Inter-state burden cost model and their management for waqf financing of higher education

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ABSTRACT : *This paper is about the costing of burdens (e.g., environmental degradation) and its management for inter-State Waqf flows in utilizing the natural resources in Malaysia. The purpose is to have greater accountability in the management of Waqf funds across State boundaries to finance higher education. The problem is to determine the cost models of these burdens that may affect the costs of Waqf transfer between the states concerned. In addition these costs are divided by the different sources of the revenue from which Waqf has been allocated. A costing algorithm is developed to build the cost model using Bailek's power tracing technique in the Power World Binary Simulator (PWS). The results indicate that the hourly costs of burdens increase as the number of states participate in the inter-state waqaf flows. This may imply that less participating States may improve the management of Waqf fund flows across the states.*

KEYWORDS: *burdens, inter-state, flow stability, cost management.*

I. INTRODUCTION

The inter-state constraint of sourcing and distributing Waqf funds in Malaysia is partly due to its unique administration of Waqf. The State Islamic Religious Council (SIRC) or the "Majlis Agama Islam Negeri" has legal rights for all *Mawquf* (Waqf assets) within the state (e.g., Enactments, Ordinance & Acts for *Provisions of Wakaf*; State Enactments,; Sarawak Ordinance, 1954; FTs Act, 1993). In the case of renewable energy resources, the administration of the Waqf revenue from the *Mawquf* (e.g., hydro, solar, geothermal, etc.) power plant, ideally its administration should be under the purview of the State Waqf Control Committee (e.g., Perak Enact. 1992). However, if the SIRCs were to act as a corporate body, its financial, legal and administrative constraints would make it almost impossible to manage the complexities of operating and maintaining a *Mawquf* energy plant utilizing the natural resources of a state. The need for fast and transparent distribution of Waqf funds from multiple Waqf sources to the multiple Awqaf institutions of higher learning within and across the State borders complicate this further. This may involve the complicated mechanics of transferring a certain amount of Waqf from the movable trans-boundary *Mawquf* (cross-border running river, solar radiation) through a common conduit of electricity flow or a flowing river stream [1](Izham, Adnan & Aziz, 2014).

Perhaps in an attempt to overcome the inter-state issue of distributing waqf to finance higher education between the SIRCs, Yayasan Waqf Malaysia was created. It may be seen as a national-level entity embracing Federal and State Islamic Religious Councils (SIRCs). However, due to its limited power, its role has been constrained to public awareness programmes in promoting the Waqf concept. In essence though, legally it may be able to overtake the roles of "SIRCs of each state that have been legally appointed by their respective legislations to supervise all *Mawquf* assets and be responsible for their development and management" [2](Mahamood, 2006; Pg. 97).

The sustainable energy resource-based power plant may well be owned and managed by a corporate *Mawquf* entity because of the huge outlay of capital, skilled labor and engineering needed. As a *Mawquf* it may be part of or a subsidiary of the SIRC. This may be similar to the corporate Waqf financing model of the Johore based

Waqaf An Nur Corporation Berhad, which is "different from the Waqf of shares and equity, it is a full fledged, autonomous corporation and Waqf enterprise itself" [3] (Hashim, M. Ali, 2013).

Through time, the economic worth of a resource-based *Mawquf* may also deplete when the harnessing of the natural resources do not anymore become profitable, as the harnessing costs exceed its revenue. Thus, a new concept of resource-based *Mawquf* may be sought. For example, the abnormal practice of exchanging *Istidbal Awqaf* assets is found with The Waqf Rules (1983) of the Waqaf Committee of Johore. *Istidbal* was seen as a solution to overcome the contemporary problems of selling the original *Mawquf* assets to be replaced by acquiring another asset with greater yield [4].

The approach to these issues would be through a critical look of the current costing of burdens when harnessing natural resources for Waqf financing. This paper would explore a cost model for burdens to determine inter-state Waqf fund distribution and its economic worth from a resource-based *Mawquf*.

