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Role of the Private Sector in Economic Growth Sustainability in Saudi Arabia

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Abstract

This paper examines the role of the private sector in promoting sustainable economic growth in the Kingdom of Saudi Arabia via investments in environmental goods and services, which can help address critical diversification challenges facing the Kingdom. The paper undertakes a quantitative analysis of the relationship between economic growth and environmental investments and finds a positive relationship between improvements in environmental goods and services and economic growth. It then identifies a number of bankable environmental businesses that would be attractive to the private sector once appropriate policy incentives are put in place. Environmental businesses with great potential for the private sector or for public private partnership (PPP) interventions include renewable energy, such as solar power, environmental equipment, such as waste water treatment and pollution control gadgets, and environmental services such as waste management and waste recycling services.

Keywords: Saudi Arabia; Sustainable Growth; Private Investment; Environmental Goods and Services; Diversification; Renewable Energy; Energy Efficiency; Environmental Investments; Private Sector; PPP.

1. Introduction

Since 1970 the Saudi government has issued ten development plans, each covering five years, with economic diversification as the main objective of all these plans. However, implementation of the diversification strategy became a major challenge, as policy makers largely became preoccupied with managing the largesse from oil revenues. Diversifying production and exports as well as boosting the competitiveness of the Saudi economy would have provided a springboard for creating jobs and tackling unemployment problems. Such a strategy would have shielded the Kingdom from the vagaries of the international oil market and would have lifted it out of the current equilibrium of low-growth, high-unemployment situation and would have helped to create a sustainable, knowledge-based economy capable of addressing the challenges of the 21st Century. Despite these economic challenges, Saudi Arabia has all the necessary ingredients to build a prosperous, industrial economy capable of creating jobs and boosting income and productivity on a sustainable basis. The Kingdom also has a young population that is increasingly becoming informed and educated. As it enters into its working-age years, there is a tremendous opportunity to boost growth and raise living standards further.

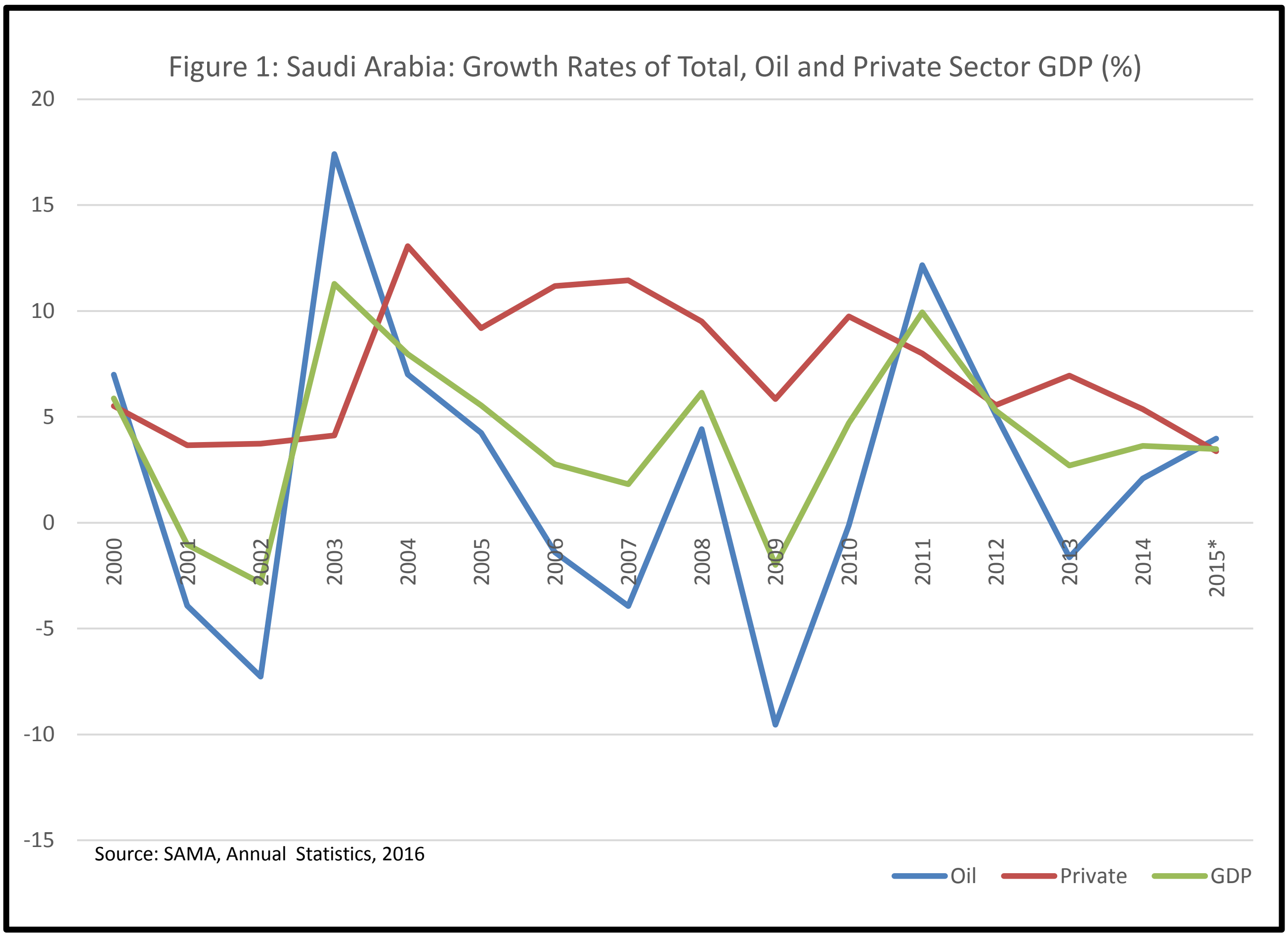
It is against this background that, on Monday 25 April 2016, Saudi Arabia's Deputy Crown Prince announced the Kingdom's long-term strategic plan dubbed 'The Vision 2030', which contained the most ambitious transformational agenda aimed at creating a sustainable economy. The Saudi Vision 2030 is built around three main themes: a vibrant society, a thriving economy and an ambitious nation. On the economic front, the Vision 2030 has outlined a number of broad strategic goals, including the following increasing the private sector contribution to GDP from 40% to 65% and increasing the share of non-oil exports in total non-oil GDP from 16% to 50% (Kamco Research, 2016).

