Research and Transport Policy in Africa
A Case for Interdisciplinarity in Science

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Abstract: *The interaction between transport and social welfare is one of the most complex problems in Africa. It is a challenge of intertwined disciplinary issues of science – both social and natural sciences. It begs interdisciplinarity. This paper explores the future of interdisciplinarity in research through two lenses. First, through a rendering of drivers and agencies of research on the continent. Secondly, by presenting an analysis of the process of policymaking in the transport sector. In both cases, textual analysis was the principal method of investigation. Development of research in 16 countries of East, Central, and West Africa is traced back to pre-independence. An emerging model of research on the continent is presented. The model identifies weak linkages between private firms and public research institutions as the hindrance to the growth of interdisciplinarity on the continent. As regards transport policymaking, six regional policy initiatives were considered. It identifies the absence of local research entities in the policy process as the main obstacle to interdisciplinarity; the local research entities would in turn require strong private sector participation for vibrant interdisciplinary research. The paper concludes that interdisciplinarity will come to bear. It could be through a natural process of evolution, or through discrete action by donors, local political actors and universities. The pressures of economic development could force the latter.*

1 BACKGROUND

The meaning of the term science has attracted a lot of debate over the ages. This paper does not explore this debate. Instead, it presents a definition that facilitates a wider discussion on the history and future of research. Science is in this context is knowledge grounded in evidence and acquired through logical reasoning, and hence reliable as a predictive tool or premise. A systematic effort at broadening knowledge is termed research. Broad and complex problems demand an interdisciplinary research. A definition of 'interdisciplinarity' presented by Repko (*1*) is adopted:

> *Interdisciplinarity* is a process of answering a question, solving a problem, or addressing a topic that is too broad to be dealt with adequately by a single discipline or profession. *It* draws on *various* disciplinary perspectives and integrates their insights through *the* construction of a more comprehensive perspective [italics added].

The paper makes a limited defence of this statement. For a broader and deeper defence, Repko's work is a good reference. This statement of definitions sets the stage to explore the use of research as a guide in policymaking, with a focus on transport policy in Africa – particularly, Sub-Saharan Africa (SSA).

The paper is guided by questions in Box 1. The paper primarily questions the nature and direction of research within the continent. It achieves this goal by tracing changes in the structures (drivers and agencies) of research in the region. It then explores future interactions between research and policymaking in Africa. Textual analysis is used as the investigatory tool, yielding empirical results presented as frames. Note that the paper adopts an integrated approach, not a discrete presentation of the problem, methodology, results and analysis.

The paper is organised as shown in FIGURE 1, which is consistent with guiding questions in Box 1. Section 2 discusses welfare challenges of SSA, identifying how these challenges relate to transport in the region. The transport-welfare challenge is assessed as non-linear and complex, and one that begs interdisciplinarity. Not only are welfare problems complex, the regional organisations that attend to these challenges are prone to organisational tension. This is illustrated.

The paper then focuses on science (through research) as a tool for understanding the evolving challenges of the region, and for diagnosing solutions to these challenges. Section 3 traces the path of research in Africa. This is done against a background of the evolution of the structures of research in the West. This section identifies obstacles to interdisciplinarity through the lens of research structures. Section 4 examines the uptake of research products [science] in policymaking. It uses the institutional rational choice framework (IRC), as a lens for examining the uptake of science. Section 5 ponders the future of research on the continent. The paper concludes in Section 6.

BOX 1 Guiding Questions

Issues of welfare in Africa are diverse and complex. Transport is a key strand in this complex mesh. The challenge begs interdisciplinary research.

Questions:

1. What drives research in Africa, and do these forces favour interdisciplinarity?
2. What framework encapsulates transport policymaking at regional and continental level in Africa, and does the process favour interdisciplinarity?

