Helpdesk Report: Transport Investment and Research Statistics

Jacquie Berry, Michael Maks Davis & Paul Schoen

08 January 2013







The views expressed in the Helpdesk Report are entirely those of the author and do not necessarily represent DFID's own views or policies, or those of Evidence on Demand. Comments and discussion on items related to content and opinion should be addressed to the authors, via <u>enquiries@evidenceondemand.org</u>.

DOI: http://dx.doi.org/10.12774/eod_hd025.jan2013.berry_et_al





Report Summary	1
Methodology and Resources	3
USD invested in transport infrastructure	7
USD invested in transport in LICs per annum	8
USD invested in transport by MICs per annum	12
Examples of where transport is in the top 3 spends in LICs	14
Investment in Research & Development	20
USD invested in LIC related transport research per annum	22
USD invested in agriculture and the related research spend	24
USD invested in Health related research	27
Conclusions	28
Reference List	29
Annex 1: List of Sources Used	32



Report Summary

The study aimed to compare the level of investment in transport infrastructure by mode, in a selection of Low-Income Countries (LICs) and Medium-Income Countries (MICs), with the level of investment in transport related research and development (R&D) in these countries. Investment in the transport sector is quite complex as investment comes from both public and private sources and from official development assistance (ODA) in many MICs and LICs. A review of international statistics provided total spending by mode for a number of MICs. Data for LICs was generally available for total spending in the transport sector but not by mode, although some data were obtained for expenditure on roads.

Transport spending as a percentage of GDP is a frequently used indicator for the level of investment. Generally, in MICs transport investment ranged from 1.5% GDP (Russia) to 2.5% (average for MICs in Sub-Saharan Africa). In LICs the average % GDP tended to be a little higher at ~2.8% GDP. The breakdown of transport spending by nature suggests a greater proportion of spending in MICs is for operations and maintenance activities than in LICs reflecting the more mature nature of their transport infrastructure, although it must be noted that there is considerable variation between different countries.

Investment in the transport sector in both MICs and LICs tends to be dominated by investment in the road sector. Although there are some notable exceptions; for example, both Russia and India (MICs) are making comparable levels of investment in their road and rail sectors. Investment in inland waterways, ports and airports was low in all countries considered. Similarly, from the information reviewed in this study, it appears that the majority of transport investment in LICs is directed towards the road sector. However, it is interesting to see that two of the LICs considered in greater detail in this study, Kenya and Uganda, include upgrading, construction and rehabilitation of their railways in their future plans.

The level of investment in transport related R&D proved more difficult to quantify as statistics on R&D do not separately report work relating to the transport sector. A frequently used indicator is Gross Domestic Expenditure on R&D (GERD) as a percentage of GDP. This indicator is 0.3% for Sub-Saharan Africa compared to 2.7% for North America and 1.8% for Europe. It has been estimated by the World Bank that R&D expenditure related to roads research in Europe is just 1% of the total spend on road transport.

GERD data compiled in this study for a number of LICs gave an average of 0.22% GDP. Hence, the overall level of investment in R&D in LICs is just 16% of that in Europe. Assuming the level of R&D in all sectors is reduced to the same extent, it can be estimated that road transport related R&D is likely to be just 0.16% of road transport expenditure in LICs. As investment on roads appears to dominate transport investment, this figure is also likely to reflect the level of R&D transport overall. This estimation is based on some major assumptions but does fit with the general observations made by the World Bank and others that the majority of ODA and nationally funded work in the transport sector relates to the construction and rehabilitation of the transport infrastructure networks. The World Bank and



DFID, both however do recognise the benefits of transport related R&D. The World Bank is currently funding the establishment of a Road Research Centre in Ethiopia and DFID, through their AFCAP transport research programme, is funding feasibility studies for three further road research centres in Kenya, Mozambique and Tanzania. The latter is also considering the potential benefits that could be obtained by regional cooperation.

Statistics for the Agricultural and Health sectors were also reviewed to facilitate a comparison with the transport sector. The average annual investment in agriculture in LIC and MICs from all sources (public, private and ODA) totalled USD 213 billion, whilst the comparable public spending on agricultural R&D totalled USD 4.7 billion, around 2.2% of the annual investment. This figure is substantially higher than the figure of 0.16% estimated for the transport sector. In the Health sector, the Commission on Health Research for Development recommended in 1990 that all countries should invest at least 2% of their national health expenditure in health research and research capacity. The African Health Observatory estimated that USD 517.5 million was spent on health expenditure for these countries in 2005 which represented 1.3% of the combined total health expenditure for these countries. Again this figure is nearly to be an order of magnitude greater than the figure estimated for road research spending in LICs.





Methodology and Resources

This study has been carried out with the objective to obtain statistics on the levels of investment in transport research compared to those for transport infrastructure. The focus is on Low and Medium Income Countries (LICs and MICs). It includes a comparison with the comparable levels of investment in the agricultural and health sectors.

The study focused on five areas:

- 1) USD invested in transport in LICs per annum, split into modes of transport.
- 2) USD invested in transport by example MICs per annum, split into modes of transport.
- 3) Examples of where transport is in the top three spends for three LICs, showing figures for spending and split into transport modes.
- 4) USD invested in LIC transport related research per annum.
- 5) USD invested in either agriculture, health or education and the related research spend (so as to make a comparison between sectors).

The research was carried out using international compilations of statistics supplemented by other national sources of data. A wide range of sources were reviewed, of which the key resources are listed in Tables 1 and 2, as discussed below. Additional sources that were considered are listed in the annex to this report.

Overall, the research was restricted by the lack of information available about the level of investment in transport research and the disaggregation of transport investment data by mode for LICs. However, estimates have been made from available data which provide indications of the data requested.

Definition of LICs and MICs

Low Income Countries are defined by The World Bank's 2011 database as those with a GNI per capita of equal to, or less than USD 1,025.

Medium Income Countries (MICs) are further subdivided by The World Bank into Lower and Upper Medium Income Countries (LMICs and UMICs). According to The World Bank's 2011 database, LMICs have a GNI per capita of between USD 1,026 and USD 4,035, and UMICs of between USD 4,036 and USD 12,475 (The World Bank, 2012a).

Investment in Transport Infrastructure

The main international compilations of transport investment statistics are the International Transport Forum (ITF) and the International Road Federation (IRF) – World Road Statistics. The ITF, at the OECD, collects data on investment and maintenance expenditure on transport infrastructure based on a survey sent to all member countries. The survey includes total gross investment by mode and includes all sources of public and private sector funding. Data from this source have been used for MIC member countries. Unfortunately, no LICs are members of ITF.

The IRF compilation provides total road expenditure for 104 countries including many LICs, and provides expenditure disaggregated into investments, maintenance and other. It does not provide expenditure for other modes of transport.

The compilation of total transport expenditure data for LICs is more fragmented. An extensive compilation of transport economic and technical data was undertaken as part of





the major, multi-donor funded, Africa Infrastructure Country Diagnostic (AICD) Project which was designed to expand the world's knowledge of infrastructure in Sub-Saharan Africa. The majority of the data relate to the period 2000-2007, and underpin a series of assessment and country reports, a number of which have been used in this work.

The compilation of internally consistent transport investment data faces a number of challenges and this was the subject of a recent International ITF/OECD Workshop on Measuring Investment in Transport Infrastructure, February 2012. A number of the presentations from this workshop provided data which has been considered in this work.

A frequently used indicator to compare transport investment between regions/countries is investment as % of GDP (%GDP). A selection of such data has also been included to highlight the differences between LICs, MICs and other countries.

Source Document	Geographical Coverage	Years	Level of Disaggregation
International Transport Forum (OECD) http://www.internationaltr ansportforum.org/statisti cs/investment/data.html	Data for ITF members – 51 countries including some MICs but no LICs	1992-2010	Total Gross Investment (new construction, extensions, reconstruction, renewal and major repair) from all sources of funding. Data disaggregated by mode (road, rail, waterways, maritime ports and airports). Also provides maintenance expenditure financed by public administrations.
			Data based on survey of members.
International Road Federation – World Road Statistics 2012 <u>http://www.irfnet.org/stati</u> <u>stics.php</u>	Data for 104 countries including MICs and LICs	2005-2010 (total)	Total Road Expenditure Expenditure for latest year available disaggregated by: 1. Category - Investments (including R&D), Maintenance & Other 2. Administrative level (i.e. regional, national)
AICD Programme Results & Database	Sub Saharan Africa	-	Collates data compiled during the AICD Programme but no investment data are available
http://www.infrastructure africa.org/about/results% 20			
AICD Programme 'Africa's Transport Infrastructure – Maintaining Maintenance & Management', 2011	Sub Saharan Africa	Early 2000s expressed in 2006/7 prices	Transport Spending & Finance Sources, by country. Disaggregated by nature (Capital expenditure & O&M)
AICD Background Paper 7, 'Improving Connectivity: Investing in Transport Infrastructure in SSA' 2009	Sub Saharan Africa	Early 2000s expressed in 2006/7 prices	Estimates of Transport Investment needs in SSA
AICD Background Paper 17, 'Off Track: SSA Railways' 2009	Sub Saharan Africa	Early 2000s expressed in 2006/7 prices	Discussion of investment in SSA railway infrastructure
AICD Programme Country Reports for Ethiopia (2010), Kenya (2010), Tanzania (2010) & Uganda (2011)	Individual SSA countries	Early 2000s expressed in 2006/7 prices	Benchmarks infrastructure sector performance. Includes discussion of investment, current state and challenges facing each sub-sector (Power, Transport, Water, ICT).

A summary of the main sources of data used is provided in Table 1.





