International Journal of Innovation and Applied Studies
ISSN 2028-9324 Vol. 25 No. 1 Dec. 2018, pp. 253-262

http://www.ijias.issr-journals.org/

The Development of the Green Capital Budgeting Approaches Based on Traditional Capital Budgeting Approaches

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ABSTRACT: The study aims at developing the green capital budgeting approaches as we as emerging structural model of green capital budgeting decisions through adjustment of the environmental degradation forces to the given investment projects' inflows and outflows respectively. Moreover, the study attempts to know the extent in which these forces contribute to justify the respective green approaches of capital budgeting and to focus how these techniques relate to conventional methods of this budgeting. The researcher has developed the green methods of capital budgeting through using the five determinants that have contributions to impair the environment. The researcher used the data of a single investment project, loan to customer provided by a bank, Rupali Bank Limited, HSTU Branch, Dinajpur, Bangladesh. The researcher found that the higher degree of environmental degradation forces are involved in investment, the lower are the value(s) of green capital budgeting approaches than corresponding traditional capital budgeting approaches. No involvement of non- green forces to an investment project till to maturity, results in the individual values of traditional capital budgeting approaches complied with individual values of respective green capital budgeting approaches. Indeed, the development of green capital budgeting approaches are justified but applied in subject to quantifying the abstract characterization of non-green variables.

KEYWORDS: Green, approaches, budgeting, project, present value and future value.

1 INTRODUCTION

Green investments call for the sustainable investment absorbing unlimited natural resources without damaging the environment, reducing the emission of CO_2 as well as reducing deforestation, that may leads to captivate green inflows and green outflows in the capital budgeting decisions that to be analyzed by green capital budgeting approaches, ethical techniques of capital budgeting decision. The financing practices of American companies found that the companies always or almost always had used NPV 74.93%, IRR 75.61%, SPP 56.74%, DPP 29.45%, and ARR 20.29 % [1]. Notwithstanding, due to the globalization, environmental changes and cutting edge advanced technological improvement, theories and models developed in the past do not hold good today and most of them are criticized and their applicability in reality is intriguing [2]. The sustainable dimension is not significant in capital investment decisions for most companies as capital investment opportunities are justified on traditional financial techniques, such as net present values or internal rates of return [3]. A capital commitment from investors is needed for a capability to trade the renewable energy credits (RECs) and emissions such as sulfur dioxide (SO2), nitrous oxides (NOX), and carbon dioxide (CO2) reductions and some funds also trade bio-fuels, and environmental credits; these green streams of revenue or green finance not only make the cost of capital cheaper but also bring much needed liquidity to emerging environmental financial markets and higher global energy demand growth will continue to drive return on investment (ROI) higher in the clean-tech space [4]. Climate risk disclosure can also reinforce the effect of climate policies and the transition towards a low carbon economy [5]. Lots of argument on traditional capital budgeting approaches are appeared but how the traditional capital budgeting approaches can be adjusted with environmental forces that are difficult to measure in the cost of devastation, are rarely studied and plasticized. The study found the positive relationship between net present value and net future value in investing perspective but negative relationship between them in borrowing perspective [6]. Japanese firms managed their decision-making by using the payback period (PBP) method that said to be theoretically irrelevant and mistaken since it ignores the time value of money and cash flows beyond the cutoff date, and the net present value method jointly [7]. There had been a substantial theory-practice gap in the use of project appraisal approaches in the firms of United Kingdom and the gap had also narrowed in areas: risk analysis, inflation adjustment, capital budget preparation, WACC calculation and post-auditing, however, other elements of capital budgeting theory such as probability and beta analysis had been adopted by very few practicing managers [8]. The positive relationship was found the between these two capital budgeting techniques - Green Net Present Value (GNPV) and Green Net Future Value (GNFV) [9]. Net present value approach and internal rate of return approach are mostly practiced and found that the total assets of the firms did not relate to the turnover of the firm in accordance with capital budgeting techniques used by firms [10]. Capital budgeting is the main focus since if it is not rightly planned; investments may have disastrous financial and cash-flow implications [11]. Traditional capital budgeting methods have been heavily criticized of discouraging the adoption of advanced manufacturing technology, resulting in undermining the competitiveness of Western firms'[12]. Over the last 2 decades, many changes and challenges had reflected in making financial decision due to the global financial crisis, fluctuations in value of money, advanced technology, profit rate, exchange rate and the risks of inflation rates and dramatic changes in economic and business area both in national and in global markets, in accordance with capital budgeting practices needs to be examined and studied again for rebuilding since it has significant impact on investment decision making [13]. The development of a budgeting manual when saying that the companies preferably develop a manual of investments [14]. The DCF method is the preeminent decision technique available and managers should learn to practice it well [15]. In recent years, modified internal rate of return (MIRR) a new measure, is supported [16]. However, it has not been popular despite the most sophisticated practitioners. Only about 3% of Fortune 500 companies practiced MIRR, whereas 84% used IRR [17]. The regression test and found that the risk and management compensation variables had an impact on the use of PBP from the aspect of managers and the risk and profitability variables had an impact on the use of PBP from the aspect of investors [18]. The uses of risk analysis techniques, in Australia, a minimum, scenario forecast was the most widely used method; Monte Carlo Simulation and Sensitivity Analysis were rarely used and found that only 12.9% small manufacturing companies, in Australia, used PI technique [19]. The rise in the scale of social, environmental, and economic problems had led to numerous questions and recommendations regarding the role and responsibilities of business in society having universal calls for companies to play a greater role in mitigating or solving these issues and capital budgeting was considered as a possible area in which firms could contribute to mitigating these various socio-economic problems, but such projects must be justified with new techniques that incorporate not only financial measures, but also social and environmental metrics, yet these methods are weak in assessing the social and environmental cost/impact of the project [20].