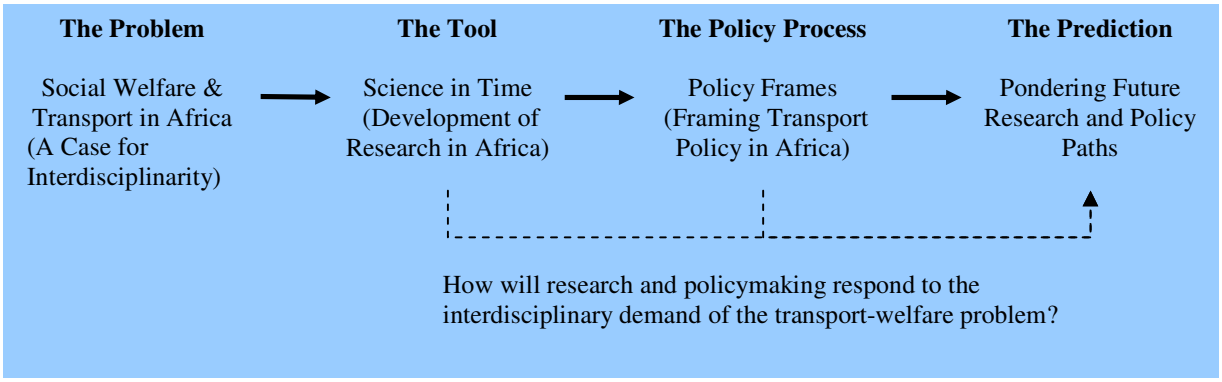

FIGURE 1 The Structure of the Paper

2 TRANSPORT AND SOCIAL WELFARE IN SUB-SAHARAN AFRICA

Transport infrastructure binds humanity. Sub-Saharan Africa is home to 800 million people, dispersed over 24, 240 square kilometres (*2*). These data are brought to perspective by TABLE 1. In respect to the productivity of road network (i.e. paved roads to GDP ratio), SSA compares well with China. However, in terms of accessibility, ["Paved Roads per 1000 Persons" is a good proxy for accessibility], SSA lags way behind the other three regions. This is a major problem in the region. Most people do not have access to reliable transport infrastructure. Not only is this an economic problem, it is a severe sociological problem. Given a high rate of urbanisation, family interaction has been severely hampered. The urbanites struggle to maintain health family relationships. This means the growth economist attending to transport policy must have a strong appreciation of sociology, and vice versa, for a truly engaged discussion to be realised.

The HIV epidemic in Africa has presented a new challenge to the transport sector. In light of the fact that transport nodes (e.g. overnight stoppages & boarder crossings) are an important platform of transmission of the virus, nearly all transport policy initiatives consider HIV (& public health issues in general). The sociologist policy actor must therefore have good grounding in public health, and so must the doctor understand basic sociology [note: In Africa medical doctors often feed transport policy forum. Fortunately, medical doctors trained in public health have a strong appreciation of sociologist, a credit to interdisciplinarity].

TABLE 1 Road Statistics for Selected Regions

	Sub-Saharan Africa	China	India	UK
Land Area (×1000 km^2)	24260	9598	3287	244
Population (million)	800	1,318	1,125	61
Population Density (persons per km^2)	33	137	342	250
Gross Domestic Product (billion US$)	847	3,206	1,177	2,772
Gross National Income Per Capita (US$)	951	2,370	950	40,660
Paved Roads (×1000 km)	225	898	1420	388
Paved Road Density (km/1000 km^2)	0.01	0.09	0.43	1.59
Paved Roads (km) per 1000 Persons	0.28	0.68	1.26	6.36
Paved Roads : GDP Ratio (km per million US$)	0.27	0.28	1.21	0.14
Aggregate Traffic (million vehicle-km)	350,000*	850,000	1,400,000	1,100,000
Per Capita Traffic (vehicle-km per person)	472	651	1279	18333
Land Area (×1000 km^2)	24260	9598	3287	244

Note:* Assumes Traffic: GDP ratio (mobility productivity) of 600 million vehicle-km per billion US dollars.
Sources: WDI *(2)* and World Road Statistics (*3*). GNI is calculated using the Atlas method.

The challenge of transport policy is not just one of growth economics, sociology and public health. Nearly all regional transport policy initiatives are driven by trade objectives. The continent does not have north-south link at either the west or the east. Neither is there a continuous east-west link (ref. Fig. 2). This poor interconnectivity is a hindrance to inland trade and competitiveness of the continent. A World Bank study (*4*) shows that investing US$1 billion on the improvement of part of the Trans-African Highways (TAH) [only the Sub-Saharan section] could expand trade by US$ 250 billion. Such potential benefits imply that the mechanics of trade and transport engross regional transport debates. The actors to the policy platform must therefore have a conceptual and linguistic appreciation of trade economics to actively participate in the debates.

A new strand is being added to this transport policy complexion. It is public-private partnerships (PPP). All the six regional transport projects studied in the lead to this paper had a strong PPP dimensions. Each of the requests for proposal (RFPs) specified a "PPP Specialist" on the team. Conspicuously, none of these RFPs did exactly specify the disciplinary background of this role. This raises a few questions: Who are these "PPP Specialists"? How and where are they trained? Unfortunately, a study of past and potential holders of this role [based on the six projects] reveals that none of them had interdisciplinary academic training. This means none of them was formally trained to frame complex problems that PPP presents. This poses a danger. It means the quality of knowledge that they brought to the policy platform was most likely very narrow. It also means that their ability to communicate their thoughts to policy actors was limited. It will be interesting to observe whether this new challenge inspires interdisciplinarity in African universities and research centres – as they aspire to influence transport policy.

