Research. The institute concluded the figure based on an interview with Kirit S. Parikh, Chairman of Integrated Research and Action for Development (IRADe) and a former member of the Government of India's Planning Commission in charge of water and energy issues.*



Map 1: Depth of Water Level (January 2016)

Source-Central Ground Water Board (January 2016)

Secondly, water mismanagement is another reason that aggravates India’s water crisis. In a country where half of India’s population (600million) depends on farming and about two-thirds of the farm fields rely on rain as their primary source of irrigation, water management and distribution becomes crucial when rain fails.

% of units	Safe	Semi-critical	Critical	Over-exploited	Salinity affected
90+	Arunchal Pr. Assam, Bihar, Goa, J & K, Jharkhand, Maharashtra, Manipur, Meghalaya, Mizoram, Nagaland, Orissa, Sikkim, Tripura, A&N Islands, Chhatisgarh, D & N Haveli				
75-90	AP, Chhatisgarh, Gujarat, Kerala, WB			Punjab	
40-75	HP, Karnataka, MP, UP, Uttarakhnad, Lakshadweep, Puducherry	Daman & Diu		Delhi, Haryana, Rajasthan, Daman & Diu	
20-40	Haryana, TN	MP, TN, Uttarakhnad, WB, Lakshadweep		Karnataka, TN, Puducherry	Puducherry
5-20	Delhi, Rajashthan	AP, Chhattisgarh, Delhi, Gujarat, Haryana, Karnataka, Kerala, Maharashtra, Rajashthan, UP	Delhi, Haryana, Karnataka, Rajashthan, UP, Uttarakhand	AP, Gujarat, HP, MP, UP	
<5		Bihar, Jharkhand, Punjab	AP, Chhattisgarh, Gujarat, Kerala, MP, Maharashtra, Punjab, UP, TN	Chhattisgart, Jharkhand, Kerala, Maharashtra	AP, Gujarat, Rajashthan, Orissa, TN

Source : Central Ground Water Board, Mia of Water Resources

Table 1: Statistics on Groundwater availability in India

Thus even though the overt and the primary reasons for water scarcity in India may be dependent on climatic factors, the underlying and aggravating reasons are due to anthropogenic activities. The study aims to find this link between water insecurity (caused by scarcity) and climate change. Once the link is established, a map will be created to qualify how much role do climatic conditions play in causing water scarcity in India.

Methodology

The study, “Water Security in India- Threat Mapping: Impact of Climate Change” is a pilot project to understand the various sociological, political and economic reasons for water scarcity in India, apart from climate change. Broadly a qualitative study, the report has divided India into 20 agro-ecological zones. An initial literature review has led to the identification of contributing factors or parameters to water insecurity: ground water depletion, glacial retreat, rainfall, temperature, national water governance and the civil society initiatives and water conservation practices. Keeping the agro-ecological zones as the base point, the report has studied the above factors in each ecological zone to understand the broad link between the causes of water

scarcity and climatic variability. Following this, a table is compiled to measure each parameter as a step to the draw the larger map. The table in the beginning of the report summarises the study and the concluding column reflects the extent to which climate change affects the water insecurity in India. The table was prepared superimposing the primary data collected from the IMD, Central Groundwater Board and Ministry of Water Resources and secondary data from published research papers and data from World Bank and IFCC. Data collected during interviews of experts and field visit was compiled to measure the vulnerability index (approximately) of water security to climate change.

Eco-system	Region	States represented	Eco-region	Soil type
Arid	1. Western Himalaya 2. Western plain, Kutch and part of Kathiawar Peninsula 3. Deccan plateau	Jammu & Kashmir, HP Gujarat, Rajasthan, Haryana, Punjab AP, Karnataka	Cold arid Hot arid Hot arid	Shallow Skeletal Desert & Saline
Semi-arid	4. Northern plain and Central Highlands including Aravalli's 5. Central (Malwa) Highlands, Gujarat Plains & Kathiawar Peninsula 6. Deccan Plateau 7. Deccan (Telangana) Plateau and Eastern Ghats 8. Eastern Ghats, TN uplands and Deccan (Karnataka) Plateau	Gujarat, Rajasthan, UP, MP, Haryana, Punjab Gujarat, MP Karnataka, AP, Maharashtra, MP AP Karnataka, TN, Kerala	Hot semi-arid Hot semi-arid Hot semi-arid Hot semi-arid	Alluvium- derived Medium & Deep black Shallow and Medium (with inclusion of deep) black Red & Black Red loamy
Sub-humid	9. Northern Plain 10. Central Highlands (Malwa, Bundelkhand & Eastern Satpura) 11. Eastern Plateau (Chhatisgarh) 12. Eastern (Chhota Nagpur) Plateau and Eastern Ghats 13. Eastern plain 14. Western Himalayas	Bihar, UP, Punjab MP, Maharashtra MP Orissa, W. Bengal, Bihar, MP, Maharashtra UP, Bihar J&K, HP, UP	Hot sub humid (dry) Hot sub humid Hot sub humid Hot sub humid Hot sub humid (moist) Warm sub humid (to humid with inclusion of per humid)	Alluvium- derived Black & Red Red & Yellow Red & Lateritic Alluvium-derived Brown forest and podzolic
Humid-per humid	15. Bengal and Assam plains 16. Eastern Himalayas 17. North Eastern Hills (purvanchal)	West Bengal, Assam Arunachal Pradesh, Sikkim, W. Bengal Tripura, Mizoram, Meghalaya	Hot sub humid (moist) to humid (inclusion of per humid) Warm per humid Warm per humid	Alluvium-derived Brown and Red hill Red and Lateritic
Coastal	18. Eastern Coastal plain 19. Western Ghats & Coastal plain	TN, Puducherry, AP, Orissa, W. Bengal Kerala, Goa, Daman & Diu, Maharashtra, Gujarat, Kerala	Hot sub humid to semi-arid Hot humid per humid	Coastal Alluvium-derived Red, lateritic and alluvium-derived
Island	20. Island and Andaman-Nicobar and Lakshadweep	Andaman-Nicobar and Lakshadweep	Hot humid per humid	Red loamy and sandy

Source: 1. *Fertiliser Statistics, 2010-11, The Fertiliser Association of India, New Delhi.*
2. National Bureau of Soil Survey and Land Use Planning (ICAR), Nagpur

Table 2: Agro-ecological Zones in India

Water Security: Mapping Vulnerability

Western Himalayas (States: J&K, Himachal Pradesh)

According to the World Bank, India is the largest user of ground water in the world, after China. There is faster depletion of ground water than replenishment. But this is due to overuse in farming and meeting population (drinking water) demand. The replenishment is further staggered due to less rainfall and longer drought periods. The reason for this can be attributed to rise in temperature and climatic anomalies even though development driven industrialization and urbanization has aggravated this phenomena. India extracted 251bcm of groundwater in 2010.

The overall contribution of rainfall to the country's annual ground water resource is 68% and the share of other resources, such as canal seepage, return flow from irrigation, recharge from tanks, ponds and water conservation structures is 32%. Due to the increasing population in the country, the national per capita annual availability of water has reduced from 1,816 cubic metre in 2001 to 1,544 cubic metre in 2011. This is a reduction of 15%.

Level of ground water development	Explanation	% of districts in 1995	% of districts in 2004	% of districts in 2009	% of districts in 2011
0-70% (Safe)	Areas which have ground water potential for development	92	73	72	71
70-90% (Semi-critical)	Areas where cautious ground water development is recommended	4	9	10	10
90-100% (Critical)	Areas which need intensive monitoring and evaluation for ground water development	1	4	4	4
>100% (Over-exploited)	Areas where future ground water development is linked with water conservation measures	3	14	14	15

Sources: Central Ground Water Board, PRS.

Table 3: Comparative status of groundwater level in past 20 years in India

The ecological zone of the Western Himalayas comprise of the states of Jammu and Kashmir, Himachal Pradesh. In Jammu, 27 million gallon of water is pumped out daily by 224 heavy lift pumps to meet the water requirement of the city. As of January 2016, the total numbers of active ground water wells are 261. According to a study conducted by the Public Health Engineering Department, out of the 22 major towns in the state, 14 are facing acute water crisis while five are on the threshold of reduced water supply. In the past decade, the ground water situation in the state is aggrieved by two factors-urbanization and changing rainfall pattern. Playing out simultaneously, the rapid development, without taking into account the ecological synergy, has in turn stressed the groundwater aquifers.

are checked. In addition, there are problems of ground water contamination like iron (in Tertiary belt and in Kashmir valley) marshy gases (in shallow and deep aquifers of Kashmir valley) and fluoride (Doda district).

Rainfall activity over the country during 2015 as a whole was above normal. According to the 2015 annual climate report, the first half of the season (1 June to 31 July) the country received normal rainfall (95% of its Long Period Average (LPA) value), while during the second half (1 August to 30 September) it received deficient rainfall (only 77% of its LPA value).

The State Centre on Climate Change in Himachal Pradesh, in its report analysing the monsoon trends from 1901 to 2012, stated that increasing trend during winter rains and summer rains in entire Himachal Pradesh was witnessed while no significant trend has been noticed in monsoon and post monsoon.

As per the Indian Network on Climate Change Assessment, the number of rainy days in the Himalayan region in 2030s may increase by 5-10 days on an average, with an increase by more than 15 days in the eastern part of the Jammu and Kashmir region. The intensity of rain fall is likely to increase by 1-2 mm/day. This prediction was made seeing the rise in temperature over the region. According to the Annual Climate Report (2015) by Ministry of Earth Sciences and IMD, parts of Himachal Pradesh, Jammu & Kashmir were warmer than the normal by more than 1 C.

The Kashmir valley has seen a rise in temperatures over the years, said G.M. Dar, associate professor (rural development), disaster management centre, J&K Institute of Management, Public Administration and Rural Development, Srinagar in an interview to Livemint. A report prepared for the state's department of ecology, environment and remote sensing in 2013 claimed average temperatures in the Kashmir valley had risen by 1.45 degrees Celsius over two decades. Is the temperature rise idiosyncratic of the region or in congruence with the global temperature rise, is a matter of future investigation. Unseasonal rains in March last year left a trail of destruction in the city of Jammu. The intense rain has led the Jhelum, which meanders through the city, to overflow.

River	Origin	Catchment area (km ²)	Average annual potential in river (Bm ³ /yr)
Indus	Mansarovar (Tibet)	321289 +	73.31
Ganga	Gangotri (Uttar Kashi)	861452 +	525.02
Brahmaputra	Kailash Range (Tibet)	194413 +	585.60
Barak and others			
Sabarmati	Aravalli Hills (Rajasthan)	21674	3.81
Mahi	Dhar (Madhya Pradesh; MP)	34842	11.02
Narmada	Amarkantak (MP)	98796	45.64
Tapi	Betul (MP)	65145	14.88
Brahmani	Ranchi (Bihar)	39033	28.48
Mahanadi	Nazri Town (MP)	141589	66.88
Godavari	Nasik (Maharashtra)	312812	110.54
Krishna	Mahabaleshwar (Maharashtra)	258948	78.12
Pennar	Kolar (Karnataka)	55213	6.32
Cauvery	Coorg (Karnataka)	81155	21.36
Total		2528084	1570.98
Other river basins of the country		248505	298.02
Total		2776589	1869.00

Source: CWC (2002)

Table 4: Major River Basins and its catchment area

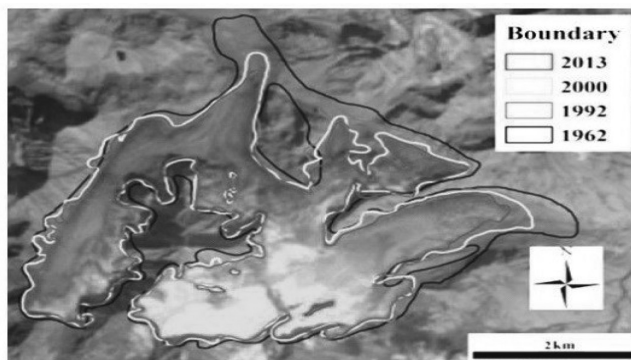
There are 12 major river basins in India with individual catchment area of more than 10Mha and a cumulative catchment area of 252.8Mha. The river systems are the major contributor (about 60%) to the surface water resource potential of the country. Jammu and Kashmir is fed primarily by Indus basin and then by Jhelum, Chenab and Ravi sub-basins. Unlike the Eastern Himalayan rivers which are mainly rain-fed, most of the water in the Himalayan rivers comes from snowmelt, which includes glacial melt. According to a research paper titled, 'Glacial retreat in Himalaya using Indian Remote Sensing satellite data' by the Department of Geology (Dharamsala) aerial extent of 466 glaciers which was estimated as 2077 sq. km in 1962 has reduced to 1628 km² in 2001-04. This is an overall 21% deglaciation.

