Society's Odious GFIP Debt, courtesy of SANRAL.

Unpacking the legacy of Gauteng's Freeway Upgrade Construction Costs

A Position Paper by the Organisation Undoing Tax Abuse (OUTA), on SANRAL's Gauteng Freeway Improvement Project Construction Costs (2008 to 2011), and why the public are paying too much.

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OUTA
ORGANISATION UNDOING TAX ABUSE

1. Introduction

The development of public services and infrastructure is essential to economic and human development. In growing developing economies and societies, governments and financial institutions require extensive planning strategies which include local and international pricing comparisons and benchmarks, with which the authorities and suppliers are able to determine the cost of infrastructure developments.

This position paper sets out to show how comparisons to reliable and internationally acceptable case studies are and can be used, to expose and explain why SANRAL's Gauteng Freeway Improvement Project (GFIP – Phase 1), was grossly overpriced, which has significant implications for; not only for the e-Toll scheme's waning compliance levels, but for SANRAL's integrity and professional conduct.

1.1. Addressing growing urban congestion.

The Gauteng Freeway Improvement Project (GFIP) is the project name given to the upgrade of the main freeway network of approximately 185 kilometers within the province of Gauteng in South Africa. This freeway conveys the bulk of commuter traffic around the metropolitan cities of Johannesburg (the largest economic hub of the country) and Tshwane (the Government administrative capital), some 55 kilometers north of Johannesburg.

The project was necessary to address the growing traffic congestion, as a result of a growing economy and more vehicles on the freeway network.

In addressing urban commuter congestion, regional planners consider and do one or more of three things:-

- Build more and / or wider roads.
- Increase and improve the efficiency of public transport networks.
- Spatial planning of urban work and residential nodes to redirect commuter flows.

Generally, the first option is the easiest to address, but if done in the absence of effective strategies in 2 and 3, wider roads simply induce more congestion and the roads become as congested within a few years (a phenomenon known as Induced Congestion or Induced Demand).

In the instance of addressing Gauteng's congestion, this is precisely what happened, as they set out to expand the existing freeway network (GFIP Phase 1), with an intention to get construct Phases 2 and 3 shortly thereafter, but which have failed to be implemented some 4 years late, due to the e-Toll stalemate of Phase 1.

As most of the GFIP Phase 1 routes formed part of the National Road network around Gauteng (N1, N2, N3), this upgrade and work fell under the control of the South African National Roads Agency Limited (SANRAL), a State Owned Entity (SOE) wholly owned by the Government of South Africa.

1.2. The financing decision of the GFIP Project.

The decision to construct the freeway upgrade was not in question, as this was a burning necessity for economic and social reasons. The question on the mechanism of financing the upgrade, was one that resulted in an unpopular decision to toll these freeways.

This position paper is not to further debate the decision to introduce e-tolling as the funding mechanism for the upgrade. However, the information, research and outcomes of this paper, could very well place the e-toll decision in further jeopardy. As it is, the scheme currently fails to raise even 25% of the expected revenues required to service the capital bonds, due to high levels of public resistance, non-compliance and inability to enforce or manage the problem.

OUTA has challenged the e-Toll decision since 2012 in that firstly, it was an irrational one suffering from poor judgment, weak research and conduct by SANRAL which OUTA maintains was a transgression of the country's constitutional values as laid out in Section 195. Secondly, the decision to introduce an electronic tolling mechanism is made worse by its high costs, numerous inefficiencies and difficulties of collection. In short, OUTA's opinion was that the scheme was always doomed to fail from the outset and its position and reasons thereof are explained in a document titled "Beyond the Impasse", which can be found at this link: http://www.outa.co.za/site/wp-content/uploads/2014/09/2014-09-01-OUTAs-submission.pdf.

2. What is at stake from this Research and Position Paper?

This research sets out to explore, if indeed the Road Construction Costs relating to the Gauteng Freeway Improvement Project (referred to as GFIP), were significantly out of line or exorbitant enough to have further implications for not only the e-Toll scheme decision, but to also look toward the role that SANRAL plays in ensuring that all road capital expenditure projects that it undertakes, are conducted at the best possible value and outcome for society.

2.1 Possible implications and consequences:

If the costs of road construction on the GFIP project are deemed as being exorbitant and unreasonably high, this could manifest itself in the following three areas:-

2.1.1 Exacerbates the original decision to toll the Freeway Upgrade:

If the construction costs paid were too high, it makes the entire decision to introduce the expensive e-toll collection process even more ludicrous. It surely strengthens the view that had the Minister of Transport (Jeff Radebe in 2007/8) been presented with a significantly lower and realistic capital costs of the freeway upgrade, (as the opinion is demonstrate in this paper), and had the Minister been provided with the correct (and extremely expensive) e-toll costs of collection at the time of the decision, he would have been compelled to set aside the e-toll decision - on the basis that it was grossly irrational to pay more to administer the collection of the tolls, than it was to service the capital bonds.

2.1.2 More reason and justification for civil disobedience:

A much higher cost of construction than ought to have been paid, provides the Gauteng motoring public with more reason not to pay their e-toll bills, as it could be construed as an unnecessary and odious debt if not incurred, could very well have swayed the decision not to toll the road in the first place.

2.1.3 Places SANRAL's integrity and professional conduct at stake:

If the construction costs were significantly excessive and unreasonable, questions will arise as to the competence and integrity of SANRAL and its

leadership. Questions in this regard have already abound, in that Mr Nazir Alli's response to journalists questions of the seemingly high costs of construction in 2011, was that there was 'nothing untoward' with the costs of the freeway construction. However, in 2013, the competition commission indicated otherwise and exposed that the construction companies had indeed colluded and pushed up the costs of the GFIP project.

This poses three further and serious questions:

a. **Were the construction companies responsible for the full extent of the unreasonable high construction costs, as is purported in this paper?**

b. **To what extent is it reasonably possible for the collusive construction companies to be able to hoodwink SANRAL with inflated construction cost pricing?**

c. **To what extent was SANRAL's leadership to blame for the high costs, as a result of incompetence, maladministration and / or corruption? It goes without saying that SANRAL knows very well, what the costs of road construction is in South Africa. One would assume then, that their suppliers will not be able to mislead them in this regard. They are after all the experts and have managed to convince Treasury in the past that no oversight mechanisms are necessary to keep their costs in line.**

3. The Extent of Gauteng Freeway Improvement Project.

The project's primary intention was to increase the freeway capacity by adding one additional lane to the existing freeway network of 185 kilometers. In the main, this meant the freeway network was widened from a three to a four-lane highway (in each direction). In some parts, the extra lane took the freeway from four to five lanes (Ben Schoeman section between Midrand and Centurion) and in others such as the R21 between Kempton Park and Pretoria, it was a case of widening from two to four lanes.

The project also attended to rehabilitation and re-surfacing of the existing road, introduced additional bridges and expansion at interchanges, and also introduced median lighting to the network.

