IMPACT OF RURAL ROAD PROVISION ON EMPLOYMENT

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ABSTRACT

This article focuses on the impact of rural road provision on the macroeconomic objective of full employment. It deals with the extent to which roads act as direct generators of jobs during their construction and service periods, and the ways in which effective roads could indirectly stimulate employment opportunities quantitatively and, from a skills perspective, qualitatively. The economic impact analysis (ECIA) of road provision indicates the typical worker–hour requirements for the approximate estimation of employment needs. These estimates can be used whenever detailed estimates are not yet available. The estimates are provided for the construction and operation of (1) basic rural road segments, (2) bridges and viaducts, and (3) intersections, roundabouts (traffic circles), and interchanges. Where road projects contain other physical components, such as tunnels and toll plazas, the former three groups of employment rates could be used in combination with worker–hour estimates for the construction and maintenance of tunnels and toll-related components.

OPSOMMING

Hierdie artikel fokus op die impak van buitestedelike padvoorsiening op die makroëkonomiese doelwit van volle indiensname. Dit handel met die mate waartoe paaie regstreeks gedurende hulle bou en dienstydperke as skeppers van werksgeleenthede dien, en die maniere waarvolgens doeltreffende paaie getalle- en gehaltegewys volgens vaardigheidsontwikkeling onregstreeks werkskepping kan aanwakker. Die ekonomiese impakontleding (EIO) van padvoorsiening toon onder meer die tipiese werkeruurberamings wat vir die skatting van indiensnamebehoeftes gebruik word. Hierdie beramings kan gebruik word wanneer ’n noukeurige bestekopname nog nie opgestel is nie. Die beramings word voorsien vir die bou en bedryf van (1) basiese buitestedelike padsegmente, (2) brûe en viadukte, en (3) kruisings, verkeersirkels en wisselaars. Waar padprojekte ander fisiese komponente bevat, soos tonnels en tolplazas, kan die eersgenoemde drie werkskeppingskoerse gekombineer word met die beramings van werkerure benodig vir die bou en instandhouding van tonnels en tolverwante komponente.

1. INTRODUCTION

Roads can help a government to pursue economic, strategic, social, and political objectives. This means that decisions about road investment could be influenced by the political sentiments of the decision-maker. However, political decisions have economic consequences. It is conceivable that uninformed road investment decision-making could have sub-optimal economic consequences. The relatively large cost of road supply as a proportion of governmental expenditure, the longevity of road infrastructure, and the indispensable economic role that road infrastructure plays make it imperative that, apart from relying on guidance for the supply of efficient roads, road-supply decisions should be informed in an objective manner of the economic impacts of prudent road investment decisions. The research results reported in this article are based on research that led to two guideline documents produced by the Committee of Transport

Officials (COTO) of the Department of Transport that were released in early 2023 to promote the objective and consistent application of social cost-benefit analysis (SCBA) to road projects [1] and to the economic impact analysis (ECIA) of road projects [2].

An ECIA of a road project focuses primarily on the expected performance of that project as an instrument of economic growth and development in a region such as a country, province, or municipal area [2]. However, to regard economic growth as a single quantum, or only in per capita terms, as a sufficient economy-wide economic growth criterion may be narrow-minded and a misleading judgement of what is needed to enhance a nation's welfare, because the growth of a community's income may be concentrated in the hands of a relatively small group of citizens. Thus any assessment of the prospects for economic growth ought also to include broad economic development [3,4].

A holistic developmental perspective on economic growth also takes distributive criteria into consideration. For example, apart from the per capita growth of a region's gross domestic product (GDP), ideally an increasing proportion of the population should become materially better off, and more essential governmental service delivery points (such as protective services, health services and clinics, and schools) should be located closer to those groups in the community who lack personal mobility. However, the pursuit of humanitarian developmental objectives should not preclude the support and enhancement of business innovation and technological improvements. For a government, on the one hand, to be materially able to assist with efforts to alleviate the fate of the indigent implies, on the other hand, that wealth-creating opportunities should be made available to those who have the ability and willingness to pursue lucrative entrepreneurial ventures, from which tax revenue may later become available for use in programmes that promote welfare.

