

## Diamer Basha Dam Imbroglia

I wholeheartedly endorse the honorable CJP & honorable PM's initiative to build the long delayed dams on the Indus & its tributaries. In this article I focus on the Diamer Basha Dam (DBD). In subsequent articles I will analyze the other equally important dams & HPPs of the so-called "Indus cascade". My articles will be under the title "Water Endowment. The Nation flying blind" I will discuss hydrology, hydropower, hydro-politics, efficacy of IWT 1960 & ecology. I will attempt to identify the major challenges. The world must be made to realize that India compelled Pakistan to give up 100% its historical water rights on the three eastern rivers namely Ravi, Sutlej & Beas on the guarantee that it will have uninterrupted use of the three western rivers (Indus, Jhelum & Chenab) under the Indus Waters Treaty. However India brazenly violates the letter & spirit of the IWT1960. Honorable Sardar Muhammad Tariq has in his 2015 article "Water Security" meticulously outlined the challenges faced by Pakistan. Besides the environmental & ecological pain inflicted there is a perpetual decline in trans-boundary river flows. He has analyzed that between 2000 and 2014, Pakistan faced 12 BCM (about 10 MAF) reduction of flows in the western rivers. Wake up Pakistan!

Tragically we observe that Indian water aggression since 1947 has continued with undiminished intensity. She is clearly stealing the waters of the Chenab. She violates the IWT-1960 on all three western rivers flowing through IHK. For the Indians, IWT just meant: India Wants Time. In the Treaty India also laid the basis for subsequent controversies concerning semantics & interpretation. The insertion of 'let flow', 'non-consumptive' and 'the then' phrases in the Treaty were all Indian manipulations that they later misuse. The imperial rulers had ensured that the three eastern tributaries of the Indus (Ravi, Sutlej & Beas) flowing through Indian Punjab are controlled by the upper riparian. Madhupur headworks on the Ravi and Ferozepur headworks on the Sutlej & Beas were delivered to India through the blatant "Radcliffe Award" that partitioned British India. A seventy years history of Indian water aggression is genocide in slow motion. Let us unite in thought and action to salvage the remaining waters of the Indus basin for the common good of our children and prosperity of Pakistan. Let us first remedy the intrigue whereby since about 20 years India starts to display our Northern Areas (Gilgit-Baltistan) as part of "Greater Kashmir". Indian maps of Indus Basin show our NA part of "Greater Kashmir". This inhibits all external financing for our NA projects.

India's first Prime Minister Pandit Jawaharlal Nehru said in 1950: "dams are the temples of modern India". He may not have ordered these temples to be built on Pakistan waters however as one of the founding fathers of independent India and with military annexation of J&K he did create conditions for her aggression. This ongoing tragedy can't be reversed without a gigantic step. All regional lobbies working against the Indus cascade are to be neutralized; academically and scientifically. We have not built a large dam since Tarbela was effectively completed in 1974. Indians in the meantime built more than 4,600 dams including Bhakra, the highest in the world in its time, and later the controversial Narmada on the intervention of the Indian SC. Dams do not consume water. Their primary purpose is to control & regulate flood waters. It was due to Mangla & Tarbela that Sindh receives a greater share of Indus Basin waters. Floods & monsoon waters supplied year round.

As per press reports WAPDA is interested to award the DBD consultancy to local consultants under the leadership of NESPAK. A project as huge & technically complex as DBD, in the hands of local consultants will be suicidal for the project & the nation. The narrative that local consultants will supplement their expertise by hiring expatriate individual consultants is fraught with serious issues of liability. The world's top engineering firms have their reputations at stake. They have home office support; availability of experts at any critical (or catastrophic) situation at the project. Individual hired consultants have no such liability. A hired individual can walk out of the project at any time. This kind of approach would be a cruel joke on the nation. I explain this in the following paras.

