Are developing countries paying for their roads? : Matching road costs and available revenues

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"Fund allocation"

1. **Guiding question:** *Are sufficient funds allocated for financing road network life cycle costs?*
   - ➔Maintenance of current transport network
   - ➔Extension / quality improvement
   - ➔Asset replacement
2. **Sufficient funding for maintenance is** crucial for the sustainability **of FC projects (which often focus on rehabilitation / major reconstruction)**
3. **Sources of funds (budget, users, donors) not as important as** adequacy **and** reliability **of funding**

"User contribution" (cost recovery)

Guiding question: *To what extent does the user contribute towards road financing?*

- ➔ Maintenance of current road network
- ➔ Rehabilitation / extension / quality improvement
- ➔ Asset replacement
- ➔ Cost of capital / interest

Fund Allocation & User Contribution

see KfW Policy Documents

Sustainable Transport Financing:
Strengthening market economy structures, calling for counterpart efforts

(http://www.kfw-entwicklungsbank.de/EN/Service/Onlinelibr23/TopicsofDi.jsp)

Two Scenarios

1. "Base Scenario": **Maintaining theoretically "new" roads**

   → **no rehabilitation or clearing of backlogs**

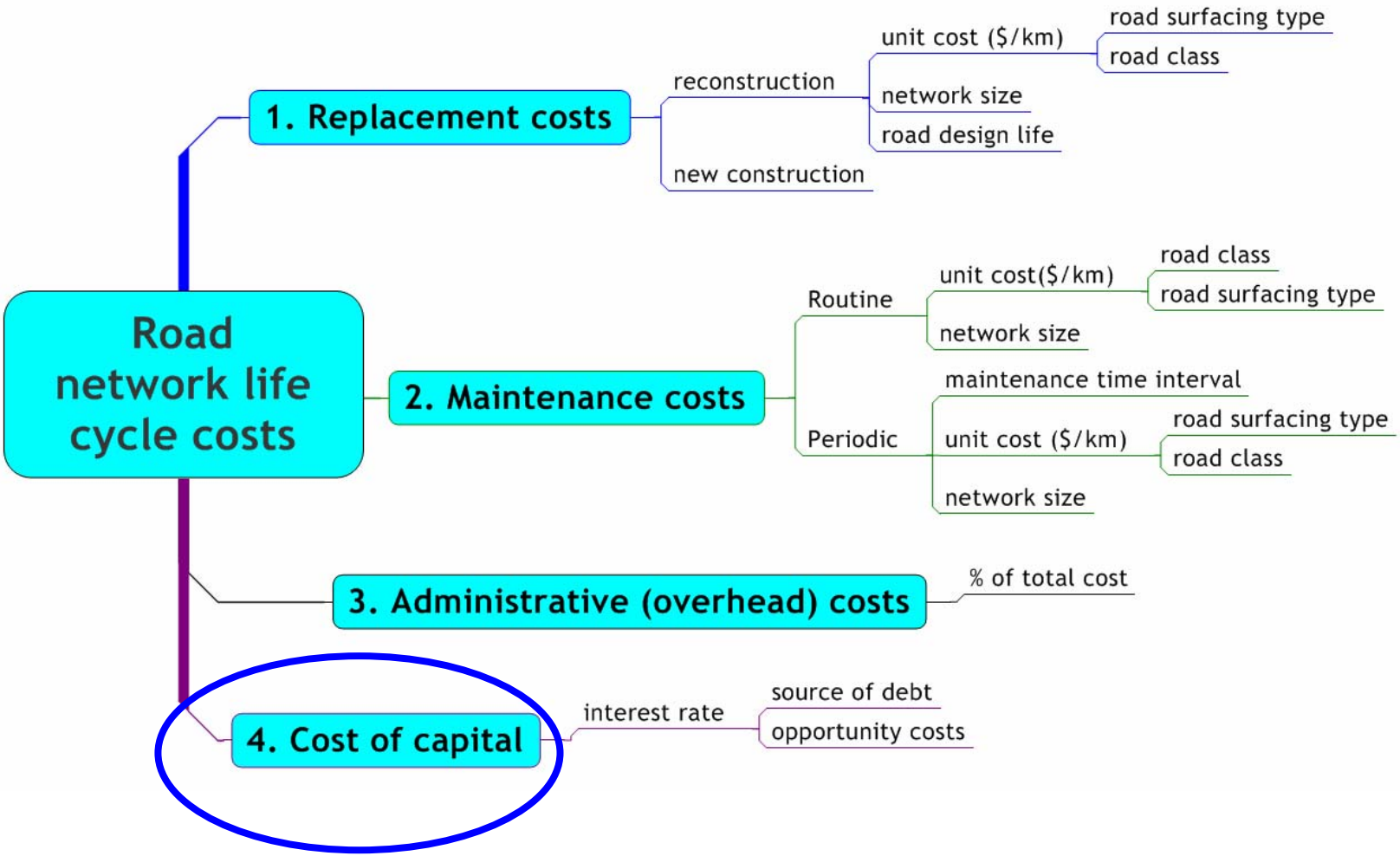
   Idea: If donors were to help a country rehabilitate its (core) network:

