Finding the multiplier effects of Job Creation and Skill shortage in Energy Sector of CPEC Projects

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CERTIFICATE

This is to certify that this thesis entitled: **"Finding the Multiplier Effects of Job Creation and Skill Shortage in Energy Sector of CPEC Projects"** submitted by Ms. Mahak Abbas is accepted in its present form by the Department of Business Studies, Pakistan Institute of Development Economics (PIDE), Islamabad as satisfying the requirements for partial fulfillment of the degree of **Master of Philosophy in Business Economics**.

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Dedication

Every challenging work needs self-efforts as well as guidance of elders especially those who are very close to our heart. My humble effort I dedicate to my sweet and loving parents, whose affection, love, encouragement and prays day and night make me able to get such success and honor, along with all hard working and respectable teachers for advice and guidance which let me to complete this research work last but not the least. I dedicate this research work to my friends. Their company acted like and educational consortium for me.

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Content

Abstract

The China Economic Corridor of Pakistan (CPEC) has become a gateway to Pakistan's economic growth and stability. It has great potential to solve the ongoing energy crisis and, ultimately, to lead Pakistan towards energy stability. In this regard, job creation is an essential component of the socio-economic effects of the various skill sets and their influence on the different stages of the production and implementation processes life cycle. This research shows number of jobs created against one megawatt of Electricity multiplier effect and try to identify the areas of skill shortage in energy projects under CPEC. In this regard, I am collecting data from the Karot hydropower plant to analyze the jobs potential of the CPEC project and then identify the multiplier effects of job development and skills shortage requirements in Pakistan's energy projects.

Chapter 1

Introduction

Employment created or supported by the energy sector is frequently an issue whenever government support is being considered or provided. Government support for the energy sector can range from subsidies of various forms (World Bank 2010) to mandates, non-mandatory targets, and incentives. In all cases the impact on employment can be a consideration in the adoption of a particular policy.

A wide range of definitions "A job is usually defined in terms of the number of job years attached to the employment". This depends on how much time each year a job is paid for, and for how many years the job exists. Part-time jobs are converted to full-time equivalents (FTEs) and then scaled by the number of years for which that particular job is required— construction for a few years, maintenance for several years. Some studies calculate the total number of job-years created over the lifetime of the project (Pfeifenberger et al. 2010). Others, in order to compare different projects with different lifetimes, divide the total number of job-years created by the lifetime of the project to arrive at an annual equivalent (Wei, Patadia, and Kammen 2010). Such annual averaging can favour projects with shorter life. For example, a 25year project creating 30 job-years of employment has a higher annual rate of job-year creation than a project lasting 40 years and creating 40 job-years of employment of employment generated by energy sector activities have been proposed and a variety of methods have been used to construct such estimates. The purpose of this research is to provide a guide to using such figures or constructing such estimates, and focuses in particular number of jobs created against 1 megawatt of energy and skill shortages in energy sector of Pakistan. Similarly, to prevent skills gaps and shortages in the labour market and generally spur the transition of private and public institutions into efficient skills producers and users, timely and reliable information on the current skill endowments of the workforce and how they will develop in the coming years is essential. Skill shortages and gaps may prevent employers from filling posts or make employers accept staff with sub-optimal skills.

The result will usually be that the organisation adopts sub-optimal working arrangements, and endures production cuts, lost orders, and dissatisfied customers. Concentration of skill problems in territories damages local productivity and competitiveness.' Source: Cede fop, 2008.

Addressing our challenges requires evidence-based and credible data on human capital in general and available skills (quantity and quality) in particular. Such data are critical for policy formulation and planning. Besides, such data are to be used for monitoring and evaluating the progress and impact of human capital, developing interventions in facilitating the economic growth and social progress in the country. Source: RDB, 2011

A majority of studies have shown that employment is considered vital for the economy to prosper. When used consistently and optimally, economic agents may be upgrade the whole economy by raising their own living standards. It enables employees to improve their absorption ability and develop their expertise by creating new entrepreneurs on the market that will cause "snowball effect" in the future, thereby creating more job opportunities. No more than illusions and fictions were considered before the emergence of the CPEC initiative, a dramatic increase in Pakistan's employment rate. The employment created through CPEC early harvesting initiatives required particular, specific abilities and experience, which had been lamentably lacking within the triumphing domestic workers. As a result, Chinese language agencies have grown to be greater inclined in the direction of foreign personnel. On this respect, the proportion of unqualified home labor running in these initiatives changed into some distance better than Pakistan's professional/technical labor. As the CPEC undertaking intends to launch numerous different initiatives, which include power projects, infrastructure initiatives, the port of Gwadar and commercial cooperation, proposed underneath 9 special monetary zones (SEZS) within the various province of Pakistan. These ventures might surely assist a decline in the modern-day persistent unemployment

price to five.9 per cent. For any economy, the crux of the matter is the mismatch of talents. The positions in the work marketplace are empty wherein the labor force exists, however the unemployment charge remains unaffected.

The abilities found out via the employees aren't steady with the process marketplace. Thus, there is a divide between practitioners and students, while ultra-modern college students do no longer make firm picks approximately their profession path. The bureau of exertions records of different developed nations carries out monthly surveys to forecast and analyze the America and downs of the paintings marketplace to lessen these differences and to direct the following generation. Now not only is the file written, but online profession portals are designed for students to brainstorm themselves for the favored occupations. Then again, advanced international locations are still inside the process of determining the variety of jobs with a purpose to be generated within the near destiny, in preference to classifying the skills needed. This enables us to explain and highlight the future of direct employment in Pakistan from the first level, while holding the current market scenario in contrast.

China Pakistan monetary hall (CPEC) is anticipated to generate 400,000 jobs for the location, in step with the ILO (worldwide labour business enterprise), even as the implemented monetary studies centre has anticipated that the mega initiative will provide about 700,000 direct jobs among 2015 and 2030.Even extra encouraging outcomes are proven by way of the planning commission numbers, with CPEC generating about 800,000 jobs inside the next 15 years. Pakistan is ready to gain a splendid deal from these possibilities, as the united states annual economic increase will also growth substantially.

CPEC consists of power and transport initiatives which might be below production connecting western china to Indian Ocean in Pakistan. Visible because the BRI’s key plank, through 2030, the price of CPEC projects is projected at $fifty-five

billion. This represents round 19% of the us$280 billion GDP of Pakistan in 2016. Investments inside the CPEC by myself will increase Pakistan's investment ratio from 15 percent of GDP over the following decade to sixteen.5 percentages (Iqbal, 2017). In November 2016, when Chinese language shipments of 250 packing containers had been transported from Xinxiang to Gwadar port and from there to the centre east and Africa, CPEC have become partially operational (sunrise, 2016). A map of many multi-billion-dollar power initiatives along the CPEC is given in determine 1. CPEC specializes in strength, street and rail infrastructure initiatives and special financial zones (sezs). An outline of CPEC investments reported with the aid of government sources as much as December 2017 can be found in table 1.

Table 1: CPEC Investments – 2017 update

Sector	*Allocated Amount $Billion*	*Percentage of Total*
Energy	36.00	67%
Railways	10.79	20%
Roads	6.10	11.3%
Gwadar Port	0.80	1.5%
Fiber Optics	0.04	0.2 %

Source: www.cpec.gov.pk

As part of China Pakistan Economic Corridor (CPEC), approximately $36 billion worth of energy infrastructure will be installed to tackle extreme energy shortages in Pakistan. In the peak season, these shortages regularly amount to over 7,000 MW (Kiani, 2017), and are expected to reduce 2-2.5 percent of Pakistan's annual GDP. Pakistan's economy lost PKR (Pakistani Rupees) 1,439bn (7% of GDP) in 2015 on the basis of higher estimates of energy deficiency (Pakistan Observer, 2017). As part of the fast-tracked "Early Harvest" projects of CPEC (Deloitte, n.d.), more than 10,400 MW of power generation capacity is expected to be produced by the end of 2018. Overall, CPEC-

related energy projects would ultimately generate 17,000 megawatts of power and nearly double the installed capacity of Pakistan. In addition, liquefied natural gas and oil will be transported by a network of pipelines, including a $2.5 billion pipeline between Gwadar and Nawabshah, which will be extended further west to import gas from Iran. Although the key source of electricity generation from these projects will be fossil fuels, hydroelectric, wind and solar projects are also being developed and built as part of the CPEC. It is projected that from 2015-2030 the CPEC will build up to 700,000 jobs (Case Study: China Pakistan Economic Corridor, 2016)

List of Energy Projects in CPEC

Sr. No.	Project	Installed capacity (MW)	Estimated cost (Million US $)
	Port Qasim Electric Company Coal-fired, 2×660 MW, Sindh	1320	1980
	Sahiwal, 2×660 MW Coal-fired, Punjab	1320	1600
	Engro Thar, 4×330 MW, Coal-fired, Sindh	1320	2000
	Gawadar Coal-fired, Gwadar, Baluchistan	300	360
	HUBCO Coal-fired, 1×660 MW, Baluchistan	660	970
	Rahimyar Khan Coal-fired, Punjab	1320	1600
	SSRL, Thar, 2×660 MW, Mine-mouth Coal-fired, Thar	1320	2000
	Quaid-e-Azam 1000 MW Solar Park Bahawalpur, Punjab	1000	1350
	Dawood 50 MW, Wind Farm, Bhambore, Sindh	50	125
	UEP 100 MW, Wind Farm, Jhimpir, Sindh	100	250
	Sachal 50 MW, Wind Farm, Jhimpir, Sindh	50	134
	Sunnec 50 MW, Wind Farm, Jhimpir, Sindh	50	125
	Suki Kinari Hydropower Station, KPK	870	1802
	Karot Hydropower Station, AJK & Punjab	720	1420
	Total	10,400	15,716

I choose Hydro Project in energy sector of CPEC because CPEC's early harvest projects provide a cumulative hydropower production of 2,850 MW. In reservoir management, these installations employ electrical, civil and mechanical engineers, technicians and professional staff. Navigant Consulting USA (2009) has estimated 5.10 Jobs per megawatt (MW), while, in latest international labor organization (ILO 2017)

study it has been estimated by 4 direct jobs per MW. According to future employment projections by the Government of Gilgit Baltistan (GB-WAPDA), the Government of Azad Jammu and the Government of Kashmir (AJK- Hydro Electric Board) and the Private Power and Infrastructure Board (PPIB), 11.66 jobs per MW are projected in the construction process and 3 jobs per MW are projected in the operation and maintenance phase (O & M, ILO-Pakistan, 2015).

