



BACKGROUND PAPER 7 (PHASE II)

Improving Connectivity: Investing in Transport Infrastructure in Sub-Saharan Africa

CROSS-COUNTRY ANNEX AND SAMPLE COUNTRY ANNEX

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Africa's Infrastructure | *A Time for Transformation*

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About AICD



This study is a product of the Africa Infrastructure Country Diagnostic (AICD), a project designed to expand the world's knowledge of physical infrastructure in Africa. AICD will provide a baseline against which future improvements in infrastructure services can be measured, making it possible to monitor the results achieved from donor support. It should also provide a better empirical foundation for prioritizing investments and designing policy reforms in Africa's infrastructure sectors.



AICD is based on an unprecedented effort to collect detailed economic and technical data on African infrastructure. The project has produced a series of reports (such as this one) on public expenditure, spending needs, and sector performance in each of the main infrastructure sectors—energy, information and communication technologies, irrigation, transport, and water and sanitation. *Africa's Infrastructure—A Time for Transformation*, published by the World Bank in November 2009, synthesizes the most significant findings of those reports.



AICD was commissioned by the Infrastructure Consortium for Africa after the 2005 G-8 summit at Gleneagles, which recognized the importance of scaling up donor finance for infrastructure in support of Africa's development.



The first phase of AICD focused on 24 countries that together account for 85 percent of the gross domestic product, population, and infrastructure aid flows of Sub-Saharan Africa. The countries are: Benin, Burkina Faso, Cape Verde, Cameroon, Chad, Côte d'Ivoire, the Democratic Republic of Congo, Ethiopia, Ghana, Kenya, Lesotho, Madagascar, Malawi, Mozambique, Namibia, Niger, Nigeria, Rwanda, Senegal, South Africa, Sudan, Tanzania, Uganda, and Zambia. Under a second phase of the project, coverage is expanding to include as many other African countries as possible.



Consistent with the genesis of the project, the main focus is on the 48 countries south of the Sahara that face the most severe infrastructure challenges. Some components of the study also cover North African countries so as to provide a broader point of reference. Unless otherwise stated,



therefore, the term “Africa” will be used throughout this report as a shorthand for “Sub-Saharan Africa.”



The World Bank is implementing AICD with the guidance of a steering committee that represents the African Union, the New Partnership for Africa’s Development (NEPAD), Africa’s regional economic communities, the African Development Bank, the Development Bank of Southern Africa, and major infrastructure donors.



Financing for AICD is provided by a multidonor trust fund to which the main contributors are the U.K.’s Department for International Development, the Public Private Infrastructure Advisory Facility, Agence Française de Développement, the European Commission, and Germany’s KfW Entwicklungsbank. The Sub-Saharan Africa Transport Policy Program and the Water and Sanitation Program provided technical support on data collection and analysis pertaining to their respective sectors. A group of distinguished peer reviewers from policy-making and academic circles in Africa and beyond reviewed all of the major outputs of the study to ensure the technical quality of the work.



The data underlying AICD’s reports, as well as the reports themselves, are available to the public through an interactive Web site, www.infrastructureafrica.org, that allows users to download customized data reports and perform various simulations. Inquiries concerning the availability of data sets should be directed to the editors at the World Bank in Washington, DC.



Transport infrastructure spending required to meet connectivity standards under two scenarios

Base scenario

Table 1 Costs of spending in transport infrastructure required to meet connectivity standards, by mode