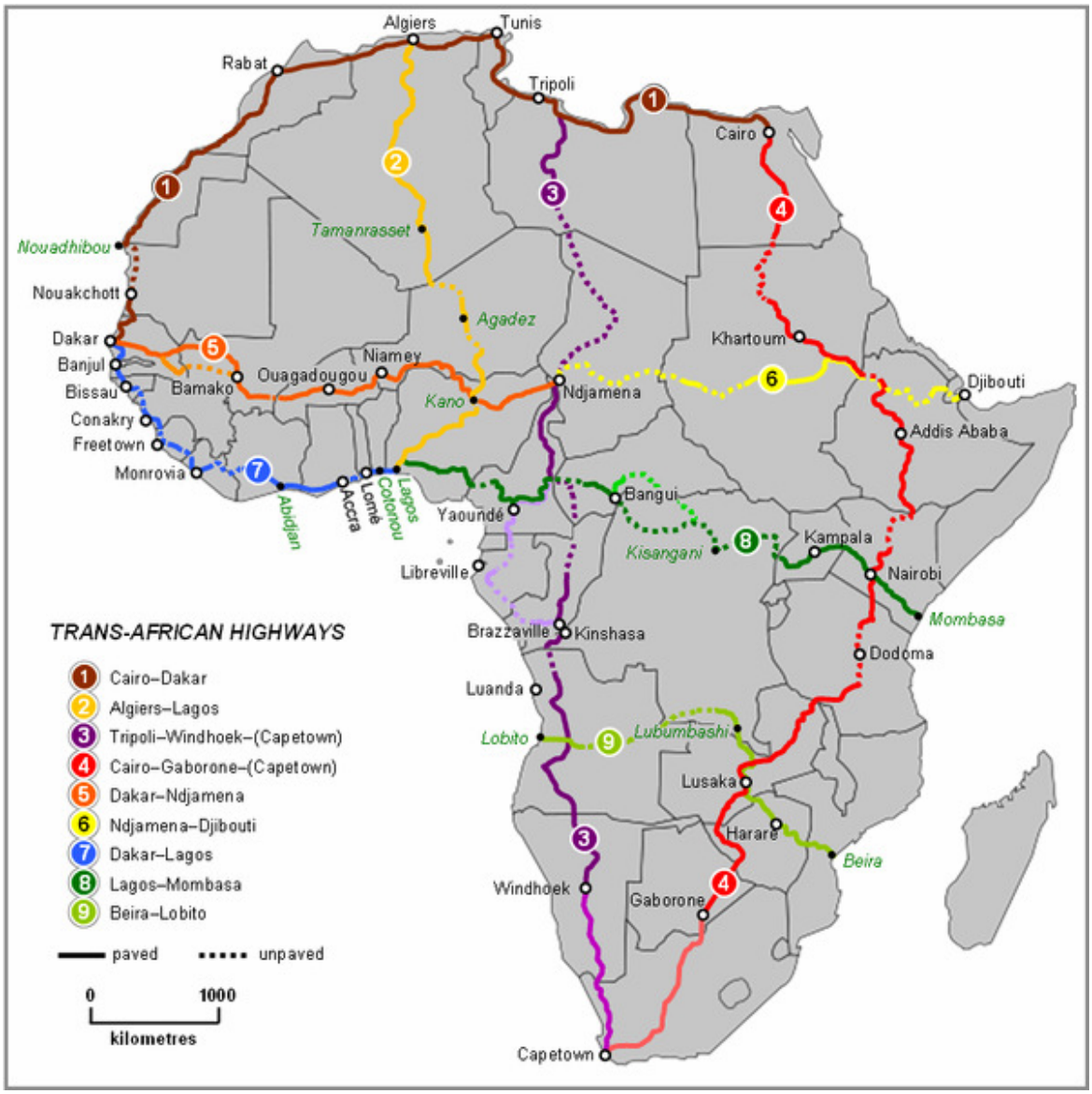

FIGURE 2 The Proposed Trans-African Highway
Source: African Development Bank (*6*)

The transport policy arena faces not just intertwining welfare issues, the regional organisations entrusted with policy formulation are numerous and complex. This partly explains why despite the indubitable high economic returns of investing in transboundary infrastructure, the TAH remains a dream after almost four decades. The remainder of this section will shed light on the structural (institutional) and agency (organisational) issues associated with transport policymaking at the regional and continental level in Africa. This will set the stage for a discussing the internalisation (or uptake) of science in policymaking in Section 4. Note that the term 'institutions' refers to humanly devised constraints that shape human interaction, which includes rules, norms and practices. Organisations, on the other hand, are structures developed to take advantage of opportunities created by institutions. These definitions are borrowed from Douglas North (*5*).

A key actor in infrastructure policymaking in Africa is the regional economic communities (RECs). These organisations aspire to be free trade areas (FTAs) and customs unions. They have infrastructure development as a key item on their policy agenda. A list of the RECs is shown in Table 2, and mapped out in Figure 3. These two abstractions show, first, that the RECs are a complex mosaic of organisations, which are prone to tension as countries fall in and out of different zones of allegiance. Efforts at integrating the RECs through development programmes such as the North-South Corridor (Figure 3: highlighted in red), lessen but do not eliminate the potential for tension.

Secondly, these countries have different colonial legacies, and hence align to different international development partners. Moreover, they have different national languages (mainly English and French), which makes consensus building particularly onerous. Note, unlike the West, bilingualism is not well developed in Africa.

