



# Operations research and development

PduT Fourie\*

*Received: 11 December 2006; Revised: 7 March 2007; Accepted: 29 March 2007*

## Dedication to Emeritus Professor Gerhard Geldenhuys

*Hierdie artikel, waarin die verband tussen ON en ontwikkeling bespreek word, word opgedra aan Gerhard Geldenhuys by geleentheid van sy 70<sup>ste</sup> verjaardag. Sy werk was nog altyd in gelyke maat gekenmerk en gemotiveer deur sy belangstelling in wiskunde en die toepassings daarvan, en sy betrokkenheid by maatskaplike kwessies in Suid-Afrika, wat insluit sy belangstelling in die HOP (Heropbou- en Ontwikkelingsprogram) gedurende die 1990s.*

*This paper, in which the relationship between OR and development is discussed, is dedicated to Gerhard Geldenhuys on the occasion of his 70<sup>th</sup> birthday. His work has always been characterized and motivated equally by his interest in mathematics and its applications, and his involvement with social issues in South Africa, including his interest in the RDP (Reconstruction and Development Programme) in the 1990s.*

## Abstract

The paper begins with a discussion of the concepts “operations research” and “development.” An overview is next given of the RDP (Reconstruction and Development Programme), which still embodies the vision of development in South Africa associated with the political transition in 1994. The efforts of ORSSA (the Operations Research Society of South Africa) to help with the implementation of the RDP are described. The international OR (Operations Research) community has been involved in various ways with the promotion of development, especially through IFORS (the International Federation of Operational Research Societies), and these are reviewed. Sustainable development, which deals specifically with a long-term view of development, is mentioned briefly. Lastly some suggestions are made as to how ORSSA and its members could help to promote development in South Africa. In the Appendix a summary is given of a paper by Gerhard Geldenhuys in which he analyzes the needs identified by the RDP as well as relevant OR methods.

**Key words:** Development, RDP, ORSSA, IFORS.

---

\*Division of Applied Mathematics, Department of Mathematical Sciences, University of Stellenbosch, Private Bag X1, Matieland, 7602, South Africa, email: [pdfourie@sun.ac.za](mailto:pdfourie@sun.ac.za)

## 1 Introduction

The two main themes of this paper, OR and development, have this in common that their practitioners have spent much time debating the nature of their disciplines. OR practitioners, to whom this paper is primarily addressed, are familiar with the recurring debates about the name(s) of the discipline as well as that of the professional societies to which they belong. Also there have been many attempts to define what OR is, is not or should be. Russell Ackoff [1], for instance, had this to say, which is especially relevant to attempts to apply OR to development: “Little of what we have done is OR, or even research in the conventional sense of the word. But we have never rejected a request for aid because it did not involve research or because it required action that was beneath our dignity (p.768) . . . OR’s objective should be the dissolution of OR as an autonomous and segregated activity by having it absorbed into every aspect of the organizational life of which it is a part” (p. 771).

“Development” (often preceded by “sustainable”) must surely be one of the most frequently used terms in public discourse. There is no doubt that it is considered to be desirable, but not all users of the term use it in the same way. Consider an example from a recent newspaper report, the headline of which reads “Development trust for Macassar” [6]. (Macassar is a township in the Helderberg area of the City of Cape Town.) It is stated that “the project was initiated . . . to create a viable, happy and caring community in Macassar . . . Aspects to which the trust hopes to give attention are: councillor-assistance, religion, welfare, public works, housing, security and policing” (ten other aspects are also mentioned). Development is thus used to refer to the improvement of all aspects of the life of a community. On the national and international level, development is used to refer to economic growth, construction of infrastructure such as roads and dams, provision of housing and improvement of the educational and health systems of a country.

However, if a property developer puts up a shopping centre or a housing estate, that is also referred to as development, even though its primary purpose is the enrichment of the developer and its benefits to the community often doubtful. In fact, from the point of view of nature and biodiversity conservation, development usually equates to destruction.