International Workshop on Measuring Investment in Transport Infrastructure ITF/OECD, 9-10 February 2012 <u>http://www.internationaltr</u> <u>ansportforum.org/Procee</u> <u>dings/InfrastructureInv/in</u> <u>dex.html</u>	Presentations from some ITF Member Countries	Various	Proceedings included presentations from: ADB on transport investment in Asia & Pacific – Total Transport Expenditure (% GDP) Magnitude & measurement of investment in India – Transport Investment (% GDP) by mode and Gross Capital Formation by industry (rail & other transport) IRF on WRS Data Eurostat data
Enhancing Regional Cooperation in Infrastructure Development, including that related to Disaster Management. ESCAP Report, 2006 <u>http://www.unescap.org/</u> pdd/publications/themest	Asia & Pacific	Up to 2005	Data for investments in transport infrastructure in Asia.
udy2006/themestudy_20 06_full.pdf			

Table 1: Sources Used for Transport Investment Data

Investment in Transport Related Research

The most commonly used indicator to monitor resources devoted to R&D worldwide is Gross Domestic Expenditure on R&D (GERD) expressed either as a %GDP or in PPP\$. The methodology adopted internationally for the measurement of GERD was established by the OECD and is presented in their Frascati Manual (OECD, 2002). More recently, a new Annex has been published providing specific guidance on measuring R&D in Developing Countries (OECD, 2012). Unfortunately, this methodology does not present transport related R&D as a separate category. Instead transport is included within 'Transport, telecommunication and infrastructure'. The UNESCO Institute for Statistics has adopted the methodology and their data centre includes data for both LICs and MICs. This source has been used to provide GERD data for LICs as a %GDP. Comparison with equivalent data for Europe has allowed the estimation of a figure for the level of transport R&D as a proportion of total transport spend in LICs. The UNESCO statistics disaggregate total R&D by field. Again, transport R&D is not considered separately but as part of 'Engineering & Technology' R&D. Where data for this category was available it has been compiled.

Source Document	Geographical Coverage	Years	Level of Disaggregation
OECD Research & Development Statistics, 2012 http://www.oecd.org/sti/inn ovationinsciencetechnolog yandindustry/researchand developmentstatisticsrds.h tm	Data for OECD members & selected non- members	1981-2010	GERD by sector of performance, source of funds, type of R&D, field of science & socio-economic objective. Transport R&D is not presented separately but is included in socio-economic objective 'Transport, telecoms & other infrastructure'. Similarly, under the field of science, Transport R&D is included within 'Engineering & Technology'.
UNESCO Institute for Statistics Data Centre <u>http://stats.uis.unesco.org/</u> <u>unesco/tableviewer/docum</u> <u>ent.aspx?ReportId=143</u>	Data for over 200 countries worldwide	1970-2012	Compiles indicators and data on education, science and technology, culture and communications. GERD data are provided by 'field of science' within the 'Science & Technology' dataset.





Table 2: Sources Used for R&D Investment Data

FactSheets/Documents/sti -rd-investment-en.pdf

Investment in Agricultural and Health Related Research

There are numerous reliable sources of information on research and development in the agricultural sector. These include organisations such as FAO and the World Bank. However the ASTI (Agricultural Science and Technology Indicators) Global Assessment of Agricultural R&D Spending provides a succinct and clear source of data on this and forms the basis for this work, unless otherwise stated. ASTI in their monitoring of such data conclude that 2008 is the latest year for such reliable information. ASTI argue that compiling accurate, up-to-date, and consistent information on global patterns of public agricultural R&D (ARD) investments requires significant, long-term human and financial resources. For some countries, no reliable information on public agricultural R&D exists, whereas for others, the available information is outdated, irregular, or incomplete.

The discussion of health related research was taken from the African Health Observatory website, the WHO Global Health Expenditure Atlas, 2012 and a paper presented at the Expert Meeting on 'How to Feed the World in 2050' held in Rome, in June 2009.





USD invested in transport infrastructure

One of the most commonly used indicators of investment is to express it as a %GDP. The ITF Trends in the Transport Sector Report 2011 (ITF 2011), presents investment in inland transport infrastructure 1995-2009 as %GDP, (at current prices), for 5 regions these being Western Europe, Central & Eastern Europe, Russian Federation, Japan and North America. The regional values for 2009 are tabulated below:

Region	%GDP
WEC	0.8%
CEEC	2.0%
Russian Fed	1.5%
Japan	1.7%
North America	0.7%

Table 3: Inland Transport Investment as % GDP (ITF 2011)

Transport investment varies considerably between individual countries within these regions but the regional indicator gives a means of comparison of the level of investment worldwide. Transport investment as a %GDP in Asia and the Pacific typically accounts for 2.0% to 2.5%GDP but may be as high as 4% in countries modernising or building new transport infrastructure, according to a UNESCAP Report (UNESCAP 2006). More recently, transport expenditure for Asia presented at the recent ITF/OECD International Workshop on Measuring Investment in Transport Infrastructure, 9-10 February 2012, indicate levels of expenditure continuing at levels between 1.5% and 4% GDP in Central and West Asia and the Pacific.



Figure 1: Transport Expenditure as %GDP (ITF/OECD, 2012)

The level of transport expenditure in Sub-Saharan Africa was investigated as part of the AICD Programme. Their report on Africa's Transport Infrastructure provides annual transport spending as a %GDP by finance source and country type as presented in Table 4.





	% GDP										
	O&M		CAPEX								
Country type	Public sector	Public sector	ODA	Non- OECD financiers	PPI	Total CAPEX	Total				
MIC	1.88	0.78	0.03	0.01	0.16	0.98	2.86				
Resource-rich	0.32	0.74	0.11	0.34	0.21	1.39	1.72				
LIC non fragile	0.98	0.67	1.12	0.22	0.12	2.13	3.11				
LIC fragile	0.16	0.56	0.61	0.13	0.04	1.33	1.49				
Total	1.20	0.74	0.28	0.16	0.16	1.34	2.54				

Table 4: Annual Spending by Finance Source and Country Type in Sub Saharan Africa (AICD, 2011b).

The highest level of capital investment is seen in LIC (non-fragile) at 2.13%GDP whilst MICs show a lower level of capital expenditure ~0.98 %GDP but substantially higher levels of operational and maintenance expenditure. This largely reflects the more mature nature of transport infrastructure in MICs.

USD invested in transport in LICs per annum

Two sources of data were identified which provided internally consistent transport investment and expenditure data for LICs. The most comprehensive data for LICs in Sub-Saharan Africa was compiled as part of the AICD Programme. This provides annualised transport spending and finance sources by country, both in millions USD (Table 5) and as a %GDP (Figure 2).

	USD millions									
	O&M		CAPEX							
				Non-						
	Public	Public		OECD		Total				
Country	sector	sector	ODA	financiers	PPI	CAPEX	Total			
Benin	41	16	46	6	0	68	109			
Chad	4	14	23	5	0	42	46			
Congo, Dem R	30	-	55	2	0	-	30			
Ethiopia	53	215	209	20	0	444	497			
Kenya	280	79	144	13	22	259	539			
Madagascar	122	32	131	4	8	175	297			
Malawi	50	25	29	2	0	56	106			
Mali	10	42	79	24	5	150	159			
Mozambique	70	48	106	16	56	226	296			
Niger	8	16	30	9	0	54	62			
Rwanda	6	3	25	3	0	32	38			
Tanzania	194	82	117	7	9	214	408			
Uganda	44	6	75	2	22	106	150			

Table 5: Annualised Transport Spending in USD millions (AICD, 2011b)

These data show the majority of transport expenditure is funded by national governments and official development assistance (ODA).







Figure 2: Sources of Finance for Transport Spending as % GDP (AICD, 2011b)

The data are not disaggregated by mode of transport. However the AICD Transport Infrastructure report provides data on the annual average expenditure on road transport by country 2001-2005 as shown in Figure 3.





Source: Briceño-Garmendia, Smits, and Foster 2009.

Figure 3: Average Annual Expenditures on Road Transport by Country 2001-05 (AICD, 2011b)

From the discussion in this report and in the AICD Background Paper 17 'Off Track: Sub Saharan Railways', 2009, it is apparent that the majority of the inland transport investment is





in the road infrastructure. The railways do not appear to be receiving much investment and are facing major competition from road for both freight and passenger transport.

The International Road Federation's, World Road Statistics Report, 2012 (WRS, 2012), provides road expenditure data (Millions USD) for a selection of LICs, as shown in Table 6. These data are disaggregated by investment (including transport R&D), maintenance and other. Although it is not possible to directly correlate these data with those from AICD for LICs in Sub-Saharan Africa it is possible to see that they support the general conclusion that a large proportion of transport infrastructure expenditure is going to the road sector.

		Millions USD					
Country	Year	Investments	Maintenance	Other	Total		
Afganistan Burkina	2010	275		0	275		
Faso	2009	130	77		206		
Ethiopia	2003	80	21	5	106		
The Gambia	2003	19	0		19		
Kenya	2010				758		
Madagascar	2010	286	159		445		
Myanmar	2010	359	34		393		
Niger	2010	230	61		291		
Tanzania	2010		174		174		
Zimbabwe	2002	15	35	14	64		

Table 6: Road Expenditure Millions USD, (World Road Statistics, 2012)

Private finance, although still a relatively small proportion of investment funds, is growing in Sub-Saharan Africa with around 60% going to the rail sector. A further 24% has gone to toll road projects. This is illustrated in Figure 4.



Note: Cumulative investment commitments from 1990 to 2007, not disbursements. Chart is compreh countries excluded do not have any private investment in transport infrastructure.

Figure 4: Private Investment in Africa (AICD, 2011b)

Finally, it is interesting to consider the work undertaken by the AICD on the level of investment required in Sub-Saharan Africa (LICs and MICs) to provide improved connectivity in the region (AICD, 2009a). Two scenarios were considered, a base scenario reflecting high international standards for the amount and quality of the infrastructure that connects people to markets and services and a less-ambitious pragmatic scenario providing less connectivity and lower quality connections. The results are presented in Figure 5. Again a much larger proportion of investment is envisaged for road infrastructure compared to rail, air and ports.





Annual spending in US\$ millions



Figure 5: Investment requirements in Africa for regional, national, rural market access and urban roads, airport, port and rail infrastructure (AICD, 2009a, pg43)





USD invested in transport by MICs per annum

A number of MICs are members of the OECD's International Transport Forum and the ITF database provides the most comprehensive source of data for these MICs. Investment data for these MICs are presented in Table 7 below. All data are expressed in current prices and have been converted from millions Euros to millions USD using the current exchange rate. These data show roads to be the major mode for investment ~60%, with rail ~ 35% and other modes <5%, although this does differ substantially between countries. In particular, Russia and India have comparable levels of investment in their road and rail infrastructure whereas investment in road is substantially higher than rail for all the other countries. Investment in waterways, ports and airports in all cases is much lower.

