A CASE STUDY OF EFFECTIVE APPLICATION OF INNOVATIVE MANAGEMENT LOCALIZATION ON RCC DAM CONSTRUCTION AT KAFUE GORGE LOWER HYDROELECTRIC PROJECT

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ABSTRACT

Despite the Chinese enterprises, particularly those associated with infrastructure and engineering construction, have a long history since getting access to African market, they suffer from inadequate working time and low skills level of human resources in countries of operation, which causes constraints to effective fulfillment of task and further development of these enterprises. This paper takes into account of RCC dam of a Zambian 750MW hydroelectric project under construction by a large Chinese state-run engineering enterprise as a sample, and studies localization management measures taken by the enterprise to increase attendance, relieve communication obstacle, upgrade management level, improve skills of Zambian employees. With these innovative localization management measures, the constraint mentioned above is substantially meditated and progress of construction is further guaranteed.

Key words: *Human resources; localization Management; RCC Dam*

1. BRIEF INTRODUCTION TO THE HOST COUNTRY

1.1 Location and History

Zambia, officially the Republic of Zambia, erstwhile Northern Rhodesia, is a landlocked country in south-central Africa. Its neighbors are the Democratic Republic of the Congo to the north, Tanzania to the north-east, Malawi to the east, Mozambique to the southeast, Zimbabwe and Botswana to the south, Namibia to the southwest, and Angola to the west. The capital city is Lusaka, located in the south-central part of Zambia.

Originally inhabited by Khoisan peoples, the region was affected by the Bantu expansion of the thirteenth century. Following European explorers in the eighteenth century, the British colonized the region into the British protectorates of Barotseland-North-Western Rhodesia and North-Eastern Rhodesia towards the end of the nineteenth century. These were merged in 1911 to form Northern Rhodesia. For most of the colonial period, Zambia was governed by an administration appointed from London with the advice of the British South Africa Company.

On 24th October 1964, Zambia became independent of the United Kingdom.

1.2 Human Resources at National Level

The population of Zambia is approximately 17 million, and is concentrated mainly around Lusaka in the south and the Copperbelt Province to the northwest, the core economic hubs of the country.

1.3 Human Resources at the District Where the Project is Located

The Project is located in Chikankata District, Southern Province, the Republic of Zambia. about 68 km from the capital of Lusaka and 50km from Mazabuka Town. The district boarders with Mazabuka District on the south and south western side, Chirundu District on the south eastern side, Siavonga District on south eastern side and Kafue district on the north west and north eastern sides respectively. The district covers an area of about 2,500 square kilometers.

Chikankata District has an estimated population of 50,909 people, which translates to 26,696 male and 30,213 female. The employment status in the district in not so good due to lack of industries in the area, therefore the main source of income is farming and charcoal burning.

The district though was blessed with the inception of the Kafue Gorge Lower Hydroelectric Project in the late 2015 which came as a relief to the people of Chikankata District in regards to employment opportunities.

So far Sinohydro Corporation Limited is the main employer in the district with a workforce of about 4,300 Zambian employees with different skill and abilities. But since the beginning of the project is has been observed that Chikankata District lacks skilled labor force in relation to heavy machinery operators like frontend loader operators, bull dozer operators, excavator operators, drill rig machine operators, mobile crane operators and even heavy vehicle drivers and as such the project is forced to source such kind of labor from other districts around Zambia.

It is therefore, recommended that Chikankata residents should find a way to acquire some skills in such areas to make themselves competitive in the labor market and not to allow people from other district to surpass them in terms of getting employment opportunities due to lack of necessary skills.

If this can be achieved then in future Chikankata residents can be more competitive in the labor market. Chikankata District has potential to be exploited by investors and new industries may mushroom.

1.3.1 *Brief Introduction to the Project*

The 750MW Kafue Gorge Lower Hydroelectric Project (herein referred to as the Project) is located on the Kafue River, some 17.3km downstream of the 990MW Kafue Gorge Upper Hydropower Station.

Permanent works of the Project include the Employer's Township, access road headrace tunnel, and a power generation plant.