II. THE PROBLEM

The concept of burden costing is based on the premise that the State has to account for the environmental and social costs of utilizing its natural resources before deciding on the compensation and mitigation measures to be paid by the corporate interest. The benefits from using natural resources such as water, geothermal, solar, biomass etc., to generate electricity for the common good usually would come with costs to abate the environmental and social. In the case of Temenggor (in Perak State) and Kenyir (in Terengganu State) hydro power plants might have been producing billions of KWhr of electricity to supply the consumers' needs, but at the same time has incurred long term distortions to the water quality, flora and fauna and displaced thousands of people. These may also include the inundation of the few hundred millionth - year forests, lost of riverine basins, disappearance of natural aesthetics areas and wild life. These are all the costs that the State has to account for.

At the early stages of development, these burdens are initially estimated by the State Forest Department, State Land Office, State Irrigation Department and other related agencies. The problem is to account these as divisional costs with respect to divisions betweeen direct and indirect, fixed and variable, tangibles and non-tangibles, Islamic and non-Islamic portions [5] (Anas Yusof & Hanita Hashim, 2015). For example, tangible cost burdens may include timber premiums, land premiums, water premiums, levy on revenue, resettlement costs, loss of plantations, land tax, State Govt. stocks, compensations, trust funds, access roads.consevation of archeological sites, loss of traditional burial grounds. Intangible burdens, which are rarely considered in the compensation calculations may include wild life losses, depleting water quality, rare specie disappearance , forest indispensiblity, loss of archeological and historic sites, etc. The Islamic Waqf sources may be from cash Waqf contributions, Waqf assets (e.g., monetory values of shares designated as Waqf, valuation of fixed property declared as Waqf,etc.). The non-Islamic sources may be accrued from other religious endowments such as from Christian, Buddhist, Hindu endowments. Or, the portion of the ownership may belong to a gambling company. The question is what are these divisional costs so that they could be easily shown in the output?

III. THEORETICAL MODEL

The question of "What did it cost?" may provide the key answer for management in organizations with their respective background [6] (Young, 2003). Determining the costs of burdens for a particular resource-based *Mawquf* may make it more important for their subsequent economic rents to determine the economic life of these resources. The economic rent will be zero or negative when the burdens of harnessing the resources would be equal to or exceeed the benefits/revenue generated. As a a departure from neo-classical economics, the economic rents for waqf resource or *Mawquf* may be perpetual. This may be because of its increasing returms from the factors of *Hibah, Sadaqah, Waqf, Marihah* (productive asset), *Qard al-Hassan* in the 3rd-sector economy model of voluntarism [7] (Arshad, 2014).

1.Divisional

The activity based costing (ABC) of burdens may help to identify improvements in the costs divisions such as between value-added and non-value added costs [8](Cooper & Kaplan, 1998: pg.213). Such management accounting approach in costing burdens may also reflect cost behavior patterns that would enable control and supervision [9] (Seal, Garrison & Noreen, 2009: pg.156). It may also be leading the change in the way the *Mawquf* is managed [10] (Hilton, Maher & Selto, 2003).

One cost activity is the economic rent of a waqf resource described as;

$$\mathcal{E}r = \{\sum(Rij - Cij), \delta x(t), \mathcal{z}\} \qquad \text{[Equation 1.1]}$$

Where,
Rij is the revenue obtained from a unit of the environmental resource e.g., P(k)ij of a forest wood of specie (k) may be valued as the unit price of useful wood sold in market.

Cij is the cost or burden incurred to the environment to generate the revenue. They can be modelled as;

$$Cij = C\,(x i)j + \beta.\tau \qquad \text{[Equation 1.2]}$$

Where C(xi)j is the harvesting/harnessing costs of an environmental unit (e.g., a forest specie) or environmentak unit (i) when the the amount of environmental resources (e.g.,forest specie stock, water resource harnessable) is xi, and τ is the transport costs per unit of environ (e.g., per forest stock from source to market, transmission costs to consumers) and β is the efficiency of conversion from the environmental unit to sales (e.g., water to electricity, forest to medicine, furniture and construction materials, etc).