The data for 2008 and 2009 for three selected countries, Moldova (Eastern Europe), India (Asia) and Mexico (Latin America) are presented in Figure 6.

Country	Income	Road I	nfrastruc	ture	Rail In	frastruct	ure	Inland	Waterwa	ays	Mari	time Port	ts	A	irports	
		2008	2009	2010	2008	2009	2010	2008	2009	2010	2008	2009	2010	2008	2009	2010
Albania	LMIC	652	637	317	2	0	0	0	0	0	4	4	5	0	0	0
Azerbaijan	UMIC	1,742	1,665	2,028	15	3	4	n.a.	n.a.	n.a.	-	-	-	108	37	264
Bulgaria	UMIC	221	133	369	94	65	170	n.a.	n.a.	n.a.	9	11	7	5	1	2
Georgia	LMIC	197	n.a.	n.a.	84	n.a.	n.a.	n.a.	n.a.	n.a.	8	0	0	4	0	0
India	LMIC	7,626	8,175	n.a.	7,596	7,589	n.a.	n.a.	n.a.	n.a.	72	79	n.a.	28	172	n.a.
Latvia	UMIC	347	176	183	80	84	102	-	-	-	343	n.a.	n.a.	24	4	4
Lithuania	UMIC	573	587	554	112	88	140	5	1	1	55	21	27	15	38	11
Mexico	UMIC	3,336	3,963	5,211	653	574	570	-	-	-	759	502	638	427	235	355
Moldova	LMIC	34	18	n.a.	32	7	n.a.	n.a.	n.a.	n.a.	-	-	-	16	5	n.a.
Montenegro	UMIC	14	30	23	n.a.	n.a.	n.a.	-	-	-	3	2	3	1	2	37
Romania	UMIC	5,101	4,071	3,736	415	233	221	643	703	555	n.a	n.a.	n.a.	12	8	1
Russia	UMIC	12,900	8,149	8,133	12,389	8,586	11,874	133	77	89	539	238	151	575	351	616
Serbia	UMIC	494	320	275	3	7	16	47	22	25	-	-	-	0	2	1
Turkey	UMIC	2,928	3,826	7,105	881	991	1,958	n.a.	n.a.	n.a.	40	26	21	169	243	412

 Table 7: Gross Investment spending (millions \$) current prices, from International Transport

 Forum database



Figure 6: Gross investment spending in India, Mexico and Serbia for 2008 & 2009 according to transport mode (from International Transport Forum Database)

The ITF database does not include any of the MICs in Africa. However, some data are provided by the AICD project (Table 8) and World Road Statistics (Table 9), as derived previously for LICs.





	USD millions									
	O&M		CAPEX							
				Non-						
	Public	Public		OECD		Total				
Country	sector	sector	ODA	financiers	PPI	CAPEX	Total			
Botswana	106	140	0	9	0	149	256			
Cameroon	175	32	53	13	0	98	273			
Cape Verde	61	23	45	1	0	69	130			
Congo, Rep	89	139	17	12	0	168	258			
Cote d'Ivoire	6	131	3	10	14	158	164			
Ghana	127	50	119	8	1	178	305			
Lesotho	11	8	18	5	0	31	43			
Namibia	61	14	23	5	0	42	103			
Nigeria	112	780	26	537	422	1765	1877			
Senegal	7	75	47	23	5	149	156			
South Africa	4661	1843	0	0	444	2287	6948			
Zambia	99	132	68	8	3	210	309			

Table 8: Annualised Transport Spending in USD millions (AICD, 2011b)



Figure 7: Sources of Finance for Transport Spending as % GDP (AICD, 2011b)

The World Road Statistics report, (WRS 2012), provides road expenditure data (Millions USD) for a selection of MICs in Sub-Saharan Africa, as shown in Table 9. These data are disaggregated by investment (including transport R&D), maintenance and other. As noted previously for the LICs, it is not possible to directly correlate these data with those from AICD for MICs in Sub-Saharan Africa, but it is possible to see that they support the general conclusion that a large proportion of transport infrastructure expenditure is going to the road sector.

		Millions USD					
Country	Year	Investments	Maintenance	Other	Total		
Cameroon	2007	230	293	4	527		
Congo, Rep	2003	19	25		44		
Ghana	2005	135	123		258		
Namibia	2010	56	972	112	1140		
South Africa	2009	2626		3977	6602		

Table 9: Road Expenditure Millions USD (World Road Statistics, 2012)





Examples of where transport is in the top 3 spends in LICs

This section has focussed on three countries of interest to DFID where the transport sector spend is one of the top three spends. The three countries selected are Tanzania, Uganda and Sierra Leone. In addition, some information has been included for Ethiopia and Kenya regarding the overall level of investment in the transport sector and their priorities.

Transport Infrastructure Investment in Tanzania

The sectoral breakdown of the national budget for Tanzania for 2011/12 is shown in Figure 8.



Figure 8: Sectoral Breakdown, National Budget for Tanzania 2011/2012 (Ministry of Finance, Tanzania, 2012)

The total Infrastructure sector allocation is 2.78 trillion shillings and includes allocations to roads and transport infrastructure, ICT and R&D (the later with emphasis on transport sector). The sector spending plans include:

- 1.7 trillion shillings (61% total infrastructure budget) for construction and maintenance of roads infrastructure as well as procurement and rehabilitation of ferries
- 112 billion shillings (4%) for construction of Airports infrastructure
- 123 billion shillings (4%) for construction and rehabilitation of Railways Infrastructure including procurement and rehabilitation of Wagons

Overall, expected transport spend accounts for at least 1.9 trillion shillings (1.2 billion USD) representing 14.3% of total national budget. (1 Tanzanian shilling = 0.000622 USD). The figure for total annualised transport expenditure reported by AICD in Table 5 was 0.408 billion USD (early 2000s data expressed in 2006/7 currency), suggesting an overall increase in expenditure in this sector.

Transport Infrastructure Investment in Sierra Leone

The national budget for Sierra Leone for 2012 was Le 2.8 trillion (0.645 billion USD), which included a budget of Le158.8 billion (0.037 billion USD) for road construction activities and Le 11.9 billion (0.003 million USD) on transport and aviation. In December 2012, the Minister of Finance, as part of his initial budget presentation for 2013, reviewed expenditure during





2012. Table 10 summarises the estimated expenditure for 2012 based on the actual data for Q1-3, compared to stated budgets. The recurrent expenditure was presented separately to the sectoral expenditure. Spend on Road Construction and Transport and Aviation was higher than envisaged in the budget and together was expected to account for 9.1% of total expenditure during 2012, significantly higher than any of the other sectors presented.

Sector	Budget 2012 (Le billion)	Spend 2012	% total spend
		(Le billion)	-
Agriculture	22.9	25.9 (Q1-3)	1.0%
Road Construction	158.8	234.4	8.7%
Transport & Aviation	11.9	11.3	0.4%
Energy & Water	75.5	103.2	3.8%
Education	84.4	133.9	5.0%
Youth & Sports	3.9	7.4	0.3%
Health	32.7	50.9	1.9%
Security	110.9	128.4	4.8%
Recurrent expenditure		898.6	33.3%
(wages)			
Interest payments		287.9	10.7%
Other recurrent		729.9	27.0%
expenditure			
Other – not specified		~85	3.1%
Total Expenditure	2800	2700	100%

Table 10: Budget and estimated expenditure in Sierra Leone in 2012, (Sierra Leone Finance Minister Speech, 2012) (1Le = 0.00023 USD)

During 2012, the road construction activities included the following major projects:

- Rehabilitation of the streets in Freetown and district headquarter towns (Le 117.2 billion)
- Widening of Lumley Roundabout to Hillcut Road Junction (Le 36.8 billion)
- Widening Lumley Tokeh Road (Le 31 billion)

The Transport and Aviation expenditure breakdown for 2012 was presented:

- Modernisation & expansion Lungi International Airport (Le 8.6 billion)
- Procurement of vehicles (Le 1.2 billion)
- Completion Phase 1 Airport Transfer Project (Le 1.3 billion)

The proposed budget for Roads in the 2013 budget is Le 646.6 billion (comprising Government funds Le 430.4 billion and Development partner funds Le 216.2 billion). The total allocation to the roads sector will account for 25.8% of total expenditure.

Priorities identified for 2013 are:

- Completion of on-going reconstruction/rehabilitation of roads in Western Area, regional and district headquarter town streets
- Commencement of reconstruction of 3 roads
- Widening of 3 further roads
- Construction of bridges in rural areas





The proposed budget for Transport and Aviation in 2013 is Le 14.6 billion, (comprising Le Government funds 4.5 billion and Development funds Le 10.1 billion). Priorities identified are:

- Preparatory activities for the construction of a modern airport at Mamamah
- Procurement of motorised ferries
- Implementation of Infrastructural Development Project
- Upgrading of Sierra Leone Maritime Administration.

Transport Infrastructure Investment in Uganda

PWC have performed a Post Budget Analysis of Uganda's Budget for 2012/13 (PWC, 2012). The total budget is Shs 10,862 trillion (4.05 trillion USD, domestic revenue 75%; donors 25%). This report includes the resource allocation to sectors shown in Table 11; the budget for transport in 2012/13 is Shs 1,651 (0.62 trillion USD). Exchange rate 1Shs = 0.0003728 USD). This is significantly higher than the 0.15 trillion USD reported in Table 5 which related to the early 2000s, expressed in 2006/7 currency, and the 0.26 billion USD in Figure 9 (2000-2009 data) suggesting an increase in annual spending. The allocation for 2011/12 is included for comparison and shows an overall increase for transport. The PWC report notes this reflects the Government's commitment to sort out deteriorating stock of roads.