2 MATERIALS AND METHODS

2.1 DATA AND STRUCTURE OF CONCEPTUAL MODEL

To serve the purposes, both qualitative and quantitative data have been carried out in this study. It also be identified the non-green forces for the studied purposes.

The researcher will justify the following conceptual model regarding capital budgeting approaches.

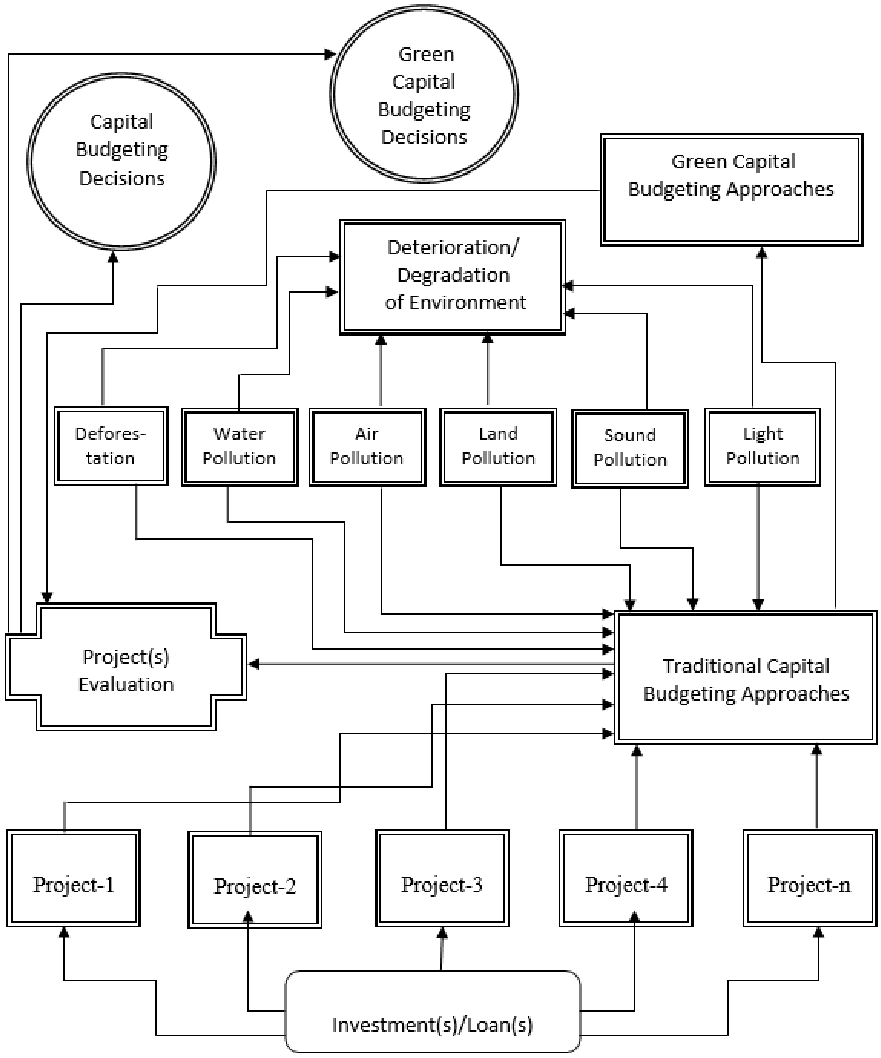

Fig. 1. Structural model of green capital budgeting approaches as well as decisions.