Mr. Hanif a former GM Contracts on Ghazi Barotha HPP, a power canal project, was made Member Water in 2016. He retired from WAPDA in May 2017, and has been since in the Member's chair as "Adviser". There is no expert on large dams in Pakistan. Any attempt to handover to a consortium of local consultants under NESPAK with MMP & few others would be a disaster. Neither of them has built even a 50m high RCC dam. Can they handle the world's highest RCC dam? The engineering community realizes that a greedy private consultant is pushing this dangerous idea. This project is the most technically challenging engineering Project ever conceived in Pakistan. National pride must not distract us. Even China had to introduce foreign experts while building the Three Gorges Dam. Large Dam Engineering is a very sensitive & complex field. The handful of local talent groomed by mid 1970s has disappeared since WAPDA has not built a large dam after Tarbela. The Mangla Raising was a limited experience for WAPDA Engineers because the design of a raised structure was available since the 1960s. WAPDA had retained two retired engineers as in-house consultants. However Dr. Izhar-ul-Haq (age 75) adviser for the DBD project was removed in 2018 on the instructions of the Federal Ministry of Water. He was found negligent. The 2<sup>nd</sup> in-house adviser with the title of "Consultant for Large Dams" Mr. Abdul Khaliq Khan (age 82) passed away in July 2018. God bless his soul. He was not a Design expert. WAPDA was and remains seriously deficient.

WAPDA must accept that the DBD design needs to be reviewed due to its controversial height and RCC (Roller Compacted Concrete) concept. The original height of DBD was 660ft but in 2004 it was increased on the direct intervention of a Senator from Sindh. The cost doubled! It was now about 50% higher than the dams built in China, Japan & Columbia who all attempted very high dams. It was a very dangerous tactic to eliminate KBD by an increase of DBD height. Lt. Gen Dr GS Butt, former WAPDA chairman, had rejected the height changes in 2004 and declared that a high RCC dam starting at 3000ft ASL in a seismic zone with the reservoir above the Eurasian fault line is a recipe for an apocalyptic disaster. He wanted WAPDA to revert to the original design of a safer & lower CFRD (Concrete Faced Rock filled Dam) and eliminate river bed excavation. This would reduce the cost and time to build DBD by half. There being no construction inputs (except rock) at site and based on his experience of the Karakorums the up-gradation of the KKH from Thakot to DBD site would be an expensive exercise of several years. He included a "pragmatic" construction schedule in his letters. I was with him at WAPDA House on June 30, 2004. His three letters to Pres. Musharraf & one to Chairman WAPDA are on the WRDC website and included in the PBC Water Panel Report of 2015.

**Quote, from Dr Butt's letter of June 30, 2004 to Chairman WAPDA Mr. Tariq Hameed:-**

*This is a dangerous area to build a dam. The prosperity and survival of the country depends on this and other dams. Geology of the area has not been fully studied. Consider also a flexible rock filled dam with RCC cloaking. Do not allow the consultant to follow their hunch or first available solution. Every critical option and parameter must be considered in detail and only then discarded.*

*This dam axis has been decided without much investigation and is most inadequate. A lot of work needs to be done. The dam main design may be done by a consultant other than the Feasibility consultant otherwise the mistakes would be compounded. Jaglot syncline is a highly active tectonic element. Basha is located within its stress field where tectonic movements are permanently going on. Frequency of heavy earthquake is considerable. Their epicenters are not too far. More detailed and precise investigations are necessary. Recent (2002) earthquakes in Nanga Parbat Massif (NPM) can initiate several landslides. If that happens after the dam is built and a wave is generated that may fail the dam and spill over it. The downstream devastation to Tarbela and all other barrages, upto Kotri would be enormous. I shudder at the thought.*

**Unquote**

We may briefly analyze the NESPAK performance on Neelum Jhelum HPP tunnel project. It has become a national shame due to the four times escalation in its cost. The talk of a race with India's

