Danced

Traineeship Report

Series of background studies to provide input into the development of an air quality management strategy for the Province of Gauteng, South Africa

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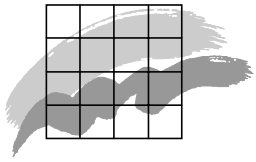

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Series of background studies to provide input into the development of an air quality management strategy for the Province of Gauteng, South Africa

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Data sheet

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Abstract: The present report is a short mission report of the author's traineeship during 14-26 August 2000 in the Province of Gauteng, South Africa related to the project about a series of background studies to provide input into the development of an air quality management strategy for the Province of Gauteng, South Africa. An independent analysis has been carried out to supplement the background studies. A technology analysis has been carried out of the current air quality management system (AQMS) and a possible future air quality management system in South Africa with the Province of Gauteng as case. Furthermore, an analysis of the transition from the current to the future air quality management system has been performed with focus on key role players in the public sector involved in air pollution assessment and management. These role players are termed social carriers of technology. The applied conceptual and methodological framework is based on work carried out by the University of Aalborg, Denmark.

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Contents

Foreword

Report

The present report is a short mission report of the author's traineeship during 14-26 August 2000 in the Province of Gauteng, South Africa.

Trainee

The trainee Mr. Steen Solvang Jensen participated in the first mission out of three planned missions during 2000 on a Danced project together with the team leader Mr. Finn Palmgren Jensen, National Environmental Research Institute, Denmark.

Background studies

The project is a series of background studies to provide input into the development of an air quality management strategy for the Province of Gauteng, South Africa. The objective of the background studies is to provide a clear analysis of the current situation with regard to air quality monitoring in Gauteng and the institutional arrangements of the air quality management in the Province of Gauteng. This analysis is to be used as the basis for the development of an air quality management strategy in the Province identifying priority areas for actions. It will also lay the foundation for development of a national air quality management strategy.

Objective of the traineeship

The objective of the traineeship is to gain working experience with air quality assessment and management in developing countries by participating in all professional activities of the team leader during the first mission of the above project.

Content

Chapter 1 is a short description of the background studies. Chapter 2 outlines the methodology for the independent analysis that the trainee has carried out to supplement the background studies. Chapter 3 presents a technology analysis of the current air quality management system and a possible future air quality management system in South Africa with the Province of Gauteng as case and chapter 4 outlines the required institutional capacity of the stakeholders in this transformation. Chapter 5 gives a short evaluation of the traineeship and recommendations for future traineeships. Chapter 6 includes a list of references.

In appendices, ToRs for the background studies (Appendix A) and for the traineeship (Appendix B) are given together with itinerary (Appendix C), list of addresses (Appendix D) and CV of the trainee (Appendix E).

Acknowledgement and disclaimer

The trainee acknowledges the financial support to the traineeship from Danced and co-funding of the National Environmental Research Institute. The views presented in this analysis is entirely the responsibility of the author.

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Acronyms & abbreviations

AQ	Air quality
AQMS	Air Quality Management System
CSIR	Council for Scientific and Industrial Research
DACEL	Department of Agriculture, Conservation, Environment and Land Affairs
DEAT	Department of Environmental Affairs and Tourism
CAPCO	Chief Air Pollution Control Office
EIA	Environmental Impact Assessment
EU	European Union
NAPI	National Air Pollution Institute
NERI	National Environmental Research Institute, Denmark
NGO	Non Governmental Organisations

Executive Summary

Report

The present report is a short mission report of the author's traineeship during 14-26 August 2000 in the Province of Gauteng, South Africa related to the project about a series of background studies to provide input into the development of an air quality management strategy for the Province of Gauteng, South Africa.

Analysis

An independent analysis has been carried out to supplement the background studies. A technology analysis has been carried out of the current air quality management system (AQMS) and a possible future air quality management system in South Africa with the Province of Gauteng as case. Furthermore, an analysis of the transition from the current to the future air quality management system has been performed with focus on key role players in the public sector involved in air pollution assessment and management. These role players are termed social carriers of technology. The applied conceptual and methodological framework is based on work carried out by the University of Aalborg, Denmark.

Main air pollution problems and current AQMS

The main air pollution problems identified are: Smoke in townships due to cooking and heating using low-grade coal in high-smoke stoves, vehicle emissions, industrial pollution including dust fallout, dust from mine dumps, and bush fires.

The current AQMS lacks techniques, knowledge and institutional set-up to effectively improve the air quality.

Recommendations

An enhanced AQMS should be characterised by meeting international standards in air quality within a reasonable time frame.

From an organisational point of view it requires an updated air pollution act that clarifies regulation and monitoring responsibilities at national, provincial and local level. It is recommended to decentralise the regulation of industrial air pollution with shared responsibility between DEAT/CAPCO (large industries), DACEL (medium sized industries) and municipalities (small industries). Monitoring should be the responsibility of the municipalities with assistance from DEAT. The implementation of the enhanced AQMS will also require more manpower and funding.

From a technical point of view it requires establishment of internationally accepted air quality standards, guidelines for monitoring and better monitoring data, guidelines for regulation of industries etc.

From a knowledge point of view it requires more technical and scientific knowledge as input to the management process. It is recommended to establish a new independent institute the "National Air Pollution Institute" (NAPI) to carry out air pollution research to support air pollution assessment and management.

Danced should be able to support capacity building to obtain an enhanced AQMS.

The main responsibilities of the different role players towards an enhanced AQMS is summaries in the table below.

Main tasks for AQ management for the different role players in the public sector						
Main responsibilities:	International level	National level			Provincial level	Local level
	Danced and partners	DEAT	CAPCO	NAPI	DACEL	Municipality
Assistance to capacity building	X					
Preparation of acts and policies		X				
Clarify responsibilities of regulation of industries		X				
Clarify responsibility of monitoring		X				
AQ standards		X		X		
Preparation of guidelines for monitoring		X		X		
Guidelines for regulation, inspection and enforcement of industrial air pollution		X	X	X		
Regulation of large industries			X			
National database for AQ data		X		X		
Annual AQ assessment		X		X		
Up-date vehicle emission control		X				
Air pollution research, information and consultancy				X		
AQ assessment and emission inventories				X	X	X
AQ monitoring				X		X
Regulation of medium sized industries					X	
Regulation of small industries						X
Bush fires					X	X
Air pollution in townships						X
Urban and traffic planning					X	X

Disclaimer

As an independent study the views presented in this analysis is entirely the responsibility of the author.

1 Short Review of Danced Project

Auspices

The background studies of the present Danced project will serve as input to formulate an air pollution management strategy for the Gauteng Province. The development of the strategy falls into Danced's environmental assistance under the South Africa – Danish Country Programme within the theme of urban environmental management and the focus area within holistic waste and pollution management where the objective is to develop and implement management programmes in South Africa.

The development of an air quality management strategy for Gauteng Province is supported by the National Department of Environment, Agriculture, Tourism and Land Affairs, and agreed to in the country to country negotiations. The Provincial Department of Environment, Agriculture, Tourism and Land Affairs in Gauteng Province is project responsible in South Africa and the National Environmental Research Institute in Denmark is responsible for the background studies.

Objective of the background studies

The objective of the background studies is to provide a clear analysis of the current situation with regard to air quality monitoring in Gauteng and the institutional arrangements of the air quality management in the Province of Gauteng. This analysis is to be used as the basis for the development of an air quality management strategy in the Province identifying priority areas for actions.

Local consultants

Two local consultants will assist in providing background reports for the final report. One background report will focus on the technical aspects as basis for formulating an air quality management strategy, that is, identifying current air pollution problems and future trends, and assessing current monitoring systems as a basis for identifying and prioritising actions. The second background report will assess the current institutional arrangements as regards air quality management by analysing the current legislation, policy and regulatory institutional capacity. The final report will include technical and institutional recommendations as input for formulating an air quality management strategy.

Duration

The background studies will be carried out during 15 August – 15 December 2000 with three short-term visits to South Africa, and the final report also have to be finalised by 15 December 2000. The final report will serve as input to design a project for development of an air quality management strategy. The project design phase is expected to take place in early 2001.

2 Terminology and Methodology for Technological Transformation

This chapter shortly introduces the terminology and methodology applied to analyse the current air quality management system in South Africa with the Province of Gauteng as case and the transformation to an enhanced future air quality management system.

2.1 Capacity development in environment

Capacity development in environment (CDE)

Danced focuses on capacity development in environment (CDE) and CDE is the long-term objective for development of a strategy for air quality management in South Africa. Danced uses OECD's definition of CDE (ref. 4 and 24): 'Capacity in environment relates to the ability of individuals, groups, organisations and institutions in a given context to address environmental issues as part of a range of efforts to achieve sustainable development. Capacity development in environment (CDE) describes the process by which capacity in environment and appropriate institutions are enhanced'.

The definition focuses on the institutional aspects to achieve environmental sustainable development. However, the definition is not very suitable from an analytical point of view. How does one actually analyse capacity and the process to enhance institutions ?