Economic Aspects:

- Has low costs for operation and maintenance.
- It is a long-lasting and durable technology; without significant new investments, systems will last for 50–100 years or more.
- A safe energy source.
- Includes validated technologies.
- Promotes regional growth
- High-efficiency technology.
- Generates sales to retain other water

Social Aspects:

- Improves living conditions.
- Leaves usable water for other purposes.
- They also have flood protection.
- It can improve conditions for navigation.
- Increases recreation.
- Enhances the territory's accessibility and its capital

Environmental Aspects:

- No atmospheric pollutants and very few emissions of GHGs are made.
- No waste is made.
- Avoids depleting the resources of non-renewable carbon.
- Creates new habitats of freshwater with improved productivity.
- Improves skill growth.
- Slowing climate change down.

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Karot hydro Power Project

In Pakistan, the Karot hydropower task is a concrete-center rock filling gravity dam run-of-river with an installed potential of 720 mw below construction. As a part of an awful lot large CPEC China-Pakistan financial hall, the Karot hydropower station in Pakistan is the primary investment project of the silk street fund and is scheduled for final touch in 2020.

The Karot electricity organization, which incorporates three gorges south Asia funding confined, a subsidiary of china three gorges enterprise, china-CTGC and associated technologies of Pakistan, is growing the Karot venture. It's far the primary hydropower venture backed via the silk road mission of china.

The organization will operate and maintain the venture for 30 years after crowning glory at a degree tariff of 7.57 cents according to unit, after which it will be transferred to the government of Punjab at a notional rate of is 1.

The Jhelum river is the largest river inside the Indus basin river gadget, and its hydropower capability has been described through several research undertaken by way of international agencies, with the first document published in 1983 by the Monaco

Canadian consultancy institution, observed in 1994 via an observe by means of the German technical cooperation enterprise (GTZ) that officially proposed the Karot hydropower mission.

The Karot hydropower challenge, a few 1.7 kilometers upstream of the Karot bridge and 74 km upstream of the Mangla dam, is deliberate at the Jhelum river close to karat village. The assignment web site can be accessed with the aid of street from Islamabad-Kahuta-Kotli road, approximately 29 kilometers from Kahuta town and sixty-five kilometers from Islamabad. On January 10, 2016, the venture's groundbreaking passed off.

The important thing assignment capabilities encompass the construction of a ninety-five. Five-meter-high concrete gravity dam with a crest length of 320 meters close to the village of Gohra. The reservoir of the dam will be about 164.Five million cubic meters in extent, with a period of 27 kilometers. As a result of construction, 72 houses and 58 companies are expected to need relocation even as the Karot-Kotli avenue is two. Eight kilometers, and the energy consumption system can be constructed right away upstream of the dam website online on the right bank of the river and will divert the water into headrace tunnels getting into cavern powerhouse. Via the tail-race channel located on the right financial institution of the river Jhelum at once downstream of Karot village, the water might be discharged returned to the river Jhelum. The dam will produce an annual common of 3,436 GWH of strength and could connect with the countrywide energy grid of Pakistan.

On September 28, 2016, a 30-yr implementation settlement was signed by using the federal and Azad Jammu and Kashmir governments with a Chinese consortium for the improvement and operation of the Jhelum river at the most livable tariff of seven. Fifty-seven cents in step with unit. In February 2017, the economic closure of the

challenge become carried out, whilst the award for land acquisition was additionally made. Through September 2017, more or less 25% of the civil works of the challenge with an established potential of 720 mw had already been completed. As the company's engineer, SMEC worldwide PTY LTD is instrumental in presenting the 720 mw Karot hydropower assignment with challenge management, design overview and construction supervision services.

Whole task charges are projected at $2 billion and could be financed by means of china's silk avenue fund, the global finance organization. China's export-import bank and china development bank will problem loans to the Karot electricity organization, a subsidiary of china's (TGDC) 3 gorges improvement agency, for you to be evolved for 30 years on a "construct-very own-perform-transfer" basis, and then possession can be transferred to Pakistan’s government.

Competencies gaps and shortages–the function of education and schooling in a developed U.S.A. Like Pakistan, it is extremely paradoxical that we are dealing with extreme shortages of talents and, at the equal time high costs of open and beneath jobs employment. A great deal has already been stated about the causes of the mismatch among the monetary skills wanted and the abilities developed by means of academic establishments. The improvement of talents is vital to the renewable power region's progress, each in accelerating its increase and in permitting people to benefit from it. Clean emphasis and determination by government, enterprise, and key stakeholders is needed to construct an expert staff.

Many re technologies (with hydropower being an exception) are nonetheless in their early stages of development and are increasing unexpectedly in share to their present low degree. From the point of view of the country wide labor markets, the fashion

is extra various, as there is constrained interest in a few international locations with each re generation, rapid boom in others, steady capability growth in a few others, and an incredibly mature enterprise someplace else. Troubles with abilities call for and hard work shortages in res arise when activity starts hastily, inflicting labor demand to shift unexpectedly. This more happens later, as the tempo at which new re ventures are brought dramatically rises or falls swiftly. In several of its member international locations, REN alliance has installed the key occupations that are difficult to fill (which encompass each advanced and growing country).

Seemingly, in all regions of the red zone, there's an enormous abilities shortage of engineers and technicians, which in lots of instances stems from a standard tendency of college students not to pursue engineering studies. In particular, skilled design engineers with specialized know-how of precise re technology are particularly required. Aside from engineers, professional turbine technicians are required for wind strength. Inside the hydropower area in developing nations, there may be an engineering and technical competencies scarcity, as well as a loss of skilled engineers and appropriately trained techno in non-technical professions, there also are talents shortages. In certain instances, prison experts, distribution experts, inspectors and economists lack specialized skills, which might be nevertheless critical for the manufacturing of res. Competencies shortages are connected to focus of re technology and their social and financial blessings, to worldwide, national or regional environmental regulations and policies, to unique applications launched by using governments to assist initiatives and different projects, and so on. A full-size loss of skilled trainers with res-unique skills has also been mentioned in the bioenergy region.

It's miles a fact that the simple occupational abilities needed for many jobs in the re region are supported via present schooling and training programs. University courses

in electrical engineering, civil engineering, mechanical engineering and environmental engineering, agriculture & forestry, biotechnology, geosciences, records generation and some of other disciplines offer the desired foundation for reds professional level paintings. Preliminary expert and vocational training and training (ITVET) and apprenticeships in technical fields offer a strong basis for working within the re industry at the technical stage.

However, retraining and/or additional schooling explicitly primarily based on re is a must for workforce with applicable information who need to move from other sections of the power region to the re enterprise, but additionally for graduates with fewer specializations. In exercise, retraining will cowl lots of the training needs, as construction and set up jobs are most customarily transient and exertions needs can range. Many already hired within the re region want good enough training to fill holes in their cutting-edge capabilities or to up-skill them.

The jobs generated by investment has been the subject of many recent studies and reports on the performance of the energy sector. Advocacy for one form or another of software highlights benefits in terms of jobs generated. Governments are also interested in job creation advantages and the potential recognition of skill shortages that could arise from a broad energy program in preparing their energy futures.

Any time government funding is considered or offered, jobs generated or sponsored by the energy sector is always a problem. For the energy sector, government funding may vary from the subsidies of various types (World Bank 2010) to regulations (such as requirements for renewable fuels) and non-mandatory targets and incentives. The effect on jobs in all situations should be taken into account in the implementation of a specific policy.

Many job proposals created by jobs in the energy sector have been proposed and various methods have been used to create such a balance. The purpose of this paper is to provide guidance on the use or implementation of such measurements of such statistics and to explain, in particular, the various methods and techniques used over the past decade to measure the activities performed. Research does not seek to provide a complete measure of the ability of various technologies to perform tasks. Pakistan's current energy mix focuses on three technologies of the first half of the 21st century: thermal (mineral), electric power and nuclear energy. However, without the growth of appropriate skill levels in the construction and maintenance of such energy plants, Pakistan lacks the design and production capacity and skills to use them effectively. In fact, the level of competence remains costly and adequate training facilities are highly limited, especially in relation to international standards and safety issues. With the exception of large-scale hydropower projects, the amount of renewable energy consumption is small, less than 1% from wind and solar energy (cf. global renewable energy consumption is 3.4 percent and over 8 percent in Europe). The biggest challenge facing Pakistan in the use of renewable resources is the lack of required skills and a serious lack of facilities that can provide adequate training in renewable energy? Significant efforts have been made to transform the TVET process in Pakistan over the past five years (2013-2018). (Khan & Pathan, 2016; Paulo and Kottmann, 2015; Shah and Muhammad, 2017). Critical concerns, however, remain, especially as much of Pakistan's currency exchange revenue is focused on remuneration from workers sent to the Middle East (Bruns, Khan, & Emaan, 2018). By sending certified skilled workers to these countries rather than unskilled workers at present, this income distribution can be increased. The industrial response to TVET in Pakistan, however, has often been ‘lukewarm’ as many industry representatives say the

current majority of TVET graduates are ‘not eligible for employment’. The low social status provided by TVET in Pakistan can be one explanation for this.

This is a consequence of Pakistan's very poor view of blue-collar workers. According to this misconception, even very poor parents tend to send their children to universities at very high economic costs, rather than to send them to TVET institutions. This results in students and teachers in the sector becoming less involved and motivated. A revised TVET strategy has been declared by the government of Pakistan (Ministry of Federal Education and Professional Training, 2017), but it is too early to see the outcome. A merger of TVET institutions with universities is one possibility that could provide an impetus for better quality TVET in Pakistan. If processes similar to those being introduced in universities are also adopted for TVET, this will help to improve the standard of training. Such mergers can also lead to mitigating the negative perception of TVET. A change like that will be expensive and time-consuming. Historical patterns of the last few decades, however, indicate that the enormous amounts invested in TVET have so far achieved little qualitative change. It is therefore possible that funding the incorporation of TVET institutions with well-established universities and the grant of scholarships to assist students could, in terms of human development outcomes, provide a greater return on investment.

In Pakistan, TVET focuses primarily on three areas: construction, mechanical and electrical technologies. The program, however, remains outdated and the standard of training is far from desirable. he shortage of modern equipment and the poor standard of teaching staff of most TVET institutions are the two main reasons for this. The Bachelor of Engineering Technology courses recently launched by the National University of Technology tend to be one exception. When this initiative is successful, it could become a model for future initiatives. However, it is currently aimed at producing a limited number

of highly skilled managers and supervisors. This would have to be extended to include a large number of highly trained staff at all levels.