The dynamic environment al unit, by the net worth equation;

$$\delta x(t) = f\,[x(t)] - h(t) \qquad \text{[Equation 1.3]}$$

Where $f\,[x(t)]$ is the instantenous natural growth (e.g., forest specie at stock size $x(t)$ and harnessing costs $h(t)$ given as $[E(t).x(t)]$ where $E(t)$ is the harvest effort at time (t) and stock size $x(t)$.

Γ is the non-market discount rate (can be affected by the new economic sector of voluntarism). The rate of harnessing the forest areas;

$$h(j) = \alpha(j,t) \qquad \text{ha/yr} \qquad \text{[Equation 1.4]}$$

where j is the State, t is year

h(j) =

$$\begin{matrix} a(1,1) & a(1,2) & \ldots\ldots a(1,t) \\ a(2,1) & a(2,2) & \ldots\ldots a(2,t) \\ a(j,1) & a(j,2) & \ldots\ldots a(j,t) \end{matrix}$$

The rate of environmental damages / harnessed is given as

$$hL(j) = L(j,t) \qquad \text{m3/yr}$$

$$\begin{matrix} L(1,1) & L(1,2) & \ldots\ldots L(1,t) \\ L(2,1) & L(2,2) & \ldots\ldots L(2,t) \\ L(j,1) & L(j,2) & \ldots\ldots L(j,t) \end{matrix}$$

The average annual cost, Ph $= \frac{\sum_{j=1}^{t} (\text{hL(j,t)})}{\text{tj}}$ m3/ha/yr

The Hourly Rate (RM/hr) per environment (*i*)

P(*i*) = Ph(i, t)

$$\begin{matrix} P(1,t1) & P(1,t2) & \ldots\ldots.P(1,tn) \\ P(2,t1) & P(2,t2) & \ldots\ldots.P(2,tn) \\ P(j,t1) & P(i,t2) & \ldots\ldots.P(i,tn) \end{matrix}$$

So, the average Hourly Rate of burdens by environ (*i*)

$$Pe(\text{i}) = \frac{\sum_{i=1}^{n} P(\text{i},t\text{n})}{t\text{n}} \qquad \text{[Equation 1.5]}$$

Where t will be the hours per year required to fully obtain yield from the resource, n = 1, 2, 3…k, and the factor of burdens to all units of environments will be;

$$P'(\text{i}) = \frac{P\text{e(i)}}{\sum_{j=1}^{k} P(i)} \qquad \text{[Equation 1.6]}$$

2.Distribution

Islamic Principle of *Al-Hisbah* is to maximize efficiency of Awqaf institution mainly for social welfare and the development of the society as a whole. The *Mawquf* is generally seen as a non-profit institution. Only the income portion over and above the initial sum can be used for benevolent activities. This may include health, education and research activities, economic and socio-economic projects, provision of infrastructure facilities, public utilities and goods. Applying *Al-Hisbah*, initial assets of inter-state corporate Waqf sources that generate income for the benefit of the Waqf recipients may be selective [11]. Some beneficiaries may incur high costs of inter-state transfer and premiums that could reduce the nett Waqf flow across the State border.

As such, the question of *Al-Hisbah* Inter-State distribution of Waqf explores the theory of 'fair' pricing of electricity flows in the transmission lines. Bialek's power tracing technique is used for the deregulated power industry which allocates the loads (waqf recipients) to be supplied and the generators (waqf sources) to supply. The technique also determines how much of a transmission line is used (for Waqf transfer) and the contribution of each generator (Waqf source) to system losses (transborder burdens). Tracing methods determine the contribution of transmission user to transmission usage. It is also used for transmission pricing. The methods proposed for tracing the power flow are upstream and downstream algorithms [12] (Singh, S., 2012).