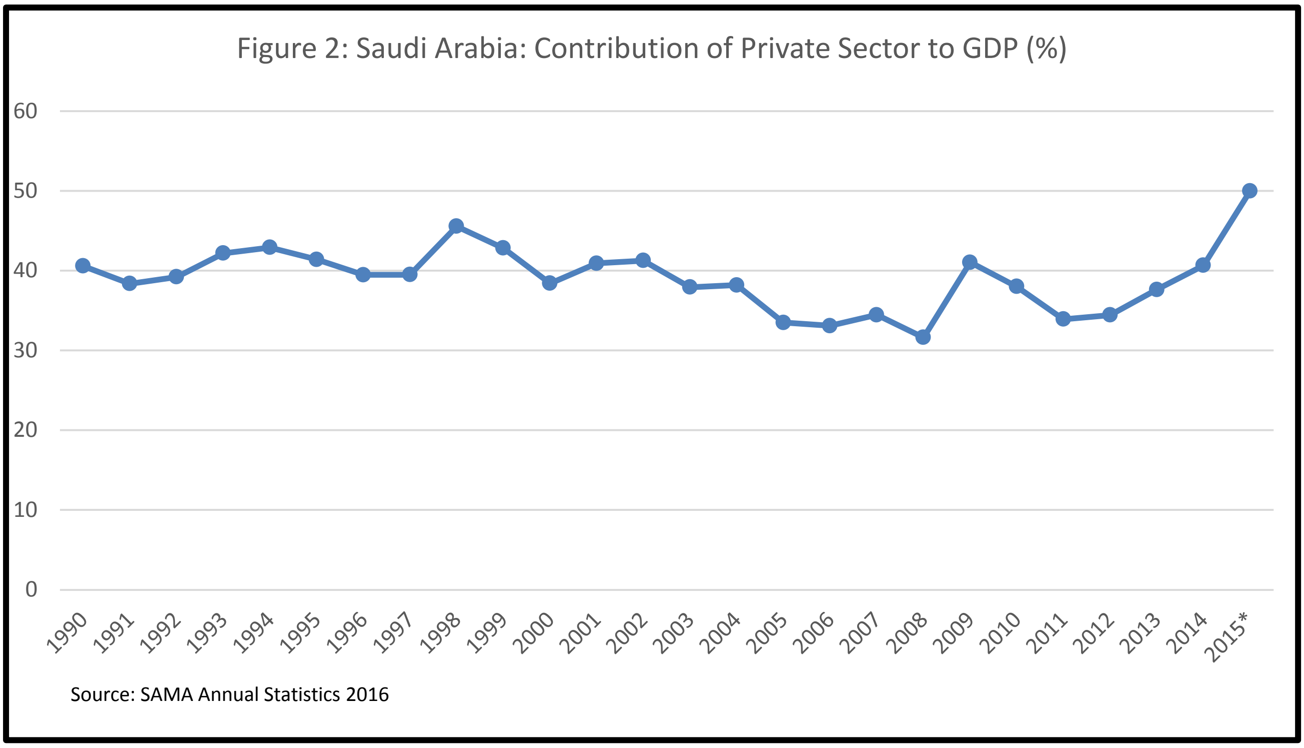
One way of increasing the role of the private sector is through the formulation of an appropriate incentive structure to encourage increased private sector participation in environmental investments, especially in clean energy projects. The main objective of this paper is to explore areas in environmental investments through the use of public-private partnership (PPP) arrangements.

Section 2 of the paper provides an overview of the Saudi Arabian economy. Section 3 reviews the empirical literature on the link between economic growth and environmental investments in Saudi Arabia. Section 4 presents the methodological approaches. Section 5 discusses investment opportunities for the private sector in environmental business channels. Section 6 pulls together the main conclusions of the paper.

2. Review of the Saudi Arabian Economy

During the past decades high oil revenues have played a supportive role in promoting government spending in Saudi Arabia, which has consequently buoyed private sector activities in the country, resulting in acceleration of economic growth. Indeed, during the last decade or so, the growth rate of private sector's real GDP has consistently surpassed that of the oil sector (Figure 1) and the share of private sector in total gross domestic product has surged considerably (Figure 2). Despite the increasing role of the private sector in the economic growth process, the Saudi economy is largely a mono product economy with a heavy concentration and dependency on the oil sector for government revenues and export earnings (Table 1).





