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Values education in a South African geography classroom

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Name:_____

A. **The Tugela-Vaal Project** (Video A - 10 mins)

1. What factors have created the need for an alternative water supply?

_____

_____

_____

_____

_____

2. Where is the nerve-centre for the Tugela-Vaal Project?

_____

3. What is the role of the Woodstock dam in the project?

_____

_____

4. Give the name of the next major dam the water passes through. _____

5. The water has been diverted from the _____ocean to the _____ ocean.

6. What storage advantages does the Sterkfontein Dam have over the Vaal Dam?

_____

_____

7. Should KwaZulu Natal share their water with Gauteng? Why/Why not?

_____

_____

_____

_____

Video B: The Lesotho Highlands Water Project (10 mins)

Lesotho Highlands Water Project	Peasant Farmers in Lesotho	Farmers in Northern Cape	Lesotho Govern-ment	S.A. Govern-ment	You
Values					
Attitudes					
Behaviour					

Lesotho Highlands Water Project	peasant farmers in Lesotho	farmers in Northern Cape.	Lesotho government	SA government	You (Name ...)
	- traditional land - have been living there for a long time. Don't want to move	They are unhappy because there supply of water will now decrease	They are happy because they need this to boost the economy of they. country.	They need the dam because of the growing demand of water.	I feel that nobody should be hurt and people should be compensated for their loss.
attitudes	Feel that its theres and should not move	Farmers are not pleased and are using various measures to stop it.	This will provide jobs and bring money into the country.	We helping the Lesotho government with finance.	We need this project for both countries. We both will gain from this.
behaviour	Extremley un helping They don't want to go. There are a few that help alot.		They taking all measures to go ahead of with their plans.	They feel this important and are helping with all the problems.	If you weigh the situation, we will see that this dam this is needed by everybody.

Lesson 6

Role Play on Different Water Consumers

References:

Hartdegen, P. (1996). "Water for All is the Real Goal" in *Engineering Week Report*, March 1996, pp.5-7.

Granelli, M. (1997). "Cabinet Approves Radical Water-law Changes" in The Star, 17 November, 1997

The Star. "Most Precious Resource" in *The Star*, 5 March 1997

Cabinet approves radical water-law changes

Abolition of riparian rights and ownership of any water is envisaged

By Marco Granelli
Political Staff

The Cabinet has approved a new set of principles which will radically change the country's water laws and strip South Africans of the right to own water.

Announcing the acceptance of the principles after yesterday's cabinet meeting in Pretoria, a clearly excited Water Affairs and Forestry Minister Professor Kader Asmal said the new water law was nothing more than a quiet revolution.

"Underground water is no longer private property. No one can drill boreholes whenever they wish," he said.

"The notion that the right to use water is attached to a piece of land will be abolished. The new principle is that water will be used for the maximum benefit of society as a whole."

Farmers, however, have rejected the loss of their water rights and said they will insist on compensation if these are taken away.

Among the fundamental changes envisaged in a new water law are the abolition of riparian rights and ownership of any water.

Riparian rights are the equal rights to use of surface water given in perpetuity to owners of land bordering on any surface water. The rights are a form of real property and are inherited with the land and give landowners the right to the water, whether they exercise that right or not.

Excited Asmal talks of 'quiet revolution'

When it is implemented, the new law would abolish the notion of the right to use water attached to a piece of land.

In future, water would be used to the maximum benefit of society as a whole.

It also separates water from the assumption that water rights can be in perpetuity and that underground water is private property.

Asmal said the new water laws would be tabled in parliament during the next session.

The new act hinges on the notion of a water reserve which, Asmal said, was founded in the principle that no one has a right to water except for two elements: the environment and the basic needs of people. All other water uses would have to be authorised.

The reserve abolishes the present water act, which says water shall be allocated to agriculture, mining, industry and for pasture. No rights would be given to these, Asmal said.

Explaining the practical effect of the water laws, water affairs deputy director-general Mike Muller said:

"We aim to regulate those things which have a significant effect and which interfere with the use of water by others."

The effect of the new law was that the government could meter and tariff all water.

Tariffs would be used to encourage proper use. The metering and regulation of water would be done at the source.

Reaction of agricultural union 'less optimistic'

It was possible that the municipalities may not be doing enough to discourage wastage and had taken no responsible steps, especially during a drought.

Then the authority to use the water could be taken away, Muller said.

He added that the new law would be positive rather than negative. "What the new laws mean is that in 25 years there will still be water for everyone. It gives a sense of security."

But the South African Agricultural Union was less optimistic in its reaction yesterday.

Following a three-hour meeting with Asmal and members of the Water Affairs Department, SAAU's director of resource services Nic Opperman said farmers would stand by their right to water.

"We are still in favour of water rights and feel they must be included in the property itself. This includes unexercised rights. We put our money in the investment of these water rights. We are in favour of a free-market approach where you can sell your rights," he said.

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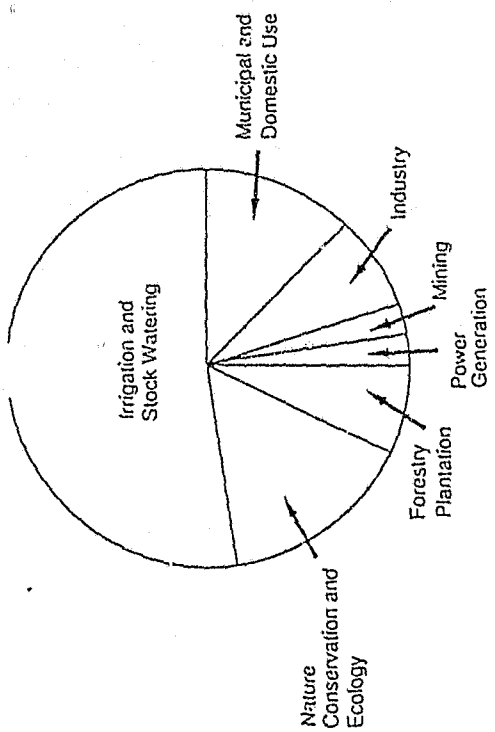
The Star

Wednesday March 5 1997
Established 1887
47 Sauer Street, Johannesburg

Most precious resource



The latest leap in the water price is one of those increases which should not cause too much protest among the public. Indeed, any precious resource so vital to the economic and physical wellbeing of 40 million people, and which costs only around 70 cents a ton, must still be considered cheap.

Water Affairs Minister Kader Asmal, perhaps the most capable and widely respected minister we have seen in this portfolio since Union in 1910, has conscientiously played an open hand ever since he took over. He has made it clear that this country, with its fickle rivers and inadequate natural water storage capacity, is bound to run into a serious water-supply crisis in the foreseeable future.

No major country on earth is so close to using 100% of the maximum assured supply of its rivers; nor is there one storing as much of its run-off as we are. An added challenge is that as agriculture improves (and it must if soil erosion is to be reduced) so run-off will naturally decrease.

To eke out our water supply we are going to need all the technology and engineering expertise possible – and that is going to cost money.

The almost 50% increase in bulk water (sold by Government to authorities such as Rand Water) will be passed on to the "retailers" – the local authorities who reticulate it to households. One hopes the shock of the increase will spur them to cut waste. There is a suspicion, fuelled by recent reports, that municipal leakages are still causing water wastage on an appalling scale. The problem is acute in places such as Alexandra and Soweto where old "temporary" piping is collapsing.

We ask one thing: that farmers must also feel the pinch. It might be fair enough that wealthy gardeners in Gauteng feel it most but half of South Africa's water is used by farmers, many of whom still do not rate water as an important overhead. The real cost of water should be felt by all.

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(4)

WATER for ALL is the REAL goal

South Africa's political transition—called a 'miracle' by many of the world's leaders and cited as an example of true democratic negotiation—has focused mainly on social issues such as curbing crime, limiting political violence and bringing about equality to everyone in this land.

In terms of water supplies and sanitation South Africa does not have a particularly good record. Statistics compiled by the DWAF make astonishing reading and among the most important are:

- More than 21-million people are without adequate or proper sanitation;
- Some 12-million people in this country do not have access to a reliable supply of water;
- The average child mortality rate for children under the age of five in rural areas is estimated to be 12% and 50% of the deaths ;
- More than 200 000 children die every year as a result of water borne diseases;
- Some 2-million people in South Africa rely on the bucket system for sanitation;
- Almost 7,7-million people in metropolitan areas do not have adequate sanitation and about 14-million people in rural areas suffer the same indignity;
- In rural areas around South Africa, as many as 75% of the existing water schemes are out of order.

Added to this is the fact that South Africa itself receives an average annual rainfall of about 500 mm which is just 60% of the world average. The water is poorly distributed throughout the country and about 65% of South Africa receives less that 500 mm of rain a year the minimum for successful dryland farming.

In arid regions of the west, such as the Karoo, much of the ground water is saline and unfit — in its natural state anyway — for human consumption.

These facts provide the DWAF with enormous challenges for the future. When combined with the natural population growth alone, it is clear that water resources will have to be carefully managed if South Africa hopes to keep its population alive in years to come.

Certainly the DWAF has done much over the years to stabilise water supplies. Sadly, though, this has not been done on an equitable basis and its astonishing, for instance, to consider that while farmers are irrigating their lands and feeding their cattle in certain arid regions of the country, many millions of people in densely populated metropolitan areas do not have access to water at all. As the Minister of Water Affairs and Forestry, Prof Kader Asmal points out, this causes immense resentment among the people.

Added to this is the growing resentment among some of the neighbouring countries over South Africa's apparent domination of the water resources in the region as a whole.

South Africa while consulting its neighbours and working closely with them, has ensured that it can maintain water supplies to its people and its fast-growing industries.

The arid western areas of Southern Africa, such as Botswana and Namibia face pressing and difficult pressures from their people to supply water and Namibia specifically seems concerned by the amount of water that is being taken from the Orange River Basin for people of South Africa.

This country does have agreements with its neighbours regarding water supplies and these seem sufficient to protect the resources. However, it is evident that greater regional co-operation will be required particularly if the water supplies become even more scarce than they already are.

Many people — both in South Africa and the neighbouring states — tend to see water as a free commodity that falls from the skies and is used for everyone's benefit.

As Asmal points out, the cost of water comes from storage, water treatment and purification, pipelines and other infrastructural elements that bring water to the people. In a rural sense, people are not used to paying for water at

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Death comes down stream



A gently gurgling brook, surrounded by indigenous forests that have been preserved by Sappi, carries South Africa's most precious resource, water.

"As custodians of portions of the Kwazulu-Natal water supply, Umgeni Water has an awesome task of providing water to millions of people throughout the region," claims Brian Walford, chief executive of the water supply utility company.

He points out that it is imperative for people to have access to safe drinking water. Moreover, the collection of water in poor communities is seen as 'a woman's task' and every day, millions of women have to cart water from the nearest source to their homes.

"Very often the only way to purify this water is to boil it, placing additional strains on the environment since firewood has to be hacked from the surrounding areas.

"As the son of a Welsh coal-miner living in a mining village in Wales, I grew up predominantly with socialistic ideals and as such I have always been acutely aware of things that should be done in South Africa.

"The squalor of the slums and squatter suburbs offer even less than the rural areas. Squatter camps are without water, do not have a proper sewerage system, are without refuse collection and the health risks are just as high," he said.