2.2 Technology analysis

At the University of Aalborg, Denmark an analytic framework has been developed that attempts to provide terms and methods to analyse technological change and capacity development in an international perspective (ref. 23). Key elements of this approach are used to analyse the capacity development required to enhance the current air quality management system.

Concept of technology

A comprehensive conception of technology is applied. Technology is the means by which mankind reproduces and expands its living conditions. Technology embraces a combination of four constituents: Technique, knowledge, organisation and product. The basic idea is that a qualitative change in any one of the variables will eventually result in supplementary, compensatory and/or retaliatory chance in the others (ref. 23), see Figure 2.1.

Technology as technique

Techniques are the physical means of production or implements and it also includes the physical labour process.

Technology as knowledge

The knowledge part or soft-ware includes skills, knowledge, intuition of the direct producers and scientific insight and creativity of the technology designers.

Technology as organisation

This part focuses on the internal division of labour and pattern of specialisation which requires management and co-ordination.

Technology as product

The product part is the result of the above mentioned components. The product includes both the intended product e.g. commercial products as well as "by-products" like air pollution.

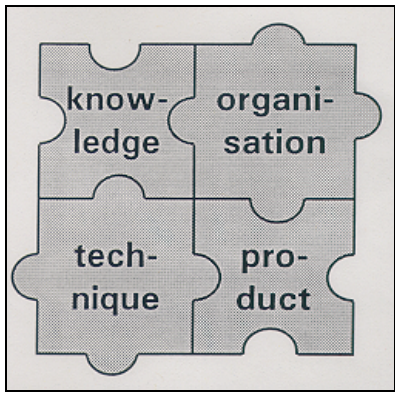


Figure 2.1 Illustration of the comprehensive concept of technology and its four constituents (ref. 23)

Technology analysis

A technology analysis using the above concept has been applied on a national level. The current air quality management system in South Africa with Gauteng Province as case is viewed as a technological system and an analysis of the requirements for transformation to an enhanced air quality management system has been performed.

Social structure

The level of technology is strongly linked to the social structure that embraces the economic and social infrastructure of the society, the social division of labour, market conditions, state, civil society etc. Within the scope of the traineeship it is not possible to fully analyse these linkages. However, the linkages between the technology and the social structure are partly taking into account in the study of social carries of technology.

2.3 Social carries of technology

Social carries of technology

Social units in society take part in technological transformation. These actors are called social carries of technology. The analysis of social carries of technology is crucial to understand the transformation from the current air quality management system to an enhanced future air quality management system, see Figure 2.2.

Technological capacity of the society

The social carriers of technology act in the social structure (ref. 23). The inter-relationship between the actors and the social structure is one of the driving forces in technological development. The technological capacity of the society is defined as: 'The capacity of a society to reciprocally match its changing social structure to the changing technological capability of its social carriers of technology' (ref. 23). The concept of technological capacity of the society focuses on the social ability to adopt or effect technological change.

In the context of South Africa, a social response is required to reduce the impacts of air pollution to human health and environmental impacts. The social setting has also changed as a democratic state is under development. Further, the industry must adopt to the requirements of the international market conditions including requirements for higher standards for environmental protection. Within the scope of the traineeship it is not possible to further analyse the linkage between the social structure and technological transformation.

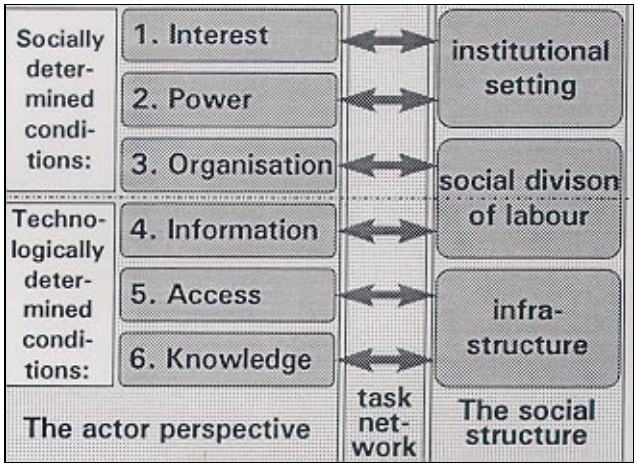


Figure 2.2 Illustration of the concept of social carries of technology and the linkages to the social structure (ref. 23)

Six conditions

According to the concept of social carries of technology six conditions have to be met for a social carrier to successfully develop or adopt a new technology (ref. 23).

Interest

Interest in applying the technology i.e. be motivated to obtain and operate the technology.

Power

Power to materialise its interest i.e. socio-political and economic means.

Organisation

Organisation to exert the power and to acquire the technology.

Information

Information about the technological options i.e. assess the potential alternatives in relations to the desired need fulfilment.

Access

Access to the technology in question i.e. be able to obtain and procure the technology.

Knowledge

Knowledge about how to operate the technology i.e. be in possession of the capability to handle the required technique and work organisation.

The social carriers of technology in the context of technological transformation or international technology transfer is illustrated in Figure 2.3. A combined social carrier can be two or more social carriers. In the case of the present project, the receiver is South African institutions involved in air quality management and the

supplier is Danced and consultants to provide funding (*power*), institutional development (*organisation*), and *information* about, *access* to and *knowledge* about enhanced air quality management.

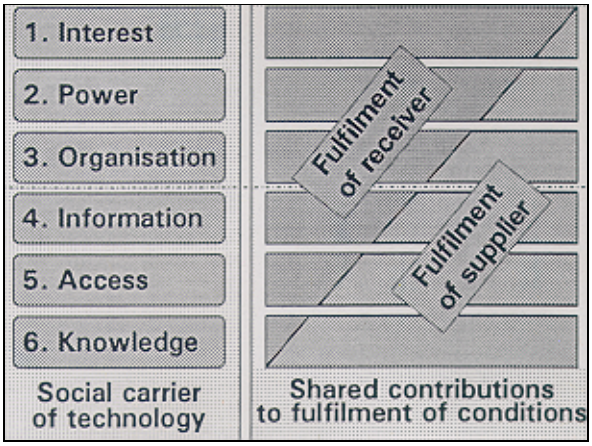


Figure 2.3 General illustration of a combined carrier of an international technology transfer and the fulfilment of the receiver and supplier (ref. 23).

Fulfilment of the six conditions

The fulfilment of the six conditions for a successful technological transformation may also be illustrated as a degree of fulfilment of the conditions. The degree of fulfilment is illustrated for a technology receiver in Figure 2.4.

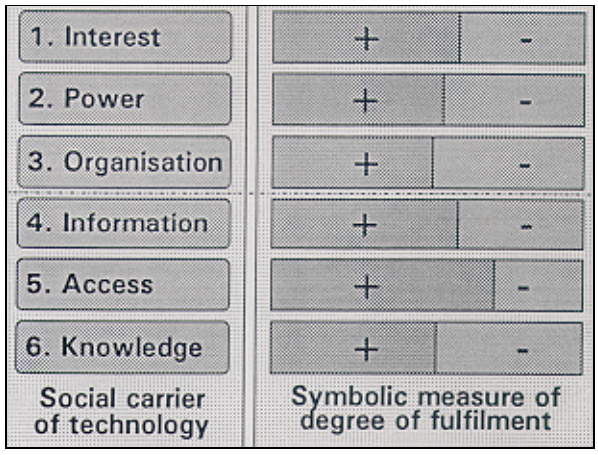


Figure 2.4 Example of the degree of fulfilment of the conditions viewed from the technology receiver

Present study

In the present study an analyse of the current air quality management system in South Africa with the Province of Gauteng as case and the transformation to an enhanced future air quality management system will be carried out using the concept of technology and the concept of social carriers of technology outlined above.

3 Technology analysis of current and future air quality management system

A technology analysis has been carried out of the current air quality management system and a possible future air quality management system in South Africa with the Province of Gauteng as case. The analysis is based on meetings with key role players and collected reports during the mission. At this stage of the project the analysis can not be very comprehensive and detailed, yet it should provide an overview of the key problems of the current air quality management system, the characteristics of a future air quality management system, and the challenges faced for transition.

3.1 Current air quality management system

Gauteng Province

The Gauteng Province is the administrative and economical centre of the country, and it is one of the most densely populated and industrialized parts of the country. It is also one of the wealthiest, although incomes are very uneven distributed.

Air pollution problems

The perception of air pollution is to a large extent related to what can be seen or smelled rather than based on scientific knowledge about pollution levels, source apportionment, documented health and environmental effects etc.

The main air pollution problems have been identified (ref. 15):

1. Smoke in townships due to cooking and heating using low-grade coal in high-smoke stoves
2. Vehicle emissions
3. Industrial pollution including dust fallout
4. Dust from mine dumps
5. Bush fires.

Smoke in townships and informal settlements

Smoke in townships and informal settlements (shacks) is a special problem since it is related to poverty where poor people are forced to use a high smoke energy source as coal although it creates extremely high indoor and outdoor air pollution. The smoke problem is most severe in the morning and late afternoon (cooking) and in the evening (heating) in cool periods. It is a large problem in terms of both high concentrations as well as the areas affected. The smoke also has an impact on adjacent urban areas due to dispersion. It is documented that the prevalence of respiratory illnesses is much higher in these areas compared to less polluted areas (ref. 15, 21).