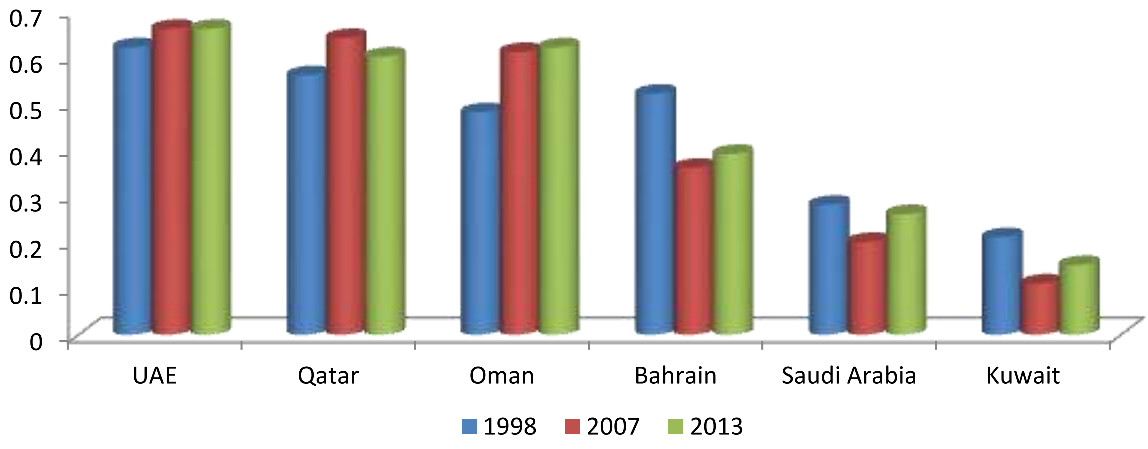
Oil wealth has also for long been instrumental in laying the foundation for solid economic fundamentals such as GDP growth rate, fiscal space, current account position, foreign reserves, price stability and physical and social infrastructure. Even so, the Saudi economy has remained highly undiversified and is currently facing a number of challenges in its quest to creating a sustainable economic growth and development. The ongoing decline in the international oil prices has continued to expose the Saudi economy to the vagaries of the international markets.

Table 1: Contribution of Oil and Non-Oil Sectors to Saudi Arabia's GDP

	Oil as a % Total GDP	Non-Oil as % GDP	Oil as a % Total GDP	Oil Exports as a % Total Exports
2005	50.01	49.99	50.01	75.90
2006	50.86	49.24	50.86	76.77
2007	50.40	49.60	50.40	76.46
2008	55.40	44.60	55.40	78.83
2009	40.89	59.11	40.89	73.94
2010	44.97	55.03	44.97	75.43
2011	51.19	48.81	51.19	78.14
2012	50.41	49.59	50.41	78.59
2013	47.40	52.60	47.40	85.70
2014	45.09	54.91	45.09	84.80
Source: Al Torkistani et al. (2015); SAMA (2015)				

Over dependence on oil has relegated the issue of economic diversification to the background despite continuous reaffirmation of diversification in all the past Saudi national development plans. Needless to say, the Saudi Arabian is one of the least diversified among the Gulf Cooperation Council (GCC) economies (Figure 3).

Figure 3: Diversification Indices of GCC Countries



Source: GCC central statistical agences

As Saudi currently faces a myriad of economic challenges, there is a call for a comprehensive diversification strategy that will allow for increased participation of the private sector. Indeed, maintaining strong growth in the private sector is crucial for job creation, but sustainability of the growth will largely depend on the diversification of the economy through investments in potentially profitable environmental goods and services, such as clean energy business. However, investment in environmental goods and services requires appropriate incentive structures to attract private sector participation. Incentives both pecuniary and non-pecuniary, including the strengthening of legal and regulatory frameworks on PPP and institutional capacity, can act as catalysts for private sector investments and diversification.

3. Review of Relevant Literature

A number of studies have recently attempted to empirically investigate the theoretical relationships between the environment and economic growth with mixed outcomes. Some of the most recent studies include Al Torkistani et al. (2015), Anjum et al. (2014), Chow and Li (2014), Stern (2014), Yaduma et al. (2013), Castiglione et al. (2012), Brock and Taylor (2004), Panayotou (2003), and Islam (2001). These empirical studies have found mix evidence about the relationship between economic growth and the environment. While some of these studies have found strong evidence of an inverted U-shaped relationship between certain types of environmental pollutants and per capita GDP (e.g. Anjum et al. 2014; Chow & Li 2014), others such as Stern 2014, have found no discernible evidence for the so-called Environmental Kuznets Curve hypothesis that have preoccupied past empirical studies.

The optimal growth models, generally based on the utility maximisation problem of the consumer, have gained strong appeal as they theoretically underpin the socio-economic-ecology factors. Such models generally involve the maximization of a social welfare function subject to economic and ecosystem constraints. The differences that exist among various studies, however, relate to the type of model estimation techniques employed, measures of ecosystem indicators used in the model, and nature/scope of the study.

Most of the environment-growth models often tend to use reduced-form single equation specifications linking an environmental variables to per capita income. However, according to Panayotou (2003), “the ad hoc specifications and reduced form of these models turn them into a ‘black box’ that shrouds the underlying determinants of environmental quality and circumscribes their usefulness in policy formulation”. The apparent limitations of the reduced-form single equation methodology are overcome by a systems-wide approach to estimating the linkages between economic growth and the environment. One empirical application of the systems-wide approach is Islam’s (2001) study of the Australian Dynamic Integrated Model of Climate and the Economy (ADICE). The model emphasizes the role of technical progress and net emissions reduction in the economic growth process in addition to the standard factors of production such as capital and labour. The generalized form of the model is as follows:

$$Y(t) = \Omega(t)A(t)K(t)^{\gamma}L(t)^{1-\gamma} \quad \text{(Production function)} \quad (1)$$

$$\Omega(t) = [1 - TC(t)/Y(t)] / [1 + DM(t)/Y(t)] \quad \text{(Net environmental pollution)} \quad (2)$$

$$TC(t)/Y(t) = b_1\mu(t)^{b2} \quad \text{(Emissions-reduction cost function)} \quad (3)$$