TABLE 2 Regional Economic Communities

REC	Status
Arab Maghreb Union (UMA)	Free Trade Area
Common Market for Eastern and Southern Africa (COMESA)	Free Trade Area
Community of Sahel-Saharan States (CENSAD)	Free Trade Area
Economic Community of Central African States (ECCAS)	Free Trade Area
Economic Community of West African States (ECOWAS)	Free Trade Area
Inter-Governmental Authority on Development (IGAD)	Free Trade Area
Southern African Development Community (SADC)	Free Trade Area
Economic and Monetary Community of Central Africa (CEMAC)	Customs Union
East African Community (EAC)	Customs Union
Southern African Customs Union (SACU)	Customs Union
West African Economic and Monetary Union (UEMOA)	Customs Union

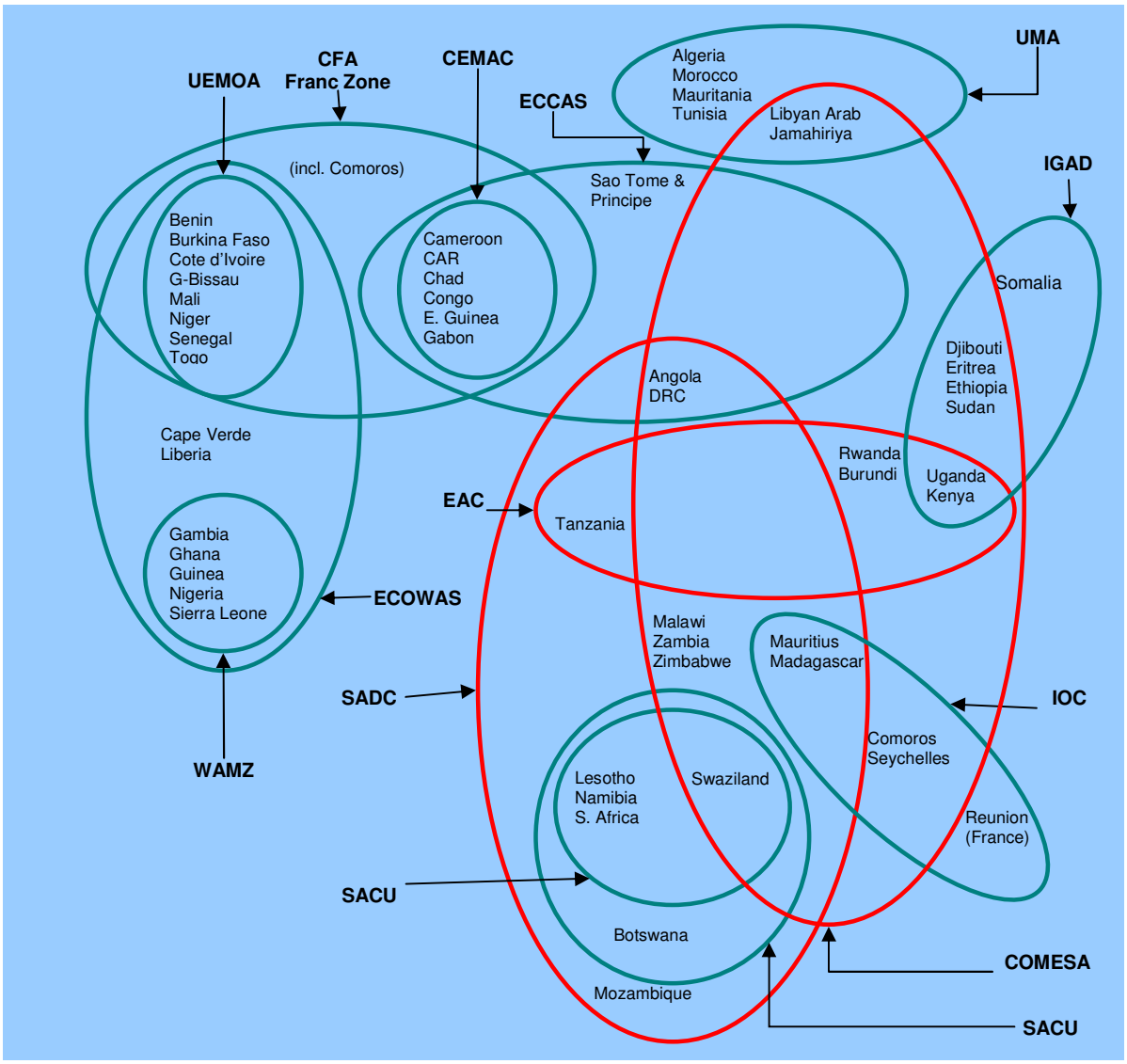

Figure 3 The Anatomy of African Regional Economic Communities
Source: Adapted from UNCTAD, 2009 (*7*)
Note: The RECs constituting the North-South Corridor are highlighted in red.

This section has shed light on the interaction of transport and social welfare in Africa. It is a complex mesh, which does not become simpler with the inclusion of environmental concerns. These non-linear complex issues cannot be solved by simple cause-effect consideration. They require interdisciplinary research. The following section attends to the development of science on the continent, and sets a platform for questioning the appropriateness of the existing paths in the development of research on the continent. This rendering is done against a background of evolutions of research in the West.

3 SCIENCE IN TIME: TRACING AND FRAMING PROGRESS OF RESEARCH IN AFRICA

The state of transport policy research in Africa can best be understood against a background of research evolutions in the West. Motivations for scientific research have changed over time. This journey is traced in FIGURE 4; for further study, Nowotny et al. (*8*) trace this path succinctly. Before the World Wars, science was considered the tool for imperialist conquests. Government research institutions sought the latest outputs of university research in a bid to lift the country's imperialist status. During the Wars [1914-1918; 1939–1945], research was an instrument of war. It allowed good roads to be built; and superior weapons to be manufactured. After the World Wars, research became mainly an instrument of competition between the Cold War camps (USA and the Soviet Union, and their respective allies).