Sector	2011/12	2012/13
Agriculture	4.5%	3.5%
Infrastructure: of which	27.2%	29.0%
 Energy & minerals 	13.7%	13.6%
- Transport	13.4%	15.2%
- ICT	0.1%	0.1%
Human Development:	31.9%	31.3%
including		
- Education	14.7%	14.9%
- Health	8.3%	7.8%
- Water & Environment	2.8%	3.3%
Government Management	30.1%	27.6%
Tourism/trade/industry	0.6%	0.7%
Lands	0.3%	0.3%

Table 11: Uganda Resource Allocation (PWC, 2012)

The Uganda Country Report prepared under the AICD Programme (AICD, 2011a) presents total annualised spending (CAPEX and O&M) on infrastructure during the earlier period 2001-09. These data show transport was second largest sector after power but ahead of water supply and sanitation and ICT.







Figure 9: Annualised spending on infrastructure in Uganda millions USD – average 2001-09, (AICD, 2011a)

The Country Partnership Strategy for the period 2010-2013, published by the World Bank in March 2010 (World Bank 2010b) discusses the Uganda Government's National Development Plan (NDP). It is recognised in the plan that weak infrastructure is a constraint for both trade and growth and the NDP gives priority to improving infrastructure, especially energy and transport. The road sector carries 96 % of total cargo freight, but only 4 % is paved. Railways carry only 3.5% of freight cargo and only 28% of it is functional. The NDP identifies several flagship projects to address these gaps, including:

- railway construction and rehabilitation
- development of Kampala rapid transport systems
- improvement of water transport on Lake Victoria

Infrastructure Investment in Sub-Saharan Africa

The previous sections discussed three specific Sub-Saharan African countries where the transport sector is one of the top three recipients of total national spend. This is reflected in many countries in the region and the African Development Bank reports that transport is the highest spend for the Southern African Development Community (SADC). It reported 42% of the total infrastructure investment between 1967 and 2008 was in transport (AfDB, 2009). This is shown in Figure 10. In 2008, transport accounted for the largest portion (45.4%) of the 1.41 Billion USD segment of the AfDB's portfolio dedicated to infrastructure investments.



Figure 10: Infrastructure investment in the South African Development Community from 1967 to 2008 (AfDB, 2009, pg2).

Some further information about the development of transport infrastructure in Ethiopia and Kenya are given in the following sections. In both cases the level of transport investment





expenditure is one of the three highest infrastructure investments. The overall levels of investment have been discussed previously in this report (Table 5), hence they are not revisited. Instead, these sections focus on the progress to date and the on-going development of the sector.

Transport Infrastructure Investment in Ethiopia

The Ethiopian Country Report prepared under the AICD Programme (AICD, 2010a) presents total annualised spending (CAPEX and O&M) on infrastructure during the period 2003/05. The data show transport is third largest sector after power and water supply and sanitation but ahead of ICT.



Figure 11: Annualised spending on infrastructure in Ethiopia millions USD – average 2003/05, (AICD, 2010a)

The Country Partnership Strategy (CPS) published by the World Bank in August 2012 (World Bank, 2012c) notes that Ethiopia has made significant improvements in the access to and quality of its infrastructure. The quality of the road network has increased and 80% of the paved network of over 40,000km is in good or fair condition. However, road density is still low and only 10% of the rural population lives within 2 km of an all-weather road. Ethiopian Airlines is now one of the three main Sub-Saharan African airlines and Bole Airport serves as a regional air transport hub for passenger and commodity transport. Ethiopia is a landlocked country. Its primary transport corridor is through Djibouti. The Government of Ethiopia has recently initiated construction of a 5,000km national railway to link Addis Ababa with Djibouti, of which the first 2,000km is expected by 2015. Ethiopia is actively trying to develop a rail industry to serve the broader region including South Sudan, Somalia and Northern Kenya.

The CPS identifies the following challenges & opportunities for the transport infrastructure sector:

- Capacity constraints at the Ethiopian Roads Authority (ERA)
- Large delays and cost overruns of on-going road construction projects
- Deficiencies in full compliance with environmental and social safeguards
- Improve rural accessibility
- Concession railway between Addis Ababa and port of Djibouti.

The strategy for 2013-16 continues to support investment in transport infrastructure, through a continuation of the on-going Road Sector Development Programme.

Transport Infrastructure Investment in Kenya

The Kenya Country Report prepared under the AICD Programme (AICD, 2010b) presents total annualised spending (CAPEX and O&M) on infrastructure during the period 2001-06.





The data show transport is second largest sector after ICT but just ahead of power and water supply and sanitation.



Figure 12: Annualised spending on infrastructure in Kenya millions USD – average 2001-06, (AICD, 2010b)

The Country Partnership Strategy for the period 2010-2013, published by the World Bank in March 2010 (World Bank 2010a) discusses the Kenyan Government's Vision 2030 and Medium-Term Plan. A key component is to accelerate growth through increased investment in the country's infrastructure. The vision is to build modern, high-quality and efficient infrastructure facilities to expand access to markets. Priorities for transport infrastructure investment are identified as:

- rehabilitating the road network;
- upgrading the railways;
- transforming ports and airports to create hubs for a modern economy;
- improving urban public transport;

The World Bank Strategy summarises the current position in Kenya as such:

'Recent investments in the transport sector have upgraded trade corridors, reduced urban traffic congestion, and modernised sector governance (through establishing autonomous road authorities and a fuel levy to fund road maintenance), but more needs to be done to complete the reforms underway, clear the backlog in road rehabilitation, ensure value for money and improve road safety. In aviation, the Government is expanding the Nairobi and Kisumu airports to support trade and tourism. Efficiency at the port of Mombasa is improving through the introduction of 24-hour operations and construction of a new container terminal, but transformation is unlikely until Mombasa becomes a landlord port and stakeholders focus more strongly on strategic development of the port and its surroundings. The port's performance will also improve if the railway improves: currently the railway operates at less than 50 % of capacity and the concessionaire introduced in 2006 has not brought the management expertise or additional capital needed'.

The World Bank Group states it will help Kenya to achieve the transport infrastructure it needs for 2030 by:

- Continuing to help rehabilitate the northern road corridor, strengthen road sector institutions, and develop opportunities for private sector financing.
- Helping to expand private sector participation in the port of Mombasa, with a view to establishing it as a world-class landlord port.
- Continuing to support the expansion of JKIA, to strengthen its position as a regional aviation hub.
- Helping to restructure the railway concession.





Investment in Research & Development

To set the context for this rapid review of spending on research and development (R&D) it is worthwhile understanding the scale of investment worldwide regardless of sector. According to the 2012 Global R&D Funding Forecast by Battelle, research spend on all sectors is estimated to be around USD 1.4 trillion. This is 5.2% more than in the previous year with growth in expenditure mainly being attributed to spend in Asia (China), Europe and North America. Of this global spend, USD 400 billion is in the USA alone. Of the total spend 92% is in the USA, EU and Asia and China being the second largest investor in R&D.

The UNESCO Institute of Statistics, recently published a Global Investments in R&D Fact Sheet (UNESCO, 2012). This provides a useful summary of the total level of R&D being undertaken worldwide. Figure 13, taken from the fact sheet, shows the R&D Intensity, GERD as a %GDP for regions worldwide. Much lower intensities are seen in LIC and MICs. The 2009 regional averages are: 2.7% North America; 0.7% Latin America & the Caribbean; 1.8% Europe; 0.4% Africa; 1.6% Asia and 2.2% Oceania. Figure 14 maps the data on a country basis.



FIGURE 2. WHICH REGIONS ARE MOST R&D INTENSIVE? GROSS DOMESTIC EXPENDITURE ON R&D AS A PERCENTAGE OF GDP BY PRINCIPAL REGIONS/COUNTRIES, 2009 OR LATEST YEAR AVAILABLE

Note: -1 = 2008, -2 = 2007. Source: UNESCO Institute for Statistics estimates, December 2011.







FIGURE 3. A SNAP-SHOT OF R&D INTENSITY

GROSS DOMESTIC EXPENDITURE ON R&D AS A PERCENTAGE OF GDP, 2010 OR LATEST AVAILABLE YEAR



Source: UNESCO Institute for Statistics, October 2012.

Figure 14: GERD as a %GDP (UNESCO 2012)

The UIC factsheet also summarises the GERD by source of funding (business, government, higher education, private non-profit, foreign). For several of the African countries e.g. Tanzania and Mozambique, foreign sources are a major component of the R&D funding.



Figure 15: GERD by Source of Funding in Africa, Asia and the Pacific (UNESCO 2012)





USD invested in LIC related transport research per annum

Expenditure data for R&D (GERD) relating to the total level of research in a limited number of LICs are present in the UNESCO Institute for Statistics Data Centre. These have been extracted and are presented in Table 12, below. Where possible the % R&D relating to the Engineering & Technology category has been included but this was not available for all countries. As noted previously, Transport R&D is not separately identified but would be included within this broader sector.

LIC	GERD as %GDP	GERD in '000 current PPP\$	GERD/ capita in current PPP\$	% Engineering & Technology	Year
Burkina Faso	0.20	38,161	2.4	na	2009
Ethiopia	0.24	208,741	2.5	4.7	2010
Gambia	0.02	525	0.3	na	2009
Kenya	0.42	241,509	6.4	na	2007
Madagascar	0.15	28,759	1.4	20.1	2009
Mali	0.25	33,872	2.4	na	2007
Mozambique	0.21	34,664	1.6	8.1	2007
Uganda	0.41	163,799	5.1	10.6	2009
Kyrgyzstan	0.16	19,378	3.7	25.2	2009
Tajikistan	0.09	11,785	1.7	23.8	2009

Table 12: R&D in Low Income Countries (UNESCO Data Centre)

As noted previously, the total level of R&D in these countries is generally an order of magnitude lower than in Japan, US and EU countries.

The benefits of transport research are well recognised and the Transformation Research Information Database (TRID), provides access to over 940,000 records of transportation research worldwide but unfortunately does not provide any information about the level of investment in transport related R&D. TRID has recently integrated the records from TRB's Transportation Research Information Services (<u>TRIS</u>) Database and the OECD's Joint Transport Research Centre's International Transport Research Documentation (<u>ITRD</u>) Database.