   - ***Would the country be able to maintain it?***
   - ***To what extent will users pay for maintaining it?***

2. "Extended scenario": **Bringing existing road network to "good" condition**

   →require rehabilitation and clearing backlogs

Cost Components



„Cost of capital" / interest

Possible interpretations / justifications**:**

- ➔ The government expects some **minimum return on investment** when building transport infrastructure (otherwise it invests the money elsewhere)
- ➔ in order to improve transport infrastructure **the government takes a loan** that has to be serviced
- ➔ The transport sector is perceived as a **business** that must generate returns on investment

„Cost Capital" / Interest (continued)

What is the "right interest rate**"?**

- 0%: only loan repayment, no interest
- 3%: "minimum" return on investment (ROI)
  (FC: 3% = minimum economic ROI for projects in very poor developing countries)
- 6%: "normal" ROI
  (FC: 6% = normal economic ROI for projects in DCs)
- > 6%: "business" ROI

Interest rate used in examples: 0%

Example 1a – Ghana 2004 / 2005 (base scenario)

Costs / funding needs

- Routine Maintenance
- Periodic Maintenance
- Asset Replacement
- Financial cost

User contribution

- Vehicle Registration
- Vehicle Tax
- Fuel Tax
- International Transit
- Tolls

Ghana: Base Scenario COSTS

Road class	Network Size(2003)	Asset replacement costs				Routine maint. costs		Periodic maintenance. costs			Total maint	Annual life-cycle costs	
Surface type	km	US$ /km	US$m	years	US$m /year	US$/km /year	US$m	US$/km	years	US$m /year	US$m /year	US$m /year	%Asset cost
Trunk Roads	**12 690**		**3 493**		**137.6**		**13.3**			**61.8**	**75.0**	**212.7**	**6.1%**
Asphalt	1 600	500 000	802	30	26.7	1 150	1.8	110 000	12	14.7	16.5	43.3	5.4%
Bituminous	4 730	300 000	1 420	30	47.3	1 040	4.9	23 000	9	12.1	17.0	64.4	4.5%
Gravel	6 360	200 000	1 271	20	63.6	1 020	6.5	22 000	4	35.0	41.5	105.0	8.3%
Urban Roads	**4 060**		**796**		**31.3**		**7.3**			**15.2**	**22.5**	**53.8**	**6.8%**
Asphalt	410	404 400	167	30	5.6	1 900	0.8	83 550	12	2.9	3.7	9.2	5.5%
Bituminous	1 520	227 300	346	30	11.5	1 900	2.9	27 580	9	4.7	7.6	19.1	5.5%
Gravel	2 130	133 000	283	20	14.2	1 700	3.6	14 400	4	7.7	11.3	25.5	9.0%
Feeder Roads	**32 610**		**873**		**43.5**		**13.0**			**38.8**	**51.8**	**95.4**	**10.9%**
Bituminous	1 210	141 300	172	30	5.7	470	0.6	16 200	9	2.2	2.8	8.5	4.9%
Gravel	17 770	30 000	533	20	26.6	470	8.4	6 300	4	28.1	36.4	63.1	11.8%
Earth	13 630	12 300	168	15	11.2	300	4.1	1 250	2	8.5	12.6	23.8	14.2%
Total	**49 370**		**5 162**		**212.5**		**33.6**			**115.8**	**149.4**	**361.8**	**7.0%**
Adm. costs (5%)					10.6		1.7			5.8	7.5	18.1	
Grand total			**5 162**		**223.1**		**35.3**			**121.6**	**156.8**	**379.9**	**7.4%**