Trends in the West influenced the growth of research in Africa. FIGURE 5 lays out results of a textual analysis of ten countries in East, Central and West Africa. Before independence, colonial powers offered scholarships to African students to study and research in Western universities. These students would return home and work as government bureaucrats. It must be stressed that this pattern was most prevalent in the run up to independence.

After independence - particularly the sixties - donor agencies spearheaded knowledge development on the continent, these donor agencies had sprung from the ashes of the Second World War. . The flow of African graduates, under donor support, to Western universities continued. These African would then be employed by the donor agencies, others would return home to work as government bureaucrats or teach at local universities [the colleges of pre-independence had graduated to universities]. Unfortunately, graduates who went to teach in local universities found no structures of research. For many of these graduates, that was the end of their intellectual journey.

A new model emerged in the nineties. This model is characterised by research partnership between African and Western universities. Secondly, research centres and institutes are slowly growing on the continent. Investigations leading to this paper show that over 85 percent of research centres and think tanks in Africa were established in the last 10 years. The research centres offer another employment avenue for African graduates of Western universities. However, an increasing number of African students are carrying out their graduate research work in African universities. Donor contribution to research is increasing. The top 50 universities in SSA [outside the Republic of South Africa (RSA)] have all had a significant increase in doctoral research projects funded by donor agencies.

However, a missing link persists in this emerging model. Hardly any SSA university, outside RSA, has long-term scientific research collaboration with the private sector. This is a troubling observation because failure to engage the private sector stifles the development of interdisciplinary research, which is a key tool to solving the complex problem of transport policy [& most public policies] on the continent. Gibbons (*9*) posits that a diffusion of doctoral researchers to private organisations underpins the growth of multidisciplinary research. Repko discusses how multidisciplinary research is mutates into interdisciplinarity.