The Power Tracing Methods may include Node method, Graph method, Method of common and Bialek's tracing algorithm. In Bialek's tracing method, it is assumed that nodal inflows are shared proportionally among nodal outflows.[13]

Assuming that the total power flow through the node is Pflw = 40 (line *j-a)* + 60 (line *k-a)* =l00MW of which 40% is supplied by line *j-a* and 60% by line *k-a*, according to proportional sharing principle. The proportional sharing principle [14] (Qian & Ji-Hui, 2005) also assume that the network node is a 'mixer' of incoming flows.

The individual Waqf source generators and losses are allocated to the loads or Waqf recipients in the upstream tracing. It shows the information on the allocation of each generator to each transmission line and the load. The assigned distribution of power flow begins from the load node, the relation between load and line flow, between load and generator output [15] (Achayakuttan & Dent, 2010).

The total flow Q*i*, the outflow to the *ith* bus, is the sum of all the outflows through the lines connected to the bus and the local bus load

$Qi = \sum_{n=1}^{\infty}(l\varepsilon\mu)\ |Qi - l| +\ QLi$ [Equation 1.7]

For i=1,2,….n (1)

where μ is the set of nodes directly supplied from node i, implying power flowing from the ith node. If the line losses are neglected, then $|Ql\text{-}i| = |Qi\text{-}l|$.

Now, looking down at the downstream algorithm the transmission usage is allocated to individual loads and losses are allocated to generators. The downstream tracing has the information about the amount of load power shared by the transmission line and the generator. When the distribution of the power flows has been assigned, starting from the generator, from the paths the generator's output. The contribution factor of each node, the relationship between the generator output and line power flow or load can be illustrate [16] (Gownden, P. N. & Mukerjee, R. N., 2009).

In the total flow Qi, the inflow to the ith bus, is the sum of all the inflows through the lines connected to the bus and the local bus injection.

$Qi = \sum_{n=1}^{\infty}(j\varepsilon\Upsilon)\ |Qi - j| +\ QGi$ [Equation 1.8]

For i=1,2,….n

Where gamma (Υ) is the set of nodes directly supplying node i, implying Power flow towards ith node. If the line losses are neglected,
then $|Qj\text{-}i| = |Qi\text{-}j|$.

Where $Cli = \frac{|Q\ j-i|}{Qj}$ expresses the relationship between line flow and the nodal flow at the jth node, using proportional sharing principle $|Q\ j - i| = C\ ji\ Q$ where, Q is the vector of gross nodal flows. QG is the vector of nodal generations, while $A\mu$ is called the Upstream matrix.

The load demand as at the $A\mu$ bus and the applying the proportional methodology :

$QLi = \left(\frac{QLi}{Qi}\right)\sum_{k=1}^{n} \left[A\mu^{-1}\right]ik\ QGk$ [Equation 1.9]

for i= 1, 2, 3…n

$$QLi = \frac{QLi}{Qi}Pi$$

This equation shows the contribution of the ith system generator to the kth load demand and can be used to trace where the power of a particular load comes from. The costs incurred to generate the total loads Qij is given by the Case Hourly Costs (RM/hr);

$\text{HCij} = \sum_{i=0}^{k} QLi\ \left|Pi'.f(\text{Cij})\right|$ [Equation 1.9]

Where, f(Cij) is the Hourly Cost function for each bus ith which reflects the burden costs or Cij = C (xi)j + β.τ as in Equation 1.2 above and the equivalent factor of burdens of environs in State j shown by Pi' (<1) as in Equation 1.8 above.

Thus, the **objective function** nett burden sharing effect δHC between *j* states will be the progressive differences between the Hourly Costs (RM/hr) in each State, in degration assuming cumulative effects of transboundary burden sharing between *j* number of states;

$\delta HC = HCij\ [j - \frac{j\text{r}}{(1+\text{r})} - \frac{(j-1)\text{r}^2}{(1+\text{r})^2} + \cdots$ [Equation 1.10]

Where depleting natural resources is indicated by the non-market discount rates r. [17] Noorgard, et al,

IV. METHOD

In this study, a *N*-State (A, B, C, D....*N*) or *j* = *N*, dynamic mathematical model of Inter-State Corporate resource-based Waqf burden sharing is proposed. The dynamic Waqf simulation model between multi-sources (*Mawquf)* and multi-receptors (Institutions of Higher Learning as recipents of Waqf funds) in a Power World Simulator (PWS) would be used to formulate the Waqf transfer function. The Waqf wealth may presumably flow between states with inter-state burden sharing in each state as shown in the Inter-State Dynamic Waqf model for hypothetical State A, B and C in Figure 1 below.