Example 1b – Ghana (extended scenario)

Costs / funding needs

- Routine Maintenance
- Periodic Maintenance
- Asset Replacement
- ➢Clearing backlogs
- Interest

User contribution

- Vehicle Registration
- Vehicle Tax
- Fuel Tax
- International Transit
- Tolls

Ghana: Extended Scenario COSTS

Road Surface Type	Network Condition	Network Needs	Network Length [2003]		Cost of clearing backlog			Annual maintenance costs							Asset Replacement costs		Total Annual Costs
								Routine		Periodic				R+P			
			km	%	US$/km	US$m	US$m/yr	US$/km/yr	US$m/yr	US$/km	US$m	Years	US$m/yr	US$m/yr	US$/km	US$m/yr	US$m/yr
Asphatic			**2.017**	**4%**		**148,4**	**14,8**		**2,6**		**210,9**		**17,6**	**20,2**		**32,3**	**67,3**
	Poor	*Reconstruct*	*236*	*12%*	*446.568*	*105,6*	*10,6*	*1.572*	*0,4*	*95.216*	*22,5*	*12*	*1,9*	*2,2*	*446.568*	*3,5*	*16,3*
	Fair	*Overlay*	*415*	*21%*	*103.163*	*42,8*	*4,3*	*1.344*	*0,6*	*103.163*	*42,8*	*12*	*3,6*	*4,1*	*446.568*	*6,6*	*15,0*
	Good	*"Do nothing"*	*1.365*	*68%*				*1.244*	*1,7*	*106.640*	*145,6*	*12*	*12,1*	*13,8*	*446.568*	*22,2*	*36,0*
Bituminous			**7.469**	**15%**		**502,9**	**50,3**		**8,4**		**170,5**		**18,9**	**27,4**		**64,6**	**142,2**
	Poor	*Reconstruct*	*1.772*	*24%*	*253.945*	*450,1*	*45,0*	*1.186*	*2,1*	*23.144*	*41,0*	*9*	*4,6*	*6,7*	*253.945*	*15,0*	*66,7*
	Fair	*Resurface*	*2.283*	*31%*	*23.109*	*52,8*	*5,3*	*1.135*	*2,6*	*23.109*	*52,8*	*9*	*5,9*	*8,5*	*253.945*	*20,7*	*34,4*
	Good	*"Do nothing"*	*3.414*	*46%*				*1.089*	*3,7*	*22.484*	*76,8*	*9*	*8,5*	*12,2*	*253.945*	*28,9*	*41,2*
Gravel			**26.252**	**53%**		**1.371,5**	**137,2**		**18,5**		**282,9**		**70,7**	**89,2**		**104,4**	**330,7**
	Poor	*Reconstruct*	*14.857*	*57%*	*87.187*	*1.295,3*	*129,5*	*751*	*11,2*	*11.450*	*170,1*	*4*	*42,5*	*53,7*	*87.187*	*64,8*	*248,0*
	Fair	*Regravel*	*7.327*	*28%*	*10.399*	*76,2*	*7,6*	*638*	*4,7*	*10.399*	*76,2*	*4*	*19,0*	*23,7*	*87.187*	*27,3*	*58,7*
	Good	*"Do nothing"*	*4.068*	*15%*			*0,0*	*648*	*2,6*	*9.005*	*36,6*	*4*	*9,2*	*11,8*	*87.187*	*12,3*	*24,1*
Earth			**13.630**	**28%**		**92,5**	**9,3**		**4,1**		**17,0**		**8,5**	**12,6**		**11,2**	**33,1**
	Poor	*Reconstruct*	*7.088*	*52%*	*12.336*	*87,4*	*8,7*	*300*	*2,1*	*1.250*	*8,9*	*2*	*4,4*	*6,6*	*12.336*	*5,8*	*21,1*
	Fair	*Regravel*	*4.089*	*30%*	*1.250*	*5,1*	*0,5*	*300*	*1,2*	*1.250*	*5,1*	*2*	*2,6*	*3,8*	*12.336*	*3,4*	*7,7*
	Good	*"Do nothing"*	*2.453*	*18%*				*300*	*0,7*	*1.250*	*3,1*	*2*	*1,5*	*2,3*	*12.336*	*2,0*	*4,3*
Total			**49.369**	**100%**		**2.115,3**	**211,5**		**33,6**		**681,4**		**115,8**	**149,4**		**212,5**	**573,4**
Adm. Costs (5%)						105,8	10,6		1,7		34,1		5,8	7,5		10,6	28,7
Total with adm.						**2221,1**	**222,1**		**35,3**		**715,5**		**121,6**	**156,8**		**223,1**	**602,0**