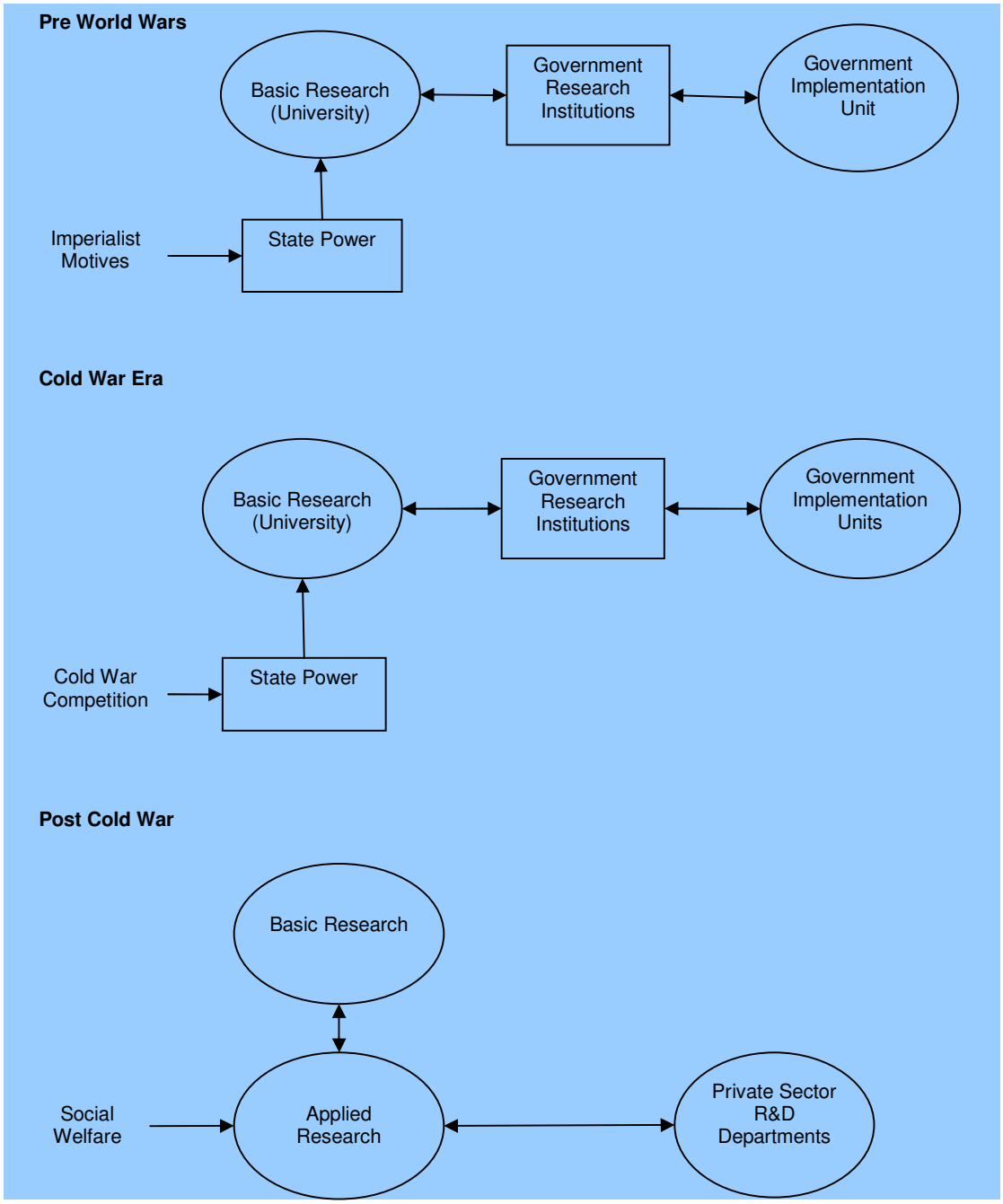

FIGURE 4 Tracing the History of Research in the West

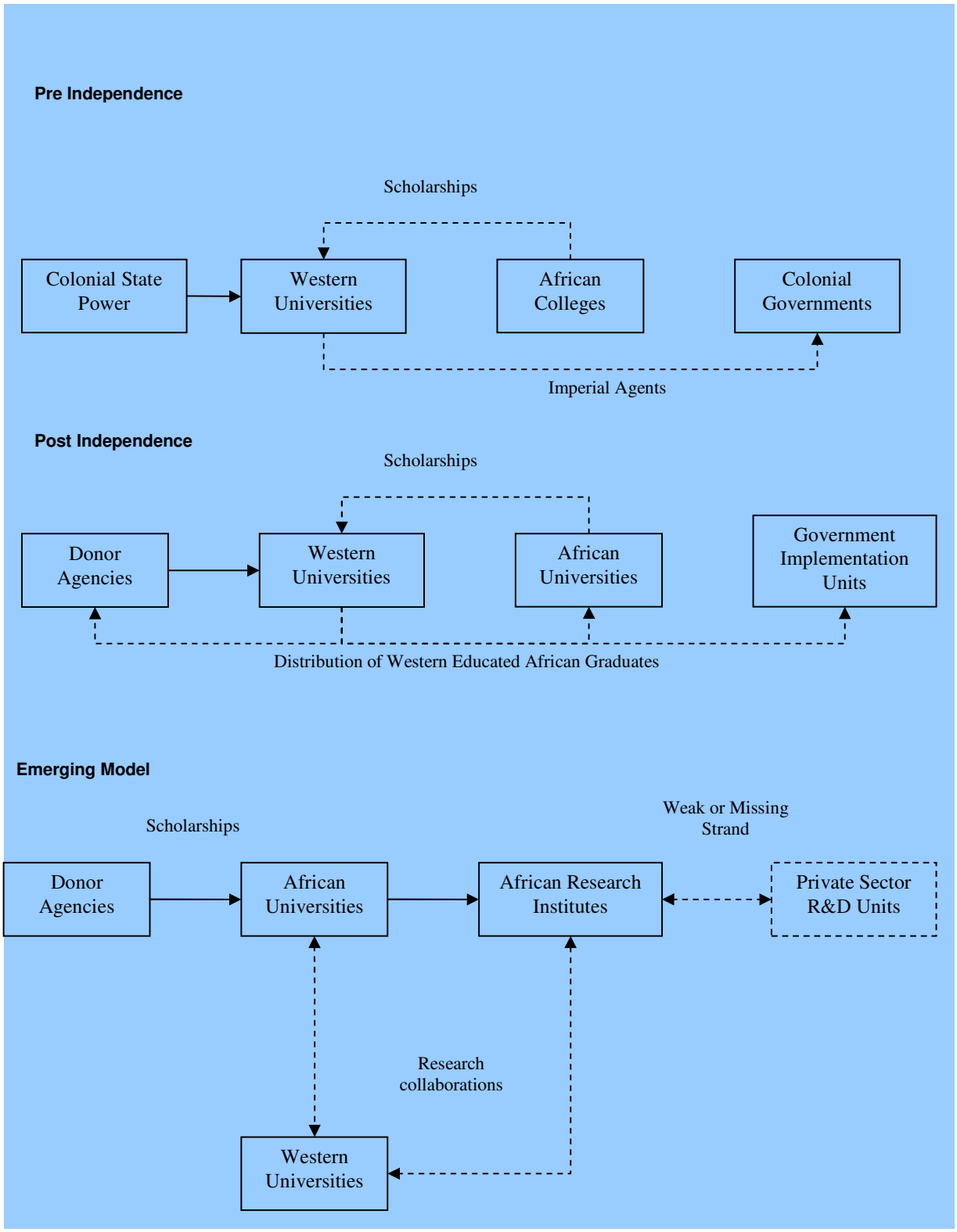

Figure 5 Mapping the Emergence of Research in Africa

4 TRANSPORT POLICYMAKING IN AFRICA

The previous section traced the path of research in Africa, and argued for interdisciplinarity as the tool for understanding the complex transport-welfare interactions. This section focuses on the making of regional and continental transport policy. The section has three objectives. First, to frame (or order) the process of regional and continental policymaking. The second objective is to assess whether the process lends itself to efficient use of science. The third is to examine how the structure of Africa-based research could change in order to have a greater influence on policy.