2.2 MATHEMATICAL MODELS

$$GNPV_i = [\,PVCI_t\ ((1-(D+W+A+L+S+LT))]_i - [\,PVCO_t\ ((1+(D+W+A+L+S+LT)]_i \ldots\ldots\ldots\ldots(i)$$

$$GNPV_{Di} = [PVCI_t\ (1-D)]_i - [PVCO_t\ (1+D)]_i \ldots\ldots\ldots\ldots(ii)$$

$$GNPV_{Wi} = [PVCI_t\ (1-W)]_i - [PVCO_t\ (1+W)]_i \ldots\ldots\ldots\ldots(iii)$$

$$GNPV_{Ai} = [PVCI_t\ (1-A)]_i - [PVCO_t\ (1+A)]_i \ldots\ldots\ldots\ldots(iv)$$

$$GNPV_{Li} = [PVCI_t\ (1-L)]_i - [PVCO_t\ (1+L)]_i \ldots\ldots\ldots\ldots(v)$$

$$GNPV_{Si} = [PVCI_t\ (1-S)]_i - [PVCO_t\ (1+S)]_i \ldots\ldots\ldots\ldots(vi)$$

$$GNPV_{LTi} = [PVCI_t\ (1-LT)]_i - [PVCO_t\ (1+LT)]_i \ldots\ldots\ldots(vii)$$

$$GNFV_i = [FVCI_t\ ((1-(D+W+A+L+S+LT))]_i - [FVCO_t\ ((1+(D+W+A+L+S+LT))]_i \ldots\ldots\ldots\ldots(viii)$$

$$GNFV_{Di} = [FVCI_t\ (1-D)]_i - [FVCO_t\ (1+D)]_i \ldots\ldots\ldots\ldots(ix)$$

$$GNFV_{Wi} = [FVCI_t\ (1-W)]_i - [FVCO_t\ (1+W)]_i \ldots\ldots\ldots\ldots(x)$$

$$GNFV_{Ai} = [FVCI_t\ (1-A)]_i - [FVCO_t\ (1+A)]_i \ldots\ldots\ldots\ldots(xi)$$

$$GNFV_{Li} = [FVCI_t\ (1-L)]_i - [FVCO_t\ (1+L)]_i \ldots\ldots\ldots\ldots(xii)$$

$$GNFV_{Si} = [FVCI_t\ (1-S)]_i - [FVCO_t\ (1+S)]_i \ldots\ldots\ldots\ldots(xiii)$$

$$GNFV_{LTi} = [FVCI_t\ (1-LT)]_i - [FVCO_t\ (1+LT)]_i \ldots\ldots\ldots\ldots(xiv)$$

$$GARR_i = [ARR\ ((1-(D+W+A+L+S+LT))]_i \ldots\ldots\ldots\ldots(xv)$$

$$GARR_{Di} = [ARR\ (1-D)]_i \ldots\ldots\ldots\ldots(xvi)$$

$$GARR_{Wi} = [ARR\ (1-W)]_i \ldots\ldots\ldots\ldots(xvii)$$

$$GARR_{Ai} = [ARR\ (1-A)]_i \ldots\ldots(xviii)$$

$$GARR_{Li} = [ARR\ (1-L)]_i \ldots\ldots(xix)$$

$$GARR_{Si} = [ARR\ (1-S)]_i \ldots\ldots(xx)$$

$$GARR_{Si} = [ARR\ (1-S)]_i \ldots\ldots(xx)$$

$$GIRR_i = L_i + \frac{GNPV_{Li}}{GNPV_{Li} - GNPV_{Hi}}\ x\ (H_i - L_i) \ldots\ldots(xxii)$$

$$GIRR_{Di} = L_i + \frac{GNPV_{DL\,i}}{GNPV_{DL\,i} - GNPV_{DHi}}\ x\ (H_i - L_i) \ldots\ldots(xxiii)$$

$$GIRR_{Wi} = L_i + \frac{GNPV_{WLi}}{GNPV_{WLi} - GNPV_{WHi}}\ x\ (H_i - L_i) \ldots\ldots(xxiv)$$

$$GIRR_{Ai} = L_i + \frac{GNPV_{ALi}}{GNPV_{ALi} - GNPV_{AHi}}\ x\ (H_i - L_i) \ldots\ldots(xxv)$$

$$GIRR_{Li} = L_i + \frac{GNPV_{LLi}}{GNPV_{LLi} - GNPV_{LHi}}\ x\ (H_i - L_i) \ldots\ldots(xxvi)$$

$$GIRR_{Si} = L_i + \frac{GNPV_{SLi}}{GNPV_{SLi} - GNPV_{SHi}}\ x\ (H_i - L_i) \ldots\ldots(xxvii)$$