In total, Phase 1 of GFIP involved the following work[1]:

- 185 km highway.
- 30 km of highway interchange upgrade (34 interchanges).
- 185 km of median lighting, with masts 50m apart.
- 185 km median concrete barriers.
- Two new-lane flyovers of one km each.
- The equivalent of 5,000 square meters of overhead bridge construction.
- The equivalent of 7,000 square meters of underpass-bridge work.

4. SANRAL's moving price-tag of GFIP.

The need for the GFIP Project was listed in SANRAL's Declaration of Intent 2006-2008), published in 2005[2] and at that time, was estimated to cost R 4,6 Billion. Over the next six years, the capital expenditure estimates attributed to the GFIP (Phase 1 – 185 km), changed a number of times until 2011, when Phase 1 was completed.

- In 2006, Sanral's indicated the 185km freeway upgrade would cost R 6,8Bn.
- By 2008 when construction started, this cost estimate had risen to R 11,4Bn.
- By the time the project was complete, the costs had risen to R 17,9Bn (excluding e-toll infrastructure).

According to SANRAL, the final GFIP (phase 1) costs of the project amounted to:

- **Capital expenditure of road construction: R 17,9 Billion**
- Capital Costs of E-Toll infrastructure & other incidentals: R 2,8 Billion
- Total Loan Capital: R 20,65 Billion.
- Annual E-Tolling operating costs once implemented – R 1,7 Billion per annum.
- Interest on capital borrowed: R 1,67 Billion per annum.

When one breaks this down, the construction cost of the GFIP (Phase 1) Freeway upgrade (i.e. road construction only, excluding the e-Toll elements), amounted to **R 96,7 Million per kilometre** (185 kilometre network at R 17,9 Billion).

[1] SANRAL. http://www.nra.co.za/live/content.php?Session_ID=77d3e8fa21e473f61fea76018522968b&Category_ID=201 (Page 27 - Gauteng Network 340km, Capital Works Expenditure in 2004 Rands: R4,6 billion)

[2] http://www.nra.co.za/live/content.php?Session_ID=77d3e8fa21e473f61fea76018522968b&Category_ID=201
(Page 27 - Gauteng Network 340km, Capital Works Expenditure in 2004 Rands: R4,6 billion)

5. OUTA's opinion: SANRAL has grossly overpaid for GFIP.

Initial research conducted by OUTA, indicated that SANRAL's price-tag of R 17,9 Billion (or R 96,7 Million per kilometre) for the freeway upgrade construction costs, are highly inflated, to the detriment of society at large and more specifically, the Gauteng road user (due to the e-toll decision).

OUTA's opinions in this respect, were reported in the media in 2015 (see article in Business Tech[3]). The opinion at the time was compiled from high level input of an independent engineer and quantity surveyor plus preliminary research, which gave rise to an estimate for the maximum cost of the GFIP project to be around R10.8 billion, in 2010 prices. This OUTA indicated at that time, showed that the final project was overcharged by around R 7.1 Billion (65%).

This paper however, provides a revision of that figure, which appears to be an overstatement and that the GFIP Phase-1 project should have been even lower than originally estimated.

In order to verify if there is merit in the above claim, OUTA commissioned a sound and experienced research team to benchmark SANRAL's GFIP costs, against international and other published costs of highway / road construction projects, on a like for like basis. We include in this document, details of the assessments and other variable factors, in order to table this report with reliable references to generic models used internationally, to determine preliminary cost estimates for highway construction in comparison to the GFIP project.

The data reported takes into account the inflation rates, rand dollar exchange rates and are projected for the year 2010 (the height of the GFIP upgrade), in order to make a meaningful comparison possible. Where reports and case studies indicated miles as the distance measurement, these figures are converted to kilometres.

[3] Staff Writer, 2015, 'Gauteng road project cost R7 billion more than it should have: Outa', in Google, viewed 17 January 2016, http://businesstech.co.za/news/general /93038/gauteng-road-project-cost-r7-billion-more-than-it-should-have-outa/html.E.

6. International Benchmarks and calculation guides

6.1 Generic Models to Estimate Road Construction Costs.

Various publications exist that guide one in estimating the projected cost of road construction projects. These require considerable calibration of information with regards to available raw materials and prices. Herewith a list of models and references.

- Food and Agriculture Organisation of the United Nations, 1992, Forestry paper 99, http://www.fao.org/docrep/T0579E/t0579e06.htm.[4]
- Early Cost Estimating for Road Construction Projects Using Multiple Regression Techniques Ibrahim Mahamid, (Hail University, Saudi Arabia).[5]
- Conceptual Cost Estimate of Road Construction Projects in Saudi Arabia, Ibrahim Mahamid, Assistant Professor, Civil Engineering Department, Hail University, Hail, KSA. E-Mail: imahamid@ymail.com.[6]
- Cost Estimating Guide for Road Construction, United States Department of Agriculture and Engineering, Forest Service, Northern Region, February 2009. htt://www.fs.fed.us/r1/projects.[7]

According to Vusi Mona, the spokesperson for SANRAL, there is "no unit cost for road construction that was an international benchmark that Sanral was aware of", adding that "typography and availability of material differed from country to country."[8]

One has to be concerned about such statements made by the spokesman of the State Owned entity responsible for building South Africa's roads, as in reality, there are a number of reports, benchmarks with international baselines that have been established by the World Bank and other institutions since 2000. The ROCKS (**RO**ad **C**ost **K**nowledge **S**ystem) developed by the World Bank is just one such Worldwide Database, which contains data from 65 developing countries on road construction and maintenance costs. The sources of information for this database includes World Bank Implementation Completion Reports, Civil Works Contracts, Project Supervision

[4] Food and Agriculture Organization of the United Nations, 1992, Forestry paper 99, in Google, viewed 17 January 2016,http://www.fao.org/docrep/T0579E/t0579e06.htm.
[5] Mahamid, I., 2011, 'Early Cost Estimating for Road Construction Projects Using Multiple Regression Techniques.', in Google, viewed January 2016, epress.lib.uts.edu.au/journals/index.php/AJCEB/article/download/...
[6] Mahamid, I., 20013, Conceptual Cost Estimate of Road Construction Projects in Saudi Arabia., Jordan Journal of Civil Engineering, Volume 7, No. 3, pp 285 – 294.
[7] United States Department of Agriculture and Engineering, 2009, 'Cost Estimating Guide for Road Construction.', in Google, viewed 17 January 2016, http://www.fs.fed.us/r1/projects.
[8] http://www.iol.co.za/business/news/sanrals-road-building-shock-1982185

Reports, Project Appraisal Documents, Pavement Information Systems, as well as Procurement and Disbursement Reports[9]. The ROCKS database serves as an international baseline for road construction costs in developing nations.

OUTA features a number of these in this report and bases its research on the average costs of road construction for each project type or description that best compares to that of the GFIP Project. It is also important to note that in most of the comparisons, we are comparing the GFIP costs to other projects that entail new road construction over the entire area of the project, whereas, in the case of GFIP, most of the project pertained to a resurfacing of an existing well maintained roadway, and around 35% of the project space pertaining to the addition of new lanes.

7. NOTES AND ASSUMPTIONS

i. Comparing like with like on projects.