The paper views continental transport policy through the lens of institutional rational choice (IRC). This framework (IRC) is a collection of policy frames that provide for the influence of the institution on otherwise rational policymakers (*10*). It therefore has rational choice theory as one of its key tenets. That is, it appreciates that to an extent individuals make decisions after comparing the costs and benefits of different courses of action. Further, the IRC framework provide for bounded rationality. This concept, credited to Herbert Simon (*11*), posits that rationality of individuals is compromised by the amount and quality of information available to them; their ability to access of this information (cognitive limitations); and the limited time available to them to make decisions.

A textual analysis of six regional policy initiatives in Africa over the past decade yielded the frame shown in Figure 6. The analysis was guided by institutional analysis and development (IAD) framework (*12*) – a genre of IRC. The resulting framework in Figure 6 shows that the science feed is restricted to donor agencies. Local political actors hardly have scientific research feeding their thinking prior joining the decision arena. Entities like parliamentary research groups and local autonomous research centres are yet to make a significant contribution on local political views. Consequently, the review and revision loop bypasses local political actors.

The positioning of science agents in Figure 6 limits the influence local actors can have on the rationale of policy. If the political actors are intellectually well equipped in a particular aspect of transport (for instance, environmental issues), this aspect is likely to dominate policy. This assumes the actor has sufficient political influence to dominate the action arena. A setting where science interacts with politics before the decision arena would result in a better balance of science influences. That is, the various strands of disciplinary issues in the transport-welfare interaction would be better considered. This detachment of science from politics can be degenerative. However, as discussed in the next section, the emerging model of research presented in FIGURE 5 should eventually close this gap between science and politics.

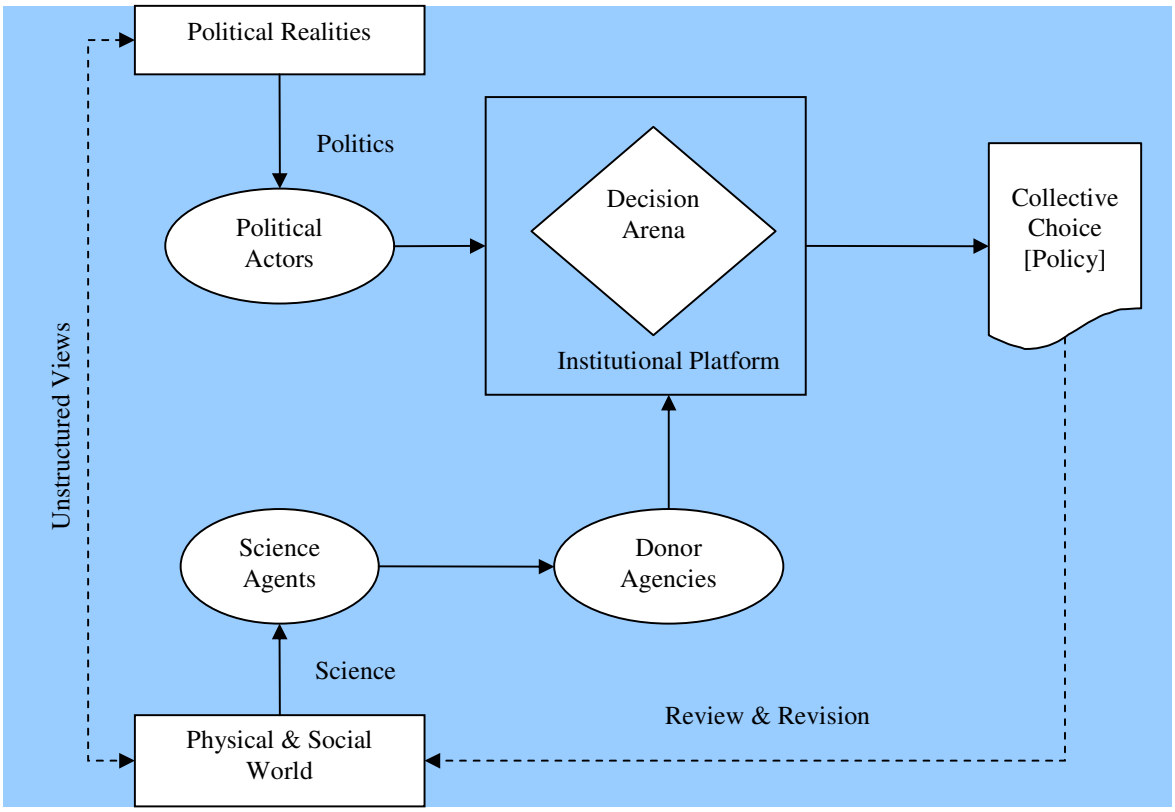

FIGURE 6 The Dominant Model Transport Policymaking in Africa

5 PONDERING FUTURE RESEARCH AND POLICY PATHS

The process of policymaking shown in Figure 6 is likely to change in response to the emerging model of research shown in Figure 5. This predicted change is captured in Figure 7. This framework places local research institutions at the centre of policy guidance. They feed both the political actors and a joint science team, which includes scientists from donor agencies.