$$GIRR_{LTi} = L_i + \frac{GNPV_{LTLi}}{GNPV_{LTLi} - GNPV_{LTHi}}\ x\ (H_i - L_i) \ldots\ldots(xxviii)$$

$$GMIRR_i = \sqrt[N]{\frac{[FVCI_C((1-(D+W+A+L+S+LT))]_i}{[PVCO_{FC}((1+(D+W+A+L+S+LT))]_i}} - 1 \ldots\ldots(xxix)$$

$$GMIRR_{Di} = \sqrt[N]{\frac{[FVCI_C(1-D)]_i}{[PVCO_{FC}(1+D)]_i}} - 1 \ldots\ldots(xxx)$$

$$GMIRR_{Wi} = \sqrt[N]{\frac{[FVCI_C(1-W)]_i}{[PVCO_{FC}(1+W)]_i}} - 1 \ldots\ldots(xxxi)$$

$$GMIRR_{Ai} = \sqrt[N]{\frac{[FVCI_C(1-A)]_i}{[PVCO_{FC}(1+A)]_i}} - 1 \ldots\ldots(xxxii)$$

$$GMIRR_{Li} = \sqrt[N]{\frac{[FVCI_C(1-L)]_i}{[PVCO_{FC}(1+L)]_i}} - 1 \ldots\ldots(xxxiii)$$

$$GMIRR_{Si} = \sqrt[N]{\frac{[FVCI_C(1-S)]_i}{[PVCO_{FC}(1+S)]_i}} - 1 \ldots\ldots(xxxiv)$$

$$GMIRR_{LTi} = \sqrt[N]{\frac{[FVCI_C(1-LT)]_i}{[PVCO_{FC}(1+LT)]_i}} - 1 \ldots\ldots(xxxv)$$

$$GPI_i = \left[\frac{PVCI\ ((1-(D+W+A+L+S+LT))}{PVCO\ ((1-(D+W+A+L+S+LT))}\right]_i \ldots\ldots(xxxvi)$$

$$GPI_{Di} = \left[\frac{PVCI\ (1-D)}{PVCO\ ((1+D)}\right]_i \ldots\ldots(xxxvii)$$

$$GPI_{Wi} = \left[\frac{PVCI\ (1-W)}{PVCO\ ((1+W)}\right]_i \ldots,\ldots(xxxviii)$$

$$GPI_{Ai} = \left[\frac{PVCI\ (1-A)}{PVCO\ ((1+A)}\right]_i \ldots\ldots(xxxix)$$

$$GPI_{Li} = \left[\frac{PVCI\ (1-L)}{PVCO\ ((1+L)}\right]_i \ldots\ldots(xl)$$

$$GPI_{Si} = \left[\frac{PVCI\ (1-S)}{PVCO\ ((1+S)}\right]_i \ldots\ldots(xli)$$

$$GPI_{LTi} = \left[\frac{PVCI\ (1-S)}{PVCO\ ((1+LT)}\right]_i \ldots\ldots(xlii)$$

$$GPBP_{i}=\left[Y+\frac{CO\ ((1+(D+W+A+L+S+LT))-CC\ ((1-(D+W+A+L+S+LT))}{CD\ ((1-(D+W+A+L+S+LT))}\right]_{i} \quad\text{.......................(xliii)}$$

$$GPBP_{D\,i}=\left[Y+\frac{CO\ (1+D)-CC\ (1-D)}{CD\ (1-D)}\right]_{i} \quad\text{...................................(xliv)}$$

$$GPBP_{Wi}=\left[Y+\frac{CO\ (1-W)-CC\ (1-W)}{CD\ (1-W)}\right]_{i} \quad\text{...................................(xlv)}$$

$$GPBP_{Ai}=\left[Y+\frac{CO\ (1+A)-CC\ (1-A)}{CD\ (1-A)}\right]_{i} \quad\text{...................................(xlvi)}$$

$$GPBP_{Li}=\left[Y+\frac{CO\ (1+L)-CC\ (1-L)}{CD\ (1-L)}\right]_{i} \quad\text{.....................................(xlvii)}$$

$$GPBP_{Si}=\left[Y+\frac{CO\ (1+S)-CC\ (1-S)}{CD\ (1-S)}\right]_{i} \quad\text{....................................(xlviii)}$$

$$GPBP_{LTi}=\left[Y+\frac{CO\ (1+LT)-CC\ (1-LT)}{CD\ (1-LT)}\right]_{i} \quad\text{..............................(xlix)}$$