Multiplier Effect:

The local multiplier impact in the area of regional economic growth relates to the spillover effect of the involvement of a certain type of job on additional local economic activity. The current theoretical debate regarding local multipliers focuses on the extent of the effects of various industries and sectors on local jobs. This chapter explains the current theory of how local multipliers work in the local economy, its policy implications, and highlights current studies on the extent of the effect. Regional economists concentrate on disparities in job growth in the tradable and non-tradable sectors of the economy when addressing local multipliers. There is a probability that additional employment will also be generated by increased demand for local goods and services if a new work is created. Some economists claim that there is a far greater local multiplier effect on jobs in the tradable sector. This is due to the demand for the tradable sector that exists outside the local region's borders. This wider market helps the tradable industry, irrespective of the local economic environment, to produce more income, have higher wages and increase in size.

Hydro-Power as a Sustainable Energy Resource for Electricity Production in Pakistan the Pakistani government has developed a long-term plan to ensure energy security in the country with a strong focus on indigenous energy sources. In this system, all energy resources are used to meet the country's growing energy needs. According to the plan 17,400 MW of wind power, 6,500 MW of solar energy including solar thermal, on the grid and outside the solar grid is included in the world's total mix at any cost by the year 2022-2023 (MOF-GOP, 2009). In nuclear power generation, the government has

empowered the Pakistan Atomic Energy Commission to generate 8,800 MW of energy production by 2030 (MOF-GOP, 2013). Pakistan has about 100,000 MW of coal but unfortunately uses only a small percentage of traditional coal due to lack of modern technology and the country imports coal to meet its energy needs. Therefore, a team of energy experts in Pakistan has set a target of using 14,000 MW of coal by 2030 (MOFGOP, 2009). Demand for the system is expected to increase from 25,919 MW in 2013-14 to 84,832 MW in 2029-30 which is a huge demand and the current energy-dependent power supply will inevitably fail to meet this significant future plan (National Transmission and Dispatch Company Limited, Pakistan, 2008). Figure 4 shows the assumptions of the total mixing power supply when all the functions mentioned in this paper are used. you can see that all energy sources can generate 118,268 MW of installed energy by 2030 with hydropower owning 40.5% and Pakistani traditional energy resources representing 80.7% and the share of oil and gas is only 11.8% and the total capacity installed in 2010 was only 20,932 MW in Pakistan where oil and gas are 66.80%.

Research Gap

CPEC is considered as game changer for Pakistan. Different studies suggest number of jobs created through CPEC for example according to planning commission of Pakistan 800000 jobs are created through CPEC and according to ILO 400000 jobs created but none of studies of studies firstly how many jobs are created in Energy sector of Pakistan specifically hydro projects. Secondly number of job created in different departments. Thirdly what kind of skills shortage in energy sector of various departments.

Objective of the Study:

- To review the employment potential of energy projects under CPEC
- To find out employment multiplier for energy projects in Pakistan
- To find out the need skill sets required for Energy projects

Significance of the study:

CPEC and its possible outcomes in the form of infrastructure, income, jobs, electricity, etc. are the focus of a large number of studies. This study is important in that we collected data from the CPEC Karot hydro plant project to review the employment potential of energy projects under CPEC and then find out how many jobs are generated in department wise per 1 megawatt of hydroelectricity. This research also allows us to address the need for skills needed for CPEC energy project.

Chapter 2

Literature:

Depending on their lifecycle, power initiatives may be broken down into two parts, i.e. Construction, installation and manufacture (CIM) and operations and renovation (O&M). Each additive has distinct job possibilities and standards for hard and want to be studied especially. The period of the CIM process relies upon on the plant's form and strength (i.e. The form of power in MWs), at the same time as the period of the O&M job regularly coincides with the lifestyles of the plant. Jobs related to O&M is rising unexpectedly as established capability increases (Dalton & Lewis, 2011). Studies have proven that during a given yr., CIM components generate greater jobs than o& m components in a given year (C.F. Sooriyaarachchi et al., 2015& ewea, 2008). Special studies were performed in distinctive parts of the arena to study the feature of hydropower using diverse strategies. Yüksel has explored the role of hydropower for

water and renewable power around the arena, as an example (2010). Creation of and recognition of water strength and dams in turkey.

Similarly, sufficient proof on age marks the fine hyperlink among energy consumption, economic boom and hard work (CDC & ODI 2016). As the worldwide energy system is a prime monetary region with a proportion of approximately 8% worldwide gross domestic product (GDP) (IER, 2010), funding and employment possibilities within the quarter.

According to Elinwa and Joshua, about 80–90% of construction projects suffered with time delays and majority of these projects i.e. 89% belonged to government sector. Assaf and Al-Hejji found that only 30% contracts in Saudi were completed within scheduled time. In Saudi Arabia, most common reasons behind schedule delays are change orders by owner during construction and delay in progress payments by owners, ineffective planning and scheduling by contractor, poor site management by contractor, shortage of labors and difficulty in financing project by contractor. Aibinu and Odeyinka studied completed building projects in Nigeria and established that 88% of identified delay factors were responsible for 90% of overall delays. It showed that none of the factor caused an independent significant impact on delay. Sambas Ivan and Soon studied Malaysian construction industry and pointed out that improper planning, poor site management and inadequate experience on part of contractor, inadequate client's finance and payments for completed work, problems with subcontractors, shortage in material, labor supply, equipment availability and failure, lack of communication between parties and mistakes during construction stage are main reasons behind time overruns in construction sector of Malaysia. Financial difficulties faced by contractor, too many change orders by owner's/ design changes, poor planning and scheduling of project by contractor and shortage of manpower are major contributors towards time overrun in

major construction projects in Jordan, Tanzania and Egypt. Kaliba et al. studied road construction projects in Zambia and evaluated various reasons behind cost escalation and schedule delays. They established that delayed payments, contract modification, economic problems, material procurement, changes in drawings, staffing issues, equipment unavailability, poor supervision, construction mistakes, poor coordination at site, changes in specifications, labor disputes and strikes are major reasons of schedule delays in these projects. Study of BOT (Built-Operate-Transfer) projects in Taiwan by Yang et al. revealed that improper contract planning, debt problem, uncertainty on political issues and Government-finished items are most significant delay causes at the stage of negotiation and signing of concession agreement.

In Pakistan, numbers of studies were carried out to identify factors causing delays and cost overruns in construction projects. Focus of most of these studies was on construction projects in general or building construction or highway projects. Shaikh et al. analyzed delays experienced in high rise building construction projects all over the world in order to develop a mathematical model and to identify most critical factors that influence causes of delay in construction projects and presented four delay factors i.e. client problems, contractor problems, resources problems, and general problems. This study focused on identification of critical factors and categorization of the reasons unearthed into these critical factors. Nasir identified delay in progress payments to contractors, land acquisition process, price escalation of major construction materials, improper planning, contractor's incapability to do job, delay in handing over site to contractor, additional work / scope changes and inappropriate government policies and priorities as major factors affecting duration and cost of a highway project. While analyzing time slippage among public sector construction projects through three case studies on medium size project in Pakistan, Jamil et al. focused on reasons caused by

owners of project and identified following as most critical: “Lack of knowledge and poor appreciation of proper planning for different phases of construction projects and its impact on cost and time”. Haseeb et al. studied about causes and effects of delay in large construction projects in Pakistan and identified 16 major causes including finance and payments, inaccurate time estimation, quality of material, delay in payments to supplier and subcontractor, poor site management, old technology, natural disasters, unforeseen site conditions, shortage of material, delays caused by subcontractors, changes in drawings, improper equipment, inaccurate cost estimation, change orders, organizational changes and regulatory changes.

Reasons for measuring employment generated by energy sector activities

In the last decade there has been considerable interest in estimating the employment generated by the energy sector. This has ranged from studies at (i) the project level, such as a solar photovoltaic reserve (CH2MHILL 2009) or a building energy retrofit (ECF 2010); (ii) the whole subsector level, such as the oil and gas industry (PricewaterhouseCoopers 2009); (iii) the macroeconomic level via the impact on national employment of increased spending on energy (Pollin and Garrett-Peltier 2009); or (iv) the global level of total employment in various subsectors, such as different types of renewable energy (UNEP 2008; REN21 2010). The studies have responded to a number of different questions and purposes, and have also used a wide range of methodologies. Employment creation examined is in the energy sector except when considering the employment impacts of stimulus packages. For the latter, other sectors—such as transport, health, education, and even the military— may be included. In addition, one

paper on a fiscal stimulus in the form of increased food assistance is also discussed (Hanson 2010) because it has informative findings on input-output multipliers.

It is crucial for the worldwide economic system. Visible results of switching to large shares of renewable power including additional manufacturing abilities, investment desires and GHG discount gasoline emissions had been tested in a selection of conditions in many countries and round the arena, as they may be additionally registered analyzed in toddler et al. (2018). But, employment related to the power sector and effect improved adoption of the revitalization of activity opportunities in the zone, has completed little or no attention. A review by way of sheikh et al. (2016) determine the situations underneath which social and political ideologies, which have observed that renewable energy has the ability to play important position in accomplishing the employment trendy. As with other financial and technological adjustments, switching to a low carbon financial system will cause the advent of greater jobs, jobs being relocated, jobs being created finished and present sports are transformed (UNEP, 2008). Combining a selection of strategies, as proposed through fortes et al. (2015), is a way of advancing the construction of a state of affairs by means of combining numerous incorporated questioning and other social and economic boundaries.

Employment styles vary widely in extraordinary strength era technology. There are many identifiable techniques used to measure the effect of converting energy quarter employment and it has been well documented in literature evaluation research, including breitschopf et al. (2011), Cameron and Zwaan (2015) and Meyer and sommer (2014). In trendy, however, the various methods used can be subdivided into low- and excessive-level strategies, or mainly including the use of analytical or enter (IO) models (international financial institution, 2011). Similarly, llera et al. (2013) and h Hondo and Moriizumi (2017), emphasize the cost chain technique and the manner to improve

satisfactory of existence respectively, by balancing task creation particularly from renewable power use. Similarly, diverse studies examine one-of-a-kind kinds of sports associated with the energy area; the overall distinction received by using direct 'direct', 'indirect' and 'completed' sports. Irena (2011) defines a clear and powerful definition of those concepts, in addition to its definition in all subjects. Lambert and Silva (2012) located that analytical studies using extensive studies have been observed to be suitable for local studies, even as enter-extraction methods.

Better suitable for countrywide and international research. Likewise, Bhutto, et al., (2012) set up local manufacturing of hydropower after which pronounced hydropower in Pakistan’s power zone. Paish, on the other hand, (2002) examined small hydropower's function, generation and current state of affairs and defined the hurdle to small hydropower growth tasks in Europe.

