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**Preprint**

## What Does Brunei Teach Us About Using Human Development Index Rankings as a Policy Tool?

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# What Does Brunei Teach Us About Using Human Development Index Rankings as a Policy Tool?

Bryane Michael, University of Hong Kong

|  |    |
|--|----|
| Introduction.....  | 2  |
| How Do Countries Improve their Human Development Index Scores?.....              | 3  |
| How Much Does Brunei Need to Grow to Achieve Its Wawasan Objectives?.....        | 8  |
| Need for Fundamental Economic Change in Order Achieve Fast Economic Growth ..... | 14 |
| How Much Construction Does Brunei Need to Achieve its Wawasan Objectives?.....   | 20 |
| The Prospects and Pitfalls of Using HDI Rankings as a Policy Tool.....           | 28 |
| Conclusion .....   | 32 |
| Bibliography .....   | 33 |

## Summary

The Bruneian Government has set an ambitious target to achieve a top 10 ranking on the UNDP's Human Development Index (HDI) by 2035. To achieve its objective (described in a national strategy document called the *Wawasan 2035*), Brunei's economy needs to grow by 6%-7%. Is setting an HDI target a good way to govern Brunei's policymaking? Is it a good way to govern any country's policymaking? In this paper, we look at the role HDI-rank targets play on economic and fiscal policy. We show that such a headline target (much like a profit target in a private company setting) automatically sets targets for growth in various economic sectors and fiscal policy targets. As such, HDI-rank targeting may provide a useful mechanism for co-ordinating development policies and for monitoring progress against a wide range development goals using only one number.

Keywords: Brunei, Human Development Index, public sector strategic planning, construction sector, dynamic optimisation

JEL Codes: F63, O11, L74, C61

# **What Does Brunei Teach Us About Using Human Development Index Rankings as a Policy Tool?**

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## **Introduction**

Brunei Darussalam (or simply Brunei) is a very rich country -- and very poor country at the same time. The country's GDP per capita -- defined almost in any way -- remains one of the top 10 in the world. Yet, after removing the effect of oil revenues, Brunei ranks in 38<sup>th</sup> place -- between Greece and Oman. Such a ranking reflects Brunei's Human Development Index ranking as well -- with a 30<sup>th</sup> place ranking on the UNDP's Human Development Index (or HDI). Following the trend in public sector long-term strategic planning, Brunei's senior government officials have created a national plan (case called the Wawasan 2035). The Wawasan is supposed to focus a range of programmes aimed at government legislation-writing and executive agency spending on a single over-arching goal -- a top 10 ranking on the UNDP's Human Development Index. Will the Wawasan 2035 work? What can other countries, looking to push up their Human Development Index rankings, learn from Brunei?

In this paper, we show that setting targets for a country's Human Development Index ranking can help co-ordinate broader macroeconomic, sectoral and fiscal policy objectives. Using Brunei as an example, we show how Brunei's top 10 Human Development Index ranking target translates into a real GDP growth rate target of about 6%-7%. Such a target, in turn, translates into target construction sector spending of around \$50 million per year. Such a target helps Brunei's policymakers clearly see that current spending of around \$44 million (and falling!) will significantly contribute to the failure of the Wawasan 2035. We could have looked at other sectors. We focus on the construction sector as this sector will play a pivotal role in Brunei's development -- and represents a contributor to HDI scores much neglected by academics. Other countries (particularly small oil-rich economies similar to Brunei like the United Arab Emirates, several Malaysian states, Qatar, Kuwait, and to a limited extent Azerbaijan) could do well by copying Brunei's HDI targeting strategy.

Our argument proceeds roughly as follows. The first section looks at the way countries like Brunei use HDI-rank targets and how these targets translate into real GDP growth targets. We look at what the literature says about the relationship changes in human development (as proxied by HDI scores and rankings) and economic growth (as proxies by real GDP growth however defined).<sup>1</sup> In the second section, we look at the GDP growth needed for Brunei to achieve its top 10 HDI ranking by 2035. Given that other countries also develop, Brunei needs a 6%-7% GDP growth rate in order to overtake

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<sup>1</sup> We use the phrase "however defined" repeated in this paper when mentioning GDP growth. As the reader knows, several definitions exist for GDP -- including nominal, real, on a purchasing power parity basis, per capita and so forth. We do not wish to focus attention on any particular definition. Instead, we want to focus on the extent to which "stuff" people make helps contribute to a rising HDI rank (as reflected in health and education outcomes measured by the HDI).

many of these rapid developers. To achieve such a fast aggregate growth rate, Brunei's construction, electric & water, transport, trade, finance, real estate and other private sectors must grow exponentially. Construction sector growth in particular will help promote growth in the other sectors – helping to ensure fast aggregate GDP growth. The third section describes concretely how construction sector growth would contribute to overall economic growth – by restructuring the economy and helping to provide the hospitals, schools and other infrastructure needed for rapid HDI rank improvements. In light of our discussion about Brunei's optimal and actual economic growth, the fourth section describes the potentials and pitfalls of using HDI rankings as a policy tool. The final concludes.

## How Do Countries Improve their Human Development Index Scores?

Many governments have explicitly defined increases their Human Development Index (HDI) scores as a key policy objective.<sup>2</sup> Figure 1 provides a partial list of countries with long-term strategic policy documents that explicitly include increases in the country's Human Development Index as a central policy objective. Many of these countries include oil rich economies looking to convert oil revenues into longer-term bases of sustainable economic growth.<sup>3</sup> Yet, others include lower-income jurisdictions looking for any way to co-ordinate economic and social development.<sup>4</sup> Even sub-national governments have started to use their own human development indices (modelled after the UNDP index) to gauge the medium and long-term success of municipal-level policymaking.

**Figure 1: Countries Citing HDI Improvement as an Explicit Policy Goal**  
(selected countries)

| Country               | Current HDI Rank | Policy Document            | Link              |
|-----------------------|------------------|----------------------------|-------------------|
| Qatar                 | 36               | Qatar National Vision 2030 | <a href="#">*</a> |
| Brunei                | 30               | Wawasan Brunei 2035        | <a href="#">*</a> |
| Papua New Guinea      | 156              | Vision 2050                | <a href="#">*</a> |
| South Africa*         | 121              | Human Development Strategy | <a href="#">*</a> |
| United Arab Emirates* | 41               | Economic Vision 2030       | <a href="#">*</a> |
| Azerbaijan            | 82               | Azerbaijan Post 2015       | <a href="#">*</a> |

We do not list all the roughly 40 countries we reviewed, in order to keep the figure readable. Countries with asterisks (\*) represent a major city in that jurisdiction.

<sup>2</sup> The UNDP's Human Development Index (HDI) has become so popular, both in academic and in practitioner circles, that we do not define the index, discuss its background or mention critiques to the index. We do not want to discuss the merits of the HDI. Instead, we only wish to discuss how to maximise performance using this imperfect indicator of policymakers' success. Stanton (2007) provides a more than adequate review of the Index. Ranis *et al.* (2006) represents one of the numerous works which attempt to improve the HDI by proposing additional components besides health, education and income.

<sup>3</sup> Every student in economics learns to allocate resources under resource constraints in order to maximise output. For an explicit formulation of the problem in the context of maximising Human Development Index scores, see Engineer and co-authors (2008).

<sup>4</sup> Authors have written about strategic planning aimed at promoting international development since the days of high developmentalism in the 1940s. We do not have space to describe the various theories and reincarnations of this literature – of which visioning and government strategic policymaking represents one of the latest. See Black and White for a discussion of some of these issues.

A government's ability to rise in the Human Development Index rankings depends on (at least in large part) accelerating economic growth. Commentators looking at the relationship between economic growth and increases in human development usually talk changes about real per capita GDP growth on a purchasing power parity basis as compared with changes in the UNDP Human Development Index. Most authors accept the empirically defined relationship between GDP and increases in HDI ranks and scores.<sup>5</sup> However, numerous authors proffer a wide range of explanations for such a relationship as well as opinions about the extent to which correlation reflects causality. Figure 2 provides a cursory overview of this extensive literature. We have divided these opinions into six groupings – uncritically accepting that GDP growth reflects economic development and increases in the UNDP's HDI rankings equate to increases in human development.<sup>6</sup>

**Figure 2: Overview of the literature about the relation between economic growth and human development indicators**

| Effect and representative authors<br>(representative authors)                     | Summary effect   |
|---|--|
| <b>Strong relationship</b><br>Ranis (2000), Suri (2011)                           | GDP growth and HDI growth strongly correlate, albeit for some groups of countries more than others.  |
| <b>Weak relationship</b><br>Brady <i>et al.</i> (2007), Mukherjee (2011).         | Looking at disaggregated data and when taking other factors into account, the relationship between HDI scores and GDP growth rates is far weaker than simple bi-variate correlation implies. |
| <b>Effect of government spending</b><br>Davies (2009)                             | Government spending has an important role to play in changing human development (and economic growth) outcomes.  |
| <b>Income distribution</b><br>Foster (2005)                                       | Economic growth ignores how gains distribute to the population. HDI scores also fail to measure and address these disparities.   |
| <b>Trade channel</b><br>Davies and Quinlivan (2006), Ghulam <i>et al.</i> (2008). | Trade brings human development as well as economic growth. Focusing on trade policies can “kill two birds with one stone.”   |
| <b>Critical</b><br>Cahill (2005), Ranis <i>et al.</i> (2006).                     | The search for a link is misguided. Human development encompasses other things that economic growth (like environmental protection and happiness).   |

The figure provides some of the authors writing in each school of thought. We do not try to provide a complete list.

Sources: see figure for authors.

<sup>5</sup> Throughout this paper, we will refer to HDI scores and rankings. The score refers to the number ranging between 0 and 1 (where 1 represents the highest level of human development and 0 as the lowest). The ranking refers to the place the country appears on the list of countries ranked by HDI scores. Thus, Brunei's HDI score of 0.855 in 2012 put the country in 30<sup>th</sup> place on the HDI rankings.

<sup>6</sup> We uncritically accept these definitions for three reasons. First, the literature already offers a far better discussion of the issues around economic development and human development than we could hope to provide. Second, Bruneian policy explicitly defines economic development and human development using these indicators. As our paper discusses how Bruneian policymakers can maximise their HDI ranking, we must use this as our definition of human development. Third, our paper focuses on the ways that Bruneian policymakers can increase their HDI ranking – focusing on the positive rather than normative aspects of such a decision.

Each of these schools of thought offer differing interpretations about the relationship between GDP growth and increases in Brunei's (and other countries') Human Development Index ranking. According to the strong relationship school, we expect to observe a strong relationship between economic growth and HDI-rank growth in Brunei and other countries. If the Bruneian economy and society reflects this school of thought, Bruneian policymakers need only increase GDP growth rates. Increases in HDI rankings will take care of themselves. If the Bruneian economy reflects the weak relationship school, then increasing GDP growth rates would only poorly serve to increase Brunei's HDI rank. Brunei's policymakers would need to focus on other policies (besides those promoting economic growth and diversification) in order to achieve a top 10 ranking. The effect of government spending school indicates that government spending does more than just increase economic growth and push a country up an HDI ranking list. Such spending can dramatically affect the way changes in GDP reflect on changes in HDI rankings. Investments in school, hospitals, and other elements of health and education can dramatically change the way the private sector crowd-in investments in health and education.

Three other schools of thought encourage us to focus on other things besides GDP growth and public spending on schools and hospitals in order to push Brunei up the UNDP's HDI ranking list. If the Bruneian economy reflects the attributes attributed to the income distribution school (as we have defined it), increasing GDP growth rates and even an HDI ranking will not help achieve Brunei's real goal – increasing actual human development for all Bruneians. Authors writing in this school admonish us to pay attention to income inequality – even if we do not explicitly include it as a policy instrument. Authors writing in trade channel school tradition argue that openness to trade can accomplish both goals (increases in economic growth and human development). Under this approach, Bruneian policymakers need not worry so much about economic and social policy. Instead, a focus on Brunei's trade policies (and openness) represents the core element of increasing both GDP growth and the country's HDI ranking. The critical school argues that Brunei's policymakers need not focus on increasing something as superficial as the UNDP's Human Development Index. Development represents a complex phenomenon involving environmental protection, well-being, happiness, adherence to Muslim values and other factors.<sup>7</sup> In this view, focusing on the UNDP index detracts attention and valuable resources from the aspects of human development which Brunei's policymakers should focus on.