$$GDPBP_{i}=\left[Y+\frac{CO\ ((1+(D+W+A+L+S+LT))-DCC\ ((1-(D+W+A+L+S+LT))}{DCD\ ((1-(D+W+A+L+S+LT)}\right]_{i} \quad\text{......................(l)}$$

$$GDPBP_{Di}=\left[Y+\frac{CO\ (1+D)-DCC\ (1-D)}{DCD\ (1-D)}\right]_{i} \quad\text{..............................(li)}$$

$$GDPBP_{Wi}=\left[Y+\frac{CO\ (1+W)-DCC\ (1-W)}{DCD\ (1-W)}\right]_{i} \quad\text{............................(lii)}$$

$$GDPBP_{Ai}=\left[Y+\frac{CO\ (1+A)-DCC\ (1-A)}{DCD\ (1-A)}\right]_{i} \quad\text{.............................(liii)}$$

$$GDPBP_{Li}=\left[Y+\frac{CO\ (1+L)-DCC\ (1-L)}{DCD\ (1-L)}\right]_{i} \quad\text{.............................(liv)}$$

$$GDPBP_{Si}=\left[Y+\frac{CO\ (1+S)-DCC\ (1-S)}{DCD\ (1-S)}\right]_{i} \quad\text{...............................(lv)}$$

$$GDPBP_{LTi}=\left[Y+\frac{CO\ (1+LT)-DCC\ (1-LT)}{DCD\ (1-LT)}\right]_{i} \quad\text{.........................(lvi)}$$

$$GRADR_{i}=\left[L+\frac{GNPV_{L}^{C}}{GNPV_{L}^{C}-GNPV_{H}^{C}}\ x\ (H-L)\right]_{i} \quad\text{..........................(lvii)}$$

$$GRADR_{Di}=\left[L+\frac{GNPV_{DL}^{C}}{GNPV_{DL}^{C}-GNPV_{DH}^{C}}\ x\ (H-L)\right]_{i} \quad\text{......................(lviii)}$$

$$GRADR_{Wi}=\left[L+\frac{GNPV_{WL}^{C}}{GNPV_{WL}^{C}-GNPV_{WH}^{C}}\ x\ (H-L)\right]_{i} \quad\text{.....................(lix)}$$

$$GRADR_{Ai}=\left[L+\frac{GNPV_{AL}^{C}}{GNPV_{AL}^{C}-GNPV_{AH}^{C}}\ x\ (H-L)\right]_{i} \quad\text{.......................(lx)}$$

$$GRADR_{Li}=\left[L+\frac{GNPV_{LL}^{C}}{GNPV_{LL}^{C}-GNPV_{LH}^{C}}\ x\ (H-L)\right]_{i} \quad\text{........................(lxi)}$$

$$GRADR_{Si}=\left[L+\frac{GNPV_{SL}^{C}}{GNPV_{SL}^{C}-GNPV_{SH}^{C}}\ x\ (H-L)\right]_{i} \quad\text{........................(lxii)}$$

$$GRADR_{LTi}=\left[L+\frac{GNPV_{SL}^{C}}{GNPV_{SL}^{C}-GNPV_{SH}^{C}}\ x\ (H-L)\right]_{i} \quad\text{......................(lxiii)}$$

$GNPV_{Ci} = [PVCI_C((1-(D+W+A+L+S+LT)) - PVCO_C((1+(D+W+A+L+S+LT))]_i$..........(lxiv)
$GNPV_{CDi} = [PVCI_{CD}(1-D) - PVCO_{CD}(1+D)]_i$........................(lxv)
$GNPV_{CWi} = [PVCI_{CW}(1-W) - PVCO_{CW}(1+W)]_i$....................(lxvi)
$GNPV_{CAi} = [PVCI_{CA}(1-A) - PVCO_{CA}(1+A)]_i$........................(lxvii)
$GNPV_{CLi} = [PVCI_{CL}(1-L) - PVCO_{CL}(1+L)]_i$..........................(lxviii)
$GNPV_{CSi} = [PVCI_{CS}(1-S) - PVCO_{CS}(1+S)]_i$..........................(lxix)
$GNPV_{LTi} = [PVCI_{CLT}(1-LT) - PVCO_{CLT}(1+LT)]_i$................ .(lxx)

Where

$GNPV_{i:}$, $GNFV_i$, $GARR_i$, $GIRR_i$, $GMIRR_i$, GPI_i $GPBP_i$ $GDPBP_i$ $GRADR_i$ & $GNPV_{Ci}$: Green Net Present Value, Green Net Future Value, Green Acconuting Rate of Return, Green Internal Rate of Return, Green Modified Internal Rate of Return, Green Profitability Index, Green Pay Back Period, Green Discounted Pay Back Period, Green Risk Adjusted Discount Rate & Green Certainty Equivalent Technique Respectively at ith Numbers of Investment(s)/Loan(s)/Investment Project(s).