Summarizing, most people would probably agree that “community development”, referring to improvements in the physical, economic and social conditions of a community, should be the ultimate aim of any civilized community. Implicit in this is already one answer to the question “Why try to promote development?”, namely that it is a moral imperative. A more pragmatic answer might be that a community in which development is very uneven — in which, for instance, material welfare is very unevenly divided — is likely to be unstable and plagued by crime, poverty and unemployment; it is therefore to every citizen’s advantage for development to take place.

The remainder of this paper is organized as follows. In Section 2 a brief history is given of the RDP (**R**econstruction and **D**evelopment **P**rogramme). Section 3 deals with the involvement of ORSSA (the **O**perations **R**esearch **S**ociety of **S**outh **A**frica) with the implementation of the RDP. In Section 4 an overview is given of possible uses of OR to promote development, including initiatives by IFORS (the **I**nternational **F**ederation of **O**perations **R**esearch **S**ocieties). Sustainability as an aspect of development is briefly con-

sidered in Section 5. Section 6 contains some suggestions as to how ORSSA and/or its members might help to promote development in South Africa.

## 2 The RDP

The RDP was at the time of the political transition in 1994 the main framework for development in South Africa. Since then first GEAR (**G**rowth, **E**mployment **A**nd **R**e-distribution) and then ASGISA (**A**ccelerated and **S**hared **G**rowth **I**nitiative for **S**outh **A**frica) have been introduced (note the emphasis on “Growth” rather than “Development”). Although the RDP does not occupy centre stage any longer, it still embodies a vision of development in South Africa which has not been superseded, and it is useful for the sake of historical perspective to describe it briefly.

### 2.1 The RDP as vision

The RDP had its origin in the Freedom Charter, which was formulated at the Congress of the People in June 1955 [30]. The Charter was an integral part of the political struggles of the succeeding four decades. After the unbanning of the ANC (**A**frikan **N**ational **C**ongress), the Charter served as the basis for the formulation of a party-political document of the ANC prior to the 1994 elections (sometimes referred to as the Base Document) [3]. After the formation of the GNU (**G**overnment of **N**ational **U**nity), a White Paper (government policy document) [32] was published in November 1994.

The vision on which the RDP is based was enunciated as follows by President Mandela in his inaugural address to Parliament on 24 May 1994: “My Government’s commitment to create a people-centred society of liberty binds us to the pursuit of the goals of freedom from want, freedom from hunger, freedom from deprivation, freedom from ignorance, freedom from suppression and freedom from fear. These freedoms are fundamental to the guarantee of human dignity. They will therefore constitute part of the centrepiece of what this Government will seek to achieve, the focal point on which our attention will be continuously focused. The things we have said constitute the true meaning, the justification and the purpose of the Reconstruction and Development Programme, without which it would lose all legitimacy” [21].

An illustration of the hopes raised by the RDP is given by the following quotation: “We had the beginnings of such a ‘hope’ conversation in 1995; it was called the RDP, and many RDP forums were established to create shared meaning and to develop shared responses. Unfortunately and perhaps understandably the agenda shifted rapidly to that of demanding that the state respond urgently to the immediate needs of the newly enfranchised, and the RDP became associated with a programme of delivery by the state rather than as a framework for a community conversation and community action” [22].

### 2.2 The RDP as macro-economic framework

Chapter Three of the White Paper [32] is devoted to the economic policy framework of the RDP. It is difficult to do justice to this in a few paragraphs, but speaking broadly the

following main threads may be identified:

- meeting the social and economic needs of the people,
- achieving sustainable improvements through economic growth,
- substantial public investment in infrastructure, and
- development of human resources and the labour market.

In short, a substantial involvement by government in the economy, primarily aimed at social and economic upliftment, but also including human development. (This does not necessarily mean social planning in the classical socialist or communist sense, but rather creating an “enabling environment” appropriate to a developing country).