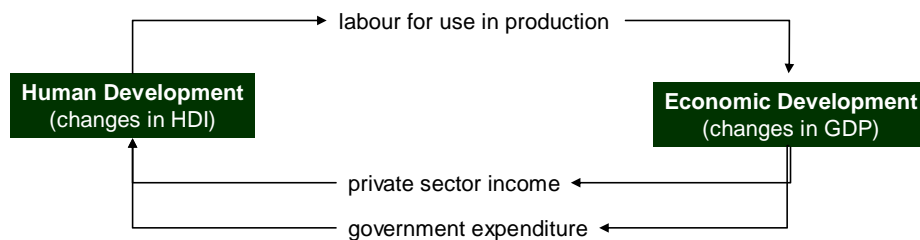
Yet, all these strands of literature over-intellectualise the problem of defining and using human development measures – making academic literature an unreliable guide for Brunei's real-world policymakers. Figure 3a shows the basic model underlying much of the academic work in this area. Most scholars see economic development and human development as a circular chain; human development leads to economic growth – which begets human development. These studies tend to define abstract concepts with data and

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<sup>7</sup> A wide variety of scholars argue for something better than the Human Development Index. Yet, other measures have not had the popular appeal of the HDI. In the Muslim world, the only potential competitor to the HDI may come in the form of a revised form of the Index which takes Islamic values into account. See Anto (2009) for an overview of a "Muslim HDI" which focuses on spiritual development.

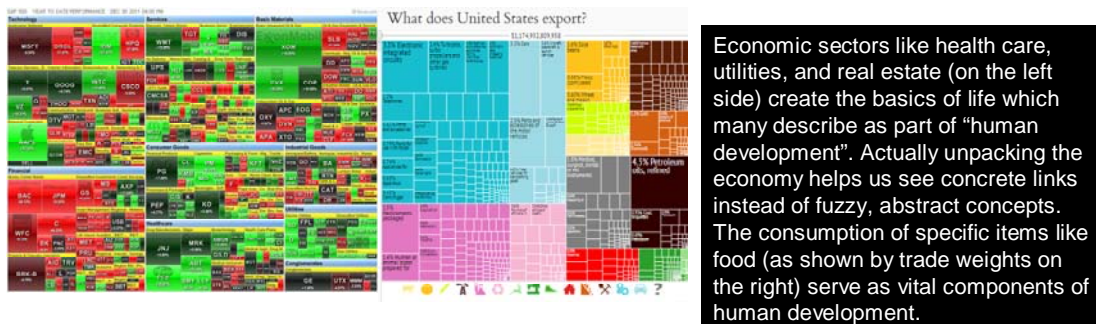
then look for a relationship – ignoring the structure of the economies and populations these studies supposedly focus on. Even a quick glance at an actual economy shows how simplistic Figure 3a is. Figure 3b shows some of the diversity of these economies – using the US as an example. The term “economic development” contains sectors like utilities, healthcare, and real estate – elements which contribute to the HDI index. Exports of basic materials drive economic growth – and provide the inputs needed to provide educational, health and other services. **We can not understand the relationship between the HDI and GDP growth per capita without unpacking the specifics of the economy.**

**Figure 3a: Relation Between Human Development and Economic Development**



Source: based on Ranis et al. (2000).

**Figure 3b: Much Economic Activity Actually Aimed at Areas Largely Considered As “Human” Development**

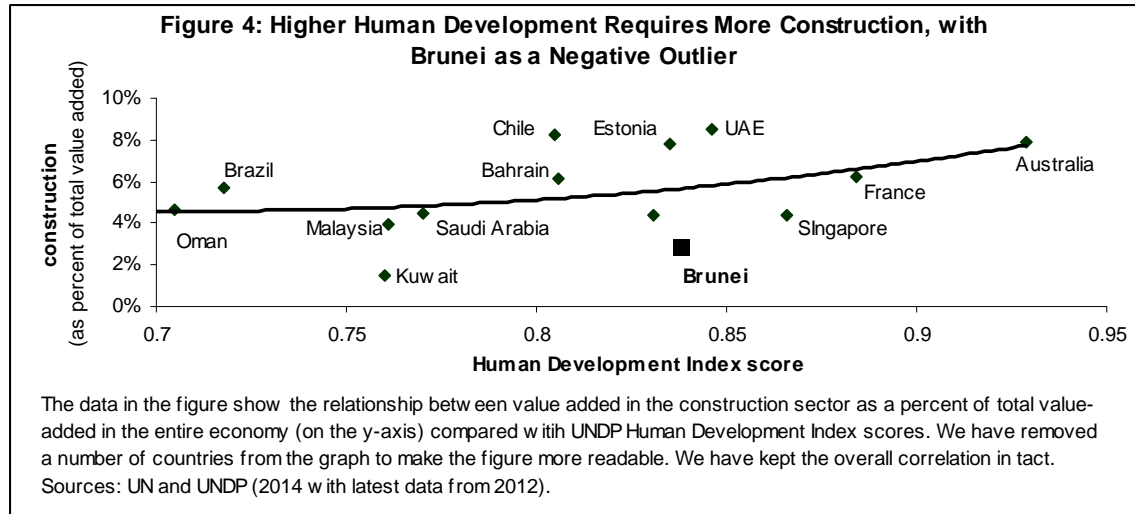


Source: Stockviz and Atlas of Economic Complexity (2014).

While a range of sectors contribute to both economic and human development, construction probably represents the most important for economies like Brunei (and its peers like Qatar, UAE, Malaysia and other developing countries). Construction obviously represents an important component of GDP. However, construction likely serves as a basis for human development (as measured by the HDI) as well. Figure 4 shows the correlation between construction (as a percent of overall economic value added) and HDI scores for a range of countries. Usually, countries with higher HDI scores need to pay for building the hospitals, schools and other amenities which promote human development.



Brunei (and Kuwait) appear as the outliers. These countries appear to invest too little in their construction sectors. The data clearly point to an important role for the construction sector in both economic development (namely GDP growth) and human development (as measured by HDI scores).



What do we know about the way construction sector growth leads to changes in economic and human development? Very little. The literature, while accepting a close link between construction and GDP, has a hard time deciding if construction leads to economic growth or visa versa. Bon (2000) represents one of the first attempts to describe the relationship between construction sector activity and a country's economic development across time. He presents evidence for, what other authors eventually describe as, the Bon Curve. The Bon Curve represents inverted-U curve when comparing construction activity with economic development. Construction activity lags overall economic growth for low income incomes, surpassing such growth as an economy enters the medium-income category and again lags overall economic activity once the economy enters upper-income status. Many authors find that construction plays an important role in economic development, particularly for already developed economies (Ruddock and Lopes, 2006). Yet, a wide range of studies focusing on a range of diverse economies like Trinidad and Tobago, Hong Kong, and Sri Lanka all suggest that economic development precedes any construction boom (Hosein and Lewis, 2005, Yiu et al., 2004, Ramachandra et al. 2013). Using evidence from India, Mallick and Mahalik (2010) find that construction promotes development – not through increasing amenities like roads, hospitals and so forth – but by supplying income-generating jobs. Authors like Agarwal *et al.* (2008) point to the important role construction plays in generating new knowledge, skills and ideas which spill over into other sectors.

What do these findings from other countries mean from Brunei? First, by looking at the rate of growth of the Bruneian economy (and particularly the non-oil part of the economy), we can guess how much growth Brunei will need to achieve a top 10 HDI ranking. We estimate how much growth Brunei needs to achieve such an HDI ranking in the next section. Second, we can look at the stylized facts about Brunei's growth to say



something about the way that construction likely contributes to economic development. Such construction would likely need to provide the basis for completely reorganising the Bruneian economy – rather than simply scaling it up. We discuss the role of such a restructuring in the third section. The literature also suggests that Brunei requires a massive construction boom in order to achieve a top 10 HDI ranking. We analyse the data to assess the extent to which such a building spree would translate into HDI ranking change. In the final section, we discuss the problems and pitfalls of using HDI ranking to decide how much construction (and other economic activity) a country should invest in – and whether such activity accurately gauges the country’s likely rise in the HDI rankings.

### **How Much Does Brunei Need to Grow to Achieve Its Wawasan Objectives?**

Brunei’s national development strategy aims to achieve a top 10 ranking in the UNDP’s Human Development Index (HDI) by 2035. As noted by the Wawasan 2035, “[t]he National Vision known as Wawasan Brunei 2035, aims to make Brunei Darussalam, by 2035, as a nation which will be widely recognised for the accomplishment of its educated and highly skilled people as measured by the highest international standards; quality of life that is among the top 10 nations in the world; and a dynamic and sustainable economy with income per capita within the top 10 countries in the world.”<sup>8</sup> As explained in Figure 5, such a goal is tantamount to achieving a top 10 ranking in the UNDP’s Human Development Index and a top 10 ranking among countries in GDP-per-capita.<sup>9</sup>

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<sup>8</sup> Brunei Council for the Long-Term Development Plan, *Sabda By His Royal Highness Prince Mohamed Bolkiah Chairman Of The Council For Long-Term Development Plan* (BPKJP), Part I: Wawasan 2035, 2006, at 3(II), available [online](#).

<sup>9</sup> The Human Development Index represents a composite of measures of life expectancy (which presumably acts as a proxy for quality of life in the Wawasan objective), education, and gross national income on a purchasing power parity basis.

### Figure 5: Is Wawasan 2035 about a Top 10 Income or Development Ranking?

The regulatory instrument (the *Sabda*) outlining the Brunei's long-term National Vision does not explicitly define a single objective. The Sultan's decree notes that education and skills will be among "the highest international standards."<sup>7</sup> Quality of life (however measured) will remain "among top 10 nations in the world." The Vision aims for income per capita "within the top 10 countries in the world." To achieve any and all of these objectives, Brunei should keep its top 10 ranking in income-per-capita. In simple terms, high incomes need to pay for high levels of education and health provision. Yet, policies aimed at keeping Brunei in the top 10 on income-per-capita terms must focus on broader development for three reasons.

**1. Income-per-capita needs to focus on non-petrol income per capita** – Brunei will run out of oil. Even now, many Bruneians without connections to the oil-industry have very low incomes – making any income-per-capita measure meaningless. Bruneians may be rich on average, even if the average Bruneian is not rich. The only way to do that is by expanding the sectors which measure health and educational attainment (like the health care sector and the range of training sectors present in a modern economy).

**2. Income generation requires broader human development** – workers can not develop goods and services for a fast growing economy without education and health. Bruneian workers can not achieve high incomes-per-capita without simultaneously achieving top-ranking education and health rankings as well.

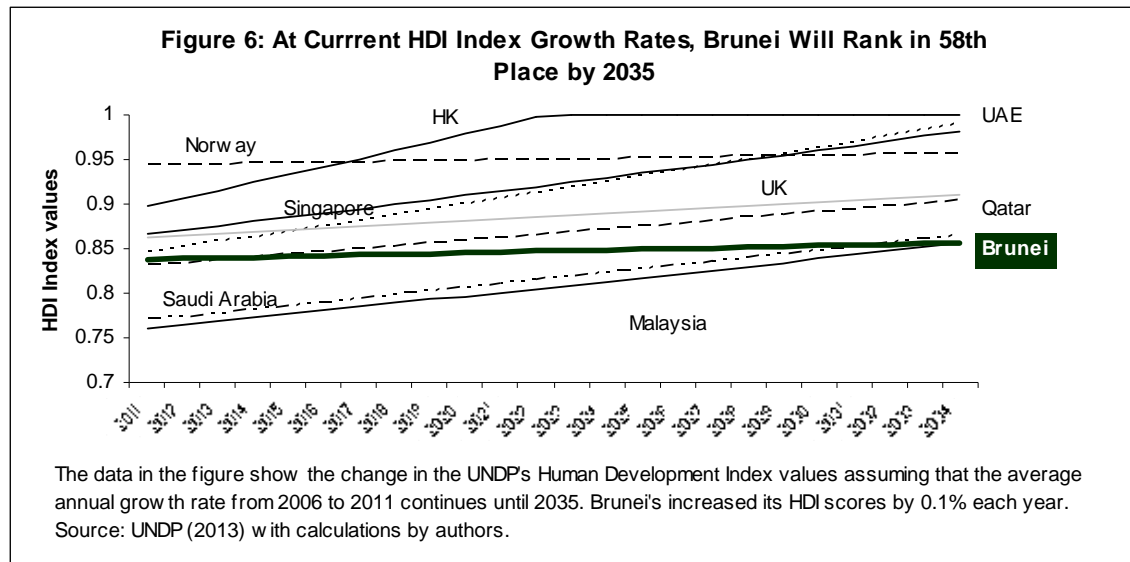
**3. The tenor of the *Sabda* clearly focuses on development and not wealth** – the Prime Minister's (Royal) decree describes 50 activities, many aimed improving overall national welfare. If the Wawasan 2035 wanted to focus only on incomes, the rest of the decree would only have set income-specific goals.