Ghana: Life Cycle Costs

Road class/ surface type	Cost of clearing backlog		Annual maintenance costs	Annual Asset replacement costs	Annual life cycle costs
	Total	Over10years			
	US$m	US$m/year	US$m/year	US$m/year	US$m/year
Trunk roads	**1,271**	**127.1**	**75.0**	**137.6**	**339.7**
Asphalt	86	8.6	16.5	26.7	51.8
Bituminous	336	33.6	17.0	47.3	97.9
Gravel	848	84.8	41.5	63.6	189.9
Urban roads	**396**	**39.6**	**22.5**	**31.3**	**93.4**
Asphalt	62	6.2	3,7	5.6	11.8
Bituminous	122	12.2	7.6	11.5	31.3
Gravel	212	21.2	11.3	14.2	46.7
Feeder roads	**448**	**44.8**	**51.8**	**43.6**	**140.2**
Bituminous	45	4.5	2.8	5.7	13
Gravel	311	31.1	36.4	26.6	94.1
Earth	93	9.3	12.8	11.2	33.3
Total	**2,115**	**211.5**	**149.4**	**212.5**	**573.4**
Adm. Costs	105.8	10.58	7.5	10.6	28.7
Grand total	**2,221**	**222.1**	**156.8**	**223.1**	**602.0**

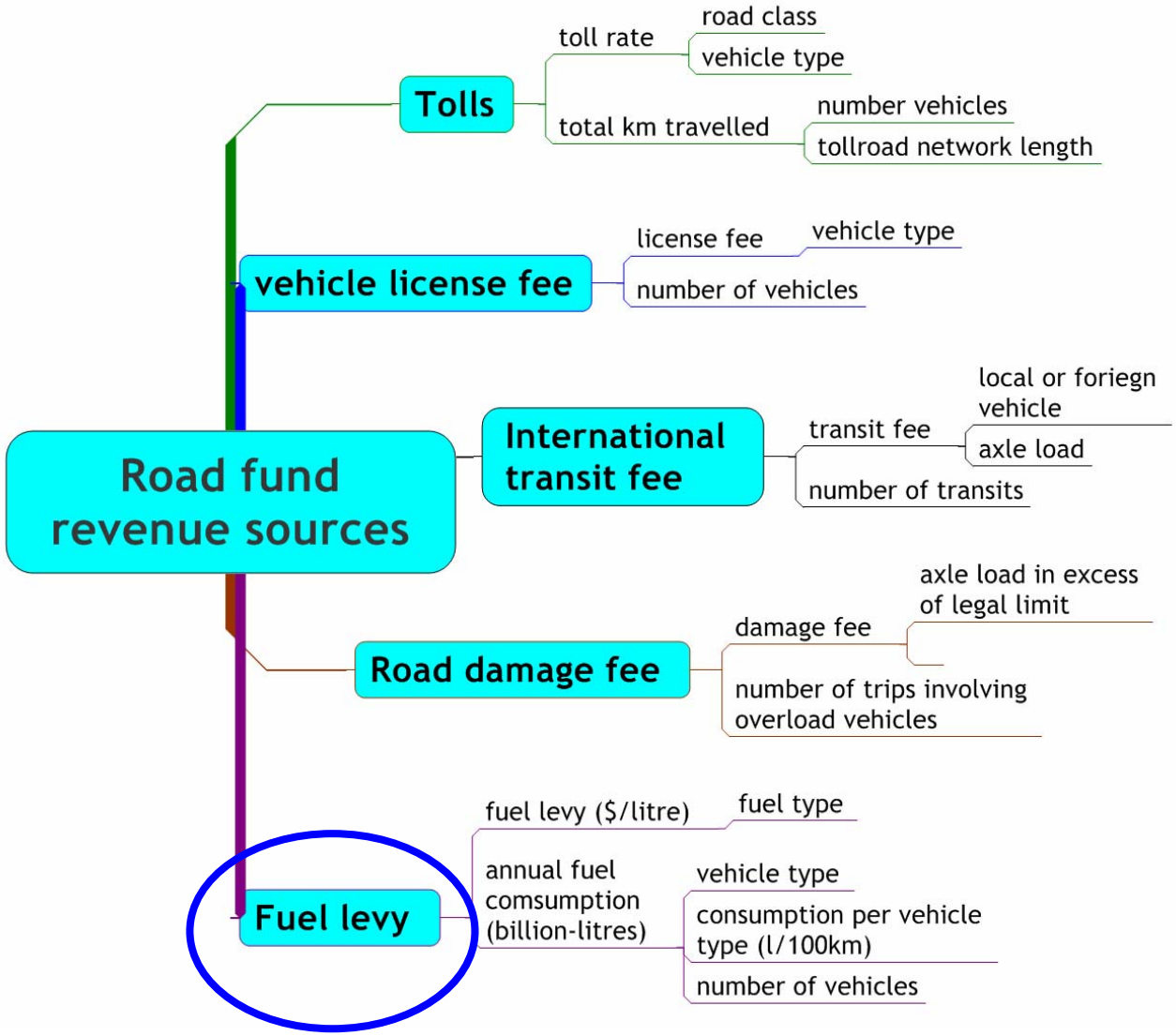
Namibia:
Estimated Costs – base scenario