The loads received from each Waqf power plant A, B, and C will show the distribution of Waqf from sources to recipients. The Hourly Cost (RM/hr) incurred to generate the Waqf sources in each state reflects the state burdens on resources of land, water and forest products lost or distorted.

Assumptions that are formulated; the bus at which the Waqf power plant is connected, the Waqf plant is assumed to ‘own’ the bus provided that the Waqf generator is the majority suipplier. Therefore Waqf power plant controls the value of incoming and outgoing ‘Waqf funds’(in terms of electricity flow that has been designated as Waqf).

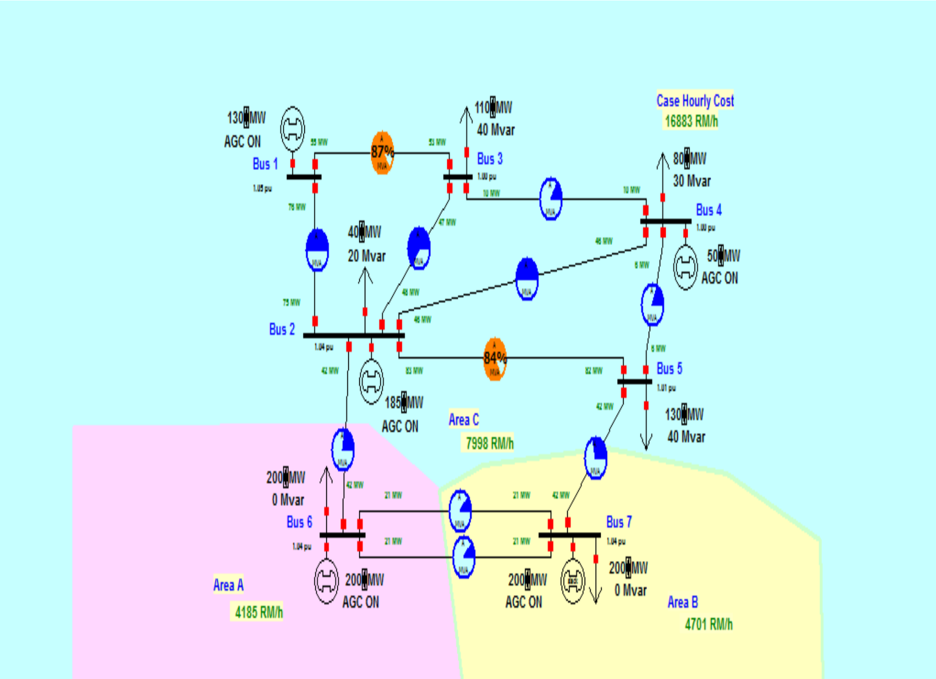

Figure 1. A dynamic *j* state model for Power World Simulation of burden sharing (Case of *j*=3).

The objective function **δHC** of Hourly Costs (RM/hr) is based on the Hour Costs HCij of each state to determine the cumulative burdens to be shared between the states, assuming that the Inter-State flows have zero losses.

Waqf transaction will be based upon the Loads (L) (Waqf Receptors/Recipents) and Generation (G) (Waqf Source) on the 'Waqf' bus. The Load (L) connnected to the 'Waqf' bus can have several options with respect to Generation (G);

i. If *Load* waqfbusx {Waqf recipient}= *G* waqfx {Waqf source), therefore, *Load* waqfbusx receives all power from G waqfx, and

ii. If *Load* waqf bus x {Waqf recipent} < *G* waqfx {Waqf source}, therefore, *Load* waqfbusx receives all power from *G* waqfx, but

iii. If *Load* waqf bus x {Waqf recipent} > *G* waqfx {Waqf source}, therefore, *Load* waqf bus x receives all power from *G* waqfx, and the balance that comes from the system.