Electricity infrastructure projects, specifically renewables, have the ability to create an extra number of process chance, supplied that the European wind sector has increased to seventy-two,000 in current years, as compared to twenty-five,000 in 1998. Power base initiatives without delay create process potentialities in a number of professions and professions with various enjoy in challenge making plans and engineering, creation, gadget production and numerous income and operation and supporting offerings (international exertions company, 2017)

Traditionally, on the subject of strength, policymakers have targeting charge, deliver availability, and environmental outcomes. Recession and related unemployment will cause the addition to the listing of conventional issues of economic and employment growth (Yergin et al., 2012). Similarly, to getting used to evaluate the viable outcomes of a given energy coverage or expenditure by way of authorities groups, job studies also can be used for advertising purposes with the aid of technology proponents or can be used to

understand talent shortages. Estimates of jobs may also be used to degree the impact of moving spending from one class of the federal budget to another (Levine, 2009). As a part of their permitting technique, some organizations including the California energy commission want challenge paintings forecasts (California code of guidelines, 2012). Although, organizations are unlikely to undertake a study to report how many jobs they could generate unless forced to accomplish that via legislation or political expedience. Since the results of policy decisions are not readily visible, models and estimates are frequently used to gain insights into the job effect of a policy or investment decision (Pollin et al., 2009). Models seeking to predict the future are fundamentally unpredictable and models of job development are no different. The initial assumptions used to start an analysis, the counterfactuals used to simulate economic reaction and the estimation technique would all lead to results uncertainty. In addition to this inherent ambiguity, employment effects are not always uniformly described or calculated, often resulting in misleading results if two studies are compared (Bacon and Kojima, 2011). It is important to note that any prediction of work growth would possibly vary from what actually happens in the real world due to the uncertainties inherent in the measurement process and the complexities of simulating labor markets.

In the process of the energy transition many parties concerned have taken note of the ability of renewable energy technologies to generate jobs in recent years, including academia, government agencies, the private sector and civil society (Child et al., 2018). Renewable energy employment will rise to approximately 16,7 million jobs by 2030 (IRENA 2013) and its global annual renewable energy job analysis shows that 10,3million employees were employed by 2017 (IRENA 2018a Jacobsonetal). This figure is calculated by the International Renewable Energy Agency. (2014) estimated jobs created and jobs lost for the nation of California for a long-term renewable energy system

that supplies 100% of energy in all sectors (electricity, transport, heating/cooling, and industry) from wind, water, and solar power (without fossil fuels, biofuels, or nuclear power) and found that it will build a net of 220,000 40-year manufacture plus operations (442,200 new 40-yr manufacture jobs and 190,600 new 40-yr operation jobs, less 413,000 jobs lost in current Californiafossil-andnuclear-basedindustries). Jacobsonetal, next. (2017) estimated that their main scenario by 2050 (that is, generating electricity with 100% water, wind and solar power for all energy sectors) would produce a remaining of 24.3 million permanents jobs in 139 countries worldwide.

Important literature is available on MHP's contribution to productivity and economic development. Dhungel (2009) concluded that MHP can be a highly effective means of enhancing Nepal's rural population's economic well-being. Paish has stressed the importance of MHP for long-term income-generating activities in Nepal (2002). He found that through small MHP projects, most of the mechanical operations, such as milling, grinding and impact of 47 Micro Hydropower Projects for rice processing, were easily performed. MHP is one of the most cost-effective energy technologies in developing countries for rural electrification and thus helps rural livelihoods [Paish (2002)]. In a study of small hydropower projects in rural areas of Laos, Korkeakoski (2010) showed that modern, healthy and affordable hydropower energy has great potential to alleviate poverty and maintain local communities' livelihoods. Cockburn (2005) studied the advantages of MHP in the development of home-level textile manufacturing, grocery stores, workshops and other companies in Tambo Rapa Pueblo... Noor (2002) examined the impact of MHP projects developed by the Aga-Khan Rural Support Programs (AKRSP)on local communities in the Chitral district of Pakistan. He found some social and economic benefits of MHP for local residents. Because of the electrical power supply, the quality of life improved at the household level. Saqib, et al.

(2013) conducted research on the impact of the micro hydropower project on job development in the Mardan district of Khyber Pakhtunkhwa province. The study found that the MHP project produced a variety of direct and indirect jobs. They also noticed an increase in household income in the MHP project area that was attributed to the diversification of livelihood strategies. A research carried out in Bhutan by the ADB (2010) found that electrification had a positive effect on household income.

With time here in Pakistan, many things are changing, but one thing that needs to be addressed is the lack of power for the people of Pakistan. It is very unfortunate that, despite having vast energy resources, our country is in the throes of energy crises, especially the coal preserve in Baluchistan Thar, and Punjab. Energy potential remains largely unused or goes to waste because of incapacitated institutions and investment strategies. Pakistan is now facing a situation of approx. The average shortfall in the electric sector is 4,000 megawatts because of a major disconnection between establish power capacity and actual generation. Because of energy shortages, industrial and commercial businesses have installed back-up diesel generators, whereas households use (UPS) battery-powered systems, often at considerably higher costs. Small and medium-sized manufacturing and commercial firms and households which are unable to afford these high-cost alternatives have always become the rough end of the stick.

Information and communication technology (ICT) and, in particular, the connectivity offered by communication networks, play a vital role in achieving each of these objectives. ICTs include enabling pre-paid systems, encouraging the operation and maintenance of power grids, enabling the introduction of renewable energy sources into grids, and enhancing energy efficiency by, for example, providing customers with information on reducing consumption. On the other hand, it is key role to note that every economy would be able to reap the full support of ICT only if access to energy is

protected. ICT-induced energy consumption can also pose a challenge, particularly in the decoupling of energy consumption and economic growth. There is a power generation capacity of 4000 MW to 6000 MW using biomass (including bagasse) as a fuel, which was recently studied by the World Bank. The Punjab government also estimates a potential of about 1500 MW using biogas as a fuel for power generation. Similarly, the ability for solid waste to produce 1000 MW of electricity. The latest estimates range from 200 MW to 400 MW of energy through waste heat recycling.

"WHEREAS NOW CPEC IS A REAL GAME CHANGER IN THE FIELD OF ENERGY BECAUSE OF PRIORITIZATION OF ENERGY PROJECTS PART OF THE CHINA-PAKISTAN ECONOMIC CORRIDOR (CPEC) INVESTMENTS HAVE ENHANCED THE CONFIDENCE OF STAKE HOLDERS IN THE ENERGY SUFFICIENCY OF PAKISTAN"

In Pakistan, the ninth Pakistan electricity discussion board 2016 mentioned energy adequacy, in which the china Pakistan monetary corridor changed into taken into consideration to be orientated closer to harnessing the economic earnings of the country and supplying possible industrialization and manufacturing powered through exports. In which a massive challenge, which include the bulk of its power element, is CPEC. About thirds of the $33 billion CPEC is earmarked for the manufacturing of electricity and power initiatives in Pakistan. CPEC renewable projects will make contributions greater than 17000 mw of electricity, in which strength storage tasks aside from CPEC will quickly add up to 3633.5 mw of strength to the country wide grid. The Chinese language have invested in generating coal in addition to hydropower, wind and solar assets. Via a brand new transmission line funded by way of them, strength will be transported from new energy era gadgets in Sindh to charging centers in Punjab. Shanghai electric, the sister enterprise of china electricity, has expressed hobby in purchasing a big stake in ok-

electric, that's Karachi’s largest provider of power to greater than 20 million people. Accordingly, the Chinese language occupy the entire cost chain of the strength market, from gas production (mining) to cease-user delivery. Progressed strength supply would permit Pakistan to improve its flagging indigenous industries, such as textiles, agriculture and production, increase exports and eventually cause sustained long-time period monetary improvement. As $33 billion may be spent in the enterprise, the CPEC electricity ventures will assist deal with the electricity shortage by using 2018. Therefore, having a countrywide excess of inexperienced power in the CPEC strength ventures performs an essential function as a way to help us gain our international achievement. It has to be remembered that inside the next years, new initiatives of round 10,000 mw might be introduced to the grid, with more than one thousand mw anticipated to be usable by means of December 2020 via predominantly renewable energy initiatives of about 16,000 mw. CPEC could additionally assist the less privileged elements of Pakistan. It's going to attach Pakistan with the arena and open approaches for residents, societies and states to cooperate throughout the use of a twelve early energy technology initiatives are presently included in the CPEC, consisting of the Sahiwal coal-fired task, the port Qasim energy plant and the Karot hydro electricity plant. It is also strongly anticipated that those projects may be completed by 2017-18, supporting to meet the energy desires of the nation sufficiently. These days, the OBOR summit in china, which took place in mid-may also 2017, added additional hopes for Pakistan, particularly within the power sector, along with different primary infrastructure regions

A 3rd of the population of Pakistan is among a while of 15 and 29 (UNDP, 2017) and is a crucial part of the body of workers. Every year, masses of heaps hope to discover decent jobs and make money for themselves and their families. But the cutting-edge macroeconomic situation affects the private sector, which creates ninety% of the us of a's

jobs (authorities of Punjab, 2019), and younger people locate it spiritual to find respectable jobs.

Many argue that younger human beings have terrible educational performance, restricted abilities, and a lack of self-belief to enter the job market and be successful (Cheema, 2017; br studies, 2019). Lack of talents particularly 'youngster's disability in terms of equitable get right of entry to high excellent labor markets and reduces the possibilities of breaking the cycle of low development' (UNDP, 2017: 87). Media coverage of the 'capabilities hole' (sunrise, 2015) and the 'countrywide emergency on abilities improvement in Pakistan' (by research, 2019) have sparked controversy within the country approximately the destiny of capabilities and the destiny of kids.

Pakistan is caught in a pit of low-abilities where employers accept the form of low-competencies to be had available on the market. The failure to interrupt away from its dependency on low-ability, low-generation synthetic exports, due in element to its low hard degree (Amjad, 2005; nadir, 2017). The running-age populace's illiteracy price (10 years or older) turned into 48.2 percentage in 2018. (lFS, 2018).