Road class	Network size(2003)	Asset replacement costs				Routine maint. costs		Periodic maint. costs			Total maint	Annual life-cycle costs	
Surface type	km	US$ /km	US$m	years	US$m /year	US$/km	US$m	US$/km	years	US$m	US$m	US$m	%Asset cost
Trunk Roads	**3,944**		**879.8**				**10.2**			**20.2**	**30.4**	**59.7**	
Bituminous	3,944	223,077	879.8	30	29.3	2,574	10.2	46,154	9	20.2	30.4	59.7	6.8%
Main Roads	**9,599**		**1,070.7**				**5.9**			**38.8**	**44.7**	**93.2**	
Bituminous	1,392	223,077	310.5	30	10.4	2,574	3.6	46,154	9	7.1	10.7	21.1	6.8%
Gravel	7,935	94,615	750.8	20	37.5	283	2.2	19,692	5	31.3	33.5	71.0	9.5%
Salt	75	94,615	7.0	15	0.5	283	0.0	18,308	5	0.3	0.3	0.8	10.8%
Earth	197	12,000	2.4	15	0.2	283	0.1	1,540	2	0.2	0.2	0.4	15.4%
District Roads	**28,695**		**1,737.8**				**8.5**			**75.0**	**83.4**	**172.4**	
Bituminous	141	223,077	31.5	30	1.0	2,574	0.4	46,154	9	0.7	1.1	2.1	6.8%
Gravel	16,361	94,615	1,548.0	20	77.4	283	4.6	19,692	5	64.4	69.1	146.5	9.5%
Salt	145	94,615	13.7	15	0.9	283	0.0	18,308	5	0.5	0.6	1.5	10.8%
Earth	12,048	12,000	144.6	15	9.6	283	3.4	1,540	2	9.3	12.7	22.3	15.4%
Total	**42,238**		**3,688.3**		**166.8**		**24.5**			**134.0**	**158.5**	**325.4**	**8.8%**
Adm. costs					8.3		1.2			6.7	7.9	16.3	
Total with dam.					**175.2**		**25.7**			**140.7**	**166.4**	**341.6**	**9.0%**