For several reasons the problem will probably remain for many years if no actions are taken. Due to continued migration to urban centres poor people in informal settlements and in townships will probably continue to be present for many years to come. It will also take a long time before poverty alleviation will make it possible to shift to electricity or gas on a large scale. However, demonstration projects have shown that a shift to more energy effective stoves promises to be socially and economically viable, and that it promises to reduce the smoke problem (demonstration project in Midrand Municipality, Gauteng Province).

Vehicle emissions

Outside townships and informal settlements, vehicle emissions may very well be the largest source to air pollution in large cities like Johannesburg and Pretoria since traffic levels on the road network is heavy. The health impacts of traffic air pollution is well documented.

If South Africa continues to experience economic growth incomes will increase and car ownership will increase leading to further increase in traffic. The contribution from traffic to air pollution will therefore increase in the future and probably become the major source in urban areas in the years to come. Vehicle emission regulation can reduce the impacts together with public transportation, and urban and traffic planning.

Industrial pollution

Industrial pollution including dust fallout and dust from mine dumps are substantial problems but localised to the adjacent areas of the industries. However, there is also a regional aspect of air pollution from industries e.g. acid rain.

Industrial activities are expected to increase as part of the economic development of the country although mining activities may stagnant or even decline (ref. 20).

It is possible to impose more stringent emission regulation on the industries, and cleaner technology and cleaning devices are available to meet these requirements.

Bush fires

Bush fires are a problem during the dry season. The vegetation is very dry and easily lit by careless or unintended behaviour.

Bush fires are already well regulated but more awareness raising and change of behaviour are still required (e.g. throwing cigarettes along road sides).

Organisational and institutional capacity

One of the local consultants will provide an overview of the legislative and institutional arrangements in relation to air pollution.

National level

Air pollution is basically regulated by an obsolete Act from 1965: the Atmospheric Pollution Prevention Act (ref. 4). More recent legislation within conservation and environmental management also has implications for air pollution regulation. Air pollution regulation is currently under revision. At policy level a white paper focuses on integrated pollution and waste management (ref. 9).

DEAT

At the national level the National Department of Environmental Affairs and Tourism (DEAT) under the Ministry of Conservation, Environment and Tourism prepares acts, policies and guidelines.

There is no national emission control standards for vehicles and catalysts are not mandatory. Unleaded petrol has been available since the last 3 years but the consumption is little. Unleaded petrol is needed because some imported cars are equipped with catalysts.

CAPCO

DEAT has regional offices in each province within air pollution control – Chief Air Pollution Control Officers (CAPCO). The regional offices issue environmental permits to so called schedules industries based on guidelines (ref. 11). Permits are issued based on emission limit values with no or little reference to the environmental limit values. CAPCO's capacity is very limited with less than 10 staff members to manage about 2.300 industries in the country. Since the air quality in the province is poor the effectiveness of the present procedures for issuing permits is inadequate.

Industries do some kind of self-control of emissions. According to the White Paper (ref. 9) emission control is done without reference to the ambient air quality. However, when looking through the Guidelines for environmental permits to industries (ref. 11) there seems to be a procedure where emission limits are set for different industrial processes, then stack heights are determined to meet threshold limit values. However, this procedure does not seem to function in practise, and threshold limit values are also obsolete.

Provincial level

At the provincial level, the provincial government of Gauteng governs the affairs of the province. The political heads are Members of the Executive Committee (MEC). Politicians are elected by the citizens of the province. The provincial government mainly obtains money from the state. One MEC is in charge of the Environment.

DACEL

The Department of Agriculture, Conservation, Environment and Land Affairs (DACEL) is under the provincial government. DACEL has a Directorate of Environment that has 4 sub-directorates: Environmental Assessment, Environmental Inspection, Waste Management, and Environmental Awareness. The Directorate of Environment was established in 1996 and has about 55 employees.

EIA

Environmental Inspection develops and facilitates implementation of pollution control strategies for air, water and soil. Environmental Inspection authorises Environmental Impact Assessments (EIA) for new developments based on EIA guidelines on a project by project approach (ref. 13). All new - small as large - developments needs an EIA for which the investor has to pay. Consultants usually prepare EIAs. Small businesses can not afford an EIA. Public participation is part of the EIA procedure and may create heated debates if stakeholders want to hinder the new development for other reasons than environmental reasons. It seems that EIA has had little impact in

controlling air pollution. The EIA may produce information that is useful in formulating the environmental permit.

Local level

Municipalities

At the local level, the Gauteng Province in subdivided into municipalities or local authorities.

Monitoring

The municipalities are responsible for monitoring of the ambient air. However, there are only few monitoring stations and few pollutants are measured. Monitor stations are owned by the municipalities and have recently mainly been funded by DEAT. Additionally, the universities may also run a few stations for research purposes.

As an example, air pollution monitoring in the Municipality of Johannesburg has been operating well for years and there has been a capacity to assess data and document the effect of regulation e.g. in relation to dust. The Municipality of Johannesburg also has a web site where air pollution monitor data is displayed. However, recently the monitoring has almost come to a stand still due to budget cuts from DEAT and the municipality. Furthermore, the department faces the problems of filling a position that requires high skills in monitoring operation since government salaries have difficulties in competing with salaries in the private sector.

Permits for unscheduled industries

The municipalities issue environmental permits to unscheduled industries that are smaller industries. The municipality controls smoke and dust problems and can pose regulation in this area. The municipalities receive complaints from citizens who live close to industrial polluters, and regulation is complaint driven.

Land-use management

The municipalities are in charge of land-use management. Change of land-use has to be confirmed by the province. Location of industries in industrial zones or otherwise separating pollution and those exposed in residential area has not been part of an urban planning strategy at least not for people living in townships and informal settlements.

On-the-road emission inspections

The only vehicle emission control that is carried out relates to diesel vehicles where the municipality does on-the-road inspections to test compliance with regulations based on a simple on-the-spot smoke test. Few vehicles are identified by this approach and it is difficult to enforce the regulation if appeals are not obeyed because fines given in court are very low.

Main problems in institutional set-up

The main problems in the institutional set-up lie in the following areas:

1. The legislation is obsolete and needs revision. This process is already in progress.

2. Regulation of industries is too centralised since the national level controls all larger industries for which they do not have the institutional capacity. More decentralisation of responsibility to provincial and local levels is needed. There is also mixed responsibilities since e.g. a scheduled industry is

regulated by national level for a pollution permit, by provincial level for an EIA and by local level for smoke and dust. There is a need for more clarity and simplification in responsibilities.

3. Guidelines for managing industrial air pollution are not based on achieving environmental targets, emission limits are to high and may vary from industry to industry, and the inspection and enforcement are insufficient and ineffective.

4. The air pollution management can be characterised as complaint driving, crisis, and project-to-project management. It lacks objectives, priorities and implementation plans. At national level policy principles have been produced and new legislation and new administrative boundaries are in progress.

5. There is lack of financial resources to do monitoring, and also for inspection and enforcement in relation to the scope of work to be carried out.

6. Another problem is the lack of a central administrative unit to collect and analyse the monitor data to provide an overview of the state of the environment and to feed information into the management process. Furthermore, there is no linkages to research to fully understand trends, source apportionment etc.

Technical capacity

Main problems in technical capacity

The following problems have been identified in the technical capacity to assess and manage air pollution:

1. Current air quality standards are political in the sense that they are South African standards that are less stringent than internationally accepted standards set to protect human health and the environment.

2. There are few, unharmonized and uncoordinated air pollution monitor stations. Most municipalities run simple monitoring equipment for SO_2, smoke and dust but some of the larger municipalities operate continuous monitoring equipment meeting international standards. However, there is lack of good quality control and maintenance of equipment.

3. CAPCO issues environmental permits based on guidelines. However, the guidelines are issued based on emission limit values with no or little reference to the environmental limit values. Improved guidelines as part of the permit system are needed that set emission limit values based on limit values for the ambient air quality.

4. Procedures are also lacking for integration and co-ordination of EIA and the permit system.

Know-how capacity

Administrative capacity

There is an administrative capacity within DEAT and DACEL. Problems with the current legislation has been identified and actions have been taken to revise the legislation. A policy paper dealing with air pollution management has also been finalised (ref. 9). The state of the environment has been described in Gauteng Province including air pollution (ref. 15) Furthermore, the present project has been initiated. However, the administrative capacity to issue permits, and carry out inspection and enforcement is insufficient in view of the scope of tasks. Some problems also exist with young and unexperienced staff due to high turnover, and some positions are not filled.

Technical capacity

DEAT and DACEL lack sufficient information about and systematic overview over the present air pollution levels, trends, source apportionment, health and environmental effects, impacts and costs of policy options etc. There is a lack of technical and scientific capacity within the institutional set-up to supply this information which hinders effective decision-making to reduce air pollution problems.