Basin	Glacier number	Glacier area (sq. km)			Volume (cubic km)		
		1962	2001-04	Loss (%)	1962	2001-04	Loss (%)
Chenab	359	1414	1110	21	157.6	105.03	33.3
Parbati	88	488	379	22	58.5	43.0	26.5
Baspa	19	173	140	19	19.1	14.7	23.0
Total	466	2077	1628	21	235.2	162.73	30.8

Table 5: Basin wise loss of glacier area

Source: State Centre on Climate Change in Himachal Pradesh

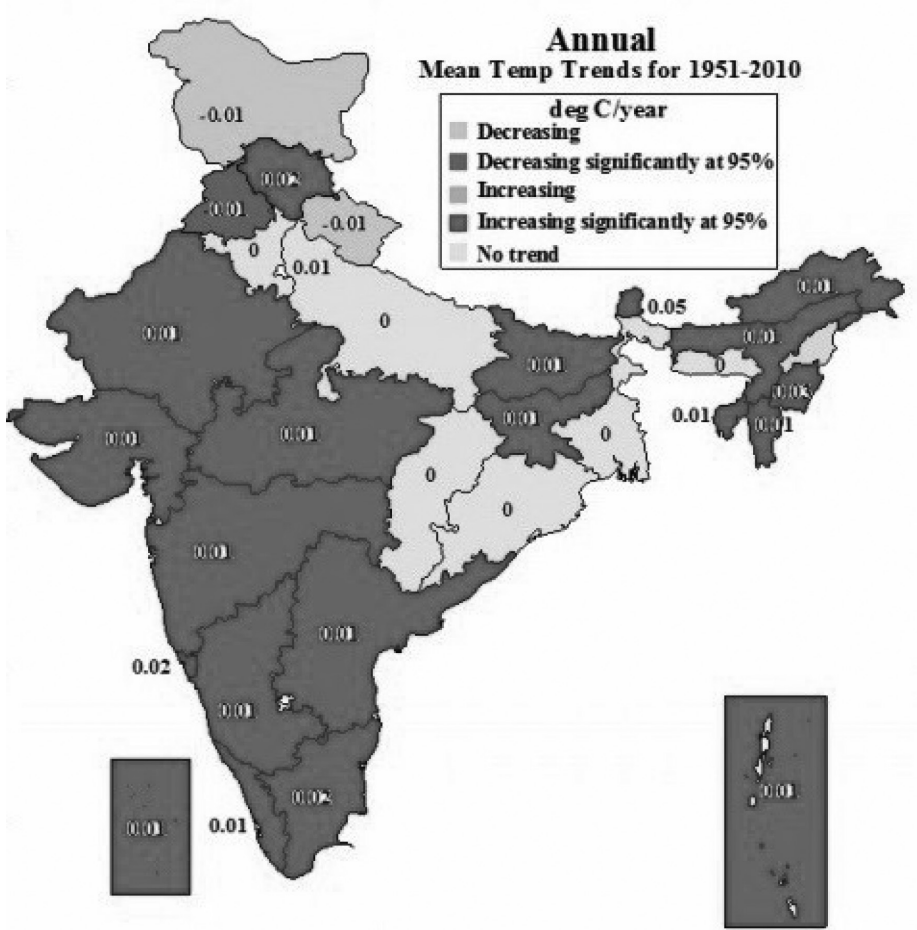
Measured by the Central Groundwater Board, the depth range of exploratory wells varies between 77 m bgl and 271 m bgl. Human encroachment and tourism activity has reduced the city's iconic Dal Lake to a sixth of its original size – from around 75 sq. km to 12 sq. km. Similarly the Wular Lake has shrunk from 159.74 sq. km to 86.71 sq. km from 1911 to 2007. From 1911 to 2004, Srinagar lost more than 50%



Changes in the extent of Kolhoi glacier from 1962-2013

S.No.	Year	Total extent km ²
1	1962	13.67
2	2013	10.92
Loss in spatial extent		(Ref: DOI:10.1657/AAR0014088) 2.75

of its water bodies because of unplanned urbanization. Srinagar lies cradled in the bowl-shaped Kashmir valley, surrounded by mountains. The city is teeming with 1.5 million people. In Himachal Pradesh, the state government has approved detailed project report of about 139 crore to construct 956 rain water conservation structures. While there exist isolated and individual efforts in building water harvesting campaigns, these are not enough to build a collective effort. In Ufrenkhal region of Uttarakhand, villagers successfully transformed a dry ravine into river by digging small percolation pits on slopes and planting grass immediately downhill of the pit to protect the edge.



Map3: Annual Temperature Trends

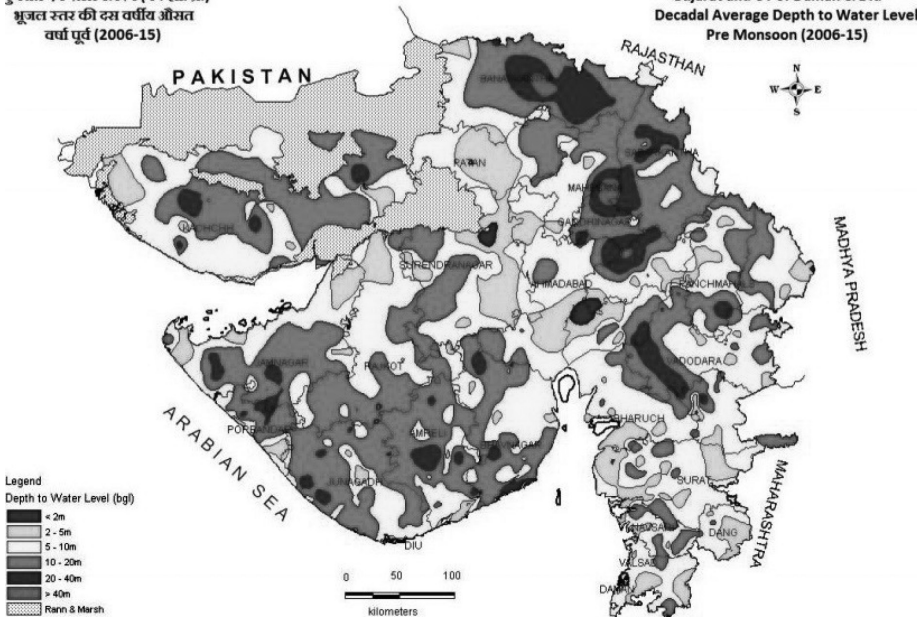
Source: Indian Meteorological Department (2013)

Western plain and Kutch Peninsula (Gujarat, Rajasthan, Haryana and Punjab)

The ground water level in Gujarat, has increased by 67 per cent as on May 2014. This was due to the rise in use of Narmada canal for drinking and irrigation purposes. According to the groundwater handbook (2015-16) by the Central Ground Water Board, over 4 meters fall has been observed in most of the districts in Gujarat including Ahmedabad, Banaskantha, Vadodara, Amreli, Rajkot and Kutch. The decadal average water level map for the period May 2006 to May 2015 reveals that the decadal average water level in Gujarat has remained close to 2 to 40 m bgl.

गुजरात पब्लिक वर्क्स & डेव (क. शा. प्र.)
भूजल स्तर की दस वर्षीय औसत
वर्षा पूर्व (2006-15)

Gujarat and UT of Daman & Diu
Decadal Average Depth to Water Level
Pre Monsoon (2006-15)



Map 4: Decadal depth of groundwater level

Source: *Groundwater Handbook (2014-15)*

It should be noted that drinking water, per capita fresh water availability is almost 40 per cent less in Gujarat compared to the national average. While fresh water availability is 1545 cubic meter per capita per person in India, it is just 945 cubic meters in Gujarat. The shallow water levels of less than 5 mbgl were observed along the coast, Rann of Kachchh. The quality of ground water is inferior along the Rann of Kutch coast and in the low-lying saline tract of Saurashtra. The deterioration in ground water quality here is due to frequent seawater ingress. In the state, out of total water availability 80 per cent goes to irrigation, 10 per cent to domestic and rest 10 per cent to industries. Haryana is considered the rice bowl of India with the largest paddy-growing areas. But the groundwater level is dropping by 21cms every year, resulting in the increase of dark zones. The groundwater level has dropped by eight metres in the last five years. In 2015, the International Journal of Enhanced Research in Educational Development published a report stating that Haryana, in its sixth drought in 11 years, is facing serious environmental degradation post Green Revolution era that made the state self-sufficient around four decades ago. A study by the National Academy of Agricultural Sciences in 2011 reads, "Water-table in 82 per cent area of Punjab and 63 per cent of that in Haryana has gone down substantially." The study also mentions, "In Haryana, only

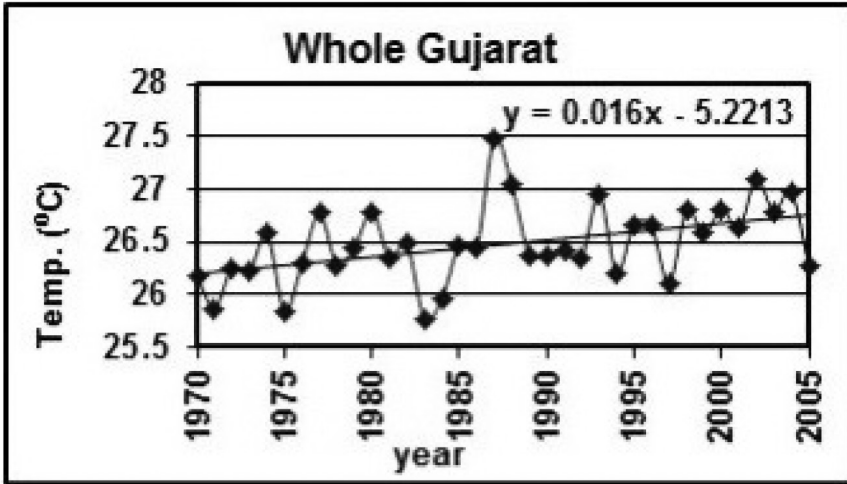
37 per cent of the water is exploited within the safe limits while 14 per cent over-exploitation has reached a semi-critical to a critical stage." According to a report published by Central Groundwater Board, Punjab extracts 145 per cent water from ground against an average 100 percent recharge and Haryana extracts 109 percent. Reduced rainfall has added to the rising water insecurity. As per the agricultural department, Haryana receives an average rainfall of 354.5 mm. It is not enough for the natural recharging of the groundwater. This has given rise to severe drinking water distressing the two states.

In the journal *Water*, a report titled, 'Understanding Groundwater Storage Changes and Recharge in Rajasthan (India) through Remote Sensing' entails a similar tale for the state. But Rajasthan is in better shape when it comes to addressing water insecurity, due to government and civil society initiatives. According to the report, Rajasthan only possesses 1.2% of the total surface water and 1.7% of the groundwater. The state is heavily dependent on groundwater for both irrigation and drinking water. During the 1970s and 1980s (the era of Green Revolution) there was widespread use of groundwater and the pressure is further increasing due to population growth and industries. About 80% of the State has witnessed groundwater depletion.

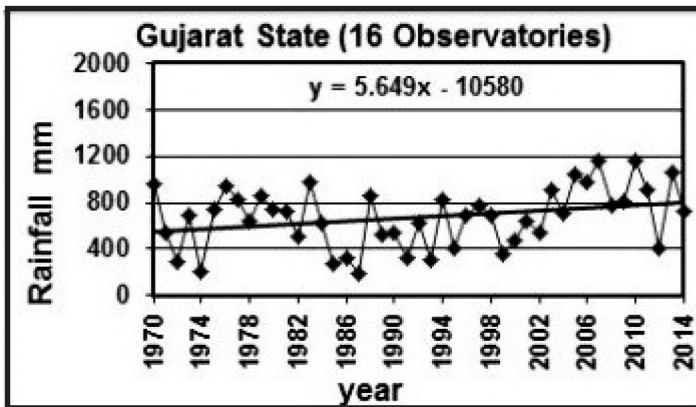
In Gujarat, the average rainfall for 2015 is 712 mm, which is 30 percent less than the decadal average. Gujarat is one of the frequent drought prone states of India. Several consecutive droughts have been experienced in last 20 years and 1986-88 was the longest and the most severe. Monsoon rainfall over the state shows a statistically significant increasing trend with a change of 56 mm/decade and over the semi-arid region the increase is much more, about 65 mm/decade.

There is a simultaneous increasing trend in temperature over the arid region of the state, but monsoon rainfall doesn't show any increase in terms of intensity as well as frequency. Thus, rainfall doesn't bring much respite as the temperature increase is felt strongly. The average recorded rainfall for the entire state of Rajasthan from 2004 to 2013 was 572 mm.