Kishenganga tunnel project (KHEP) was always a bluff. The IWC under PCIW Jamaat Ali Shah had damaged, in mid 1990s, Pakistan's position on KHEP under the IWT tenets. However NESPAK played along with WAPDA's Member Water Raghieb Abbas Shah & Chairman Shakeel Durrani to create conditions for a four times increase in the cost of NJ HPP. Project launched in 2007 was effectively completed in 2018. Nearly everyone initially involved in this project tried to enhance the project cost. Why the longer tunnel option was selected? If there was a genuine "race" with India's KHEP, could WAPDA and NESPAK allow this theatre and increase the cost & time required to construct? Going under the Upper Jhelum River with a double tunnel also added over a billion dollars worth of steel lining works. An excuse of earlier completion was found to induct massive Tunnel Boring Machines (TBMs) for a part of the double tunnel section. A contract of around USD 1.4 bn has escalated to +USD 5 bn and contractor claims are still coming. NESPAK opened the "pandora box" by changing the exclusive Drill & Blast (D&B) basis of the contract by inducting TBMs. The longer tunnel option has caused environmental damage besides the financial bleed. Their promise of an earlier completion of the project never materialized. It was a bluff. The expected success for India at the PCA, Hague happened on Feb 18, 2013. PCA concurred with the Indian position that the KHEP is a "Run-of River" plant in-line with Para 15, Annex D of IWT1960. India could divert Neelum waters into the Bonar Nallah. Where will NESPAK take the DBD costs? From USD 15 bn to USD 60 bn? Completion time 20 years? Due to lack of design expertise in hydropower, large dams & even large thermal plants, NESPAK has now the mindset of a PWD or MES outfit. They can supervise construction if someone else will provide vital design expertise. Did NESPAK ever caution the WAPDA management or President Zardari's ministers that NJ HPP is the most expensive HPP in history on installed MW basis especially due to the longer tunnel option? Did they declare to the people of Pakistan that there is no race with the KHEP? Did they raise an alarm about the serious loss of energy output of NJ HPP after the PCA ratified the Indian position? I do not believe that NESPAK ever evaluated the hazards of crossing the "Muzaffarabad Fault" as a result of the longer tunnel option. WRDC document IWA-6(D) raised these issues on 29 Dec 2013. **It is also critical for a consultant on such a mega project that he should be capable of resisting pressure from all quarters who would be tempted to milk a major project.** At DBD both safety & economic future of Pakistan are at stake.

In 2018 we saw another engineering disaster. This time it is the Tarbela 4th HPP Ext. The engineering world knows since decades about the sediment scenario at Tarbela. Consultant Chas T. Main at the Tarbela 3<sup>rd</sup> HPP Ext proposed in 1991, that it was possible to install a 960 MW (2 x 480 MW) extension on the 4<sup>th</sup> tunnel. Sulzer Hydro (supplier of turbines for Tarbela 3<sup>rd</sup> HPP Ext) offered to do an EPC on commercial financing. WAPDA's senior management was apprehensive due to the sediment scenario and refused the offer. In 2008 thanks to IBRD financial commitment Tarbela 4<sup>th</sup> HPP Ext was pushed by Member Water Raghieb Abbas Shah & Chairman Shakeel Durrani. The MMI/MMP led consultant consortium with CeB, France was selected in 2010 despite a 50% higher cost proposal compared to the highly experienced POYRY (Switzerland) led JV that included SMEC, Australia & Fichtner, Germany. With dead level of the Tarbela reservoir at the height of 1386 ft ASL, the MMI/MMP led JV decides to jack the proposed capacity from 960 MW to 1410 MW, ignoring the mountain of sediment parked in front of tunnel 4. High level intakes are useful if the consultant can operate the turbines under a very strict regime. The Tarbela 4<sup>th</sup> HPP Ext consultant proved that they defacto ignored the sediment scenario. The Feasibility Study should have convinced them to offer a smaller power plant. Firstly due to the deteriorating sediment scenario the plant factor cannot go beyond 20% i.e. the project will generate power for about 10 weeks in a year. Secondly after DBD even 10 weeks is not possible. WAPDA must penalize MMI/MMP for the greed & unrealistic design of Tarbela 4<sup>th</sup> HPP Ext. They ignored the sediment scenario. Was it a case of "fraudulent inducement" by MMI/MMP? Their Feasibility Study claims annual energy generation of 3840 GWh (3.84 bn units) based on three generating units of 470 MW each. By declaring 3.84 bn electrical units per year from Tarbela 4<sup>th</sup> HPP Ext they exactly doubled the Inception Report figures of Chas T. Main presented in 1991 i.e. 1.9 bn electrical units of energy per year. In 2011 the sedimentation scenario

had further depreciated compared to 1991. MMP has clearly exhibited unprofessional conduct on Tarbela 4<sup>th</sup> HPP Ext. They were negligent about the safety of Tarbela Dam in their pursuit of enhancing the power plant costs. Can we afford a similar situation on mega project DBD and trust our safety & economic future in the hands of NESPAK & MMP? WAPDA must reverse this decision.