Peter O'Neill from the Transport, Water & ICT Department at the World Bank, gave a presentation about Building Transport Research Capacity in the Developing World at an AFCAP meeting in November 2010 (AFCAP, 2010). He noted that the total annual spend on road transport in the EU is ~20% of GDP (USD 3.32 trillion). Whilst R&D spend on road transport research in the EU is only ~USD 35 billion (approx. 1%). He noted that Developing Country spend on transport research is very much less and often almost zero.

The average level of GERD for the LICs in Table 12 is 0.22%GDP. Hence, the overall level of investment in R&D in LICs, expressed as %GDP, is just 16% of that in Europe. Assuming the level of R&D in all sectors is reduced to the same extent, it can be estimated that road transport related R&D is likely to be just 0.16% of road transport expenditure in LICs. As investment on roads appears to dominate transport investment, this figure is also likely to reflect the level of R&D transport overall. This estimation is based on major assumptions but





does fit with the general observations made by the World Bank and others that the majority of ODA and nationally funded work in the transport sector relates to the construction and rehabilitation of the transport infrastructure networks.

DFID has long recognised the importance of transport related research, where studies in the UK have shown the benefits gained to be an order of magnitude greater than the initial costs (DFID, 2008b). The DFID budget dedicated to investment in transport in 2008 was 20% of the total, which with the organisation being responsible for GBP 5.7 billion at that time (DFID, 2008a) can be estimated to be some USD 7.4 billion (DFID 2008b). The amount dedicated to transport research however was several orders of magnitude less at approximately GBP 4 million. DFID is currently funding the major African Community Access Programme (AFCAP) which addresses the challenges of providing reliable access for poor communities in Africa. It funds a portfolio of research, demonstration, advisory and training projects. Current projects include three feasibility studies for the establishment of road research centres in Kenya, Mozambique and Tanzania and investigation of the opportunities for regional collaboration. The World Bank also recognises the potential benefits of transport related research and although the majority of their support is directed at major infrastructure construction and refurbishment, they are currently funding the establishment of a road research centre in Ethiopia. A recent in-house review by TRL of the bilateral aid provided by other European countries in Africa did not identify any other significant transport research programmes.





USD invested in agriculture and the related research spend

The FAO in their 2012 State of Food and Agriculture suggest that agricultural capital investment by the private sector for on-farm activities for LICs and MICs was around US\$ 170 billion (see Annex 1 for full list of countries). Furthermore it is reckoned that somewhere between 1% and 2% of GDP goes into agricultural research amongst LICs/MICs although this figure is really needed to increase to between 6% and 10% to ensure that food production continues to grow based in contributions from research¹. The following graph taken from their latest report makes a clear comparison of level of investment between direct capital investment in agriculture and investment in agricultural research.



Source: FAO State of Food Agriculture, 2012, Page 4

Figure 16: Investment in agriculture in selected LIC and MICs (FAO 2012)

Between 2000 and 2008, total public spend on agricultural R&D worldwide went up from USD 21.6 billion to around USD 31.7 billion (representing about 2% of all R&D spend worldwide and about 18% of all investment into agriculture according to the FAO) with China and India representing nearly 50% of this investment as Middle Income Countries (MIC) (see Figure 17). Other countries important to note include Argentina, Brazil, Nigeria and Mexico. Public spending in these MIC's also increased.

¹ Page 13, FAO, 2009





Brazil 5%

6%

Other Latin America & Caribbean

West Asia & North Africa 6%



50%

Figure 17: Total global public spending on agricultural R&D in 2008: US\$ 31.7 billion (2005 PPP dollars) by Region/Country

Within Africa as a region ARD spend was USD 1.7 billion (in 2008 PPP USD terms), in constant prices the actual investment level was USD 0.8 billion. This represented only 0.1% of global research spend. Growth in R&D spend was seen only seen in a handful of African countries during this period.

The whole sector in Africa only employs some 12,000 people continent-wide in ARD.

Most growth in ARD spending in LICs was seen between 2000 and 2008 but driven mostly by the larger East African countries of Ethiopia, Kenya, Tanzania and Uganda. Nigeria represented around 30% of all growth in ARD in the Sub-Saharan African region. Spending growth in MICs on ARD was around 4.4% per year between 2000 and 2008. (See Figure 18).



Figure 18: Growth rates by region low and middle income (Source: ASTI 2012, Eurostat 2012, OECD 2012)





Amongst Low Income Countries (LICs) on the other hand, average spending grew by 2% between 2000 and 2008. Research investment amongst LICs suffers from volatility as countries ebb and flow between donor and development bank support.

In terms of GDP per capita expenditure on ARD the following set of figures is quite stark:

- Low Income Countries US\$ 0.44 cents per capita is invested
- Medium Income Countries US\$ 0.55 cents per capita is invested
- High Income Countries US\$ 2.63 to US\$ 3.07 per capita is invested

The following table provides a summary of key data on global research and health investment and investment in research.

	Amount in USD/or %	Year	Source
Global research (all sectors)	1.4 trillion	2012	Battelle
Agriculture			
Percentage of GDP given to ARD in LICs/MICs (on average) ²	1%-2%	2009	ASTI
Agricultural investment in agriculture (private on farm investment)	170 billion	2012	FAO
Agricultural Research and Development (ARD) amongst LICs and MICs	31.7 billion (ca 2% of all R&D)	2008	ASTI
ARD in Africa	1.7 billion (ca 0.12% of all R&D)	2008	ASTI

Table 13: Summary Table for Agricultural Research Statistics

² Page 13, FAO 2009





USD invested in Health related research³

The Commission on Health Research for Development, in its 1990 report, recommended that all countries invest at least 2% of their national health expenditure in health research and research capacity. This followed the understanding that an estimated 10% of the world's research funds are allocated to address the health problems or conditions of 90% of the population. In the last decade, there has been pressure to expand the monitoring and tracking of financial resources for health research, particularly in low-income and middle-income countries. But limited monitoring activities have so far been carried out in low-income and middle-income countries, particularly in the WHO African Region.

The estimated health research expenditures for the two main groups of countries in the Region are based on the recent survey of national health research systems in the Region.

An estimated total of USD 517.5 million was spent on health research in 37 African countries in 2005. This total represents roughly 12.6% of the total expenditure reported by the Global Fund for Health Research for low-income and middle-income countries in 2003 which was USD4.1 billion. It also represents about 1.3% of the combined total health expenditures for the 37 countries. In global terms all health expenditure has been recorded to amount to about US\$ 6.5 trillion. To this end therefore expenditure on health research represents about 6% of all health expenditure as of 2012⁴.

The pattern of expenditure for various health research topics varies from institution to institution in the Region. Each major research topic receives attention through research carried out in at least one type of health research institution, except for research on innovative practices and product development, which receives a small share of hospital research funds. The prevention and treatment of tuberculosis, HIV/AIDS and malaria, in particular, are studied by almost all types of institution and account for significant shares of institutional funds.

	Amount in USD	Year	Source
Global research (all sectors)	1.4 trillion	2012	Battelle
Health			
Global investment in health research	4.1 billion (ca. 0.29% of all R&D)	2003	WHO
Research in health amongst 37 African countries	517 million (ca 0.04% of all R&D)	2005	WHO
Global spend on health (all types both research and general expenditure)	6.5 trillion	2012	WHO

The following table provides a summary of key data on global research and health investment and investment in research.

Table 14: Summary Table for Agricultural Research Statistics

³ This section was so succinctly written it is taken verbatim from the web listing African Health Observatory: <u>http://www.aho.afro.who.int/profiles_information/index.php/TopicView:Financing</u> ⁴ WHO Global Health Expenditure Atlas, (2012)





Conclusions

This short study identified international compilations of statistics for transport investment in LICs and MICs but found much more limited data available describing the split of investment between the different transport modes. The study also highlighted the lack of data relating to the level of investment in transport research. Despite these data issues, the following conclusions can be drawn from the study:

- Transport investment in LICs is recognised as important for trade and growth. The level of transport investment in LICs in Sub-Saharan Africa was ~2.8% GDP, substantially higher than that in Western Europe and North America at 0.8% and 0.7%, respectively.
- Transport investment in LICs appears to be predominantly for the construction and upgrading of the road network, although in some countries, e.g. Kenya and Uganda, there are also plans to invest in the railway network.
- Transport investment in MICs ranged from 1.5% GDP (Russia) to 2.5% (average for MICs in Sub-Saharan Africa, although there was considerable variation between individual countries). Generally, the highest levels of investment were for roads but some notable exceptions were identified; for example, both Russia and India (MICs) are making comparable levels of investment in their road and rail sectors. Investment in inland waterways, ports and airports was low in all countries considered.
- Investment in transport related road research has been estimated to be ~1% of total road expenditure in Europe. In this study, investment in road related research in LICs is estimated to be ~ 0.2% of total road expenditure, using data for the total level of R&D in LICs compared to Europe.
- Investment in agricultural research in LICs and MICs is around 2.2% of the total annual investment in agriculture. Likewise, expenditure on health related research is around 1.3% of the total health expenditure in these countries.
- Transport related research appears to receive substantially lower levels of investment compared to agricultural and health related research.
- The benefits of transport related research are well recognised but ODA funding does not generally support such work. Notable exceptions are DFID who are currently funding the AFCAP Programme in Sub-Saharan Africa and the World Bank who is funding the establishment of a road research centre in Ethiopia.





Reference List

AFCAP (2010) AFCAP Meeting, Addis, 23-25 November 2012. *Building Transport Research Capacity in the Developing World*, Peter O'Neill, World Bank. Available at: https://www.afcap.org/Documents/Keynote%20address%20-%20Building%20transport%20research.pdf [Accessed 3 January 2013].

AfDB (2010) *Infrastructure Deficit and Opportunities in Africa*, Tunisia: African Development Bank. Available at:

http://www.afdb.org/fileadmin/uploads/afdb/Documents/Publications/ECON%20Brief_Infrastr ucture%20Deficit%20and%20Opportunities%20in%20Africa_Vol%201%20Issue%202.pdf [Accessed 11 December 2012].