3.2 Future air quality management system

A future air quality management system is outlined below that aims to address the problems identified in the current system. Furthermore, the main priority areas that need to be addressed have been identified. The outlined air quality management system is a draft proposal that needs further elaboration based on information gathered by the two local consultants, further discussions among stakeholders etc. It could be seen as a starting point for further discussions.

Objectives

The long-term objective of a new air quality management system should be to produce good air quality by international standards to obtain insignificant annoyances, human health effects and environmental effects. The intermediate objective should be to take actions to progressively improve the air quality.

Organisational and institutional capacity

New legislation

New legislation is being drawn up to replace the obsolete Atmospheric Pollution Prevention Act from 1965. One of the local consultants writes a report that describes the current institutional arrangements including an analysis of existing legislation and policy and the capacity of regulatory bodies as regards air quality management.

Hopefully, the new legislation will address the question of decentralisation of regulation, inspection and enforcement to the provincial and local level, and clarify the responsibilities at national, provincial and local level.

National level

The national level should be responsible for legislation, regulations, policies and guidelines, and have some kind of support function but

also control and approval function in relation to provincial and local authorities. It should also cater for a technical and scientific capacity to feed information into the decision-making process. The national level should be in charge of vehicle emission regulation to be able to control all imported and domestic cars.

Provincial and local level

The provincial and local level should be responsible for implementation of air quality assessment and management. The responsibilities include monitoring and assessment, issuing permits to industries and inspection and enforcement, EIAs etc.

There could be a division of responsibilities between the provincial and local level depending on the type and size of industries e.g. the provincial level could be responsible for large industries that require more specialised knowledge and also more political power to control, and local authorities could control smaller industries. The same could be the case for EIAs.

Monitoring could be the responsibility of the municipalities based on national guidelines.

Policy and goal oriented management

The national level and the provincial and local levels with severe air pollution problems should draw up action plans that identify priority areas, state goals, identify and assess abatement measures, outline implementation plans and carry out recurrent evaluation of objectives.

More funding

The institutional capacity at primary provincial and local levels have to be stringent to meet the scope of management of air pollution. This will require more personnel and funding.

Technical capacity

International air quality standards

Air quality limit values for ambient air should be based on international accepted standards that are effect based e.g. WHO recommended standards. South Africa will not be able to meet these standards in the short run, therefore, political targets should be developed that state the year of compliance and the margin of tolerance for exceedances for intermediate years. This procedure is presently under implementation in the European Union.

Guidelines for monitoring

Guidelines should be developed to assist municipalities in selection of monitoring sites, pollutants to monitor, methods and quality control etc. and outline requirements for reporting to the provincial and national level.

New guidelines for industries

New guidelines for issuing of permits to industries should be developed that are based on regulation of emissions and stack heights to be able to meet international accepted limit values for the environment. These guidelines should also include guidelines for self-control by the industry and inspection by the authority in charge.

Better co-ordination

Procedures should also be developed for the authorities that are involved in environmental regulation of industries to be able to better co-ordinate land-use planning (localisation of industries), EIAs and issuing of environmental permits.

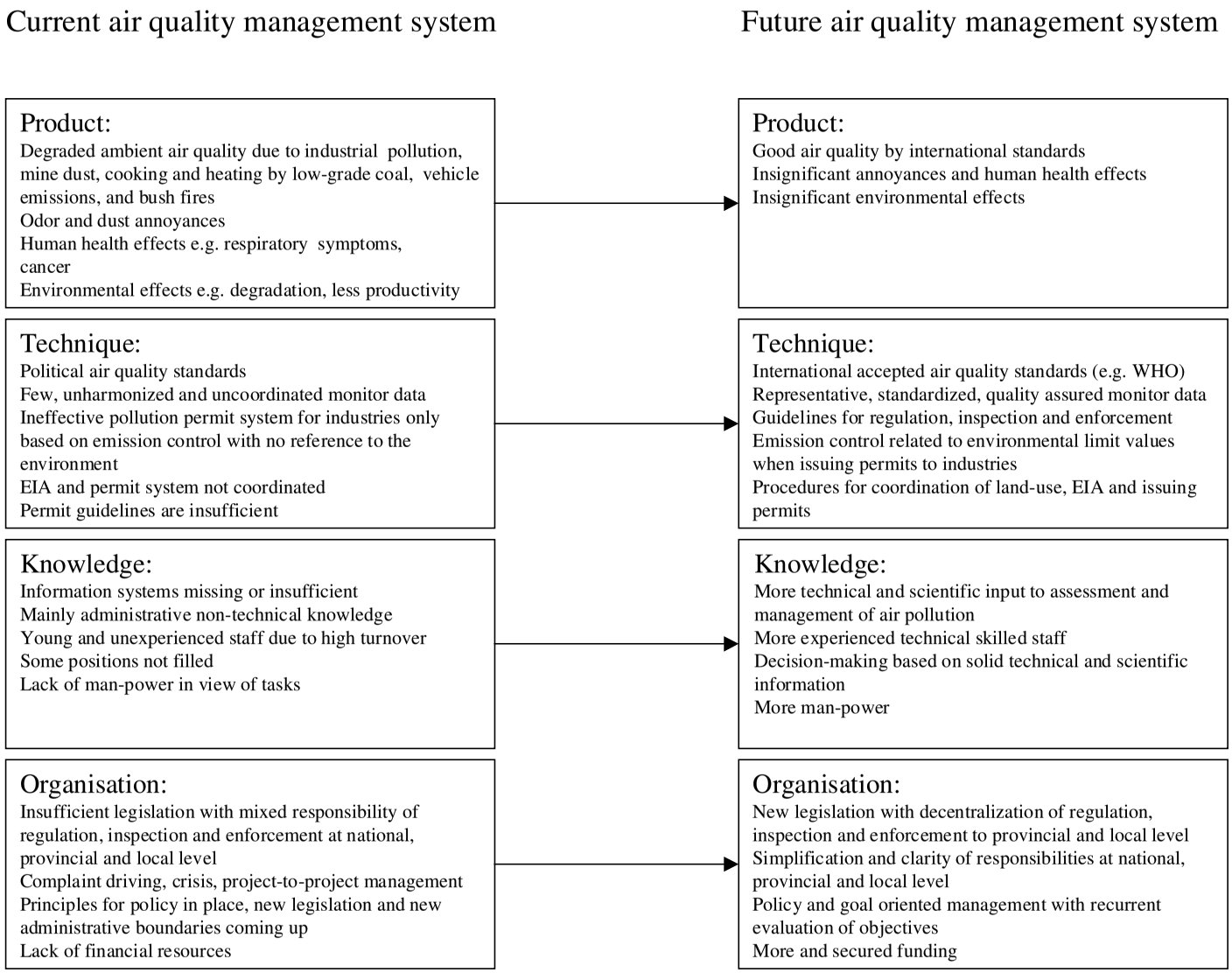
Know-how capacity

Technical and scientific support unit

Decision-making should be based on more solid technical and scientific information. The present organisational set-up lacks highly specialised expertise in air pollution that can support assessment and management of air pollution. Such an unit should be developed that that is able to synthesise air pollution data at a national and provincial level, understand the chemical and physical processes of air pollution to be able to understand trends in air pollution, source apportionment etc. and predict the impact of different abatement measures. The unit should have expertise in measurements and modelling. It should be able to prepare guidelines for monitoring, issuing permits etc.

The unit could be based at a university or an institution like CSIR to link up to technical and scientific expertise. The unit should be under the auspices of DEAT and also funded by DEAT.

Fejl! Henvisningskilde ikke fundet. summaries the characteristics of the current and future air quality management system.


Current air quality management system
Future air quality management system
Product:
Degraded ambient air quality due to industrial pollution, mine dust, cooking and heating by low-grade coal, vehicle emissions, and bush fires
Odor and dust annoyances
Human health effects e.g. respiratory symptoms, cancer
Environmental effects e.g. degradation, less productivity
Product:
Good air quality by international standards
Insignificant annoyances and human health effects
Insignificant environmental effects
Technique:
Political air quality standards
Few, unharmonized and uncoordinated monitor data
Ineffective pollution permit system for industries only based on emission control with no reference to the environment
EIA and permit system not coordinated
Permit guidelines are insufficient
Technique:
International accepted air quality standards (e.g. WHO)
Representative, standardized, quality assured monitor data
Guidelines for regulation, inspection and enforcement
Emission control related to environmental limit values when issuing permits to industries
Procedures for coordination of land-use, EIA and issuing permits
Knowledge:
Information systems missing or insufficient
Mainly administrative non-technical knowledge
Young and unexperienced staff due to high turnover
Some positions not filled
Lack of man-power in view of tasks
Knowledge:
More technical and scientific input to assessment and management of air pollution
More experienced technical skilled staff
Decision-making based on solid technical and scientific information
More man-power
Organisation:
Insufficient legislation with mixed responsibility of regulation, inspection and enforcement at national, provincial and local level
Complaint driving, crisis, project-to-project management
Principles for policy in place, new legislation and new administrative boundaries coming up
Lack of financial resources
Organisation:
New legislation with decentralization of regulation, inspection and enforcement to provincial and local level
Simplification and clarity of responsibilities at national, provincial and local level
Policy and goal oriented management with recurrent evaluation of objectives
More and secured funding

4 Social Carriers of Technology towards an Enhanced Air Quality Management System

In this chapter, the concept of social carriers of technology is used as a framework for analysis of the main actors involved in a transition towards an enhanced air quality management system (AQMS). The analysis has been limited to actors in the public sector although the industry, universities, consultants and NGO's are other important stakeholders. The analysis focuses on what the actors should to do ensure a successful transition to enhanced AQMS. The analysis can only be indicative since it is based on selected meetings and reports. However, the analysis should underlie the key role players in the public sector, their new roles in an enhanced AQMS and the main inputs to secure a successful transition towards an AQMS. For each key role player an indication of the degree of fulfilment of six conditions for a successful transition to an enhanced AQMS is given.