$D(t)/Y(t) = \theta_1 T(t)\theta_2$.	(Environmental damage function)	(4)
$E(t) = [1 - \mu(t)]\sigma(t)Y(t)$	(Emissions-Economic output function)	(5)
$C(t) = \alpha_0[Y(t)]^{\alpha 1}$	(Consumption function)	(6)
$K(t) = (1-\delta_k)K(t-1) + I(t)$	(Capital accumulation function)	(7)
$R(t) = \gamma Y(t)/K(t)(1-\delta_k)$	(Discount Rate)	(8)
$Y(t) = C(t) + I(t) + NX(t)$	(National Income Identity)	(9)

Where:

Y(t) = Gross domestic product

Ω(t) = Output scaling factor due to emissions controls and environmental damage

A(t) = Growth of technological progress

K(t) = Stock of capital

L(t) = Labour force

TC(t) = Total cost of reducing environmental emissions

D(t) = Damage from environmental emissions (GHG and waste)

E(t) = Environmental emissions

T(t) = atmospheric temperature relative to base period

C(t) = Total aggregate consumption

I(t) = Gross fixed capital formation (investment)

NX(t) = Net exports (exports minus imports)

Parameters:

γ = elasticity of output with respect to capital

(1-γ) = elasticity of output with respect to labour, assuming a constant return to scale Cobb-Douglas-type production function.

b_1, b_2 = parameters of emissions-reduction costs function

θ_1, θ_2 = parameters of damage function

μ(t) = rate of emissions reduction (the emissions control rate)

σ(t) = ratio of the uncontrolled emissions to output

δ_k = rate of capital depreciation

α_0 and α_1 = autonomous consumption and marginal propensity to consume respectively.

Equation (1) describes the production function of the overall economy where real GDP depends not only on the usual factor inputs of capital, K(t), and labour, L(t), but also on technological progress, A(t), and on an environmental scaling factor, Ω(t), which captures the net environmental pollution. Equation (2) shows that the net environmental pollution [environmental-output scaling factor, Ω(t)] itself is jointly determined by costs of emissions abatement and environmental damage. The environmental damage function, in turn, is defined by non-linear scaling parameters (θ_1 and θ_2). To reduce the output loss due to environmental damage, policy makers will have to formulate a number of environmental protection measures that will reduce emissions and the total cost of such measures.

Equation (3) suggests that the total cost of environmental policy is determined by the emissions-reduction ratio (μ), while Equation (4) provides the link between environmental damage and the earth's atmospheric temperature. Equation (5) shows the relationship between environmental emissions and real GDP where such a relationship is also influenced by key parameters: the rate of emissions reduction (μ) which is a policy variable under the control of the policy-makers, and the uncontrollable emissions (σ) that is directly related to economic activity but outside the control of policy makers. For instance, in the ADICE model only CO_2 and chlorofluorocarbon gases are assumed to be under the policy control and the rest of the GHG are exogenous to the model.

Equation (6) is a standard consumption function, where aggregate consumption in the economy depends on gross domestic product. Equation (7) defines the economy's capital accumulation process where current stock of capital depends on the previous stock and current investment (i.e. gross fixed capital formation). Equation (8) defines discount rate as output-capital ratio with allowances for capital depreciation, while Equation (9) is the national income identity which consists of aggregate consumption (private and public), investment (private and public) and net exports (i.e. exports minus imports).

The model depends on key assumptions. On the economic side of the model, investment, labor force, technological progress, and net exports are assumed to be exogenous although future growth of labor force is inextricably linked to the growth rate of population just as technical progress is heavily influenced by the growth rate of technology. For simplicity of exposition investment is assumed to be an important economic policy instrument in the same manner as the emissions reduction variable is used in the ecosystem model.

3.1 Methodological Approach for Saudi Arabia

The above methodology for evaluating the environment-growth nexus may not be suitable for emerging economies such as Saudi Arabia due to lack of data availability. Nonetheless, we follow Al Torkistani et al. (2015) to use a parsimonious version of the model by introducing an environmental abatement variable in the standard neoclassical production function, as follows:

$$Y = g(A.E.L.K.t) \qquad (1a)$$

Where:

Y = Gross Domestic Product (GDP) in real terms

L = Labor input

K = Capital stock

E = Output scaling factor due to emissions controls and environmental damage

A = Growth of technological progress

a = Elasticity of output with respect to capital

t = time trend

Equation (1a) represents the aggregate production function where real GDP depends on labor (L), capital (K), technological progress (A) and an environmental scaling factor (E), which captures the net environmental pollution. A priori, the estimated coefficients of capital, labor and technological progress are assumed to be positive, while that for net environmental pollution variable (E) is negative albeit its magnitude can be reduced by improvements in environmental control mechanisms.

Assuming equation (1) to be linear in logarithms, taking logs and differentiating with respect to time will yield an equation describing the determinants of the growth rate of GDP, with estimated parameters representing the elasticities of output with respect to each of the explanatory variables.

4. Analysis of Results

Following Al Torkistani et al. (2015), equation (1a) was estimated using the relevant data over the period 1980-2010 with the E-Views statistical software using two-stage least squares regression. Two sets of estimated results corresponding to two emissions-output scaling factors (E1, E2) are presented in Table 2.

Equation (A) in the table corresponds to the estimated parameters for the equation associated with net environmental pollution factor E1, which is based on a 5% emissions reduction scenario. In this equation, the estimated parameters of all explanatory variables are in line with the a priori expectations and are statistically significant at the various levels, except the coefficient of investment. The negative coefficient of the net environment degradation variable, E1, at -10.22, suggests that environmental damage reduces economic growth. This implies that, with a 5% cut in environmental pollution, *ceteris paribus*, environmental degradation would reduce Saudi Arabia's GDP by 10% vis-à-vis a do-nothing approach. The high F-statistic for this equation attests to the high overall goodness of fit of the model. The equation, however, seemingly appears to suffer from the econometric problem of serial correlation as implied by the low Durbin-Watson statistics. This is not, however, of major concern given that the data are in first differences.