Namibia:
Needed Costs – extended scenario

Road class / Surface type	Network condition	Network needs	Network length [2003]	Cost of clearing backlog		Over 10 years
			km	US$/km	US$m	US$m/yr
Trunk roads			**3,944**		**64**	**6.5**
Bituminous			**3,944**		**64**	**6.5**
	Poor	*Reconstruction*	*237*	*223,077*	*53*	*5.3*
	Fair	*Overlay*	*2,209*	*5,128*	*11*	*1.3*
Main roads			**9,599**		**131.1**	**13.2**
Bituminous			**1,392**		**35**	**3.5**
	Poor	*Reconstruct*	*139*	*223,077*	*31*	*3.1*
	Fair	*Overlay*	*863*	*5,128*	*4*	*0.4*
Gravel			**7,935**		**94**	**11.4**
	Poor	*Reconstruct*	*794*	*94,615*	*75*	*7.5*
	Fair	*Reseal*	*4,920*	*3,938*	*19*	*1.9*
Salt			**75**		**1**	**0.1**
	Poor	*Reconstruct*	*8*	*94,615*	*1*	*0.1*
	Fair	*Regravel*	*47*	*3,662*	*0*	*0.0*
Earth			**197**		**0**	**0.1**
	Poor	*Reconstruct*	*20*	*12,000*	*0*	*0.0*
	Fair	*Regravel*	*122*	*770*	*0*	*0.0*
District roads			**28,695**		**917.2**	**91.7**
Bituminous			**141**		**8**	**0.8**
	Poor	*Reconstruct*	*94*	*223,077*	*8*	*0.8*
	Fair	*Resealing*	*27*	*5,128*	*0*	*0.0*
Gravel			**16,361**		**824**	**82.4**
	Poor	*Reconstruct*	*8,508*	*94,615*	*805*	*80.5*
	Fair	*Regravel*	*4,908*	*3,938*	*19*	*1.9*
Salt			**145**		**7**	**0.7**
	Poor	*Reconstruct*	*75*	*94,615*	*7*	*0.7*
	Fair	*Reshape*	*44*	*3,662*	*0*	*0.0*
Earth			**12,048**		**78**	**7.8**
	Poor	*Reconstruct*	*6,265*	*12,000*	*75*	*7.5*
	Fair	*Reshape*	*3,614*	*770*	*3*	*0.3*
Total			**42,238**		**1,112.5**	**111.3**
Adm. Costs (5%)					*55.6*	*5.6*
Total with adm.					**1,168.1**	**116.8**

Revenue Components



"Fuel tax"

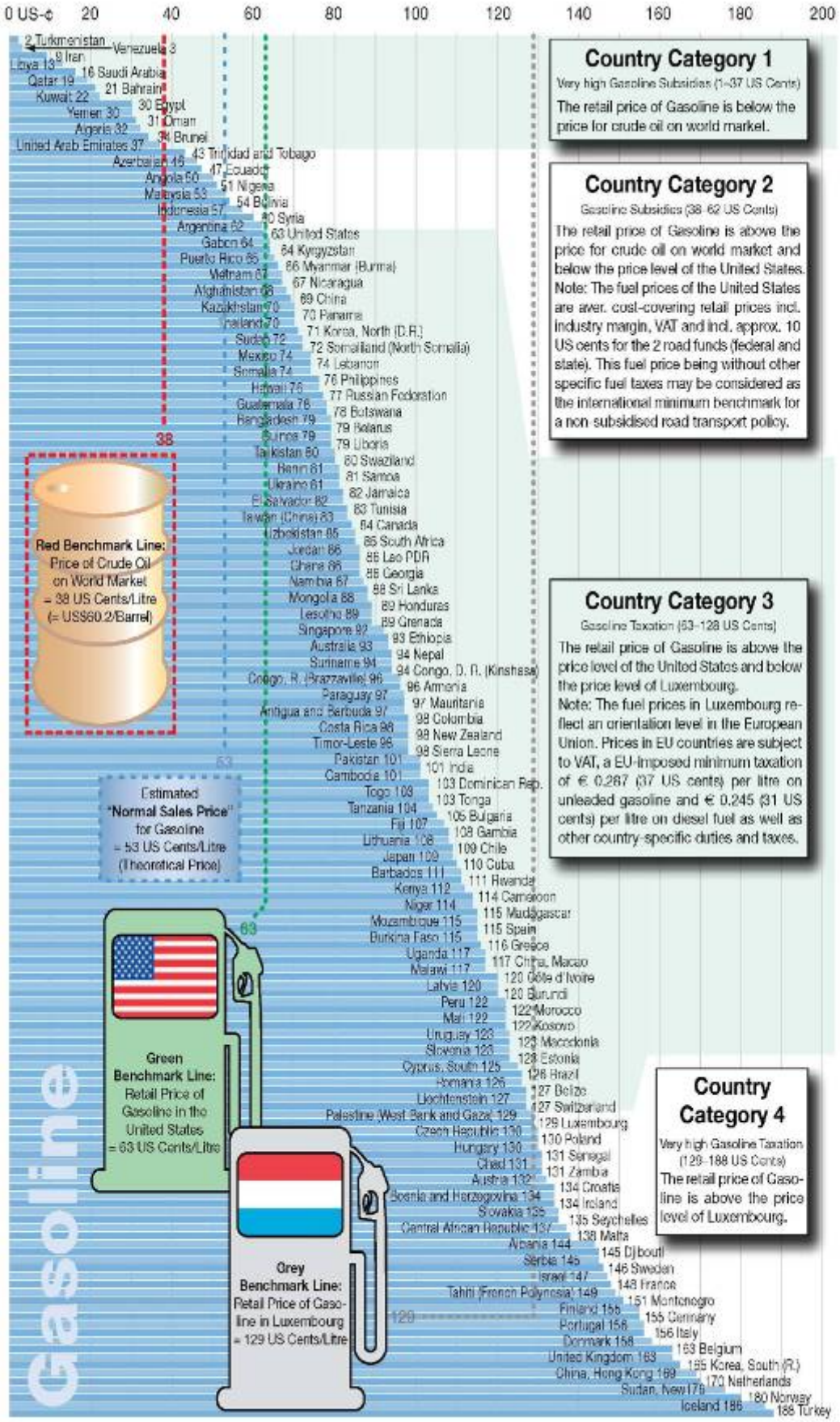
To calculate the user contribution from fuel tax has to be perceived as:

Ex-pump sales price

minus

"normal sales price" *

* **see *International Fuel Prices 2005*:**
„Normal Sales Price“ of unsubsidized fuel (which means „mineral fuel“ is sold under normal market conditions comparable to „mineral water“, including VAT etc., but without special import taxes and specific fuel taxes)



www.gtz.de/fuelprices

Survey date: Mid-November 2006

"Fuel tax" (continued)

Calculation from Ghana example:

	Cost items	Unit	Diesel	Super gasoline	Comments
(0)	**Crude Oil Price (barrel) f.o.b.**	**USD / barrel**	**77,00**	**75,00**	**09/2006**
(1)	**Crude Oil Price (liter) f.o.b.**	**USD / liter**	**0,48**	**0,40**	
(2)	**Refinery and distribution costs; Industry and dealer margins**	**USD / liter**	**0,19**	**0,18**	**Ghana National Petroleum Authority, 2005**
(3)	**Sales tax or VAT**	**USD / liter**	**0,10**	**0,08**	**VAT 15%**
(4) **= (1)+(2)+(3)**	"Normal Sales Price" of unsubsidised fuel	USD / liter	0,77	0,66	
(5)	**Ex-pump price**	**USD / liter**	**0,89**	**0,83**	
(6) **= (5)-(4)**	"User contribution"	USD / liter	0,12	0,17	**used to calculate user contribution**
(7)	**Road fund levy**	**USD / liter**	**0,07**	**0,07**	**GRF, 2006**

Ghana: User contribution

Vehicle population		Vehicle registration rev.			Vehicle inspection revenues			User contribution from fuel levy			International transit revenues			Toll revenues			User contr.
Vehicle type	No. of veh	Reg. veh.	Fee	Rev.	Vehicles inspected	Fee	Rev.	Road levy	Consum ption	Rev.	No. int. transits	Fee	Rev.	No. of trips	Toll rate	Rev	Total
	[2005]		US$	US$m		US$	US$m	US$/litre	Metric Tonnes	US$ m		US$	US$m		US$	US$ m	US$m
Motor Cycles	112 400	15 150	5.6	0.08	89 900	2.2	0.20	0.17	633 400	148.8				3 237 400	0.02	0.07	151.7
Cars	427 300	29 600	22.0	0.65	341 800	2.2	0.75				179 500	2.2	0.39	12 308	0.05	0.68	
Pickup /Light Bus	48 800	8 700	33.0	0.29	39 000	3.3	0.13	0.12	928 500	134.4	76 900	2.4	0.19	1 405 300	0.09	0.12	137.8
Heavy Bus	107 400	5 600	43.9	0.25	85 900	3.8	0.33				59 700	4.4	0.26	3 094 500	0.14	0.44	
Light Trucks	37 500	2 500	55.6	0.14	30 000	3.3	0.10				20 500	2.6	0.05	1 079 200	0.20	0.21	
Medium Trucks	16 600	960	72.2	0.07	13 300	4.4	0.06				9 200	4.4	0.04	479 300	0.20	0.09	
Heavy Trucks	13 700	1 380	131.8	0.18	11 000	11.0	0.12				7 200	5.5	0.04	395 600	0.44	0.17	
Total	**763 700**	**63 870**		**1.66**	**610 900**		**1.69**			**283.3**	**353 000**		**0.98**	**22000 000**		**1.80**	**289.4**