There's a susceptible link between call for from the numerous industries of TVET graduates with their capabilities and provision. For instance, in 2018, the need for professional students in the course of Pakistan became very excessive for machine drivers, station operators, and electricians. But their provision changed into not made to satisfy this want, and the deficit became first rate. The supply of skilled TVET college students turned into very high in the use of computer systems and people, tailors, beauticians, and holders of diplomas in electric engineering and engineering however the demand for their skills changed into decrease than that provided.

key informants in any respect stakeholder organizations explained that training vendors do now not behavior market-primarily based studies that enables to inform look at

drawings. As an end result they offer previous and inefficient courses in comparison to the wishes of employers. The content of the education does now not expose commercial enterprise professionals to the volume that TVET graduates have to become looking for jobs in place of taking over a self-hired job. The certification machine is precise and does not offer dependable indicators inside the. hard work market (USAID, 2018)

There are some of sizable job organizations that can be considered, no matter the purpose of gathering or predicting employment linked to a power initiative or sub-region. Making sure that trustworthy, precise, and coherent ideas are carried out is important in order to evaluate projects or sub-sectors. The time part of a piece desires to be entirely expressed earlier than aggregating jobs made from separate elements of an undertaking or rules. In terms of the quantity of years of work delivered to the location, an activity is normally indexed. This depends on how a good deal time consistent with year a job gets paid for and how many years the employment keeps. Part-time jobs are turned into full-time counterparts (FTES) after which scaled by means of the amount of years predicted for the unique position, constructing for a few years, servicing for decades. Any studies calculate the cumulative amount of years of employment generated over the duration of the plan (Pfeifenberger et al. 2010). Others destroy the cumulative variety of working years created by way of the undertaking's length to acquire an annual same to be able to stability different packages of different lifetimes (wei, Patadia, and Kammen 2010). Such annual averages will help initiatives with shorter lives. A 25-12 months' plan generating 30 process-years, for example, has a better annual task-year creation price than a 40-12 months' plan generating 40 process-years. On the way to produce the extra 10 running years of the second one task, a few alternative expenditures might be needed, accordingly growing the value of achieving a given employment effect through 19. The time factor is essential for energy-associated fiscal stimulus regulations, in which the principle need

might be to build jobs fast, in the expectation that the recovery within the financial system will compensate after the initial advantages of the stimulus put on off. Irrespective of how the average period of work is handled, there are some of one-of-a-kind additives of workers that can be integrate together if appropriate, furnished that each represent is concern to the identical time-averaging method.

Direct effect: greater jobs have been produced or lost within a given sector because it acknowlgment to a growth within the final marketplace for its items. The paintings produced to build and run a wind turbine is one instance. Wind turbine output could be shorter than the period of operation.

Indirect effect: whole extra jobs created or lost as different sectors enhance their outputs to be able to offer the required inputs for the sector to be advanced, employment generated via different sectors in reaction to demand for his or her manufacturing from the sectors presenting the sector, etc. The processing of metallic to supply turbine unit creates indirect employment, as does the extra energy important to provide the steel. These outcomes are normally often related to the production stage of the initial call for growth and are as a result shorter in period. The ratio of the quantity of oblique and direct people to direct jobs is called the type I multiplier. The overall indirect jobs in every sector relies upon on the input purchased from each region and the employee in keeping with output unit in every area, that means that there will nonetheless be special oblique results for stimulus projects with disparate direct results.

Internet effect for venture alternative: the difference in employment produced or lost in respond to a given boom inside the real output for the arena as met with the aid of unique generation (e.g. Wind energy strength technology) and alternatives (e.g. Fuel fired energy technology) generating the equal incremental electricity output. Each have to be

calculated totally on the premise of direct jobs, the range of direct and oblique jobs, or the amount of direct, indirect and mediated jobs, in order that the net impact can be envisioned for any of the three combinations. Wei, Patadia, and Kammen (2010) calculated the amount of jobs (direct and indirect) produced the use of alternative generation technologies to attain a given production, but did now not recollect the paintings losses that could end result from financing them. There'll nevertheless be varying probabilities of people losing because the cost of the technology could be exceptional.

Construction, installation and manufacturing effect: work created by the design, manufacturing, improvement, shipping, and production of the plant allowed the very last call for or law to be fulfilled. This is established such that the first-rate - designed plant could be up and running for the needful number of years.

Operations and preservation effect: jobs wanted for the control and protection of an electricity investment after the development of the plant or machinery are predicted to closing for the existence of the plant or machinery.

Backward linkage: compared to the average job boom in all different sectors, the inner and external impact of an unmarried unit increase in the mixture output for its output on people in that zone are similar with those of the average job introduction in many different sectors, every going through a comparable one-unit increase in at some point of the very last call for its outputs (Rasmussen 1956).

Ahead linkage: in reaction to the extra unit of real output emerging from all sectors of the financial system, the influences of direct and indirect on jobs in the area are 21 in comparison to the average employee produced in each zone in reaction to the same stimuli generated by using their supply reaction (Rasmussen 1956).

Employment according to standardized unit of output:

While comparing the effect of opportunity tasks on jobs, it is crucial to make sure that initiatives are same to a certain agreed output measure. The maximum distinguished state of affairs is that of opportunity technology that are generational. It's miles viable to equate initiatives with employment (average worker) according to unit of output, defined as gigawatt hours (GWH) of power generated annually. Some research has pronounced jobs in step with unit of power, along with megawatts (mw), but a distinction has to be made among the capability of the plant label (peak mw) and the predicted ability consumption of the plant capability (average mw). Due to the massive variance in potential elements among opportunity technologies, the number of human beings hired to provide a given quantity of GWH in line with 12 months differs substantially across technology, even as at peak demand, the cost of the same annual GWH rises. As any other factor to bear in mind, the capability to dispatch indicates that the assessment between technologies need to make mention of their possibly overall performance against the load curve at plant level. Estimates of back and forth links, extensively utilized in popular commercial coverage debates, have an intimate relationship with the calculation of the indirect outcomes of labor. They offer a means for the significance of the paintings boom industry to be equated with that of different sectors of the economic system.

Limitations of the study:

This study is not in wide aspect because there is large number of factors involved which influence our research. But our study is limited to Karot hydro power project and then we can use the multiplier effect of job creation gins 1 mw. We use the simple percentage method to check how many jobs are created against 1 Mw of energy. So this is not in border sense but good helping material for future research.

Chapter 3

Methodology

Data Collection and Methods

I collect data from the Department of Karot Hydro Power Plants in order to verify how many jobs are generated against 1 megawatt of energy and then use the multiplier effect of job creation in remaining hydro projects to estimate how many jobs are created against 1 megawatt of energy. And the second major concern of our research is skill shortages in CPEC energy projects.

For this, I first use the Exploratory Research Approach Exploratory Data Analysis refers to the essential process of conducting initial data investigations in order to find trends, recognize anomalies, test hypotheses and verify conclusions using summary statistics and graphical representation

Each industry has backward links to economic sectors that provide the required materials for the production of the industry, and each industry has forward links to the economic sectors in which the employees of the industry spend their profits. Therefore, a significant number of indirect workers, in addition to those directly provided by an industry, may also be supported by that industry. Broad ripple effects can be triggered by the subtraction (or addition) of employment and production in industries with deep backward and forward linkages to other economic sectors.

To highlight the value of these linkages, this brief calculates job multipliers by sector, updating previous work by Bivens (2003) and Baker and Lee (1993). Jobs multipliers calculate how the production or loss of production or employment in a single sector contributes to larger shifts in employment in the economy.

Population

CPEC is considered as the game changer project for Pakistan. specially in Pakistan is faced severe Energy Crises. For our research we choose hydro power project of Karot to find out job creation and skills shortage in energy Sector.

Sample size

We choose Karot hydro power project as a base study and the estimates its multiplier effect on other hydro power projects as well. For skill shortages we used adapted scale of questionnaire and use percentage method because due to covid 19 we are not allowed to enter any premises. We collect data from only 30 respondents who are in working in key managerial posts.

I choose a hydropower plant project because it is a kind of first study in Pakistan that will quantify job creation against 1 megawatt of hydropower per 1 MW of electricity, with hydropower producing a total of sixteen percent of the world's energy supply. It is the largest source of renewable energy, accounting for around 70% of all energy generated by renewable sources.

Formula to Calculate Job Creation against 1 MW

We use simple percentage method to calculate how many jobs are created against 1 MW and then number of jobs created department wise against 1 Mw.

Skill Shortage

We will use adapted version of questionnaire for skill gaps that what supervisor will think at initial phase of the project how many percentage of the employees are not used to equipment’s and technologies that has been brought up.

Due to covid 19 we only collect data from 30 supervisors

Chapter 4

Result and Analysis

Result shows how many jobs are created agains1 MW of hydro energy and further 1 Mw of energy produce how many jobs in different departments.

DETAIL	MANAGEMENT	DOCTOR	CONTRACTOR	ENGINEER	SUBENGINEER	DRIVER	COOK	CLEANER	SKILL LABOUR	UNSKILL LABOUR	TECHNICAL	TOTAL
TGDC-1	11	-	45	19	03	349	13	03	275	876	215	1809
TGDC-2	19	-	32	08	20	87	16	07	175	333	179	876
TGDC-3												
Camp (2)	-	-	-	-	01	449	03	02	227	37	227	148
TGDC-3(2)	-		-	-	-	02	09	18	02	-	01	32
Camp-3												
TGDC-3(1)	-	-	-	-	-	04	01	-	01	02	08	17
TGDC MAIN	01	02	-	03	02	21	-		03	-	03	35
KPCL	04	-	-	06	-	03	05	-	09	20	03	50
CSPDR	02	-	-	02	-	05	02	01	06	08	11	37
SMEC	03	-	-	07	-	03	07	01	04	09	06	97
TOTAL	41	02	77	45	26	523	51	32	502	1277	453	3031

Table 2 Number of employees working in KHPP

Karot Hydropower Project is the fourth of five cascade hydropower stations planned on the Jhelum River. Three gorges technology and Economic development co. TGDC are further divided into different camps such as TGDC, TGDC1, TGDC2, TGDC MAIN etc. Changjiang survey planning, design and research co. ltd CSPDR also part of Karot hydro power project. SMEC International is also part of Karot hydro power project. This table shows forty-one jobs created in management department in which eleven jobs are created in TGDC 1 and nineteen jobs are created in TGDC 2, One management job created in TGDC Main, four management related jobs created in KPCL, TWO jobs created in CSPDR and three jobs created in SMEC. Similarly, 71 jobs created in engineering department, 523 jobs created in logistics, 51 jobs created in culinary arts, 32 jobs created in cleaning department. 507 employees are working in skill labor department, 1277 unskilled employees are working at Karot and 453 employees are working in technical staff department.