Table 2: Estimation Regression Equations: Dependent Variable: Growth Rate of Real GDP		
Independent Variable	**Equation A (5% cut in emissions)**	**Equation B (10% cut in emissions)**
Constant	-33.56*** (-3.75)	-15.22 (-1.04)
E1	-9.12*** (-7.60)	
E2		-3.13* (2.32)
INV	0.11 (1.87)	0.18** (2.65)
LF	0.57*** (3.58)	0.61*** (6.12)
TFP	3.04*** (3.22)	3.78** (2.45)
Adjusted R-squared	0.97	0.97
F-statistic	125.11	127.18
Akaike info criterion	-3.77	-3.76
Schwarz criterion	-3.19	-3.41
Hannan-Quinn criterion	-3.26	-3.61
Durbin-Watson statistic	1.24	1.27
No. of observations	31	31
Source: Al Torkistani, et al. (2015)		

The second equation (B) in Table 2 corresponds to a 10% cut in emissions (net environmental pollution variable E2). Here again, all estimated parameters possess the correct expected signs and are statistically significant, except the coefficient of total factor productivity. The absolute value of the estimated coefficient on the environmental variable, at 3.13, in Equation (B) is much lower than the absolute value of the coefficient on the environmental factor, 10.22, in Equation (A). Given the relatively large emissions cut in this equation, at 10%, the magnitude of the estimated coefficient on the environmental degradation variable is smaller than the one corresponding to the emission reduction of 5%. Clearly, this suggests that the higher the emissions cut, the smaller the impact of environmental damage on GDP. The overall fitness of the model is good and, with the exception of the low Durbin-Watson statistic, the equation does not appear to suffer from any other econometric problems. Even in the case of the seemingly correlated regression equation errors as demonstrated by the low Durbin-Watson statistic, it is likely to be a spurious alarm since all the data are in first differences of their logarithms.

5. Environmental Investment Segments

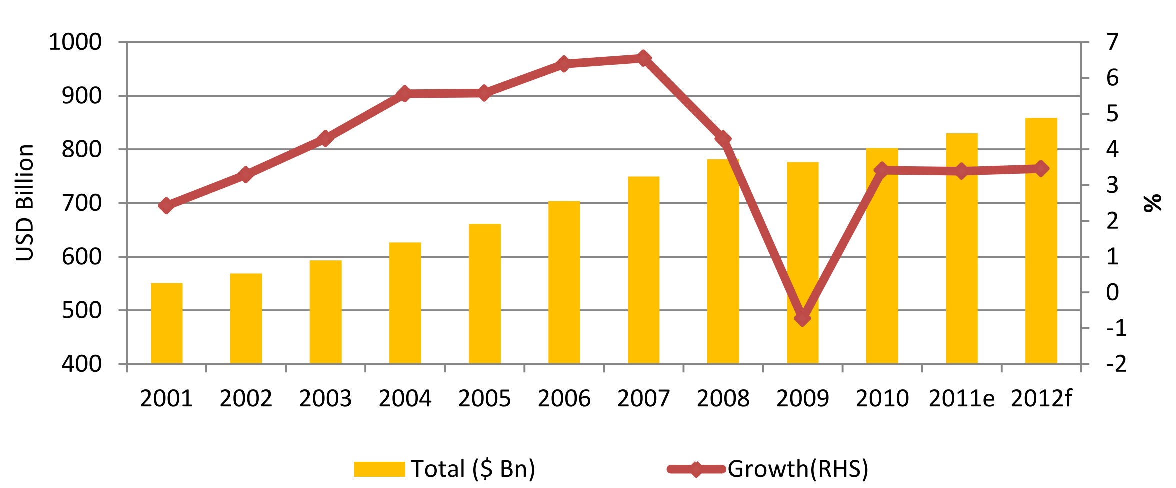
The preceding data analysis suggests that improvements in the environment could spur economic growth and thereby lead to a sustainable Saudi Arabian economy. However, attracting private sector investors into the business of environmental goods and services would require incentive structures that will address the challenges of weak regulatory framework, limited institutional capacity and lack of innovative financing mechanisms. As Al Torkistani et al. (2015) have argued, policy incentives are critical determinants of environmental investments. Assuming that such incentives can be granted, which of the environmental business segments would be potentially attractive to the private sector in Saudi

Arabia? This requires a review of the long term prospects of the global environmental investment landscape with a view to drawing lessons for Saudi Arabia.

The environmental businesses can be broadly classified into three broad segments: environmental services, environmental equipment, and environmental resources. The key question is which of these business channels have the potential of offering the most profitable investment opportunities for the private sector in Saudi Arabia?

The global market for environmental business has expanded considerably over the past decade or so due to a number of factors, including the growing concerns about environmental pollution and energy insecurity caused by supply-side constraints associated with conventional energy and its escalating prices. Figure 4 shows that the global market value for environmental technologies grew by nearly 5% per annum to reach an estimated value of $860 billion by 2012.