Ghana: Road Fund Revenue

Vehicle population		Vehicle registration rev.			Vehicle inspection revenues			Road fund fuel levy revenues			International transit revenues			Toll revenues			Road fund
Vehicle type	No. of veh.	Regd. Veh.	Fee	Reve-nues	Vehicles inspected	Fee	Reve-nues	Road levy	Consum ption	Rev.	Int. transits	Fee	Reve-nues	trips	Toll rate	Reve -nues	Total
	[2005]		US$	US$m		US$	US$m	US$/litre	Metric Tonnes	US$m		US$	US$m		US$	US$m	US$m
Motor Cycles	112,379	15,136	5.6	0.08	89,903	2.2	0.20	0.07	633,381	57.3				3,237,413	0.02	0.07	60.2
Cars	427,267	29,635	21.97	0.65	341,814	2.2	0.75				179,521	2.2	0.39	12,308,704	0.05	0.68	
Pickup /Light Bus	48,783	8,715	32.95	0.29	39,026	3.3	0.13	0.07	928,534	72.3	76,917	2.4	0.19	1,405,340	0.09	0.12	75.7
Heavy Bus	107,417	5,585	43.94	0.25	85,934	3.8	0.33				59,660	4.4	0.26	3,094,468	0.14	0.44	
Light Trucks	37,463	2,457	55.6	0.14	29,970	3.3	0.10				20,509	2.6	0.05	1,079,234	0.20	0.21	
Medium Trucks	16,637	963	72.2	0.07	13,310	4.4	0.06				9,183	4.4	0.04	479,279	0.20	0.09	
Heavy Trucks	13,731	1,379	131.8	0.18	10,985	11.0	0.12				7,236	5.5	0.04	395,563	0.44	0.17	
Total	**763,677**	**63,870**		**1.66**	**610,942**		**1.69**			**129.7**	**353,026**		**0.98**	**22,000,000**		**1.80**	**135.8**

100% of user contribution

100% of user contribution

46% of user contribution

100% of user contribution

100% of user contribution

Performance indicators
Primary

Performance indicator	Ghana	Namibia
Users contribution in relation to		
(a) routine maintenance costs	861.5%	603.9%
(b) total maintenance costs	193.7%	93.4%
(c) total costs (base scenario)	76.2%	43.3%
(d) total costs (extended scenario)	48.1%	32.3%
Domestic funds as in relation to		
(a) routine maintenance costs	551.3%	785.8%
(b) total maintenance costs	124.0%	121.5%
(c) total costs (base scenario)	48.7%	56.4%
(c) total costs (extended scenario)	30.8%	42.0%
Domestic funds as share of users contribution	53.8%	130.1%

Performance indicators
Secondary

Performance indicator	Ghana	Namibia	Unit
Road density	0.21	0.05	km/km2
Users contribution per vehicle	379.0	800.9	US$/year
Users contribution as share of GDP	3.3	2.7	%
Users contribution per capita	13.8	72.9	US$/year
Domestic funds as share of GDP	2.1	3.5	%
Road maintenance costs in relation to total road costs	39.3	46.4	%
Road maintenance costs as share of GDP	1.7	2.9	%
Total road costs as share of GDP	4.3	6.2	%
Affordable network (with domestic funds)	35.7	56.4	%
Affordable network (with users contribution)	76.2	43.3	%

Options for sustainable network funding

Increase road user charges:

- Ghana: Road fuel levy (from US$0.07 to US$0.14)
- Namibia: Road fuel levy (from US$0.11 to US$0.23)

Focusing on core network

- The most trafficked roads should be given priority when it come to maintenance
- Key rural roads should have sufficient seasonal improvements

Road concessioning

- Tolling of major highways
- Road funds could be spent on network sections which cannot be self-financing (e.g urban and feeder roads)

Conclusion

Road users may be paying more than what the road fund fuel levy is telling us

High cost of deferred maintenance (upto 40% of network life-cycle costs)

On average 1.5-2.0% of GDP – for maintenance costs

4.5-6.0% of GDP --for total road costs

Maintaining an affordable network size is a crucial requirement for sustainable road financing

THANK YOU