Since 1996 the RDP has been supplemented (some would say supplanted) by GEAR and then ASGISA as the government’s macro-economic strategy. Government spokespersons say that the goals of development are still the same, but that there has been some changes in the methods used to attain these goals. COSATU (Congress Of South African Trade Unions), for one, is not impressed by this argument, and interprets the change as an abandonment of the RDP and a surrender to supporters of the free market. Amongst the claims and counter-claims it does seem that there is now less emphasis on the government’s role and on social spending and more on the encouragement of economic growth leading to development (the “trickle-down” theory of development).

### **2.3 The RDP as organization**

In May 1994, the first ANC government created many structures for the implementation of the RDP (see [12] for details). In 1996 the entire programme was reorganized, and the programme was placed under then Deputy President Mbeki. The officials in the RDP office were dispersed to various line departments; the various programmes concerned with water, housing and health were again made the responsibility of the line departments. Since then the various RDP structures have gradually faded away.

### **2.4 Local RDP fora**

Apart from RDP structures at national and provincial level, the White Paper also envisaged RDP fora at local level, charged with implementing the RDP in their own areas. These took various forms determined by circumstances in various areas; specifically the form often depended upon the way in which local communities handled the transition period prior to the elections of May 1994. In many communities there were discussion groups or fora, often crystallizing around a single person, a small group or pre-existing organization such as a peace committee. After the elections efforts were made to turn these more or less informal groupings into formal structures designed to help identify, formulate and carry out RDP projects. In fact, it was stated from the beginning that these fora would be the most important mechanism to implement the RDP, mainly by influencing local authorities to reshape their budgets in line with RDP priorities. (It should be noted that

in some areas the name “RDP Forum” was replaced by “Local Development Forum”). In most of the country these fora did not live up to expectations (see the quotation from [22] in Section 2.1 above).

### 3 The involvement of ORSSA with the RDP

In 1995 ORSSA decided to become actively involved in the implementation of the RDP. In October 1995 a seminar titled “The RDP — A Challenge and Opportunity” was organized jointly by ORSSA and the Statistical Association of South Africa, as part of the annual conference of ORSSA. The papers delivered on that occasion were collected in a special issue of *ORiON* (Volume 12 of 1996), edited by Dave Evans. Here are the titles:

- “The RDP — A Challenge and Opportunity” by Paul Fatti [7],
- “The RDP — A Challenge and Opportunity” by Erica Ferreira [8],
- “The RDP — A Challenge and Opportunity” by Willie Conradie [5],
- “Numbers for the RDP — the role of the CSS” by JP Lynch (the name Central Statistical Services (CSS) has now been changed to StatsSA) [20],
- “The RDP — what can OR offer?” by Hans Ittmann [16],
- “Implementing an integrated information system to support development planning” by MF Bhyat [4],
- “An analysis of key RDP issues and proposed support by the statistical profession” by CF Smit [28],
- “Spatial foundations for addressing the statistical needs of the RDP” by JA Kahimbaara [18], and
- “Enabling Analysis: Across the development divide” by Jonathan Rosenhead [24].

These papers have in common an emphasis on the “scientific” and quantitative aspects of OR and the importance of economic growth. A few quotations will illustrate this:

“Statistics, as the scientific field of study concerned with the collection of data and the process of extracting information from it . . . and Operations Research, as the scientific approach to solving decision problems . . . are clearly both of central importance in the planning, execution and monitoring of RDP programmes” [7, p. 1],

“... the tremendous need for quantitative skills in all aspects of the RDP...” [7, p. 2],

“... the demand for statistics . . . is virtually unlimited . . .” [20, p. 19],

“We do not just need growth but rapid and sustained growth” [16, p. 26], and

“... the biggest impact that OR can make and the greatest contribution toward the RDP, is contributing towards economic growth” [16, p. 33].

A different note is sounded in the paper by Jonathan Rosenhead [24]. (This is a reprint of the original, for which the reference is also given). He remarks, for instance, “For our purposes, then, development can most securely be identified with community development, not economic development”. He hopes that “. . . community OR . . . might learn from OR aimed at promoting the self-reliance of communities in developing countries”.