"In fact if we had a safe, healthy water supply in the rural regions many millions of people could return to their homes and live productive lives using the land to generate income," he added.

He points out that while the costs of providing an infrastructure for safe water supplies throughout the country are enormous, the benefits to the community as a whole are just as vast.

"People living in rural areas cannot afford the financial burden of building an infrastructure to provide sufficient water. So the costs will have to be borne by others. What is fundamental is that we must rapidly provide safe, consistent and clean water for all of South Africa's people."

He believes that this is more important than supplying homes, schools, roads or other infrastructural elements.

"Water is essential for prolonging human life. Without it, people die. Right now, about 200 000 children die each year in South Africa as a result of waterborne diseases.

"Human faecal bacteria creates or contributes to some of the most deadly diseases in this world and about 33% of all global deaths are caused by waterborne diseases," he said.

Walford claims that there is a finite amount of potable water available for consumption and this is estimated at less than 1% of the available water on earth.

"Ironically, while humans are polluting the water supplies, industry, too, damages the water courses and the environment paying scant regard to the fact that millions of people depend on this same water for their daily needs."

Umgeni Water has extended its business and is now supplying and providing reticulation services to consumers in rural areas to ensure that water quality standards are maintained.

According to Walford, the water authorities throughout the country are doing their best to ensure that in future there will be some water for everyone. But he points out that to achieve this vast amounts of money will have to be spent by the government and probably by private institutions as well.

"Dams must be built, water treatment plants erected and commissioned, pipelines laid to carry water to the people. This requires money and that money must be seen as an essential investment in a secure future for all South Africans."

Walford admits that the costs of providing an infrastructure in the rural areas is much higher than extending water supplies in metropolitan areas.

"It is in the rural areas that an efficient and consistent water supply is badly needed.

"South Africa's water supply is cyclical. We can have floods one year and then droughts for the next five or even ten years," he said.

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all. They walk down to the river, help themselves and walk back to the village.

If the rivers are low, they resort to ground water reservoirs. At no stage, though, do they expect to pay for water.

The DWAF, just last month, announced that the price of water in bulk will increase by about 30% and it says that this should not impact seriously on industrial or domestic users as it will mean an increase of between 3% and 5% for the end user.

In general terms, the quality of South Africa's water is high and all tap water is safe to drink. Whether this can be maintained in future is not certain since the amount of pollution, coupled with increased recycling of existing water, means that water treatment has to become more and more sophisticated, pushing up costs correspondingly.

Over the years, the DWAF has been faced with decreasing budgets for investment in water resources and this, too, has had an impact on the provision of services particularly to under-privileged communities.

The DWAF budget, for instance, declined from about 0.9%of the total government budget in 1984 to just over 0.3% in 1993, climbing marginally to about 0,35% in 1994. The DWAF has estimated that it will need to spend about R2,8-billion or 2,24% of the annual budget each year to provide basic services to the majority of the South African citizens.

However, the DWAF points out that an additional 1% of the national budget over the next seven years would meet the goal of providing universal basic water supply and sanitation services to all citizens.

In terms of sanitation, the DWAF has produced a draft white paper on sanitation which follows the identical lines of the draft white paper produced for water supplies.

The goal of the DWAF is to provide every household with a basic minimum sanitation service using what it calls a [illegible] improved VIP latrine or its equivalent.

According to Asmal, the government is committed to an appropriate and sustainable strategy for the improvement of health and quality of life through improved household sanitation and protection of the environment throughout the nation.

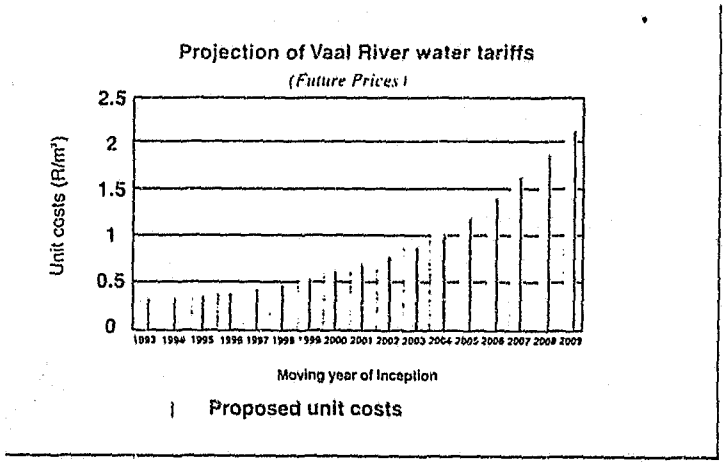
In terms of adequate sanitation, the DWAF points out that it seeks to provide a safe and easily accessible means of disposing of human excreta and waste water, providing an effective barrier against excreta-related diseases.

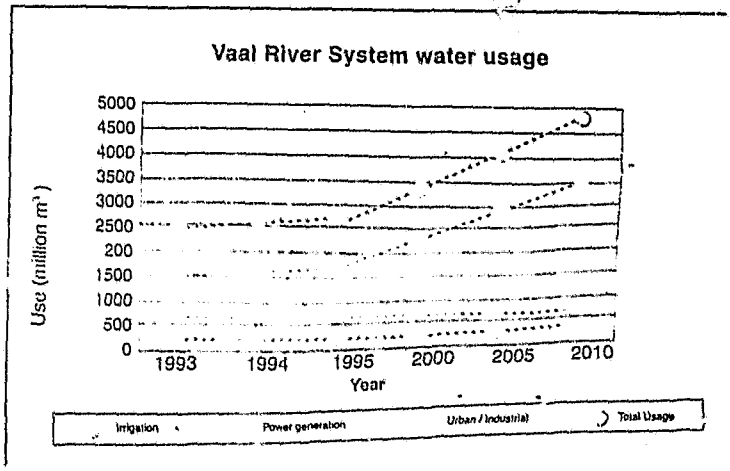
One of the key issues facing the Department is that of affordability in providing proper or adequate sanitation. The DWAF points out that when examined critically, the costs of improved sanitation and particularly that of waterborne sewerage for low income households is high and large amounts of public investment will be needed to construct, operate and maintain sewerage systems for all households or even for all urban residents.

The principle that the 'user pays' for sanitation services is an integral part of the DWAF's approach to solving the sanitation problems facing the country.

In devising a tariff policy for sanitation, the DWAF has recommended:

- Affordability;
- Fairness — tariff policies should be simple and fair;
- Separate tariffs — A separate tariff should be charged for sanitation services, depending on the level of service provided;
- Consumers should pay in proportion to the amount of the service used;
- Payment of operation and maintenance costs is essential;
- Life-line tariffs are applied to poorer communities, to recover operating and running costs;
- Local determination of tariffs should be decided and agreed by the relevant local authority;





Lesson 7

River Study At Bezuidenhout Park

Background

This was a joint fieldtrip between the grade 11 geography and biology classes. This would give biology learners and insight into geographical factors and vice versa.

Bezuidenhout Park is approximately 5 kilometers from the school.

Aim

To observe, distinguish and record various physical and chemical factors of a freshwater stream

To observe and identify the organisms of the stream

To compare and analyse the relationship between the abiotic factors and organisms.

Background Information

Many organisms can be found living along and in a freshwater ecosystem. The number and types of organisms vary throughout the year, depending on a variety of factors which form the physical and chemical characteristics of the stream. Changes in the physical and chemical environment can alter the behaviour of entire communities living in and around the stream.

When a stream or river and an urban settlement comes together; the impact of people on the water supply is usually immediate and obvious. Human activities often upset the natural balance of wetlands and protected rivers. They degrade rivers and create health risks to local communities. In a well conserved catchment, wetlands filter and holder water slowly releasing it into the surrounding habitats and communities. River-bank vegetation slows down flood waters and traps silt. This maintains the erosion at its natural slow rate. In a stable system, nutrient substances are washed into waterways slowly enough for the web of interdependent organisms to use. (Green, water quality monitoring in Southern Africa.)

Unfortunately, the draining of wetlands, the removal of river-bank vegetation, increased soil erosion and the inflow of nutrient rich effluent have severely degraded many catchments and rivers, threatening human economic activities and health.

On this field trip the class will be divided into groups of six students each. Each group will be assigned to a section along the stream.

Each group should have:

2 polystyrene cups
glass jars and a paint brush
pH paper

The other equipment you need must be shared and can be collected from a central point.

The worksheets will guide your investigation of the Jukskei River as it flows through the suburb of Observatory. Human impact has reduced much of this river system to an open gutter, and human activity has destroyed this river's natural ability to cleanse itself effectively.

This research project is best done as a group activity in four stages:

ASK

CHECK

TEST

REPORT

ASK

Aim

- to find out about the history of the Jukskei River and its catchment.

Method

- Read books on the history of Observatory, Johannesburg.
- Find out about the geology and geography of the area by looking at old maps.
- Interview people who have lived here for many years to find out how the river has changed.

Check

Aims

- To investigate the catchment area. To find out what activities occur here which will affect water quality.

Method

- Observe the catchment by answering the questions below.

CATCHMENT OBSERVATIONS

1. Where is the source of the river?

   .....

2. Is this river seasonal or perennial? Explain what these words mean.

   .....

3. Who lives in the catchment area?

   .....

4. How is the land used in this area?

.....

5. Observe the bottom of the stream. Record the type of bottom- sand, mud, rock, gravel etc. Note also the material making up the banks of the stream.

6. Determine the speed of the current. You do this by placing a twig or something that floats in the middle of the stream and measuring the time it takes to travel along a measured distance say 1 to 2 metres.

Speed of current = $\frac{\text{distance travelled}}{\text{Time taken}}$

7. Take a look at the riverbank vegetation. Are there any plants growing on the river bank at all?

.....

8. Is the vegetation natural or has it been disturbed by people?

.....

9. Any other observations.

CHECK POLLUTION

Aim

- to record the visible pollution in the river and on the river banks.

Method

- Observe the catchment closely using the questions headed River Observations.

Did you know? If you shake some river water in a bottle and foam appears on the surface there is a good chance that it contains soap (detergents which are high in phosphates)

CHECK THE HEALTH RISK

Aim

- To investigate the health risk of the water. Is it polluted? Is it safe to drink, wash in or swim in?

Method

- Use your senses to see and smell if the water is safe to drink.
- Use the questions below to guide your observations.

1. Are people washing or bathing in the river?
2. Fill a glass with river water – Smell the water LOOK at the colour

DO NOT TASTE the water.

3. Use the information from the river observations to assess the health risk.

TEST FOR AQUATIC ORGANISMS

Aims

- To find and identify the animals that live in the water
- To use the number and type of organisms found as a guide to determining the water quality. (Such organisms are called bio-indicators)

Method

- Use the handout called "Sampling common water life" and the water quality card.

RIVER OBSERVATIONS:

Name of River .....

Observation point/s .....

Litter (Plastic, paper, catons and cans) .....

Sewage contamination and animal faces (Cloudy grey or green slime)

.....

Waste water from household washing (Soap froth)

.....

Factory effluent (Oil, froth or sludge)

.....

Dead animals (Dogs, cats, birds, frogs etc)

.....

Soil erosion (Muddy water)

.....

Destruction of riverbank vegetation

.....