According to the report titled 'Trends in intense rainfall events over Gujarat (India) in the warming environment using gridded and conventional data' in the International Journal of Applied Environmental Sciences, the period 1991-2014, recorded a temperature increase at a rate of 0.100C/decade. A shift (increase) in annual temperature of 0.910C is observed between 1931-1990 and 1991-2014. For Gujarat, the increasing trend in the annual mean temperature for the period 1971-2006 is statistically significant and it is about 0.160C/decade.



Graph 1: Temporal variation of the mean annual temperature over



GujaratGraph 2: Temporal variation of the mean annual monsoon over Gujarat

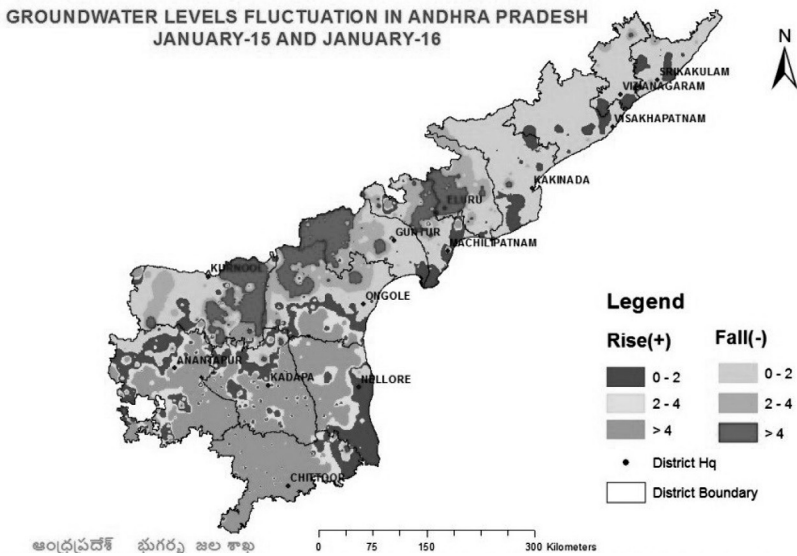
Sources: IMD (2014)

In this ecological zone, given the soil texture, arid to semi-arid climate, the problem of water security is acute. But except in the state of Punjab and Haryana, the stress has been considerably overcome with the involvement of government and several civil and individual actions. In January 2000, the Gujarat government launched the Sardar Patel Participatory Water Conservation Programme wherein 25,000 check dam was built by the people themselves. On account of this, the rate of groundwater recharge and availability of drinking water has increased. One such village is Padodar in Gharda tehsil of Bhavnagar district. In the past two years, no government

water supply reached the village. Yet, in September 2000, there was ample water. It is recorded that between March 17 and June 17, the villagers built 51 check dams. Similarly, in Rajasthan, the Aakar Charitable Trust by Amla Ruia, has helped in the construction of 200 check dams in 100 villages for over 2 lakh people. The most famous tale of water conservation is by Rajendra Singh called the waterman of India. By helping the villagers build mud dams (*johads*), today, there are nearly 8,600 *johads* to collect water. This has provided water to over 1,000 villages across Rajasthan. Farmers of the Saurashtra and Kutch region revived the once perennial Meghal River by building check dams to store water all throughout the year.

Deccan Plateau (Andhra Pradesh and Karnataka)

Even though, Andhra Pradesh has 40 rivers, 12 of them being inter-state, there is a gap between the demand and supply of water to all sectors such as irrigation, domestic and industry. According to Andhra Pradesh government estimate, the total water utilisation in the state in 2015 was 29.18 BCM of which 96 per cent was for irrigation and only 0.6 per cent was by industries. The total domestic drinking water use is about 3.25 BCM. It has been estimated that water consumption across these sectors is expected to increase by at least 50 per cent from the current 29.18 BCM to 42.68 BCM. In addition, with population growth and urbanisation, the demand and supply gap in water distribution is bound to widen.



Map 5: Andhra Pradesh Groundwater level scenario

Source: Central Groundwater Board (2016)

The groundwater consumption is also dire. According to the central groundwater board report, the average groundwater level for the state in January 2016 was 9.74 m., where as it was 10.86m.during the same period in the previous year. In 2015, the Vempalle mandal of Kadapa district in AP has recorded 114.10 m BGL. This is the deepest water table in the state. The reasons as projected were overtopping of the third aquifers by drilling borewells to a depth of more than 1,000 feet. Second, is the geological formation of the Vempalle area where recharging is inherently poor. Usually, when limestone is on the top and shale is below, the ground water will be on the top. But in the most of Deccan plateau region, limestone layers are deep below the shale and on account of this water is available only after a certain depth. With this geomorphologic setup, deficit rain fall has created a longer dry spells thereby inducing water scarcity in the central Deccan belt.

According to the IMD report, Andhra Pradesh as a whole received 3.6 mm rainfall as against the normal rainfall of 8 mm thus records 55% less rain during January 2016. Similarly in 2015 Karnataka recorded 22 percent rainfall deficit during monsoon. Speaking on the rainfall deficit, chief minister of Karnataka gave the estimation that the state records only 50 TMC of water (as of 2016). Nearly 40 TMC of water will be needed for activities other than drinking thus just 20 TMC is left to fulfil the drinking needs of the whole state.

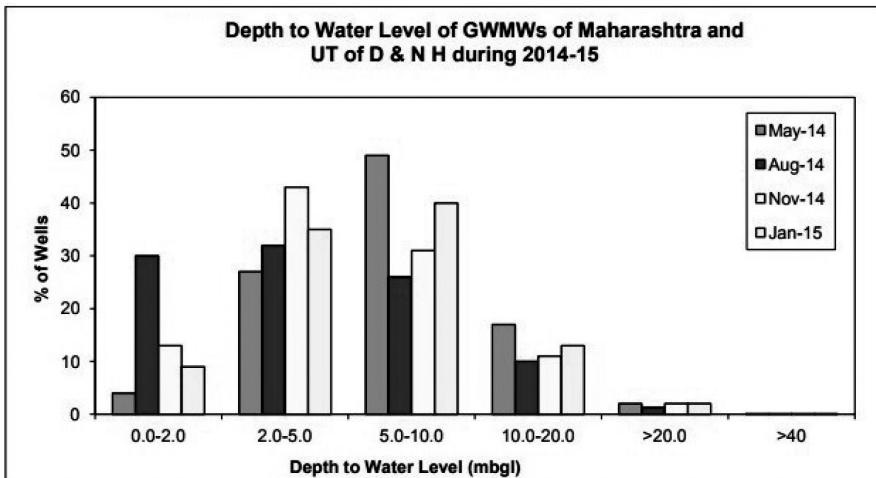
There are seven river systems in the Karnataka namely Krishna, Cauvery, Godavari, North Pennar, South Pennar and Palar. According to an Indian Express report, the country's southern tip — the old Mysore region (south interior Karnataka), Kerala and Tamil Nadu — has had an approximately 25 per cent below-average rains this year. This comes on top of rainfall deficiency that amounted to over 35 per cent last year. This new statistics has replaced Maharashtra as the new epicentre of drought, with back-to-back rainfall failures similar to what Marathwada experienced in 2014 and 2015. This rainfall deficit coupled with fall in groundwater levels has intensified the inter-state water sharing issue. Last year September saw a major stand-off when the Karnataka government, on account of a Supreme Court order, was forced to release water from its reservoirs on the Cauvery river basin to the Mettur dam across the border in Tamil Nadu. It triggered violent protests by pro-Kannada groups who contended that there was hardly any water in the Krishna Raja Sagara reservoir. Kabini and Harangi are at 40 percent capacity while Krishna Raja Sagara and Hemavathy have only between 15-20 percent of their capacity. Rising temperature has also been a concern in the southern peninsula. Severe heat wave incidences over the south peninsula and eastern parts of the country took a toll of over 1400 lives from the states of Andhra Pradesh and Telangana

during May and June. An analysis of the meteorological measurements of temperature for Karnataka has shown a steady warming trend in both the minimum and maximum temperatures.

There are several government initiatives in place like the irrigation water projects over the Papagni near Anantapur in Andhra Pradesh, the Andhra Pradesh Water, Land and Trees Act, 2002, wherein construction of bore well is banned in regions with groundwater level below 20mts and the Neeru Meeru programme. The Neeru Meeru programme that aimed to desilt old tanks in 3,348 villages is a failure. This is because, the way the programme has been planned, has left room for contractors and engineers to exploit many villagers. In Karnataka, rain water harvesting as a measure to adapt to water insecurity has taken ground. In addition, several impact land treatment, intervention-drainage treatment and restoration of tanks have been initiated. Still in its nascent stage, RWH is yet to translate into conclusive solutions especially in urban Karnataka.

Deccan Plateau (State: Maharashtra)

According to a report by the Maharashtra Groundwater Surveys and Development Agency, the groundwater level in 60 per cent tehsils of Maharashtra has depleted by a minimum of one metre. The report further estimates that a total of 2,130 villages in 72 tehsils, where there was a rainfall deficit in a range of 0-20 per cent in 2016, have shown groundwater depletion of more than one metre.



Graph 3: Groundwater level in Maharashtra during 2014-15

Source: *Groundwater Yearbook of Maharashtra and UT Dadra and Nagar Haveli (2014-15)*

In addition, the 17 big reservoirs in the state are left with just about 2 BCM of water, which is 14% of their total capacity. Data from the Central Water Commission (CWC) show that water levels in Maharashtra's reservoirs was just over 30% of full capacity in the first week of January this year. Between January and May this year, water levels in all 91 big reservoirs in the country, including the ones in Maharashtra, almost halved from a cumulative 44%. According to same report, the basins of the Tapi, Krishna and Godavari, all of which lie partially in Maharashtra, have very little water compared to normal levels.

From a departure of normal monsoon rainfall trend, as per the IMD, rainfall in 34 districts of Maharashtra, especially Marathwada regions, have received deficient rainfall with negative departure of -42%. When the decadal fluctuation of ground water levels was checked, the Groundwater Yearbook reported that the long-term decline in water levels may be due to poor saturation of aquifers and may be due to large-scale developmental activities for which the ground water resources are frequently exploited.

Around 82% of the state is made up of hard rock or Deccan trap basalt, this has a very low water storage capacity. In addition to this, a look at the rainfall pattern shows that it is not uniform and there is considerable regional as well as annual variability. Maharashtra experiences extremes of rainfall ranging from 6000 mm to less than 500 mm. The Western Ghats receive more than 6000 mm of rainfall while the plains receive 2500 mm of rainfall. The rainfall decreases towards eastern slopes and plateau areas where it is less than 500 mm.

The rainfall then again decreases towards east i.e. in the direction of Marathwada and Vidarbha to around 1500 mm. Thus, the Madhya Maharashtra sub-division is the region of the lowest rainfall in the state and is almost always in the grip of water scarcity and droughts. As high as ninety-nine talukas in the state are chronically drought affected.

Maharashtra is one of the few states that enacted the Maharashtra Groundwater (Regulation for Drinking Water Purposes) Act 1993. However, the law is silent on issues such as how much water may be withdrawn for irrigation. In 1999, the Chitale Commission reviewing the drought situation in the region had put forth the concept of looking at groundwater use in totality as that used for drinking as well as irrigation, with deeper groundwater to be used for drinking purposes while the annually replenish able one for irrigation. Post this recommendation, the Maharashtra Water and Irrigation Commission had recommended that it is necessary to register wells, bore wells and tube wells and

to consider and estimate groundwater and surface water together and that too on a watershed/sub basin basis. Periodic estimation of the groundwater level fluctuations was taken into consideration by the Maharashtra Groundwater Surveys and Development Agency. In addition, there exist a government-sponsored watershed programme called the 'Jalyukta Shivar Abhiyan' that has begun in over 6,000 villages and aims at making 5,000 of them free of water scarcity. Acute water scarcity in the belt has resulted in failure of agriculture. In a public statement the State's Relief and Rehabilitation Minister Eknath Khadse said over 1,000 farmers have committed suicide last year.

In Latur, the villagers have revitalised 2.5 km out of 7 km of the nullah in the village, spending their own money. The Kumar Sahwas a residential complex in the foothills of Pune has successfully attempted to divert all the rainwater flowing down from the roads to recharge bore wells after passing the water through soak pits and sand filters. These government and civil society initiatives have helped in combating the issue of water security in the region. It should be noted all these initiatives are short term and time bound mitigation initiatives rather than long term plans directed at tackling the anthropogenic (developmental activities) causes to water security.