$GNPV_{Di}$, $GNPV_{Wi}$, $GNPV_{Ai}$ & $GNPV_{Ci}$: Green Net Present Value for Deforestation,Water Pollution, Air Pollution and CO_2 Emission respectively at ith Number(s) of Investment(s)/Loan(s) / Investment Project(s).

$PVCI_t$ and $PVCO_t$: Present Value of Cash Inflow(s) and Present Value of Cash Outflow(s) at Time Period t that Starts with t= 0, 1, 2, 3, 4,..............................k.

D_i, W_i, A_i, & C_i: Percentage of Deforestation, Water Pollution, Air Pollution & CO_2Emission Respectively at ith $PVCI_t$ & $PVCO_t$of ith Numbers of Investment(s)/ Loan(s).

$GNFV_{Di}$, $GNFV_{Wi}$, $GNFV_{Ai}$ and $GNFV_{Ci}$: Green Net Future Value for Deforestation, Water Pollution, Air Pollution and CO_2Emission respectively at ith Number(s) of Investment(s)/Loan(s) / Investment Project(s).

$GARR_{Di}$, $GARR_{Wi}$, $GARR_{Ai}$ & $GARR_{Ci}$: Green Accounting Rate of Return for Deforestation, Water Pollution, Air Pollution and CO_2 Emission respectively at ith Number(s) of Investment(s) / Loan(s)/ Investment Project(s).

$GIRR_{Di}$, $GIRR_{Wi}$, $GIRR_{Ai}$ & $GIRR_{Ci}$: Green Internal Rate of Return for Deforestation, Water Pollution, Air Pollution and CO_2Emission respectively at ith Number(s) of Investment(s)/Loan(s) / Investment Project(s).

$GMIRR_{Di}$, $GMIRR_{Wi}$, $GMIRR_{Ai}$ & $GMIRR_{Ci}$: Green Modified Internal Rate of Return for Deforestation, Water Pollution, Air Pollution and CO_2Emission respectively at ith Number(s) of Investment(s)/Loan(s)/ Investment Project(s).

$GPBP_{Di}$, $GPBP_{Wi}$, $GPBP_{Ai}$ & $GPBP_{Ci}$: Green Pay Back Period for Deforestation, Water Pollution, Air Pollution and CO_2Emission respectively at ith Number(s) of Investment(s)/Loan(s)/ Investment Project(s).

GPI_{Di}, GPI_{Wi}, GPI_{Ai} & GPI_{Ci}: Green Profitabilitiy Index for Deforestation, Water Pollution, Air Pollution and CO_2Emission respectively at ith Number(s) of Investment(s)/Loan(s)/ Investment Project(s).

$GDPBP_{Di}$, $GDPBP_{Wi}$, $GDPBP_{Ai}$ & $GDPBP_{Ci}$: Green Discounted Pay Back Period for Deforestation, Water Pollution, Air Pollution and CO_2Emission respectively at ith Number(s) of Investment(s)/Loan(s) / Investment Project(s).

$GRADR_{Di}$, $GRADR_{Wi}$, $GRADR_{Ai}$ & $GRADR_{Ci}$: Green Risk Adjusted for Deforestation, Water Pollution, Air Pollution and CO_2Emission respectively at ith Number(s) of Investment(s)/Loan(s)/ Investment Project(s).

$GNPV_{CDi}$, $GNPV_{CWi}$, $GNPV_{CAi}$ & $GNPV_{CCi}$: Green Certanity Equivalent Technique for Deforestation, Water Pollution, Air Pollution and CO_2Emission respectively at ith Number(s) of Investment(s)/Loan(s) / Investment Project(s).

CD: Cash Flow During the Year, DCD: Discounted Cash Flow during the Year CC: Cumulative Cash Flow A: Year before Recovery. H_i: High Discount rate at i^{th} Investment L_i: Low Discount rate at i^{th} Investment DCC: Discounted Cumulative Cash Flow