Any other observations

.....

Rating scale for assessing river observations:

0%	25%	50%	75%	100&
Entire river Severely contaminated				River clean and well conserved

RIVER QUALITY SCORE

Sampling common water life

Method 1: Brush five rocks

Pick up large stones from the centre of the Stream, look under each and carefully brush all of the organisms into a tub or bucket.
The animal life from 5 large stones should be sufficient for completing the table opposite.

To assess diversity, record the number of different types of organisms found.

Method 2: Brush sampling into D- frame net.

Approach the sampling area from downstream and place the net firmly on to the stream bed. Brush off the larger upstream stones holding them underwater and in the mouth of the net. Finally, kick up the remaining smaller stones in the stream bed starting upstream and working your way towards the net. Wash the organisms into the collecting jar and complete the table opposite.

Using the water quality card

Use the pictures on the back of the card to identify organisms and complete the table on the right with the numbers found. For a quick assessment of water quality, match the pattern of organisms found with the blocks in the windows on the front of the card. Turn to page 27 to match your data with the card and for a rating scale of water life observations.

Please return the animals to the river after identification and counting.

Water Life Observations:

Weather conditions .....

(Both on the day of the observations and for the weeks preceding them, if floods or dry.)

Some common animals sensitive to, or tolerant of, water pollution

ORGANISMS	Number Found	Sensitivity Rating	TOTAL SCORE	
1. Mayfly nymph		4		Score for extremely Sensitive organisms (1-2)
2. Stonefly nymph		4		
3. Caddisfly larva		3		Score for sensitive Organisms (3-4)
4. Flatworm		3		
5. Dragonfly nymph		2		
6. Whirligig beetle		2		Score for moderately sensitive organisms (5-8)
7. Water snail		2		
8. Blood worm		2		
9. Rat-tailed maggot		1		Score for pollution tolerant organisms (9-10)
10. Sludge worm		1		
11. Water algae		1		Total score for test site (1-11)

Other water organisms found at the sampling site (List)

Total number of different types (diversity) of animals found.
(1-11 + other organisms listed above)

Note: *Sampling water life can provide the most reliable, most variable, least objective but most useful assessment of water quality, all in one! Use the card as a start and talk to experts to develop a more accurate scale of indicator organisms for your area.*

Interpreting Results

The higher the score the better the water quality, High diversity and good populations of organisms 1-6 usually indicate a stable ecosystem. Strings of water algae and low diversity suggests severe nutrient enrichment.
Remember, sampling water life merely provides a rough indication of water quality. It is not always conclusive and other tests should be done before one can be sure that the water is safe to drink.

- Dredge out some mud and filter in to look for additional organisms. Add these to your list.
- place a sample of water on a microscope slide and see if you can identify additional organism. Add these to your list.
- Take not of the plants growing next to the stream. Record the number and type of plants growing at your site. List the plants as submerged, floating or emergent (rooted in the bottom with stem and leaves above or on the water surface). Note if any of the rocks have algae or other plants growing on them. Collect a sample of algae and examine it under the microscope.

TEST for bacteria and oxygen

Aim

- to find out if there are many bacteria in the river

Method

- Carry out the "Methylene Blue test" as outlined below.

In the classroom
Sterilise the two 30ml bottles by boiling them in tap water for 5 minutes. Label one bottle TEST and the other CONTROL.

A Fill the test bottle to the very top (almost overflowing) with river water. Using the dropper place 3 drops of methylene blue on the top of the water. Screw the lid onto the bottle. Turn it upside down to check that there are no air bubbles. (Air bubbles contain oxygen which will dissolve in the water. This will confuse the results of the test).

B Fill the bottle labelled CONTROL with river water that has been boiled and allowed the cool. Do exactly the same as you did with the TEST bottle: Add 3 drops of methylene blue, close the bottle and check for air bubbles.

What is the difference between the water in the test bottle and the water in the control? Why do you think both bottles have been included in the experiment?

C. Put both bottles back into their place in the box, put the lid on and turn the box onto its side so that the bottles are standing upright. We do this for two reasons:

We are INCUBATING the two Bottles of river water. This Means keeping them at the Same constant temperature We know that temperature Affects the dissolved oxygen Levels in water

The water must be kept in a dark place because bacteria grow in the light We want to know how many bacteria are in the water now not how many will grow if we breed them

- set up the coliform bacteria test explained in the notes. (There are only a limited number of these kits so make sure you return the equipment when you are finished.)

Sampling Coliform Bacteria In Fresh Water

1. Sterilisation
Wash your hands thoroughly and boil all equipment for 10-15 minutes to sterilise. The use of a bathroom tile as a lid provides a sterile surface upon which to assemble filter units. Remove the equipment from the boiler with sterile forceps and assemble the base of the filter unit, ensuring that the flat surface is uppermost.

2. Filtration unit
Press into place a sterile pad and filter membrane, taking care not to touch any of the sterile surfaces with your fingers. Press the top container into place and check that there are no wrinkles in the filter membrane. Finally, assemble the syringe, place the petri dish and its sterile pad with a sterile stick and the laurel sulphate broth in a zip-lock bag.

3. Water Sample
Use the syringe to collect a 5ml sample of river water from just below the surface. Take care not to suck up any debris. Squirt the sample into the top of the filter unit. Add the same amount of sterile water to flush the syringe.

4. Filtration
Holding the filter unit upright, use the syringe to suck the sample through the filter membrane. Gently swirl the filtration unit and apply a slow, even suction. Keep the filter upright to ensure an even distribution of bacteria on the membrane. (To vacuum a second time remove the syringe, push in the plunger and then suck again).

5. Transferring filter to petri-dish
Saturate the pad in the petri dish with laurel sulphate. Take off the top of the filter unit and squeeze the sides until you force up the edge of the membrane filter and pad, Finally use the sterile stick to lift the filter membrane, leaving the pad behind. Place the membrane grid-up on to the saturated pad in the petri-dish.

6. Incubation
For "body-heat incubation" of total coliform, place the petri-dish in a zip-lock bag and incubate against the skin for 24 to 36 hours.

NOTE: The grid must face the skin. For faecal coliform put the petri-dish in an incubator at 44°C for 12-24 hours.

Keep the zip-lock bag sealed and the petri-dish closed at all times, even when counting colonies.

Count the yellow coliform colonies, across the grid from top left to bottom right as you would read a book. To ensure accuracy count 3-4 times.
For a 5ml sample, multiply your coli-count by 20. See overleaf to interpret results and to calculate a water quality score (Q-value).

Note: If the pad is mass of yellow small colonies do another test decreasing the sample size.

A filter unit can be fairly reliably used to take a second sample if you rinse it out with sterile water and put in another sterile filter.

'RECYCLING' EQUIPMENT:

After counting, empty the contents of the petri dish on to a compost heap.
Compost bacteria will break down coliform bacteria when they are out of their preferred habitats (our intestines and fresh water). Wash all of the equipment in water soapy water, then rinse and sterilise to use once again.

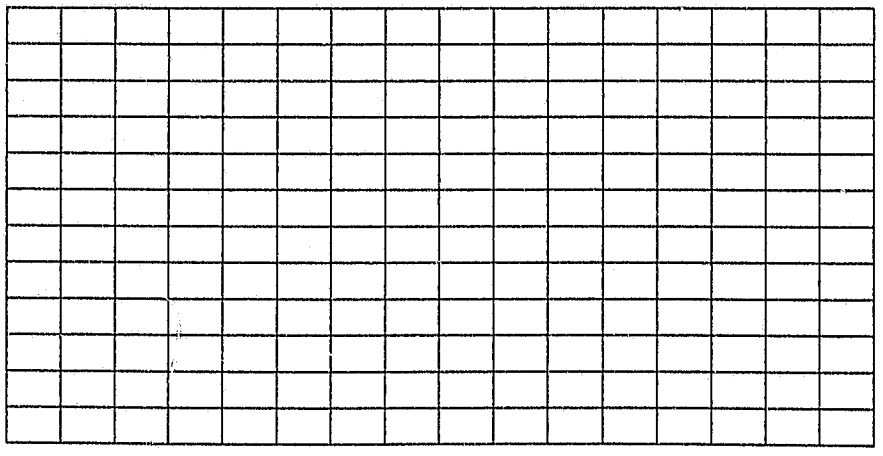
Interpreting coliform counts (Count yellow colonies incubated at body heat for total coliform (TC)* or yellow colonies incubated at 4 °C for faecal coliform (FC)*)

	Safe / acceptable standard	*USA*	*RSA*
	Drinking water	*1TC / 100ml*	*1TC / 100ml*
	Body contact (no swimming)	*200 FC / 100ml*	*500FC / 100ml*
	Serious health hazard (no boating	*1000FC / 100ml*	*2 000FC / 100ml*
	Treated sewage returned to river	*< 200 FC / 100ml*	*< 500 FC / 100 ml*

Results:

Record a mean colicount .....colonies / 100ml and use the graph below to get a water quality score (Q-value).

CHART 2: Faecal Coliform (FC)



FC/100ml

Note: If FC> 100 000 per 100ml then Q = 2

* **Note:** *(TC) Total coliform includes bacteria from cold-blooded animals and from soil. Research suggests that TC counts are usually ten times higher than FC. (FC) Faecal coliform bacteria are from the faeces of warm blooded animals*

TEST the temperature, ph, nitrates and turbidity

Aim

- to measure these aspects of the river and to decide if it is normal or if it has been disturbed.

Method

- use a thermometer to measure the temperature at different depths. (there are only three thermometers so please return them to me when you have finished)
- use the pH stick and colour charts
- Use the discs and the plastic bottles as indicated below to measure turbidity.

Testing water temperature

Fill one of the glass bottles with water and insert the thermometer. Wait for two minutes, and read the temperature. Take at least two readings so that you can make a comparison. For example, before and after a tributary meets the river before and after effluent from a factory enters the river; before the river enters a town and in the town itself. If you take the readings at different sites, be sure that they are similar sites, and sample at the same depth.

N.B. When filling the bottle submerge it upside down and turn the bottle over when it is about 10cm below the surface of the water. This is especially important when measuring the temperature of slow-moving or standing water. The temperature should be measured immediately after filling the bottle so that the water does not become warmer or cooler.

Interpreting results

Get local advice in interpreting the results (from the local conservation authority or water utility). Take into account the time of day (early morning or late afternoon) and the time of year (winter or summer). Daily fluctuations in water temperature are generally small (2°C- 15°C). A winter temperature of 14°C – 19°C is typical for South African Rivers. Summer temperatures typically range between 25°C and
30 °C

Temperatures Generally too high or too low for fish to survive.	*Temperature Suitable for hardy species, but not for spawning*	*Temperatures suitable for all species but spawning of hardy species only*	*Temperatures suitable for spawning of most species*	*Temperatures suitable for spawning of all species*

Water (H20) contains hydrogen ions (H+) and hydroxyl ions (OH). Pure deionised water contains equal numbers of H+ and OH ions and is considered neutral (Ph 7), neither acid nor basic. If the sample measured has more H+ ions it has a pH less than 7 and is considered acid. If it has more OH ions than H+
ions it is considered basic and has a pH greater than 7.