Northern Plains (States: Bihar)

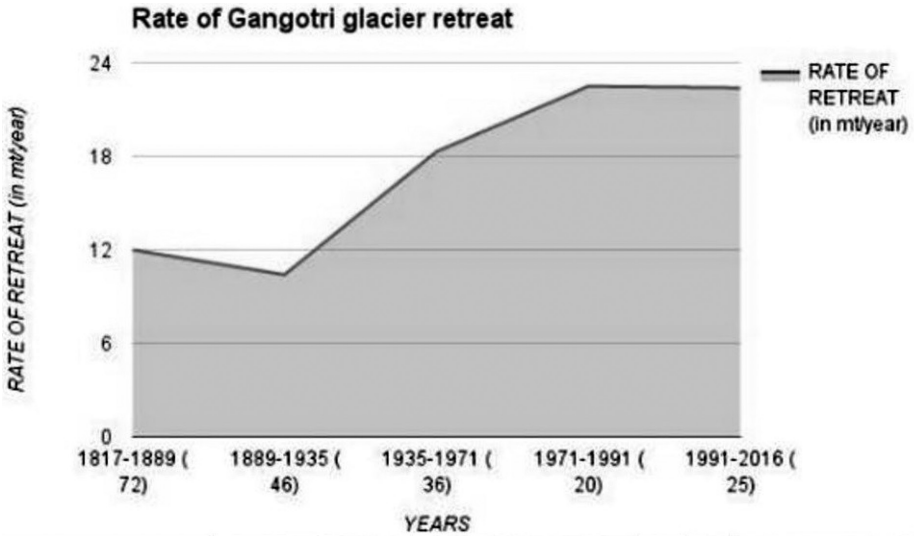
Bihar is highly flood prone during monsoons and drought prone in the pre monsoon seasons. While North Bihar in general is highly flood-prone, South Bihar is highly drought prone. In the (relative) absence of state level climate models and/or vulnerability studies, as well as low community awareness, Bihar is potentially more sensitive and vulnerable to the climate change and its impact. In addition, the state is also prone to earthquake. Located in the high seismic zone perched on the boundary of the tectonic plate joining the Himalayan tectonic plate near the Bihar-Nepal border and having six subsurface fault lines penetrating through its Gangetic planes in four directions, Bihar is vulnerable to the disaster caused by earthquake of near maximum intensity.

According to the Groundwater yearbook Bihar (2015 - 2016), for the period from May 2014-2015 the fluctuation of ground water level of 441 monitored centres indicate rise in water level in 181 well sand fall in water level in 255. The decadal mean of groundwater fluctuation from January 2015 to 2016 (post monsoon period) indicate that in 24% of the monitored centres, rise in water level is recorded and remaining 76% centres fall in water level has been observed. This indicates that the aquifer recharge is heavily dependent on rainwater and a weak monsoon for the past few years has affected the

groundwater levels as well. A look at the rainfall pattern indicate that in the year 2015 the state received only 742.3 mm rainfall which is about 28% less than normal monsoon.

The northern plains/Terai region of Bihar is highly flood prone. Several reports have indicated the rising river water in Mahananda, Kosi, Gandak, Bagmati, Burhi Gandak and Kankai rivers in Nepal and a cumulative high intensity rain for a shorter period (cloudburst) as the reason for frequent landslides and flash floods. As detailed in the Vulnerability Atlas of India, 27 districts in Bihar are fully affected by high-speed winds of 47 m/s intensity. In addition to intensive rain, melting of glacier is also seen one of the many factors behind rising river water and subsequent flood. It has been estimated that the Gangotri glacial (source of Ganga) have retreated by over 3 kilometres since 1817. Though a three-kilometre retreat over two centuries might seem negligible but the rate of retreat has increased sharply since 1971. Currently as estimated by the National Institute of Hydrology (NIH), Roorkee, the rate of retreat is 22 metres per year.

Winter precipitation feeds the glacier. About 10-15 spells of winter snow as part of western disturbances maintains the glacier. But last year Gangotri received very little snowfall. According to an interview in *The Hindu* Professor Manohar Arora, scientist at NIH, said more rain and slight temperature has been observed over the Gangotri, both of which transfer heat on to the glacier, thereby warming it. Small lakes have formed on top of the glacier near Tapovan. As an eminent conservationist and mountaineer Harshwanti Bisht said, it was the blast of one such glacial lake in Chorabari that led to the June 2013 flood disaster in Kedarnath. If expert opinion and research work are to be believed then the frequent floods in Bihar cannot solely be attributed to rain and river overflow. A particular attention needs to be given to glacier retreat as well. Disaster gets exacerbated by certain other factors like high population growth, environment degradation, sand casting and changes in land use due to sand casting. However, most of the disaster management measures are aimed at mitigation rather than prevention.



Graph 4: Gangotri Glacier Retreat

Source: *The Hindu* (2016)

Taking into account the scorching heat and depleting groundwater level (especially in south Bihar), urban development and housing department of Bihar government has decided to set up a control room at the secretariat. People can lodge their grievance related to water crisis on 0612-2210000. This apart certain individual civil society initiatives like in Gaya Bihar: Magadh Jal Jamaat a group aims at reviving *ahar pyne*. A traditional water conservation and disaster management mechanism, *ahar pyne* involves construction of diversion channels to lead the floodwaters of the rivers into a reservoir with embankments on three sides.

Central Highlands (States: MP and UP)

Comparison of November 2015 water levels with that of May 2015 shows that there is a rise in the ground water level in about 84.54% of the wells due to monsoon recharge and 15.46% of wells show decline in water level (Groundwater yearbook -2015-16- Madhya Pradesh). Rise in the order of 0-2 m is seen in about 37.33% of wells in the state. 26.47% of wells show a rise in the order of 2-4 m. However a pre-monsoon report by the Central Ground Water Board on the groundwater scenario stated that 68% of the wells monitored in Madhya Pradesh have recorded a decline in groundwater levels, as compared to 2014.

When the groundwater level of 2015 is compared to the decadal mean

(2005 -2014), 48% of the wells show a decline in water level. According to a report in Hindustan Times, an increasing demand of water for human consumption, agriculture and industry, coupled with erratic rainfall has led to the indiscriminate exploitation of groundwater. In the same report, Lokendra Thakkar, state coordinator of the Climate Change Knowledge Management Centre on Climate Change, said over 90% of the water used for drinking and domestic purposes in MP. According to the Groundwater Yearbook 2015 estimates 33.52% wells have nitrate concentration above permissible limit.

The study, "Climate Change in Madhya Pradesh: Indicators, Impacts, and Adaptation," done jointly by IIT-Gandhinagar and IIM-Ahmedabad says that with rise in temperatures, the "frequency of severe, extreme, and exceptional droughts in the state" will also increase. In UP, there is a declining trend in 51.4% of the monitoring wells covering over 10 years. Apart from groundwater, the states depend on river water for drinking purposes as well. Catchments of many rivers of India lie in Madhya Pradesh. The northern part of the state drains largely into the Ganga basin and the southern part into the Godavari system. The Narmada and Tapi rivers flow from east to west.

Data from the agriculture department of MP show that the state has had deficit rainfall almost every year since 2002. 2013-14 was only year when above average rainfall was recorded. There is a definite trend of increase in events like drought, heavy rain, hailstorms, etc," concluded the Bhopal meteorological centre director Anupam Kashyapi in the same report. It was observed that the long-term monsoon precipitation for the state of MP was stable for the period of 1951-2013. However, it can be noticed that monsoon season precipitation declined slightly during the recent decades. During the monsoon season, the five most deficit years occurred in 1979 (597 mm), 1965 (610 mm), 2007 (696 mm), 1966 (702 mm), and 2009 (725 mm). On the other hand, the five most surplus years during the monsoon season occurred in 1961 (1372 mm), 2013 (1307 mm), 1994 (1303 mm), 1973 (1243 mm), and 1990 (1167 mm). It was observed that the state experienced four severe droughts during the period of 2000-2010 highlighting that the drought frequency has increased during the recent years.

On the other hand, UP has received 189.8 mm rainfall which is 102.2% of the 185.6 mm normal rain after three parched years. Sixteen districts have deficient rains. Rainfall in the state is largely uneven as out of 71 districts of Uttar Pradesh, 42 districts received deficient, 26 received scanty, two districts received normal and only one received 20 excess rainfall (IMD report 2014). According to the study, "Climate Change in Madhya Pradesh: Indicators, Impacts, and Adaptation," there is a sharp increase in the frequency of the

number of hot days during the period of 1951-2013. The number of hot days has greatly increased after 1990 in the state of MP. So have the frequency of heat waves. The year 1988 experienced the most number of heat waves and was also the year with a severe drought in the region.

In Madhya Pradesh, post the Bundelkhand drought, a new act has been enacted wherein; no new hand pump will be dug without maintaining minimum distance between two handpumps. Around 2.13 lakh riser pipes were also constructed to ensure constant supply during the three crucial summer months. However since last 15 years all state sponsored schemes meant for water conservation have not shown good results. During Congress regime in 2001, government initiated rain water conservation on a big scale and launched the Rajiv Gandhi Watershed Development Mission. As this watershed development was restricted in certain areas, the state government took a new programme of conservation that could reach out to all districts and named it Paani Bachao Abhiyan. To ensure rights to village panchayats to own their resources, another programme Ek Panch Ek Talaab was started. This was to ensure every member of the village, block and district panchayat becomes responsible for reviving or constructing a pond or tank. A similar programme in Malwa region, Malwa Jal Sammelan (water conference) was also organised. However, these programmes lacked the intended reach and with acute shortage came corruption and water mafia that deterred the implementation.

During the BJP regime, Balram Talab Yojana was launched to increase the ground water-table which was later restructured as Atal Talab Yojana. Under the scheme a subsidy of 25% up to a maximum of Rs50,000 would be provided for constructing a large tank to augment irrigation potential. Corruption charges galore in disbursing funds for the projects. In UP, 400 water tankers have already been delivered by the Uttar Pradesh government to equitably distribute water among these regions reeling under water shortage.

In addition, the '100 Pond Restoration Scheme' has been launched by Akhilesh Yadav aimed at improving land-irrigation in the drought affected regions. In Lalitpur (UP), one of the worst drought affected region, had only one pump for around 600 people. Similarly Bundelkhandis starved of water and food. According to the 2011 Census, there are 18.3 million people living in the 13 districts that make up this region spread across Uttar Pradesh and Madhya Pradesh. But given the current drought propensity, migration has increased to about 60-65 per cent, against 30-40 per cent in previous years. Few isolated efforts have been taken by the communities to combat water insecurity. Such as, the women of Langoti village in Khandwa district of Madhya Pradesh have successfully dug a well on their own after the gram panchayat refused to help them.

Eastern Ghats (States: Tamil Nadu and Kerala)

The 2011 Census shows that 65 per cent of rural and 59 per cent of urban households have wells in Kerala. This density of wells is the highest in the country and is higher in the coastal regions. In addition, Kerala has recorded 45 per cent less water in its dams compared to last year. According to the Kerala irrigation department, in 20 big and small dams under the department, water storage stands at a pathetic 535.74 mm³. On the same day last year, the storage stood at 978.36 mm³, meaning the dams had held 45.24 per cent more water then. These figures indicate that as the water in the reservoirs are reducing the construction of wells are simultaneously increasing water woes in the state.

Year	Population (crores)	Per capita ground water availability (Litre/day)
1901	0.64	3,095
1911	0.71	2,790
1921	0.78	2,539
1931	0.95	2,085
1941	1.10	1,801
1951	1.35	1,467
1961	1.69	1,172
1971	2.13	930
1981	2.45	780
1991	2.95	672
2001	3.36	590

Table 6: Per capita groundwater availability in Kerala

Source: Devi, I.P. (2012)

In South Kerala, the Vamanapuram River in Thiruvananthapuram, for instance, has recorded low water storage. The water is down so much that water supply scheme dependent on it may have to be halted in the absence of summer rainfall. Similarly, tubewell-based irrigation in Alappuzha is hit on account of depleted groundwater levels. Thalassery and Koothuparamba blocks in the district have been categorised as semi-critical in a recent report by the Ground Water Department. The situation in central Kerala may be little better. Water levels in Periyar and Chalakkudy rivers have dipped but not to the extent as the Vamanapuram River.

On account of low water in the river basins as well as dipping groundwater levels, drought has severely hit in many areas in Kerala. The Bharatapuzha and Manalippuzha, the main water sources for Thrissur district is most hit. In Palakkad, schemes dependent on Bharatapuzha, Kunthipuzha and Thoothapuzha are facing a crisis. About 50 % wells are showing decline

in water level, out of which 37 % wells are showing decline in water in the range of 0-2 m. The groundwater potential of Kerala is limited because 88 per cent of the total geographical area of the state is formed of crystalline rocks devoid of any primary porosity. This year, with 29.1 per cent deficiency in rainfall, Kerala's power production also would be affected due to fall in rainfall. As the chief minister of Kerala, Vijayanin a public statement said, the shortage was 36 per cent in Idukki, 59 per cent in Waynad and 35 per cent in Thiruvananthapuram, where major hydel power projects were situated. There is an increasing trend of drought years. Looking at the long-term rainfall trend of Kerala, Tamil Nadu and Pondicherry there was no abrupt fluctuation up to 2000. In Kerala, the fluctuation occurs for certain period of interval that is still going on. This is because the consistent departure of rainfall from the normal course for 61 years has led to the formation of severe drought like condition. Along with it there was simultaneous rise in temperature. The report in 'Kerala Climate', a publication of Institute of Climate Change Studies, has attributed this temperature rise to the rise in temperature in the Indian Ocean.