Simulations on the PWS are carried out based on the above assumptions and for two runs for the same conditions. This is to test consistency for the concept of trans-boundary Waqf transfer.

V. RESULTS

In the simulation, the 3-State condition of Waqf A, Waqf B and WaqfC is shown by the data and results in TABLES A, B and C below;

TABLE A: Mawquf Power Plants and the potential of Waqf to be transferred between States A, B and C.

WAQF FROM SALES OF ELECTRICITY					Source i	Recipientj			
MAWQUF Power Plants (4 sen/kwh)				MW	RM	MW			
WAQF PLANT A (3000hrs/yr)				242	29040000	242			
WAQF PLANT B (3000hrs/yr)				242	29040000	242			
WAQF PLANT C (3000hrs/yr)				242	29040000	242			

In each State A, B and C is a Mawquf power plant A, B and C. Each plant would operate 3000hrs a year with the balance for compulsory maintenance and unplanned shutdown. The potential Waqf funds transferable will be

TABLE B:The incoming Waqf funds from (Mawquf) sources and outgoing Waqf funds to recipients (Mawqif) at the Waqf Plant Buses.

State	Mawquf	Bus	Source	Recpient	run1	run2	
A	WPA	6	200(WPA)	200(WPB)	4085	4185	(RM/hr)
			40(Bus2)	21(Bus6)			
				21(Bus6)			
B	WPB	7	200(WPB)	200(WPC)	4705	4701	(RM/hr)
			21(Bus6)	42(Bus5)			
			21(Bus6)				
C	WPC	2	75(Bus1)	40(Load)	7994	7998	(RM/hr)
			185(WPC)	48(Bus3)			
				46(Bus4)			
				83(Bus5)			
				42(WPA)			
		Total burdens (HCij)			16884	16884	(RM/hr)

At Bus6 of the PWS in StateA the incoming generated source of funds will be from 200MW of Mawquf Power Planr A (WPA) and balance is imported from Bus2 of StateC. The Waqf recipient (Receptor) would get funds from 200MW of Mawquf Power Plant B (WPB) and 42MW importe from Bus6 in StateA.

In StateB, Bus7 of PWS would have Waqf funds source from 200MW of Mawquf Power Plant C (WPC) on State C with imported 42MW from Bus6 of StateA. Likewise, 200MW cf Waqf funds will be imported from Bus5 of StateC.

The incoming Waqf funds at Bus7 will be sourced from 185MW Mawquh power plant C and 45MW from Bus1 of State A.The Waqf recipient would have waqf funds from Buses 3, 4 and 5 of StateA. In TABLE C below, the Waqf transfer factor between states is shown by $f(jr)$ to reflect cumulative effects of trans-boundary inter-state burden sharing as more states are involved in the Waqf transfer.

TABLE C: Transboundary inter-state waqf burden sharing

Inter-State Mawquf Burdens for Higher Education				
No.States	j	1	2	3
DiscntRt	r	0.1	0.1	0.1
Cumfactr	f(jr)	0.090909	0.172573	0.255447
CaseBrdn	Hcij	16884	16884	16884
CumBrdn	δHC	1534.909	2913.716	4312.968
242	WPHCi	721395.3	717258.9	713061.1
242	WPBHCi	220	220	220
242	WPCHCi	220	220	220

The hourly costs of burden sharing is shown by (δHC) in TABLE C above with the nett Waqf funds transfered across the State boundaries shown by (WPHCi) .

IV. DISCUSSIONS

The Waqf Power Plants WPA, WPB an WPC were pre-selected to be in each State respectively, as shown in TABLE B. In terms of allocation Waqf funds, the selection of Bus 6, 7 and 2 are more important as they represent a wider divisional distribution of Waqf funds across States. The consistency of these preselected Bus is shown by the Hourly Costs of generating and distributing the 242 MW from each Waqf plant, as indicated by the very small margins between results of Hourly Costs of Run1 and Run2 in TABLE B.