Many H+	equal numbers	many OH
0	pH7	14
Acid	neutral	alkaline

Rainwater is naturally slightly acidic but the type of rocks and minerals in a catchment usually determines the pH. Limestone is alkaline and basalt very slightly acid. Atmospheric pollution (nitrogen oxides & sulfur dioxides) from vehicles and thermal power stations produces acid rain, a serious threat to aquatic systems particularly in the Eastern Transvaal. Sewage and industrial effluent discharges can also effect the pH balance of rivers.

1. Dip the pH stick into a water sample for About 15 seconds or until a colour change Has taken place.

2. Compare the dip stick with the colour code And read-off a pH value.

Dip sticks are convenient and reliable for testing the pH of water. They are, however, fairly costly so do not waste resources by doing this test more than once. To save costs cut the sticks in half with a pair of clean, dry scissors.

Interpreting test scores

PH can be high with high photosynthesis and can vary over a 24 hour period. For comparative testing of rivers, or for eutrophic (very enriched) systems, ensure that testing is done at the same time of day. The pH of healthy rivers is usually neutral (7) or ranging between 6.5 and 8,5. Many rivers in the south western cape have a pH of 4-5. PH can be linked to aquatic life observations (See Stapp, 1990 p43)

Results:

Record the pH ..... units and use the graph below to convert this into a Q-value.

Note: if pH<2 the Q-0
If pH > 12 then Q-0

Contrast the river with the canal on the south side of the park.

1. Consider why the river is in a man made concrete canal.

2. Conduct a five minute search for plants and animals. List those animals that you have found and compare the list to the list of organisms found in the stream. Explain possible reasons for any differences, if any.

Other questions to consider:

1. In which type of area were algae, moss and liverworts most abundant? Suggest a reason for this.
2. What factors could cause changes in the phosphate, nitrate and ph level in the stream.
3. What daily changes do you think occur in this ecosystem?
4. Which plant and animal types were most common in this ecosystem?
5. How do bank height, plant cover and composition of the bank affect erosion?
6. Does the amount of shade and light affect the organisms in the stream?

Evaluation Sheet on Water Access and Conservation

1. Siting of Reservoir

2. Water Conservation (poster with circles)

3. Water for Jabula Squatter Camp

4. Water Consumption (Pie Chart, Bar Graph and Balloons)

5. Water Transfer Schemes (Video on Tugela - Vaal, LHWP)

6. Role play on different water sector consumers

7. River Study at Bezuidenhout Park

Water

1. Siting of Resevoir

It was very interesting to see how people were selfish and only thought about themselves and it was actually quite difficult to decide on who to listen to because on both sides people's lives would be disturbed.

2. Water Conservation (poster with circles)

I learnt how people use water and think it's a easy way in which to get rid of different kinds of waste The poster was a nice way to do the lesson and I could also express my values and attitudes.

3. Water for Jabula Squatter Camp

From this section I learnt that water was valued so much more by other people than by us, that just open our taps and let them run. It was sad that these people had no where to live and had no water and sanitation facilities ther.

4. Water Consumption (Pie Chart, Bar Graph and Balloons)

From the pie chart I found out alot I didn't know, like who used how much water. The balloons showed us how the whole ecosystem was affected by pollution.

It was interesting to see how familys used ~~how~~ water and how much for each thing.

5. Water Transfer Schemes (Video on Tugela - Vaal, LHWP)

I enjoyed this section because I learnt alot. I didn't really know where the water we got was from and what we would do if anything happened, such as if the level dropped.

6. Role play on different water sector consumers

The Role play was a good way to do the lesson on different water sector consumers. We learnt how people could be selfish and only thought about themselves because it was to their benefit

APPENDIX C

COAL MINE AT THE VAAL RIVER UNIT

Plan of Lessons

1. **Living in South Africa**
2. **Lesotho Highlands Water Project**
3. **Introduction to Coal Mine at the Vaal River**
4. **Preparation for Public Enquiry**
5. **Public Enquiry**
6. **Environmental Impact Assessment**
7. **Drakensberg Fieldtrip**

Environment Questionnaire 1 **Name:**_____

References:

Huckle, J. (1982). "Teaching Environmental Issues: A Workshop On Nuclear Power," In *New Leads In Geographical Education* pp. 53-56 (Bedford College)

Issue	Strongly agree	agree	neutral	Disagree	Strongly disagree
1. We are approaching the limit of the number of people the earth can support.					
2. The balance of nature is very delicate and easily upset.					
3. Humans have a right to modify the natural environment to suit their needs.					
4. Humankind was created to rule over the rest of nature.					
5. When humans interfere with nature it often produces disastrous consequences.					
6. Plants and animals exist primarily to be used by humans.					
7. To maintain a healthy economy we will have to develop a "steady state" economy where industrial growth is controlled.					
8. Humans must live in harmony with nature in order to survive.					
9. The earth is like a spaceship with only limited room and resources.					
10. Humans need not adapt to the natural environment because they can remake it to suit their need.					
11. There are no limits to growth beyond which industrialised society cannot expand.					
12. Humankind is severely abusing the environment.					

Environment Questionairre
Name: _____ —.

Issue	strongly agree	agree	neutral	disagree	strongly disagree
1. We are approaching the limit of the number of people the earth can	✓				
2. The balance of nature is very delicate and easily upset.		✓			
3. Humans have a right to modify the natural environment to suit their needs.				✓	
4. Humankind was created to rule over the rest of nature.					✓
5. When humans interfere with nature it often produces disastrous consequences.	✓				
6. Plants and animals exist primarily to be used by humans.				✓	
7. To maintain a healthy economy we will have to develop a "steady state" economy where industrial growth is controlled.		✓			
8. Humans must live in harmony with nature in order to survive.	✓				
9. The earth is like a spaceship with only limited room and resources.		✓			
10. Humans need not adapt to the natural environment because they can remake it to suit their need.			✓		
11. There are no limits to growth beyond which industrialised society cannot expand.			✓		
12. Humankind is severly abusing the environment.	✓				

Lesson 1 **Living in South Africa** **Name:**_____

References:

Living in South Africa video (details unknown)

Groups	Values	Attitudes	Behaviour
FISHING **Big fishing Companies**			
Local fishermen			
ELECTRICITY **Power stations**			
Township residents			
WATER **Rural dwellers**			
Urban dwellers			
SABIE RIVER **Plantation owners**			
Commercial farmers			
Game parks			
Rural dwellers			
Narrator			
Me			

Living in South Africa Name:

Groups	Values	Attitudes	Behaviour
FISHING big fishing Companies	making money	Doesn't care about local fisherman	the more fish the better
local fishermen	They value the fish because it bring income	angry because life is very hard.	against the fishing companies
ELECTRICITY power stations	The importance of electricity	sacrifices must be made to provide	To drive the economic growth
township residents	want electricity	if there was electricity, their lives would be better	use wood for cooking, no electricity.
WATER rural dwellers	water ↓ availability	water to survive	~~[illegible]~~ unhappy ~~[illegible]~~ about ~~[illegible]~~ walking for water
urban dwellers	the ~~[illegible]~~ clean water that is supplied	more water is needed	more water usage
SABIE RIVER plantation owners	grow crops to export		using water to make money
commercial farmers	~~[illegible]~~ need water for crops	~~[illegible]~~	use less water
game parks	value animals and plants	Expand the land because of tourism	Working together to save water
rural dwellers	need water	They need it more than animals	They want more availability to the water resource
narrator			
me			

Lesson 3

Introduction to Coal Mine at the Vaal River

Allen, A. (1997). "Selling Paradise Down the River" in *The Star*, 10 February, 1997

Sellschop, S (1996). *SAVE Newsletter* , December, 1996, (Zuurfontein, SAVE)

Sellschop, S. (1997). "Battle to Save Wetlands Continues" in *Sandton Chronicle*, 28 March, 1997, pp. 15

Van Eyssen, B. Sasol Plan to Open Strip Mine Infuriates Vaal Residents, (undated)

Selling 'paradise' down the river

When a couple bought a home on the banks of the Vaal in 1943, they had no idea of the tragic changes ahead

By Rusta Fallon
Science Writer

In 1943 a young couple, Jack and Susan Sellschop, bought their piece of paradise on the banks of the Vaal River. Since then they have watched refineries, power stations, steel mills, factories and other industries spring up around them and the creation of a whole town, Sasolburg, with sprawling townships.

Today, air pollution in the region is considered a health hazard, large tracts of land have been degraded to wastelands and wetlands have been drained by farmers. The whole riverine ecology is undergoing profound change, which adds up to a massive loss in biodiversity of the various ecosystems.

The Sellschops, and other residents on the Gauteng bank of the Vaal River near the Barrage, tolerated the burgeoning development around them while they were screened from the worst impacts. But the latest development proposal has them up in arms. According to this project, Sigma Colliery intends to open a mammoth open-cast coal mine opposite their

Residents are being held to ransom

The three Free Staters who own surface rights on land to which Sasol, as the holding company, has the mineral rights are facing developments which they knew would happen one day – and they will be compensated for the farmlands they will lose.

In contrast, shock and horror was the reaction from residents on the Gauteng bank of the river, who will look straight on to the strip mine, and investors in the multimillion-rand Boschenvaal property development next to the proposed mine.

Like thousands of South Africans across the country who are faced with developments on their doorstep, Vaal River residents have been drawn into participating in an official assessment of the impacts of the mining proposal.

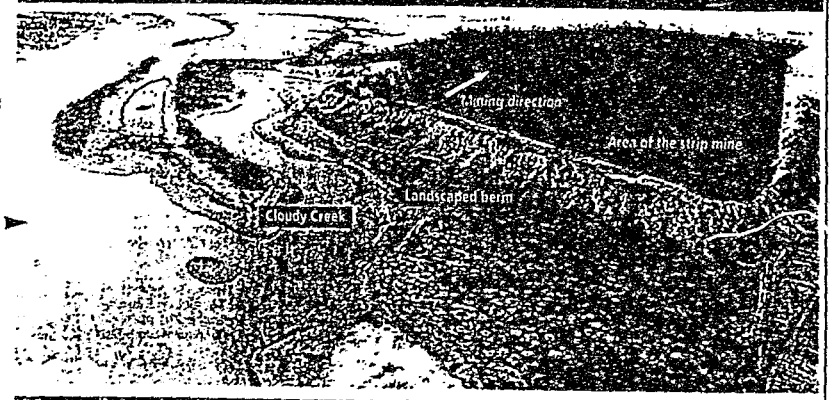
Most residents feel that this is rather like conspiring in arranging one's own demise. But in one respect they are fortunate: the Environmental Impact Assessment (EIA) conducted by consultants Walmsley Environmental Consultants, promises to be a model affair.

The first phase of the EIA, known as scoping, is now complete.

PROPOSED STRIP COAL MINE ON VAAL RIVER

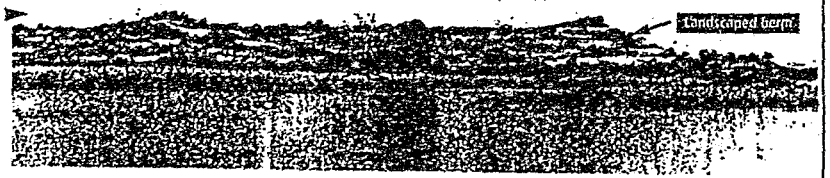
Sigma Colliery's proposed strip mine on the banks of the Vaal River near the Barrage, has shocked residents in the area. But like thousands of South Africans across the country who are faced with some or other kind of development on their doorstep, Vaal River residents are participating in an official assessment of the impacts of the mining proposal.