DBD is a complex & very large structure presently designed as the highest RCC (Roller Compacted Concrete) dam in the world. Around 900ft above rock-bed of the Indus River. Rock-bed base is at an elevation of 3000ft above sea-level/ASL. The project area is in an active Seismic zone. The reservoir will be located on the Central Asian fault-line. Three letters written in 2004 by Lt Gen. Dr. GS Butt to President Musharraf (& one to the WAPDA Chairman) are on record. Let us recall the destruction by the Oct 08, 2005 earthquake in the Northern Areas and the deadly Sichuan earthquake of May 12, 2008. The later caused by locating the reservoir on a fault line. Dr Butt was very disturbed on learning that DBD is being contemplated as an 8.1 MAF reservoir with 6.4 MAF live storage. He declared the height increase irresponsible. He was convinced its reservoir must not impound more than 5.7 MAF (live storage of 5 MAF) or less. A safer/lower DBD makes possible the upstream Raikot HPP (110 m, 1,800 MW.) **A report on the DBD Seismic Hazard studies submitted to DBD/WAPDA management on Jan 20, 2017 states that during the period August 2014 through Dec 2016 a total of 732 seismic events were located within 250 km radial distance from DBD site. Magnitude of located events between 0.1 & 4.7 (depth ranged from 0.0 to 367 km.) Seismic events within 100 km radial distance are also plotted.** DBD will act as a sediment check dam for all downstream hydro projects. A more critical function compared to its flood control, storage & power gen capability.

To avoid further fiascos let us launch CIBSA (Commission for the Indus Basin Strategic Analysis). Our response to India's ICID comes 68 years late. ICID is clearly behind this height increase in 2004. The enemy would achieve a deadly stranglehold. **A high DBD makes Pakistan extremely vulnerable.** Such strategic issues could be analyzed by CIBSA. **DBD is a sediment/debris trap that must be available within 6 to 8 years for clean operation of the HPP cascade downstream (Dasu, Pattan, Thakot).** Let CIBSA be involved in regulating Ground Water extraction. The reality of untreated effluents? We continue to receive four major drains of Indian Punjab; Hudiana, Fazilka, Saleem-shah & Kasur nallah. The Indians have refused requests for environmental flows in the Ravi and Sutlej. I did confront them on the illegality of Art 4 of the IWT1960. Environmental science was recognized after Helsinki 1962 (post-IWT1960.) They are cognizant of the environmental damage. Sindh has a viral hepatitis epidemic as well. Build Akhori off-channel as back-up to Tarbela storage. T-5 HPP Ext is not feasible. KBD remains blocked by lobbies. Akhori is blocked since 2006. How do the Indians justify to include our NA into their part of the Indus Basin? Incidentally the Indus Basin is prominent in all five classifications of Indian River Basins. How waters of the western rivers in IHK are diverted? Their NRL may be a cover? Power needs of IHK are 3000 MW but India is moving quickly towards 28,000 MW in IHK. CIBSA can be on voluntary basis. It can help recreate the bridge between WAPDA and the IWC to ensure another Kamal Majidulla never usurps the IWC and mishandles arbitrations.

WAPDA Authority must realize that a Member Water specializing in Large Dam Design has to be located from a worldwide talent hunt. Pakistan's hydropower assets & economic future will depend on this success. WAPDA must now move quickly to build a safer/lower DBD in half the cost & time. Please remember that average annual flow of the Indus River at DBD site is around 50 MAF. On this yard stick too, a 5 MAF reservoir is appropriate. The Indus Cascade including KBD has the potential to break the poverty cycle of the nation. Pakistan Paindabad.

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