The HDI – by definition – represents a composite of income, health and education rankings. Thus, achieving the Wawasan 2035 goals clearly requires achieving a top 10 HDI ranking. Such a ranking also requires a top 10 income-per-capita ranking. So, Brunei will need to achieve a top 10 HDI ranking -- no matter how one interprets the *Sabda*.

According to even the most simplistic projections, Brunei won't be able to achieve a top 10 HDI ranking (and thus a top income-per-capita ranking) without sustained GDP growth. Figure 6 provides an extremely simplistic (yet illuminating) illustration of the challenge of obtaining a top 10 HDI ranking. Since 2005, Brunei's Human Development Index score has increased annually by about 0.1% per year. In contrast, the United Arab Emirate's HDI score has increased 0.7%. Reflecting the way geometric growth compounds over time, these small differences translate into very large differences over time. Both jurisdictions have started out at relatively similar levels of human development (as defined by the UNDP). Yet, by 2035, the UAE will emerge as one of the most "developed" jurisdictions (in human development terms) in the world. In contrast, Brunei's human development will stagnate. Eventually far lesser developed jurisdictions like Malaysia will catch up with Brunei (on human development terms).<sup>11</sup>

<sup>10</sup> The Bruneian Sultan serves as the Prime Minister. His *Sabda* thus serves as an executive order.

<sup>11</sup> We do not want to develop a perfect predictor for Human Development Index change over time in Brunei. Instead, we want to use simple methods to calculate and argue for the relative difficulty Bruneian policymakers will face as they put policies into place which help achieve the Wawasan 2035 goals.



Achieving the top 10 will be harder than the framers of Wawasan 2035 might have imagined. According to the Wawasan, Brunei's Human Development Index should reach 10<sup>th</sup> place or better. Bruneian policies must accelerate HDI growth beyond its current 0.1% per year. Yet, only 11 of the roughly 28 countries able to increase the rate of change of their HDI scores in recent years come from outside of Sub-Saharan Africa. Moreover, Bruneian policies must increase HDI growth rates by more than just a little. Figure 7 shows the effect that increasing Brunei's HDI growth rates would have on its relative ranking with other countries, under a range of assumptions. For example, if Bruneian manpower development policies lead to an extra 0.1% increase in HDI growth, Brunei would rank in 46<sup>th</sup> place – assuming other countries merely keep their historic their HDI growth rates.<sup>12</sup> Even if all other countries “froze in place” (in terms of their human development), Brunei would still reach a 23<sup>rd</sup> ranking. Out of the roughly 170 countries the UNDP tracks, only about one-quarter of them (43 countries) increased their HDI growth rates during the previous decade. Under the crazy assumption that all other countries stop developing, Brunei would still need to increase its human development index score growth rate from 0.1% to 0.3%. Under more realistic (though still simplistic) assumptions, **Brunei would achieve its Wawasan 2035 objectives only if economic growth and broader government policy caused human development growth to accelerate by a factor of 6.** Only 9 countries managed to accelerate their human development by such a factor during the previous decade.

<sup>12</sup> We use simple extrapolation of historical growth rates in order to illustrate a general argument rather than provide rigorous estimates for HDI development across countries. Using more complex (and probably more accurate) methods would require us to provide detailed and confusing explanations which would draw attention away from the main point of our analysis.

**Figure 7: Achieving Tenth Place on the HDI will Require at Likely Trebling the Growth Rate of Progress on Human Development**

| increasing Brunei's HDI growth rate by | gets this HDI score in 2035* | new rank if other countries continue at previous growth | new rank if all countries keep 2011 scores | number countries able to achieve from 2000 to 2010 |
|--|------------------------------|---|--|--|
| <b>0.1%</b>                            | 0.876                        | 46  | 23   | 43   |
| <b>0.2%</b>                            | 0.895                        | 39  | 15   | 32   |
| <b>0.3%</b>                            | 0.915                        | 30  | <b>3</b>                                   | 27   |
| <b>0.4%</b>                            | 0.935                        | 18  | 2  | 21   |
| <b>0.5%</b>                            | 0.956                        | 13  | 1  | 15   |
| <b>0.6%</b>                            | 0.977                        | <b>7</b>  | 1  | 9  |

The data in the figure show the effect on Brunei's relative human development index scores and ranking across countries under a range of different assumptions. Looking at the first two columns together, if Brunei increased its HDI growth by one extra tenth of one percent per year until 2035, the Sultanate's HDI score would increase to 0.876 by 2035. If other countries' HDI indices continued growing at their previous average growth rate, Brunei would rank in 46<sup>th</sup> place. If all other countries keep their 2011 scores while Brunei's HDI index growth accelerated by one-tenth of one percent, Brunei would only rank in 23<sup>rd</sup> place. The first black cell with the "3" shows that Brunei would rank in third place with by tripling its HDI score growth rate while all other countries remained at their 2011 score. The second black cell with the "7" shows that Brunei would rank 7<sup>th</sup> if policies sextupled the current growth rate (assuming other countries grew at their current growth rate).

As we show in the next figure, an HDI growth rate of 0.3% appears to be the highest average achievable growth rate in HDI indices for the optimal GDP growth rate of about 3% (if we use other countries' experiences as a guide). A HDI score growth rate of 0.6% appears the optimal growth rate if Brunei follows the best-in-class country examples of Papua New Guinea (!?!), Cyprus, and Uruguay.

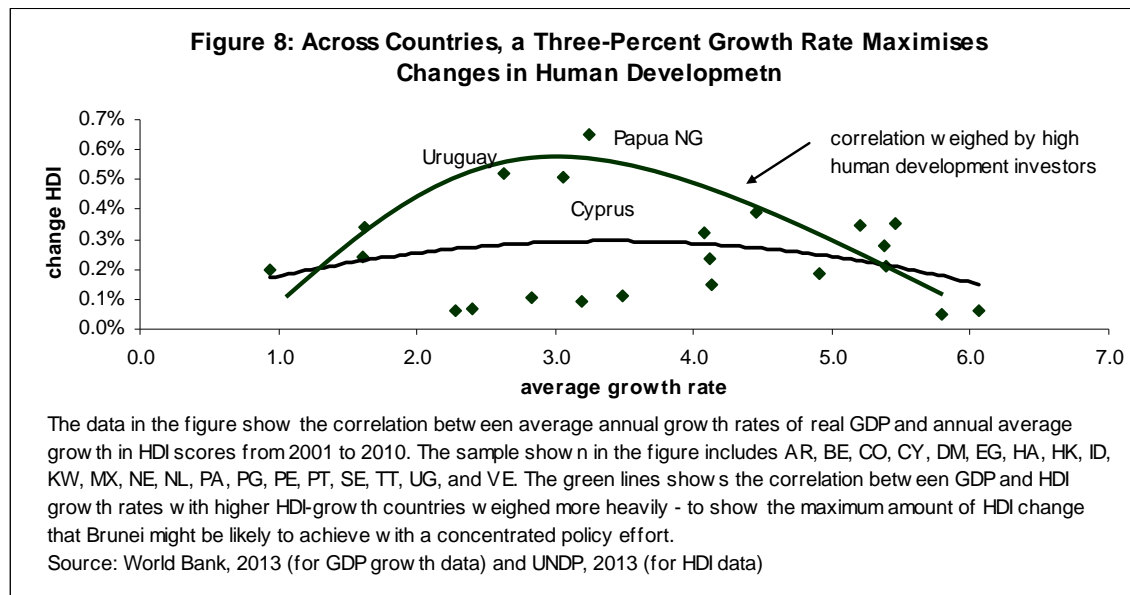
Source: authors.

To achieve its Wawasan targets, Brunei would need to achieve sustained GDP growth rates of about 6%-7% (with about 4% of that growth coming from non-oil).<sup>13</sup> Figure 8 shows the cross-country change in HDI scores for changes in GDP growth rates over the past decade. We have labelled the countries which achieved the highest accelerations in HDI scores (of about 0.6% per year). As shown in the figure by the solid black line, 3% growth in real GDP seems to correlate with the highest growth rates in Human Development Index (HDI) scores. If Brunei managed to replicate Uruguay's, Cyprus' and Papua New Guinea's HDI acceleration, a real GDP growth rate of 3% would correspond with the 0.6% acceleration in HDI scores needed for Brunei to achieve its Wawasan objectives. Yet, growth rates of more than 3% could likely decrease HDI.<sup>14</sup> For oil-

<sup>13</sup> For readers too impatient to read ahead, our estimate of 5% comes from current growth rates attributable to the oil sector (of about 2% over the course of the last 5-6 years) and 3% from the non-oil sector. The countries which achieved the fastest growth rates in HDI scores had been non-oil economies. We thus (and only somewhat implausibly) argue that the oil sector has and will contribute relatively little to HDI growth. Thus, we argue that Brunei will need to achieve 3% growth in the non-oil sector to achieve the same results as other economies which grew at 3%. Notice that 3% growth in non-oil output has not automatically maxed-out HDI score growth in all economies. Venezuela and Paraguay each grow at an average 3% -- with similar HDI growth rates as Brunei's. We thus attribute the difference to the oil sector.

<sup>14</sup> Such decreasing developmental returns to GDP growth could arise for a wide number of reasons. Public expenditure could focus on financing industrial production while starving funding for schools and hospitals. Workers could spend too much time working while sacrificing their health and the continuation of their

exporting economies -- like Mexico, Egypt, Venezuela and others – their faster GDP growth correlated with slower HDI score growth. We thus see oil as a drag on human development. As such, we argue that **Brunei would need to achieve an additional 3% GDP growth (above its current oil-fuelled GDP growth) to achieve the HDI score acceleration needed to achieve its Wawasan objectives.** If Brunei follows the path of non-oil countries shown in Figure 4 along the green line (as opposed to the black line which included oil-exporting countries), the country will achieve its Wawasan objectives.



Where will future production need to come from in order to ensure that Brunei's economy can deliver on the Wawasan commitments? Government has grown over the period at 5%. We can set both mining and manufacturing at 1% growth (to match the average growth rate of the economy over the period). We can also assume that government consumption of GDP matches the overall growth rate of 3%. These simplistic assumptions allow us to make crude predictions about the extent to which other sectors need to grow in order achieve an overall growth in GDP of 3% in nominal terms. Other sectors of the economy must grow by double digits (around 15% per year until 2035) in order to achieve the 3% overall growth rate needed to achieve the Wawasan 2035 targets.<sup>15</sup> Figure 9 shows the required in Brunei's economy needed to achieve such a 3% bump-up in GDP growth. Production in these other sectors must increase to about 15% (a result which we obtain because we spread the required growth over sectors

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studies. We want to present these data and tell what they mean for Brunei rather than theorise why they might arise.

<sup>15</sup> Mining and manufacturing (which we assume includes some oil sector related production) accounts for 70% of Brunei's GDP. The oil sector has grown at a relatively slow 1%-2% per year (with a large amount of annual variation) and manufacturing at about 5% per year. Because the other sectors of the economy represent a small share of the overall economy, they must grow far more quickly to bring the overall average growth rate to 3%. To argue by analogy, imagine a 100 tonne boat wanted to go at 3 miles per hour. If a 30 tonne boat pushed the larger boat, the small boat would need to push its engines more quickly (about 15 miles per hour in our example of the Brunei economy) to get the big boat travelling at 3 miles per hour.

evenly). In most cases, the required change in growth comes out at 4-5 times current growth rates. Construction production must increase from its growth rate of 4% to roughly 15%. Finance growth rates per year must increase by 5 fold. The column in black shows needed growth rates assuming that construction represents 20% of an after-the-oil-dries-up economy.<sup>16</sup>

**Figure 9: The “Productive” Sectors Must at Least Double their Growth Rates to Achieve Wawasan 2030**

| Sector                      | share of<br>“productive”<br>economy in<br>2011* | growth rate<br>in 2011** | if use same<br>weights | if<br>construction<br>at 20% of<br>GDP | trade<br>heavy (at<br>30%) |
|-----------------------------|---|--------------------------|------------------------|--|----------------------------|
| <b>Construction</b>         | 14%   | 4%                       | 16%                    | 17%                                    | 17%                        |
| <b>Electric &amp; Water</b> | 3%  | 7%                       | 15%                    | 16%                                    | 16%                        |
| <b>Transport</b>            | 16%   | 8%                       | 15%                    | 16%                                    | 16%                        |
| <b>Trade</b>                | 17%   | 8%                       | 15%                    | 16%                                    | 18%                        |
| <b>Finance</b>              | 14%   | 3%                       | 15%                    | 16%                                    | 16%                        |
| <b>Real Estate</b>          | 11%   | 4%                       | 15%                    | 16%                                    | 16%                        |
| <b>Private</b>              | 25%   | 7%                       | 15%                    | 16%                                    | 15%                        |

The data in the figure show the growth rates of various sectors in Brunei before 2012 and the required growth rates for achieving an overall non-oil GDP growth rate of 3% (with total GDP growth at about 5%-7% if past oil-driven growth continues as in the past). We assume that the sectors shown in the figure maintain their current proportional contribution to GDP

\* These weights omit the value of mining, manufacturing and government production.