We have noticed that in most of these benchmark case studies, the exercise notes that these figures pertain to road construction and / or rehabilitation, excluding the costs of bridges and interchanges, median lighting and other incidentals. For this reason, we have reduced the cost of the GFIP Construction cost comparison by an amount of R1.62 billion, which pertains to estimates of costs attributed to these extra elements of the GFIP project as follows:

- 2 x 1km Flyover interchange bridges: R256,000,000
- Overhead Bridge Construction (5000 Sq M): R 50,000,000
- Underpass Bridge Work (7000 Sq M): R 70,00,0000
- Concrete Median Barrier & Lighting: R970,000,000
- Interchange Work (30 km): R270,000,000

TOTAL DEDUCTED FROM GFIP COMPARISON: **R1,615,510,000**

Thus, the total GFIP (road) cost of R 17,9 Billion is reduced to R 16,3 Billion, which over 185 km equated to **R 88,1 Million per kilometre**, for purposes of comparison to international benchmarks.

[9] World Bank. 2001. ROCKS Database Available at: http://www.worldbank.org/transport/roads/rd_tools/rocks_2-01_database.htm

ii. Lane and Centreline Distance Calculations:

When benchmark projects are calculated at "Lane Kilometres", we have calculated the GFIP Projects average width to be equivalent to 9 lanes.

iii. Mile and Currency Conversions:

Mile calculations were converted to Kilometres and the currency was converted to Rands at the time of 2010, which is in SANRAL's favour in this project, as more than half the project was completed by 2010.

iv. Inflation:

We adjusted pricing upward by 7% per annum, for all costings prior to 2010 and reduced by the same for those benchmarks conducted after 2010.

8. Benchmarking to International & Developing Countries Examples of Road Construction Costs

8.1 International Case Studies

1. Nederland 'IMPACT' Study (FY 2008)

CE Delft is a company in the Netherlands, which performed a study they named "IMPACT", investigating road construction costs in 10 countries situated in Europe [10]. They reported average construction cost in these countries as follows:

- France as the lowest costs per kilometre at € 0.52 Million.
- Switzerland as the highest costs per kilometre at € 1.1 Million.

Converting this to South African rand the equivalent costs per kilometre of highway, using 7% inflation rate from 2005 to 2010 and approximate R/€ = 9,0 average exchange rate during 2010, it equates to R 6,56 Million and R 13,89 Million respectively. In this instance, to give SANRAL the benefit of the doubt, we have selected the comparison of the GFIP Project, to the highest value projects and as these costs pertain to the "average road project" we have doubled the value in light

[10] Doll, C. & van Essen, H.,2008, 'Road infrastructure cost and revenue in Europe.', in Google, viewed 17 January 2016, http://www.pedz.uni-mannheim.de/daten/edz-os/gdv/08/2008_road_infrastructure_costs_and_revenues.pdf

of a freeway being larger that an average road project. Thus, our benchmark for this comparison was R 27,77 million per kilometre.

CONCLUSION FROM CASE STUDY 1: If one bears in mind that SANRAL paid R88.1 million per kilometre for the GFIP in South Africa (excluding bridges, interchanges etc), when compared to the marked up benchmark of the Nederland 'Impact' Study of 2008, SANRAL has overpaid on the GFIP by 217%.

2. USA – Kansas Study (FY 2004)

Kansas Department of Transport reported a typically construction costs per ***mile*** after a study they performed on the construction costs of highways in the USA [11]:

Type of Project	**Cost in USD/mile** (in 2004)	**Cost in SA Rand/km** (2010) (R/$ = 7,32)
Widening 2-4 Lanes Urban	2,6 Million	**17,7 Million**
New Rural, 2- Lane Mountain Terrain	2,3 Million	15,7 Million
Rural Interstate Reconstruction	3,6 Million	24,6 Million
New Interstate Construction	6,5-8,5 Million	44,4 – 58 Million

Table 1: Typical Road Construction Costs as reported in the Kansas study during 2004. (R/$ in 2010 = 7,32; adjusted at 7% pa inflation rate for ZAR rates in 2010).

It clear from this study that construction projects rarely and only by exception exceed the R 50 Million per km mark. It would only be expected to reach this level in mountainous areas where tunnelling, bridges and protective walls are required.

CONCLUSION FROM CASE STUDY #2: From the above table, the GFIP compares closest to the 1st line item in Table 1 above. This benchmark of R 17,7 Million per kilometre when compared to the GFIP of R 88,1 Million per kilometre, SANRAL have overpaid by 398%.

3. USA - Virginia GASB 34 Study (FY 2002)

During 2002 the Virginia Department of Transportation's GASB 34 Infrastructure Valuation determined that the average cost per mile road is as follows[12]:

[11] Washington State Department of Transport, 2004, 'Highway Construction Cost', in Google, viewed 17 January 2016, http://www.arkansashighways.com/about/facts2000.html

Type of Road	$ per Mile (2000)	ZAR per km (2010)
Interstate	$ 1,87 Million	**R 14,6** Million
Primary	$ 0,77 Million	R 6 Million
Secondary	$ 0,24 Million	R 1,9 Million

Table 2 : Typical Road Construction Costs as reported in the Virginia GASB 34 study. (R/$ in 2010 = 7,32; adjusted at 7% pa inflation rate for ZAR rates in 2010).

CONCLUSION FROM CASE STUDY #3: It is important to note that the GFIP costs should be compared to the costs of interstate highway as reported in the GASB 34 study, of R 14,6 Million per kilometre of freeway. At this rate, SANRAL overpaid for GFIP by 503%.

4. Tanzania Roads Fund Board Study.

Cesar Queiroz a consultant, former World Bank Highways Adviser, reported key trends in road construction trends comparing China, OECD (Organisation for Economic Co-operation and Development) membership countries and other Africa countries with costs in Tanzania during 2012[13]. The cost per kilometre of a **2-Lane Road Equivalent** by Geographical Group and Type of Work are shown in the table below (2007 US$). The same table are reproduced to indicate costs ZAR (2010).

Costs in USD (2007).

	Rehabilitation and Reconstruction		Re-gravel	Upgrade to Paved		Periodic Maintenance
	Inter-urban	Urban	Inter-urban	Inter-urban	Rural Access	Inter-urban
Local	$333,003	$1,632,225	$59,473		$105,587	
China	$357,866			$361,167		$98,414
OECD	$568,817			$398,681		$137,152
Other African			$28,216	$285,868		

[12] Virginia Department of Transportation, 2000, Review of the Virginia Department of Transportation's GASB 34 Infrastructure Valuation', in Google, viewed 17 January 2016, http//www.virginiadot.org/business/ gasb34-welcome.asp.

[13] Queiroz C, 2012, 'Tanzania Roads Fund Board: Construction and Maintenance Unit Costs Workshop: Monitoring Road Works Contracts and Unit Costs in Sub-Saharan Africa for Enhanced Governance'., in Google, viewed 17 January 2016, http://siteresources.worldbank.org/EXTAFRSUBSAHTRA/Resources/1513929-1344621380722/Monitoring-Works-Contract-July2012.pdf

Equivalent costs in ZAR (2010).