4.1 International Level

Danced

Fulfilment

Danced is a representative of an international donor engaged in capacity building of institutions dealing with environmental issues. Danced has a general knowledge about environmental issues and capacity building and is capable of obtaining specific knowledge from the Danish and international resource base. Danced can fund capacity building and to some extent also equipment. However, Danced lacks specific knowledge about the South African conditions within air pollution and also the general institutional setting. To fill this gap Danced has hired the National Environmental Research Institute of Denmark and two local consultants in South Africa. In the following these partners are referred to as Danced assistance.

Table 4.1 shows the degree of fulfilment of the six conditions for Danced as a combined carrier together with all role players in South Africa. It is a requirement for a successful development of an enhanced AQMS that South African institutions have interest in the objective, political and economic power to provide man-power and funding etc., and the institutional set-up to take decisions and implement an enhanced AQMS. Danced can mainly assist in capacity building through transfer of knowledge (e.g. training, exchange of specialists, funding of studies and development of strategies etc.) and techniques (e.g. AQ standards, development of guidelines, funding of monitoring equipment etc.)

Table 4.1 Degree of fulfilment of six conditions for Danced. Fulfilment by Danced assistance (x) and fulfilment by South African partners (-)

	Degree of fulfilment					
1. Interest	X	-	-	-	-	-
2. Power	X	X	-	-	-	-
3. Organisation	X	-	-	-	-	-
4. Information	X	X	-	-	-	-
5. Access	X	X	X	X	-	-
6. knowledge	X	X	X	X	-	-

4.2 National Level

DEAT

Fulfilment

DEAT has a strong interest in a new AQMS since it has been a key role player in the initiation of the series of background studies to provide input into the development of an air quality management strategy and it has also initiated a policy paper on integrated pollution and waste management for South Africa. It is further engaged in the revision of the air pollution act. DEAT has requested Danced assistance to obtain more information, access and knowledge about modern AQMS.

Table 4.2 Degree of fulfilment of six conditions for DEAT. Fulfilment by DEAT (x) and fulfilment by Danced assistance (-)

	Degree of fulfilment					
1. Interest	X	X	X	X	X	-
2. Power	X	X	X	X	-	-
3. Organisation	X	X	X	X	-	-
4. Information	X	X	X	-	-	-
5. Access	X	X	X	-	-	-
6. knowledge	X	X	X	-	-	-

New role

DEAT should be overall responsible for the state of air quality in South Africa and secure good air quality be international standards with insignificant health and environmental effects. It should continue to prepare acts, policies and guidelines and the new air quality management strategy will be an important tool to obtain these goals.

Clarity of responsibilities

The new air pollution act should clarify the responsibilities at national, provincial and local level of air pollution management and decentralise regulation, inspection and enforcement to the lower administrative levels.

AQ standards

International accepted air quality standards should be established and a time frame, strategy and implementation plan for their fulfilment.

Monitoring

The responsibility for monitoring should be clarified. There are many options for organisation of monitoring. However, it is important that monitoring is carried out in a sufficient, optimised and economic way to provide data for both national and local air quality assessment. It requires national and local engagement. The final division of responsibility is depending on the administrative boundaries of local government that are under revisions.

One option could be that DEAT is overall responsible for monitoring but DEAT should not run monitoring networks. The municipalities should be responsible for management of monitoring networks where it is appropriate to carry out monitoring. In the large cities areas the metropolitan councils should be responsible for monitoring. DEAT should only be responsible for preparing guidelines for monitoring e.g. defining zones where monitoring is necessary, pollutants to monitor, monitoring methods, reporting etc.

The proposed National Air Pollution Institute (NAPI) should then run a supplementary network to be able to give a complete picture of the state of the air quality and deposition in South Africa e.g. for rural areas.

Assessment

DEAT should be responsible for preparation of an annual air quality assessment and emission inventory report that describes the state of air quality, identify problems, state objectives, and identify abatement measures.

Industrial air pollution regulation

DEAT should prepare up-to-date guidelines for regulation, inspection and enforcement of emission control related to permits to industries. The regulation of permits should be revised and divided among the three layers of government. DEAT should regulate large industries, the provincial level medium sized industries and the local level small industries. This means that the regulation of scheduled industries will be divided among the national and provincial level. The idea is that the administrative body should match the capability of the industries. Large industries requires specialised expertise to regulate that is only feasible to maintain at a national level. Furthermore, experience shows that local politicians may find it difficult to enforce regulation of large industries due to their impact on the local economy, and industries may be tempted to play off one municipality against one another to gain little regulation.

Vehicle emission regulation

DEAT should be responsible for vehicle emission regulation. At the moment, vehicle emission regulation is very rudimentary and actions have to be taken to phase out leaded petrol, introduce catalyst cars, and improve fuel quality. Road side inspection could remain a local responsibility based on national guidelines.

Co-ordination

DEAT should establish procedures for co-ordination of land-use (localisation of industries), EIA and permits for industries to support local government.

Requirements

The necessary manpower and funding for this new role should be ensured by DEAT.

CAPCO

CAPCO under DEAT will get a new role since it will only be responsible for regulation of the large industries. It should also take part in preparation of revised guidelines for regulation of industries. Since some of the responsibility is decentralised to local government, CAPCO should provide support to local government in questions related to regulation of industries. CAPCO may also be integrated into the organisation of DEAT as e.g. a department for industrial air pollution

Table 4.3 Degree of fulfilment of six conditions for CAPCO. Fulfilment by CAPCO (x) and fulfilment by Danced assistance and DEAT (-)

	Degree of fulfilment					
1. Interest	X	X	X	-	-	-
2. Power	X	X	X	-	-	-
3. Organisation	X	X	X	-	-	-
4. Information	X	X	-	-	-	-
5. Access	X	X	-	-	-	-
6. knowledge	X	X	-	-	-	-

National Air Pollution Institute (NAPI)

National Air Pollution Institute (NAPI)

A new separate institutional unit is proposed under the auspices of DEAT. DEAT should fund the unit and Danced could possible provide funding during a built up phase. The unit should be the national focal point for air pollution research. The institute should do research, information and consultancy. The unit should employ highly skilled and specialised staff that can assist DEAT and others in assessment and management of air quality based on sound technical and scientific knowledge. It could be named the National Air Pollution Institute (NAPI). It could have a board of directors with representatives from DEAT but also local government, industries and

NGOs. NAPI should co-operate with the existing knowledge base at CSIR and universities. The institute should be independent and allowed to offer salaries that are competitive to qualifications. The institute should also be allowed to take on assignments on a commercial basis.

The institute should focus on emission control, air quality assessment, and impact studies. It should hold monitoring expertise and run some monitoring stations, and have model expertise. The institute should hold expertise in the fields of the identified air pollution problems: industrial pollution, mine dust, township air pollution, vehicle emissions and bush fires.

It could assist DEAT in the following way e.g.

- Establishment of AQ standards for ambient air by international standards.
- Prepare guidelines for monitoring.
- Prepare guidelines for regulation of industries.
- Provide input for annual air quality assessment e.g. maintain a database of monitoring data.
- Provide input for national emission inventory.
- Apply, modify and develop AQ models for South African conditions for industrial sources, vehicles in streets, urban areas and background areas.
- Take part in environmental and health effect studies in co-operation with other institutes.
- Identify and assess abatement measures within AQ management.
- Provide information about air pollution to the public.
- Assist provincial and local government, the industry and citizens in air pollution issues.

Table 4.4 Degree of fulfilment of six conditions for NAPI. Fulfilment by NAPI (x) and fulfilment by Danced assistance and DEAT (-)

	Degree of fulfilment					
1. Interest	-	-	-	-	-	-
2. Power	-	-	-	-	-	-
3. Organisation	-	-	-	-	-	-
4. Information	-	-	-	-	-	-
5. Access	-	-	-	-	-	-
6. knowledge	-	-	-	-	-	-

4.3 Provincial Level

DACEL

DACEL has a strong interest in promotion of an AQ strategy. Together with DEAT, DACEL has initiated the background studies and DACEL has also produced a state of the environment description including air pollution for the Gauteng Province (16). DACEL is presently engaged in EIAs which also includes air pollution issues.

DACEL lacks capability in AQ assessment and management and should built up this capacity on the selected areas given below.