The work to be performed under this Contract includes(without limitation) planning, design, engineering, procurement, construction, manufacture, transportation to site, installation, field testing, commissioning, testing and handing over to the Employer of 750 MW (5*150 MW) hydroelectric project scheme, comprising infrastructure, civil, hydro-mechanical and electro-mechanical works.

Design and construction of the power generation plant include the following salient features:

Table 1 **: Features of the Project**

S.N	Description of Feature	Remarks
1	Roller Compacted Concrete (RCC) gravity dam, with a maximum height of 139m	
2	Power Intake	
3	Headrace Tunnel, with an approximate length of 4.4 km	
4	Surge Shaft, with a diameter of 32m	
5	Five Power Tunnels, each with a diameter of 4.8m	
6	Sub-surface Powerhouse, with five (05) generating units having a total installed capacity of 750MW	
7	Tail-water pool	
8	330kV Switchyard	

The Project is an EPC project contracted to Sinohydro Corporation Limited. Its total investment cost is USD 1.56 billion.

The construction period of the Project is 1549 days (51 months) and commissioning of the first generating unit will be 1437 days (48 months) from commencement of construction works.

The Project is the first large hydropower project that Zambia has undertaken over the past 40 years. Construction of this project will mitigate power shortage Zambia is experiencing now and will offer reliable power supply for the development of the agricultural sector, the mining industry, and other sectors of the economy, thereby improving the micro and macro economies of Zambia to a higher level.

Upon completion of the Project, the existing installed electric power capacity of Zambia will increase by 38%. It will also have a positive effect in improving power reliability of the Power Grid in Southern Africa.

Construction of the Project has greatly contributed to creation of job opportunities. To date, it has provided more than 10,000 employment opportunities for local communities.

1.3.2 *RCC Dam*

The site of the Project has been studied for two dam types as follows:

(i) A CFR Dam with conventional concrete face, a primary gated spillway situated separately on the left abutment side of the dam as well as a flood release tunnel;

(ii) A RCC dam with a gated spillway

It has been determined that both dam types are feasible. The RCC option, however, is preferred by the Employer and shall be the basis for preparation of the bid. Bidders may additionally submit an alternative bid for a CFR dam.

The 130m-high RCC Dam has a crest width between 8m, a length of approximately 374.5m, and 83 million cubic meters roller compaction concrete to be placed.

2. APPLICATION OF INNOVATIVE LOCALIZATION MANAGEMENT ON RCC DAM CONSTRUCTION

2.1 Staff Composition

2.1.1 *Ratio between Chinese and Zambian Employees*

At peak period of time for RCC construction, 50 Chinese and 932 Zambian employees are provided, with the ratio between Chinese and Zambian approximately 0.05:1.

2.1.2 *Profession of Chinese and Zambian Employees*

Table 2 : Profession of Chinese Employees

Profession	Number	Remarks
Section Head	1	
Deputy Section Head	3	
Division Head	3	
Duty Engineer	5	
Technician	3	
Foreman (civil, mechanical, electrical, etc.)	35	

Table 3 : Profession of Zambian Employees

Profession	Number	Remarks
Engineer	5	
Foreman	23	
Operator (Mobile Crane, Tower Crane, Roller, Loader, etc.)	49	
Driver (Tipper Truck, Canter, etc.)	68	
Skilled Worker (Welder, Electrician, Carpenter, etc.)	199	
General Worker	535	
Others	53	

2.1.3 *Constraints of Zambian Human Resources*

When the Zambian employees, particularly those who have no experience working on hydropower station, are employed and assigned to work at the RCC Dam Section, skills level of them is generally not so high, which constitute a great challenge and barricade for successful and smooth implementation of construction activities.

More than half of them are from Southern Province which is mainly depending on agriculture other than mines or industry. Those who are adequately skilled to carry out their assignment only account for minority of the whole team and normally they are from Copperbelt Province which has the most and skilled industrial workers across Zambia. Even for these skilled ones, they still have difficulties facing different construction activities, working environment, work sequence, Chinese foremen, and types of machinery to use.