STATE OF CHINESE DESIGNATIONS	DETAIL	CAMP-1	CAMP-2	MAIN CAMP	CSPDR	BEOR CAMP	TOTAL
	MALE	424	77	886	14	-	1401
	FEMALE	5	6	37	-	-	48
	TOTAL	429	83	923	14	-	1449
	EXECUTIVE	28	10	49	01	-	88
	ENGINEERS	64	14	198	12	-	288
	STAFF	92	23	110	-	-	225
	LABOUR	245	36	666	01	-	848
	TOTAL	429	83	923	14	-	1449

Table 3 Number of Chinese employees working in KHPP

This table shows state of Chinese designations at Karot hydro power project. Data shows 1449 Chinese male are working in Karot hydro power project and 48 females are working at Karot Hydro Power Project. At KHPP 88 Chinese. Executives are working 288 Engineers are working, 225 staff workers are employees are working at KHPP, 848 Skilled and un skilled Chinese labor are working at KHPP.

Jobs created per MW

Jobs/MW is the most common method of assessing the economic potential of RE. It is derived by equation 1:

Karot hydro power project =4600/720=6.39 jobs/MW

Total number of jobs created in Karot power hydro project is 4600 that includes both Pakistani and Chinese national as shown in table 1 3031 Pakistani employees are working in different departments of Karot hydro power project and 1449 Chinese employs are working in Karot hydro power project.

Job creation in each department

1-Management Department

At Karot hydro power project currently 41 employees are working. These employees are working in TGDC, CSPDR, KPCL and SMEC.

Job creation against 1 MW=Jobs in MD/Total MW

=41/720=0.0569 ……EQ 1

Result shows in equation 0.0569 jobs are created in management department.

2-Engineering Department

At Karot hydro power project currently 45 Pakistani engineers and furthermore 26 sub-engineers are working. These ENGINEERS are working in TGDC 1, TGDC2, TGDC 3(1), TGDC3 (2), TGDC MAIN, CSPDR, KPCL AND SMEC.

Job creation against 1 MW=Jobs in ED/Total MW

=523/720=0.099 ……. EQ-2

Result shows in equation 0.099 jobs are created in engineering department.

3-Logistics Department.

At Karot hydro power project currently 523 Pakistani drivers are working. These drivers are working in TGDC 1, TGDC2, TGDC MAIN, CSPDR, KPCL and SMEC.

Job creation against 1 MW=Jobs in ED/Total MW

=45+26/720=0.73……. EQ 3

Result shows in equation 0.73 jobs are created in logistic department.

4-Culinary Arts Department

Culinary arts refer to the art of preparing, presenting and serving food. According to data currently 51 Pakistani workers are working in department.

Job creation against 1 MW=Jobs in ED/Total MW

=51/720=0.071

Result shows in equation 0.071 jobs are created in the concern department.

5-Cleaning Department

Cleanser obligations consists of cleaning, stocking and presenting targeted facility areas (dusting, sweeping, vacuuming, mopping, cleaning ceiling vents, restroom

cleansing and so on.). Appearing and documenting ordinary inspection and upkeep sports. Currently 32 employees are working in Karot hydro power project.

Job creation against 1 MW=Jobs in CD/Total MW

=32/720=0.044……. EQ 4

Result shows in equation 0 .044 jobs are created in the concern department.

6-Skilled labor department

Skilled labor refers to paintings that calls for a positive quantity of training or abilities. This form of work is exemplified in electricians, administrative assistants, medical doctors, plumbers and more. Skilled hard work workers are both blue-collar or white-color.

Currently 502 skill employees are working at Karot that includes electricians, administrative assistants, plumbers, etc.

Job creation against 1 MW=Jobs in CD/Total MW

=502/720=0.697……. EQ 5

Result shows in equation 0.697 jobs are created in the concern department.

7-UNSkilled labor department

Unskilled exertions refer to people who've no special schooling or experience. It is a part of the staff with a very restrained skill set. Unskilled labor includes humans with a high school degree or less. But, while the economic system is suffering, people with tiers might also do unskilled paintings. Currently 1277 unskilled labors are working at Karot. As we discussed with the supervisors at Karot they said some of them are qualified but due to lack of job opportunities their wage rate is equal to unskilled labor.

Job creation against 1 MW=Jobs in CD/Total MW

=1277/720=1.774…… EQ 6

Result shows in equation 1.774 jobs are created in the concern department.

8-Technical department

Job creation against 1 MW=Jobs in CD/Total MW

=453/720=0.629……. EQ 7

Result shows in equation 0.629 jobs are created in the concern department

Chinese employees at Karot

At Karot hydro power project currently huge number of Chinese national is working which includes Executives, Engineers, Staff and labor in CAMP 1, CAMP-2, MAIN CAMP and CSPDR. A total number of 1449 Chinese employees are currently working at Karot.

1-Executives

Currently 88 Chinese ore working as executives at Karot hydro power project

Job creation against 1 MW=Jobs in CD/Total MW

=88/720=0.122…… EQ 8

Result shows in equation 0.122 jobs are created in the concern department

2-Engineering

Currently 288 Chinese engineers are working at Karot hydro power project which is almost four time more than Pakistani Engineers.

Job creation against 1 MW=Jobs in CD/Total MW

=288/720=0.4…… EQ 9

Result shows in equation 0.4 jobs are created in the concern department

3-Skilled and Unskilled Staff/ labor

Almost 1023 skilled and unskilled labor is working at Karot

Job creation against 1 MW=Jobs in CD/Total MW

=1023/720=1.421……. EQ 10

Result shows in equation 1.421 jobs are created in the concern department

Department	A jobs for Pakistan employee's	Jobs for Chinese
MANAGEMENT	0.0569	-
DOCTOR	0.002	-
CONTRACTOR	0.107	-
ENGINEER/ SUB ENGINEER	0.0986	0.4
Executives	-	0.122
DRIVER/logistics	0.726	-
Culinary arts	0.0708	-
CLEANER	0.0444	-
SKILL LABOUR	0.697	1.421
UNSKILL LABOUR	1.773	
TECHNICAL	0.629	
TOTAL	4.5098	1.943

Table 3 Number of Jobs created against 1 Mw department wise.

This table shows almost 4.5098 jobs are creating for Pakistani employees and 1.943 jobs are created for Chinese employees which are almost 42 percent of the total job creation.

Multiplier Effect JOB creation in hydro power projects in Pakistan

According to planning commission of Pakistan currently almost 3571 MW of hydro projects that includes CPEC ENERGY priority, potential and actively promoted projects such as Gilgit KIU Hydropower 100 MW, Phandar Hydropower Station 80MW, Azad Pattan Hydel Project, AJK 701 MW, Kohala Hydel Project, AJK 1100MW, Suki Kinari Hydropower Station, Narran, Khyber Pukhtunkhwa870MW, Suki Kinari Hydropower Station, Narran, Khyber Pukhtunkhwa720MW. Our estimation suggest almost 6.39 jobs are created against 1 MW Hydro Electricity in Pakistan. So for 3571 Mw of energy

3571*6.39=22818 jobs are created overall from hydro projects in Pakistan.

Table4 Total number of jobs created in different departments of hydro power projects

Departments	JOB creation against 1MW	TOTAL MW	TOTAL JOBS
MANAGEMET	0.0659	3571	203.189
DOCTOTR	0.OO2	3571	7.142
CONTRACTOR	0.107	3571	382.097
ENGINEERS	0.4986	3571	1780.5
EXECUTIVES	0.122	3571	436
CULINARY ARTS	0.0708	3571	252.826
LOGISTICS	0.726	3571	2529.5
CLEANING	0.O444	3571	158.55
SKILLED LABOR PAK	0.697	3571	2488.987
UNSKILLED LABOR PAK	1.773	3571	6331.383
TECHNICAL PAK	0.629	3571	2246.159
SKILLED/UNSKILLED CHINESE	1.421	3571	5074.391

This table shows how many jobs are created in CPEC hydro power project in Pakistan in various departments. As against 1 mw of Energy 6.39jobs are created then we calculate jobs creation department wise this table shows total number of jobs created against department wise. For3571 we need 203 Management and 436 Executives, 8doctors,382 contractors, 1780 Engineeers,252 workers in Culinary ARTS, 2246 TECHNICAL WORKERS, 6331 Unskilled workers,2529 workers in logistics department. Hydropower projects of Pakistan almost create 21866 jobs in Pakistan that include management jobs. Engineering job, technical staff jobs in various departments, jobs in logistics department, number of skills and unskilled labor required.

Skill development/GAP Analysis

As we have mentioned, we were unable to find any study discussing the impacts future economic outcomes such as how many jobs are created in different projects of CPEC. In fact, the problem of mismatch between skill demand and supply is less problem for the developed countries. As we discussed Pakistanis facing some serious issues regarding CPEC Energy projects because almost 42% of the Chinese employees are working on CPEC energy projects because Pakistani workers are not used to latest machinery equipment's for this purpose Chinese and Pakistani authorities conduct a special training sessions firstly in a Pakistan and then in china for maximum output. In this we conduct a questionnaire based survey from the heads, supervisors from where Pakistani workers are facing problems and how can we meet the international standards.

Technical skills required

Figure shows that the technical skill required for Pakistani workers who are currently working at Karot hydro power project at initial phase of the project 35% of the team leads tells us the they are short with the technical skills required for the concern departments are short 30 % said they have medium level of technical skill knowledge 25 % said they have high level technical skill and only10 %said that they have fulfill required task and have command on the technical skills required for the project.