Gerhard Geldenhuys supported the ORSSA initiative wholeheartedly, and as he did at the CSIR in 1963, wrote a survey article together with the present author which described some areas where the principles of the RDP might be relevant, as well as the corresponding OR techniques which might be applied. The paper was delivered at the conference and later published [14]. It is also summarized in the Appendix. (The paper by Hans Ittmann mentioned above covers similar ground.) Following from this analysis, some work was done at the University of Stellenbosch on the application of “weighting and rating” to the evaluation of projects in the Helderberg municipality [13].

The main thrust of the ORSSA initiative mentioned at the beginning of this section was directed towards central government, with the emphasis being on organizing a workshop to introduce government officials to the methods of OR and statistics, and present success stories about applications of OR, especially in the public sector. (The connection with development was at best indirect, in the sense that if government decision-making could be improved by the introduction of OR, then development projects would be carried out more successfully.) At the time there were several attempts to organize such a workshop, but without success. The current president of ORSSA, Marthi Harmse, stated in her report delivered at the AGM in September 2006 that a new working group for OR for development had been formed by EURO, and that she was a member [15]. Could this be the beginning of a new initiative by ORSSA?

## 4 OR and development

(This section is based on [12], which contains further details and references). Since World War II the concepts of *development*, *underdevelopment*, *development aid* and related terms have become common currency, especially in economics and international relations. Initially development was equated to an increase in the economic growth rate of a country, or increases in social indicators such as post-natal survival rates, literacy or housing stock. However, a more nuanced view of development has gradually emerged where more emphasis is placed on an increase in the “quality of life”, a point of view stressed by, among others, Russell Ackoff — see for instance [2]. To put it another way, there can be development without growth, and also growth without development. As Ackoff puts it in his provocative way, “A poet can develop without growing; a rubbish heap can grow without developing.”

Nowadays, it is generally accepted that *development* should include dimensions of poverty reduction, community empowerment, and sustainability. As the United Nations puts it, a new paradigm of development is called for, one which “puts people at the centre of development, regards economic growth as a means and not an end, protects the life opportunities of future generations, as well as the present generation, and respects the natural systems on which all life depends”. Accordingly, development indicators also need to go beyond

GDP (**G**ross **D**omestic **P**roduct) and per capita income. The HDI (**H**uman **D**evelopment **I**ndex) which is increasingly being used by international development agencies, represents a measurable criterion to compare levels of development across regions or countries. The HDI is a composite of three basic indicators of the state of human development: longevity, knowledge and standard of living. In short, the process of development may be understood to refer to the improvement of the life-chances and living conditions of people living in a region, with particular reference to the poorer groupings of that population. The HDI may be considered an indicator of development understood in this sense.

There is an extensive literature on OR for development; see [12] for details. Interesting examples of the application of OR to problems in development are given in a 1996 publication, *Operational Research for Development* [25]. (A review has appeared in the *Newsletter for Operational Research for Developing Countries* [9].) One of the noteworthy contributions is that of Tripathy, “Approaches for Successful OR/MS Application in Developing Countries” [25, p.348]. Two quotations give the flavour:

“The OR/MS scientist must undertake the study with a missionary dedication rather than playing the role of an external consultant.”

“The OR study is in a sense a change process; . . . the OR team should be prepared to be involved in an educating process of all the people involved in the study.”

This may be easier said than done: old habits die hard! To take the case studies in [25] as an example, the majority are solely or mainly concerned with a technical problem and its solution, for instance a mixed-integer program for the long run supply of petroleum products in India. One does find a minority of cases which explicitly take into account the people involved, for instance “Assessing the Human Impact of Canal Building in the Sardar Sarovar Project”, by Appa and Sridharan. What this collection of cases illustrates clearly is that there is as yet in the OR community no consensus as to the meaning of “OR and Development” — whether this simply means “OR practiced in developing countries” or “OR applied in situations where human development is important”.