	Rehabilitation and Reconstruction		Re-gravel	Upgrade to Paved		Periodic Maintenance
	Inter-urban	**Urban**	**Inter-urban**	**Inter-urban**	**Rural Access**	**Inter-urban**
Local	R2,96Mil	**R14,64Mil**	R0,53 Mil		R0,95Mil	
China	R3,21Mil			R3,24Mil		R0,88Mil
OECD	R5,10Mil			R3,58Mil		R1,2Mil
Other African			R0.14Mil	R2,57Mil		

Table 3: Comparison of Tanzanian Road Construction Cost with China, OECD member countries and other African countries. (R/$ in 2010 = 7,32; adjusted at 7% pa inflation rate for ZAR rates in 2010).

The costs of urban road construction in Tanzania compares well with costs reported both in Europe and USA and it is therefore expected that the GFIP costs should be in.

CONCLUSION OF CASE STUDY #4:

Taking the highest cost of a local urban area, at R 14,64 Million per kilometre of the average 2 lane road equivalent, and doubling this to a 4-lane road, this will equate to R 29,28 Million per kilometre. When compared to GFIP, SANRAL has overpaid by 201%.

5. Idaho Department of Transport - Gem County CIP Tables.

The Idaho Department of Transport published the following tables in July 2011 to aid planners in obtaining rough estimates for projects in early planning phases[14]. The figures are averages for the past 2 years. Each table is converted to ZAR per kilometre and also displayed graphically.

(Turnkey Projects on new Location with "Average" Drainage without Bridge Quantities) per mile.

ROAD TYPE	URBAN AREAS	RURAL	OTHER
6 LANE FREEWAY	$ 10,850,000	N/A	N/A
4 LANE FREEWAY	$ 8,800,000	$ 10,400,000	$ 6,750,000
4 LANE Painted median	N/A	$ 5,675,000	$ 4,725,000

[14] Idaho Department of Transport, 2007, 'Gem County CIP, Construction cost per mile.' in Google, viewed 17 January 2016, www.co.gem.id.us/.../publications/FINAL-COST-PER-MILE.pdf.
Idaho Department of Transport, 2007, 'Gem County CIP, Construction cost per mile', in Google, viewed 17 January 2016, www.co.gem.id.us/.../publications/FINAL-COST-PER-MILE-HAUL.pdf.

4 LANE UNDIVIDED	$ 5,525,000	N/A	N/A
4 LANE DIVIDED	$ 5,675,000	$ 6,400,000	$ 4,725,000
4 LANE ARTERIAL*	N/A	N/A	$ 10,375,000
2 LANE ARTERIAL	$ 3,175,000	$ 2,975,000	$ 2,750,000
2 LANE COLLECTOR	$ 2,100,000	$ 1,900,000	$ 1,700,000

Table 4a: New Roads (2011)

ROAD TYPE	URBAN AREAS	RURAL	OTHER
6 LANE FREEWAY	R 46 103 210	N/A	N/A
4 LANE FREEWAY	**R 37 392 465**	R 44 191 095	R 28 681 721
4 LANE Painted median	N/A	R 24 113 891	R 20 077 204
4 LANE UNDIVIDED	R 23 476 519	N/A	N/A
4 LANE DIVIDED	R 24 113 891	R 27 194 520	R 20 077 204
4 LANE ARTERIAL*	N/A	N/A	R 44 084 867
2 LANE ARTERIAL	R 13 491 032	R 12 641 203	R 11 685 145
2 LANE COLLECTOR	R 8 923 202	R 8 073 373	R 7 223 544

Table 4b: Guide for estimating typical costs of different road types for Idaho road planners. (R/$ in 2010 = 7,32; adjusted at 7% pa inflation rate for ZAR rates in 2010).

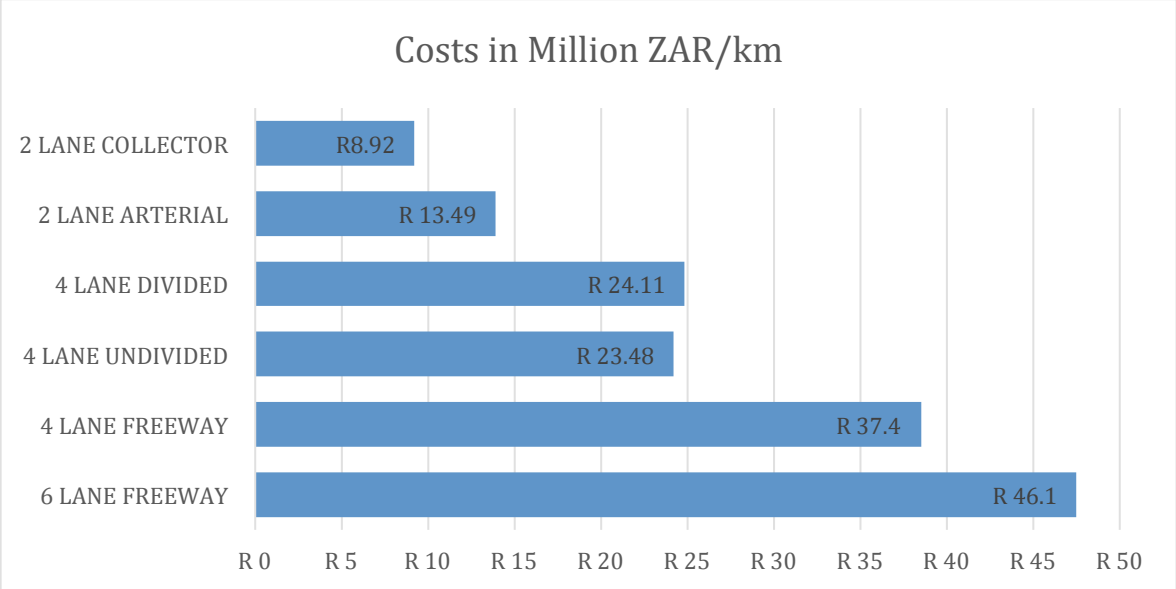

Figure 6: Graphical summary of typical road construction costs of different road types for Idaho road planners.

CONCLUSION OF CASE STUDY #5: At R 37,4 Million per kilometre for a new 4-lane Freeway, (remember the GFIP was not new for all 4 lanes, but was 1 lane added and a resurfacing of three lanes), the GFIP Project is still 136% overstated.

6. Capitol Fax – Generic cost per mile models.

The state of Illinois published the following generic model to assist road planners in making initial cost estimates, updated in January 2010[15]. The values are converted to kilometres and ZAR in 2010 prices and graphically presented below the table.