Africa Infrastructure Country Diagnostic (2009a) *Improving Connectivity: Investing in Transport Infrastructure in Sub-Saharan Africa*, Washington: The World Bank. Available at: www.infrastructure in Sub-Saharan Africa, Washington: The World Bank. Available at: www.infrastructure in Sub-Saharan Africa, Washington: The World Bank. Available at: www.infrastructureafrica.org/system/files/BP7_Transport_maintxt.pdf [Accessed 11 December 2012].

Africa Infrastructure Country Diagnostic (2009b) *Off Track: Sub-Saharan Railways,* Washington: The World Bank.

Africa Infrastructure Country Diagnostic (2010a), *Ethiopia's Infrastructure: A Continental Perspective*, Washington: The World Bank.

Africa Infrastructure Country Diagnostic (2010b), *Kenya's Infrastructure: A Continental Perspective*, Washington: The World Bank.

Africa Infrastructure Country Diagnostic (2011a), *Uganda's Infrastructure: A Continental Perspective*, Washington: The World Bank.

Africa Infrastructure Country Diagnostic (2011b) *Africa's Transport Infrastructure Mainstreaming Maintenance and Management*, Washington: The World Bank.

African Development Bank (2005) *National Level Infrastructure Data*, Tunisia: AfDB. Available at: <u>http://www.infrastructureafrica.org/DataAnalysis/</u> [Accessed 10 December 2012].

African Development Bank (2009) *Development Research Briefs – Infrastructure Investment in Africa*, Tunisia: AfDB. Available at:

http://www.afdb.org/en/documents/publications/development-research-briefs/ [Accessed 11 December 2012].

African Health Observatory - Available at: http://www.aho.afro.who.int/profiles_information/index.php/TopicView:Financing

ASTI (2012), (Agricultural Science and Technology Indicators) *Global Assessment Of Agricultural R&D Spending – Developing Countries Accelerate Investment*, October 2012, IFPRI, (Nienke Beintema, Gert-Jan Stads, Keith Fuglie, and Paul Heisey). Available at: <u>http://www.asti.cgiar.org/data/</u>

Battelle (2012). Global R&D Funding Forecast, December 2011, www.battelle.org

Center for Global Development (2012) *Assessing the quality of Aid for Agriculture*, Washington: CGD. Available at: <u>http://www.cgdev.org/content/publications/detail/1426425</u> [Accessed 10 December 2012].

Department for International Development (2008a) *Annual Report and Resource Accounts*, London: DFID. Available at: <u>http://www.DFID.gov.uk/Documents/publications1/departmental-report/2009/volume1.pdf</u> [Accessed 10 December 2012].

Department for International Development (2008b) *The Value of Transport Research – A DFID Perspective*, London: DFID. Available at:





http://www.DFID.gov.uk/R4D//PDF/Outputs/SeaCap/DF68 Value-of-research.pdf [Accessed 11 December 2012].

Food and Agriculture Organisation (2012) *State of Food and Agriculture, 2012* Available at: <u>http://www.fao.org/docrep/017/i2885e/i2885e00.pdf</u>

FAO (2009). Setting Meaningful Investment Targets In Agricultural Research And Development: Challenges, Opportunities and Fiscal Realities, Nienke Beintema (ASTI-IFPRI) and Howard Elliott (ISNAR), Paper prepared for the Expert Meeting on "How to Feed the World in 2050". FAO, Rome. June 24-26, 2009.

IFPRI (2012) Agricultural R&D Spending on the Rise, but Low-Income Countries Continue to Lag Behind. Available at: (<u>http://www.ifpri.org/pressrelease/agricultural-rd-spending-rise-low-income-countries-continue-lag-behind</u>

IMF (2012a) *World Economic Outlook*, Washington: International Monetary Fund. Available at: <u>http://www.imf.org/external/pubs/ft/weo/2012/01/pdf/text.pdf</u> [Accessed 11 December 2012].

IMF (2012b) *World Economic Outlook Database, India*, Washington: International Monetary Fund. Available at:

http://www.imf.org/external/pubs/ft/weo/2012/01/weodata/weorept.aspx?pr.x=51&pr.y=6&sy =2009&ey=2012&scsm=1&ssd=1&sort=country&ds=.&br=1&c=534&s=NGDPD%2CNGDPD PC%2CPPPGDP%2CPPPPC%2CLP&grp=0&a= [Accessed 11 December 2012].

International Transport Forum Database. Available at: http://www.internationaltransportforum.org/statistics/investment/data.html

[Accessed 3 January 2013].

International Transport Forum (2011) *Trends in the Transport Sector 2970-2009*, OECD/ITF, Paris, 2011. Available at:

http://www.keepeek.com/Digital-Asset-Management/oecd/transport/trends-in-the-transportsector-2011_trend_transp-2011-en [Accessed 19 December 2012].

ITF/OECD (2012) International Workshop on Measuring Investment in Transport Infrastructure, 9-10 February 2012 Available at: http://www.internationaltransportforum.org/Proceedings/InfrastructureInv/index.html

Invest India (2012) *Roads & Highways*, New Dehli: Federation of Indian Chambers of Commerce and Industry (FICCI). Available at: <u>http://www.investindia.gov.in/?q=roads-and-highways-sector</u> [Accessed 11 December 2012].

Minister of Finance Speech (2012) Government Sierra Leone. Available at: http://www.mofed.gov.sl/index.php?option=com_content&task=view&id=13&Itemid=28

Ministry of Finance, United Republic of Tanzania (2012) Government budget for Financial Year 2011/2012 Citizen's Budget Edition. Available at: <u>http://www.mof.go.tz/mofdocs/budget/Citizens%20Budget/CITIZEN_ENGLISH_2011_12_FI</u> NAL.pdf

OECD (2002) Frascati Manual: Proposed Standard Practice for Surveys on Research and Experimental Development, 6th edition. Available at:

http://www.oecd.org/sti/innovationinsciencetechnologyandindustry/frascatimanualproposedst andardpracticeforsurveysonresearchandexperimentaldevelopment6thedition.htm

OECD (2012) Measuring R&D in Developing Countries. Annex to the Frascati Manual. Available at:

http://www.oecd.org/sti/innovationinsciencetechnologyandindustry/49793555.pdf

PWC (2012) Uganda's FY 2012/13 Post Budget Analysis. Available at:





http://www.pwc.com/ug/en/pdf/pwc-uganda-2012-budget-bulletin.pdf

The World Bank (2012a) *GNI per Capita, Atlas Method (current US\$)*, Washington: The World Bank. Available at: <u>http://data.worldbank.org/indicator/NY.GNP.PCAP.CD</u> [Accessed 11 December 2012].

The World Bank (2012b) *How we Classify Countries, Group Definitions*, Washington: The World Bank. Available at: <u>http://data.worldbank.org/about/country-classifications</u> [Accessed 11 December 2012].

The World Bank (n.d.) *East Asia and Pacific Infrastructure Report, Full Statistical Annex*. Washington: The World Bank. Available at: <u>http://go.worldbank.org/2NANY0S520</u> [Accessed 13 December 2012].

The World Bank (2012c) Country Partnership Strategy for the Federal Democratic Republic of Ethiopia. Available at:

http://documents.worldbank.org/curated/en/2012/08/16702735/ethiopia-country-partnershipstrategy [Accessed 19 Dec 2012]

The World Bank (2010) *Country Partnership Strategy for the Federal Democratic Republic of Kenya*. Available at: <u>http://documents.worldbank.org/curated/en/2010/03/12012273/kenya-country-partnership-strategy-period-fy2010-13</u> [Accessed 7 Jan 2013]

The World Bank (2012c) *Country Partnership Strategy for the Federal Democratic Republic of Uganda.* Available at:

Transportation Research Information Database (TRID) Available at: http://trid.trb.org/

[Accessed 19 December 2012].

UNESCAP (2006) Enhancing Regional Cooperation in Infrastructure Development, including that related to Disaster Management, 2006. Available at: http://www.unescap.org/publications/detail.asp?id=1148

UNESCO Institute for Statistics Data Centre, Available at: http://stats.uis.unesco.org/unesco/tableviewer/document.aspx?ReportId=143

UNESCO Institute for Statistics, 2012, *Global Investments in R&D Fact Sheet Dec 2012*. Available at: <u>http://www.uis.unesco.org/FactSheets/Documents/sti-rd-investment-en.pdf</u> [Accessed 3 Jan 2013]

WHO (2012) Global Health Expenditure Atlas, 2012 Available at: <u>http://www.who.int/nha/atlas.pdf</u>

World Road Statistics (2012), Geneva, 2012. Available at: <u>http://www.irfnet.org/statistics.php</u>





Annex 1: List of Sources Used

Please note that this list is indicative only, and as such does not include every search or resource used. Any references to sources in the report can be found in the reference list.

Search engines:

BASE (Bielefld Academic Search engine) CORE (Connecting Repositories) Google scholar Google books

Searches from Journal Databases:

DOAJ <u>http://www.doaj.org</u> IEEE: <u>http://ieeexplore.ieee.org/</u> (digital library) INGENTA: <u>http://www.ingentaconnect.com</u> JournalSeek: <u>http://journalseek.net/</u> World Wide Science: <u>http://worldwidescience.org/</u>

Other websites and resources:

International Transport Forum statistics: <u>http://www.internationaltransportforum.org/statistics/index.html</u> Data and statistics relevant to the transport sector for OECD countries.

IMF: <u>http://www.imf.org/external/</u> General statistics, data and articles from the international monetary fund

ECLAC: http://www.eclac.org/

The economic commission for Latin America and the Caribbean: statistics per country (LICs and MICs in Latin America and the Caribbean) in investment of transport and articles on the subject of transport, infrastructure and research on transport/ infrastructure

ECA: http://new.uneca.org/acgs/home_gsd.aspx

The Economic Commission for Africa: statistics per country (LICs and MICs in Latin America and the Caribbean) in investment of transport and articles on the subject of transport, infrastructure and research on transport/ infrastructure

ESCAP: <u>http://www.unescap.org/</u>

The Economic and Social Commission for Asia and the Pacific: statistic and articles on public expenditure on transport.

