

Peace Engineering: A Hope For Controlling Conflicts and Promoting Peace.

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Abstract— Engineering and engineers are contributing tremendously to safeguarding and enrichment of humanity in wide array of fields. However, it is also undeniable fact that in the new era warfare: technical skills of engineers are essential for the developing, manufacturing and using of modern weapons. Research shows that majority of war victims are civilians.

With a new conflict being reported from some place in the world, future of the world looks bleak and disheartening. At core of many such conflicts are the results of engineering projects. This makes engineers parties to such conflicts. To help reduce tensions and conflicts engineers should raise the awareness of the potential effects of their projects and explore alternative designs and implementation methodology.

This paper explores new research area known as peace engineering. The field of peace engineering distinguishes itself from other knowledge areas of engineering by holistically considering factors that contribute to violence and conflict. This paper offers a list of factors that engineer need be consider when designing engineering projects. To ensure that every engineer has the knowledge of factors that helps avoid conflicts, paper also proposes that peace engineering be made an integral part engineering curriculum.

Keywords—*Peace Engineering, Conflicts Community,*

I. INTRODUCTION

In most cases, engineering projects are at the core of such conflicts. This invariable makes engineers reluctant and unavoidably trigger to the cause of the problem. This also brings disrepute to engineering professionals.

On many occasions, engineers may have an opportunity to play a pivotal role in preventing the conflicts even before they occur or contribute to a peaceful resolution. Thus, the social responsibilities of every engineer are now under the spot light and have become a subject with many books and journals focusing on this. However, except for their role in the design and manufacture of military weapons, the link between engineering and conflict, is not that deeply researched especially in developing countries [2].

Conflicts between neighbors, communities, peoples, and countries are on the rise and due to multiple causes and many a time these conflicts escalate to violent wars [11]. A study by World Bank shows that there has been an increase in conflicts. The figure 1 shows that the overall number of ongoing conflicts each year has increased, as compared to the immediate post-WWII period. This increase however only relates to civil conflicts within states.

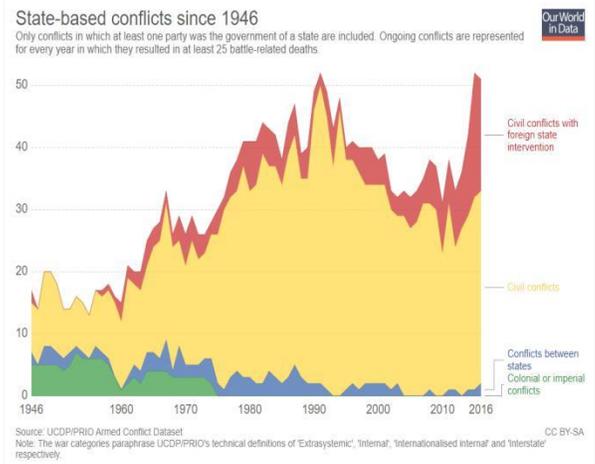


Fig 1: UCPD/PRIO Armed State Based Conflict Data

Many engineering projects across the world are potential sources of conflict. Such conflicts are more seen between two neighbors as a project with potential advantage for one country or state may be perceived as harmful to adjoining neighbor. With growing awareness about pollution or global warming, it's not just two countries or even the people within the communities of a country oppose projects that they perceive as harmful to them or their surroundings.

Many such disputes have reached feverish pitch and sometimes have ended up in violent conflicts. In few of the developing countries, groups that are of the view that their interests are being compromised by some upcoming engineering decisions have on occasions resorted to protests to resolve disagreements which could not be settled by

negotiation or political process. In few cases, projects have sown seed of deep intergroup animosities that initially may have been present among the groups for ages due to religious, cultural, economic or political affiliations [6].

The silver lining is that not all projects have resulted in initiating conflicts. There have been engineering projects which have had positive outcomes and have brought the countries, communities and interfaith groups together. The key for such successful projects is that they have been designed through processes that have been aimed at avoiding animosities. Even more successful projects are engineering investments meant to create economic interests among groups [1].