URBAN ROADS	Models Cost Per Mile (2010)	Cost Per km in ZAR (2010)
New Construction 4 Lane Divided Urban Interstate Closed 22' Median with Barrier Wall 10'	$8 598 289	R 39 092 842
Shoulders Inside + Out New Constr 5 Lane Undivided Urban Arterial with Center Turn Lane and 4' Bike Lanes	$5 312 066	R 24 151 753
New Construction 6 Lane Urban Road with 22' Median and 4' Bike Lanes	$6 386 655	R 29 037 462
New Construction Divided Urban 6 Lane Interstate with 22' Closed Median with Barrier Wall 10'	$9 543 509	R 43 390 364
Shoulders Inside + Out New Construction Extra Cost for Additional Lane on Urban Arterial	$515 867	R 2 345 433
New Construction Extra Cost for Additional Lane on Urban Interstate	$555 802	R 2 527 000
Mill + Resurface 2 Lane Urban Road with 4' Bike Lanes	$484 922	R 2 204 739
Mill + Resurface 3 Lane Urban Road with Center Turn Lane and 4' Bike Lanes	$664 561	R 3 021 482
Mill + Resurface 4 Lane Undivided Urban Roadway with 4' Bike Lanes	$954 929	R 4 341 665
Mill + Resurface 4 Lane Divided Urban Roadway with 4' Bike Lanes	$965 050	R 4 387 681
Mill + Resurface 5 Lane Urban Roadway with Center Turn Lane and 4' Bike Lanes	$1 143 408	R 5 198 600
Mill + Resurface 6 Lane Divided Urban Arterial with 4' Bike Lanes	$1 514 689	R 6 886 661
Mill + Resurface 1 Additional Lane Urban Arterial	$200 731	R 912 640
Add 2 Lanes to Existing 2 Lane Undivided Arterial 1 Lane Each Side with 4' Bike Lanes	$3 646 379	R 16 578 568

[15] Illinois, Department of Transport, 2001, 'Generic Cost per Mile Models', in Google, viewed 17 January 2016, http://capitolfax.com/summary.pdf.

Widen 2 Lane Urban Arterial to 4 Lane Divided with 22' Median + 4' Bike Lanes	$4 230 437	R 19 234 037
Add 2 Lanes to Existing 3 Lane Undivided Arterial 1 Lane Each Side with Center Turn Lane and 4'	$3 830 330	R 17 414 917
Bike Lanes Widen 4 Lane Urban Divided Arterial to 6 Lane Urban Divided with 22' Median and 4' Bike Lanes	$3 938 157	R 17 905 161
Widen 4 Lane Urban Interstate with Closed Median to 6 Lanes Outside ` Mill + Resurface Existing`	$6 323 291	R 28 335 634
10' Shoulders Outside Widen 6 Lane Urban Divided Arterial to 8 Lane Urban Divided with 4' Bike Lanes	$4 231 522	R 19 238 970
Widen 6 Lane Urban Interstate with Closed Median to 8 Lanes Outside ` Mill + Resurface Existing` 10' Shoulders Outside	$6 809 415	R 30 959 576

Table 12: Capitol Fax cost estimation tables for early planning in road construction.

(R/$ in 2010 = 7,32; adjusted at 7% pa inflation rate for ZAR rates in 2010).

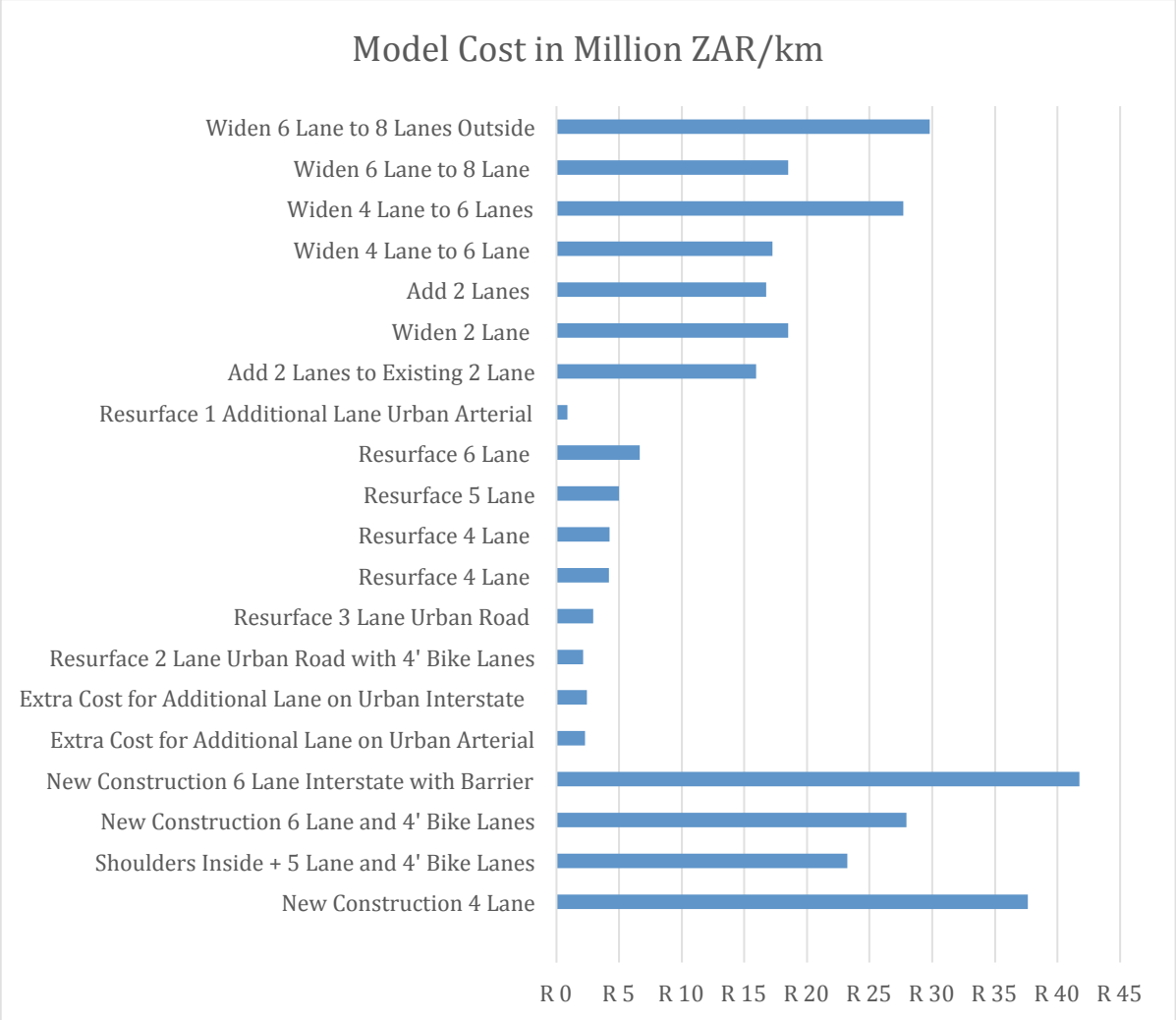

Figure 13: Graphical summary of Capitol Fax cost estimation values for early planning in road construction.

CONCLUSION OF CASE STUDY #6: A more apt comparison of the GFIP to the Capitol Fax estimation is that the addition of two lanes (R 17,4 Million per kilometre) and Resurface of 4 lanes (R 4,4 Million per kilometre) to get to R 22 Million per kilometre. The GFIF project cost of R 88,1 Million per kilometre, is 300% overpriced.