The discussion so far implies that the concept of 'economic growth' as a criterion of economic performance needs to be broadened to include the aspect of 'economic development'. In this article economic development is regarded as a sustained increase in the economic standard of living of a country's population, achieved by (*i*) increasing the real income in per capita terms, (*ii*) increasing the proportion of the population whose income grows, (*iii*) increasing the employability and enhancing the skills of a greater proportion of the population, and (*iv*) improving the country's infrastructure and production technology. It is therefore necessary to take cognisance of secondary performance criteria in addition to the primary criterion of economic growth and development. The following objectives usually serve as criteria for judging the state of the economy [3]:

1. Economic growth (including economic development);
2. Full employment;
3. Price stability;
4. Balance of payments stability;
5. Equitable distribution of income.

This article focuses on the impact of road provision (or supply) on the second macroeconomic objective listed above, namely full employment. Road provision consists of road construction and road operation [2]. In the article, 'road construction' refers to the actions needed to supply a road facility that is complete and ready for use. This entails (*i*) direct planning, design, and project management to establish the road facility; (*ii*) preparation of the road's land reserve for development; and (*iii*) building the facility (including the installation of appurtenances, construction of access links to the road network, and landscaping). 'Road operation' involves (*i*) the supply of traffic services to use road space effectively; (*ii*) the upkeep of the road surface and other physical road and road reserve components in order to protect and preserve the riding quality of road users; and (*iii*) the staffing of toll plazas and other toll-related activities, if road use is tolled.

'Full employment' is the situation when every available worker (who is able and willing) for employment has a job. It is unlikely that this could ever be fully achieved, even when there is general excess demand in labour markets [3]. Some forms of unemployment probably cannot be reduced to zero – for example, frictional unemployment, when people leaving and/or 'losing' their jobs in declining sectors of the economy have not yet obtained (or 'won') a job in the expanding sectors. It is therefore more realistic to view the ideal of full employment as the objective of achieving maximum attainable employment or minimising unemployment [4].

The Draft White Paper on Roads Policy for South Africa lists 12 policy objectives, of which one is "increased jobs and skills development". Regarding employment creation, the draft policy states [5]:

"

- *Employment-creation efforts within the road infrastructure sector must focus on the creation of multi-faceted employment opportunities, including casual, temporary, and permanent employment, for semi- and unskilled individuals operating at the elementary skill level (NQF Level 1-3).*
- *The skills shortage within the road infrastructure sector, particularly with regards to technical expertise, must be addressed through the inclusion of at least one junior/ candidate specialist(s) (NQF Level 4-10) in the construction and maintenance of road infrastructure. This may be facilitated through an internship, learnership or apprenticeship for the duration of the activity concerned.*
- *The role of local communities in roads construction projects is supported by Road Authorities. Possible mechanisms include the use of local labour and the temporary employment by the contractor (through the provisions of the contract) of a community liaison officer.*
- *Prioritise employment creation in rural areas. Rural unemployment is especially concerning. As such, secondary and rural roads development must support efforts to provide employment opportunities to rural communities, especially in marginalised areas.*

"

This article deals with the extent to which roads act as direct generators of jobs during their construction and service periods, and the ways in which effective roads could indirectly stimulate employment opportunities quantitatively and, in respect of skills, qualitatively. Section 2 of the article deals with the direct impact of road construction on employment. The direct impact of road operation on employment is dealt with in Section 3. Section 4 is devoted to the indirect employment multiplier impacts of road provision. The conclusions drawn from the reported research are provided in Section 5.

2. DIRECT IMPACT OF ROAD CONSTRUCTION ON EMPLOYMENT

The worker hours necessary to complete a road construction project will mainly depend, among other less important factors, on the following [2]:

1. Length of the road;
2. Cross-sectional features of the road;
3. Whether the project entails new (greenfield) construction or reconstruction of a physically worn-out road;
4. Worker productivity;
5. Availability and capacity of construction equipment;
6. Topographical terrain type (ranging from flat to mountainous);
7. Geological terrain conditions (ranging from sandy and loamy soil to rock);
8. Need for intersections, roundabouts, interchanges, bridges, tunnels, and toll-related constructions;
9. Type of road surface;
10. Occurrence of construction interruptions.

Analysis of the cost estimates of proposed major rural road construction projects by the South African National Roads Agency Limited (SANRAL) between 2002 and 2014 indicates the following average relative percentages in respect of market prices (actual expenditure) exclusive of VAT and profit [6]:

Cost component	Split
Labour	21%
Plant	24%
Equipment	16%
Fuel	19%
Materials	20%

These results show that just over one fifth of rural road construction expenditure is spent on human resources (i.e., labour). This human resources payroll amount for road construction in South Africa, excluding labour-based road construction, is split approximately as follows [7]:

Labour class	Expenditure split
Unskilled labour	50%
Semi-skilled workers	20%
Skilled workers	10%
Highly skilled workers (professionals and managers)	20%

In this article, unskilled labourers are regarded as those workers for whom literacy and numeracy are not required to conduct their work; semi-skilled and skilled workers are those persons for whom tertiary education is not a requirement for their work. Professionals and managers are those employees for whom appropriate or specified tertiary education is a requirement for their work.