Figure 4: Global Market Value of Environmental Technologies

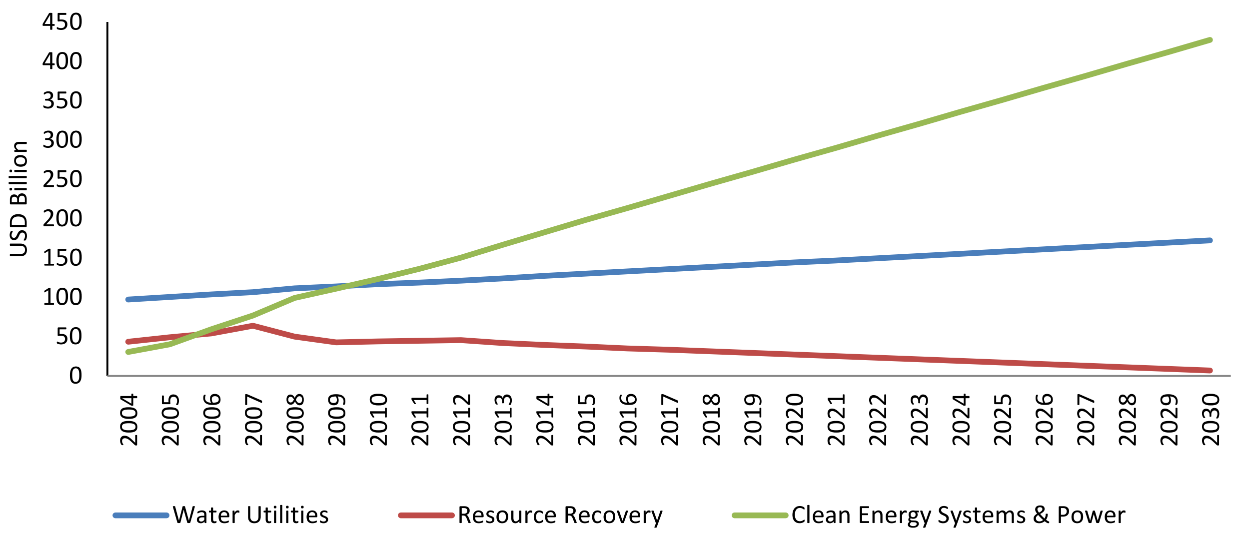


Source: Environmental Business International (EBI, 2011), Taher & Hajjar (2014)

5.1. Investment Opportunities in the Environmental Resources Business

The environmental resources business consists of clean energy (renewable energy and energy efficiency), water utilities and resource recovery. The clean energy business segment is, however, forecast to be the fastest growing environmental business channel, followed by water utilities, as Figure 5 illustrates. Indeed, the clean energy investment can also help to reduce the overall energy sector impacts on climate change (Taylor et al., 2008).

Figure 5: Global Environmental Resources Market Forecast



Source: EBI (2011)

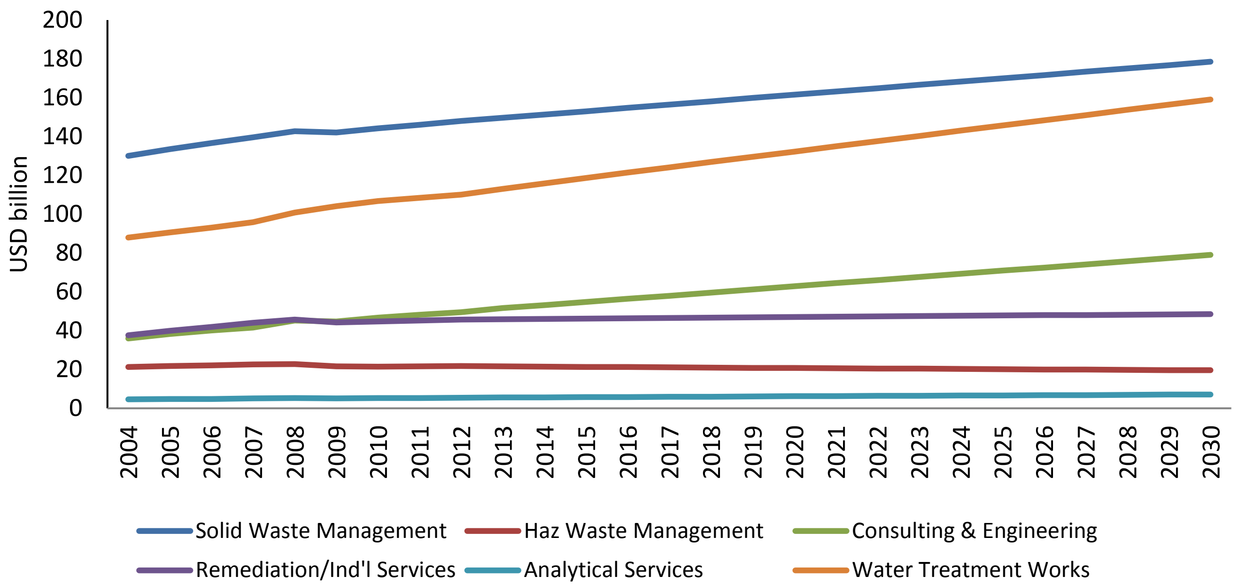
However, renewable energy business is a diverse activity consisting of solar power, wind power, geothermal energy, fuel cells, wave/tide power, and biofuels. Such a diversity provides profitable business opportunities within the renewable energy technology sector. Globally, it is estimated that by 2030 new power generation capacity of 4,700 gigawatts will be built at an estimated investment of about $4 trillion investment, one-third of this capacity will be built in the emerging economies of Asia (Asplund 2008). This means that there is a big opportunity for energy to supply a significant portion of this new electricity generating capacity, since it currently accounts for less than 1% of global electricity production. China in particular provides a classic example of policy-led growth in renewable energy that has created jobs, income and revenue streams for nascent low carbon industries. The renewable energy sector was estimated by Asplund (2008) to have added over $17 billion to China's GDP and employed an estimated 1.5 million at the end of 2009.