Apart from the generally low skills level, low attendance of Zambian employees is another great challenge. Compared with Chinese employees who could nonstop work all year round, Zambian employees seem to have different work ethics. The Project makes payment to them on monthly basis, and they will take at least five days off every time the salary is paid. Production during this period of payment time would be greatly reduced, and quite a few construction resources such as Chinese manpower, machinery and materials have to be left idle.

In addition, having grown in a different culture and linguistic background, ways of thinking and speaking of Zambian employees are quite unlike those of Chinese ones, which lead to long-standing cooperation and communication obstacles, even disputes and misunderstandings. This situation makes it really difficult for Chinese and Zambian employees to fulfill their shared assignment in an effective way.

2.2 Innovative Measures for Localization Management

2.2.1 *Provide Full Attendance Bonus to Increase Operational Use Time*

To increase operational use time of Zambian employees, the Project has worked out a form of bonus intended to encourage them to work more days.

Since the very beginning of the Project in January 2016, payment for Zambian employees has been made in two different periods for some reasons, one for 28 days, and the other 35 days, and these two periods take turns, with exceptions occasionally.

For the period of 28 days, the attendance bonus will be paid to an employee on the condition that he or she has to work up to not less than 26 days; and for the period of 35 days, not less than 33 days. Attendance bonus is in direct proportional to the employee's working days. Details could be seen in the table below.

Table 4 : Breakdown of Attendance Bonus

Period	Working Days	Attendance Bonus	Calculation	Remarks
28 Days	26	Basic Salary for 1 Day	1*Rate*8h	
	27	Basic Salary for 2 Days	2*Rate*8h	
	28	Basic Salary for 3 Days	3*Rate*8h	
35 Days	33	Basic Salary for 1 Day	1*Rate*8h	
	34	Basic Salary for 2 Days	2*Rate*8h	
	35	Basic Salary for 3 Days	3*Rate*8h	

2.2.2 *Select Zambian Foremen for Mitigating Communication Constraints*

Chinese foremen of different professions account for majority of the Chinese employees engaged in RCC Dam construction and the main workforce to carry out basic construction activities. However, almost all the Chinese foremen have not gained a good command of English language, and similarly, almost all the Zambian employees could not speak Chinese language. To improve linguistic skills of either Chinese or Zambian employees in a short time is really difficult, let alone they all face the fact that schedule for construction has been so tight that they rarely have time to learn a language.

To mitigate communication constraints between the Chinese and Zambian employees, a Zambian foreman mechanism is introduced. Currently, a total number of 23 Zambian foremen are working on RCC Dam Section, accounting for approximately 2.5% of its all Zambian employees. These foremen have been selected through stringent and comprehensive procedures. They are assessed not only from respective of skills, experience, but also from respective of cooperative spirit, attitude, attendance, ability of leadership and solving problems within their own teams, etc. To be a foreman is not a permanent appointment. Dynamic assessment and evaluation is made to them periodically. Those who fail the periodic assessment and evaluation, punishment measures such as warning or even relieving his of post may be taken against him.

As an effective extension of mechanism of Chinese foremen, Zambian foremen could act as a bridge between Chinese foremen and their Zambian fellow employees. They could partly take on responsibility of Chinese foremen for organizing and supervising Zambian fellow employees in an assigned task.

Since application of Zambian foremen mechanism, obvious improvement in communication constraints and construction efficiency has been noticed.

For those Zambian foremen who are able to fulfill their duty well as a foreman, the Project pays them ten kwacha per day as foreman allowance, which has been a great motivation to them.

2.2.3 *Recruit Well Educated Zambian Talents to Improve Construction Management*

Standing as the largest scale infrastructure under construction in Zambia, KGL inevitably requires adequate number of engineering talents to provide qualified technical guidance. For reasons of cost reduction, enhancing localization, and preparing local talents for long term development in Zambia and Africa, the Project will hesitate to bring too many Chinese counterparts. In such a circumstance, the Project is left no choice but recruit the required talents from local communities. Since 2016, the Project has been employing the graduates within Zambia. Currently, more than 80 Zambian graduates are working on the Project.