THE MINE AREA



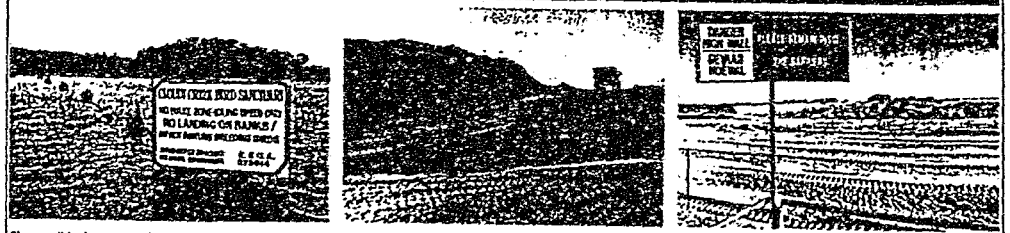
The mine area, with Cloudy Creek on the left and an artist's impression of the berm. The area will be mined in strips progressively moving in a southwesterly direction. The coal lies between 40 and 55m from the surface and the lifetime of the mine would be about 20 years.

VIEW FROM THE OTHER SIDE OF THE RIVER



The view of the mine from the Gauteng bank of the Vaal River, after the construction of a 25-35m high berm. This is about the height of a seven-storey building.

CLOUDY CREEK DURING THE OPERATION ... AND AFTER



The possible destruction of Cloudy Creek, a popular bird and fish breeding area, is a major concern. This issue will have to be addressed by the developer

Mining will start with a boxcut, literally a huge hole in the ground to uncover the first coal.

Once the coal has been removed, the original soils are replaced and the area is landscaped and revegetated.

GRAPHIC: FRANCOIS SMIT

fected parties (IAPs). The more than 600 IAPs identified have been given the opportunity to raise issues of concern to them.

And these have been recorded in a scoping report, which was completed last week.

The purpose of this scoping phase was to determine the extent of the EIA – all the factors of concern values – that the developer will have to address.

A reading of the scoping report shows that interesting challenges lie ahead for developer and IAPs alike. For example, residents feel the strip mine is the last straw in a long history of environmental degradation that is of national importance. However, the Department of Environmental Affairs and Tourism (Deat) does not

David Rudolph of the Deat's Directorate of Environmental Impact Control, said his department had no interest in the proposal. It was not a "national issue" and therefore responsibility rested at the provincial level.

The South African Bass Association is objecting to the proposed mining on the grounds of its negative impact on bass breeding and fishing, including local bass and trout – has possibly caused more irreversible environmental damage than mining on the highveld," was the reaction from one ichthyologist who wrote to the consultants.

To date I doubt that any mines have resulted in the complete eradication of certain minnow species in rivers. The introduction

Eastern Cape, Western Cape and Lesotho being totally denuded of endemic minnows. We must be careful of pandering to the breeding needs of aliens in South Africa."

Other ichthyologists and fisheries scientists would support a programme on the Vaal River to eradicate the pesky alien bass, the ichthyologist said.

The scoping report for Sigma

available to all IAPs. In the next investigative phase until December, various environmental and specialist studies will be conducted to provide scientific-based information on the impacts of the development and issues raised by IAPs.

In January a draft Environmental Management Programme Report (EMPR) will be prepared. This EMPR is a legal requirement under the Minerals Act and entails a detailed environmental management plan laying out how the strip mine would be run, as well as rehabilitation of the environment disturbed by mining.

The draft EMPR also has to include a list of all the issues raised by the IAPs and how these were addressed. In February this will be made available for IAPs to comment on and thereafter it will be finalised and submitted to the regional director of Mineral and Energy Affairs (MEA), who decides whether a permit to mine will be issued or not. At that stage, if objectors are not happy with the decision, they can take it on appeal to the national director-general of MEA.

Mining is never an ecologically friendly option. By its very nature it always has a permanent impact on the environment, so costs must always be evaluated against benefits. This is precisely what the EMPR requirements under the Minerals Act have been designed to achieve.

Vaal River residents, like other South Africans drawn willy-nilly into development on their doorsteps, are serving their own interests best, by fully participating in the EIA exercise.

"The intense interest in the project has been of significant benefit to the scoping programme," the consultants comment. "It has ensured that issues of most concern to IAPs have been captured in the planning phase of the project and studies for the EIA."

A crucial issue that objectors have raised is the question of the true costs – and sustainability – of not only Sigma's mining operations, but also nearby Sasol Chemical Industries, which buys its coal. If the mining does not go ahead, Sigma argues, 3 000 people comprising virtually the whole town of Sasolburg will have to be retrenched with far more long-term and far-reaching impacts than the mine will have on a relatively few individuals.

But for Vaal River residents it is cold comfort that they are being held to ransom for the sake of the good of society at large. In the end, there must be a balance between the rights of the individual and the common good and that is exactly what the Sigma Colliery

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NEWSLETTER December 1996

TO ALL SIGNATORIES OF THE SAVE SUPPORT AND MEMBERSHIP FORM.

It is now seven months since Sasol announced their intention to mine the North West Strip Mine on the Rietspruit wetland and six months since SAVE was formed to oppose this proposal and to protect the environment of the Vaal area in general. This is the first NEWSLETTER to be distributed, giving you information on the process to date and the plan for the future. The committee of SAVE would like to thank you for your support and hope you will spread this information so many more concerned people can be informed so as to prevent this potential environmental disaster.

The first important decision made by the newly formed committee of SAVE was to appoint Duard Barnard to act as the environmental legal advisor. Duard is experienced in fighting environmental issues and is expert in the new planning, environmental and mineral legislation. He is also familiar with the constitution and the rights of communities to be involved in planning decisions and in that way to fight enviironmental degradation. The committee has gathered information to verify that mining is not the best use for this land and that the cost to the community far outweighs the potential savings that Sasol would make by strip mining the wetlands which, according to them, is their cheapest option. The decision to switch from underground mining will not only devastate the environment but result in the net loss of 1300 jobs.

The EIA (Environmental Impact Assessment) being carried out by Andrew Duthie of Walmsley & Associates was flawed from the start. The bias towards Sasol is obvious and has been continuously demonstrated in his words and actions. He seems determined to demean the wetland that covers 1800ha and is under consideration for Ramsar status. The most important function of the wetland is that it acts as a filter. The Rietspruit catchment feeds 2 million cubic meters of water into the Vaal River system annually. SAVE has a Landsat image which has been ground truthed by a wetland expert, clearly showing the extent of the wetland. The wetland contains all species of South African waterfowl and, with its surrounds, is habitat for 237 species of bird and at least 20 mammal species.

In addition to the wetlands, the tranquil surroundings and the beautiful Vaal river would be seriously impacted upon by the noise, light and dust pollution, if the mining were permitted on this last unspoiled, natural stretch of the river banks. It now seems certain that boreholes on both banks of the river would be contaminated and could dry up as the underground water systems are all linked via the general water table. All this for only twenty years of low-grade coal.

Shortly after SAVE was constituted, an informal meeting was held with Peter Cox and Paul Kruger, Sasol's senior executive. It seemed important to tell them personally of

our objections to the project and to ask for access to the information on their three alternate sources of fuel for Sasol Chemical Industries (SCI) which they had investigated. This request was refused. Nevertheless, in the interim, SAVE has identified 11 sources of alternate feedstock that could be used instead of mining the Rietspruit wetlands.

SAVE has made a concerted effort to bring this potential environmental disaster to the notice of the public. We have had many newspaper and periodical articles published as well as a slot on Carte Blanche. So far we have over 1000 signatories supporting our cause and hope to get many more. SAVE is funded solely from donations, most of which is spent gaining professional legal advice. The Save accounts are open on request for scrutiny.

Sasol have attempted to spread false rumors that SCI would close if they were prevented from mining the North West Strip Mine. According to Mr. Kruger of Sasol, this is not the case. Sasol have also attacked SAVE as an elitist group but residents of Sasolburg and Zamdela are members of the association as well as many other concerned people. The Zamdela Environmental Steering Committee (ZESC) has approached SAVE to collaborate on parallel environmental issues such as air and noise pollution affecting their community.

The SAVE committee is continuing to meet with Sasol to try to obtain an impartial EIA. They are also concerned about Wonderwater and other shafts belonging to Sasol that do not have Environmental Management Programmes (EMPs) in place and are therefore not following the rule of the law. SAVE is lobbying Sasol to correct this situation.

The committee of SAVE thanks you for your concern and undertakes to do everything in its power to prevent the mining of the Rietspruit wetlands.

Ian Player will be the guest speaker at the next report back meeting to be held on Sunday 12th January so diarise this date as it will be an important event for SAVE and should not be missed. SAVE T shirts are now available. For further information contact the SAVE numbers listed below. The SAVE URL is http://save.org.za

Susan Schschoop.

Chairperson SAVE

NEXT SAVE MEETING

Date;	*Sunday 12th January 1997*
Guest lecturer;	*IAN PLAYER*
Place';	*Vaalview Aquatic Club ; Plot 230 Vaal view*
Time ;	*10.00 am*

SAVE

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Week ending March 28, 1997 SANDTON CHRONICLE Page 15

Battle to save wetlands continues

Susan Sellschop, chairman of SAVE (Save the Vaal Environment) reports back:

THE committee of SAVE would like to thank all Caxton readers - and the Sandton Chronicle and Rosebank Killarney Gazette, in particular - for their support in the campaign to save our wetlands from being strip-mined.

Conservationist Ian Player was the guest speaker at a report-back meeting which was held on January 12.

The SAVE committee has appointed Duard Barnard as their environmental legal advisor, an expert in the new planning, environmental and mineral legislation.

The SAVE committee has gathered information to verify that mining is not the best use for this land and the cost to the community outweighs any potential savings Sasol would make by strip-mining the wetlands - their cheapest option. The switch from underground mining will not only devastate the environment but will also result in the net loss of 1 300 jobs.

We believe the Environmental Impact Assessment carried out was flawed from the start with a bias towards Sasol. The study demeans the wetland that covers some 1800 hec and is under consideration for Ramsar status. The most important function for the wetland and Cloudy Creek is that it acts as a filter. The Rietspruit catchment feeds 2 million cubic metres of water into the Vaal River system annually.

SAVE has a Landsat image which has been ground truthed by a wetland expert clearly showing the extent of the wetland which also contains all species of South African waterfowl, 237 species of birds and at least 20 mammal species.

Apart from the potential destruction of this last unspoiled natural stretch of the river, strip mining will bring noise, dust pollution and the possible destruction and contamination of the underground borehole and underground water systems linked to the general water table.

In a meeting with Peter Cox and Paul Kruger, senior executives at Sasol, we voiced our objections to the project and requested access to information of the three alternate sites for fuel for Sasol Chemical Industries. This request was refused. SAVE has however identified 11 sources of alternate feedstock that could be used instead of mining the Rietspruit wetlands.

We will continue to meet with Sasol to try and obtain an impartial EIA.