Similar issues are discussed by Stewart [29]. He asks: “Why do we need to distinguish between OR for development and OR in a developed context? Does not OR/MS involve a universal set of principles and approaches that are applicable in all contexts?” He answers as follows: “In the developed world, most traditional applications of OR emphasize the improving of *efficiency*. . . In the developing world, on the other hand, critical problems relate to *effectiveness* and *delivery*”. (Note again that “OR for development” and “OR in the developing world” are used interchangeably.) He then discusses examples of OR applications in water resources management, awarding of permits for the establishment of plantations, and allocation of fisheries rights. In all cases, workshops were held with stakeholders, including community groups. Regarding the workshops he concludes:

- Communities and their representatives, even with little formal education, are quite adept at identifying different goals and at expressing understanding of the impacts of policy alternatives on these goals.
- It is important to ensure that the MCDA methodologies are sufficiently simple and transparent, to be accessible and understandable to all stakeholders.

Although the author does not state this explicitly, it may be assumed that these workshops had an important human development function as well, in the sense that community representatives gained self-respect through being involved in decisions of vital importance to them, as well as learning about computer technology, meeting procedures and other skills.

IFORS has played an important role in fostering the use of OR in developing countries through its Developing Countries Programme. Five international conferences on OR in development (ICORD) have been held, in India, Brazil, the Philippines, South Africa and India again. The next one will be held in Brazil in 2007. ICORD 4 was held in South Africa in April 2001, with the theme “Fostering the use of Operations Research in Development”. (In retrospect, the word “Development” could well have been replaced by “Developing Countries”. Out of the 57 papers delivered, only 8 dealt with development issues — although this judgment is perhaps subjective).

IFORS awards an OR in Development Prize for the best paper on an OR application in a developing country, to coincide with the triennial IFORS conferences. IFORS also publishes a newsletter, “Direct Connection to Developing Countries”, which Hans Ittmann has edited since 2003. The newsletter has contained summaries of the prize-winning papers from the 2002 and 2005 competitions, as well as other similar papers and news reports.

To conclude this section it may be useful to consider a theoretical framework for the possible use of OR/MS in the planning and management of development described by Sagasti [26]. After pointing out some of the pitfalls (*e.g.* “Clouding the issues to make them unintelligible”, “Model fetishism” and “Satisfying ego trips of foreign researchers”) he states that decisions with regard to the planning and management of development may be grouped into five categories.

“These five anticipatory decision categories are the domain of stylistic, contextual, institutional, activity and resource planning. The interactions among these categories of decisions can be summarized by saying that *resources* are allocated to *activities* through *institutions*, taking into account the *context* in order to approach the *desired future*.” (p. 943). As “traditional” OR is mainly concerned with the first two categories, namely the allocation of resources to activities, this would indicate, as Sagasti suggests, that OR practitioners concerned with development should be prepared to devote more attention to other aspects such as its vision, its context and its implementation.

## 5 Sustainable development

Another aspect of development which should be mentioned briefly is *sustainable development*: see [10], [11] and references given therein for more details. This focuses especially on the long-term effects of human activity on the natural, social and economic environment. The area in which this concept originated is natural resource management, where it soon became clear that resources — both renewable and non-renewable — may be depleted in a finite time. Most fish stocks, for example, are at present being depleted at a rate far beyond that at which the natural population increase is able to replace the fraction of the population being caught. The arguments around world oil reserves and energy supplies



generally also illustrate an increasing awareness of the necessity for longer-term thinking and planning.

One popular formulation of sustainable development is that given in the Brundtland Report [31]: “Sustainable development is development which satisfies the needs of the present generation [*of humans — implied*], without compromising the ability of future generations to meet their needs and aspirations”. To judge whether a particular development is sustainable, it is necessary to construct a set of criteria which reflects its ecological, social and economic impacts [11]. Underlying these there will be an ethical view of humankind, its environment (in the broadest sense) and their interaction. Movement towards the sustainability of human society also implies changes in the way we govern ourselves or allow ourselves to be governed, a topic further explored in [23].