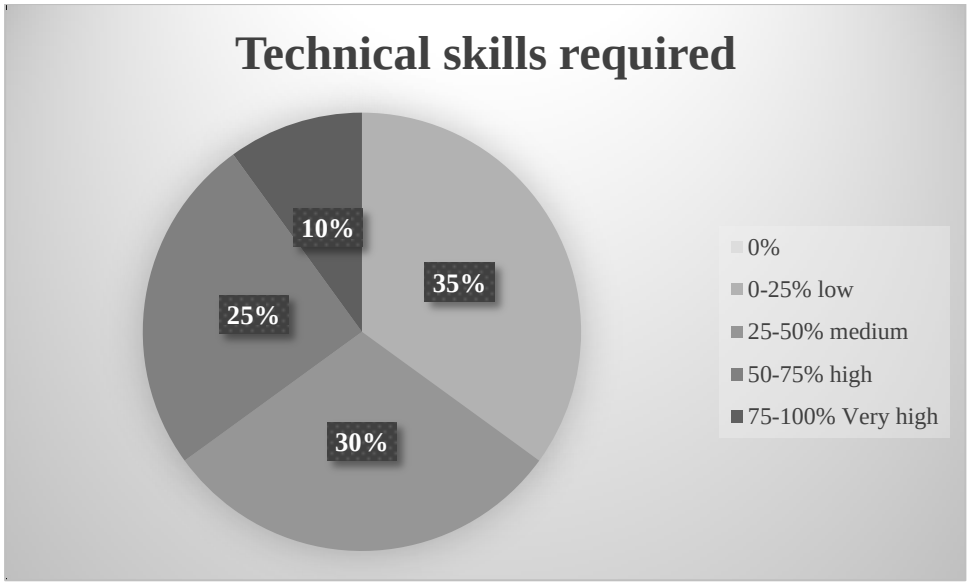

Figure 1

Technical skills required relating to specific department

For a spread of reasons, technical capabilities are crucial. They'll help you figure extra efficaciously, improve your confidence and make you a extra a hit business enterprise prospect. Technical skills relating to a specific department 55%of Pakistani department heads thinks that at initial phases Pakistani employees are short with required skill set. Only 10 % heads thinks that their employees had medium level of understanding at initial phase. 30 % head show that their employees are highly skilled at initial phase and only5% supervisors are think that their employees are highly qualified according to International standards**.**

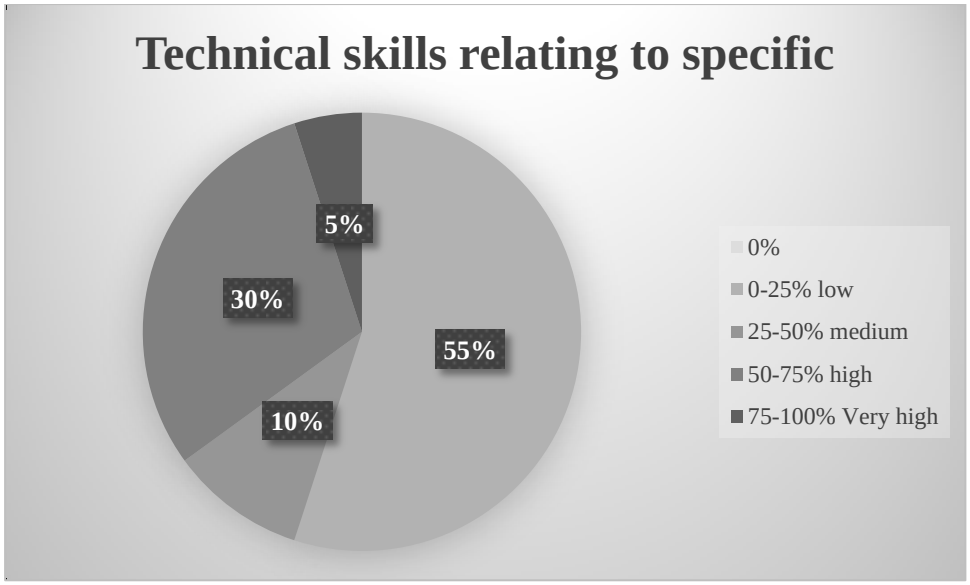

Figure 2

Technical, technological or scientific knowledge

Engineering, the systematic use of scientific knowledge in the development and application of technology, has grown from the art of science to science itself. Scientific knowledge provides a way to estimate what behavior will be even before we make or keep it. In addition, science often proposes new types of behaviors that were previously unimaginable, thus leading to new technologies. Engineers use scientific and technological know-how, in line with design techniques, to solve practical problems. According to results 45 % of employees have less technical, technological or scientific knowledge at initial phase of the projects company's investment at these employees are very high at initial phase.35% said that they have medium level of technological or scientific knowledge. 10 % said that they have high level of required skill sets and only 11% said they are up to mark.

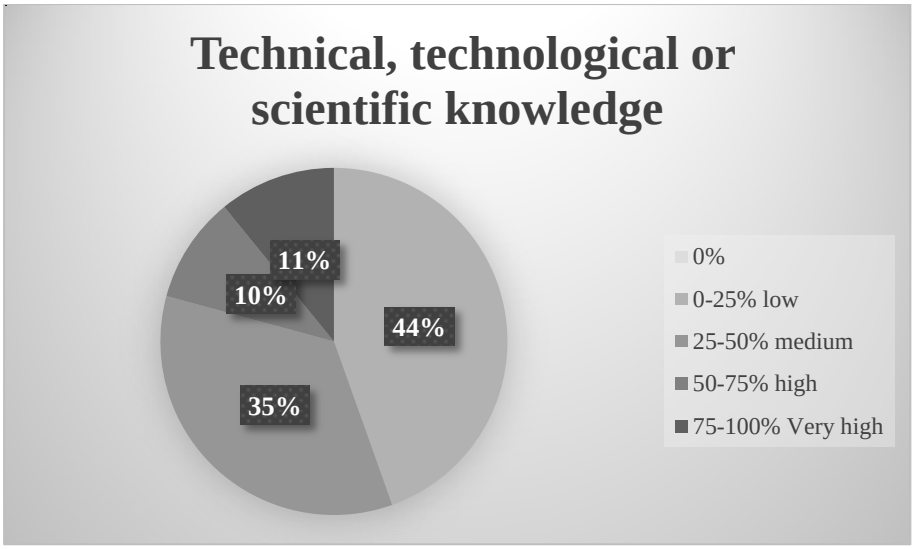

Figure 3

Negotiation skills

Negotiation skills re very important for two parties to reach compromise. As there are two parties involve at Karot hydropower project chines and some Pakistani employees most of the time there is a communication barrier.30 % employees on both side fail to negotiate most of the time because there is a communication error.

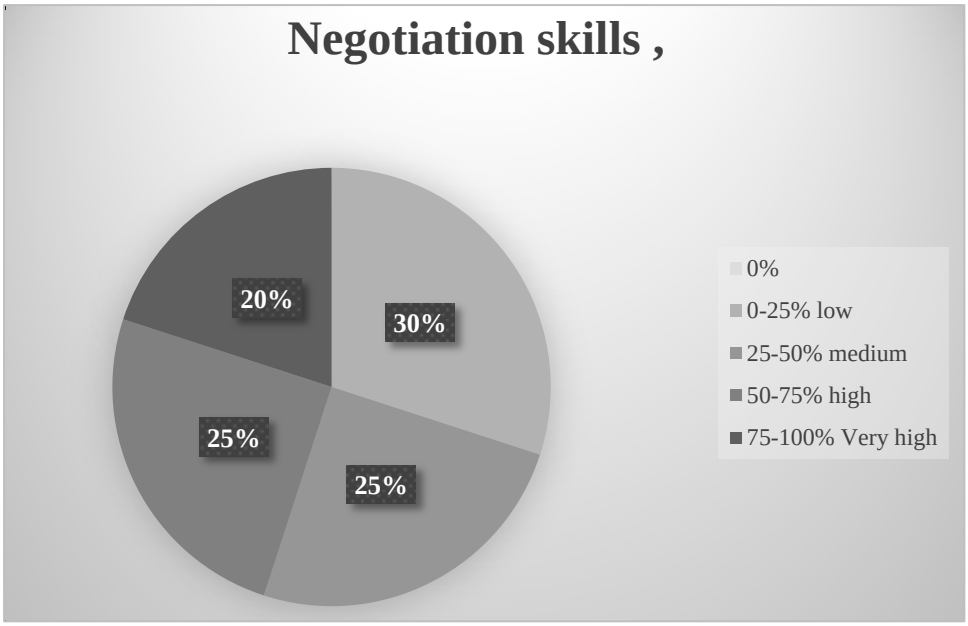

Figure 4

Problem solving skills figure shows only 20% employees have facing such problems due to certain circumstance e.g. language barrier, required knowledge is missing about the specific equipment etc. 30% employees have medium level of skills solving problems. And 20 % employees have very high level of skill solving problems

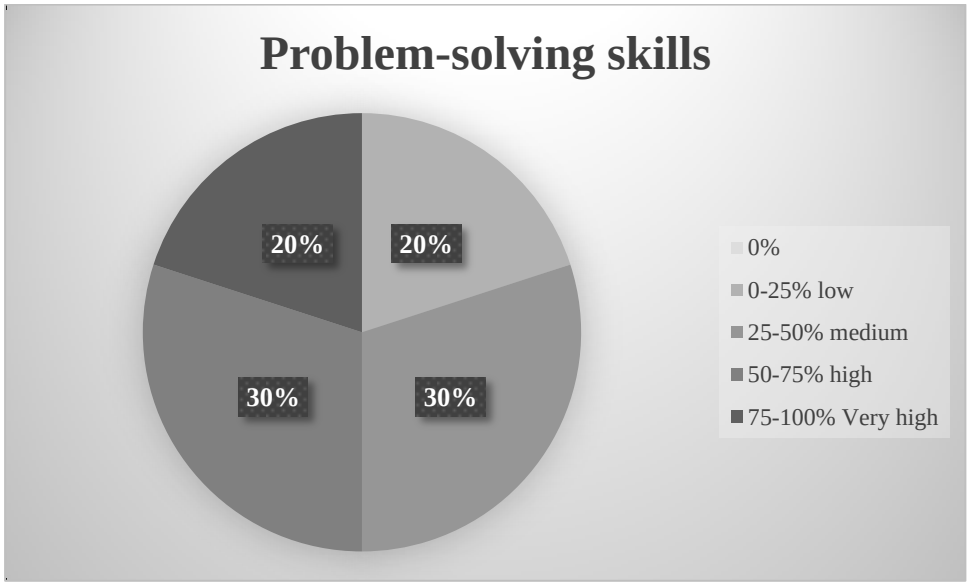

Figure 5

Efficient use of materials, technology, equipment and tools

In the initial phase of the projects 45% of the employees are un aware of using the new technology machines, 40% of the supervisor said they have medium level of understanding. 10 % of employees are used to and 5 % are highly effective in various departments.