Analysis demonstrated that, with a gross income multiplier of 4.58, the construction of economically viable roads gives the government a 'very good' opportunity to generate income effectively [2], especially taking into account that the national economy-wide gross income multiplier in South Africa is 3.27 [8], which shows that the gross income multiplier effect of road construction is 40% higher than the economy-wide gross income multiplier. Each rand invested in the construction of an economically viable road during its construction period will increase the GDP by R4.58.

Previous research showed that (rural) road construction is a very good national and regional economic growth and development trigger [9]. Road construction expenditure injects funds into the private sector, which stimulates transactions and promotes production. This, together with the capacity to accommodate an associated increased demand for transport after completion of a major road project, may stimulate regional economies.

The reasons why the gross regional income-multiplier effect stemming from construction expenditure on rural road projects is 'very good' may be ascribed to the following four factors [9]:

1. A substantial proportion of the payroll of road construction workers is subject to zero or low personal tax rates, which means that their disposable income forms a high proportion of their gross income. The taxation leakage as a percentage of road construction expenditure in South Africa equals about 4.58%, which is low for construction expenditure in general.
2. The propensity to consume among unskilled and semi-skilled rural workers (where rural roads are constructed) is generally high, which implies a low savings leakage. The research showed that the savings leakage as a percentage of road construction equals about 4.25%.
3. Labourers needed for road construction are usually recruited in (or close to) the areas where a road will be located, which implies that there is little need to import migrant workers from further afield. Furthermore, low-income earners tend to buy and consume goods that are produced locally.
4. Generally, there is a relatively small need to import economic resources for road construction projects. Items such as timber, sand, stone, gravel, filling material, bitumen, cement, steel, and other road-building material, and a large proportion of the content of road construction

equipment, are of South African origin, which is a stimulus for local employment. Import expenditure represents about 7.36% of the total construction expenditure of rural road projects [7].

Typical worker-hour estimates are provided in Tables 1 to 3, which can be used for the approximate estimation of employment needs in the ECIA of the planned or intended construction and operation of the different components of road facilities [2, 6, 7]. These estimates can be used whenever detailed estimates are not yet available. The estimates are provided for the following road components:

1. Table 1: Basic rural road segments. These segments do not contain any bridges/viaducts, intersections, roundabouts, interchanges, tunnels, or toll-related constructions;
2. Table 2: Bridges and viaducts (excluding trestle bridges, suspension bridges, arch bridges, bowstring bridges, truss bridges, and cable-stayed bridges);
3. Table 3: Intersections, roundabouts, and interchanges.

Table 1: Approximate worker requirements for basic rural road segments

Type of basic rural road segment	Worker requirement per kilometre during entire construction period (worker years)	Average annual maintenance worker requirement during the service period (worker years per km per annum)
Two-lane single carriageway road per kilometre*[1]	30	0.20
Three-lane single carriageway road per kilometre*[1]	40	0.27
Four-lane single carriageway road per kilometre*[1]	50	0.33
Four-lane double carriageway road per kilometre*[2]	56	0.37
Six-lane double carriageway road per kilometre*[3]	76	0.50

*[1] Including construction of two paved shoulders and preparation of two verges.

*[2] Including construction of four paved shoulders, and preparation of two verges and a median.

*[3] Number of shoulders, verges, and medians remains constant as number of lanes increases above four lanes. Add 20 construction worker years and 0.13 maintenance worker years per km per pair of lanes above four-lane double carriageway.

Where projects contain other physical components such as tunnels, toll-related constructions, and/or any of the bridge types mentioned above, the three tables can be used in combination with worker-hour estimates for the construction and maintenance of tunnels, toll-related components, and/or mentioned bridges. Such estimates can be obtained from the quantity surveyor(s) of the tunnel constructor, the toll road concessionaire, and/or the bridge constructor.

To indicate how a proposed road project would support the government's policy objective of creating multi-faceted employment opportunities, the article recommends that the ECIA report on a proposed public road detail the following points about direct employment during the construction of the road.