7. Rodrigo Archondo-Callao Report

In addition Rodrigo Archondo-Callao published a report, based on World Bank Reports, range values for different types of road construction projects, data was collected 93 construction project in 40 different countries[16]. The values are converted to ZAR (2010).

Paved Roads	**Cost in $/km (2000)**	**Cost in ZAR/km (2010)**
Seals	5,000 - 32,000 $/km	R 71,998 – 460,786
Functional Overlays	30,000 - 107,000 $/km	R 431,986 – 1,540,752
Structural Overlays	74,000 - 198,000 $/km	R 1,065,567 – 2,851,110
Rehabilitation	45,000 - 700,000 $/km	R 647,980 – 10,079,684
Construction	142,000 - 1,832,000 $/km	**R 2,044,736 – 26,379,972**
Unpaved Roads	**Cost in $/km**	**Cost in ZAR/km**
Re-gravelling	9,000 - 13,000 $/km	R 129,596 – 187,194
Rehabilitation	17,000 - 47,000 $/km	R 244,792 – 676,779
Improvement	11,000 - 114,000 $/km	R 158,395 – 1,641,548
Paving	62,000 - 609,000 $/km	R 892,772 – 8,769,325

Table 14: Cost ranges for different road types as published by Illinois department of transport. (R/$ in 2010 = 7,32; adjusted at 7% pa inflation rate for ZAR rates in 2010).

From this data it is clear that the most expensive construction project in urban areas will be the construction of a new six-lane highway with a 10 feet barrier wall. This will amount to approximately R 45 Million per kilometre.

CONCLUSION FROM CASE STUDY #7: Based on the highest value above, for the average of 93 road construction in 40 countries, the cost per kilometre of R 26,4 Million. GFIP's comparison was spend by 234%

[16] Archondo-Callao, R., 2000, 'Roads Works Costs per Km Source: World Bank Reports.', in Google, viewed on 17 January 2016, www.worldbank.org/transport/roads/c&m_docs/kmcosts.pdf.

8.2 African related Studies

1. Africon Study (2008)

The Africon study, commissioned by the World Bank, analysed infrastructure costs across Sub-Saharan Africa. The aim of the study was to "design, generate and analyse a database of the unit costs of infrastructure projects in Sub-Saharan Africa over the last decade."[17] Africon sampled 115 road projects (25 new paved road construction projects, 45 rehabilitated paved roads, 8 projects to maintain paved roads and 37 unpaved roads) across twenty-four (24) Sub-Saharan African countries (including South Africa but just prior to and therefore excluding the GFIP), to determine the unit costs for road construction and maintenance. Whilst the sample is spread across the 24 counties, it best represented of Angola, Mozambique, Uganda and Burkina Faso.

It is important to note what this research does not include:

- Certain costs related to design, supervision and taxes are not included in study.
- The study also excludes major structures such as bridges. This should be taken into consideration.

The differences in unit costs seen in the tables may be as a result of design characteristics (eg: terrain, climate, design standard etc…). The results were taken from 2006, and adjusted for 7% per annum inflation for 2010.

Type	Unit	Lower Quartile (2006)	Lower Quartile (2010)	Median (2006)	Median (2010)	Upper Quartile (2006)	Upper Quartile (2010)
Construction (paved) <50km	US$/ lane km	349,523	458,153	401,646	526,476	613,929	804,736
Construction (paved) >50km	US$/ lane km	209,427	274,516	290,639	380,968	344,135	451,091
Rehabilitation (paved) <50km	US$/ lane km	220,186	288,619	352,613	462,204	505,323	662,375
Rehabilitation (paved) >50km	US$/ lane km	194,679	255,184	299,551	392,650	457,714	599,970
Periodic Maintenance (Paved)	US$/ lane km	81,854	107,294	158,009	207,118	235,157	308,243
Regraveling	US$/ lane km	12,835	16,824	15,625	20,481	19,490	25,547

[17] http://www.eu-africa-infrastructure-tf.net/attachments/library/aicd-background-paper-11-unit-costs-summary-en.pdf

Table 15: The unit costs of road construction and maintenance (In US$)

Type	Unit	Lower Quartile (2006)*	Lower Quartile (2010)**	Median (2006)*	Median (2010)**	Upper Quartile (2006)*	Upper Quartile (2010)**
Construction (paved) <50km	ZAR/ lane km	2,558,508	3,353,680	2,940,049	3,853,804	4,493,960	5,890,668
Construction (paved) >50km	ZAR/ lane km	1,533,006	2,009,457	2,127,477	2,788,686	2,519,068	3,301,986
Rehabilitation (paved) <50km	ZAR/ lane km	1,611,762	2,112,691	2,581,127	3,383,333	3,698,964	4,848,585
Rehabilitation (paved) >50km	ZAR/ lane km	1,425,050	1,867,947	2,192,713	2,874,198	3,350,466	4,391,780
Periodic Maintenance (Paved)	ZAR/ lane km	2,558,508	3,353,680	2,940,049	3,853,804	4,493,960	5,890,668
Regraveling	ZAR/ lane km	1,533,006	2,009,457	2,127,477	2,788,686	2,519,068	3,301,986

**Dollar Rand Exchange 2010 Average = R 7.32

CONCLUSION FROM CASE STUDY #8: According to the Africon figures, the construction costs for the Gauteng Freeway Improvement Project if built as a new road, at R 3,3 Million per **lane** kilometre, (being the upper quartile) would equate to R 29,7 Million per kilometre of the GFIP (Average 9 lanes wide). With GFIP comparison cost at R 88.1 Million per kilometre, is roughly 197% higher.

2. African Development Bank (AfDB) Study 2010/2011

Following the study by Africon in 2008, the African Development Bank (AfDB) conducted a study in 2010/2011 to analyse the road infrastructure and construction unit costs in Africa. The study looked at creating a database of road projects in Africa, which offer a baseline for construction costs in Africa, and assist in identifying the prevalence and extent of cost overruns in African based projects.

What this study highlighted is that while there is no specific unit cost that can be determined, unit costs can be estimated by comparing broadly similar projects, whilst taking into account differing designs details and circumstances. In addition, the size of the project has a large impact on the unit rate – economy of scale. The larger the project, the smaller the unit. For comparison sake, major physical and

location factors such as bridges and taxes are excluded from the comparison in the study.

The study also indicated that, in Africa, cost overruns in road infrastructure are increasingly common, ranging between at least 35% and 100%. These cost overruns can be caused by a lack of competition in the bidding process, technology practices, increase in fuel prices and availability and quality of road materials. However, understanding these cost overruns is difficult due to limited data availability.

To standardize the unit costs determined in this study, financial adjustments were made to exclude costs related to:

- feasibility, environmental, design and other studies;
- social mitigation costs (eg: relocation costs)
- supervision and audit services
- taxes

The unit costs were determined by analysing the Project Completion Reports of 172 projects around Africa. Unit rates are expressed in US$, but converted to ZAR, taking into account the exchange rate of the time, as well as inflation. It is important to note that unit rate data is subject to variances. Factors such as regional characteristics (geography, climate, business practices etc...), the origin of the main contractor and the country's accessibility to the sea will affect construction costs.