## 6 ORSSA and development

When looking at ways in which ORSSA may aid development in South Africa, a distinction should be made between (i) ORSSA as an organization acting through its executive, (ii) its members acting in their professional capacity, and (iii) members acting in their private capacity as citizens.

1. As mentioned in Section 5, attempts were made by the ORSSA executive in 1995 and subsequent years, to make government officials aware of the possible applications of OR. There are other courses of action that the executive might consider, including some of the following:
  - Initiate a debate on a common vision for development in South Africa — firstly among its members but perhaps later in a wider circle. (This may be seen as a continuation of the original function of local RDP fora, as described in [22].)
  - Include a regular section on development in the ORSSA Newsletter. (This may, for instance, be used to disseminate information on local development with a view to encouraging ORSSA members to take part in development projects in their own communities.)
  - Review OR education to ascertain whether some aspects of development theory or practice (community OR) may be included in OR courses at universities and technikons (universities of technology). Already some interesting experiments in this direction have been carried out, notably at the Potchefstroom University for CHE (now part of the University of the North West). Also, a taught Masters course on OR in Development is offered at the University of Cape Town.
2. OR practitioners acting in their professional capacity would do well to keep in mind the “Oath of Prometheus” introduced by J-P Brans at the EURO Conference in 2000 (this is similar to the Hippocratic oath for medical practitioners). In part it reads as follows:
 

“As a **decision-maker**, I commit myself to take into account not only my own objectives but also the social, economic and ecological dimensions of the problems . . .

As a **consultant** or an **analyst**, I commit myself to convince the decision-makers to adopt a fair ethical behaviour and to assist them to meet their goals within the limits of sustainable development. I will feel myself free to refuse to provide information or tools, which to my opinion, could bring into danger the social welfare of mankind and the ecological future of Earth” [17].

All ORSSA members who are interested in development would also do well to read the reviews by Geldenhuys and Ittmann referred to in Section 3 and the Appendix, as a guide to possible applications of OR. Practitioners are usually constrained by organizational requirements in their choice of topics on which to work, while academics may have more freedom in this regard, but for both groups it would be a step forward if they could be sensitized to look for a human or development angle in whatever problems or assignments they have to deal with. The work by Leanne Scott reported in [27], for which she was awarded the Tom Rozwadowski medal in 2006, is an excellent example of the application of OR techniques to a topic with important implications for development.

3. ORSSA members in their capacity as private citizens may take part in the activities of bodies such as ward committees and NGOs which are working to improve their local communities. Because of their training, they should be able to contribute towards helping to prioritize local government spending, improve service delivery and promote development.

## 7 Conclusion

Looking back, some of the important issues regarding OR and development which should be emphasized are:

- The different meanings of the word “development”, and the importance of distinguishing between them in various contexts.
- The importance of human development in addition to stimulating economic growth, improving infrastructure and supplying services.
- The difference between “OR for development” and “OR in the developing world”.
- The roles that ORSSA and its members may play in promoting development in South Africa and Africa.

## Acknowledgement

The author would like to thank the two anonymous referees, whose comments and suggestions helped to improve the paper. Thanks also to the many people not mentioned in the paper who have helped me to gain a better understanding of development issues.