The district office of the Ground Water Department in Kerala has constructed four groundwater recharge structures in the past five years, including those at Navodaya Vidyalaya, Chendayad, and Kendriya Vidyalaya, Payyanur. As part of the 'Haritha Keralam' project 15,022 water bodies have been recharged and 3931 public wells dug. Besides this, 3855 new ponds were built and 13247 ponds across the state were rejuvenated. Mazha Polima,' a project which seeks to create public movement on recharging of open wells through rain water harvesting and was successfully launched in Thrissur district as part of National Rural Employment Guarantee scheme. In the Thrissur, Mazhapolima district of Kerala in 2008 an initiative was launched for rain water harvesting. Similarly, a group of 20 women in Kalikavu village near the Malappuram district of Kerala (collaborating under the National Rural Employment Guarantee Scheme) have dug over 100 bore wells in a year to end water scarcity in this region.

Case Study: Chennai and Water Security


Located on the leeward east coast, Chennai has always been water starved. But over the past few years, along with chronic water shortage, the city/the state is reeling under frequent high-intensity cyclonic storms, heavy rains and floods. In a city surrounded by three major waterways — Cooum, Adyar and Buckingham canal (now mostly reduced to sewage carriers) water scarcity is ironic. This reflects the degenerating impact of urbanisation over the city's natural resources. The Chennai deluge in December 2015 and then the Cyclone

Vardah in the second week of December 2016: a question has often been asked as to whether these extreme events are an effect of climate change? According to the statistics by the IMD, the death toll due to two major flood and rain related incidents during 9 November to 2 December 2016 was nearly 350 in Tamil Nadu. The cyclone has affected around 17.64 lakh people in Tamil Nadu. The answer to the above question (after interviewing experts at MIDS, M S Swaminathan Research Foundation and vetting several reports) is No.

Chennai Metropolitan Water Supply & Sewerage Board

STORAGE AS ON 22.8.2017

WITH REFERENCE TO MEAN SEA LEVEL

 RESERVOIR	Full Tank Level (ft.)	Full Capacity (mcf)	Level (ft)	Storage (Mcf)	Inflow (cusecs)	Outflow (cusecs)	Rainfall (mm)	Storage as on same day last year (mcf)
POONDI	140.00	3231	118.70	22.00	0	1	0.0	609.00
CHOLAVARAM	64.50	881	0.00	11.00	35	0	2.0	72.00
REDHILLS	50.20	3300	24.39	46.00	52	5	1.0	804.00
SUB TOTAL	-	7412	-	79.00	-	-	-	1,485.00
CHEMBARAMBAKKAM	85.40	3645	65.25	139.00	160	22	11.0	1266.00
TOTAL	-	11057	-	218.00	-	-	-	2,751.00
ENTRY POINT	-	-	-	-	0	-	0.0	-
KORATTUR ANICUT	-	-	-	-	-	-	0.0	-
TAMARAIPAKKAM	-	-	-	-	-	-	0.0	-

A paper published in the Bulletin of the American Meteorological Society theorised human-induced factors as the major cause of climatic changes. Widespread use of wood as cooking fuel has resulted in a blanket of pollutants-aerosols. These aerosols block sunlight and act as a counter to the warming caused by greenhouse gases – mainly carbon dioxide. After studying a plethora of models, the scientists said that over the last 40 years, sea surface temperature in the Bay of Bengal along India's eastern coast has been lower than global climate models. Around the time of the heavy rainfall off the Chennai coast, this part of the Bay remained cooler than the Indian Ocean overall. Thus, this cooling seawater might have generated strong wind system to pull the moisture bearing clouds towards the land but the real reason is the

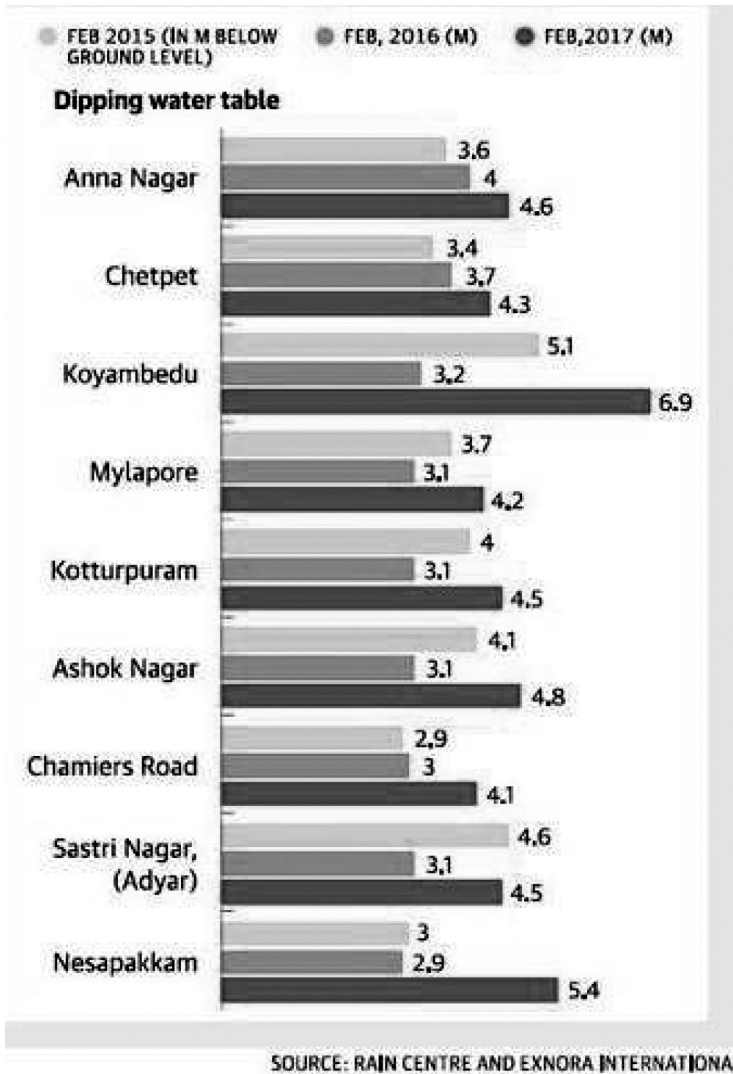
human error to open the sludge gates of the reservoir on time.

On December 1, 2015, it rained 494 mm (19.45 inches) within 24 hours in Chennai. Any city without adequate natural underwater seepage capabilities would be flooded. The Chemberabakkam dam feeding the drinking water potential of Chennai was kept at a higher storage level of almost 85-88% (instead of 75%) of the total capacity of 3645 mcft. When heavy rains to the tune of nearly 48 cm fell on the reservoir on December 1, 29,000 cusecs was released over 12 hours without warning. The city of Chennai has further lost its natural water rechargeable aquifers due to water body encroachments as housing properties. For residents of rain-parched Chennai, where Metro water pipes are running dry even before summer has set in, drilling deep is a convenient way to find water. But for every extra depth that is dug to pump out water, the groundwater level drops exponentially. The Chennai Aquifer System, the crucial source of groundwater for about 1 crore people, is critical. A study by the Central Ground Water Board under the Union water resources ministry has found that Chennai's groundwater resources are over exploited, with water below the surface being extracted at a rate of 185%. Thus, this means the groundwater table in Chennai is depleting between 10cm and 20cm per year.

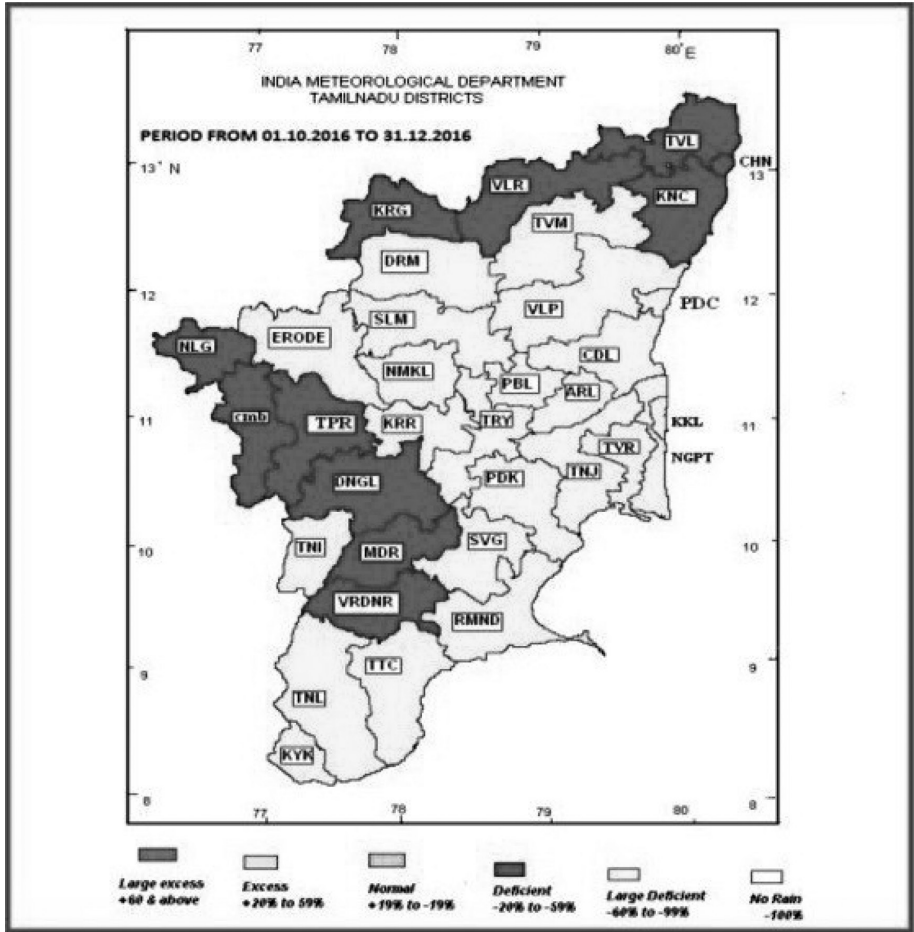
The root of the problem of drought (failing crop) and subsequent water security is lack of awareness among the farmers. The literacy rate for Tamil Nadu in 2011 has increased to 80.33 % from 73.45 % in the 2001 Census. As Dr K Sivasubramaniam told, most of the farmers could barely sign and don't have adequate knowledge of climate change other than the fact that they can't farm the way they used to. Thereby they don't understand the coping mechanism as well. Third reason for reduced water table is well irrigation. Instead of well, there should be a shift to drip or tank irrigation. As tanks are natural reservoirs of rain water and underground aquifers have been neglected both in government policies and farming techniques. The tanks along the Cauvery Pakkam belt is in dire need of desilting. Drought is the best time to desilt waterbodies. In addition, pollution of the river and canal networks has also led to deficit in clean drinking water. In Tirupur effluents from bleach and dye factories and remains from tanneries in Palar have led to water pollution.

S.Janakarajan, president of South Asia Consortium for Interdisciplinary Water Resources Studies, in an interview to the Hindu said "There are nearly 3,600 waterbodies in Tiruvallur, Chennai and Kancheepuram districts. If maintained properly, nearly 80 tmcft of water could have been stored during floods. The reservoirs that cater to the city have a capacity to store 11 tmcft." Chennai is traditionally a rain-starved city. Meteorologists note that the water scarcity is

more of human-induced, as the annual rainfall has been less than 100 cm only on a few occasions since 1969.



The metropolis of 8.2 million people – by the 2011 census – has an estimated 150,000 illegal buildings, many built over what used to be natural streams, ponds and even rivers. In a report of the Parliamentary Standing Committee on Home Affairs the advisory board acknowledged the lack of timely desilting, inadequate flood zone planning and large-scale settlements in low-lying areas as major contributors to water insecurity in the city.



Grey water recycling could be an efficient answer to water insecurity. Chennai generates nearly 700 million litres of sewage daily. This could be recycled through decentralised treatment plants. It would work out cheaper at ₹28-30 per kilo litre than the desalinated water that costs ₹48 per kilo litre. The sludge could be converted into bio manure. Now, the city gets an average of 550 million litres a day from lakes, desalination plants, (Veeranam scheme) and newly included groundwater resources in Poondi and Thamaraiakkam wells. Until now, there exists input subsidy relief of Rs 2,247 crore. This government-sanctioned amount is aimed towards providing relief to farmers reeling under water deficit. The state has taken to construction of new deep borewells, rejuvenation of existing borewells and open wells, replacement of pump-sets and supply of water through lorries in aggrieved.