AQ assessment

It is not feasible that DACEL manage a monitoring network. However, DACEL will be able to obtain monitoring data from Gauteng Province from DEAT's national database. DACEL could supplement such data with specific studies from problem areas carried out by e.g. NAPI. The province should produce an annual or biannual report of the state of air pollution.

Emission inventories

DACEL should built up a capability to carry out emission inventories in co-operation with the municipalities in the province. Emission inventories provides an overview of the contribution from different sources and is a basis for assessment of the effect of emission control measures. Emission inventories can be linked to AQ models to provide an overview of AQ levels in a city and region. Such model activities could be undertaken in co-operation with NAPI.

Industrial regulation

It is proposed that regulation of medium sized industries is decentralised to DACEL. DACEL should regulate, inspect and enforce all aspects of air pollution (emissions, dust fallout, odour) from medium sized industries. DACEL will have to built a capability to regulate, inspect and enforce air pollution from industries.

Integrated approach

DACEL should also integrate and implement procedures for land-use planning (localisation of industries in the province), EIA and permits for industries.

Bush fires and townships

DACEL should also assist the municipalities in fighting bush fires and reducing air pollution in townships.

Urban and traffic planing

Urban and traffic planing are also instruments to diminish exposure of the population by separation of localised air pollution sources and the population, to reduce overall vehicle emissions by implementation of land-use planning to diminish transport distances between different functions in a city, and to reduce traffic emissions by promotion of environmentally friendly public transportation together with bicycles and walking. Urban and traffic planing has to be carried out in co-operation with the municipalities.

Table 4.5 Degree of fulfilment of six conditions for DACEL. Fulfilment by DACEL (x) and fulfilment by Danced assistance, DEAT and NAPI (-)

	Degree of fulfilment					
1. Interest	X	X	X	X	X	-
2. Power	X	X	X	-	-	-
3. Organisation	X	X	X	-	-	-
4. Information	X	X	-	-	-	-
5. Access	X	X	-	-	-	-
6. knowledge	X	X	-	-	-	-

4.4 Local Level

Municipalities The municipalities should carry out AQ assessment and management locally based on guidelines from DEAT and support from CAPCO and NAPI.

Monitoring The municipalities should be responsible for management of monitoring networks and the metropolitan councils should be responsible for the largest cities.

Emission inventories The municipalities should also carry out emission inventories in co-operation with the provincial level.

Assessment The municipality should carry out AQ assessment annually or biannually in co-operation with the provincial level.

Reporting The municipalities should report data to NAPI for input to a national AQ assessment.

Regulation of industries The municipalities should regulate, inspect and enforce all aspects of air pollution (emissions, dust fallout, odour) from small industries.

Bush fires Municipalities should have the responsibility for regulation of bush fires.

Air pollution in townships The municipalities should be responsible for solving the air pollution problems in townships and therefore provide assistance to the citizens in townships to solve local air pollution problems related to heating and cooking. NAPI could carry out studies of air quality in townships and different abatement measures. DEAT and maybe Danced may provide financial support to such assistance.

Urban and traffic planning Similar to the provincial level the municipalities can regulate air pollution through urban and traffic planning.

Table 4.6 Degree of fulfilment of six conditions for municipalities. Fulfilment by municipalities (x) and fulfilment by Danced assistance, DEAT, CAPCO, DACEL and NAPI (-)

	Degree of fulfilment					
1. Interest	X	X	X	X	X	-
2. Power	X	X	X	-	-	-
3. Organisation	X	X	X	-	-	-
4. Information	X	X	-	-	-	-
5. Access	X	X	-	-	-	-
6. knowledge	X	X	-	-	-	-

The new roles of the different role players in the public sector is summed up in table 4.7.

Table 4.7 Main tasks for AQ management for the different role players in the public sector

Main responsibilities:	International level	National level			Provincial level	Local level
	Danced and partners	DEAT	CAPCO	NAPI	DACEL	Municipality
Assistance to capacity building	X					
Preparation of acts and policies		X				
Clarify responsibilities of regulation of industries		X				
Clarify responsibility of monitoring		X				
AQ standards		X		X		
Preparation of guidelines for monitoring		X		X		
Guidelines for regulation, inspection and enforcement of industrial air pollution		X	X	X		
Regulation of large industries			X			
National database for AQ data		X		X		
Annual AQ assessment		X		X		
Up-date vehicle emission control		X				
Air pollution research, information and consultancy				X		
AQ assessment and emission inventories				X	X	X
AQ monitoring				X		X
Regulation of medium sized industries					X	
Regulation of small industries						X
Bush fires					X	X
Air pollution in townships						X
Urban and traffic planning					X	X

5 Evaluation of traineeship and recommendations

Objective

The objective of the traineeship was to gain working experience within air quality assessment and management in developing countries through participation in the first short-term mission of the present project to be able to take part in NERI's international activities within this area.

Evaluation

The trainee has taken part in all meetings, discussions and field visits, and he has gained insight in Danced's policies and strategies, and the technical and institutional capacity of stakeholders in Gauteng Province. The objective of the traineeship has been fulfilled, and the trainee is prepared to take part in e.g. the coming project definition phase if Danced decides to support development of an air quality management strategy for Gauteng Province and for South Africa.

Recommendation

The meeting schedule was tight during the mission and did not leave much time to prepare the present report. Danced should allow trainees to charge working time (without overhead) for preparation before the mission and for finalisation of the report after the mission.

List of References

Danced:

1. Danida & Danced (1996): Strategy for Danish Environmental Assistance.
2. Danida & Danced (1996): Strategy for Danish Regional Environmental Assistance in Southern Africa.
3. Danced (1998): South African Danish Country Programme for Environmental Assistance, 1998-2002.
4. Danced (2000): Evaluation of Danced Supported Capacity Development Projects in the republic of South Africa. Evaluation Report.

Legislation:

5. Atmospheric Pollution Prevention Act. No. 45 of 1965.
6. Environmental Conservation Act, 1989.
7. National Environmental Management Act, 1998.
8. Mines and Works. Act No. 27 of 1956. Chapter 5: Surface Protection, the Making Safe of Undermied Ground and the Prevention and Combating of Pollution.
9. Government Gazette No. 20219, No. R 801 25 June, 1999. Minerals Act, 1991. Amendment of Regulations. On Performance Assessment and Monitoring of Environmental Management Programme.

Policy papers:

10. Department of Environmental Affairs and Tourism (2000): White Paper on Integrated Pollution and Waste Management for South Africa. A policy on pollution prevention, waste minimisation, impact management and remediation.
11. Department of Minerals and Energy. Policy concerning the granting of a certificate in terms of section 12 of the minerals act, 1991, to mines releasing such mines from further regulatory responsibilities concerning environmental management and conservation.

Guidelines:

12. Department of Environmental Affairs and Tourism (1980es): Guidelines. (Guidelines for issuing permits to scheduled industrial processes.
13. Dapartment of Minerals and Energy (1992): For the Preparation of Environmental Management Programme Reports for Prospecting and Mining.
14. Department of Environmental Affairs and Tourism (1998): Environmental Impact Management. Guidelin document. EIA Regulations. Implementation of Sections 21, 22 and 26 of the Environment Conservation Act.
15. Dapartment of Minerals and Energy (2000): Environmental Management Co-operation Agreements: A guide for their design and use for industry. Draft discussion document.

State of the Environment:
16. Department of Agriculture, Conservation and Environment. Directorate of Environment (1997): State of the Environment in Gauteng. A preliminary report.

17. Municipality of Johannesburg. Greater Johannesburg Air Pollution Monitoring Stations. List of stations including map and pollutants monitored.

18. Municipality of Johannesburg. Johannesburg Photo Chemical Smog Monitoring Program. Summary Statistics for June 1998.

19. Department of Agriculture, Conservation and Environment. Directorate of Environment (2000): Questionnaire and reporting on institutional arrangements for local authorities, finacial resources, types of pollutants, soruces of pollution, monitoring, community, industrial and commercial participation, initiatives, legal issues.

20. Albertyn, C.H. (1997): Determination of Lead Concentration in Urban Air. Report for the period 1 April 1996 to 31 March 1997. C & M Vonsulting Engineers cc. Annual report on a project executed on behalf of the Department of Environmental Affairs and Tourism.

21. Department of Minerals and Energy (1998): South Africa's Mineral Industry.

Popular materials:
22. Midrand Quarterly No. 1 January 2000. Midrand EcoCity of the Future. Danish grant provides boost for the Midrand environment.

Conceptual framework and terminology:
23. Müller, J. (2000): Lecture note on international technology transfer. Conceptual and Methodological Framework. Department of Development and Planning. University of Aalborg, Denmark, 38 p.
24. OECD (1996): Capacity Development in Environment: Principles in Practice.

Appendix A ToR for Background Study

Terms of Reference

For a

Background Study to Provide Input into the Development of an Air Quality Management Strategy for the Province of Gauteng, South Africa.