## References

- [1] ACKOFF RL, 1970, *A black ghetto's research on a university*, Operations Research **18**, pp. 761–771.
- [2] ACKOFF RL, 1975, *Does quality of life have to be quantified?*, General Systems **XX**, pp. 213–219.
- [3] AFRICAN NATIONAL CONGRESS, 1994, *The Reconstruction and Development Programme: A policy framework*, Umanyano Publications, Johannesburg.
- [4] BHYAT MF, 1996, *Implementing an integrated information system to support development planning*, ORiON, **12(1/2)**, pp. 37–42.
- [5] CONRADIE W, 1996, *The RDP — A challenge and opportunity*, ORiON, **12(1/2)**, pp. 11–14.
- [6] *Development trust for Macassar*, 2006, District Mail, 18 September, p. 3.
- [7] FATTI P, 1996, *The RDP — A challenge and opportunity*, ORiON, **12(1/2)**, pp. 1–6.
- [8] FERREIRA E, 1996, *The RDP — A challenge and opportunity*, ORiON, **12(1/2)**, pp. 7–10.
- [9] FOURIE P, 1998, Newsletter for Operational Research for Developing Countries, November, pp. 9–10.
- [10] FOURIE P, 2004, *Sustainable development — Implications for OR*, ORSSA Newsletter, October, pp. 8–10.
- [11] FOURIE P, 2006, *The Lynedoch EcoVillage: An experiment in sustainability*, ORSSA Newsletter, December, pp. 6–8.
- [12] FOURIE PDU T, 1999, *Community OR and OR for development: A South African perspective*, ORiON, **15**, pp. 53–66.
- [13] FOURIE PDU T & DE CLERK R, 1996, *A simple evaluation technique for RDP projects*, ORSSA Newsletter, December, p. 25.
- [14] FOURIE PDU T & GELDENHUYS G, 1995, *Operations research and the RDP (in Afrikaans)*, ORSSA Newsletter, December, p. 32.
- [15] HARMSE M, 2006, *President's report 2006*, ORSSA Newsletter, September, p. 4.
- [16] ITTMANN HW, 1996, *The RDP — What can OR offer?*, ORiON, **12(1/2)**, pp. 21–36.
- [17] ITTMANN HW, 2006, CSIR (Personal communication), Contactable at [hittmann@csir.co.za](mailto:hittmann@csir.co.za).
- [18] KAHIMBAARA JA, 1996, *Spatial foundations for addressing the statistical needs of the reconstruction and development programme*, ORiON, **12(1/2)**, pp. 55–68.

- [19] LOOTSMA FA, 1999, *Multi-criteria decision analysis via ratio and difference judgement*, Kluwer Academic Publishers, Dordrecht.
- [20] LYNCH JP, 1996, *Numbers for the RDP — The role of the CSS*, ORiON, **12(1/2)**, pp. 15–20.
- [21] MANDELA N, 1994, *State of the nation address*, Houses of Parliament, Cape Town, [Online], [Cited May 1st 2007], Available from: <http://www.anc.org.za/ancdocs/history/mandela/1994/sp940524.html>
- [22] O'CONNELL BP, 2002, *Inaugural address as Rector and Vice-Chancellor*, University of the Western Cape, Bellville.
- [23] PRUGH T, COSTANZA R & DALY HE, 2000, *The local politics of global sustainability*, Island Press, Washington DC.
- [24] ROSENHEAD J, 1996, *Enabling analysis: Across the developmental divide*, ORiON **12(1/2)**, pp. 69–103 (reprinted from Systems Practice, 1993, **6(2)**, April).
- [25] ROSENHEAD J & TRIPATHY A (EDS), 1996, *Operational research for development*, New Age International, Delhi.
- [26] SAGASTI FR, 1976, *Thoughts on the use (and abuse) of OR/MS in the planning and management of development (or: Can OR/MS help in the planning and management of revolutions?)*, Operational Research Quarterly, **27**, pp. 937–948.
- [27] SCOTT L, 2005, *Unpacking developmental local government using SSM and MCDA tools*, ORiON, **21(2)**, pp. 173–195.
- [28] SMIT CF, 1996, *An analysis of key RDP issues and proposed support by the statistical profession*, ORiON **12(1/2)**, pp. 43–54.
- [29] STEWART TJ, 2006, *Operational research for development in Africa*, International Conference on Modelling, Simulation and Optimization (MSO2006), Gaborone. (Paper available from author on request.)
- [30] SUTTNER R, 1984, *The Freedom Charter — The people's charter in the nineteen-eighties*, University of Cape Town, Cape Town.
- [31] WCED (World Commission on Environment and Development), 1987, *Our common future* (The Brundtland Report), Oxford University Press, Oxford.
- [32] *White paper on reconstruction and development (Cape Town, 15 November 1994)*, Government Gazette, vol 353, no 16085, Cape Town, 23 November 1994.