\*\* These growth rates reflect compound annual average growth rates from 2007 to 2011 in US nominal dollar terms with each year’s average Brunei to US dollar exchange rate used.

Brunei’s policymakers (and the public which must make this growth happen) should not underestimate the magnitude of the Wawasan-induced changes to come.<sup>17</sup> Figure 10 shows the value of GDP each sector must contribute by 2035 in order to for Brunei to reach an oil-dependency-free top 10 place on the HDI list. By 2035, Brunei’s construction sector must add the same value as the 2013 gross metropolitan value of Bandung (Indonesia). Hopefully, such expenditure will have complementarities with -- and create public goods for -- other sectors. However, even without such effects, the construction sector must expand by billions and billions in order to achieve the Wawasan 2035.

<sup>16</sup> As we argue later in the working paper, construction will play a pivotal role in the early stages of Brunei’s development.

<sup>17</sup> As we argue in this brief, Brunei’s policymakers will have only a small role to play in achieving the Wawasan objectives. Government’s optimal regulatory response to achieving the Wawasan objectives consists of laissez-faire policies which encourages Brunei’s manpower to develop the economy.



**Figure 10: Brunei Will Need to Add the Value of Several Large Cities in Non-Petrol Production to Achieve its Wawasan 2035 Targets**  
(all figures in US dollars to facilitate international comparisons)

|                             | 2011  | 2025    | 2035   | city with similar GMP*  |
|-----------------------------|-------|---------|--------|-------------------------|
| <b>Construction</b>         | \$44m | \$8.4b  | \$22.1 | Bandung (Indonesia)     |
| <b>Electric &amp; Water</b> | \$11m | \$1.9   | \$5.0  | Samut Prakan (Thailand) |
| <b>Transport</b>            | \$5m  | \$7.4b  | \$19.3 | George Town (Malaysia)  |
| <b>Trade</b>                | \$52m | \$17.4b | \$46.8 | Amsterdam (Netherlands) |
| <b>Finance</b>              | \$45m | \$7.8   | \$20.7 | Medina (Saudi Arabia)   |
| <b>Real Estate</b>          | \$35m | \$4.6   | \$11.9 | Semarang (Indonesia)    |
| <b>Private</b>              | \$78m | \$8.7   | \$22.5 | Kuala Lumpur (Malaysia) |

The data in the figure show the total production in the sectors shown needed for an overall growth rate of 3% excluding the mining (oil) and manufacturing sectors. We excluded government, mining and manufacturing sectors from GDP data from Brunei's 2011 national accounts to order to look at the "productive" sectors. We then projected resulting GDP out until 2035 at a growth rate of 4% per year (which corresponds to 3% of "pure" growth while keeping the 1% growth from the oil sector). We then assigned the resulting amount to each sector according to its 2011 weight in GDP (excluding the mining, manufacturing and government sector).

\* GMP stands for gross metropolitan product.

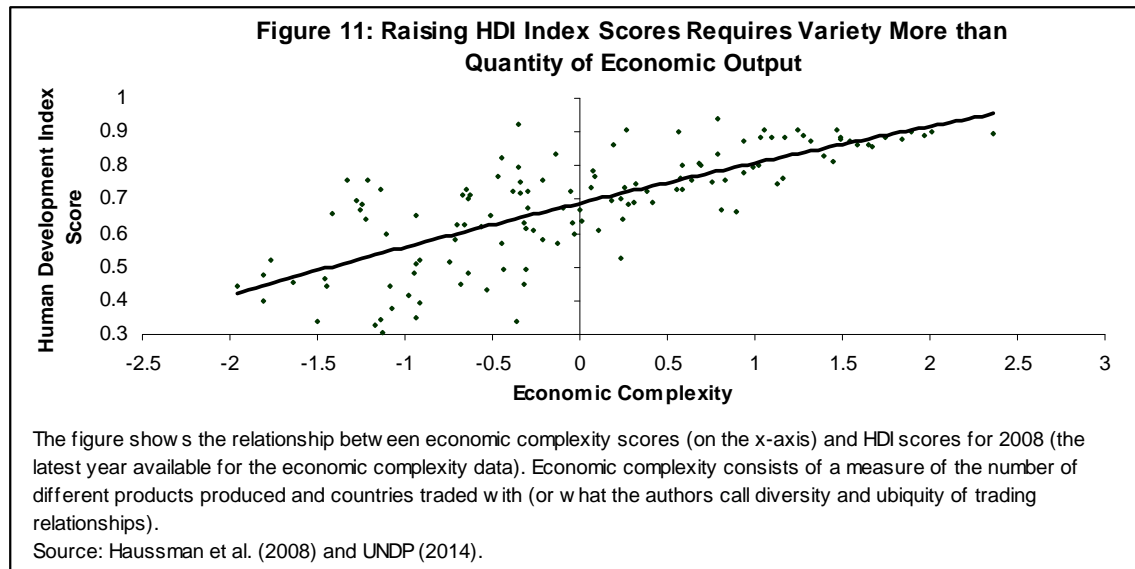
Source: Authors calculations (for needed value of production to achieve a top 10 ranking), Pricewaterhouse Coopers (2008) for gross metropolitan equivalents up to \$20 billion and McKinsey Urban World website for smaller cities.

The data show that economic growth must greatly accelerate so that Brunei can achieve a top 10 HDI ranking. However, Bruneian business owners and government officials can not simply scale up existing economic activities. Bruneian company owners must enter new sector. The entire economy requires reorganisation away from petrol-producing (and related) activities. The government will need to fund huge amounts of infrastructure (and thus construction) in order accomplish such a restructuring.

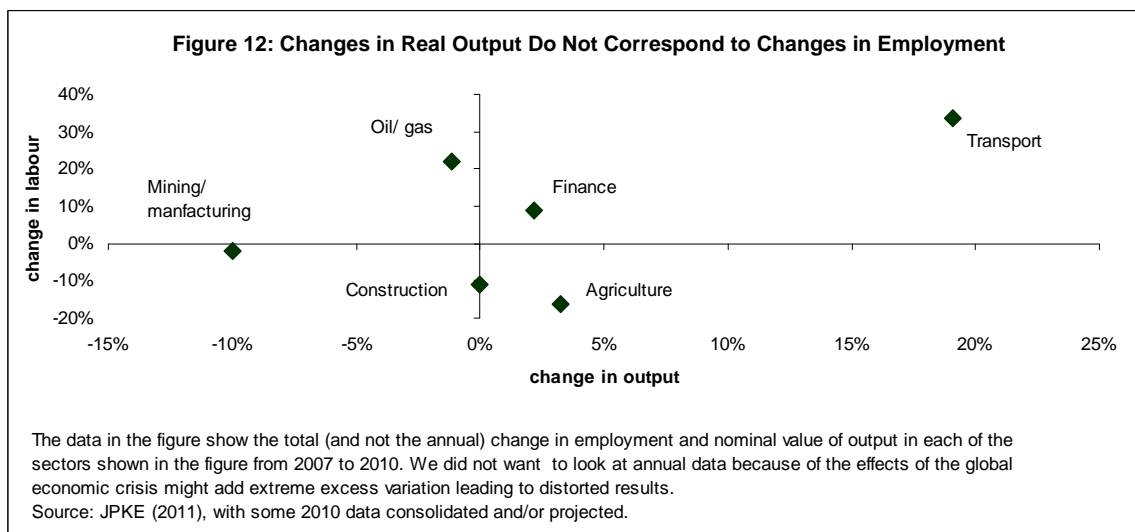
### **Need for Fundamental Economic Change in Order Achieve Fast Economic Growth**

The analysis above assumed that Bruneian policymakers can just pump in more resources into order to get ever-higher HDI rankings. Yet, we know that simply scaling up an economy producing \$8,000 per capita per year in GDP does not have the same economic structure as one producing \$40,000 (to take a hypothetical example). Bruneian policymakers can not simply expand existing economic sectors in order to increase GDP growth (especially non-oil GDP growth) and move up the HDI rankings. Figure 11 shows the strong relationship between economic complexity (as measured by the number of different products a country makes for trade and the number of trading partners that country has) compared with HDI index scores. As shown, more complex economies tend to have higher HDI scores.

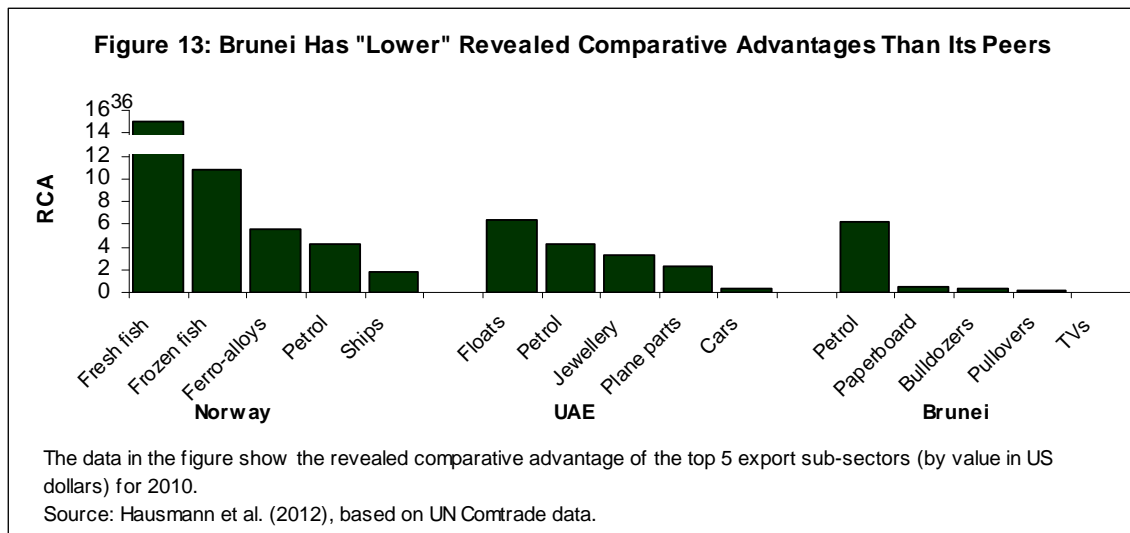




Even the most superficial glance at output and employment suggests that we can **NOT** simply pile-on workers into sectors we want to grow. Figure 12 shows the way that employment changed in response to (or at least at the same time as) changes in various sectors. The oil and gas sector grew by over 20% at a time when its employment decreased, albeit slightly. The agriculture sector lost workers, despite growing slightly. Only transport followed the typical trend – increasing the number of workers while growing rather vigorously throughout the period. Changes in labour certainly don't follow changes in sectoral output. Bruneian public company and private sector managers can not throw more resources at particular sectors and expect them to expand.



Brunei's international patterns also show why the economy requires complete reorganisation – rather than expansion along a business-as-usual principle. Figure 13 shows revealed comparative advantages in Brunei compared with Norway and the United Arab Emirates (UAE) – which we use just to provide an illustration of more general trends.<sup>18</sup> Two trends pop out at the reader. First, Brunei relies on petrol exports far more than other petrol-exporting countries like Norway or the UAE. Petrol represents Norway's fourth most competitive export product and the UAE's second. Second, Brunei's comparative advantages are "lower" (less than) these other countries. At the risk of dumbing down our explanation too much, Norway's frozen fish sector (its second most competitive if you use revealed comparative advantage scores as proxy for competitiveness) scores about 10 on this scale. Brunei's second most competitive sector, paperboard, barely scores 1 on this scale. Simply put, Brunei does not – at the present time – seem particularly competitive in any particular sector. Significant and smart industrial policy must to alter incentives to produce various goods and services.





While a number of authors have proposed such transformation for Brunei, none have described the construction boom needed to bring such a structuring into existence. Siddiqui and co-authors (2012) have described Brunei's highly oil-reliant economy, and prospects for diversification. Gollin *et al.* (2013) have noted that industrialisation of Brunei (and other places) will likely bring about urbanisation. Yet, none of these authors talks about the massive construction spree needed to transform Brunei's economic structure. Figure 14 shows the scale of the construction boom required if Brunei wants a top 10 position on the UNDP's HDI Index. Becoming a top 10 economy (either in human

<sup>18</sup> Revealed comparative advantage refers to the extent to which countries show (through market choices) the competitiveness of their exports. The index shows the country's proportion of a particular good in world trade relative to other countries' proportion of exporting that good. If Brunei's television exports equalled 5% of its total exports and if all other countries' exports equalled 3% (roughly speaking), Brunei would have a revealed comparative advantage in television export. Showing data for all of Brunei's peers would confuse our explanation far more than help it.

development or in non-oil GDP-per-capita terms) will require a building spree.<sup>19</sup> Simple geography shows the reason why. A growing population of highly skilled workers (if other countries’ experience provides any guide) requires a modern city infrastructure. Such modern infrastructure includes the basics – like schools, hospitals, offices and homes. However, higher levels of human development require higher levels of value-added in health, education and other developmental services. A modern metropolis needs state-of-the-art hospitals with gamma knives, on-site 3D printing, and on-site blood work and other diagnostics.<sup>20</sup> A modern metropolis also needs quantity of hospitals as well as quality (given the larger population base and more sophisticated tastes of medical consumers). Universities which provide higher end teaching also have world-class laboratories, computer mainframes, and other infrastructure. Construction expenditure is required to build out these facilities.