1) The total payroll rand amount and number of direct job opportunities provided for, accompanied by a breakdown of the total payroll rand amount and the number of job opportunities in respect of unskilled, semi-skilled, skilled, and highly skilled workers, expressed as: a) total payroll rand amount and rand amount per skills category, b) number of workers, and c) number of worker hours or worker years.
2) The number of workers per skills category recruited locally (in the vicinity of the construction project).
3) The steps that will be taken to enhance the employability and the skills level of workers (a) to be permanently appointed as a road construction worker after completion of the analysed project, or to be retained as a road maintenance worker after implementation of the analysed project; (b) to be promoted to an employment position that demands higher skills levels – for example, to qualify to drive construction vehicles and/or operate construction equipment; (c) to function at a supervisory level; and (d) to be employed as a construction worker or equipment operator elsewhere (in non-road construction) after completion of the road construction project.

Table 2: Approximate worker requirements for bridges and viaducts

Type of bridge section	Worker requirement per 100-metre deck length during entire construction (worker years)	Average annual maintenance worker requirement per 100- metre deck length during the service period (worker years per annum)
Two-lane single carriageway bridge per 100-metre length*[1]	9	0.04
Three-lane single carriageway bridge per 100-metre deck length*[1]	12	0.05
Four-lane single carriageway bridge per 100-metre deck length*[1]	15	0.07
Four-lane double carriageway (twin deck) bridge per 100-metre twin deck length*[2]	18	0.08
Six-lane double carriageway (twin deck) bridge per 100-metre twin deck length*[3]	24	0.11

*[1] Including construction of two paved shoulders, two kerbs, two sidewalks, and two railings.
*[2] Including construction of four paved shoulders, two kerbs, two sidewalks, two verges, and four railings.
*[3] Number of shoulders, kerbs, sidewalks, verges, and railings remains constant as number of lanes increases above four lanes. Add six construction worker years and 0.03 maintenance worker years per 100 metres per pair of lanes above four-lane double carriageway.

To indicate how a proposed road project would support the government's policy objective of creating multi-faceted employment opportunities, the article recommends that the ECIA report on a proposed public road detail the following points about direct employment during the construction of the road.

1) The total payroll rand amount and number of direct job opportunities provided for, accompanied by a breakdown of the total payroll rand amount and the number of job opportunities in respect of unskilled, semi-skilled, skilled, and highly skilled workers, expressed as: a) total payroll rand amount and rand amount per skills category, b) number of workers, and c) number of worker hours or worker years.
2) The number of workers per skills category recruited locally (in the vicinity of the construction project).
3) The steps that will be taken to enhance the employability and the skills level of workers (a) to be permanently appointed as a road construction worker after completion of the analysed project, or to be retained as a road maintenance worker after implementation of the analysed project; (b) to be promoted to an employment position that demands higher skills levels – for example, to qualify to drive construction vehicles and/or operate construction equipment; (c) to function at a supervisory level; and (d) to be employed as a construction worker or equipment operator elsewhere (in non-road construction) after completion of the road construction project.

Whenever a strategy of labour-based road construction is considered – for example, to affect positively a fair distribution of income in the service area of the road – care should be exercised that the labour-based strategy being considered will not compromise the quality of road construction, and that, in relation to time, is not pursued at the cost of more valuable economic goals, such as the acceleration of economic growth through increasing the pace at which transactions take place. The employment of a labour-based construction programme might prolong the construction period of the road at the expense of more laudable economic objectives; the actual need might be to expedite the implementation of the road to eliminate the transportation problem as soon as possible and so gain the fruits of the availability of the new road, from which job creation (both quantitatively and qualitatively in the sense of skills-demanding employment opportunity creation) and equitable income distribution may be supported.

Table 3: Approximate worker requirements for intersections, roundabouts, and interchanges

Type of road component	Worker requirement per 100-metre carriageway length during entire construction period (worker years)	Average annual maintenance worker requirement per 100-metre carriageway length during service period (worker years per annum)
Two-lane single carriageway overpass (flyover) per 100-metre elevated length*	9	0.04
Three-lane single carriageway overpass per 100-metre elevated length*	12	0.05
Four-lane single carriageway overpass per 100-metre elevated length*[1]	15	0.07
Four-lane double carriageway (twin deck) overpass per 100-metre elevated length*[2]	18	0.08
Six-lane double carriageway (twin deck) overpass per 100-metre elevated length*[2]	24	0.10
Single-lane ramps, loops and auxiliary lanes per 100-metre elevated length*[3]	6	0.027
Single-lane at-grade and/or embanked ramps, loops, and auxiliary lanes per 100-metre length*[3]	4	0.018
Single-lane roundabout with outside shoulder and kerb face, and inside mountable kerb with negotiable verge per-100 metre length	2	0.009
Single-lane roundabout without shoulders, kerbs, and verges per 100-metre length	1	0.004

*[1] Including two paved shoulders, two sidewalks, and two railings.