US\$ millions per annum	Roads				Railways	Ports	Airports	Total	Total % of GDP
	Regional	National	Rural	Urban					
Angola	125	79	75	43	20	66	16	423	1.4
Benin	15	35	12	29	12	8	5	116	2.7
Botswana	53	12	21	10	6	0	4	107	1.0
Burkina Faso	25	61	28	19	6	0	5	144	2.7
Burundi	6	16	5	10	0	0	3	40	5.0
Cameroon	111	78	49	54	8	10	18	328	2.0
Cape Verde	0	0	0	2	0	8	8	19	1.9
CAR	124	64	46	15	0	0	2	250	18.5
Chad	175	92	78	18	0	0	2	364	6.2
Congo Republic	46	32	39	12	10	5	19	163	2.7
Congo, Dem. Rep	406	395	433	121	57	14	48	1,474	20.7
Cote d'Ivoire	34	118	82	46	23	25	12	341	2.1
Equatorial Guinea	4	4	11	6	0	55	2	82	1.1
Eritrea	4	6	8	17	0	5	3	43	4.4
Ethiopia	104	95	84	74	5	0	30	393	3.2
Gabon	37	37	38	18	16	5	11	163	1.9
Gambia	3	12	0	20	0	4	2	41	8.9
Ghana	44	64	44	80	9	38	28	307	2.9
Guinea	92	49	55	36	6	8	5	251	7.7
Guinea-Bissau	9	6	9	10	0	4	0	38	12.7
Kenya	70	65	56	84	50	40	109	474	2.5
Lesotho	0	17	5	2	0	0	1	25	1.7
Liberia	31	35	34	88	3	5	1	198	37.3
Madagascar	68	108	139	33	5	9	16	377	7.5
Malawi	20	32	6	9	14	0	5	85	3.0
Mali	68	56	76	15	13	0	8	236	4.5
Mauritania	30	51	13	5	5	5	4	114	6.2
Mauritius	0	0	0	42	0	19	19	79	1.3
Mozambique	76	81	136	44	30	16	12	395	6.0
Namibia	49	18	4	45	17	14	7	154	2.5
Niger	39	32	44	22	0	0	3	139	4.2
Nigeria	138	220	236	366	96	98	69	1,222	1.1

IMPROVING CONNECTIVITY: CROSS-COUNTRY ANNEX AND SAMPLE COUNTRY ANNEX

US\$ millions per annum	Roads				Railways	Ports	Airports	Total	Total % of GDP
	Regional	National	Rural	Urban					
Rwanda	4	12	4	11	0	0	4	36	1.5
Senegal	38	26	11	33	9	15	9	141	1.6
Sierra Leone	21	13	24	54	0	6	1	120	9.9
South Africa	114	280	0	268	196	344	265	1,467	0.6
Sudan	198	224	143	131	52	23	16	786	2.9
Swaziland	60	3	0	6	6	0	1	76	2.9
Tanzania	111	161	165	78	46	21	36	619	4.4
Togo	3	10	7	99	11	6	6	142	6.6
Uganda	50	91	17	26	13	0	24	221	2.5
Zambia	58	70	109	23	9	0	12	280	3.8
Zimbabwe	15	15	134	26	22	0	6	218	6.4
Resource-Rich	893	836	776	668	211	262	164	3,810	1.7
LIC-NoFragile	761	971	834	563	217	153	298	3,797	3.4
LIC-Fragile	748	740	836	542	122	77	90	3,155	8.2
MIC	277	330	30	374	226	385	305	1,926	0.7
SSA	2,678	2,877	2,477	2,147	776	876	856	12,689	2.0

Table 2 Costs of spending in transport infrastructure required to meet connectivity standards, by purpose of spending

Percent (except as noted)