**Figure 14: A Fast Growing, Top 10 HDI Jurisdiction Has the Construction Stock Needed to Support an Educated, Healthy and Affluent Population**

| <b>Bandar Seri Begawan (Brunei)</b>   | <b>Hong Kong (China)</b>  |
|---|---|
| <b>HDI Rank: 30</b>   | <b>HDI Rank: 13</b>   |
|   |    |
| <b>Bandar Ser Begawan has hospitals and schools, but few buildings housing advanced educational and medical services.</b> | <b>Hong Kong provides a range of world-class medical and educational services with “build up” top ranked hospitals and schools.</b> |

<sup>19</sup> Common sense tells us that a growing economy needs buildings, highways, public spaces and infrastructure. Giang and Pheng confirm the existence of a strong relationship between construction sector development and economic growth.

<sup>20</sup> The literature covers a wide range of studies showing a murky relationship between expenditure and health outcomes in both the national and international data. However, more spending on higher quality equipment, buildings and personnel does associate in the longer-term with better health outcomes – particularly morbidity and quality-of-life outcomes. For a dated by still topical overview of the issues and data, see Weisbrod (1991).

### Singapore (Singapore)

HDI Rank: 18



**Singapore provides a built environment through constant construction which rivals the best cities in the world.**

The figure shows the difference in urban development between Bandar Seri Begawan (the capital of Brunei) and several other urban areas in order to graphically illustrate the difference in construction “stock.” We do not necessarily suggest that Bandar Seri Begawan should look like Singapore or the other urban centres.

### Frankfurt (Germany)

HDI Rank: 5



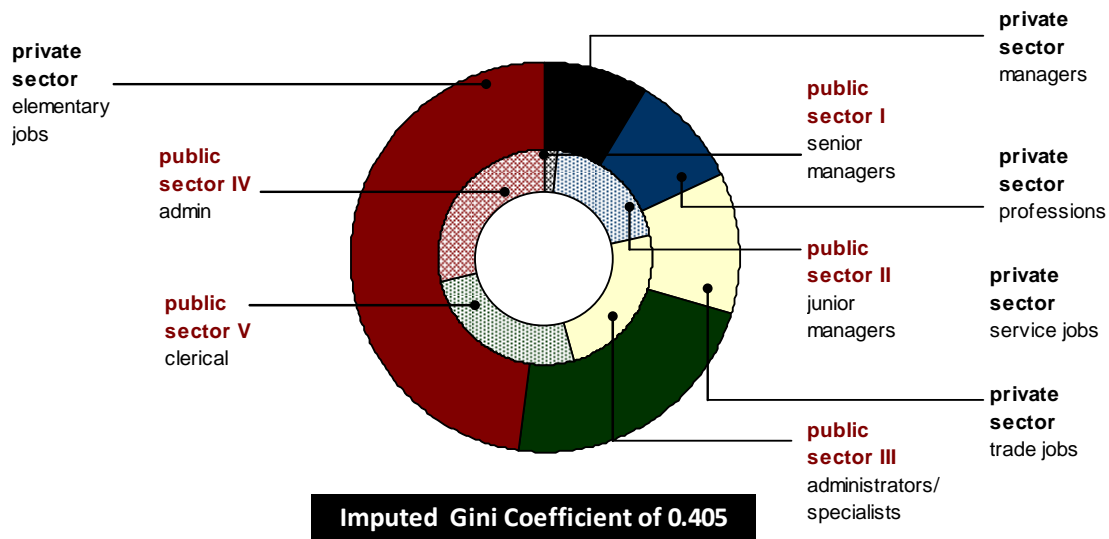
**Frankfurt provides another example of how education, health and growth go together. The best and brightest tend to flock together.**

A radical restructuring of the Bruneian economy will also require a radical restructuring of income distributions. As we previously mentioned in our literature review, GDP growth alone can not translate into durable and broad-based changes in HDI Index values without a relatively equal distribution of income.<sup>21</sup> Figure 15 shows the steps we took to calculate a Gini coefficient for Brunei of roughly 0.41. Basically, we calculated the number of persons working in various levels of jobs and the average wage of each job level. The outer ring shows the distribution of jobs (by level) in the private sector and the inner ring shows the distribution of jobs (and thus wages) in the public sector. **The Gini coefficient we calculated for Brunei would place the country roughly in 94<sup>th</sup> place – out of 157 countries providing relatively recent data.**

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<sup>21</sup> The nexus between income equality and human development is so strong that many scholars – like Hicks (1997) have argued for an Inequality-Adjusted Human Development Index. Grimm (2008) particularly shows how different income groups can experience very different human development outcomes.

**Figure 15: Inequality in Brunei Means that Incomes for the Average Bruneian are Far Lower than the Average Bruneian Income**



The data in the figure come from statistical office information about the number of people working in various occupational groups in the private sector and public sectors. In the private sector, these groups consisted of legislators (and administrators), professionals, technicians, clerical workers, service workers and cleaners. In the public sector, these data consisted of the numbers of people working in each of the public sector's five job categories (described as I, II, III, IV, and V). The width of the circles in the figure thus describe the relative proportion of private to public sector jobs.

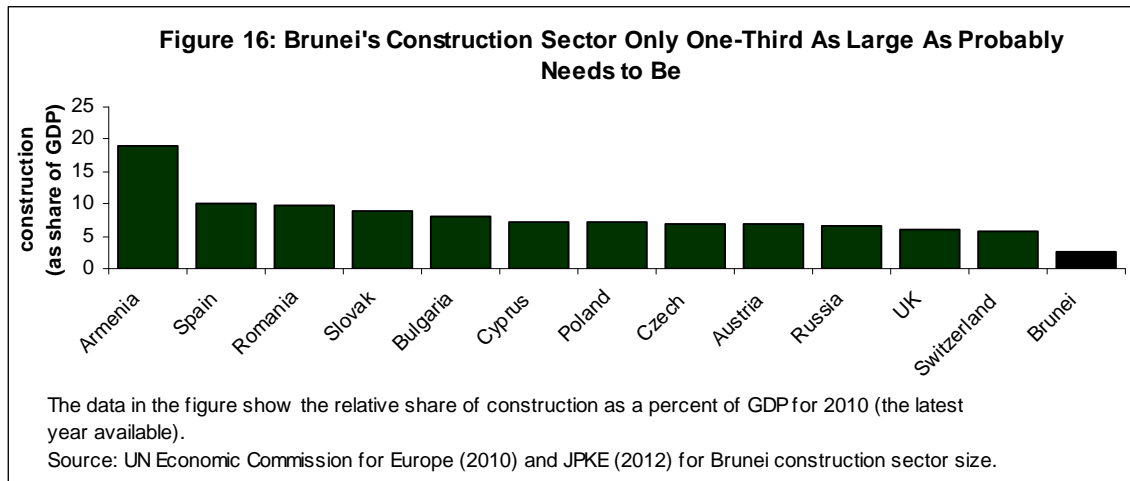
Our imputed Gini coefficient comes from a back-of-the-envelope calculation derived from relatively detailed data about the distribution of the workforce and average salaries in each job task. We used the corresponding monthly wage for each job category on the internet – thus providing us with the numbers and proportions of the population earning income. We used this information to draw a Lorenz curve for the Brunei population. We fitted a line of best fit to our data or  $11.172x^4 - 22.937x^3 + 16.793x^2 - 4.5022x + 0.4194$ . We integrated from 0% of the population to 100% and subtracted the result from one-half. The corresponding figure (a Gini coefficient) represents the area between the 45 degree line on the graph showing relative proportions of the population holding relative proportions of income, and the area under the curve we plotted.

We need to focus on economic inequality in our discussion of economic reallocation for three reasons. First, economic reallocation of the kind we have discussed will likely exacerbate income inequality – creating forces for political and social upheaval (Easterly, 2007). If social policies do not address income inequality in Brunei, disenfranchised populations could militate for greater social and political rights – causing social unrest. Such unrest would jeopardise economic transformation, at least in the short-run. Second, income produces health and educational outcomes. While Bruneian citizens have health and education provided by the Government, the quality of these services varies significantly between region and kampong (Sainah, 2010). What does it profit the Bruneian government to obtain a top 10 HDI ranking if a large part of the population would fall in the bottom half if reported separately? Third, income inequality would deprive part of the population from the income needed to effect many of the economic transformations we describe in this paper. We have argued that Brunei will need greater business diversity and comparative advantages in non-oil goods and services. Small business owners must have the capital needed to develop these sectors. Such capital only

comes with income.<sup>22</sup> Only 1,560 construction establishments operate in Brunei – with only one employing more than 500 workers. Roughly 50 companies have between 100 and 500 workers. These workers will require higher incomes in order to grow existing construction companies – and start new ones.

### How Much Construction Does Brunei Need to Achieve its Wawasan Objectives?

Even the most rudimentary analysis shows that Brunei's construction sector needs to grow in order to provide the amenities needed for a top 10 HDI ranking. Figure 16 compares Brunei with other expanding economies. As a percent of GDP, the Brunei construction sector is only 1/3 as large as required to fuel and build for a top 10 economy. As a percent of GDP, Brunei's construction sector probably needs to treble in size. Most modern economies have grown – particularly at the beginning of their development -- because of construction. If Brunei's policymakers want to hoist the country into a top 10 HDI ranking, they should build out the amenities a healthy and educated workforce requires.<sup>23</sup>



Just how big should the housing and office unit part of the construction boom be? Figure 16 provides a graphic illustration (using amazingly simple assumptions) of the extent of the required building boom – if Brunei will meet its Wawasan objectives. If we could portray extra housing and office units simply as space on a map of Bandar Seri Begawan, by the Wawasan deadline, almost 30,000 extra housing units need to be constructed and about 15,000 extra offices. Assuming Government policy does not change population growth rates at all (and under our extremely simple assumptions), Brunei's construction

<sup>22</sup> Bank lending still remains relatively under-developed in Brunei. Brunei's bank sector supplies only 8% of GDP in domestic credit -- compared with Singapore banks' 92% of GDP, Qatar's 71% and the UAE's 84% (Beck et al, 2009).

<sup>23</sup> Such construction also needs to modernise Brunei's currently under-developed housing, office stock and infrastructure. Even with assuming the replacement (or infra-marginal) real estate, the construction sector remains extremely underdeveloped.



sector would need to add about 18,000 households and over 1,000 offices.<sup>24</sup> Accommodating the larger population sizes needed to achieve the Wawasan objectives, Brunei's construction sector would need to provide over 80,000 housing units. These numbers do not even take into account required infrastructure investment in energy, water, transport and communications (among other investments).

**Figure 17: Size of the Wawasan 2035 Construction Spree**



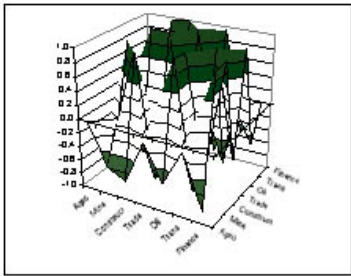
The figure shows the "size" (as portrayed in area terms) of construction required in the upcoming years. Without any changes to population demographics (and assuming a linear growth), population will equal 578,000 people. Assuming a household size of 4, that means 17,920 households. Assuming that 10% of the population engage in service sector work (doctors, traders, etc) requiring offices, and an office size of one office to every five service professionals, about 1,160 extra offices need building by Wawasan 2035. These simplistic illustration aim to show the magnitude of the construction-related needs – not to provide an accurate real estate forecast.

How can growth in Brunei's construction sector contribute to overall economic growth – and thus the provision of health, educational and income generating services? The growth rate of the Bruneian economy (and thus the growth rate of its manpower) depends on the growth of its various sectors. Figure 17 shows the way changes in real output correlates with changes in real output in other sectors. The figure shows high correlations between some sectors like mining and the construction sector with the oil sector. Construction sector output has historically negatively varied with transport and agricultural output. The development of a vibrant construction sector in Brunei will very likely lead to overall economic growth – with the exception of transport and agricultural sector development. The extent to which these sectors contribute to human development (such as providing access to food and/or transport to hospitals and schools) will require further study.