The study found that:

- The smaller the project, (particularly projects that are shorter than 50 kilometres) were more expensive than contracts larger than 50 kilometres. This also meant that smaller projects were more susceptible to cost overruns.
- Upgrading or new construction of roads are more susceptible to cost overruns.
- The location of the project did not significantly influence the unit rate distribution
- There is a difference between landlocked and seaboard countries, but without major influence.

Bearing in mind the effect of design details and specific circumstances such as geographical location, as well as issues related to economy of scale, the following table indicates the unit rate statistics for road infrastructure across 24 African countries and 172 projects.

Type of Road Infrastructure Investment	Rehabilitation of Paved Road (US$ - 2006)	Construction & Upgrading of Paved Roads (US$ - 2006)
< 100 lane km		
Quartile 3	290 000	425 400
Median	180 300	227 800
Quartile 1	109 800	166 300
≥ 100 lane km		
Quartile 3	130 500	162 000
Median	84 400	147 100
Quartile 1	47 400	115 900

Table 17: Summary of Unit Rate Statistics for Different Types of Road Infrastructure Investment (USD/lane km, US$ rounded to '00)

Type of Road Infrastructure Investment	Rehabilitation of Paved Road (ZAR - 2010)**	Construction and Upgrading of Paved Roads (ZAR - 2010)**
< 100 lane km		
Quartile 3	2,782,558	4,081,724
Median	1,729,983	**2,185,747**
Quartile 1	1,053,534	1,595,653
≥ 100 lane km		
Quartile 3	1,252,151	**1,554,394**
Median	809,820	1,411,428
Quartile 1	454,804	1,112,064

Table 18: Summary of Unit Rate Statistics for Different Types of Road Infrastructure Investment in 2010 (ZAR/lane km)

** The results were taken from 2006, and adjusted for 7% per annum inflation for 2010. Exchange rate of R7,32 to the dollar used for 2010.

According to the African Development Bank figures, the baseline construction costs for road construction, for the average 9 lanes wide GFIP Project in excess of 100km long, should be R 19,67 Million per kilometre. It is important to note this figure is not limited to highway construction. This figure will exclude additional structure such as bridges.

CONCLUSION: CASE STUDY #9:

This study at R19.7 million per kilometer, this equates the GFIP build cost of R 88,1 Million per kilometer at 347% higher than this benchmark.

8.3 South African Context

3. CSIR Report. (FY 2006)

Dr James Maina from the CSIR reported during 2006 in the article "Multi-million Rand Research to Design Better, Durable Roads" that the cost to build 1 km urban highway is in the order of R 25,0 Million per kilometre[18]. This equates to R 32,8 Million per kilometre at 7% annual inflation rate by the year 2010.

This report is an informed estimation from within the Republic what the reasonable costs to construct roads in South Africa and therefore mentioned upfront in this report.

CONCLUSION OF CASE STUDY # 10: From this figure of R32.8 million per kilometre of urban highway, we can deduce that at R 88,1 Million per kilometre, SANRAL has overpaid by 169%

4. Trans-Kalahari Project.

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The Trans-Kalahari Project, which connects Namibia and Botswana via Gobabis with Buitepos, represents a new construction of 75 km. The project objective was to "to improve road links with the neighbouring countries of Angola, Botswana, Zambia and Zimbabwe. The objective of the present project was to improve transport service levels and road safety conditions on the Trans-Kalahari Highway connecting Namibia and Botswana" [19]. The project was initiated to upgrade existing two lane gravel surface roads to a new bitumen standard with a 7.4 metre wide carriageway with 2.50 metre shoulders on each side including drainage structures and ancillary works. The total estimated cost of the project was therefore NS$ 78,96 Million (UA 21,07 Million). It is important to note that this cost included civil works and construction supervision (including contingencies and price escalations). At completion of the project, the total project cost actually came out at NS$ 69,81 Million, which was lower than the estimated cost.

[18] Mania, J.,2010, 'Multi-million rand research to design better, durable roads.'', in Google, viewed 17 January 2016,http//www.slideshare.net/Abdelkariem/22-ss-betransportlogisticschap1.pdf

[19] http://www.afdb.org/fileadmin/uploads/afdb/Documents/Project-and-Operations/ADF-BD-IF-99-165-EN-NAMIBIA-TRANS-KALAHARI-HIGHWAY-PROJECT.PDF

The project was completed in 1999 and taking into account that the Namibian dollar is in effect the same as the South African Rand, at an annual inflation rate of 7% the estimated project will amount to R166,2 Million or R2,1 Million/kilometre (for 2 lanes) in the year 2010. One can assume with the proximity and similarities in economy between South African and Namibia, the GFIP cost would be in same order of magnitude in costs for the Trans-Kalahari Project.

CONCLUSION OF THIS BENCHMARK: For the GFIP Project (working with a cost of R2,1 Million/kilometre for 2 lanes), the 9 lanes would equate to R 9,45 Million/kilometre. The GFIP is therefore priced at 832% more than the Trans-Kalahari Project. In addition, it was a smaller project and located far from the sources of raw material and manpower. The economies of scale of the GFIP and its location were of immense benefit to the GFIP. This specific case study and benchmark, is closer to home and a serious indication of out of line the road construction price of the GFIP project has become.

5. OUTA's Research.

Following on from OUTA's earlier research in 2015 which depicted a cost of GFIP at R10.8 billion, the OUTA Research team conducted further analysis of the project and have revised their calculation of a reasonable price for GFIP to be R7.1 billion, for the entire road construction project, including interchanges, bridges, median lighting etc. This equates to R38.3 million per kilometre and is the lowest variance from SANRAL's GFIP cost. We were however, very generous in many of our estimates and our costing would be construed as the maximum for this project.

CONCLUSION OF OUTA's CASE STUDY: This figure indicates that at the full R96.7 million for the GFIP project per kilometre, it would appear that society has been overcharged by around 152%

GFIP ROADS CONSTRUCTION COSTING EXERCISE (2010)

STUDY BY OUTA (2016 at 2010)