ESCWA: http://www.escwa.un.org/

The Economic and Social Commission for Asia and the Pacific: statistic and articles on public expenditure on transport.

FLACSO: <u>http://www.flacso.org/</u> Latin America Faculty of Social Sciences; searches in the public online library.

AFDB: <u>http://www.afdb.org/en/</u> African Development Bank; searches into documents by country and theme.

AICD: www.infrastructureafrica.org

Data and Research at The World Bank: http://data.worldbank.org/





The World Conference on Transport Research Society: http://wctrs.ish-lyon.cnrs.fr/

The Transit Cooperative Research Program: <u>http://www.tcrponline.org/bin/publications.pl</u> (<u>Publication on</u> transportation industry)

Community Transportation Association: http://web1.ctaa.org/webmodules/webarticles/anmviewer.asp?a=23&z=2

Sources used for Agriculture and Health

a) Agricultural Sources on R&D Spend:

- 2012 Global R&D Funding Forecast, December 2011, <u>www.battelle.org</u>
- Agricultural R&D Spending on the Rise, but Low-Income Countries Continue to Lag Behind (<u>http://www.ifpri.org/pressrelease/agricultural-rd-spending-rise-low-incomecountries-continue-lag-behind</u>), October 2012
- ASTI (Agricultural Science and Technology Indicators) Global Assessment Of Agricultural R&D Spending - Developing Countries Accelerate Investment, October 2012, IFPRI, (Nienke Beintema, Gert-Jan Stads, Keith Fuglie, and Paul Heisey) -<u>http://www.asti.cgiar.org/data/</u>
- FAO State of Food and Agriculture, 2012, <u>http://www.fao.org/docrep/017/i2885e/i2885e00.pdf</u>
- Setting Meaningful Investment Targets In Agricultural Research And Development: Challenges, Opportunities and Fiscal Realities, Nienke Beintema (ASTI-IFPRI) and Howard Elliott (ISNAR), Paper prepared for the Expert Meeting on "How to Feed the World in 2050". FAO, Rome. June 24-26, 2009
- Prime source: Agricultural Research and Development Globally:

The Agricultural Science and Technology Indicators (ASTI) initiative compiles, analyzes, and publishes primary data on institutional developments, investments, and human resources in agricultural R&D in low- and middle-income countries. The ASTI initiative is managed by the International Food Policy Research Institute (IFPRI) and involves collaborative alliances with many national and regional R&D agencies, as well as international institutions. The initiative is widely recognized as the most authoritative source of information on the support for and structure of agricultural. R&D worldwide. www.asti.cgiar.org

ASTI also maintain an online detailed interactive tool on spending in agricultural research and development. Most countries are listed in the metadata set.

A note on the data from ASTI:

Compiling accurate, up-to-date, and consistent information on global patterns of public agricultural R&D investments requires significant, long-term human and financial resources. For some countries, no reliable information on public agricultural R&D exists, whereas for others, the available information is outdated, irregular, or incomplete. Importantly, spending patterns can be highly dynamic over time, as recent ASTI publications have shown so global estimates based on simple estimations and extrapolations need to be made with caution. **ASTI has determined that 2008 is the latest year for which sufficiently reliable data are available to support an accurate assessment of public agricultural R&D spending at the global level.** Contingent on the availability of resources, ASTI plans to update its datasets in a number of regions in order to provide a global assessment to 2012 in time for GCARD 2014.





b) Health Source on R&D Spend:

- African Health Observatory <u>http://www.aho.afro.who.int/profiles_information/index.php/TopicView:Financing</u>
- WHO Global Health Expenditure Atlas, 2012, <u>http://www.who.int/nha/atlas.pdf</u>





Average Annual Investment in Agriculture in Low and Middle-Income Countries, by Source and Country (2005-2007) or most recent year

	On-farm investment in agricultural capital (76)	Government investment (76)	Public spending on agricultural R&D (42)	Official development assistance (70)	Foreign direct investment (36)
		Milli	ons of US dollars		
Low- and middle-income countries	168,577	37,957	4,718	3,106	3,380
East Asia and the Pacific	51,675	20,607	1,693	682	1,675
Cambodia	365	148.9		56.5	87.0
China, Mainland	34,379	17,412.4	1,324.0	160.4	677.1
Fiji	49	13.6		5.8	0.5
Indonesia	5,546	696.1	82.8	142.7	182.0
Malaysia	1,090	742.7	204.4	2.0	671.2
Mongolia	1,552	14.9		18.9	
Papua New Guinea	123	13.5	9.2		
Philippines	1,491	325.7	55.9	59.8	1.3
Thailand	2,128	873.8		17.1	4.7
Tonga	7	3.2		0.8	
Vanuatu	42	1.5		3.0	
Viet Nam	4,903	360.4	16.6	215.2	51.4
Europe and Central Asia	21,791	4,138		78	383
Azerbaijan	666	70.0		13.8	
Belarus	670	532.6		0.5	
Bulgaria	258	105.8			50.0
Georgia	320	16.4		13.1	
Kazakhstan	2,599	212.5		0.5	-0.4
Kyrgyzstan	317	9.5		24.8	0.0
Lithuania	555	157.7			11.7
Republic of Moldova	208	25.4		10.0	1.4
Romania	2,128	701.3			67.7
Russian Federation	5,400	507.7			187.7
Turkey	6,727	1,377.5		9.5	7.3
Ukraine	1,943	421.7		5.6	57.3
Latin America and the Caribbean	26,483	2,910	1,356	213	1,225
Argentina	4,217	55.9	183.7	12.3	367.9
Bolivia (Plurinational State of)	629	14.9		96.4	0.4
Brazil	10,879	305.2	714.9	42.0	420.9
Chile	1,011	157.5	59.9	2.6	49.5
Costa Rica	135	44.5	16.3	8.4	30.9
Dominican Republic	629	68.8	10.4		
El Salvador	99	2.1	0.3	7.9	0.3
Guatemala	860	55.7	4.1	12.6	
Jamaica	149	31.7		12.7	0.0
Mexico	6,167	2,089.8	328.3	7.7	54.9
Panama	206	47.9	5.7	3.8	
Saint Vincent and the Grenadines	2	1.6		6.2	
Uruguay	1,499	34.2	31.9	0.8	300.3