Country	Improve condition	Upgrade category	Expand capacity	Maintenance	Total spending US\$ millions per annum
Angola	25	27	10	38	423
Benin	26	27	16	32	116
Botswana	31	22	0	47	107
Burkina Faso	9	43	5	44	144
Burundi	43	12	0	45	40
Cameroon	15	45	2	37	328
Cape Verde	14	3	33	50	19
CAR	5	64	0	30	250
Chad	2	43	25	30	364
Congo Republic	24	27	7	42	163
Congo, Dem. Rep	17	41	15	27	1,474
Cote d'Ivoire	24	27	7	41	341
Equatorial Guinea	17	5	54	24	82
Eritrea	31	23	1	45	43
Ethiopia	11	35	17	38	393
Gabon	18	42	1	39	163
Gambia	49	9	2	40	41
Ghana	26	26	5	43	307
Guinea	17	45	2	36	251
Guinea-Bissau	40	20	0	40	38
Kenya	22	20	6	51	474
Lesotho	41	13	0	45	25
Liberia	11	37	32	20	198
Madagascar	13	40	3	44	377
Malawi	26	28	1	46	85
Mali	16	34	11	39	236
Mauritania	31	9	23	37	114
Mauritius	10	18	40	32	79
Mozambique	14	35	8	43	395
Namibia	38	14	1	47	154
Niger	26	14	13	47	139
Nigeria	31	19	9	40	1,222
Rwanda	26	11	27	37	36
Senegal	31	14	16	38	141
Sierra Leone	17	23	34	26	120

IMPROVING CONNECTIVITY: CROSS-COUNTRY ANNEX AND SAMPLE COUNTRY ANNEX

Country	Improve condition	Upgrade category	Expand capacity	Maintenance	Total spending US\$ millions per annum
South Africa	19	8	24	49	1,467
Sudan	5	30	34	31	786
Swaziland	18	33	6	43	76
Tanzania	9	44	4	43	619
Togo	13	8	63	16	142
Uganda	18	42	2	38	221
Zambia	25	25	0	50	280
Zimbabwe	50	14	0	36	218
Resource-Rich	19	28	15	37	3,810
LIC-NoFragile	17	32	8	43	3,797
LIC-Fragile	20	36	14	30	3,155
MIC	21	11	21	48	1,926
SSA	19	29	14	39	12,689

Pragmatic scenario

Table 3 Costs of spending in transport infrastructure required to meet connectivity standards, by mode

US\$ millions per annum	Roads				Railways	Ports	Airports	Total	Total % of GDP
	Regional	National	Rural	Urban					
Angola	70	58	44	22	12	31	5	241	0.8
Benin	10	27	6	11	9	6	3	72	1.7
Botswana	35	9	13	10	4	0	1	72	0.7
Burkina Faso	18	49	24	8	4	0	3	105	1.9
Burundi	4	12	3	10	0	0	1	30	3.7
Cameroon	61	61	32	21	5	10	7	196	1.2
Cape Verde	0	0	0	1	0	6	3	9	0.9
CAR	62	50	36	11	0	0	1	160	11.8
Chad	96	72	61	7	0	0	1	237	4.0
Congo Republic	26	25	27	12	8	5	5	106	1.7
Congo, Dem. Rep	208	309	229	50	50	9	21	876	12.3
Cote d'Ivoire	21	85	52	19	17	15	5	215	1.3
Equatorial Guinea	3	3	6	6	0	28	0	46	0.6
Eritrea	3	4	5	5	0	5	1	23	2.4
Ethiopia	57	74	61	30	3	0	9	233	1.9
Gabon	20	29	28	15	12	5	3	112	1.3
Gambia	2	9	0	20	0	4	0	36	7.8
Ghana	29	49	26	40	6	28	7	184	1.7
Guinea	52	38	37	13	4	8	2	154	4.7