Majored in various subjects such as electrical engineering, mechanical engineering, civil engineering, safety and environment engineering, etc., these graduates have graduated both Zambian universities, such as University of Zambia, and Copperbelt University, and foreign ones, such as those in Algeria, Russia and China. To ensure qualification of the graduates, the Project has requested the engineering graduates to show their membership certificate issued by Engineering Institution of Zambia (EIZ for short) when they are looking for employment on the Project.

Considering the RCC Dam is mainly civil works, some Zambian civil and safety engineers have been assigned for it, and these engineers are effective extension of Chinese engineering team. One of their advantages is that they could take advantage of their linguistic skills and cultural background to communicate with the Employer and Consultant's staff that are from Zambia and other foreign countries in a better way. Having practiced and learned from the Chinese counterparts, 2 of them have been given a promotion both in position and salary.

2.2.4 *Training Opportunities Are Provided to the Employees for Improving Skills Level*

As aforesaid, skills level of Zambian employees is generally low, which could not satisfy the demand of particular construction activities, such as metal fabrication, electrical, mechanical, etc. To remove this bottleneck and fulfill corporate social responsibility, a skills training school has been built and operated by the Company at its own cost. So far, it has witnessed successful graduation of 289 trainees from five intakes. Currently, 61 trainees of the 6th intake are being trained. The trainees are Zambian youths aged 20 to 30 who have no any kind of industrial skills before they are recruited as a trainee. They are provided with 6 months intensified practical and theoretical training for free, and employment opportunities in the Project upon graduating successfully. Some trainees who successfully graduated from the training school have been sent to RCC Dam Section to work as welders, mechanics, surveyors and or electricians.

In addition, some skilled heavy machinery operators are also in great shortage, such as tower crane operator, mobile crane operator, etc. In this respective, the Project provides some unskilled operators and even non-operators a chance to be trained by skilled Chinese operators. When they are considered to be adequately skilled, they will be advised to undertake examination or test by authorized certificate issuing institute for accreditation. Meanwhile, the Chinese operators who train Zambian operator would be given a bonus as training allowance.

Through training offered by the training school and Chinese employees, the overall skills levels of RCC Dam Section has been improving steadily. To date, skills of Zambian employees are able to substantially meet some of the construction activities requirements.

2.2.5 *Group Employees and Stagger Holidays to Guarantee Continuity of Construction*

A great challenge for RCC Dam construction is the period of monthly holidays of Zambian employees. It seems conventional that the Zambian employees would take some days (5 days in general) off every time they get paid on monthly basis, which causes discontinuity of construction of the dam while in most cases they are expected to work continuously. Frequent and long time off by the Zambian employees would cause serious idleness of materials and machinery and lead to accumulative delay in the progress of works. To mitigate this situation, the company decided to group the employees into Group-A and Group-B, whose payment days are separated at an interval of 7 days. Group-A accounts for majority of employees while Group-B is mainly responsible for carrying out some preparation works for the next block concrete placement. Thus, the whole sequence will not have any disconnection and efficiency could be evidently improved.

3. FURTHER EXPLORATION OF APPLICATION OF LOCALIZATION MANAGEMENT IN CONSTRUCTION

Although Chinese enterprises have entered Africa market for a long time and bilateral relations between China and Africa has been getting closer, various challenges still has to be addressed. Due to difference in history, culture, language, social systems, policies, work ethics, etc., engineering construction enterprises from China has a long way to go in Africa.

Some of the challenges include things such as local employees' frequent long time off, lack of self-discipline, low level of skills, slowness to learn, and linguistic obstacles, shortage of materials or machinery needed, expensive transportation, exceedingly strict labor laws, etc. could not be substantially addressed in a short term. Chinese enterprises involved have to keep making efforts to search for more space for further development in Africa.

With unremitting fulfillment of "The Belt and Road" initiative and increased exchange and cooperation between China and Africa in various fields and sectors, more opportunities would be available for Chinese enterprises to explore the African market and expand their business in Africa.

As one of the key resources during this course, local employees are expected to account for more of the whole workforce of a Chinese enterprise, and it's surely a trend that localization management would help a lot with survival and development of Chinese enterprises in Africa.

REFERENCE

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