## Appendix: Operations Research and the RDP

Certain needs identified in the RDP and the corresponding sections of the White Paper [4] are summarized in Table 1 (p. 72).

The question is then asked: how can one become involved in helping to address these problems? Two possibilities are described, namely a top-down and a bottom-up approach. In the first, at the level of central government, provincial government or the CSS (Central Statistical Services, now StatsSA), mathematical modelling may be helpful in the design of management information systems, geographical information systems and performance indices. At both national and provincial level, manufacturing may play an important role in stimulating the economy and creating jobs. Research on manufacturing processes and logistics is therefore important. In the bottom-up approach, the emphasis is on working through local RDP fora to address local problems.

Amongst the technical aids mentioned in the paper that may be used to attain these goals are (i) MCDA (Multicriteria Decision Analysis) and multi-objective programming, (ii) fair allocation, and (iii) game theory. MCDA is useful in all situations where there are conflicting objectives, and an “optimal” solution must involve trade-offs between the different objectives. Fair allocation methods, as the name implies, deal with the allocation of resources in order to satisfy some measure of equity; they may be applied, for instance, to the calculation of the contributions from central government to provincial budgets. (See Chapter 7 in [23] for more details). Game theory may be applied in all situations involving conflict.

Some developments since 1995, when the paper was written, are worth mentioning.

- The 2006 ORSSA conference with the theme *Production Scheduling and Logistics* illustrates the importance of manufacturing and logistics.
- The discussion of the bottom-up approach referred to RDP fora. However, as mentioned in Section 2.4, these fora no longer exist, and the closest equivalent would be the ward councils in metropolitan areas, or NGOs and other non-statutory bodies such as ratepayers’ associations. The main task of these bodies must still be the same, namely to align municipal budgets with development priorities, and to help reform local government to improve transparency and accountability, leading to better service delivery.
- The application of MCDA techniques to development problems has been carried out by Theo Stewart and his colleagues at the Department of Statistical Sciences at the University of Cape Town. Interesting examples are described in [29]. Also, at a meeting of the Western Province chapter of ORSSA in October 2006, Stewart, Leanne Scott and Alison Joubert presented some of their work, in papers titled “The Monitoring and Evaluation of Government Policy: Appropriate Alignment Across the Spheres and Functions of Government” and “OR in Governance and Public Sector Decision Making.”

Need	Section(s) in the White Paper
Increases in standard of living and quality of life	1.2: Why we need the RDP 9: Arts, culture, science and technology
Peace structures	1.3: Basic principles of the RDP A2.4: Urban renewal 9: Home affairs 9: Safety and security
Access to facilities	1.3: Basic principles of the RDP 1.4: Programmes of the RDP A1.1: Rural water supply A1.3: Land restitution A2.3: Extension of municipal services A2.4: Building of clinics 9: Health 9: Safety and security
Development of human resources	1.4: Programmes of the RDP 7.6: Capacity for effective participation
Measures of effectiveness	6.3: Business planning processes 9: Office of the President 9: Sport and recreation
Information management	2.5: Transformation plans 9: Office of the President 9: Sport and recreation 9: Health
Project management	9: Office of the President
Nature conservation	9: Agriculture 9: Environmental affairs and tourism
Allocation of funds	9: Arts, culture, science and technology
Multicriteria decision-making	9: Transport
Manufacture	1.4: Programmes of the RDP 3.2: Economic policy goals 3.3: Economic policy strategy 3.6: Industry strategy 3.7: Trade strategy 3.10: SMM enterprises 3.11: The labour market and development of human resources 9: Trade and industry

**Table 1:** *Summary of White Paper.*