II. International Conflicts Due to Engineering Projects

Maurice Strong, Secretary General of the 1992 United Nations Conference on Environment and Development, said, "Sustainable development will be impossible without the full input by the engineering profession." [8]. for that to occur, engineers must adopt a completely different attitude towards natural and cultural systems and reconsider interactions between engineering disciplines and non-technical fields. Engineers should be take responsibility not just the direct outcome of their project but also indirect outcome of their project. Also the success of project should not just be measured by the economical profit it brings but measured by the last peace and benefit it brings to people.

Recently there have been spurt in the international frictions mainly due engineering projects that have been envisioned to use the scarce natural resource and land. Example for one such project is the overlapping claims to include islands in the South China Sea as they are rich in oil and countries adjoining to this area, want to initiate engineering projects to utilize this scarce natural resource. This claim has drawn these adjoining countries to brink of conflict and also threatens to blow in to international conflict [5].



Fig 2: Overlapping area in South China Sea.

Another example of such conflict is between Israel and west bank Palestine that has risen over engineering project to provide large scale housing and conflicting claims over the right to land over which housing projects are envisioned.



Fig 3: Israel and Palestine conflict zone

Few other examples for such conflicts are northern and southern Sudan for oil production, division of water resources among Lebanon, Israel, and West Bank Palestine and hydro and irrigation schemes along the Mekong River affecting downstream countries. Internal conflicts in developing countries - over mineral, land, water and other resources [7].

However, with proper planning, will, determination, desire for peace and involvement of all the parties can help resolve such conflicts. One such example of an engineering project that was resolved is the sharing and building of dams over rivers shared between India and Pakistan.

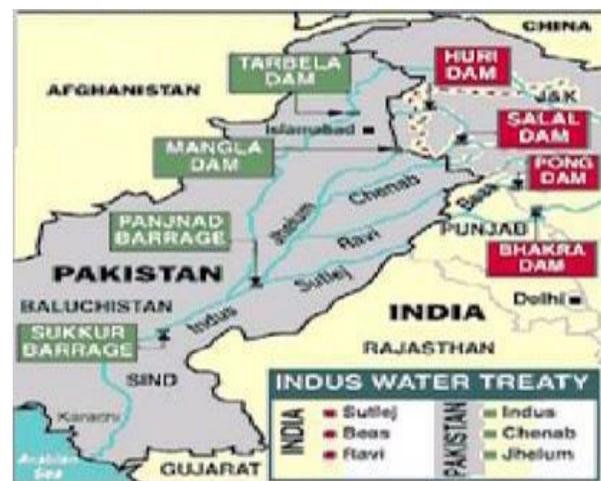


Fig 4: River Sharing Treaty between India and Pakistan

After partition India and Pakistan wanted to build dams on the east and west flowing rivers. These huge engineering projects would have led to deadly conflict and it was clear to all that failure to create a system for control and distribution of the Indus River basin water acceptable to both countries could result in warfare. That is when World Bank stepped in and took the lead in designing, negotiating, and financing a multi-dam irrigation solution that was acceptable to both the countries [4].

III. Factors to Be Considering During Project Design

Engineers have social and ethical responsibility to take all required steps to avoid such conflicts. To avoid such conflicts, engineers need to be alert to the fact that the project that they are designing may lead to conflict. It is best that these conflict risks are considered during design phase of a project as it is easy mitigate such risks during design phase rather than during implementation phase. Hence when designing a project, engineers and others involved (directly or indirectly) in planning and designing should take cognizance of below factors [3].

1) Will the project be implemented close to borders of two rival countries or groups? If yes, then engineers and project planners need to hold discussion and negotiation (directly when possible or through world governing body when direct negotiation is not possible) with all the impacted countries to ensure that there is no conflict during or after project implementation.

2) Engineers should make a list of different groups that will be affected positively or negatively by this project and should take all steps deemed necessary to ensure that project does not escalate the divisions between different groups [5].