Sasol's open-cast mine an ecological disaster

Gawie Gouws of Northdene on the Vaal writes:

I READ the Sandton Chronicle's recent article about Sasol defending its mining operation on the Vaal.

I am flabbergasted that the OFS Nature Conservation has given the Wonderwater Open-Cast Mine an "Industrial Conservancy of the Year' award!'

I have lived on the Vaal for 10 years. I currently own a property downwind of and facing this mine at a distance of one-and-a-half kilometres on the -e side of the river.

The name of my property is "Serenity" which has become a sick joke.

Since the mine was established in 1993 our tranquil life on the river has been utterly destroyed. Dynamite blasts rattle our window panes and have caused structural cracks to my home. There is the continuous - 24 hours a day - drone of heavy machinery particularly on a Friday evening when there appears to be a flurry of activity prior to the weekend. I am dumbfounded to read that "Sasol has been extremely sensitive to the need for noise and dust control"....fine coal dust settles on our patio and pool each day - heaven knows how much is going into the river!

After a hard day's work we used to enjoy nothing more than sitting at our boathouse admiring the view with a sundowner. That all changed with the mine. We now have enormous floodlights and 120-ton truck headlights flashing at us continuously.

The "berms" (a euphemistic term for mine dumps) that surround Wonderwater were supposed to be "tastefully sculpted to resemble Suikerbosrand". Please come and look at them. They are sparsely grassed and thoroughly eroded without a natural-looking rock or tree in sight. In addition to all of this, Sigma does not have an approved Environmental Management programme in place for Wonderwater.

You are welcome to verify this with the Regional Director of Mineral and Energy Affairs, Neels Hoek. Sigma has been operating this mine on a temporary permit since its inception, in fact they appear to operate the whole Sigma operation on temporary permits.

Given Sigma's abysmal track record at Wonderwater it is:

❑ Amazing that they be granted a conservancy award.

❑ No wonder SAVE and all river residents are so utterly opposed to another, far learger strip mine being opened against the Vaal.

The new mine, with drag lines and even bigger machinery can only be worse than the current Wonderwater mine.

Big business has a habit of paying lip-service to the environment while chasing massive short-term profits for already wealthy shareholders. (Old Mutual owns 22 percent of SASOL). To SAVE - keep up the good work.

Sasol plan to open strip mine infuriates Vaal residents

BY BENITA VAN EYSSEN

The owner of an ecologically sensitive parcel of land next to the Vaal river is taking Sasol to court in a bid to stop the company from strip-mining his property.

Gianni Ravazzotti, an Italian businessman, is preparing to launch legal action against Sasol's coal-mining subsidiary Sigma Colliery, which plans to set up an opencast coal mine on Rietfontein, his 650ha farm on the river's southern bank.

In 1982 Sasol bought the mineral rights to Rietfontein and an adjacent farm. According to the Minerals Act of that year, the land could only be mined using conventional underground mining methods. However, when the act was amended in 1992, opencast mining qualified as a conventional mining method.

Ravazzotti's legal counsel are opposing the establishment of Sigma's North West mine. They say their client bought the land in 1993 on the understanding that mineral rights could only be exploited using underground methods. Sasol responded by saying that, in terms of the current Minerals Act, the company had the right to use the opencast method on the land.

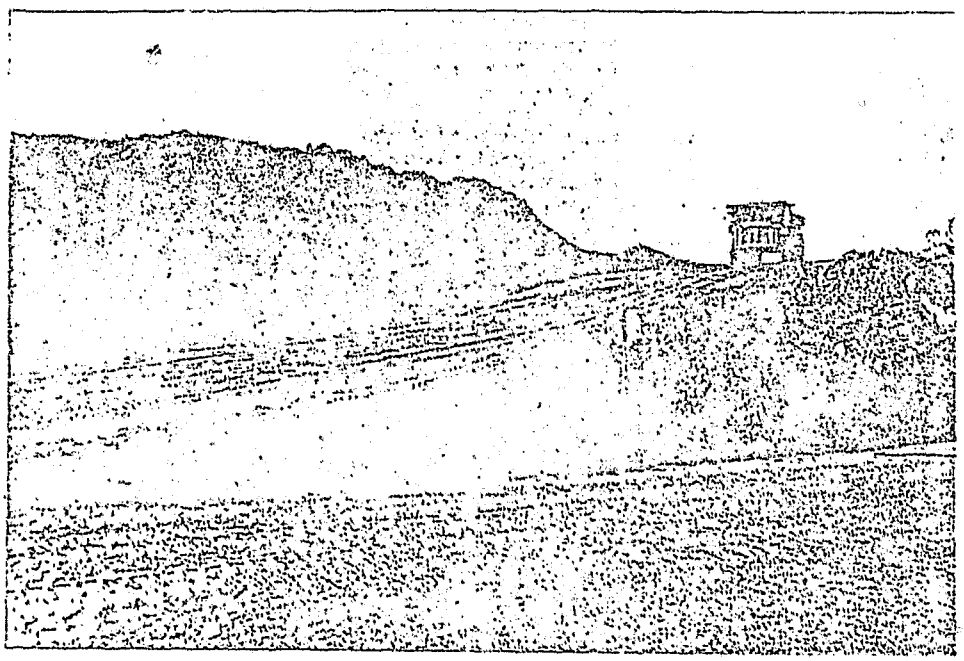
A letter from Sasol responding to Ravazzotti's plans to go to court threatened that Sasol would go ahead with its plans regardless if Ravazzotti did not sell the land. It threatened to do so by applying to the minister of mineral and energy affairs, Penuell Maduna, to "arrange a purchase" of the land in terms of the Minerals Act, or it would apply to have the land expropriated, also in terms of the act.

Last year Ravazzotti had Rietfontein fenced in as a conservation area. Although Sasol said it was "negotiating to buy Rietfontein", Ravazzotti said: "I have no plans to sell but Sasol has already conducted an evaluation of my land."

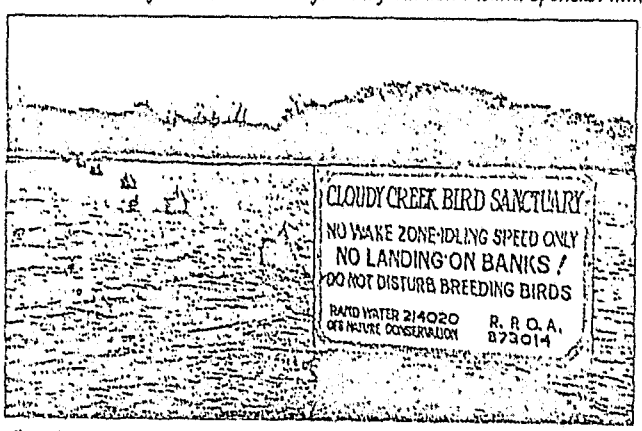
Sasol would go ahead with the Sigma North West mine only after it had completed an environmental impact assessment early next year, a spokesman said.

Ravazzotti is not the only property owner opposed to Sasol's plans. Residents of the area, which has an 1 800ha wetland, believe the land around the proposed mine and possibly the entire area will be destroyed if the project goes ahead. Save the Vaal Environment, an environmental group, appealed to the department of water affairs, which is responsible for final approval, to put pressure on Sasol to abort its plans. Earlier this year Sasol decided on the new mine as the only viable means of obtaining coal for making chemical products.

In June Sasol briefed residents on its intention to explore the area, which is across the river from its Wonderwater strip mine, as a new source of coal. The company assured residents that minimum damage to the environment would occur.



What residents of the area near Rietfontein farm don't want: opencast mining PICTURES: RIAN HOPE



The Cloudy Creek bird santuary is part of the wetland environment that could be upset by Sasol's plan to begin opencast mining in the area

However, residents have conducted their own research and say the area would be irreversibly damaged.

"Besides the damage to the ecology, living here will not be the same again," said a resident, Noelle Bolton. Residents were particularly concerned about the destruction of the wetland, which is inhabited by more than 200 bird species.

The proposed mine will be on the Rietspruit, a tributary of the Vaal river. Sasol plans to redirect the Rietspruit while mining is under way. But, says Bolton, "the mine will obliterate the major part of the river, which contributes two million cubic metres of clean water to the Vaal river's flow each year".

If mining goes ahead, Sasol will erect two 30m berms, or artificial hills, which it claims will shield residents from dust and noise and hide the mine from view. But the berms, residents say, will block off the view of the Free State landscape across the river. Save the Vaal Environment says the berms cannot be an effective barrier against dust and disturbances at night.

Lesson 4

Preparation for Public Enquiry

References:

Asmal, K. (1996). Letter to Ms. Molenaar, 14 August, 1996.

Du Toit, J. (1997). "The Battle of Rietspruit" in *Keeping Track*, February/March, 1997, pp. 16-19.

Molenaar, P. M. (1996). Letter to the President, 24 June, 1996.

SASOL (1997). Sigma Colliery: North West Strip Mine – Environmental Impact Assessment Briefing Document.

Walmsley Environmental Consultants, (1997). "Executive Summary" in *Environmental Management Programme Report for the Sigma colliery: North West Strip Operations*, Vol. 2 (Johannesburg, Walmsley Environmental Consultants).

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Ref.
4/14

14 August 1996

Ms P M Molenaar
P O Box 248
EDENVALE
1610

Dear Ms Molenaar

SIGMA COLLIERY: PROPOSED NORTH WEST STRIP MINE

I refer to your letter in which you expressed your concern for the environment should the new North West Strip Mine go ahead.

Sigma Colliery has not yet formally applied for permission to mine at the proposed mining site on the banks of the Vaal River. Representatives from the Department of Water Affairs and Forestry attended an initial scoping meeting at the Mine on 4 June 1996. The Mine is following the Integrated Environmental Management procedure and is undertaking the scoping exercise, at present.

Objections that were lodged during the meeting, included the following:

- It appears that the no-go option is not regarded as an option. The negative sociological and environmental impacts must be compared to the economic loss the country would suffer, should the project not go ahead.

- The Mine is concerned about transportation costs should coal have to be imported from Ogies but their treatment costs for water prior to releasing it into the Vaal River have not been taken into account. The feasibility of the whole project may be affected by this calculation. The Mine would under no circumstances, neither temporary nor in the long-term, be allowed to discharge water of sub-standard quality into the Vaal River.

- The hydrological link of the sub-strata to the Vaal River has not yet been clarified and therefor the impact the mining would have on the Vaal River is not clear. The Department of Water Affairs and Forestry would not allow mining on the river bank should there be a significant impact on the water regime of the area.

- The proposed berm to screen the mining activity from the residents across the River is planned to be built on a wetland that currently hosts a variety of birds.

Representatives from other State departments made additional comments regarding their concerns. Departments were assured that their concerns would be addressed and that they would receive a report back at a later stage. Until such time and taking cognisance of the fact that a formal application for permission has not yet been received, the Department is obliged to wait for the final Environmental Impact Assessment report before any further comment can be made.

I must agree with you that the oversight of the 10 items that you have listed does not leave one with a sense that the Mining Company is as committed to environmental issues as it obviously is to mining development. We must, however, assume that once brought to their attention, as it has been, the Mine will take environmental concerns seriously.

I would like to thank you for your concern for the environment and would like to offer my continuous support and assistance in this matter.