Hourly costs of burden sharing shown in TABLE C are illustrated by Figure 2 below.The inter-state cumulative burden sharing increases as more states are involved as shown by the gradual increase of burden sharing factor (green line). The effect is the gradual reduction of the potential Waqf fund transfer across borders as more number of States are involved, j=1, 2, 3…k.

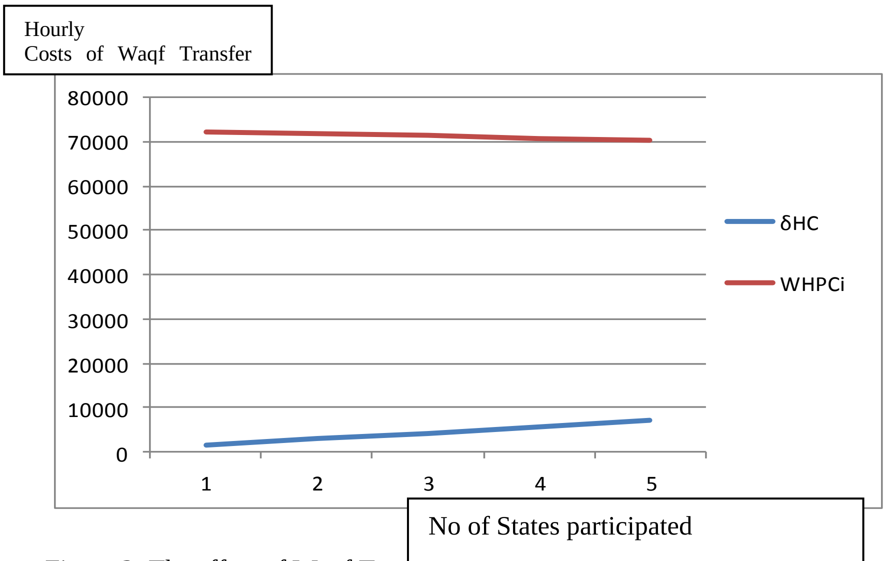

Figure 2: The effect of Waqf Transfer function (HC) to the Value of Waqf transferred (WHPCi)

The number of States that participate in the Waqf burden sharing are increased to 5 from the original 3 States. The cumulative Waqf burden sharing between State A and State B increases from RM 1435/hr to RM 1567/hr between States A, B and C. With the initial application of *Al-Hisbah (0.1)* on the State B Waqf recipients, the objective function of Waqf Flow decreases from RM 71509/hr to RM 71387/hr. As the number of states increase the Waqf Flow decreases because of increasing burdens. This indicates that a minimization of Waqf burden sharing can be achieved by modulating the burden sharing with the application of *Al-Hisbah (<0.1).* The effect of State recipients is the high costs of State burden premiums and Waqf transfer costs.

The divisional cost model of burdens at both the sources (Mawquf) and recipients (Mawqif) as shown in TABLE 3 seem to indicate increased burden sharing with more cost divisions . For the same number of divisions as in WPA and WPB plants, the burdens remain about the same. The increased number of cost divisions in WPC show increasing burdens.

VI. CONCLUSION

This paper reports a prelimined increasary finding of the theoretical inter-state waqf burden cost model for financing higher education institutions within and across the states. There is a need to reduce the number of States that participate in the Inter-State Waqf fund transfer. In addition there is also the need reduce the number of cost divisions of each participating Waqf power plants.

The validation would be required on the outcomes of the Inter-State model such as through the studies of social and environmental accounting flows and the *maqasib shariah* of burden sharing. Nevertheless, the validated dynamic inter-state model is based on the inter-state power systems analysis that has been used to determine optimal hourly costs , which has been shown in this paper.

Finally, cost model of burdens provide the dynamic adjustments of the hourly rate outcomes from each Waqf Power Plant from sources (Mawquf) to recipients (Mawqif).

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