3 RESULTS

The researcher applied green capital budgeting approaches to be developed to collected information from the Rupali bank that invests Tk. 3000000 at 9 % profit margin for one year with monthly frequency to a client who engaged in stock business of cereal crops, getting back the fund from him Tk. 262354 per month. The bank utilizes 30 pages of A4 size papers that affect the forest with carbon emission around .1% (monetary basis) within 1 square kilometer in the bank surrounding area identified as the deforestation .01% both of the percentage perceived by researcher. The researcher did not get any significant impact of this investment's nature toward water pollution and land pollution. However, in this study, it is perceived that Rupali bank uses the day lights to operate banking function that leads to environmental cost in respect light pollution cost with health issue around .5%, air pollution cost with health issues by radiation results from computer running around .5% and the noisy activities within bank create the health issue, costing through the sound pollution about .2 % to the given loan. Although these costs are not measured exactly, the researcher has taken into consideration through monetary basis. These environmental issues motivate the researcher to develop the green capital budgeting approaches and decision. And the rate of inflation in June/ 2018 was 5.54% which in this study has been considered as the discount factor or compound factor. The values of NPV, NFV, ARR IRR, MIRR, PI, PBP, DPBP, RADR, NPV_C are 138821, 156254, 0.087451333, 0.0899969, 0.037534, 1.018592, 11.86986286, 12.54352, 0.0899969 and 138821 respectively.

Table 1. Summary of Findings

Techniques	Value	Comparison	No. of equation of mathematical model
GNPV	59016	GNPV <NPV	i
$GNPV_D$	132682	$GNPV_D$ <NPV	ii
$GNPV_W$	138821	$GNPV_w$ = NPV	iii
$GNPV_A$	108127	$GNPV_A$ <NPV	iv
$GNPV_L$	138821	$GNPV_L$ = NPV	v
$GNPV_S$	126543	$GNPV_S$ <NPV	vi
$GNPV_{LT}$	108127	$GNPV_{LT}$ <NPV	vii
GNFV	59344	GNFV <NFV	viii
$GNFV_D$	133419	$GNFV_D$ <NFV	ix
$GNFV_W$	156254	$GNFV_w$ = NFV	x
$GNFV_A$	108727	$GNFV_A$ <NFV	xi
$GNFV_L$	156254	$GNFV_L$ = NFV	xii
$GNFV_S$	127246	$GNFV_S$ <NFV	xiii
$GNPV_{LT}$	108727	$GNFV_{LT}$ <NFV	xiv
GARR	0.086314466	GARR <ARR	xv
$GARR_D$	0.087363882	$GARR_D$ <ARR	xvi
$GARR_W$	0.087451333	$GARR_w$ = ARR	xvii
$GARR_A$	0.087014077	$GARR_A$ <ARR	xviii
$GARR_L$	0.087451333	$GARR_L$ = ARR	xix
$GARR_S$	0.087276431	$GARR_S$ < ARR	xx
$GARR_{LT}$	0.087014077	$GARR_{LT}$ < ARR	xxi
GIRR	0.086314466	GIRR <IRR	xxii
$GIRR_D$	0.0862271	$GIRR_D$ <IRR	xxiii
$GIRR_W$	0.0899969	$GIRR_w$ = IRR	xiv
$GIRR_A$	0.071180	$GIRR_A$ <IRR	xv
$GIRR_L$	0.0899969	$GIRR_L$ = IRR	xvi