Within the renewable energy sector, however, solar power is estimated to create sufficient energy needs of the world's 7 billion people by 2030 (US National Renewable Energy Laboratory, cited in Asplund 2008). In essence solar energy holds great promise for transformation the energy landscape of Saudi Arabia which unlimited supplies of sunshine. In fact, according to the United Nations' Economic and Social Council for West Asia (ESCWA, 2011), the Middle East more than 3,000 hours of sunshine per year, with more than 5.0 kilowatts per square metre of solar energy per day, giving the Kingdom an opportunity to create and sustain competitiveness in solar energy.

5.2 Investment Opportunities in the Environmental Services Business

In the case of environmental services business, two business channels hold great promise for private sector involvement. These are solid waste management and wastewater treatment works, as can be seen from Figure 6. Needless to say, waste management is a very important environmental and health issue for Saudi Arabia due to the high proportion of organic materials in the solid waste stream. Apparently, this can provide potential business opportunities for the private sector in the recycling business.

Figure 6: Global Environmental Services Market Forecast



Source: EBI (2011)

In fact, recent studies have estimated that the GCC region alone generates over 80 million tonnes of waste per annum, 53% of which is on account of construction and demolition waste, 33% due to municipal solid waste and 14% attributed to industrial waste (Taher and Hajjar, 2014). Much of the municipal solid waste materials (64%) in the GCC region is in Saudi Arabia, closely followed by the UAE (19%), and Kuwait (5%), while Qatar, Oman and Bahrain each accounts for 4% (ibid).

Thus the UN ESCWA (2011) has identified the following private sector investment opportunities in waste management services in Saudi Arabia and other GCC countries:

- Site management and cost recovery;
- Specialized services, such as industrial or medical waste servicing;
- Financing investment priorities for expanding waste management coverage;

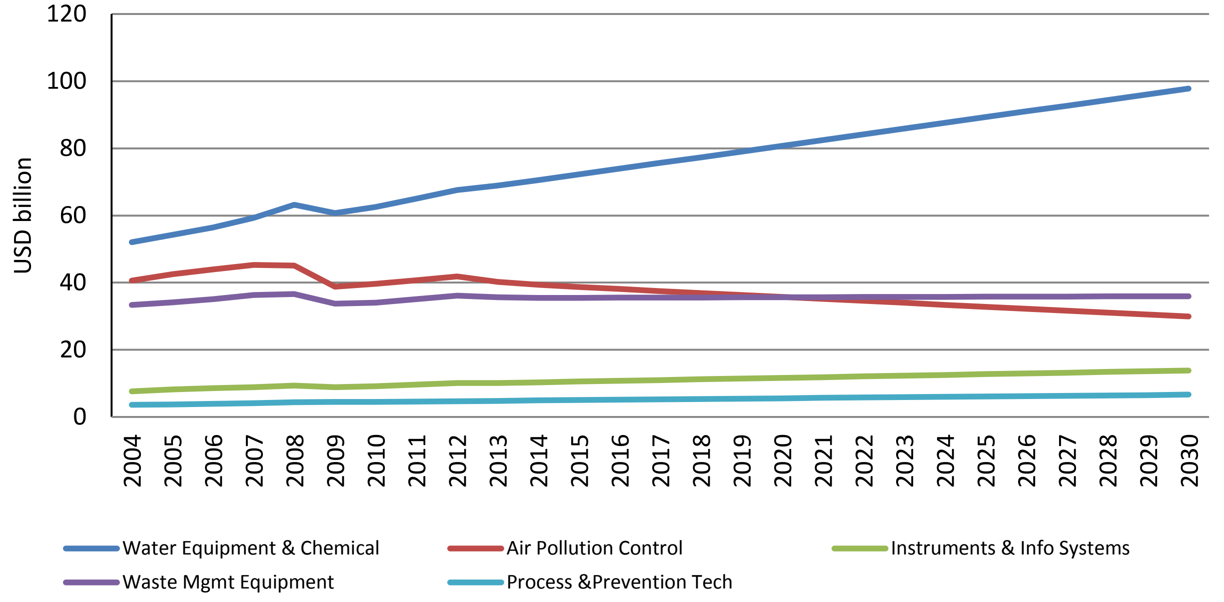
- Establishing waste facilities that are affordable and technologically proven, rehabilitating old dumps and collecting and disposing of hazardous healthcare waste;
- Recycling and Biodegradable plastics activities.

Indeed, the recycling of industrial waste energy, especially in the largely untapped area of Combined Heat and Power (CHP), provides yet a fertile ground for environmental investment in Saudi Arabia, which can also have the potential to create jobs in manufacturing the waste energy recovery equipment, creating the "energy islands" where industrial hosts' waste energy is recycled into power, operating and maintaining the onsite energy islands, and jobs resulting from higher energy productivity and increased competitiveness (Lowe and Gereffi, 2009).

5.3 Investment Opportunities in the Environmental Equipment Business

Business channels in the environment equipment sector consist of waste management equipment, air pollution control equipment, water equipment and chemicals and instruments and information systems. Within this particular business category, the market for water equipment and chemical appears to have the greatest potential for long-term growth for investors, as Figure 7 illustrates.

Figure 7: Global Environmental Equipment Market Forecast



Source: Environmental Business International; Gulf One

This is not surprising in view of the overarching importance of clean water and effective treatment of wastewater to sustainable development. Thus, the global market for water and wastewater treatment equipment is expected to grow tremendously due to the rising water requirements associated with industrialization, demographic dynamics, rapid rate of urbanization, strict laws and stringent discharge limits, and increased awareness about the benefits of water recycling. Stringent wastewater discharge limits or requirements could boost market sales as much as upgrading and building of municipal facilities. Similarly, sales could also be bolstered by filters used as a complementary technology. These activities could provide huge potential for private sector investment in environmental services sector in Saudi Arabia.