For this case study an interview with Dr.K.Sivasubramaniyan, Associate Professor, Madras Institute of Development Studies and Dr Sophie at the M S Swaminathan Research Foundation in Chennai was taken by the researchers.

Eastern Coastal Plains (States: Odisha)

According to a report in the Odisha Suntimes in 2015, the districts of Chandrasekharpur and Aiginia in Odisha are among the worst hit with groundwater level falling rapidly. As per the records of the past five years, the groundwater level in Aiginia was 4.55 meter in 2009 which slipped to 2.78 meter in 2014. Likewise, the groundwater level in Chandrasekharpur area, which was 5.95 meter in 2009, has now dropped to 4.82, a decrease of 3 meter in just five year. Odisha, being a coastal state has faced extreme weather conditions from cyclone, depressions and typhoon. But over the past few years rising sea level has led to instances of tidal erosion, floods and drought. Some climatologists attribute it to global change in climatic conditions but most label it on human-induced climate change.

The survey, conducted by the state government's groundwater survey and investigation division in Ganjam, Gajapati and Kandhamal districts, have revealed that the level of groundwater has depleted from 3.48 metres in 2014 to 4.12 metres in 2015. In the south eastern part, about 200 to 300sqkm area of Chilika area is deprived of surface irrigation. Chilika Lagoon and six blocks around cannot use surface flow due to water logging, salinity intrusion and back water. Therefore the only alternate is the ground water. But with over use of groundwater the salinity intrusion has extended up to 30 to 40km inland. The salinity rates of wells have increased after Tsunami on 26th Dec 2004 far inland exhibiting salinity intrusion. Salinity issues are acute in Kanas, west Sakhigopal and north Delang area. The depth of ground water availability during monsoon is 0-7m where as in non-monsoon period it is available at a depth of 4-20m or even more. According to government set rules, a distance of 150 to 200 metres between borewells has to be maintained. But the rules are often flouted and excessive drilling of borewells has led to over exploitation of groundwater. Perched aquifers are also available at a very low depth of 0-3m. About 4.36BCM of ground water is being drafted with irrigation sector extracting the highest (79.6 per cent) in coastal areas of south Mahanadi delta.

The major river basins of Odisha are the Suvarnrekha, the Baitarani, the Budhabalanga, the Brahmani, the Mahanadi, the Rushikulya, the Vansadhara, Indrabati, Nagabali and Kolab. The average annual availability of surface water resources in Odisha according to a survey is 120.397 BCM. In rivers such

as the Narmada and Mahanadi, the percentage utilization is quite low being 23% and 34%, respectively.

According to environmentalists, the city receives around 1,500 mm of rainfall every year, but the number of rainy days has gone down. Earlier, the average rainfall was from 70 to 82 days during the three-month monsoon season, but it has dropped to 60 now. The state has been declared disaster-affected for the past two decades. Since 1965, these calamities have not only become more frequent, they are also intense with more destructive capability. For instance, a heatwave in 1998 killed around 2,200 people -- most of the casualties were from coastal Orissa, a region known for its moderate climate. Since 1998, almost 3,000 people have died due to heatstroke. Between 1998 and 2007, the annual mean maximum temperature has increased by 0.40C at Gopalpur, 0.50C at Bhubaneswar and 1.10C at Paradeep. When it comes to tidal erosion, 20 other villages along the coast are at high risk. Most have lost around 60 per cent of their land to the sea. Drought in 2001 caused an economic loss of about Rs643 crore in Odisha, due to crop damage and affected 11 million people. Floods in 2001 inundated 25 of the 30 districts. Due to such calamities, an average 9,00,000 hectare of agricultural land lose crop every year. During the last 14 years, annual rainfall showed increasing trend in the coastal districts and declining in the interior districts except Kalahandi. But the number of rainy days in the state has declined by 5-7 days in the last 40 years.

There has been a dispute between Chhattisgarh and Odisha over the damming of Mahanadi. Chhattisgarh being the upper riparian state benefits from the developmental works in Mahanadi but at the same time deprives water to the agricultural lands in Odisha. The onus to resolve the conflict (at the administrative level) has been taken up many civil societies in both the states. Several Mahanadi peace rallies have been taken out in the two states of Odisha and Chhattisgarh to connect people of both the States to the mother river and resolve the water dispute amicably. The campaign for peace, 'Mahanadi Peace Initiative', was formed by the Odisha-based Mahanadi River Waterkeeper and Chhattisgarh-based Nadi Ghati Morchha.

Western Coastal Plains (State: Goa)

Located on the coastal region, Goa is often faced with climatic extremes like tidal erosion and depression, thus leading to water problems. However, it is the anthropogenic activities like mining, tourism, mega-housing projects with high-rise buildings, purchase and sale of land that is responsible for environmental pressure and degradation. Cities in Goa, mainly Panjim,

Vasco, Margao and Mapusa have been experiencing frequent smoggy days during the winter. Panjim is most affected by the smog, which is caused by temperature inversion and trapping of atmospheric dust and exhaust gases. Episodes of respiratory disorders shoot up during these smoggy days. And chances are that the frequency of smoggy days with poor air-quality will increase in almost all the cities in the state, in the near future.

As the Nobel Peace Prize winner, Rajendra Pachauri told in an interview, the city of Panaji (this tiny riparian state) is "very vulnerable" due to thermal expansion of the oceans combined with rising sea levels due to global warming. The sea level rise is predicted to be around 98 cm. This could in turn have an impact on river flooding and coastal inundation.

The Water Resource Department has estimated that groundwater level in 11 coastal villages had gone down to 8.97m below ground level in May 2009 from the level of 8.30m recorded in May 2008. In Anjuna, it dropped to 7.44m in May 2012 from 6.69m recorded in May 2010. This fall may not be drastic but given the population growth and the added pressure from the tourism sector the exploitation of the aquifers may become a concern. Whereas, the change in ground water level for other nine villages was within the range of -0.21m to +0.17m. In the South Goa district, the water level is in the range of less than 2 to 20 m bgl. Water level in the range of 10 to 20 m bgl is seen only the small pockets of Salcete, Canacona and Sanguem taluks. Estimating the data for the pre-monsoon period in 2011, (May 2001 to May 2010) 12 wells (60%) show a rise in water level. The remaining 8 wells (40%) show a fall in water level. In the district of North Goa, extensive mining area at specific locations has impacted both shallow and deep groundwater system in the districts. In a study done by the Indian Journal of Science and Technology, titled, 'Assessment of Groundwater Quality in the Mining Areas of Goa, India,' it was estimated that the mining activities have however not impacted the water level contamination considerably.

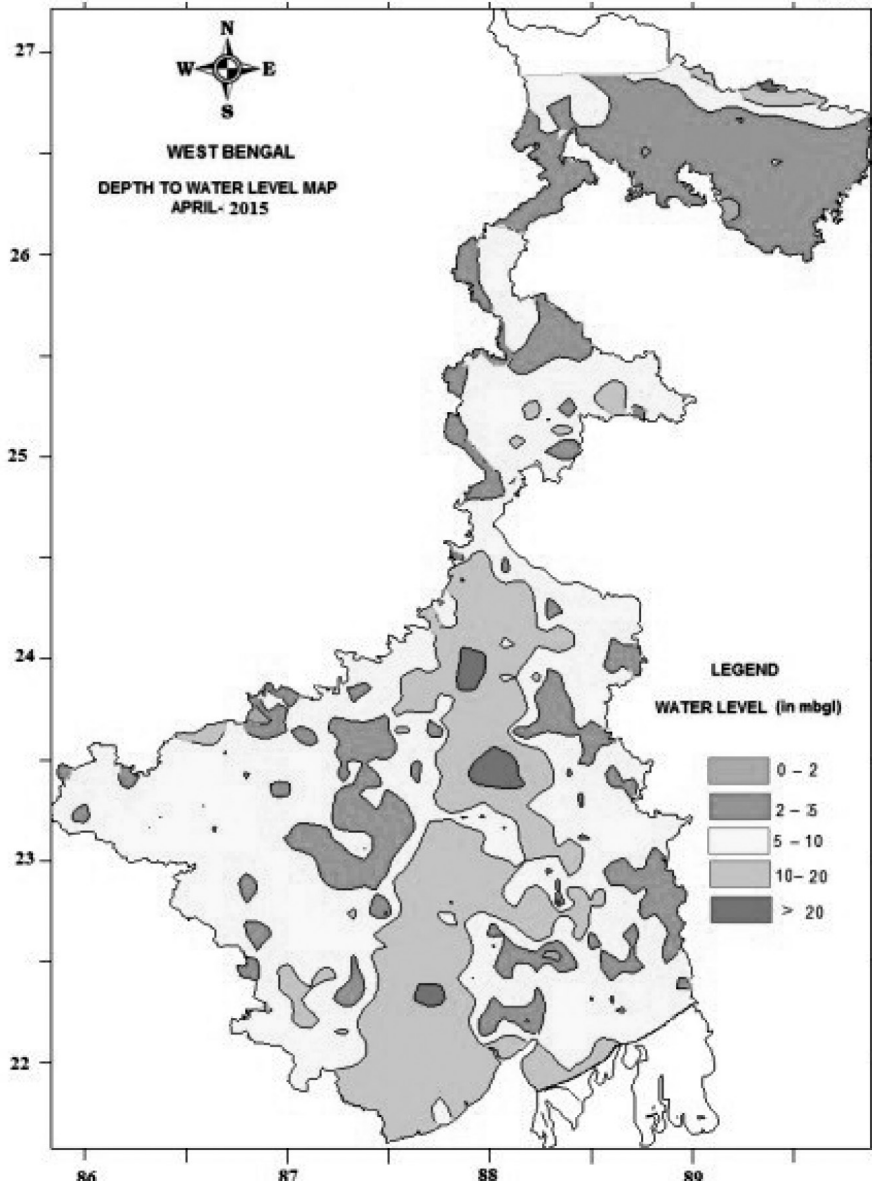
In the Konkan coast of Goa, rainfall has exceeded by 30%, according to the IMD data for 2017. The current season had shown a surplus for a few days after the monsoon hit Goa on June 8. But after a few days, the weak monsoon activity sprung up a deficit, which has continued throughout the season. The poor rainfall activity during the peak month of July had showed a deficit of 24%, as the total rainfall during the month was 840.0mm as against the normal of 1104.1mm. The State Agriculture department has targeted to cover 28,000 hectare area in Goa under the paddy cultivation. But this deficit of rain will hamper the farmers in Salcette, Bardez and Tiswadi areas where almost 50 per cent of their plantings has been completed. Water insecurity in Goa may not

be that acute as the state is equipped legally with the Policy on Rain Water Harvesting - Department of Water Resources (Government of Goa) (2008) and civil society initiatives. Located on the windward side of the Western Ghats, rainfall has become erratic with late onset but the amount hasn't gone down. It is only with underground water depletion that seems to be a concern.

Bengal and Assam plains (States: Bengal and Assam)

In West Bengal, the main sources of water for consumption are the Ganga river system and the groundwater borewells. The river system encompasses the catchment areas of the Mahananda, Jalangi, Bhairab in the eastern part and the Mayurakshi, Ajoy, Damodar, Dwarakeshwar and Kasai in the western part. The Teesta, Torsa and Jaldhaka, streams off the Brahmaputra, in the northern part of the State. Beside these, there is a small independent river basin, namely the Subarnarekha basin covering the southwestern part of the State.

According to the groundwater statistics by the CGWB, during the pre-monsoon season last year, the southern part of the state with shallow aquifers, depth of water level ranged between 2-5 m bgl. On the other hand, confined aquifers of Haora, East Medinipur, South 24 Parganas showed a deeper water level of 5-10 m bgl and 10-20m. Annual fluctuation in water level between April 2014 and April 2015 was within 0-2 m. Out of 1120 analyzed wells, 530 wells were grouped under falling zone category and 590 wells are grouped under rising zone category. The rise and fall of water level is mostly restricted within 0-2 m (42.1% shows rise and 36.1% shows fall). In Kolkata city, the piezometric-level (level to which water in a confined aquifer would rise) generally varied from 14.50m bgl – 16.50 m bgl. This is due to huge withdrawal of groundwater for domestic and industrial uses. The groundwater scenario worsens in the Sunderbans area as over exploitation and lack of maintenance has led to brackish/saline water table.



Map 6: Groundwater level (pre monsoon) in West Bengal (2015)

Source: Groundwater Statistics by the CGWB

For past few years, disaster events like floods, heavy rain and landslides have ravaged the state of Assam. From April 2017, flood has ravaged Bordubatop village in Morigaon, Dhemaji, Lakkhimpur, Barpeta, Bongaigaon, Dhubri,

Nagaon, Dibrugarh and Hailakandi districts. In Dhemaji, 496 villages have flooded, with nearly 1,76,566 affected persons and 96 affected villages. In Majuli, 58 villages have submerged, affecting 48,381 persons. These are also the areas facing severe drinking water crisis. According to the district administration, a huge number of localities in the city are facing water shortage. People said a major reasons for the problem is the haphazard drilling of deep tube wells in residential areas and selling the water from them commercially.