Millions of US dollars Middle East and North Africa 12,864 3,594 427 194 Algeria 873 365.7 5.3 Egypt 2,272 453.7 97.9 Iran (Islamic Republic of) 5,529 1,114.5 176.9 0.7 Jordan 86 44.3 5.8 1.9 Lebanon 1142 9.1 3.0 Morocco 1,287 206.7 70.6 33.3 Syrian Arab Republic 1,350 1,113.0 147.0 4.3 Tunisia 6647 248.1 26.3 27.4 Yemen 679 39.3 20.0 South Asia 36,726 4,715 703 912 Bangladesh 4,597 191.5 46.2 74.1 Bhutan 20 16.0 7.0 14.3 India 22,506 4,043.6 581.4 554.9 Maldives -2 4.2 2.4 <t< th=""><th>gn direct stment 36)</th></t<>	gn direct stment 36)
Middle East and North Africa 12,864 3,594 427 194 Algeria 873 365.7 5.3 5.3 Egypt 2,272 453.7 97.9 Iran (Islamic Republic of) 5,529 1,114.5 176.9 0.7 Jordan 86 44.3 5.8 1.9 3.0 Lebanon 142 9.1 3.0 3.0 3.0 3.0 3.0 3.0 3.0 3.0 3.0 3.0 3.0 3.0 3.0 3.0 3.0 3.0 3.0 3.0	
Algeria 873 365.7 5.3 Egypt 2,272 453.7 97.9 Iran (Islamic Republic of) 5,529 1,114.5 176.9 0.7 Jordan 86 44.3 5.8 1.9 Lebanon 142 9.1 3.0 Morocco 1,287 206.7 70.6 33.3 Syrian Arab Republic 1,350 1,113.0 147.0 4.3 Tunisia 647 248.1 26.3 27.4 Yemen 679 39.3 20.0 20.0 South Asia 36,726 4,715 703 912 Bangladesh 4,597 191.5 46.2 74.1 Bhutan 20 16.0 7.0 1 India 22,506 4,043.6 581.4 554.9 Maldives -2 4.2 2.4 2.4 Nepal 544 37.0 6.1 86.8 Pakistan 8,720 283.2 55.1 <th>67</th>	67
Egypt 2,272 453.7 97.9 Iran (Islamic Republic of) 5,529 1,114.5 176.9 0.7 Jordan 86 44.3 5.8 1.9 Lebanon 142 9.1 3.0 Morocco 1,287 206.7 70.6 33.3 Syrian Arab Republic 1,350 1,113.0 147.0 4.3 Tunisia 647 248.1 26.3 27.4 Yemen 679 39.3 20.0 20.0 South Asia 36,726 4,715 703 912 Bangladesh 4,597 191.5 46.2 74.1 Bhutan 20 16.0 7.0 10 India 22,506 4,043.6 581.4 554.9 Maldives -2 4.2 2.4 2.4 Nepal 544 37.0 6.1 86.8 Pakistan 8,720 283.2 55.1 147.9 Sri Lanka 341 139.7	
Iran (Islamic Republic of) 5,529 1,114.5 176.9 0.7 Jordan 86 44.3 5.8 1.9 Lebanon 142 9.1 3.0 Morocco 1,287 206.7 70.6 33.3 Syrian Arab Republic 1,350 1,113.0 147.0 4.3 Tunisia 647 248.1 26.3 27.4 Yemen 679 39.3 20.0 South Asia 36,726 4,715 703 912 Bangladesh 4,597 191.5 46.2 74.1 Bhutan 20 16.0 7.0 1 India 22,506 4,043.6 581.4 554.9 Maldives -2 4.2 2.4 2.4 Nepal 544 37.0 6.1 86.8 Pakistan 8,720 283.2 55.1 147.9 Sri Lanka 341 139.7 14.6 38.9 Sub-Saharan Africa 19,038 1,993 539 1,027 Botswana 159 57.8	50.9
Jordan 86 44.3 5.8 1.9 Lebanon 142 9.1 3.0 Morocco 1,287 206.7 70.6 33.3 Syrian Arab Republic 1,350 1,113.0 147.0 4.3 Tunisia 647 248.1 26.3 27.4 Yemen 679 39.3 20.0 South Asia 36,726 4,715 703 912 Bangladesh 4,597 191.5 46.2 74.1 Bhutan 20 16.0 7.0 1 India 22,506 4,043.6 581.4 554.9 Maldives -2 4.2 2.4 1 Nepal 544 37.0 6.1 86.8 Pakistan 8,720 283.2 55.1 147.9 Sri Lanka 341 139.7 14.6 38.9 Sub-Saharan Africa 19,038 1,993 539 1,027 Botswana 159 57.8	
Lebanon 142 9.1 3.0 Morocco 1,287 206.7 70.6 33.3 Syrian Arab Republic 1,350 1,113.0 147.0 4.3 Tunisia 647 248.1 26.3 27.4 Yemen 679 39.3 20.0 South Asia 36,726 4,715 703 912 Bangladesh 4,597 191.5 46.2 74.1 Bhutan 20 16.0 7.0 1 India 22,506 4,043.6 581.4 554.9 Maldives -2 4.2 2.4 1 Nepal 544 37.0 6.1 86.8 Pakistan 8,720 283.2 55.1 147.9 Sri Lanka 341 139.7 14.6 38.9 Sub-Saharan Africa 19,038 1,993 539 1,027 Botswana 159 57.8 11.2 2.9 19.9 Cameroon 384	
Morocco 1,287 206.7 70.6 33.3 Syrian Arab Republic 1,350 1,113.0 147.0 4.3 Tunisia 647 248.1 26.3 27.4 Yemen 679 39.3 20.0 South Asia 36,726 4,715 703 912 Bangladesh 4,597 191.5 46.2 74.1 Bhutan 20 16.0 7.0 101 India 22,506 4,043.6 581.4 554.9 Maldives -2 4.2 2.4 2.4 Nepal 544 37.0 6.1 86.8 Pakistan 8,720 283.2 55.1 147.9 Sri Lanka 341 139.7 14.6 38.9 Sub-Saharan Africa 19,038 1,993 539 1,027 Botswana 159 57.8 11.2 2.9 19.9 Cameroon 384 55.2 44.7 2.9 19.9 2.3 </td <td></td>	
Syrian Arab Republic 1,350 1,113.0 147.0 4.3 Tunisia 647 248.1 26.3 27.4 Yemen 679 39.3 20.0 South Asia 36,726 4,715 703 912 Bangladesh 4,597 191.5 46.2 74.1 Bhutan 20 16.0 7.0 100 India 22,506 4,043.6 581.4 554.9 Maldives -2 4.2 2.4 Nepal 544 37.0 6.1 86.8 Pakistan 8,720 283.2 55.1 147.9 Sri Lanka 341 139.7 14.6 38.9 Sub-Saharan Africa 19,038 1,993 539 1,027 Burundi 148 0.6 2.9 19.9 Cameroon 384 55.2 44.7 2.9 Burundi 20 6.4 7.1 2.9	2.8
Tunisia 647 248.1 26.3 27.4 Yemen 679 39.3 20.0 South Asia 36,726 4,715 703 912 Bangladesh 4,597 191.5 46.2 74.1 Bhutan 20 16.0 7.0 1 India 22,506 4,043.6 581.4 554.9 Maldives -2 4.2 2.4 Nepal 544 37.0 6.1 86.8 Pakistan 8,720 283.2 55.1 147.9 Sri Lanka 341 139.7 14.6 38.9 Sub-Saharan Africa 19,038 1,993 539 1,027 Botswana 159 57.8 11.2 2.9 Burundi 148 0.6 2.9 19.9 Cameroon 384 55.2 44.7 Cape Verde 20 6.4 7.1	6.3
Yemen 679 39.3 20.0 South Asia 36,726 4,715 703 912 Bangladesh 4,597 191.5 46.2 74.1 Bhutan 20 16.0 7.0 India 22,506 4,043.6 581.4 554.9 Maldives -2 4.2 2.4 2.4 Nepal 544 37.0 6.1 86.8 Pakistan 8,720 283.2 55.1 147.9 Sri Lanka 341 139.7 14.6 38.9 Sub-Saharan Africa 159 57.8 11.2 2.9 Burundi 148 0.6 2.9 19.9 Cameroon 384 55.2 44.7 Cape Verde 20 6.4 7.1	7.3
South Asia 36,726 4,715 703 912 Bangladesh 4,597 191.5 46.2 74.1 Bhutan 20 16.0 7.0 India 22,506 4,043.6 581.4 554.9 Maldives -2 4.2 2.4 Nepal 544 37.0 6.1 86.8 Pakistan 8,720 283.2 55.1 147.9 Sri Lanka 341 139.7 14.6 38.9 Sub-Saharan Africa 19,038 1,993 539 1,027 Botswana 159 57.8 11.2 2.9 Burundi 148 0.6 2.9 19.9 Cameroon 384 55.2 44.7 Cape Verde 20 6.4 7.1	
Bangladesh 4,597 191.5 46.2 74.1 Bhutan 20 16.0 7.0 1 India 22,506 4,043.6 581.4 554.9 1 Maldives -2 4.2 2.4 1 <	10
Bhutan 20 16.0 7.0 India 22,506 4,043.6 581.4 554.9 Maldives -2 4.2 2.4 Nepal 544 37.0 6.1 86.8 Pakistan 8,720 283.2 55.1 147.9 Sri Lanka 341 139.7 14.6 38.9 Sub-Saharan Africa 19,038 1,993 539 1,027 Botswana 159 57.8 11.2 2.9 Burundi 148 0.6 2.9 19.9 Cameroon 384 55.2 44.7 Cape Verde 20 6.4 7.1	3.6
India 22,506 4,043.6 581.4 554.9 Maldives -2 4.2 2.4 Nepal 544 37.0 6.1 86.8 Pakistan 8,720 283.2 55.1 147.9 Sri Lanka 341 139.7 14.6 38.9 Sub-Saharan Africa 19,038 1,993 539 1,027 Botswana 159 57.8 11.2 2.9 Burundi 148 0.6 2.9 19.9 Cameroon 384 55.2 44.7 Cape Verde 20 6.4 7.1	
Maldives -2 4.2 2.4 Nepal 544 37.0 6.1 86.8 Pakistan 8,720 283.2 55.1 147.9 Sri Lanka 341 139.7 14.6 38.9 Sub-Saharan Africa 19,038 1,993 539 1,027 Botswana 159 57.8 11.2 2.9 Burundi 148 0.6 2.9 19.9 Cameroon 384 55.2 44.7 Cape Verde 20 6.4 7.1	6.0
Nepal 544 37.0 6.1 86.8 Pakistan 8,720 283.2 55.1 147.9 Sri Lanka 341 139.7 14.6 38.9 Sub-Saharan Africa 19,038 1,993 539 1,027 Botswana 159 57.8 11.2 2.9 Burundi 148 0.6 2.9 19.9 Cameroon 384 55.2 44.7 Cape Verde 20 6.4 7.1	0.0
No. No. <td></td>	
Sri Lanka 341 139.7 14.6 38.9 Sub-Saharan Africa 19,038 1,993 539 1,027 Botswana 159 57.8 11.2 2.9 Burundi 148 0.6 2.9 19.9 Cameroon 384 55.2 44.7 Cape Verde 20 6.4 7.1	
Sub-Saharan Africa 19,038 1,993 539 1,027 Botswana 159 57.8 11.2 2.9 Burundi 148 0.6 2.9 19.9 Cameroon 384 55.2 44.7 Cape Verde 20 6.4 7.1	
Botswana 159 57.8 11.2 2.9 Burundi 148 0.6 2.9 19.9 Cameroon 384 55.2 44.7 Cape Verde 20 6.4 7.1	20
Burundi 148 0.6 2.9 19.9 Cameroon 384 55.2 44.7 Cape Verde 20 6.4 7.1	
Cameroon 384 55.2 44.7 Cape Verde 20 6.4 7.1	
Cape Verde 20 6.4 7.1	
Central African Republic 147 3.7 17.9	
Côte d'hyoire 459 74 9 23 5 19 9	
Ethiopia 4849 227.0 18.8 119.3	14.5
Ghana 481 7.3 26.6 126.7	14.5
Guinea-Rissau 115 0.5 4.8	
Kenya 880 717 614 1460	
lesotho 72 124 16	
Madagascar 1298 40.6 2.0 62.4	-0.2
Malawi 286 13.9 6.2 76.8	4.8
Mali 1.099 141.2 12.3 172.7	110
Mauritius 14 22.7 12.2 11.7	0.7
Namibia 166 50.6 15.7 6.0	
Niger 994 22.4 2.5 27.6	
Nigeria 4.309 190.1 130.4 25.0	
Sevchelles 0 8.1 2.4	
South Africa 2.206 837.6 183.7 19.1	
Swaziland 35 26.2 13.0	
Liganda 582 33.3 25.5 56.3	
Zambia 335 88.4 4.4 43.5	
Notes: The number of countries covered is shown in parenthesis next to the relevant type of flow. All flows are re-	norted
in constant 2005 LIS dollars with the excention of EDI inflows which are reported in current LIS dollars. Data are the	o
average for the years 2005 - 2007 or for the most recent year(s) available prior to that period. There may be some	
overlap hetween data on ODA on the one hand and government investment in agriculture and/ or expenditure or	-
arricultural R&D on the other hand	
segmenter of new off the other name. Sources: On-farm investment in agricultural capital is calculated using data on agricultural capital stock from EAC	(2012)
Government investment in agricultural capital is calculated using data on agricultural capital Stock (roll PAC) Government investment is estimated using data from (EDD) (2012a), public spending on agricultural PSD is from (EDRI
(2012b), official development assistance is estimated using data from OECD (2012) and foreign direct investment	data are
from UNCTAD (2011).	uata are

Source: "Who invests in agriculture and how much? An empirical review of the relative size of various investments in agriculture in low- and middle-income countries", Lowder, Carisma and Skoet, FAO, ESA Working Paper 12-09, December, 2012