<sup>24</sup> Our goal consists of illustrating the scale of a needed construction sector – not to provide exact estimates of Brunei's future retail and commercial real estate needs. As such, the reader should not rely on these numbers or cite them against more rigorously derived estimates.



Figure 18: Correlation between Real Output Levels Across the Bruneian Economy

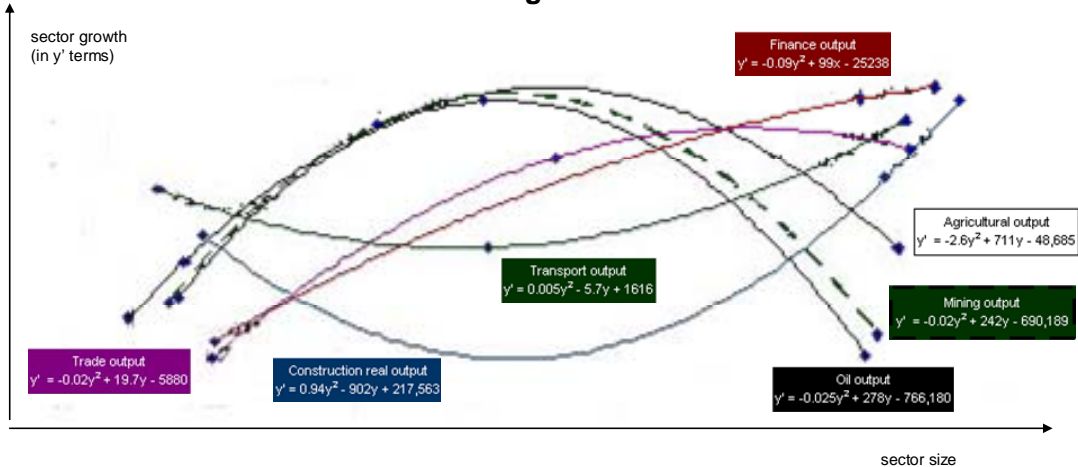


|           | Mine  | Construct    | Trade        | Oil         | Trans        | Finance      |
|-----------|-------|--------------|--------------|-------------|--------------|--------------|
| Agro      | -0.59 | <b>-0.72</b> | -0.09        | -0.59       | -0.06        | -0.81        |
| Mine      |       | <b>0.98</b>  | -0.75        | 1.00        | -0.77        | 0.95         |
| Construct |       |              | <b>-0.63</b> | <b>0.98</b> | <b>-0.65</b> | <b>0.99</b>  |
| Trade     |       |              |              | -0.75       | 1.00         | <b>-0.51</b> |
| Oil       |       |              |              |             | -0.77        | 0.95         |
| Trans     |       |              |              |             |              | <b>-0.53</b> |

The data in the figure show the correlation coefficients between changes in real output in Brunei from 2007 to 2010. We show interesting correlation coefficients in black boxes. We do not differentiate between statistically significant and non-significant correlations as (given the very limited data range) we must assume our estimates are unbiased but imprecise.

The development of Brunei’s construction industry also potentially offers developmental returns in the form of increasing returns to scale. Figure 19 shows the way that the growth rates of various sectors depend on their size. For example, in the agricultural sector, the growth rate of agriculture depends on the size agricultural output. In this case, such growth equals -2.6 times output squared -- which represents a “volume” or growth effect of output -- plus 711 times the real value (in constant 2000 Bruneian dollars) of such output plus a term which reflects the way agricultural output grows independently of the size of the sector. In the case of the construction sector, growth will likely accelerate as the sector increases in size. **Thus, an ever-expanding construction will mean Brunei’s ever rapid climbing up the HDI rankings.**

Figure 19: Construction Likely One of Two Bruneian Sectors With Increasing Returns to Scale



The data in the figure show the way that real output in Brunei changes as that sector grows (or shrinks). In technical language, we plot the first derivative of output with respect to time as a function of real output. We do it in this strange way (rather than using growth rates or proportions) to give the reader enough information to check our differential equation based modelling and analysis. We do not label the axes because these curves have different scales.

Exactly how much will construction contribute to economic development (and thus HDI increases) – and how can the construction sector contribute? To answer these questions, we draw on two branches of mathematical economics. Even rudimentary differential equations and time series analysis can tell us how the construction sector will likely evolve – given past events.<sup>25</sup> Dynamic optimisation tells us what level of construction Brunei needs in order to maximise economic growth (and thus its Human Development Index ranking).<sup>26</sup> In order to find out how much construction – and thus economic growth – the Bruneian economy needs, we start with a simple regression.

Simple regression analysis – and some simple maths -- can tell us how much construction Brunei needs in order to maximise its economic output (and thus HDI ranking). Figure 20 shows – in summary form – the results of a regression looking for the way that construction sector value-added has correlated with Bruneian output levels from 2000 to 2012.

**Figure 20: Using Statistics to Figure out the Way Manufacturing Affects Output Over Time**

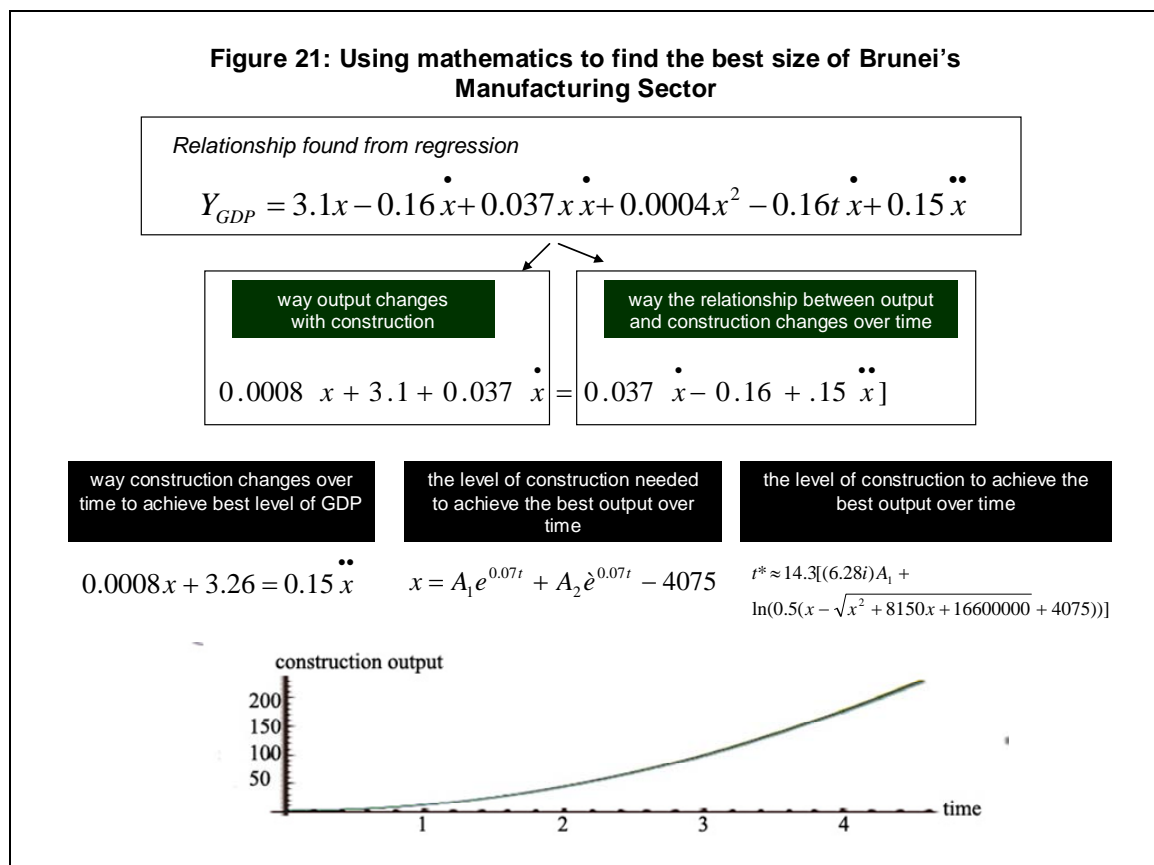
| Variable   | b-value*      | stdev* | p-value | What it Means   |
|--|---------------|--------|---------|---|
| Intercept  | <b>445</b>    | 270    | 0.18    | Nothing (it tells the output level without a construction sector)   |
| <b>Construction value-added</b>  | <b>3.14</b>   | 12.7   | 0.81    | Tells that one million dollar increase in construction sector value added increases output by \$3.14 million. |
| <b>Way construction value-added changes with respect to time</b>                                   | <b>-0.17</b>  | 1.15   | 0.89    | when the construction sector grows due to the passing of time alone, output decreases slightly.               |
| <b>Interaction between construction value added and the way that value added changes over time</b> | <b>0.04</b>   | 0.06   | 0.54    | Output increases slightly with an increase in the <u>change</u> in construction output over time.             |
| <b>Geometric effect of construction sector growth</b>  | <b>0.0004</b> | 0.0001 | 0.04    | When construction sector gets bigger, its effect on output becomes more pronounced.                           |
| <b>Interaction of time and the way that construction sector output changes over time</b>           | <b>-0.16</b>  | 0.15   | 0.34    | As construction sector output grows over time, adding more time doesn't help output growth.                   |
| <b>acceleration of construction sector output over time</b>  | <b>0.15</b>   | 0.11   | 0.23    | as the change in the rate of change of the construction sector grows, output increases by about \$150,000.    |

<sup>25</sup> Our purpose consists of illustrating the method in a simple way so that Bruneian (and other) policymakers can understand the techniques involved. As such, we employ one of the simplest differential equation – without using simultaneous differential equations or recourse to investment, capital and endogenous growth effects (Cass 1965, Matsuyama, 1991, Mulligan and Sala-i-Martin, 1993). Interestingly, we could not find a paper that presents the simple, one-equation model of construction sector output in the literature. In our rush to use ever complex mathematical methods, we seem to be failing to use the basics (and show them to new generations of policymakers and researchers in applied research).

<sup>26</sup> Similarly with differential equations methods, researchers have not seriously used dynamic optimisation as a method of presenting economic arguments in years. For a dated paper discussing how policymakers can use dynamic optimisation, see Sakakibara (1970).

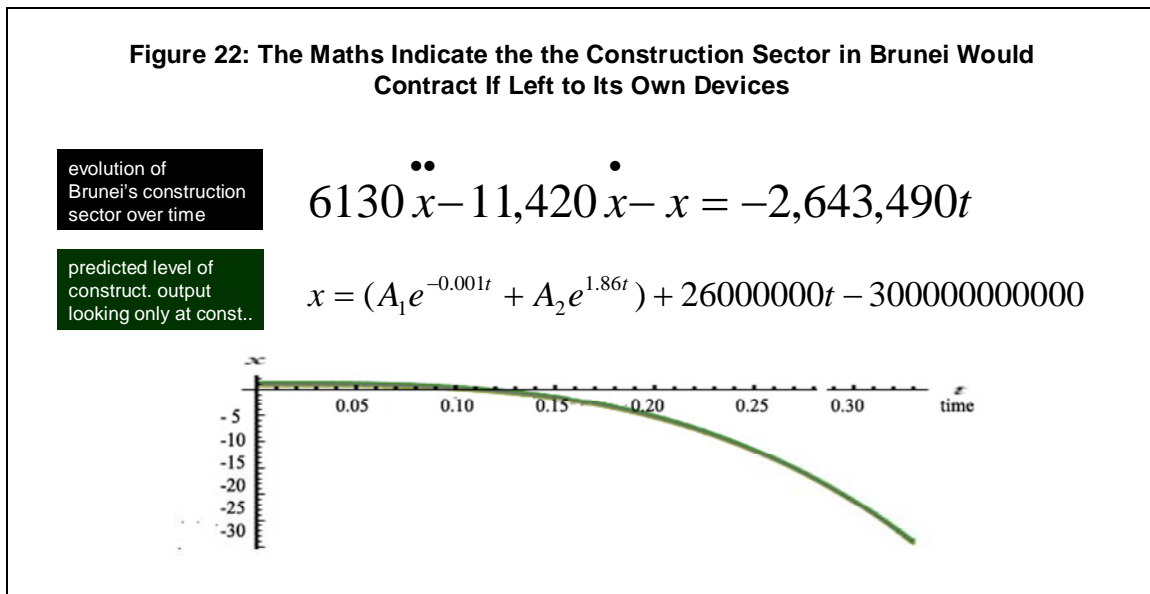
The level of output in current US dollars represents the independent variable in this regression (in millions). We used construction sector value-added (again in millions of US dollars) as the basis for our dependent variables. We did not use log values as this would multiple the independent variables together. The regression we show reflects a wide range of regressions using various components of GDP. We do not report all these regressions for the sake of space. Many of the insignificant variables we report became significant depending on the model we used (the variables included in any particular regression). As such, we use these estimates on the understanding our estimate may be unbiased but highly imprecise. For what its worth, the adjusted R<sup>2</sup> on this regression comes in at about 0.98. B-values tell the change in the dependent variable for a one unit change in the independent variable(s).