*[2] Including four paved shoulders and four side walls when elevated and four barriers when embanked.

*[3] Including two paved shoulders and two barriers.

To indicate how a proposed road project would support the government's policy objective "to provide employment opportunities to rural communities, especially in marginalised areas", the article recommends that, when a labour-based strategy is contemplated in a road construction project, the ECIA report should state whether the deemed benefits of the strategy have been weighed up against the possible negative effects it might have on road construction quality, the construction period, and the project cost.

3. IMPACT OF ROAD OPERATION ON EMPLOYMENT

The employment of human resources in the operation of a road entails actions involving the following [2]: (a) The supply of traffic services to enhance lawful, effective, and safe usage of the road. The services needed include those required to exercise traffic control and law enforcement, and the supply of information, rescue, emergency, and security services to road users; (b) the upkeep of the road surface and other physical road and road reserve components in order to protect and preserve the usefulness and technical integrity of the road facility; and (c) the staffing of toll plazas and toll-related activities if road use is tolled.

The upkeep of physical road components requires staff for the following purposes [2]:

1) Road surface and roadside inspection;
2) Operating traffic control devices such as traffic signals, traffic signs, surveillance and monitoring devices and equipment, such as weighbridges and traffic counting equipment;
3) The management of long tunnels. (A tunnel is regarded as 'long' whenever it needs continuous lighting and ventilation.)

A road requires ongoing routine maintenance during its service period to keep it in a sound, passable, and well-preserved operational condition. Routine maintenance includes mainly the following ten activities [2]:

1) Road pavement maintenance (including the pavement of bridges and tunnels).
2) Grading and gravel replacement on gravel roads.
3) Road markings, traffic signs, and guardrails: Renewal, reparation and replacement (renewal because of wear and tear, reparation of damage caused by accidents and vandalism, and replacement because of destruction and theft).
4) Road verge and median maintenance: Mainly edge filling, mowing, pruning of shrubs and trees, weeding, cleaning, and garbage removal.
5) Clearing of side drains (clogged by debris, mud, and silt).
6) Fence repairs and replacement.
7) Reparation and replacement of road appurtenances and furniture (because of traffic accidents, vandalism, and theft).
8) Flood repairs and removal of loose and fallen rocks in cuttings, and inspection of the stability of the edges of cuttings.
9) Bridge and culvert care: Inspection and maintenance of the pavement, deck, and other concrete and steel components for possible crack formation and corrosion, and clearing after flooding.
10) Tunnels: Inspection and maintenance of the pavement and upkeep of wall visibility. In the case of long tunnels, also maintenance of lighting and ventilation equipment.

If detailed worker-hour estimates for the supply of traffic services and the upkeep of road components are not available, the default labour rates supplied in Tables 1, 2 and 3 could be used to determine estimates for (1) basic rural road segments, (2) bridges and viaducts, and (3) intersections, roundabouts, and interchanges.

The opportunity costs of defaulting on maintaining existing roads are punishingly high. Neglecting to maintain roads according to laid-down schedules increases the expense of rectifying the maintenance backlog at an exponential rate [11]. Not only do road repair costs rise geometrically after periods of neglect of road maintenance, but premature road deterioration also retards the ability of a road to fulfil its economic and other functions effectively.

To indicate how, through dedicated maintenance programming during its service life, a proposed road project would support the government's policy objective of creating multi-faceted employment opportunities, the article recommends that the ECIA report detail the following points:

1) The total number of direct job opportunities provided for, accompanied by a breakdown of the number of job opportunities in respect of unskilled, semi-skilled, skilled, and highly skilled workers, expressed as (a) total payroll rand amount and rand amount per skills category, (b) number of workers per skills category, and (c) number of worker hours or worker years per annum.
2) The number of workers per skills category recruited in the vicinity of the road.

Staffing of toll plazas and toll-related activities of toll roads

The operation of tolling functions necessitates (i) the staffing of on-site supervisory, maintenance, and administrative functions; (ii) the control of toll booths and monitoring of equipment; (iii) the operation of the toll plaza area outside the toll booths; (*iv*) the execution of vehicle and load inspection to establish the fitness of vehicles and their loads to pass through the toll facility; and (*v*) the supply of support services to escort risky vehicles through the toll facility and to aid troubled vehicles and their occupants.