Note that the new framework brings science close to institutional and organisational challenges of policymaking. It should allow local scientists from a variety of disciplinary backgrounds to interact in finding solutions to a mesh of welfare problems that relate to transport. These local research centres would begin as multi-disciplinary hubs, and the budding centres in the region are multi-disciplinary. Repko (*ibid*. Section 1) argues that such multi-disciplinary centres should gradually influence local universities to adopt interdisciplinary research. Interdisciplinarity in local universities should produce scientists better equipped to frame the complex challenges that transport policymaking presents.

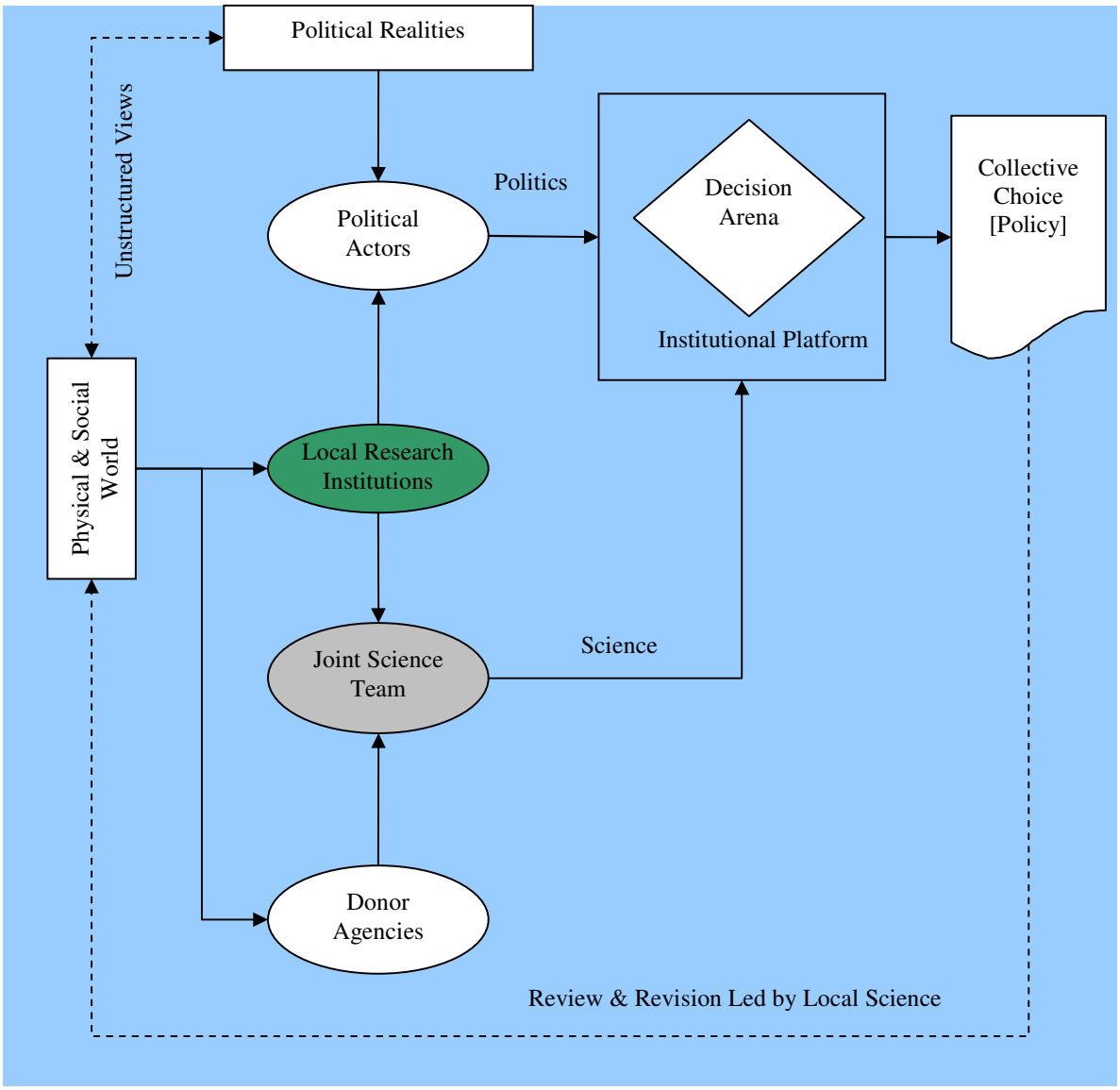

FIGURE 7 Exploring Future Transport Policy Process in Africa

6 CONCLUSIONS

This paper has exposed the challenges at the interface between transport and social welfare. These challenges transcend the traditional academic disciplines. They beg interdisciplinarity. The paper has examined the future of interdisciplinary in the transport sector using two lenses: the history of research on the continent, and the making of transport policy at regional and continental level. A poor linkage between private firms and the research community is identified as the key hindrance to interdisciplinary research. This begs the question: How can a stronger link be developed between the private firm in Africa and budding research institutions on the continent? This is a question for further research. Further, how can interdisciplinarity be promoted without compromising the rigour [depth] associated with disciplinary efforts?

7 ACKNOWLEDGEMENT

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