How does output (and thus HDI ranking) depend on the way that construction sector output changes over time? Figure 21 shows how we transformed the statistical model into a useable tool for assessing how construction sector growth in Brunei can best help achieve the Wawasan 2035 objectives. We provide the equations mostly for experts able and willing to check our maths (and statistics). The main conclusion sits at the bottom of the figure. Construction output needed to maximise output growth needs to grow at about \$50 million per year. The other item of interest in the figure relates to the optimal time – which depends on the imaginary number  $i$ . Usually this pops up when another variable determines the relationship determining the optimal construction sector size.<sup>27</sup>



<sup>27</sup> Most mathematicians would probably balk at the idea of  $i$  representing a tacit (unknown) variable. However, in our experience, the extra dimension that  $i$  adds usually turns out to represent another variable outside the model.

How far does construction in Brunei need to go to reach that optimal level? We know the optimal level of construction output (if you believe the maths). What do the maths say the likely evolution of construction sector output would be? **The data suggest that construction sector output – far from expanding – looks poised to contract by about \$20 million per year.** Figure 22 shows the equations we found from the data – explaining the construction sector’s likely change only using historical data.<sup>28</sup> Unlike in the previous figure (which shows the way construction output needs to change in order to maximise GDP over time), this figure only shows the way construction output will likely change – if the past helps predict the future. The figure shows that construction output will likely fall over time.

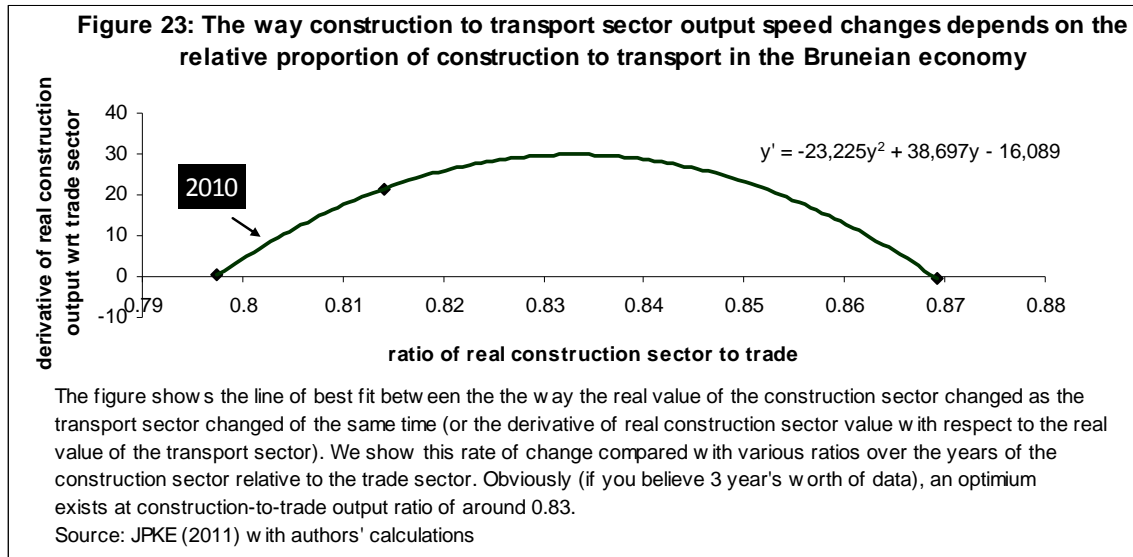


We care less about what construction sector output will do by itself, and more about what it will do relative to other sectors of the economy. If other sectors shrink (and thus reduce Bruneians’ opportunities for human development), then Brunei clearly would not need an expanding construction sector. Figure 23 shows the historical relationship between the real value (in “things terms” not monetary terms in 2000 Bruneian dollars) of the construction sector and the trade sector.<sup>29</sup> In theory, more construction should provide a facilitating environment for trade. The data show, for a range of dates, that a construction to trade ratio of about 0.835 maximises the growth of the construction sector compared

<sup>28</sup> We do not repeat our reporting about the statistical methods we used to derive the formula in the figure. We regressed the level of construction value-added on its time derivative and double time derivation. We use these methods instead of normal time series methods in order to draw the link with the maths we use in our exposition. Indeed, the use of time series and complex econometric tools has led researchers to ignore the powerful mathematical tools we learn in graduate school and subsequently ignore for the rest of our careers.

<sup>29</sup> In the next two examples (figures), we use a different data source and data expressed in a different currency (Bruneian dollars instead of US dollars). We mix up our examples in order to make sure that our results do not depend too heavily on one data source. By using different data sources, we can thus check our tentative results.

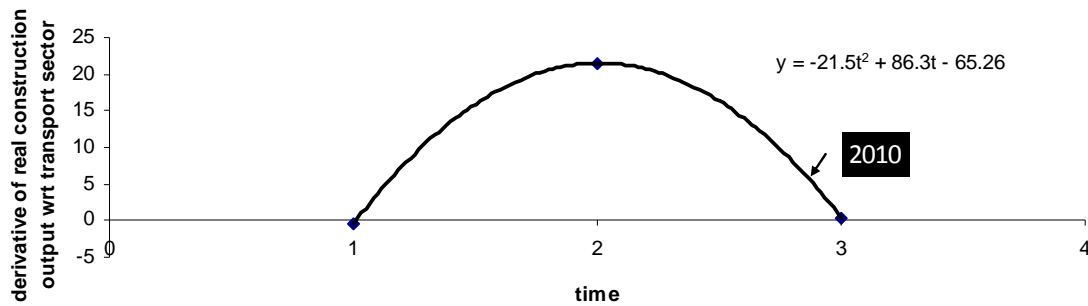
with the growth of the trade sector.<sup>30</sup> In Figure 23, assuming recent construction sector to trade sector ratios reflect the current situation, the Bruneian construction sector must “work its way up” to the top of the curve shown in the figure.



The speed at which the construction sector grows relative to the trade (and other sectors) changes over time. Figure 24 shows the way that speed has changed in Brunei for real construction sector output and real trade sector output. As shown, the peak growth rate of the construction sector occurred in 2009. Going back to that growth rate would require levels of investment in the construction sector relative to their 2009 levels (and again relative to those levels in the trade sector). In this way, Bruneian construction operations would need to “go back in time” (at least from a growth-in-output view) to achieve a required growth rate.

<sup>30</sup> The year 2010 represented the latest data available using the most extensive publicly available data we had access to. The rate of change of the construction sector relative to the trade sector reflects the derivative of construction sector output with respect to trade sector output as measured by the difference of construction sector output each year divided by the difference of trade sector output.

**Figure 24: Construction Sector Shrinks Over-Time, Making "Going Back In Time" a Necessity for Brunei**

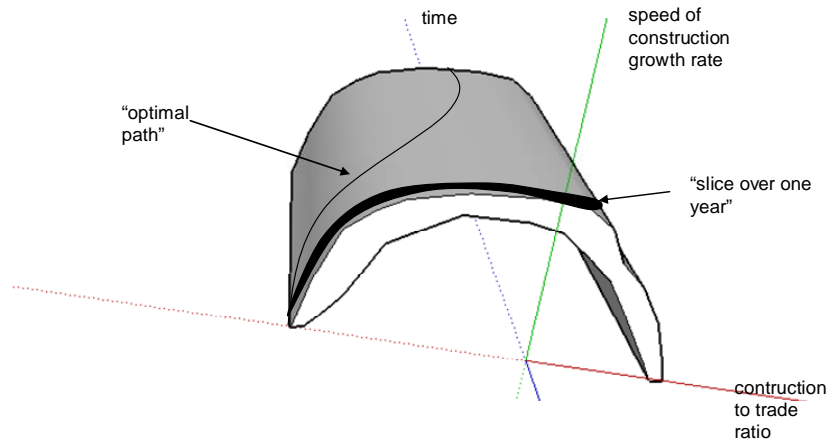


The figure shows the line of best fit for the way the real construction sector changes over time with respect to changes in the trade sector. We show this derivative as the difference between real construction sector output in a year divided by the difference in real trade sector output. Our graph basically shows the way the derivative changes over time (a time derivative).

Source: JPKE (2011) with calculations by authors.

Combining the intuitions of these two figures shows how construction sector output (and thus manpower) needs to evolve over time. Figure 25 shows a graphical representation the way we use mathematics to find the optimum level of construction sector output and manpower over time. We find the optimal construction sector size needed to maximise growth in that sector – as shown by the “slice over one year.” We then find the best way that rate of change needs to grow (or shrink) over time in order to maximise total output. The “optimal path” reflects the way the construction sector needs to growth – assuming output growth at a level capable of achieving the Wawasan 2035 objectives. **Brunian policymakers must fill the gap between the output needed to achieve the Wawasan 2035 objectives, the optimal level the sector can achieve on its own and the construction sector’s current sub-optimal output.**

**Figure 25: Graphic View of the Way Construction to Trade Ratios Need to Grow to Achieve Wawasan 2035**



The optimal path basically sums-up the best possible growth rate in the construction sector each year and sums up those optimum points over the years. We showed the best growth rate of the construction sector with respect to the trade sector as an example. In a fuller report (on which we base this paper), we conducted this exercise for each of Brunei's sectors.

These data imply several things about Brunei's ability to achieve the Wawasan target of obtaining a top 10 HDI ranking by 2035. First, the construction sector growth – without a radical transformation – with more likely detract from achieving those goals instead of helping to accomplish them. As shown in figure 20, left to its own devices, construction sector output will fall over time. Second, the steady state level of output can achieve the 6%-7% output growth required to maximise a country's HDI growth rate. The steady state growth rate of \$50 million exceeds the \$44 million required (as shown in Figure 10). Third, such economic growth rates can catapult Brunei into a top 10 place – assuming the Government adopts policies similar to Papua New Guinea, Cyprus, and Uruguay (!?!).<sup>31</sup>

### The Prospects and Pitfalls of Using HDI Rankings as a Policy Tool

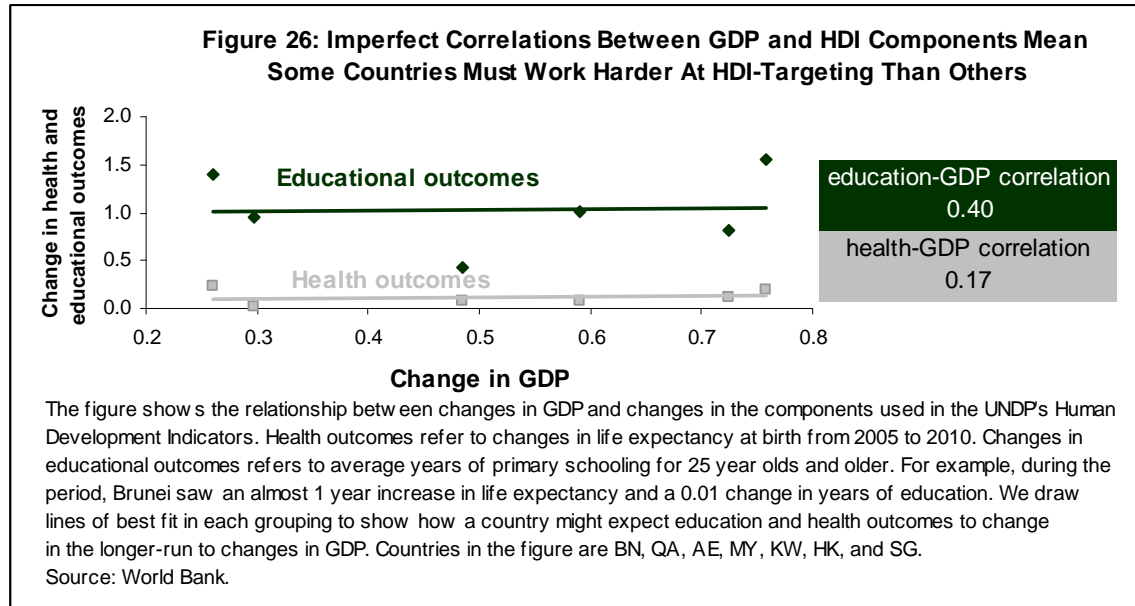
The goal of a top 10 HDI ranking clearly sets targets for real GDP growth in the Bruneian economy as well as growth in each of its sub-sectors (including construction). Naturally, a fair amount of slippage occurs between GDP growth and improvements in the underlying health, education and income outcomes which make up the HDI. Figure 26 shows the correlation between GDP growth and changes in the health (actually life) and educational (actually years of schooling) indicators which make up the Human Development Index.<sup>32</sup> We have put Brunei into a group of other similar economies to

<sup>31</sup> Figure 8 shows that these countries attained the highest increase in HDI scores for relative changes in GDP growth. We can not explain what these countries did, or why higher growth across countries actually translates into lower HDI score growth.