3. Draft

August 1, 2000

1. Background

The Danish Co-operation for Environment and Development (DANCED) was established in 1993 as a follow-up to the United Nations Conference on Environment and Development (UNCED) held in Rio de Janeiro in 1992. The overall objective of DANCED is to contribute to restoring the global environment in accordance with the recommendations of UNCED (Agenda 21). DANCED is managed by the Danish Ministry of Environment and Energy in co-ordination with the Ministry of Foreign Affairs.

In accordance with the DANCED policy guidelines, activities are currently concentrated in two regions, namely, South East Asia (Malaysia and Thailand) and Southern Africa (Botswana, Namibia, Lesotho, Swaziland and South Africa). All DANCED programmes/projects are viewed in a regional perspective.

Air pollution management activities would fall under the thematic cluster of general environmental management as defined by DANCED's "South Africa - Danish Country Programme for Environmental Assistance 1998 - 2002" (DANCED, 1998).

The development of air quality management strategy by Gauteng is supported by DEAT and was agreed to at the country to country negotiations in the later half of 1999.

2. Objectives

The objective of the background studies is:

> *To provide a clear analysis of (i) the current situation with regard to air quality monitoring in Gauteng and (ii) the institutional arrangements of air quality management in the Province of Gauteng. This analysis is to be used as the basis for the development of an air quality management strategy in the Province identifying priority areas for action.*

3. Outputs

The outputs of the Mission are:

a. A report detailing the air quality situation in the province and the monitoring systems that currently exist providing this data. The report will also assess the expected future trends of air quality in the province (including a clear identification of the forces driving them) and using this as a basis for identifying and prioritising actions that could be implemented as part of an air quality management strategy.
b. A report detailing the current institutional arrangements as regards air quality management in the Province. This is to include an analysis of existing legislation and policy and the current capacity of regulatory institutions as regards air quality management.
c. A Project Proposal for the annual South African-DANCED negotiations in September 2000.

4. Activities

The scope of work for the Mission will include, but not necessarily be limited to the following tasks:

Re: Output a: A report detailing the air quality situation in the province, the future trends in and driving forces for air quality management in the province and the monitoring systems that currently exist providing this data.

With regard to this output the consultants will undertake the following activities;

a.1 Evaluate the identified sources of air quality and identify follow-up action/ investigation.
a.2 Using the sources of information available to develop an emissions inventory for the province identifying key sources and pollutants.
a.3 The impact of these sources on ambient concentrations should be assessed.
a.4 Potential trans-boundary sources and their potential impacts should also be clearly identified.
a.5 Locations, which are currently being severely impacted by declining air quality, should be identified.
a.6 On the basis of the information gathered the Province's performance in terms of national and international standards and guidelines should be assessed.
a.7 Using the existing situational analysis as a basis, future trends for air quality in the Province will be assessed including an identification of the driving forces behind declining air quality in the Province.
a.8 Actions that could form part of an air quality management plan should be pro posed. These should be prioritised by assessing their impact on air quality and hu man health in relation to costs. The prioritisation should also indicate their feasibility in terms of existing institutional and regulatory arrangements. If institutional barriers exist these should be identified and proposals made to remove them.
a.9 The existing ambient monitoring systems should be assessed in terms of their effectiveness and applicability.
a.10 The report should make clear recommendation on how an effective and efficient monitoring system for the province should be developed.

Re: Output b: A report detailing the current institutional arrangements as regards air quality management in the Province. This to include an analysis of existing legislation and policy and the capacity of regulatory bodies as regards air quality management.

With regard to this output the consultants will carry out the following activities;

b.1 Identify and detail all air quality management initiatives (taking cognisance of the first study that will be detailing the monitoring activities, which should be excluded) in the Province. This to include a clear indication of what resources (human and financial) are being used to implement the initiatives.

b.2 Identify all the legislative provisions that would have implications for the development of an air quality management strategy in the Province and clearly analyse what these implications would be.

b.3 Based on the above provide an analysis of the existing institutional and regulatory barriers that exist with regard to implementing an effective air quality management strategy in the Province and suggested recommendations to address these barriers.

b.4 The issue of what regulatory mechanisms could possibly be used to address the issue of transboundary pollution by a Provincial Air Quality Management Strategy should also be investigated. Recommendations for possible new regulatory mechanisms should also be made.

Re.: Output c: A Project Proposal for the annual South African-Danced negotiations in September 2000.

c.1 Assist Department of Agriculture, Conservation and Environment (DACE) by formulating a project proposal for the development of the AQMS. The proposal should be ready for the annual negotiations in September 2000.

In the development of the background studies the consultants should ensure that they consider international best practise when developing recommendations.

When gathering interviews the consultants will conduct interviews with identified stakeholders face to face or telephonically on the basis of semi-structured questionnaires. No standard questionnaires are to be sent out to stakeholders for them to fill in and send back to the consultants.

Draft reports will be presented to the DACE project leader 6 weeks before the end of the consultancy. Comments will be given back to the consultants 2 weeks afterwards for finalisation of the reports.

5. Staffing

Mr. Finn Palmgren, Senior Research Officer, Danish Ministry of Environment and Energy. (Team Leader)

Mr. Gerald Geernaert, Department Director, Danish Ministry of Environment and Energy (Homeoffice support and participant on the 2nd mission in October)

2-3 local consultants will assist the team leader throughout the four months of the consultancy assistance. The consultants will be identified from the long list provided by DACE.

6. Timing and duration of the assignment

The studies must be completed in a four-month period from 15 August - 15 December 2000.

The team leader is expected to visit DACE on three visits each expected to last two weeks:

Week 33-34 (First working day in South Africa on 15 August)
Week 40-41 (Tentative)
Week 48-49 (Tentative)

The exact timing of the studies and the extend of the activities and outputs will be fully agreed upon between the consultants, DACE and DANCED after the first visit of the team leader in August. This notwithstanding, the Final Draft Project Document will be submitted prior to the 15 December 2000

7. Reporting

The consultants will report to the designated DACE project leader i.e. Ms Lunelle Serobatse, Deputy-Director Inspectorate. All documents will be delivered in twenty copies and as Word Perfect 6.0 document files on DOS formatted diskettes (spreadsheets shall be Microsoft Excel 4.0 documents).

8. Inputs

DANCED will cover the full cost of the consultants for the Mission.

The Department of Agriculture, Conservation and Environment will provide project management resources.

9. Attachments

State of the Environment in Gauteng, Report, 1998.

Letter to DANCED from DACE, May 2000, requesting the Background Study .

Development and Implementation of an Air Quality Management Strategy for the Gauteng Province, Project Proposal for the annual country negotiations, September 1999.

Appendix B ToR for Traineeship

Terms of Reference for a traineeship on a short-term mission on development of an air quality management strategy for the Province of Gauteng, South Africa

Background

The traineeship will be connected to the project: "Series of background studies to provide input into the development of an air quality management strategy for the Province of Gauteng, South Africa". The project is carried out by the National Environmental Research Institute in Denmark together with local consultants in South Africa for Danced to assist the Department of Agriculture, Conservation and Environment in developing a strategy for an air quality management system for the Gauteng Province.

The objective of the background studies according to ToR is: "to provide a clear analysis of (i) the current situation with regard to air quality monitoring in Gauteng and (ii) the institutional arrangements of air quality management in the Province of Gauteng. This analysis is to be used as the basis for the development of an air quality management strategy in the province identifying priority areas for action". Output of the studies shall be three reports: (i) one report on assessment of the current monitoring system and air quality together with future trends to identify priority areas for an air quality management strategy (ii) one report on assessment of the institutional arrangements, and legislation and policy capacity regarding air quality management (iii) a project proposal for the annual South African-Danced negotiations in September 2000.

Mr. Finn Palmgren, senior research officer, National Environmental Research Institute, Department of Atmospheric Environment, Denmark is team leader and will be assisted by 2-3 local consultants. The studies will be completed within 15 August - 15 December 2000 and include three visits each expected to last two weeks.

Trainee

The trainee is Mr. Steen Solvang Jensen, research officer at the National Environmental Research Institute, Department of Atmospheric Environment, Denmark (see attached CV). The trainee has a specialisation in international technology planning and almost 6 years of working experience within air quality assessment and management including a PhD. He has previously some working experience as a consultant in various developing countries within a different professional area (road infrastructure development) but no

international working experience within air quality assessment and management in developing countries.

Objective of traineeship

The objective of the short-term mission is to gain working experience within air quality assessment and management in developing countries by participating in the first mission of the above project. The traineeship will improve the CV of the trainee to make it possible to take part in the department's activities within air quality assessment and management in developing and East European countries. Participating in the department's international activities is one of the objectives of the carrier development plan of the trainee.

Work plan

The trainee will participate in the first mission during 14-26 August 2000 to South Africa. The trainee will participate in all the professional activities of the team leader.

The trainee will also carry out an independent analysis to supplement the background studies. The analysis will apply the technology planning theory and terminology developed at the Institute of Planning at the University of Aalborg, Denmark. Technology is viewed in a broad and inter-linked way including techniques, knowledge, organisation and product, and its relations to infrastructural and social conditions. The methodology also focuses on the social carriers of technology - the actors of technological change. The analysis will view the air quality management system as a technology, and analyse the required technological changes and required changes of the social carriers of technology (institutions) to develop an air quality management strategy for the province.