According to a public statement by the Assam State Disaster Management Authority, around 1,115 tubewells are left contaminated by the flood. Nearly 12,00,000 hand tubewell and electric pump sets in lower Assam districts are running dry because of fast depletion of the water table. The situation further compounded following the drying up of the river basin and deficient rainfall for the past few years. Officials at the lower Assam districts' urban water supply department said in a public statements that deep water boring to the level of 120 feet now has failed to pump out water. As the water table has fallen below 100 feet, people are not getting water for the past five years. The problem becomes acute from December to March.

At present in Guwahati, the Guwahati Municipal Corporation (GMC), Public Health Engineering Department and Assam Urban Water Supply and Sewerage Board are primarily involved in distribution of domestic water supply mainly drawn from Brahmaputra. However, the water supplied by these agencies meets the demands of just 30 % of the city's population. The total installed capacity of potable water generation under GMC area is around 98 MLD (Million Litre per Day) while the requirement is as much as 132 MLD. This indicates lack of infrastructure to cope with the rising population and the subsequent rise in water demand.

Guwahati experiences an average annual rainfall of about 162cm, which is less than the average annual rainfall of about 220 cm for the state as a whole. The average number of rainy days per year in the city is about 110 days. The annual rainfall in the Brahmaputra valley has shown a decreasing trend by the rate of 72.0 mm/decade during last three decades (1981-2010). This decreasing trend was mainly contributed by significant decrease in monsoon rainfall (103.8 mm/decade).

According to the Regional Meteorological Centre, Assam recorded a maximum temperature of 38.5 degrees Celsius last year, the highest in the last 33 years. The annual mean temperature in the Brahmaputra valley increased significantly due to rise in both maximum and minimum temperature in the last 60-years (1951-2010). The maximum increase was noticed in post-monsoon

period. The warming trend in the valley was particularly pronounced in the recent 30 years period and was 1.6 times higher than all-India average. The rise in temperature has been attributed to the deficit in pre-monsoon rainfall.

FIGURE AT A GLANCE, 2012

Seasonwise Rainfall (all seasons)		
Actual		2151.8mm
Normal		2295.8mm
Departure from Normal		(-)-6.27%
Status		Normal
Winter Season		
Actual		14.5mm
Normal		48.2mm
Departure from Normal		(-)-69.92%
Summer Season		
Actual		420.4mm
Normal		455.2mm
Departure from Normal		(-)-7.64%
Monsoon Season		
Actual		1555.0mm
Normal		1523.9mm
Departure from Normal		2.04%
Post Monsoon		
Actual		161.9mm
Normal		168.5mm
Departure from Normal		(-)-2.00%

Table 5: Rainfall estimate for Assam (2012)

Source: Statistical handbook of Assam, 2013

North-Eastern Hills (States: Arunachal Pradesh, Sikkim, Manipur, Mizoram, Tripura, Nagaland and Meghalaya)

As per the International Water Management Institute records, only 21% of households in NE India (occupying 8% of India's landmass and about 4% of the total population of India, as per the 2011 census) have reportedly access to tap water as the main drinking water source even though there is enough annual rainfall. This is due to lack of conservation practices. Though certain traditional practises of water conservation exist but developmental activities in the form of dam construction, road and bridge construction in this young fold mountain region has made the zone more susceptible to disasters.

In Imphal, Manipur, around 7.55 lakh estimated population and sub-urban areas including floating population of para-military forces need 101.9 million litres per day, according to the Public Health Engineering Department. Efforts by the administration are also being made to bridge the demand supply gap as the actual production from 17 water supply plants is hardly 70 MLD against its installed capacity of 101.3 MLD. Besides rainwater and groundwater, wetlands are also one the water sources in Imphal. It comprises of 1820 sq km of flat alluvial valley and 20,507 sq km of hilly terrain. Apart from water crisis in the bowl-shaped valley, the nine hills surrounding Imphal are also facing water depletion due to rampant deforestation. In R K Rajan Singh authored chapter, 'Tipaimukh High Dam on the Barak River,' in *Water Conflicts in Northeast India*, states that construction of the Tipaimukh dam will lead to permanent displacement and loss of livelihoods of indigenous communities, mostly belonging to the Zeliangrong and Hmar people. A total of 25,822 hectares of forest area in Manipur will be affected by this which will lead to felling of 7.8 million trees. In addition, the major rivers that pass through the Imphal areas, namely the Imphal, the Iril, will rapidly go dry. All the rivers in Manipur empty into the Loktak Lake. But the National Hydroelectric Power Project has been generating 105 MW using the lake water around the clock. This is one of the reasons for the depleting water level since water used by the three turbines is siphoned off towards Assam instead of recycling it.

In Aizwal, Mizoram, in spite of good rainfall of more than 2,000 mm in the district, there is acute shortage of water during summer, because most of the rain water flows out as surface run off. Transboundary issues like building of dams by China on the Brahmaputra River have given rise to serious apprehension and concerns over water availability in the region. An already conflict-striven region, with increasing water perils, a transboundary/interstate disputes over water sharing might erupt. Landslide dams getting breached or diffused in Bhutan or Tibet have caused catastrophic floods in downstream

areas in Arunachal and Assam. Unwarranted release of water to rivers from dams both in Bhutan and within the region has caused devastating flash floods in the plains. Lack of coordination and cooperation between countries sharing the river basins is a major obstacle in resolving these problems. The scope for ground water storage is limited mostly to secondary porosities controlled by structures. These aquifers are the main source of springs. Ground water emanating in the form of springs are being developed for use as a source for water supply. In South Tripura district, the trend analysis showed that both pre-monsoon and post-monsoon groundwater depths have declining trends in places like Harshumukh. Conversely, an increasing trend was estimated in places like Gorjee Bazar, Subroom and Udaipur and a uniform trend at Santir Bazar.

Case Study: Water Security and Sohra¹⁰ in Meghalaya

“Sohra is not the wettest place anymore,” said Vijay Kumar Singh, Range Officer, Meteorological Department, Sohra. In November 1999, for the first time, a Sohra (formerly Cherrapunji) resident, Nitin Gogoi, wrote about this phenomenon in his blog, later carried by Rediff news. “It is perhaps the ultimate irony,” he wrote, “The Khasis, who inhabit Cherrapunjee have to worry about” water shortage. Sohra lies in a small valley among the hills of East Khasi. “There was a time when denizens of Cherrapunjee, reputed to be the wettest place in the world, invoked Lae Slat, the rain god, to stop the rain. On occasions such as funerals, when gathering mourners was difficult because of incessant rain and wind that sometimes beat down for weeks on end, village elders would sit under a banana tree and pray for the rain to end, at least for one day, in one village,” Teresa Rehman, a Northeast-based journalist for the Thomson Reuters Foundation wrote in 2010.

‘Now the people have to pray for rains,’ said Vihar Kumar Singh. Large scale deforestation and industrialization in the form of limestone quarrying has affected rainfall patterns in the valley. The Meteorological Department at Sohra said orographic pattern of rain in northeast India is shaped by the high hills and mountains in the region. However, relentless quar-rying has decreased size of some Khasi Hills which in turn has reduced the amount of rainfall.

According to the statistics provided by the Meteorological Department in 2013, rainfall has declined from 12,261.6mm in 2000 to 7,560.3mm in 2013, recording

10 *This case study was done independently by the author in 2013.*

a reduction of 4,701.3 mm of rainfall over a decade in Sohra. Rains are the only source for the perennial streams and natural reservoirs from where many villages receive their drinking water. "Even before winter, the streams and the reservoir dry up, creating a water crisis. We are now compelled to depend on costly packaged drinking water," said Bah Homeland, a teacher from Kong Thong village. Indeed, Subir Bhaumik, a Kolkata based BBC correspondent reported that long rows of trucks loaded with water drums can be seen travelling to Cherrapunjee from the plains.

Some tankers, normally in the business of carrying oil are loaded with water and incur huge profits by selling supplies in Sohra. Water is a source of income for many who depend on tourism. A change in rainfall pattern has led to water depletion in the Nohkalikai falls, a major tourist attraction. Constant deforestation and burning of forest for cultivation has changed the foggy picturesque dell into a barren hill town. The people have shifted from tourism to daily labour in the cement companies like Cherasima Limited. Teibor Rajee, a 24 year old hotel manager, said "The quarry stretches from Sohra to Assam. Along the roads of Mawsmi, Burnehar to Shillong and Guwhati, one can find trucks loaded with cement." Though the limestone quarry has generated employment opportunities, it has come at the cost of health and environment.

"Breathing the dusty air and smoke has increased the possibility of diseases such as asthma and tuberculosis. Labourers working for a prolonged period in the lime kilns are often victims of lung cancer," said Teibor Poonendu Kumar Pal, a 68 year old high school teacher and a shop-keeper has lived in Sohra since 1947. He said, "Over the years, there has been a rise in temperature. We are unable to cultivate vegetables which grew in this climate such as cauliflowers, tree tomatoes, green chillies and spinach." Cutting of the hills has increased

the soil erosion. Sincerity Phanbuh, Public Relation Officer, Government of Meghalaya said, "The Forest department has taken up the responsibility of planting trees."

Islands (State: Andaman, Nicobar)

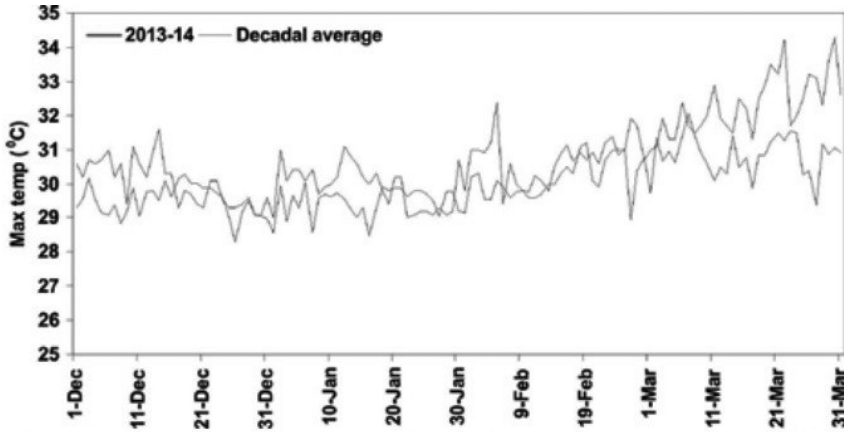
The physiography of Andaman and Nicobar is one of the most important factors influencing the islands' vulnerability to climate change. It is manifested in the form of coastal erosion, stream flow and increase in sea level. The Nicobar Islands are surrounded by shallow seas and coral reefs. Barring a few Islands the terrain is mostly undulating with main ridges running North-South. In between the main ridges deep inlets and creeks are formed by submerged

valleys. In most of the Islands perennial streams are non – existent except in Great Nicobar where there are five perennial rivers. In Great Nicobar, the important perennial streams are Galathea, Jubilee, Dark Anaing, Dark Tayal, Amrit Kaur.

An analysis of the historical rainfall data since 1951 indicate no significant change in the average decadal rainfall though the pattern of rainfall has changed with increase in the number of extreme rainfall events. It has also highlighted decreasing trend in rainfall and rainy days over Andaman and Nicobar Islands in winter and post-monsoon seasons which has negative consequences on fresh water aquifers.

In May 2015, depth of water levels mostly range from 0-2 mbgl (43.5%) followed by 2-5 mbgl (47.2%) and 5-10 mbgl (8.3%). In the year 2005-15, out of 108 well, 73 wells show rising trend of water level in the tune of 0.058 to 4.1 m/yr. Rest 35 wells show falling trend of water level in the tune of 0.002 to 4.54 m/y. Ground water is the main source of drinking water supply in these islands. About 90% of the dry bore well were in compressed sedimentary deposits, which act aquitard whereas rocky subsoil formation was found to be more successful (CGWB, 2010). It has been experienced that the scarcity of fresh water is often a limiting factor for socio-economic development of Nicobar as in the case of other small islands.

One of the striking features observed after the 2004 Indian Ocean tsunami was the impact on those areas which are located behind dense mangrove patches than the terrain directly exposed to the tsunami waves. The digital elevation of Nicobar Islands indicated that among the islands, Trinket and Chowra have over 15% of the total land area with an elevation less than 10 m above mean sea level and are thus significantly vulnerable to climate change events particularly of wave action and coastal inundation. Yet another important aspect of A&N Islands which expose to vulnerability is earthquake. These Islands lie in the most severe seismic zone (zone V), where the expected intensity of seismic shaking is IX or greater on the MSK intensity scale (Rai et al. 2005). Further, massive earthquakes also result in the alteration of island topography leading to submergence of the islands which further exacerbate the impact of sea surges. Analysis of the estimated area that will be affected with 0-5 m increase in sea level revealed that the loss of land varies from 1-14% and it would be greatest in Chowra where about 13% of island will be inundated.