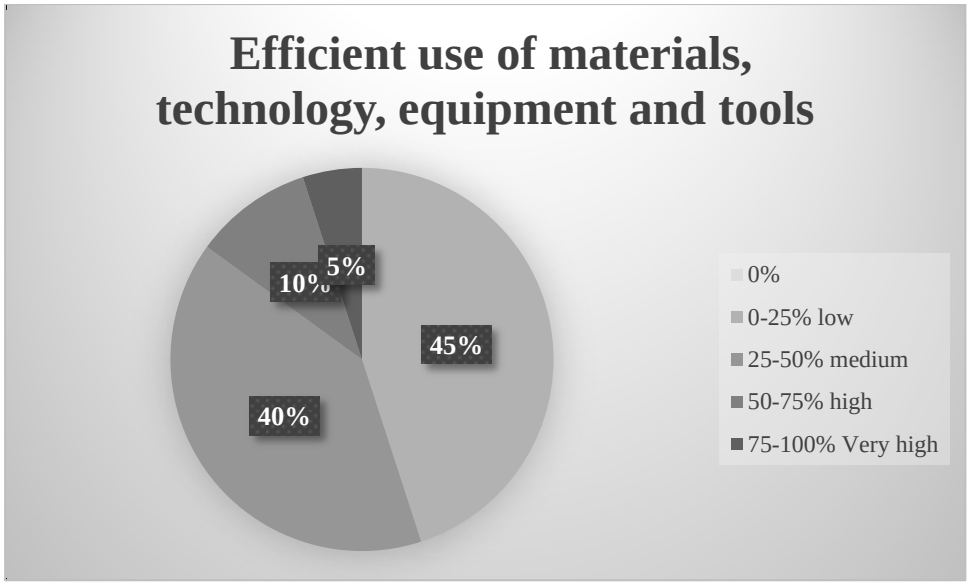

Figure 6

Ability to work accurately and in compliance with standards

Governments play a key role in the growth of expertise at both the federal and provincial levels. The Ministry of Federal Education & Vocational Training and the Ministry of Overseas Pakistanis and Human Resources play a crucial role at the federal level. Figure shows employees have less ability to work accurately and incompliance with Internationally

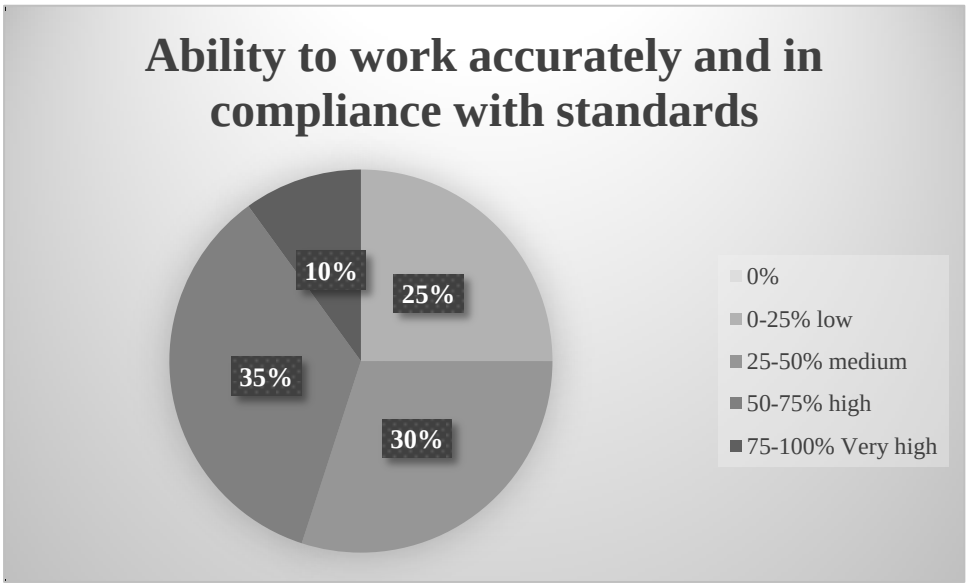

Figure 7

Organizational and planning skills

Employers look at employability skills more closely than technical credentials or academic institutions that have attended (HEC, 2016). In their opinion, analytical, problem solving, self-discipline and individual skills, organizing and planning skills are the most important employability skills. Figure shows the required planning and organizing skills in the Pakistani employees.

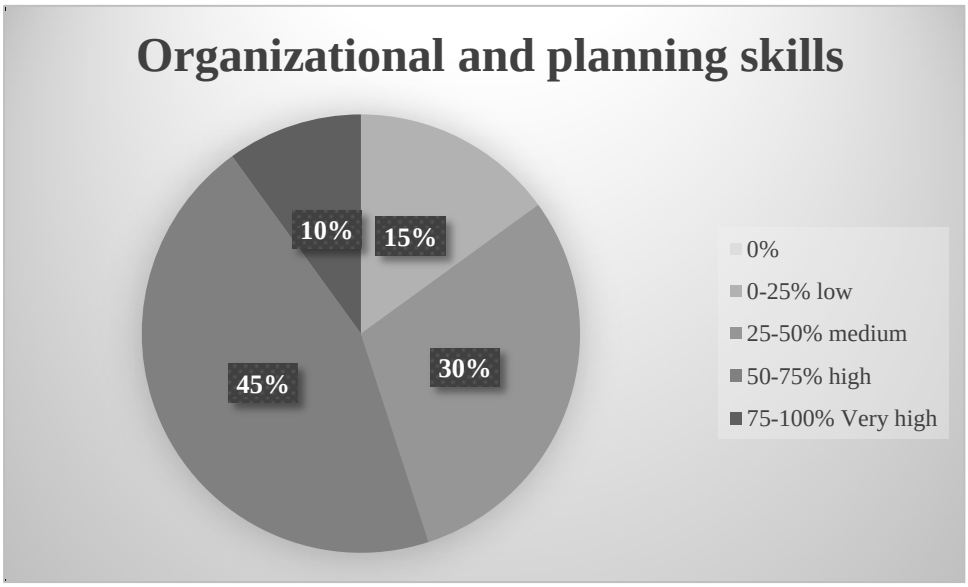

Figure 8

Chapter 5

Discussion and Conclusions

Pakistan and China Energy and Economic Corridor (PCEEC) are also called China-Pakistan Economic Corridor (CPEC) advanced BRI program that has brought significant social and economic benefits to Pakistan. China-Pakistan Economic Corridor (CPEC) costs have risen to $ 62 billion from the original $ 46 billion. It is also expected to spend $ 100 billion on additional projects in CPEC by 2030. CPEC is estimated to have invested $ 33,793 billion in energy projects in Pakistan. CPEC energy projects aim to add about 17,000 megawatts of electricity generation to the national grid through various sources including coal, wind, solar, and hydropower

Pakistan's energy needs.

Process advent is a key element of policy, mainly in developing countries wherein unemployment and unemployment, be it a protracted-term problem or a right away monetary outcome monetary downturn. On this context, the renewable electricity area is going through the modern monetary and economic demanding situations successfully, in comparison to many other industries (Irena, 2013). Furthermore, it has been comparable a mature financial system with constant technological advances, declining manufacturing value and rising hard work product. As international trade closer to sustainable electricity continues, renewable power people requirements are set to increase (Behrens et al., 2014; green peace worldwide, 2015; Jacobson et al.,2017).

Pakistan is blessed with considerable water wealth by straddling the Indus Valley. According to the Water and Power Development Authority of Pakistan (WAPDA), the country has a hydropower capacity of 60,000 MW, of which only 7,320 MW has been

produced. The untapped hydropower capacity of Pakistan lies largely in the mountainous north along the Indus River in the Gilgit-Baltistan and Khyber Pakhtunkhwa provinces, as well as in the Jhelum River in the Punjab and Azad Jammu and Kashmir provinces. Supervised by the Private Power & Infrastructure Board, including Karot, Suki and Kohala, many projects are currently under planning and construction in the private sector. These projects are part of the CPEC, a series of infrastructure projects funded by the Chinese government to improve the economy of Pakistan and strengthen economic cooperation between the two countries.

Conclusion

This research explores the capacity of Pakistan's hydropower and tries to demonstrate why both large and small-scale hydropower are essential for sustainable development in Pakistan, large-scale hydropower projects are required. If Pakistan makes use of It can get rid of oil import bills and the capacity of its hydropower and other renewable energy resources. At the same time, the issue of energy crises, employment opportunities and various skill gap can be addressed. This research shows that Pakistan have a huge potential to produce hydroelectricity. Our Research shows that only hydropower projects will create almost twenty-one thousand jobs in hydro power. These projects will create huge amount of job creation in Pakistan but according to results almost 42% Chinese employees are working in hydropower projects in Pakistan that shows we are not meeting the requirement of skills that are required for international projects. So there may be a first-rate need and role for education in abilities improvement and in generating younger college students who are qualified to fulfill the desires of the exertions marketplace and who can enhance their improvement effects. Schooling machine in Pakistan needs to consciousness on competencies that sell intellectual improvement, processing and

mirrored image. And except Pakistan develops close cooperation between the numerous applications - lower, higher, better, abilities education - there may be a chance that young human beings will now not be in the destiny international of work. More verbal exchange between the schooling device and the enterprise is wanted.

Pursue the implementation of the "abilities for all" roadmap for the improvement of abilities, referred to by means of the authorities of Pakistan and submitted to the cabinet, which in particular units out sustainability measures certain training institutes are running for ability development sports in a Pakistan but they want modern gadget to train them. Selling the development of a single and accredited framework for awarding qualifications. This framework should ensure that valid and true countrywide certificates are given in a well-timed manner and with a purpose to diagnosed nationally and the world over. Assisting the advertising of satisfactory warranty in the same manner network inside the implementation of guidance and evaluation.

Spend money on studies to determine the competencies want and to assist inform the layout of appropriate education to satisfy the demand. So there may be a first-rate need and role for education in abilities improvement and in generating younger college students who are qualified to fulfill the desires of the exertions marketplace and who can enhance their improvement effects. Schooling machine in Pakistan needs to consciousness on competencies that sell intellectual improvement, processing and mirrored image. And except Pakistan develops close cooperation between the numerous applications - lower, higher, better, abilities education - there may be a chance that young human beings will now not be in the destiny international of work. More verbal exchange between the schooling device and the enterprise is wanted.

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Spend money on studies to determine the competencies want and to assist inform the layout of appropriate education to satisfy the demand.

In a developed country such as Pakistan, it is extremely paradoxical that we are Facing severe skill shortages and high levels of free and under-employed jobs at the same time. Much has already been said about the causes of the discrepancy between the abilities needed by the economy and the abilities produced by Institutions of Education.so we need institutions that will produce skill labor that they will meet the international standards. More job opportunities will create for Pakistani employees and economy will grow.

Recommendations for individual energy companies:

- Treat skills shortages and leadership development as strategic boardroom issues that need long-term planning.
- Invest in in-house training and development programs to upgrade skills of existing and future workforce.
- Develop strategies to manage retention of experience – even beyond retirement - and transfer of knowledge - make a more creative use of your experienced workforce and prospective returners to combat the rapid strides towards larger scale retirement year on year.
- Engage with universities to offer technical support, student placements and allow recruits to return to university to promote the industry to future graduates.
- Make it clear to potential recruits that the energy industry as a whole offers a worthwhile and fulfilling long-term career.

Recommendations for Academia:

- Engage closely with industry to develop and deliver qualifications that meet business needs.
- Demonstrate the 'can do' skills of your students to employers when seeking to secure work placements.
- Liaise with professional membership bodies to provide students with a head start towards professional recognition and use such bodies as sources of useful information and contacts.

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