3) Engineers should consider and inculcate the World Bank rules and guidelines when implementing projects especially water or hydro related projects on rivers flowing between two or more countries [8].

4) Similarly, cautions issued by World Bank or UN or any other world body should be applied to projects in areas that are claimed by different countries [8].

5) While designing the project, an engineer should also consider the unwanted effect of their project like pollution or hazardous waste generation that may impact lives of people, animal and environment alike and take steps to Mitigate such unwanted effect even if there is risk of project cost increase.

6) If a project leads to displacement of people, then engineers should also take in to account displacement of indigenous people who have been living in project location for centuries. Engineers should ensure that indigenous people are explained the long-term benefit of the project, win their confidence and plan the movement of people to new place in

such a way that the lives of people who are moving are least inconvenienced [6].

7) When planning a mining or hydro project which would invariably result in environmental degradation, engineers should ensure that project itself is justified and damage to environment is minimized even if the cost of project goes up.

8) Engineers should ensure that they negotiate with the people who are negatively impacted by the project and ensure that the affected people are fairly compensated for the loss and hardship that will undergo due to the project.

9) Engineers are obligated to ensure that project results in equal benefits for all the communities.

In general, engineers should seek opportunities for project designs that create motivation for peaceful coexistence or cooperation, or at least do no harm.

IV. Questions about Engineer Readiness

The list of factors that needs to be considered by engineers in the design phase of projects, which are critical to avoid the avoidable conflicts, raises uncomfortable question about the knowledge and skills of current engineers. Few of these questions that crop up are [2]

To what extent is curriculum of current engineering colleges planned to address these critical factors and prepare students with knowledge beyond the scope of technical skills and professional collaboration?

Are the colleges preparing engineers who are capable enough to manage the conflict of interests, social and political complexities involved in implementing a project? ,

Does the underlying ideas presented in this paper be considered for inculcating in the curriculum of the engineering professions, and if yes, how could this be accomplished?

Which institutions of the engineering community are best suited to take the leadership roles in such an effort to include peace engineering in their curriculum?

V. Engineer Education

As the natural resources vanish due to plundering and uncontrolled use by the humans, in future there are likely to be more and more projects with intention to extract last remaining resources. This would result in more projects that are likely to create conflicts, conflicts in number not seen before and some of these conflicts could be devastating for all. Given this grim situation, it is high time that engineering colleges change curricula to include peace engineering as part of overall knowledge and skill development of engineers.

As engineers are bound to play vital role in future projects, we propose below changes to engineering curricula so that the next generation of engineers is prepared for the future. Without these skills the engineers will not be able to play a role in controlling the conflicts

To equip students with the skillset required to manage conflict prone projects, there is no need to change whole curriculum. Simple actions to include peace engineering as part of curricula and engineering faculties laying emphasis and advantages of peace engineering can be effective. Also making peace engineering a mandatory part of the engineering curriculum will help the current engineering students manage and effectively handle future challenges

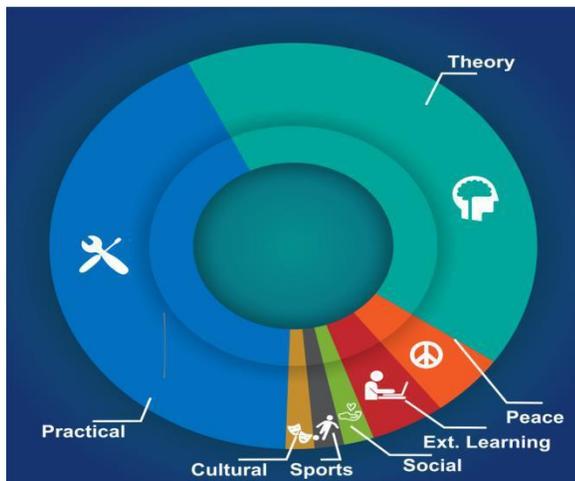


Fig 5: Ideal Curricula for Engineers

In line with above points, some of the recommendations that needs to be considered by educators and curriculum designers [10] are