With kind regards

Yours sincerely

Prof Kader Asmal MP
Minister of Water Affairs and Forestry

JULIENNE DU TOIT explores the issues behind the row over strip mining on the banks of the Vaal.

the battle of Rietspruit

What is it about wetlands that divides cor -vationists? There are still people who are not talking to each other because of St Lucia.

The latest furore is over the so-called Cloudy Creek or Rietspruit wetland on the south bank of the Vaal River, 6km above the Barrage. Sasol wants to strip mine the area with draglines for coal as feedstock for Sasol Chemical Industries, which needs 7 million tons of coal a year to turn into plastics, fertiliser, paint solvents, waxes, explosives and a variety of chemicals. The company does have the underground Sigma mine close by, but Sasol spokesman Alfonso Niemand says that, because of geological stresses, conditions have become too dangerous at that mine – tons of rock are starting to fall from the ceilings of the tunnels. Luckily there have been no casualties so far, says Niemand, but productivity has dropped substantially. The mine will have to be closed within three years.

The problem is that Sasol would be mining in what the anti-mining lobby claims is a very large and important wetland (1 800 hectares), an ancient underground river delta purifying and slowly pushing two million cubic metres of water a year into the Vaal Barrage, according to Rand Water. The Rietspruit itself, Save the Vaal Environment (SAVE) claims, is the only source of clean water flowing into the Vaal Barrage. Sasol plan to dam and divert the stream.

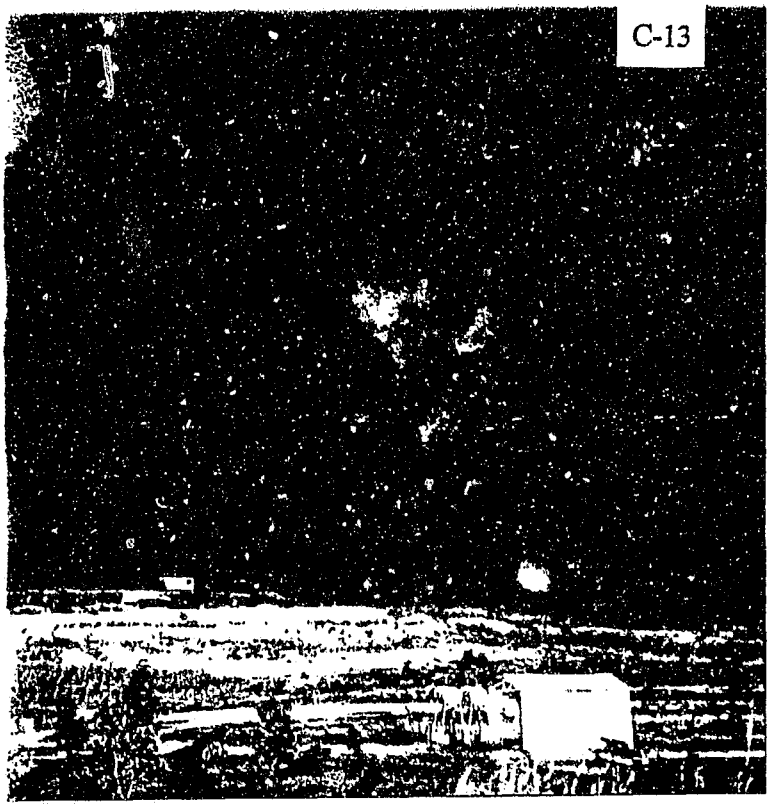
Internationally recognised conservationist Paul Dutton, who was raised in the area, and whose family has property close to where the mining would take place, is vociferously against it.

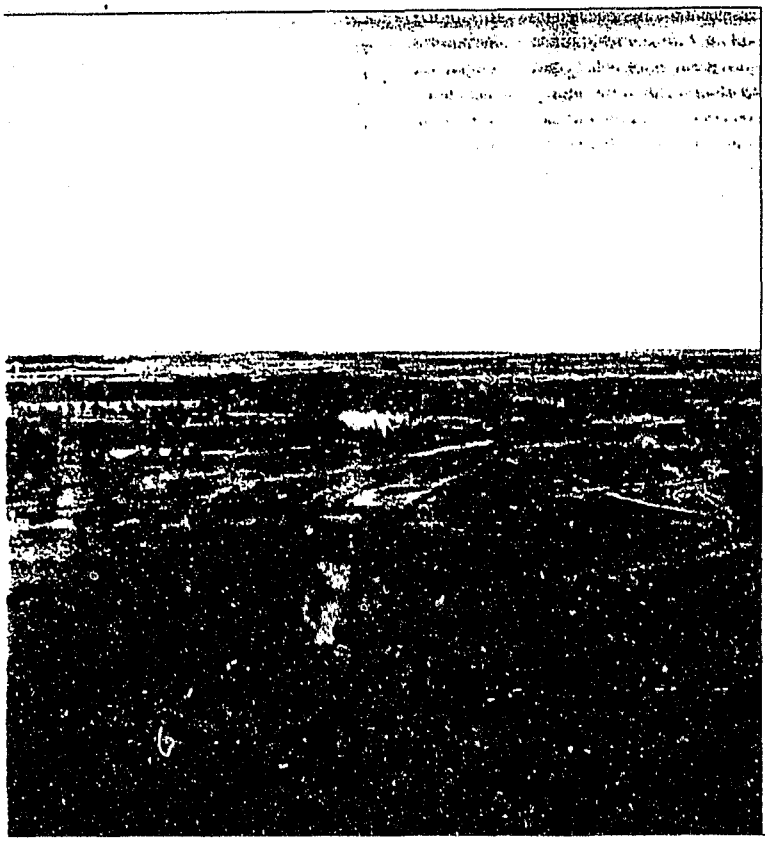
Seen to be on the opposite side of the fence – whether he likes it or not – is Andrew Duthie, who used to be environmental conservationist for the Wildlife Society. Duthie made a name for himself as a man of integrity, a fearless opponent of development if it was not environmentally sound. He moved to Walmsley Environmental Consultants some years ago, and was recently appointed to put together Sasol's Environmental Impact Assessment (EIA).

Duthie is tightlipped at the moment, saying he felt it was premature to comment before the EIA came out in early February (unfortunately, after this magazine had gone to press). All he would say was that more than 10 respected professionals were working on the EIA, and that the real facts would come out in the study. Some of these facts would support what SAVE had to say, but other claims would be refuted.

Dr Ian Player, who championed the fight against dune mining at St Lucia, has also been pulled into the battle, and recently gave a talk advising SAVE members and supporters how to fight potential mining and why it was so important to save wetlands.

SAVE bases its argument on the following claims:





WHAT IS A DRAGLINE?

A dragline is very large machine about the size of a three-bedroomed house with an enormous crane-like attachment and a huge bucket on the end of a series of chains. In one bite it can gouge out the same volume of coal or earth as would fit in the average swimming pool and it is so heavy that it can only be assembled on site. It moves very slowly, shuffling forward at few centimetres at a time on large peg-like structures as opposed to wheels or tracks, and has its own dedicated electrical power supply.

Top: A fire that raged for days on Sasol's property has only made the anti-mining lobby mistrust Sasol's environmental controls even more. Below: The area that could be mined is from this little peninsula southwards. Rand Water had planned to use the peninsula as an animal rehabilitation centre.

- Firstly, that the area to be mined is of great ecological importance, from the point of view of providing a source of clean water into the Vaal Barrage, and from the point of view of the species living there – 242 species of birds and 21 species of mammals, according to SAVE.
- Digging into the wetland, according to Dutton, will negatively alter the hydrology and water regimes, as well as the soil profiles.
- The recreational value of the Vaal Barrage will be affected.
- Property values will go down, collectively, to the tune of R1 billion.
- Sasol is looking only at short-term profits, while forcing nature to pay the price, and mining is not the best land-use option in that area.
- Sasol is overlooking the constitutional right to "an environment which is not detrimental to our health and well-being".
- In any case, strip mining would be difficult simply because it is a wetland. Aerial pictures taken of the nearby Sigma Wonderwater strip mine shows water standing in the box cuts.

will employ only about 250 workers, compared to around 1 500 in the present Sigma underground mine. SAVE has raised the concern that there will be a nett job loss of around 1 300. Niemand says Sasol is even more concerned that a total of 3 000 people – the staff complement at Sasol Chemical Industries in Sasolburg – could lose their jobs if Sasol cannot get its coal. But as Sasol claims that this side of their business earns them several hundred million rand in foreign exchange every year, it seems unlikely that they would seriously consider closing SCI.

SAVE attorney Duard Barnard, in a letter to Minister of Water Affairs and Forestry Kader Asmal, pointed out that as Sasol was making such huge profits (R2 220 million after tax for 1996) it could well afford to buy in coal from Delmas, which SAVE estimated would only take R55 million off post-tax profits.

Sasol has listed this as a possible option, but has declared it unviable, because there would have to be a truck offloading coal literally every minute of the day – a huge, continuous train of trucks between the Witbank area and Sasolburg. Niemand says the logistics and the infrastructure could cost billions, as roads would have to be strengthened, and trucks bought or subcontracted. The environmental implications as far as noise, dust and traffic are concerned might be even worse than the Rietspruit option.

Other options listed by Sasol include mining its other coalfields, but Niemand says they have the same geological stresses as the mine that is facing closure, so they cannot be mined by underground methods. These coal seams are also too deep (over 100m) to strip mine, he said.

Although Sasol has publicly stated it will abide by the results of the EIA, Niemand says if they cannot mine the Rietspruit area, which they predict could deliver enough coal for their chemicals plant for 20 years, they will have a very serious problem on their hands. There is no viable plan B.

SAVE is arguing there are at least nine plan Bs, among them rail transportation of coal from Delmas, buying in coal from a combination of sources, using an increased synthetic gas production from Secunda, piping in natural gas from Mozambique or mining Koppies coal reserves. Sasol has not commented on these alternatives, while members of SAVE feel Sasol should do a detailed analysis of their viability.

And then there is the issue of the noise. Two huge 25m high berms or artificial hills will be constructed out of the waste from the first box cut, parallel to the river. Walmsley subcontractors who were carrying out the study reported that the first two years of the project will be the noisiest and messiest. According to Development Planning and Research, "while the berm is under construction, the operation will vindicate residents' worst fears". Ambient noise is predicted to treble.

For those who are sensitive to sound, noise pollution is a huge problem. One family, living opposite Wonderwater strip mine, has been driven almost to distraction. In fact, the ordinarily mild-mannered Bernie Madelyn, who lives opposite Wonderwater, found himself wandering around the Wonderwater site one night with a shotgun cradled in his arms, trying desperately to put a stop to the noise. He couldn't find the source, and eventually left without shooting anything – but he has had to spend close to R50 000 triple-glazing his windows, buying shutters and building an outbuilding in front of his bedroom window to try to shut out the sound. The worst, according to an interview he gave to psychologist Sheila Ramsay, was that the mining carried on day and night, excepting weekends, and that blasting has damaged his borehole, his café and his house.