<sup>32</sup> Obviously, the purported educational and health outcomes used in the HDI are in fact inputs. Years of education and years of life are inputs into outcomes (extent of knowledge and know-how and quality of life). As we have previously mentioned, we accept the HDI "as is" (as this is the indicator the Brunei and other governments seek to maximise).



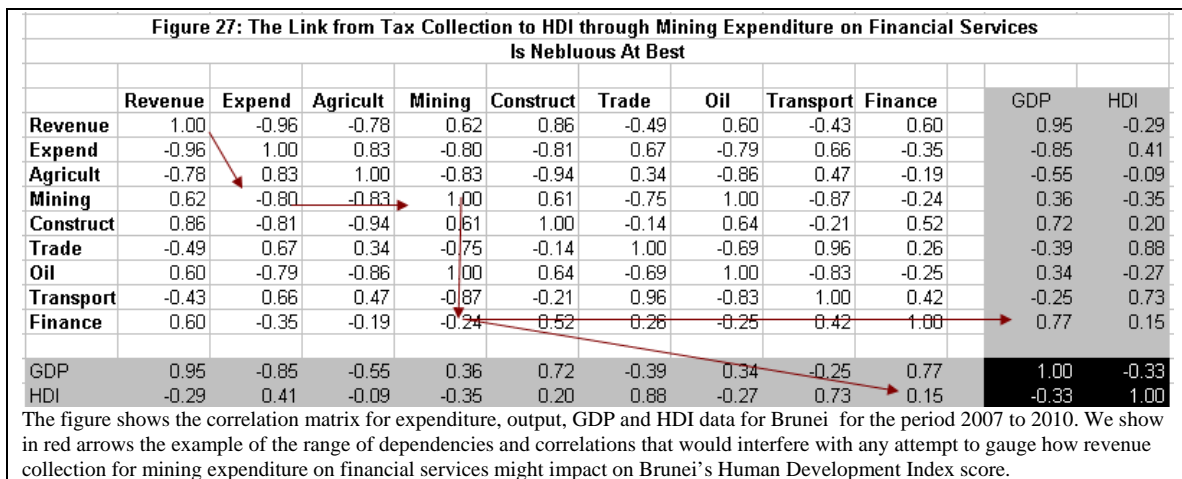
facilitate comparison. Correlations between GDP growth and human development (as measured by the Human Development Index) remain relatively low. Such low correlations stem from the important role government – rather than the economy – plays in promoting health and educational outcomes.



So why use Human Development Indicators as a headline measure of policymaking effectiveness if these indicators correlate so poorly with GDP and other aspects of economic growth? If GDP reflects so poorly (particularly in the short-run) on HDI rankings, why focus on GDP growth – and the growth of particular industries like the construction sector – at all? First, GDP growth eventually translates into human development. A fast growing and large GDP represents a necessary condition for human development, but not a sufficient condition (Streeten, 1994). Second, a focus on GDP as part of the larger drive to achieve a particular HDI ranking promotes private sector responsibility for educational and health outcomes (Mundle, 1998). Third, for most countries, focusing on GDP growth equates to focusing on maximising the tax revenue which can be used to fund health, education and income generation programmes (Qureshi, 2009). To take an analogy from a private company – not everything the company does contributes to bottom line profits. However, everyone in the company knows their work eventually needs to translate into profits. A similar logic applies to HDI-targeting. Not every public sector action will directly contribute to rising in the HDI rankings. However, every employee and citizen should know that HDI rankings (scores) are the indicator to watch.

Doesn't the complexity of a modern government and economy make HDI-rank targeting impractical? How can a customs officer, fisher or even grade-school teacher assess the extent to which their organisations contribute to the country's HDI ranking? How can staff working in the centre-of-government (like the policy co-ordination unit in the Prime Minister's Office) assess whether adding an extra HIV-awareness programme to next year's budget will help improve the country's HDI ranking? Given that the opportunity

cost for funding the HIV-awareness programme might be extending schooling to an underserved area, using a broad-based indicator like HDI seems to provide very little guidance. Figure 27 provides a simplified view of the complexity involved in trying to use a headline HDI rank (or score) as a tool in deciding policy objectives, activities and funding. Looking at contemporaneous correlation (correlation in the same year) between revenue and HDI scores for Brunei shows a negative (albeit not statistically significantly negative) correlation. Expenditure levels and levels GDP also show a highly negatively correlation. The red arrows in the figure highlight the impact of tax collector's work (though Brunei has only a limited range of services and incomes which it taxes) on Brunei's Human Development Index score. One of the literally millions of propagation mechanisms involves using the tax revenue for buying mining equipment for a state owned company. The mining company in turn may use financing (or put the money in a bank in the short-term). Such use-of-funds will impact health and education directly (through workers' incomes for examples) and indirectly through GDP growth. Such complexity seems to spell the end of HDI-rank targeting as a viable policy tool.



However, the Wawasan (and its peers in a wide range of other countries) shows that HDI-target may not be as impractical as it seems. Changes in yearly HDI scores should not determine public officials' salaries or bonuses. Yet, the targeting exercise itself encourages policymakers at the centre-of-government to focus on the most high impact policies and programmes. The Wawasan focuses on an education strategy, economic strategy, security strategy, institutional development strategy, local business development strategy, infrastructure development strategy, and environmental strategy – all with Brunei's HDI-rank in mind.<sup>33</sup> Using an HDI-target does not mean tracing every action through to its ultimate impact on Brunei's HDI-rank.

<sup>33</sup> Interestingly, the Government does not make available an English language version of the Wawasan (we do not know about the Malay language version). As a policy co-ordination document and focus all stakeholders' efforts (including the private sector and civil society), such lack of transparency bodes ill for the strategy document's ultimate success. We obtain a summary from the Brunei Economic Development Board's website.

For countries interested in tracing policy objectives, activities and funding into direct and indirect HDI-rank impacts, we have three pieces of advice. First, the Policy Co-ordination Unit in the country's centre-of-government (usually a Prime Minister's or Cabinet-level office) can help with such tracing. These centres of government often have work plans for the entire government, measures of performance, and long-time intuitions about how programmes work – or don't work – together (Ben-Gera, 2009). Second, internal auditors can help elucidate the linkages between public (and private) sector programmes and HDI in ways different to see at first glance. Most people think of financial and fraud audit when they think about internal audit. Internal auditors, particularly in the course of a performance audit or systems audit, are particularly adept at finding the linkages between programmes and their impacts. Governments with HDI-rank targets (like Brunei) can rely more heavily on internal auditors to assess progress and ensure that programmes actually focus on HDI-objectives. Third, modern computing power allows project managers and third-parties to discover the extent to which various policies and programmes contribute to the country's HDI ranking. Techniques like multiple regression, non-linear modelling, multi-variate exploratory techniques, general classification models, component analysis and other tools can often unearth relationships which no other methods can. As more students learn how to use statistical software packages like Statistica, SPSS and SAS, more individuals will be able to find these patterns quickly and cheaply.

Of course, policymakers need not limit themselves to the HDI's components measures. Having something more complex than the HDI as a tool for making and monitoring policy partly defeats the purpose of HDI-targeting. Yet, working level officials in the Ministry of Health, Ministry of Education and in Cabinet-level working committees have a wide range of outcome measures to focus on. Figure 28 shows some of the measures available from the World Bank's online and freely available *Education Statistics*. These statistics provide for cross-time and cross-country monitoring. Education sector administrators with even a basic understanding of *Microsoft Excel* can create graphs in order to assess progress on education-related inputs, outputs and outcomes (Scheerens, 2007). Policymakers – both in Brunei and other places that use HDI-rank targeting – need to decide how much micromanagement to engage in as they seek to increase the overall number of years in education of the population (and thus raise their HDI rank). Having an HDI-rank or HDI-score target does not preclude the use of these intermediary indicators to monitor progress. Using statistics to learn how these indicators change with changes in macroeconomic outcomes (like construction sector output) also represents a possible avenue for future policymaker work.

**Figure 28: Why Should Policymakers Settle for One Indicator When they Have over 40 to Use in their Targeting and Monitoring?**

| Educational Level           |                         |                           |                        |
|-----------------------------|-------------------------|---------------------------|------------------------|
| Pre-Primary                 | Primary                 | Secondary                 | Tertiary               |
| Enrolment Rates             | Enrolment Rates         | Enrolment Rates           | Enrolment Rates        |
| Total Enrolments            | Total Enrolments        | Total Enrolments          | Total Enrolments       |
| School Life Expectancy      | Out-of-School           | Out-of-School             | Enrolment by Program   |
|                             | Intake                  | Transition Rates/Entry    | Completion             |
|                             | Repetition              | Repetition                | Graduates by Program   |
|                             | Survival/Drop-out Rates | Survival/Graduation Rates | School Life Expectancy |
|                             | Textbooks               | School Life Expectancy    | Mobility               |
|                             | Infrastructure          |                           |                        |
|                             | Completion              |                           |                        |
| System                      | System                  | System                    | System                 |
| Resources and Outcomes      |                         |                           |                        |
| Teachers                    | Expenditures            | Literacy                  |                        |
| Pre-Primary                 | All Levels              | Youth                     |                        |
| Primary                     | Pre-Primary             | Adult                     |                        |
| Secondary                   | Primary                 | Elderly                   |                        |
| Post-Secondary/Non-Tertiary | Secondary               |                           |                        |
| Tertiary                    | Tertiary/Post-Secondary |                           |                        |

The figure shows the range of education-related indicators available on the World Bank's *Databank*. To the extent these indicators correlate with, and contribute to, HDI-rank improvements, Ministry of Education officials and others should take a vivid interest in them in countries pursuing HDI-rank targeting. Source: World Bank (2014).

## Conclusion

What does Brunei teach us about using Human Development Index scores as a policy tool? A concrete target for a public administration serves almost like a profit target for a private company. Once Brunei's (and other countries') policymakers set that single, solitary target, many other policy targets follow logically and mathematically. In this paper, we showed how a top 10 HDI ranking for Brunei requires a 6%-7% growth rate in real GDP. In turn, such a growth rate requires roughly \$50 million in annual growth of Brunei's construction sector. Using publicly available macroeconomic data, we could calculate the likely growth rate in Brunei's construction sector (likely negative given the numbers we looked at). We could also calculate the optimal growth in construction sector value added – namely the growth rate that would maximise the value of GDP growth. We found that, with the proper policies and only look at the math side of the topic, Brunei's construction sector could increase from present \$44 million per year growth \$50 million per year. Such growth would help Brunei achieve its HDI-target (and thus its Wawasan objectives).

Our analysis for Brunei provides insights which other countries seeking to use an HDI target could emulate. First, we showed how to calculate the way Human Development Indicators change with respect to economic (GDP) growth. Government Cabinets seriously considering using HDI-targets as a policy coordination and monitoring tool can use their own domestic data rather than rely on international patterns in the data (as we have done). Of course, these figures will also correlate with education and health sector spending. Second, we showed how to calculate the needed change in various economic sectors' growth in order to achieve a particular "headline" growth rate. In our example – and without recourse to complex macroeconomic models – we showed that Brunei would need to add the value equivalent to the gross metropolitan product of Bandung (Indonesia), a transport sector equal to the value of George Town's (Malaysia) gross metropolitan product and so forth. Third, we showed how to calculate the likely change in a sector's value-added (as a simple differential equation). Numerous studies continue to show that time series data predict better than complex multi-sector models (Lupoletti and Webb, 1986). Fourth, we showed how Ministry of Finance could calculate the optimal growth in a sector's output in order to achieve the optimal level of output growth (as a simple Euler or dynamic optimisation) problem.<sup>34</sup> Fifth and lastly, we showed how these policymakers could compare the optimal growth rate (in our case of Brunei's construction sector) with the growth rate needed to achieve the headline growth rate needed to maximise the country's HDI (in our case 6%-7%). We also showed that governments need not be as quantitative as we have been in this paper – using them as a broader policy coordinating tool rather than a econometric tool. The Wawasan 2035 provides an example of HDI-target as broad policy tool rather than maximand on an econometric model.

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<sup>34</sup> We did not define the kind of math we used – and Euler equations. We wanted to focus on the economics and policy making around the exercise, rather than scare the reader away with reference to high math.

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