1. Educators need to be make it clear to student engineers the distinction between theory and practice. Building awareness about this distinction will enable students to develop the skills to convert the knowledge gained in to practical purpose. Workshops and practical trainings is best to methodology to familiarize students with different challenging circumstances they would encounter in real life.
2. The courses should bring students in contact with real-life examples and experiences. The courses should be designed to bridge the gap with class room theory and ground reality that engineers come across when implementing projects. The course content should to equip engineers with the knowledge on peace engineering to ensure engineers have the knowledge to diffuse conflicts and promote peace.

3. During academic years, institutions should provide instructions that encourages students to think about the problems they want or don't want to do come across or be held responsible for. They should also be made aware about their societal responsibilities, characteristics of the conflicts that society would face due to upcoming project and why engineers should take the lead to avoid or resolve these conflicts. This will ensure future engineers feel responsible for their own upcoming actions.

VI. Conclusion

In conclusion, it is harsh reality that the world is growing less tolerant and more violent. For trivial reasons there are conflicts that are being reported from around the world. At the core of such conflicts are engineering projects. Many conflicts triggering projects are initiated to use scarce resources claimed by multiple parties or projects which are conceived disadvantage to one or more group or projects that are advantageous to one ethnic group and group which are left behind take to conflict route to express their anguish.

At center of design and implementation of such conflict infested projects are engineers. Hence engineers are in best position to take steps to such conflicts. Under such a scenario, engineers can make a significant contribution to make this a peaceful world, take steps that benefit not just the planet, but also the engineers themselves. For engineers to be able to make such invaluable contributions, they should be provided with knowledge and awareness about peace engineering. With engineers empowered with the knowledge of peace engineering, engineers will be effective and valuable combatants of conflicts.

To make engineers conflict combatants, there should be changes in engineering curriculum and change in teaching approach by the engineering faculties. Also, given the value and contribution that peace engineering can make to this world, peace engineering should not be offered as an optional course and should be made a mandatory part of engineering curricula. These factors would help make this world a peaceful place and bring a hope to future of humanity which is the main objective of this paper. Engineering education could further this objective by enriching curricula with peace education components, relevant multidisciplinary materials, and specific engineering case studies and issues like those discussed in this paper.

REFERENCES

- [1] Banfield, J. &Tripathi, S. (2006). Conflict-sensitive business practices: Engineering contractors and their clients. London, UK: International Alert. Retrieved from <http://www.international-alert.org/resources/publications>.

- [2] Peace and Conflict: Engineering Responsibilities and Opportunities, Robert J. Muscat, Global Peace Services USA
- [3] Fox, James W. (2011) Evaluation of the Implementation of the Paris Declaration by the U.S. Government: Millennium Challenge Corporation Case Study. Washington, DC. Retrieved from <http://www.oecd.org/development/evaluation/dcdndep/47780793>.
- [4] Haney, M. & Plummer, J. (2008). Taking a holistic approach to planning and developing hydropower: Lessons from two river basin case studies in India. Washington, DC: World Bank. Retrieved from <https://openknowledge.worldbank.org/handle/10986/10597>.
- [5] Muscat, Robert J. (2002) Investing in Peace: How development aid can prevent or promote conflict. Armonk, NY: M.E.Sharpe.
- [6] Survival for Tribal Peoples (n.d.). The Yanomami. Retrieved from <http://www.survivalinternational.org/tribes/Yanomami>.
- [7] Uphoff, Norman (1998) Learning from Gal Oya. Ithaca, NY: Cornell University Press.
- [8] World Bank (2012). Operational Manual. Washington DC: World Bank.
- [9] <http://drexel.edu/engineering/areas-of-study/peace-engineering/research/>
- [10] https://www.ipinst.org/wp-content/uploads/publications/ipi_e_pub_engineering_peace.pdf
- [11] <https://ourworldindata.org/war-and-peace>