Based on input from experienced Road Construction Engineer,

#	DESCRIPTION	KM	# of LANES	# OF LANE KM	UNIT USED	NEW ROAD	RESURFACE / REHABILITATE EXISTING ROAD	ESTIMATED CONSTRUCTION COST
1	New lanes constructed (Centre island of the freeway network. One lane in each direction - excluding R21)	142	3.0	426	LANE KM	3,500,000		**1,491,000,000**
2	NEW ROAD CONSTRUCTION FROM BARE GROUND - Flat. R21 - From Flying Saucer interchange to Kempton Park	32	5.0	160	LANE KM	3,500,000		**560,000,000**
3	Resurfacing existing freeway on R21 - From Flying Saucer interchange to Kempton Park	32	4.5	144	LANE KM		2,500,000	**360,000,000**
4	Resurface of existing roads (excluding R21)	142	8.0	1,136	LANE KM		2,500,000	**2,840,000,000**
5	Resurfacing existing freeway - K/Park to Boksburg	11	8.0	88	LANE KM		2,500,000	**220,000,000**
	SUB TOTALS	**185**		**1,954**	**Lane KM**			**5,471,000,000**
6	Widening and rehabilitation of Interchanges	30	2.0	60	LANE KM	4,500,000		**270,000,000**
7	Two new 2-lane fly-overs (1km each) - One Gilooleys and one at Flying Saucer interchanges	2	2.0	4	LANE KM	64,000,000		**256,000,000**
8	Overhead Bridge Construction (5,000 sq m)	5,000	Sq M	1.00	LANE KM	50,000,000		**50,000,000**
9	Underpass bridge work (7,000 sq m)	7,000	Sq M	1.40	LANE KM	50,000,000		**70,000,000**
10	Concrete Median Barrier*: 185 km.	185	Per KM	185	KM	4,200,000	**< Cost /KM**	**777,000,000**
11	LIGHTING: Lamps at 50m apart over 185km = 3700 Poles**	185	Km	3,700	Poles	52,300	**< Cost per pole installed with cable**	**193,510,000**
	TOTAL PROJECT COST							**7,087,510,000**

GFIP Construction costs **17,900,000,000**

GFIP Construction costs % Higher than these estimated and benchmarks **153%**

NOTES **OVERCHARGE A/P OUTA's CALCULATION:** **10,812,490,000**

* Each barrier 3,6 long @ 1m3 cost R8800each + R1800/m meter for mesh and installed.

** Lighting Breakdown: at R20,000 per pole, plus R32,300 per installation (includes R5,000 per pole installed and R500/m for cable and installation of cable)

9. Conclusion & Recommendations

Summary of 11 Benchmarks and case study comparisons

SUMMARY OF OUTA's INTERNATIONAL COST REPORTS & BENCHMARK CASE STUDIES:

#	BENCHMACH CASE STUDY	RAND PER CENTRELINE KM (Rx Millions)		% Overpaid
		R/KM OF BENCHMARK PROJECT	SANRAL (R96.7m/km - R7,0m)*	
1	Nederland Impact Study of 2008	27.8	88.1	**217%**
2	USA - Illinois Study (FY 2002).	17.7	88.1	**398%**
3	USA - Virginia GASB 34 Study (FY 2002)	14.6	88.1	**503%**
4	Tanzania Roads Fund Board Study	29.3	88.1	**201%**
5	Idaho Department of Transport - Gem County CIP Tables.	37.4	88.1	**136%**
6	Capitol Fax – Generic cost models	22.0	88.1	**300%**
7	Rodrigo Archondo-Callao Report	26.4	88.1	**234%**
8	Africon Study (2008)	29.7	88.1	**197%**
9	African Development Bank (AfDB) Study 2010/2011	19.7	88.1	**347%**
10	CSIR Report. (FY 2006)	32.8	88.1	**169%**
11	Trans-Kalarai project (Namibia) (1999)	9.5	88.1	**832%**
	AVERAGE OVERPAYMENT OF GFIP COMPARED TO 11 CASES & BENCHMARKS>			**321%**
12	OUTA's Research (Revised Feb 2016)	38.3	96.7	**152%**

NOTE: * SANRAL's Cost per KM for GFIP reduced by R7m / km being cost of bridgework, interchanges, median barriers and lighting

From OUTA's research and comparisons to international studies, we have summarised the variations to the GFIP cost on 11 projects and come out at an average of 321% as the overcharge for GFIP (see Table above), excluding the results of OUTA's own exercise on the GFIP costing.

This leads OUTA to conclude that in their opinion, the South African society have been severely and significantly overcharged for the construction costs of the GFIP. If we have to put a figure on it, we would say that anything over OUTA's generous estimate of R7,1 Billion is too much. Furthermore, when taking the comparisons with the international case studies and benchmarks referenced in this paper, the South African public have every right to feel ripped off, to the tune of a minimum of R10,8 billion on the GFIP Project. In addition, when reading the current price-tags being placed on the GFIP Phases 2 & 3, we are concerned that this overpricing problem will continue unabated and the need for urgent and absolute transparency, plus independent investigations are called for.

The E-Tolls decision is now grossly unjustified.

The cost of collection of e-tolls, is over R 1 Billion per annum (or R 80 Million per month). Actually, SANRAL's own figures of the E-Toll collection costs amount to R1,7bn per annum, had thee scheme gone according to their initial plan.

It is therefore our contention that had the GFIP construction cost come in at a more realistic price tag of R7 Billion, the repayment costs on the loan would have amounted well under R1 Billion per annum, over 20 years, at an (achievable) interest rate of 10%. This means that the servicing of the capital debt of the road upgrade would have cost less than the e-Toll collection costs, which would make the scheme highly irrational and unacceptable.

All motorists and citizens of South Africa who read this report, have every reason to feel aggrieved by these high costs and should certainly feel very motivated to refrain from paying e-Tolls.

Many questions now abound. What really happened?

The question is how and why was did we overpay for the GFIP construction. As indicated earlier, Sanral are the supposed experts and should know the comparative and true price of road construction in SA.

We are aware that the following factors may have influenced the costs upward and that SANRAL will invent more excuses, as they try to justify the high prices paid:-

- Engineering Skills shortage.
- Shortage and therefore a higher cost of Bitumen.
- Working under constrained conditions and after hours / weekends.
- Construction collusion.

However, it is clear to us that even when factoring in these elements, not much of a difference happens to the overall price of the project. Furthermore, it is important to note that this project was mainly one of a resurfacing of an existing road surface when compared to the other benchmarks, which were largely projects involving new road construction, which is a far more expensive exercise.

Construction Company's Collusion Impact

The highest impact that may have come into play, could be attributed to the construction company collusion. The question is, how much would the construction companies been able to convince their customer (SANRAL) to accept, in a collusive

environment, before raising SANRAL's alarm bells? 10%? 15%, 50%. This however, does not answer the question as to the average benchmark overcharge of 321%.

Other possibilities.

Whilst we know there was collusion (Corruption) through the conduct of the construction companies, we cannot overlook the a glaring opinion and possibility that a portion of the estimated overcharge, (R 10,8 Billion in OUTA's opinion), might be attributed to incompetence, maladministration or possibly even corruption within SANRAL and or between them and their suppliers. We therefore believe the SANRAL Board and the Department of Transport will have a lot to answer to the public about this matter.

Recommendations

In light of the findings in this report, we suggest the following:-

1. **That SANRAL's acceptance of such high road costing, is a serious problem for the public. As such, a thorough and extremely independent investigation is required to get to the bottom of these concerns.**
2. **The Treasury Oversight rules need to apply to SANRAL going forward.**
3. **All future contracts and bills of quantities, pricing etc, for all road projects in South Africa, must be conducted in an open and transparent manner, with invitations to civil society to scrutinise.**
4. **The Gauteng e-Toll scheme is cancelled.**
5. **That SANRAL abandons its plans to toll the Western Cape Freeway project.**
6. **That all toll road projects and major road construction projects undertaken by SANRAL be investigated.**

Wayne Duvenage.
OUTA Chairman.

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