Report

The trainee will prepare a short report on the findings of the above analysis. The report will also include a short evaluation of the traineeship in terms of the experience gained and make recommendations for future Danced trainees. The report will also include an itinerary and a brief review of the Danced project.

Appendix C Itinerary

Date:	Activities and persons met:
August 15 morning	Arrival
August 15 1300	Royal Danish Embassy, Pretoria Mr. Peter O. Jonsson, Councellor (Environment)
August 16 1000-1330	Department of Agriculture, Conservation, Environment and Land Affairs (DACEL), Johannesburg Ms. Lunelle Serobatse, Deputy-director: Environment Mrs. Joanne Yawitch, Chief Director: Nature Conservation and Environment
August 17 1400-1600	Royal Danish Embassy, Pretoria Mr. Peter O. Jonsson, Councellor (Environment)
August 18 1000-1200	Department of Agriculture, Conservation, Environment and Land Affairs (DACEL) , Johannesburg Dr Rama, Director: Environment Ms. Lunelle Serobatse, Deputy-director: Environment
August 18 1600	Environmental Counsel CC, Johannesburg Ms. Jenny Hall (consultant on legislation)
August 20 1200-1500	Visit to the township of Soweto, Johannesburg
August 21 900-1200	Greater Johannesburg Metropolitan Council Mr. Gideon Slabbert, Manager of Environmental Pollution Prevention
August 21 1300-1430	Department of Health, Johannesburg Mr. Paul Brits, Director, Department of Environmental Health Mr. Francis L. Masenya, Deputy Director Department of Environmental Health
August 21 1800-1930	Environmental Management Services CC (consultant on air quality assessment and management Ms. Yvonne Scorgie Dr. Lucian W. Burger
August 22 900-1100	Department of Minerals and Energy, Pretoria Mr. A. (Sandy) Clark , Director, Mine Rehabilitation WJS van Zyl, Deputy Director: Environment. Directorate: Mine Rehabilitation
August 22 1100-1200	Department of Environmental Affairs and Tourism, , Pretoria Tsietsi Mahema, Deputy Director Air Quality Management Jan H. Marais, Chief Air Pollution Control Officer
August 22 1300-1400	Department of Agriculture, Conservation, Environment and Land Affairs (DACEL) , Johannesburg Dr. P. Hanekom, Head of Department Mrs Joanne Yawitch, Chief Director: Nature Conservation and Environment Dr Rama, Director: Environment Ms. Lunelle Serobatse, Deputy-director: Environment
August 22 1400-1900	Visit to townships in Johannesburg to get a first hand impression of smoke problems
August 23 930-1300	Vaal Triangle Atmospheric Pollution Committee (APAC) workshop on air quality management (Vaal area)
August 24 1100-1230	Midrand Community Services Francois van der Westhuisen
August 24 1400-1600	Environmental Counsel CC Ms. Jenny Hall (consultant on legislation)
August 24 1800-2000	Environmental Management Services CC Ms. Yvonne Scorgie, Dr. Lucian W. Burger (consultant on air quality assessment and management)
August 25 1100-1230	Chemical Allied Industrial Association, Johannesburg Dr. Laurian Lotter
August 25 1400-1600	Debriefing at Department of Agriculture, Conservation, Environment and Land Affairs (DACEL), Johannesburg Dr. P. Hanekom, Head of Department Mrs Joanne Yawitch, Chief Director: Nature Conservation and Environment Dr Rama, Director: Environment Ms. Lunelle Serobatse, Deputy-director: Environment
August 25 evening	Departure

Appendix D List of Addresses

Department of Agriculture, Conservation, Environment and Land Affairs (DACEL)
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Paul Brits, Director for Dept. of Environmental Health in Gauteng Province

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Appendix E CV for Trainee

NERI
National Environmental Research Institute, Denmark

Name	Steen Solvang Jensen
Profession	Planning engineer
Date of birth	December 25, 1960
Nationality	Danish
Education	MSc (Eng) from the University of Aalborg, Denmark with a degree in planning (urban, sector, international technology transfer) PhD from the University of Roskilde, Denmark (Modelling human exposure to traffic air pollution using GIS
Occupation	Researcher at the Department of Atmospheric Environment, National Environmental Research Institute under the Ministry of Environment and Energy
Examiner	External examiner at the University of Aalborg, Denmark within international technology planning. 1994-.

Key qualifications
Steen Solvang Jensen has worked as project manager of many projects in Denmark and in developing countries over the last ten years within administration, consultancy and research and he has acted as an advisor for the Danish Environmental Protection Agency and the Danish International Development Agency (Danida). The main qualifications include:

- System analysis and planning of technological systems in relation to societal conditions.
- Urban air quality management and its relations to urban and traffic planning.
- Mapping, impact assessment, scenario analysis, and policy options within emission, air quality, human exposures and health.
- Development of integrated modelling systems for air pollution and human exposures for application as decision-support systems in urban air quality management and in air pollution epidemiological studies.
- Application and development expertise of Geographic Information Systems (GIS).

Education and postgraduate experience
- MSc (Eng) from the University of Aalborg, Denmark with a degree in planning (urban, sector, international technology transfer). Graduated 1988.
- PhD study on modelling of human exposures to traffic air pollution using GIS, University of Roskilde, Denmark and NERI, 1999.

- Ph.D. course in Environmental Assessment and Scientific Techniques for Predicting Impacts, University of Roskilde, Department of Environment, Technology and Social Studies, 1995.

- Course in Urban traffic and GIS in Traffic Planning, Technical University of Denmark, Department of Planning, 1995.

- Ph.D. course in GIS, Technical University of Denmark, 1995, and Course in GIS Avenue Programming, NERI, 1996.

- Course in Modelling of Air Pollution Transport and Chemistry, University of Copenhagen, 1995.

- Course on "Project Management", NERI, 1998.

Language skills

	Speaking	Reading	Writing
English	excellent	excellent	excellent
Danish	(mother tongue)		

Employment record

1999-present
Researcher at the Department of Atmospheric Environment, National Environmental Research Institute, Denmark.

1995-1999
PhD student at the Department of Atmospheric Environment, National Environmental Research Institute, Denmark.

1990-1995
Consultant at the Department of Traffic Planning, COWI, private consulting engineers and planners, Denmark.

1989-1990
Desk officer, Department for International Affairs, the Danish Road Directorate.

1989-1989
Research assistant, Physical Laboratory III, the Technical University of Denmark.

Project experience in relation to air pollution and traffic planning

- Development and validation of a personal exposure model to traffic air pollution based on a street pollution model (OSPM), digital maps and administrative databases and a Geographic Information System (GIS) where the time-activity pattern of subjects are recorded using GPS receivers (Global Positioning System). project leader for exposure modelling activities. Under the National Strategic Environmental Research Programme 1998-2003.

- Development of an integrated modelling system for air quality and human exposures to traffic air pollution using a street pollution model (OSPM), digital maps and administrative databases and a Geographic Information System (GIS) for

application in urban air quality management and air pollution epidemiology. PhD project at NERI 1995-1999.

- Preliminary assessment of air pollution in the county of Ribe, Denmark. Screening and identification of problems related to air quality, odour, deposition to natural and rural areas in relation to sources of traffic, industry and agricultural production. Project leader. For the county of Ribe 1999-2000.

- Urban Environment and Traffic Study under the Danish Integrated Environmental Assessment Systems Project (DIAS). Development of an integrated air pollution exposure and transport behaviour model for estimation and management of the population's exposure to air pollutants. Project leader. For NERI 1998-99.

- Modelling of the impacts of the European Commission's Auto Oil Programme on future air quality in Danish cities. Project leader. For the Danish EPA 1998-2000.

- Review study on the evaluation of health impacts of air pollution from road traffic. For the Danish EPA 1996-1997.

- Development of methods for traffic air pollution exposure assessment at about 19,000 residences of children in a large epidemiological study on development of childhood cancer headed by the Danish Cancer Society under the National Strategic Environmental Research Programme 1994-1997.

- Research study about traffic driving patterns and air pollution emissions and energy consumption. For the Danish Road Directorate 1991-93.

- Many studies as traffic planner within traffic emissions, environmental impact assessment of traffic and road schemes, environmental and traffic action plans, life cycle analysis, multi-criteria priority ranking of road investments etc. for national and local authorities. COWI, consulting engineers and planners 1990-1994.

International experience

- Road infrastructure planning in developing countries. Pre-appraisal study, socio-economic impacts study, monitor and evaluation studies. 3 short-term missions to Kenya and 1 mission to Nepal. For Danida 1991-1994.

- Evaluation of replies from authorities and interest groups concerning the localisation of a large national freight railway station in Sweden. Recommendations on further studies within land-use and environmental impact assessment. For SIAR Boassard, Sweden for the Swedish Railways, 1992.

- Study of Integrated Farming Systems, China. Trainee period as part of MSc., 1987.

Publications

Papers in international journals: 4
Scientific reports: 6
Consultative reports: 13
Conference presentations: 14
Popular articles: 15