When a new or improved road will be a toll facility, the ECIA report should provide an estimate of the number of workers per skills category that will be needed to operate the entire tolling function of the road. This number must be obtained from the road authority, or from the toll operator if it is not the road authority.

The employment impacts (or multipliers) provided in Table 4 also apply to road operation [8]. The same procedure followed to estimate the employment impact of road construction is applied to estimate the employment impact of road operation.

This article recommends that, whenever a road is constructed as a toll road, the ECIA report furnish the separate and combined details as is prescribed above with respect to employment during the service period of a non-tolled road and the staffing of toll plazas and the toll-related activities of toll roads.

4. UPSTREAM EMPLOYMENT MULTIPLIER IMPACTS OF ROAD PROVISION

In addition to the direct employment impact of providing a road facility (including both road construction and road operation), road provision gives rise to various upstream (i.e., input-related) employment multiplier impacts. These are the following:

1) Supplier impact involving direct supply to the road provision industry;
2) Indirect supplier impact involving direct suppliers to direct suppliers in 1);
3) Induced employment impact involving jobs generated to supply the household demands of all road-provision workers, including direct and indirect suppliers.

The sum of the above employment impacts constitutes the economy-wide road supply employment impact upstream of the provision industry. Computation of the direct supplier, as well as the indirect and induced employment impacts of road provision, requires multi-sectoral economy-wide input-output analysis. Macroeconomic data are available on multi-sectoral multipliers for the different provinces in the country [8, 10], and it is recommended that these data be used to estimate the employment impacts of roads. The data for 2021 are provided in Table 4.

Table 4 provides three multipliers that can be multiplied by the number of road construction and operation workers to estimate the number of workers employed by direct suppliers and indirect suppliers, as well as induced employment. A fourth multiplier is also provided, which is the sum of the above three multipliers, and which can be used to estimate the economy-wide supply employment impact.

Table 4: Construction employment multipliers of each province and of South Africa for 2021 [8, 10]

Geographic area in which road project takes place	Direct supplier multipliers	Indirect supplier multipliers	Induced employment multipliers	Industry wide multipliers
Western Cape Province	0.76	0.34	1.20	2.30
Eastern Cape Province	0.45	0.22	0.62	1.29
Northern Cape Province	0.78	0.16	0.12	1.06
Free State Province	0.58	0.21	0.36	1.15
KwaZulu-Natal Province	0.54	0.30	1.16	2.00
North-West Province	0.81	0.28	0.32	1.41
Gauteng Province	0.43	0.35	2.70	3.48
Mpumalanga Province	0.57	0.24	0.45	1.26
Limpopo Province	0.69	0.20	0.43	1.32
South Africa (country-wide)	0.56	0.30	1.43	2.29

The article recommends that, in addition to indicating direct road job creation through road project provision, the ECIA report detail the number of job opportunities created because of the multiplier effect of direct suppliers, indirect suppliers, and induced household demand stemming from road provision.

5. CONCLUSIONS

About one fifth of rural road construction expenditure is spent on human resources (i.e., labour). Of this one-fifth road construction expenditure, about one half is spent on unskilled labour, and one half is spent on semi-skilled (20%), skilled (10%), and highly skilled workers (20%).

When a labour-based strategy is contemplated for a road construction project, the economic impact analysis (ECIA) report should state whether the deemed benefits of the strategy have been weighed up against the possible negative effects it might have on road construction quality, the construction period, and the project cost.

The worker requirements given in the text that are recommended for use in the ECIA of road construction projects are based on the actual cost estimates of major SANRAL rural road construction projects between 2002 and 2014. However, the worker requirements for road maintenance quoted in the article are based on road engineering norms that ought to be followed in road maintenance schedules. The latter maintenance requirements may be regarded as prudent labour rates.

In addition to the direct employment impact of providing a road facility (including both road construction and road operation), road provision gives rise to various upstream employment multiplier impacts. These are the following:

1) Supplier impact involving direct supply to the road construction and maintenance industry;
2) Indirect supplier impact involving direct suppliers to direct suppliers in 1);
3) Induced employment impact involving jobs generated to supply the household demands of all workers in the construction industry, including direct and indirect suppliers.

For South Africa as a whole, for every employment opportunity that is directly created in providing (i.e., constructing and operating) public roads, 2.3 upstream employment opportunities are generated.

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