IMPROVING CONNECTIVITY: CROSS-COUNTRY ANNEX AND SAMPLE COUNTRY ANNEX

	Roads			Railways	Ports	Airports	Total	Total	
Guinea-Bissau	6	5	5	3	0	4	0	23	7.6
Kenya	44	50	37	33	36	25	22	247	1.3
Lesotho	0	12	3	1	0	0	0	16	1.2
Liberia	16	27	18	31	2	5	1	99	18.8
Madagascar	39	84	101	13	3	9	5	252	5.0
Malawi	14	24	3	6	10	0	2	60	2.1
Mali	40	43	52	5	10	0	3	153	2.9
Mauritania	19	38	7	5	3	5	2	80	4.3
Mauritius	0	0	0	15	0	19	6	40	0.6
Mozambique	49	63	100	18	19	16	6	271	4.1
Namibia	37	14	3	45	10	14	2	124	2.0
Niger	27	24	30	9	0	0	1	91	2.7
Nigeria	93	152	122	114	76	51	44	652	0.6
Rwanda	3	9	2	5	0	0	1	20	0.8
Senegal	27	19	6	14	6	12	3	87	1.0
Sierra Leone	12	10	16	19	0	6	1	64	5.3
South Africa	90	222	0	96	93	146	62	710	0.3
Sudan	107	173	154	51	35	8	5	532	1.9
Swaziland	37	2	0	2	5	0	0	46	1.7
Tanzania	61	126	128	25	29	19	13	401	2.8
Togo	2	7	4	34	9	6	2	65	3.0
Uganda	29	70	8	9	9	0	5	130	1.5
Zambia	44	54	74	6	5	0	3	186	2.5
Zimbabwe	10	11	63	10	13	0	2	110	3.2
Resource-Rich	519	626	548	253	153	137	71	2,307	1.0
LIC-NoFragile	464	749	591	231	147	120	83	2,385	2.2
LIC-Fragile	400	568	466	225	95	62	37	1,853	4.8
MIC	199	259	18	170	111	185	74	1,018	0.4
SSA	1,582	2,202	1,624	879	506	504	266	7,563	1.2

Table 4 Costs of spending in transport infrastructure required to meet connectivity standards, by purpose of spending

Percent (except as noted)

Country	Improve condition	Upgrade category	Expand capacity	Maintenance	Total spending US\$ millions per annum
Angola	16	24	2	58	241
Benin	21	33	0	46	72
Botswana	17	16	0	66	72
Burkina Faso	3	39	0	57	105
Burundi	31	12	0	57	30
Cameroon	10	40	1	50	196
Cape Verde	35	0	33	32	9
CAR	5	51	0	43	160
Chad	1	33	22	43	237
Congo Republic	21	20	7	51	106
Congo, Dem. Rep	5	40	15	40	876
Cote d'Ivoire	13	26	1	61	215
Equatorial Guinea	17	6	36	41	46
Eritrea	32	9	1	58	23
Ethiopia	5	31	9	54	233
Gabon	21	32	0	47	112
Gambia	47	8	1	43	36
Ghana	23	22	2	53	184
Guinea	12	36	2	50	154
Guinea-Bissau	33	10	0	57	23
Kenya	27	16	4	53	247
Lesotho	18	14	0	69	16
Liberia	8	45	8	39	99
Madagascar	7	29	3	61	252
Malawi	16	27	0	57	60
Mali	11	23	11	55	153
Mauritania	20	10	20	49	80
Mauritius	20	31	15	34	40
Mozambique	8	29	2	61	271
Namibia	31	14	0	54	124
Niger	9	11	6	73	91
Nigeria	23	10	9	57	652
Rwanda	14	15	14	56	20
Senegal	23	17	4	56	87
Sierra Leone	14	26	10	50	64

IMPROVING CONNECTIVITY: CROSS-COUNTRY ANNEX AND SAMPLE COUNTRY ANNEX

Country	Improve condition	Upgrade category	Expand capacity	Maintenance	Total spending US\$ millions per annum
South Africa	26	8	7	59	710
Sudan	3	28	28	42	532
Swaziland	8	22	6	64	46
Tanzania	7	34	4	56	401
Togo	18	16	39	27	65
Uganda	11	44	3	43	130
Zambia	11	17	0	72	186
Zimbabwe	21	15	0	63	110
Resource-Rich	13	23	13	52	2,307
LIC-NoFragile	12	27	5	56	2,385
LIC-Fragile	10	35	9	46	1,853
MIC	25	11	6	58	1,018
SSA	14	25	8	52	7,563

Sample country annex

Table 5 Angola: Cost of spending in transport infrastructure required to meet connectivity standards, by mode and purpose of spending