Table 2. Summary of Findings

Techniques	Value	Comparison	No. of equation of mathematical model
$GIRR_S$	0.08246055	$GIRR_S$ < IRR	xvii
$GIRR_{LT}$	0.071180	$GIRR_{LT}$ < IRR	xviii
GMIRR	0.024133	GMIRR <MIRR	xxix
$GMIRR_D$	0.036497	$GMIRR_D$ <MIRR	xxx
$GMIRR_W$	0.037534	$GMIRR_w$ = MIRR	xxxi
$GMIRR_A$	0.032359	$GMIRR_A$ <MIRR	xxxii
$GMIRR_L$	0.037534	$GMIRR_L$ =M IRR	xxxiii
$GMIRR_S$	0.035461	$GMIRR_S$ <MIRR	xxxiv
$GMIRR_{LT}$	0.032359	$GMIRR_{LT}$ < MIRR	xxxv
GPI	0.992448	GPI <PI	xxxvi
GPI_D	1.016557	GPI_D <PI	xxxvii
GPI_W	1.018592	GPI_w = PI	xxxviii
GPI_A	1.008456	GPI_A <PI	xxxix
GPI_L	1.018592	GPI_L =PI	xl
GPI_S	1.014525	GPI_S <PI	xli
GPI_{LT}	1.008456	GPI_{LT} < PI	xlii
GPBP	12.17109	GPBP> PBP	xliii
$GPBP_D$	11.89276	$GPBP_D$ > PBP	xliv
$GPBP_W$	11.86986	$GPBP_w$ = PBP	xlv
$GPBP_A$	11.98479	$GPBP_A$ > PBP	xlvi
$GPBP_L$	11.86986	$GPBP_L$ =PBP	xlvii
$GPBP_S$	11.91569	$GPBP_S$ > PBP	xlviii
$GPBP_{LT}$	11.98479	$GPBP_{LT}$ > PBP	xlix
GDPBP	12.86040	GDPBP> DPBP	l
$GDPBP_D$	12.56761	$GDPBP_D$ > DPBP	li
$GDPBP_W$	12.54352	$GDPBP_w$ =D PBP	lii
$GDPBP_A$	12.66442	$GDPBP_A$ > DPBP	liii
$GDPBP_L$	12.54352	$GDPBP_L$ =DPBP	liv
$GDPBP_S$	12.59174	$GDPBP_S$ > DPBP	lv
$GDPBP_{LT}$	12.66442	$GDPBP_{LT}$ > DPBP	lvi
GRADR	0.086314466	GRADR> RADR	lvii
$GRADR_D$	0.0862271	$GRADR_D$ > RADR	lviii
$GRADR_W$	0.0899969	$GRADR_w$ =RADR	lix
$GRADR_A$	0.071180	$GRADR_A$ > RADR	lx
$GRADR_L$	0.0899969	$GRADR_L$ =RADR	lxi
$GRADR_S$	0.08246055	$GRADR_S$ > RADR	lxii
$GRADR_{LT}$	0.071180	$GRADR_{LT}$ >RADR	lxiii
GNPVC	59016	GNPVC > NPVC	lxiv
$GNPV_{CD}$	132682	$GNPV_{CD}$ > NPVC	lxv
$GNPV_{CW}$	138821	$GNPV_{CW}$ =NPVC	lxvi
$GNPV_{CA}$	108127	$GNPV_{CA}$ > NPVC	lxvii
$GNPV_{CL}$	138821	$GNPV_{CL}$ =NPVC	lxviii
$GNPV_{CS}$	126543	$GNPV_{CS}$ > NPVC	lxix
$GNPV_{CLT}$	108127	$GNPV_{CLT}$ > NPVC	lxx

4 DISCUSSION

The environmental sustainability is the big challenges to be fixed up. Human factors are the direct forces to drive the encouragement of non- green forces, however, the proper and the crucial decision regarding the investment to various form of projects have come to the question to be figured out through the techniques that can motivate the incumbents of the society leading toward to practicing the environmental friendly outlays with inflows. The traditional capital budgeting approaches that exist today, seeks to choose the best investment decisions, contributing to the motivation of not considering environmental deterioration. The study results show that the values of GNPV, GNFV, GARR GIRR, GMIRR, GPI, GRADR and $GNPV_C$ are lower than those of traditional techniques- NPV, NFV, ARR IRR, MIRR, PI, RADR and NPV_C but the values of GPBP and GDPBP are higher than those of traditional techniques-PBP and DPBP, that indicate that the recovery time of investment under green approaches consumes more time than those other techniques of traditional approaches of payback. However, the decision criteria of traditional capital budgeting techniques are applied in green capital budgeting techniques similarly. Firms that invested earlier in equipment to decrease pollution had higher profit growth [21]. Tradable emissions permits might not encourage investment environmentally in beneficial equipment [22]. measurements regarding cost savings, cost effectiveness, cost avoidance, discount rates and risk management and environmental issues are essential input to investment appraisals and non-financial issues require consideration, since they relate to the trade-off between the effectiveness of the investment alternatives in respect of environmental outcomes against the financial investments and benefits; a reduction in emissions may be beneficial in that it reduces the probable risk of regulatory non-compliance, and the propensity for environmental impact risk that is established once the total emissions are determined [23]. Environmental indicators cover performance related to inputs such as material, energy, water and outputs such as emissions, effluents, waste and they also cover performance related to biodiversity, environmental compliance, and other pertinent information such as environmental expenditure and the impacts of products and services [24]. To take the green decisions, the green techniques help decision maker in respect of evaluation of investment project in the best way, discouraging impairment of natural environment that brings out peaceful lives.

5 Conclusion

The green capital budgeting approaches are helpful for sustainable development of investment project as well as for maintenance of rupture environment. The applications of these approaches looking forward to evaluating the investment projects will create the justified decisions having proper balance of cash inflows and outflows. Overall, the green capital budgeting approaches are the motivation approaches for project selection in most effective and efficient ways. These approaches yet do not compete with the decision rules that applied in traditional capital budgeting approaches.

Acknowledgement

First and foremost, the researcher is grateful to the creator of the universe, who has kept the researcher sound with peaceful mind during this study. Afterward, he thanks to this journal authority who have helped the researcher to submit this fundamental research article online without having difficulties. Finally, the researcher thanks to all scholars from whom he has got references.

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