Graph 5: Post-monsoon season changes in maximum air temperature (2013-14)

Similarly the long term average of mean air temperature showed increasing trend, more significantly the post-monsoon average. During 2013-15, it was 15% higher than the decadal average resulting in drying up of many of the freshwater pond and falling of ground water level in the islands. Owing to factors of limited size, availability, and geology and topography, water resources of Nicobar Islands are extremely vulnerable to seasonal changes and variations in climate, especially in rainfall. As these islands are not suitable for large scale development of surface storage facilities, decentralized rainwater harvesting and recharging the shallow water table is the only option.

Conclusion

In India, the 'scarcity' dilemma with regard to water security lies in inefficient water distribution/management and climate change is a mere catalyst to the existing peril. The data analysed gives us a picture that the climatic changes affecting South Asia is in congruent with the global climate change conditions. Severe summer, late monsoons, extreme downpour and less winter months are common to all the zones in the country. As water replenishment and availability is directly proportional to the hydrological cycle, late monsoons and severe summer has given rise to water scarcity in the country. As IPCC defines, climate change refers to any change in climate over time, whether due to natural variability or as a result of human activity. It should be noted that in India, man-made developmental activities are greatly responsible for these climatic conditions which in turn has stressed water availability.

The water resources in the country are unevenly distributed. This brings in the necessity to build a water regulatory body to monitor the frequent usages.

As the country lacks any such concrete policies the onus shifts to the civil society to ensure responsible usage of water. In arid and semi-arid zones of India, water scarcity has been significantly overcome due to civil society initiatives. While in Punjab and Haryana, the rice bowl of India and land of five rivers, faces acute water shortage due to overexploitation of groundwater for irrigation. Poor water quality is also a major environmental issue in India as most of its river networks, lakes and surface water are polluted. As a result, more than 100 million Indians live in areas where water is severely polluted. Lastly, leakages and lack of proper technology has led to 50 per cent of India's piped water supply wasted.

Thus we see poor infrastructure, lack of policy planning, pollution and other developmental projects are the primary and first hand cause of water shortage in India. However, it is these very activities that has spiralled anomalies in the climatic conditions thereby aggravating the already water stressed situation in India.

References

"Assam floods effect: drinking water scarcity leaves many in distress," *The Northeast Today*, 17 July, 2017

Accessed: 28 August, 2017

URL:<https://thenortheasttoday.com/assam-floods-effect-drinking-water-scarcity-leaves-many-in-distress/>

"Andhra Pradesh records deepest groundwater level in the country," *Deccan Chronicle*, 4 July, 2017 Accessed: 6 July, 2017

URL: <http://www.deccanchronicle.com/nation/current-affairs/040717/andhra-pradesh-records-deepest-groundwater-level-in-the-country.html>

"Bihar govt to set up control room to manage water crisis," *The Times of India*, 14 April, 2016

Accessed: 1 August, 2017

URL: <http://timesofindia.indiatimes.com/good-governance/bihar/Bihar-govt-to-set-up-control-room-to-manage-water-crisis/articleshow/51821874.cms>

Borah, Amarjyoti, "Assam reels under unseasonal heat wave, water shortage," *Down to Earth*, 05 May, 2014

Accessed: 28 August, 2017

URL:<http://www.downtoearth.org.in/news/assam-reels-under-unseasonal-heat-wave-water-shortage-44226>

"Climate change and Nicobar Islands: Impacts and adaptation strategies," *Journal of the Andaman Science Association* Vol. 20(1):7-18 (2015), ISSN 0970-4183

Climate Change in Madhya Pradesh: Indicators, Impacts and Adaptation, *Indian Institute of Management Ahmedabad* (2016) W.P. No. 2016-05-05

"Changing rainfall pattern damaging agriculture in MP," *Hindustan Times*, 06 April, 2016

Accessed: 5 August, 2017

URL:<http://www.hindustantimes.com/bhopal/changing-rainfall-pattern-damaging-agriculture-in-mp/story-ykLXaLGnFS4P1BkJDUuSFI.html>

"City groundwater depleting, at risk of contamination," *The Tribune*, 24 August, 2015

Accessed: 5 August, 2017

URL:<http://www.tribuneindia.com/news/jammu-kashmir/city-groundwater-depleting-at-risk-of-contamination/123463.html>

"Climate change: Clear and present danger in Kashmir," *Livemint*, 23 April, 2015

Accessed: 5 August, 2017

URL:<http://www.livemint.com/Politics/jwYMXBkqZSuIEKuAiQiARP/Climate-change-Clear-and-present-danger-in-Kashmir.html>

"Groundwater Yearbook, Bihar (2015 - 2016)," *Ministry Of Water Resources, Central Ground Water Board* (2016)

Accessed: 1 August, 2017

URL: [http://www.cgwb.gov.in/Regions/GW-year-Books/GWYB-2015-16/GWYB%20MER%20\(Bihar\)%202015-16.pdf](http://www.cgwb.gov.in/Regions/GW-year-Books/GWYB-2015-16/GWYB%20MER%20(Bihar)%202015-16.pdf)

"Groundwater Yearbook of West Bengal and Andaman and Nicobar Islands(2015 - 2016)," *Ministry Of Water Resources, Central Ground Water Board* (2016)

Accessed: 13 June, 2017

URL: <http://www.cgwb.gov.in/Regions/GW-year-Books/GWYB-2015-16/GWYB%20ER%202015-16.pdf>

"Groundwater Scenario in South Tripura District of North-East India," 20th International Conference on Hydraulics, Water Resources and River Engineering, IIT Roorkee, (2015)

Accessed: 28 August, 2017

URL: https://www.researchgate.net/publication/290117636_Groundwater_Scenario_in_South_Tripura_District_of_North-East_India

"Groundwater levels depleted by North Goa hotels: CAG," *The Times of India*, 14 October, 2013 Accessed: 8 June, 2017

URL: <http://timesofindia.indiatimes.com/city/goa/Groundwater-levels-depleted-by-North-Goa-hotels-CAG/articleshow/24109035.cms>

"Groundwater level dips in lower Assam," *The Telegraph*, 5 April, 2012

Accessed: 28 August, 2017

URL: https://www.telegraphindia.com/1120405/jsp/northeast/story_15334759.jsp

"Haryana govt working towards checking groundwater depletion," *The Pioneer*, 06 September, 2015

Accessed: 5 August, 2017

URL <http://www.dailypioneer.com/state-editions/chandigarh/haryana-govt-working-towards-checking-groundwater-depletion.html>

Kabirdoss Yogesh, "Groundwater level in Chennai hits 'critical state'," *The Times of India*, 30 March, 2017

Accessed: 5 August, 2017

URL: <http://timesofindia.indiatimes.com/city/chennai/groundwater-dips-20cm-per-year-as-chennai-overexploits-aquifers/articleshow/57905446.cms>

Maneesh P, C. Muniyandi, "Depleting Sustainability: A Detailed Study on Ground Water Situation in Kerala," *International Journal of Arts and Humanities*, Spring Journals, Vol. 5(1): pp 187-191, (2017)

"Manipur facing acute drinking water shortage," *The Hindu*, 19 May, 2016

Accessed: 28 August, 2017

URL: <http://www.thehindu.com/news/national/other-states/manipur-facing-acute-drinking-water-shortage/article5819061.ece>

Rajwi, Tiki, "Water level frighteningly low in Kerala dams: Report," *The New Indian Express*, 05 March, 2017

Accessed: 5 August, 2017

URL:<http://www.newindianexpress.com/states/kerala/2017/mar/05/water-level-frighteningly-low-in-kerala-dams-report-1577753--1.html>

Ramani, Srinivasan and Vasanth Srinivasan, "A wrong call that sank Chennai," *The Hindu*, 10 December, 2015

Accessed: 5 August, 2017

URL:<http://www.thehindu.com/news/cities/chennai/chennai-floods-a-wrong-call-that-sank-the-city/article7967371.ece>

Singh, Chandra Shekhar *et al.* "Disastrous Challenge due to Climate Change in Bihar, Developing State of India," *International Journal of Scientific & Engineering Research*, Volume 5, Issue 6, (2014)

"Temperatures in Madhya Pradesh to surge by 2045, increasing drought conditions: Study," *The Indian Express*, 06 June, 2016

Accessed: 5 August, 2017

URL:<http://indianexpress.com/article/india/india-news-india/temperatures-in-madhya-pradesh-to-surge-by-2045-increasing-drought-conditions-study-2837111/>

"The Maharashtra Groundwater (Development and Management) Act 2009," India water portal, 25 April, 2015

Accessed: 6 July, 2017

URL: <http://www.indiawaterportal.org/articles/maharashtra-groundwater-development-and-management-act-2009>

Venkatesan D, Suresh Gandhi M and Manjulav, "Long-term rainfall trend of Kerala, Tamil Nadu and Pondicherry using departure analysis," *International Journal of Earth Sciences and Engineering*, Vol:08, No. 01 (2015)

Accessed: 22 August, 2017

URL: https://www.researchgate.net/publication/298649039_Long-term_rainfall_trend_of_Kerala_Tamil_Nadu_and_Pondicherry_using_departure_analysis

Venkat Vidya, "Gangotri glacier retreated by 3 km in two centuries," *The Hindu*, 04 March, 2017 Accessed: 5 August, 2017

URL: <http://www.thehindu.com/sci-tech/energy-and-environment/gangotri-glacier-retreated-by-3-km-in-two-centuries/article14386191.ece>

"With depletion of forest cover, water scarcity looms large in Manipur," *Eastern Mirror*, 16 October, 2016

Accessed: 28 August, 2017

URL:<http://www.easternmirrornagaland.com/with-depletion-of-forest-cover-water-scarcity-loom-large-in-manipur/>

"Water crisis looms in Tamil Nadu, with just 7-8% storage in reservoirs," *Business Standard*, 1 April, 2017

Accessed: 5 August, 2017

URL:http://www.business-standard.com/article/economy-policy/water-crisis-looms-in-tamil-nadu-with-just-7-8-storage-in-reservoirs-117040100687_1.html

“68% wells in MP show fall in groundwater level,” *Hindustan Times*, 14 January, 2016

Accessed: 5 August, 2017

URL:<http://www.hindustantimes.com/bhopal/68-wells-in-mp-show-fall-in-groundwater-level/story-3ENnrdoHY96CYyUkpJmryN.html>

“22 districts in Uttar Pradesh still await ‘sufficient’ rain for sowing paddy,” *Hindustan Times*, 13 July, 2017

Accessed: 5 August, 2017

URL:<http://www.hindustantimes.com/lucknow/22-districts-in-uttar-pradesh-still-await-sufficient-rain-for-sowing-paddy/story-cXEdJOqzZnvIFUqB6f4vML.html>

About BIPSS

Bangladesh Institute of Peace and Security Studies (BIPSS) is a leading institute in Bangladesh for informed analysis on all aspects of broad spectrum of peace and security studies in the region and beyond. It is a non party, non profit organisation and independent think tank which provides significant platform for the leading strategic thinkers, academics, former members of the civil, foreign and armed services and media persons to chalk out a comprehensive framework for peace and security issues. The Institute is headed by the President of BIPSS, Major General ANM Muniruzzaman, ndc, psc (Retd). He directs and coordinates all research and administrative activities of the Institute. A team of highly qualified full time researchers with varied social science background conduct research activities. BIPSS also maintains a pool of affiliated experts whom we engage frequently for different assignments.

BIPSS has also established two specialised centres within its framework named Bangladesh Centre for Terrorism Research (BCTR) and Bangladesh Centre for China Studies (BCCS). BCTR is the first centre of its kind in Bangladesh dedicated to the study and research on terrorism related issues. The Centre is headed by BIPSS President who has been engaged with various specialised centres on terrorism in the Asia Pacific region as well as other parts of the world. BCTR has been working in partnership with a number of international centres on terrorism research in South Asia, South East Asia, Europe and USA. On the other hand, Bangladesh Centre for China Studies (BCCS) has been established to understand, study and analyse Chinese Foreign Policy and Chinese strategic and security posture. It also aims to study Chinese economic advancement with a view to advocating greater economic and development cooperation between Bangladesh and China as well as China and the greater South Asian region.

BIPSS maintains an interactive website to inform, share and exchange knowledge and ideas to enrich the people who have a greater stake in peace and security. You are cordially welcome to visit our website at www.bipss.org.bd. You can also write to us to express your opinion via email at info@bipss.org.bd.