Base scenario						
ANGOLA		Improve condition	Upgrade category	Expand capacity	Maintenance	Total spending
US\$ millions per annum						
Roads	Regional	22.2	57.8	6.4	38.7	125.1
	National	31.0	9.9	0.4	38.2	79.4
	RAI	35.7	5.0	0.0	34.5	75.2
	UAI	12.8	12.1	0.0	17.8	42.7
	Railways	0.0	12.4	0.0	7.2	19.7
	Ports	5.0	15.8	35.0	9.8	65.6
	Airports	0.6	0.0	1.4	13.8	15.8
	Total	107.3	112.9	43.1	160.1	423.4
	Percentage of GDP					
Roads	Regional	0.07	0.19	0.02	0.13	0.41
	National	0.10	0.03	0.00	0.12	0.26
	RAI	0.12	0.02	0.00	0.11	0.25
	UAI	0.04	0.04	0.00	0.06	0.14
	Railways	0.00	0.04	0.00	0.02	0.06
	Ports	0.02	0.05	0.11	0.03	0.21
	Airports	0.00	0.00	0.00	0.05	0.05
	Total	0.35	0.37	0.14	0.52	1.38
	Pragmatic scenario					
ANGOLA		Improve condition	Upgrade category	Expand capacity	Maintenance	Total spending
US\$ millions per annum						
Roads	Regional	6.8	23.9	3.8	35.7	70.2
	National	9.5	7.4	0.3	40.4	57.6
	RAI	4.0	1.1	0.0	39.1	44.2
	UAI	12.8	0.0	0.0	9.2	21.9
	Railways	0.0	9.3	0.0	2.4	11.7
	Ports	5.0	15.8	0.0	9.8	30.6
	Airports	0.9	0.0	0.7	3.0	4.6
	Total	39.0	57.4	4.8	139.6	240.8
	Percentage of GDP					
Roads	Regional	0.02	0.08	0.01	0.12	0.23
	National	0.03	0.02	0.00	0.13	0.19
	RAI	0.01	0.00	0.00	0.13	0.14

IMPROVING CONNECTIVITY: CROSS-COUNTRY ANNEX AND SAMPLE COUNTRY ANNEX

ANGOLA	Improve condition	Upgrade category	Expand capacity	Maintenance	Total spending
UAI	0.04	0.00	0.00	0.03	0.07
Railways	0.00	0.03	0.00	0.01	0.04
Ports	0.02	0.05	0.00	0.03	0.10
Airports	0.00	0.00	0.00	0.01	0.01
Total	0.13	0.19	0.02	0.46	0.79

Table 6 Transport infrastructure: quantities, categories, and condition

Transport Infrastructure	Current	Base scenario	Pragmatic scenario
Regional roads km	4,396	4,396	4,396
% 2-lane	64	100	100
% 1-lane	0	0	0
% other	36	0	0
% Good condition	30	100	50
National roads km	4,581	4,581	4,581
% 2-lane	85	85	85
% 1-lane	1	15	15
% other	14	0	0
% Good condition	30	100	50
Rural Social criterion	n.a.	15,285	10,039
Rural Accessibility Index	n.a.	75%	50%
Local Access Market criterion	n.a.	19,453	19,453
Rural Accessibility Index	n.a.	42%	42%
Urban paved roads km	1,604	2,489	1,175
% Good condition	25	100	50
Railways, km			
Length in operation	852	426	426
% Good condition	0	100	100
Ports			
Container berths	1	2	2
General cargo berths	11	24	24
Bulk freight berths	3	2	2
% Good condition	9	100	100
Airport runways			
1,524m to 3,000m, number	8	3	3
More than 3,000m, number	1	1	1
% Good condition	11	100	100
Airport terminals			
Passenger, sq.m	n.a.	12,579	12,579
Freight sq.m	n.a.	12,581	12,581

Similar tables for other countries can be constructed using the data contained in BP7_Transport_etry_data.xlsx, available for download from <https://www.infrastructureafrica.org/aicd/>.