6. Conclusion

This paper has used quantitative methods to investigate the environment-economic growth relationship in Saudi Arabia. The main finding from the statistical exercise is that economic growth sustainability in the Kingdom is heavily influenced by ecological factors, suggesting that environmental investments could generate material rate of return on investment, create jobs, boost income and sustainability growth and development. The paper has also identified potential business opportunities for private sector investment in Saudi Arabia. These include renewable energy, especially solar power, wastewater treatment, solid waste management, and recycling businesses. A key caveat, however, is that some of environmental businesses, especially renewable energy investments, are associated with considerable risks and high sunk costs, which often deter private investors. Attracting huge volumes of private investments would require appropriate incentives including pecuniary and non-pecuniary incentives including strengthening institutional and regulatory frameworks and research and development support.

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References

[1] Al-Torkistani H. M., Salisu M. A., & Maimany K. A. (2015). Promoting Sustainable Growth and Development in Saudi Arabia through Environmental Investments: The Role of Incentives (2015), Journal of Economics and Sustainable Development, vol.6, no.24, pp. 220-229.

[2] Anjum Z., Burke P.J., Gerlagh R. & Stern D.I. (2014). 'Modeling the emissions-income relationship using long-run growth rates'. CCEP Working Papers 1403.

[3] Asplund, R.W. (2008), Profiting from clean energy: a complete guide to trading green in solar, wind, ethanol, fuel cell, carbon credit industries and more, New Jersey, John Wiley & Sons Inc.

[4] Bovenberg A.L. & Smulders S. (1995). 'Environmental quality and pollution augmenting technological change in a two sector endogenous growth model'. Journal of Public Economics, no. 57, 369-391.

[5] Brock W.A. & Taylor M.S. (2004). 'The Green Solow model'. NBER Working Paper no.10557, National Bureau of Economic Research, New York.

[6] Castiglione C., Infante D. & Smirnova J. (2012). 'Rule of law and the environmental Kuznets curve: evidence for carbon emissions'. International Journal of Sustainable Economy. 4:254–269.

[7] Chow G.C. & Li J. (2014). 'Environmental Kuznets curve: conclusive econometric evidence for CO2'. Pacific Economic Review, 19:1–7.

[8] Costantini V. & Martini C. (2006). 'Modified Environmental Kuznets Curve for Sustainable Development Assessment Using Panel Data'. Nota Di Lavoro 148.2006.

[9] ESCWA (2011), Environmental goods and services in the ESCWA Region: Opportunities for Small and Medium-sized Enterprises, New York.

[10] Environmental Business International (EBI) (2011). The Global Environmental Market, EBI Report 3000, San Diego, U.S.A.

[11] International Monetary Fund (IMF). (2015). IMF staff completes 2015 Article IV mission to Saudi Arabia. Press Release No.15/249. [2015 June 1], [cited 2015 September 14]. Available from: https://www.imf.org/external/np/sec/pr/2015/pr15249.htm.

[12] International Monetary Fund (IMF). (2014). Saudi Arabia 2014 Article IV Consultation. Washington (DC): IMF Press.

[13] Islam S.M.N. (2001). 'Optimal intertemporal climate change economics: a country perspective'. In Islam S.M.N. (ed.). Optimal growth economics: an investigation of the contemporary issues and the prospect for sustainable growth. London: Elsevier.

[14] Kamco Research (2016). Saudi Arabia's Vision 2030 - Key Highlights, April.

[15] Lowe M. and Gereffi G. (2009). "Recycling Industrial Waste Energy" http://www.cggc.duke.edu/environment/climatesolutions.

[16] Panayotou T., Peterson A. & Sachs J. (2000). 'Is the Environmental Kuznets Curve Driven by Structural Change? What Extended Time Series May Imply for Developing Countries'. CAER II Discussion Paper no.80, Harvard Institute for International Development, Cambridge, MA.

[17] Panayotou T. (2003). Economic Growth and the Environment. UNECE Online, cited 2015 May 11. Available from: http://www.unece.org/fileadmin/DAM/ead/pub/032/032_c2.pdf.

[18] Renewable Energy Policy Network for the 21st Century (REN21) (2011). Renewables Global Status Report: 2011 Update. Paris: REN21 Secretariat.

[19] Sawin J. L. (2004). 'Mainstreaming Renewable Energy in the 21st Century'. World Watch Paper 169, State of the World Library: Washington D.C.

[20] Selden T.M. & Song D. (1994). 'Environmental quality and development: Is there a Kuznets curve for air pollution emissions?' Journal of Environmental Economics and Management, no.27, pp. 147-162.

[21] Stern D.I. (2014). 'The environmental Kuznets curve: A primer'. CCEP Working Paper 1404.

[22] Stokey N.L. (1998). ‘Are There Limits to Growth?’ International Economic Review, no.39, pp.1-31.

[23] Taher, N. & Hajjar, B. (2014). Energy and Environment in Saudi Arabia: Concerns and Opportunities. Switzerland: Springer.

[24] Taylor R.P., Govindarajalu C., Levin J., Meyer A.S. and Ward W.A. (2008). Financing Energy Efficiency: Lessons from Brazil, China, India, and Beyond, Washington D.C.: The International Bank for Reconstruction and Development/The World Bank Publications.

[25] Yaduma N., Kortelainen M. and Wossink A. (2013). ‘The environmental Kuznets curve at different levels of economic development: A counterfactual quantile regression analysis for CO2 emissions’. Manchester University Economics Discussion Paper Series. EDP-1322.