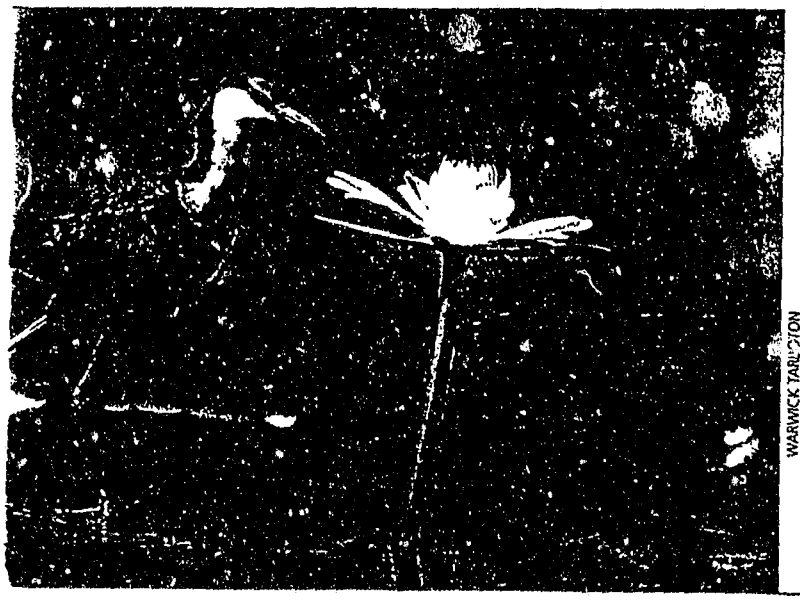
In fact, several Vaal residents have complained that blasting at Wonderwater has silted up their boreholes.

Nevertheless, Wonderwater was recently named as Industrial Conservancy of the Year by the Nature and Environment Directorate of the Free State.

Niemand has also pointed out that Sasol generally has a very good environmental record, which it cannot jeopardise as many of its products are sold to environmentally supersensitive countries. He says the company's stated aim is to restore the mined area to an even better condition than it is in now.

There are no easy answers to the problems of the Rietspruit saga. And at stake is more than a beautiful piece of land, the coal underneath, and whether it is right or wrong to mine there. The whole validity of EIAs, and the public's trust in them, is also being questioned.

Watch this space. ■



WARWICK TARLTON

Top left: Aerial photographs show water standing in Sigma Colliery's nearby Wonderwater strip mine. SAVE members are concerned that water contaminated by pyrites in the coal could make water flowing into the Vaal polluted and acidic.

Left: The Rietspruit stream, according to SAVE, is home to 242 species of birds including the African jacana.

Rand Water, represented by Peter Hoge, is opposed to the mining on the grounds that it could affect water quality (Rand Water is anxiously awaiting the EIA to see how the mine will deal with polluted waste water) and because the proposed land is zoned as a "nature area" in terms of the Vaal River Complex Guide Plan of 1982. Rand Water comments that strip mining is "certainly not compatible" with this.

At the centre of all the trouble is the Environmental Impact Assessment.

The SAVE people have publicly said that they mistrust the EIA process. Dutton maintains that the structure of the EIA is closed, that it allows interested and affected parties only limited input, and that it has no final arbiter, as did the St Lucia EIA.

In fact, both parties seem disillusioned about the EIA process, Sasol because they feel that there is no use in doing an EIA if the interested and affected parties pursue their own agenda anyway, and SAVE because they are convinced that Sasol is determined to mine the wetland whatever happens, and that the EIA is just there to placate the authorities.

Niemand, however, maintains that Sasol has not made any decision to mine at Rietspruit and that Sasol will abide by the EIA. In fact, he said that there was no way they would mine in a proclaimed wetland, for ecological and logistical reasons.

Sasol are leaving it up to Dathie and his team to decide whether the area is a wetland or not. When I visited the site there was no standing water, but when Rennies Wetland Project co-ordinator David Lindley did soil tests we could see water only 15cm below the surface. Lindley said that apart from the Rietspruit stream itself, the soil type and vegetation also corresponded to what one would expect to find in a wetland, specifically a type called wet grassland.

Dutton is using a satellite photograph of the area to show that it is a wetland. In addition, he and wetland ecologist Gary Marneweck did tests on the ground to back up the photograph.

In theory, if both sides agree the area is a wetland, mining may not happen at all.

But this is not the impression given in a letter written to Neels Hoek, Gauteng regional director of the Department of Mineral and Energy Affairs, by Riaan Rademan, general manager of Sigma Colliery. In it, Rademan says determining the best land use option is irrelevant, and that the regional director, Hoek, is under a statutory duty to issue a mining authorisation if certain pre-conditions have been met: "Since we believe that we shall be able to satisfy those pre-conditions in our application for a mining licence, we do indeed believe that we shall be granted a mining licence."

Rademan also writes that Sasol does not consider SAVE to be a legal entity or that it has *locus standi* and that Hoek has no right, "let alone duty", to consider submissions by third parties in relation to an application for a mining licence. This, he elaborates, would set an unfortunate precedent which might give rise to unwarranted expectations by third parties in other applications of this nature to other regional directors.

Hoek sent a terse letter back saying that the concerns of interested and affected parties had to be addressed in the EIA: "Whether you agree with the concerns or not does not exempt you from taking cognisance thereof and including it in your assessment. Be advised that this office will not consider an application for mining authorisation which is not accompanied by an in-depth assessment which includes the concerns of the affected parties. Your attention is furthermore drawn to article 39(1) of the Minerals Act 1991, which states that even when you have been granted a mining authorisation, you may not proceed with operations until approval of your environmental management programme has been obtained."

Keeping Track has copies of this correspondence.

There are many other issues which still have to be sorted out. The bulk of the land that Sasol wants to mine belongs to Gianni Ravazzoti, owner of Italtile and CTM. He is determined not to sell out to Sasol, but the land could still be expropriated if the Government feels it necessary. Sasol holds the mining rights, but these were originally issued for underground (conventional) mining. It is only recently that strip mining has been classified as conventional.

Then there is the fact that strip mining





24 June 1996

Dear Mr President,

I salute you as a man, who cares.
Cares about all people and their concerns.
Cares about the economy and the labour situation.
But especially about the environment
That is my concern too.

The letter which I enclose here will be forwarded to as many bodies as I can possibly manage, but I wanted to send it to you first.

It is extremely difficult for us to fight big concerns like Sasol. We need all the help we can get.
I would love for you, to see this Cloudy Creek which we love so much. It is only an hour's drive from the battle of the centre of Johannesburg. Here we find the peace and quiet which revives the spirit.
The Creek has been declared a bird sanctuary, but it's much more than that.
The greatest pity is that coal is found there as well.

I know you are extremely busy but please try to contact me at the address below. Or if it is more convenient, you could contact my daughter, Mrs Cummins, Vice Principal at Sacred Heart College.

With my greatest respect,
P.M.Molenaar (Mrs)
P.O.Box 248
Edenvale
1610

REPORT ON THE PROPOSED NORTH WEST STRIP MINE.

South Africa is today a fledgling democracy. We have a new president, a new democracy and a new constitution. But our country is falling apart. Every where you look new pollution making factories are going up. Is major damage of the environment the price we have to pay for progress, or is the government going to help every one by imposing stricter laws on where factories, buildings and even strip mines can't be placed. For many years, Cloudy creek has been recognised as a haven for many kinds of bird, fish and animals. In Cloudy Creek alone there are 242 different species of birds and 21 species of mammals. The new strip mine will destroy this haven. The birds, fish and animals will not like the noise, light, pollution etc. that come with a strip mine. The area will lose all the animals and everyone will be unhappy. The area in question is a very big breeding area for animals, birds and fish. If the strip mine were placed there then these animals would ~~lose~~ leave on of the few remaining breeding areas in South Africa. I am sure that Sasol has given many fancy reports stating that there will not be any dangerous pollution, but even a little pollution is enough to cause distress among the animals. Should Sasol start digging it will cause irreversible damage to the water and soil system (according to a report by Dutton). The area is also a major recreational area and with the strip mine there it will lose this value. A loss of property values adding up to R1 Billion will occur. Sasol will in short pollute the environment, even if it is a little bit of pollution, it is still more than we had before. According to the constitution we are entitled to an environment that is not detrimental to our health and well being. To see the damage of what a strip mine does, we simply have to look at the mine on the Vaal river. Residents complain about problems consistently, these problems range from dust all over their house (which Sasol claim doesn't occur) to actual structural damage to their home. The mine is a bad idea. The ecological costs more important than the profits. Should a company like Sasol be interested in making money when they are actually killing the planet. It would be an ecological disaster to place the mine in Cloudy Creek and the loss of wildlife would be too large too calculate. The report that Sasol says was 'fair and impartial' is a load of 'crap' and it is obvious that it was bias towards the people that were paying the salaries of the experts. If this country wants to avert an ecological disaster it must put a stop to Sasol's plan.

EXECUTIVE SUMMARY

The Project

Sigma Colliery, near Sasolburg in the Free State Province, is proposing to mine its north-west reserves by strip mining methods. The 4.2 million tons of sub-bituminous coal produced per annum will be sold to Sasol Chemical Industries for use as feedstock in its chemical plant in Sasolburg. The North West Strip Operations (NWSO) will employ about 300 people over its 20 year lifespan.

The proposed NWSO site lies adjacent to the Vaal River, about 4 km upstream of the Vaal Barrage, on the Free State side of the river. A ridge separates the site from an upmarket resort development, Boschenvaal, which lies to the east of the site. A large number of residences are situated on the Gauteng side of the Vaal River, across from the site. The Rietspruit, a tributary of the Vaal River, crosses the site diagonally from south to north, entering the Vaal River through an inlet, known locally as Cloudy Creek. Land use on the site, which comprises portions of the farms Petronella 313, Rietfontein 123 and Uitkomst 413, is mainly agricultural. In 1996 the farm Rietfontein was gazetted as a private nature reserve. Agricultural activities on this property subsequently ceased. The Barrage Road passes over the southern part of the site.

It is proposed that mining operations start on the eastern side of the site with the development of three boxcuts. Material removed from the boxcuts would be used to build a berm to screen residents on the Gauteng side of the river, from the potential impacts of the mine. The southern berm will be constructed in about 18 months and landscaped and revegetated as work proceeds. The construction of the northern berm would commence in Year 5 of mining and take about three years to complete. Exc[illegible]tion of the boxcut and berm construction would be by truck and shovel methods. A dragline [illegible] commence operations after about 18 months and advance in strips in a south-westerly direc[illegible]

Predicted Environmental Impacts of the Project

Wetlands

Wetlands in the proposed mining area are generally of low conservation status and by their nature play no significant role in sustaining baseflows in the Rietspruit or promoting water quality in Cloudy Creek or the Vaal Barrage. Much of the former wet meadow area on the mining area has been ploughed and drained and colonised by weeds. Consequently the loss of the wetlands on the site will have a LOW negative impact locally. However, the cumulative loss of wetlands on a national scale, to which this small local loss adds, is HIGH negative.

The majority of the wet meadow occurs to the west of the proposed mining area. Due to the nature of its soils and hydrology the impact of mining operations on this wetland will be LOW. Damming of water behind the southern extension of the berm will change the nature of the wetland slightly and is likely to enhance the heterogeneity of its habitats and increase its conservation value, having a LOW postive impact. The longer periods of inundation of the area will increase its sedge vegetation having a MODERATE negative impact on the grazing value of the area on Rivierplaats.

The Rietspruit acts mainly as a channel to direct ephemeral flows into the Vaal River and plays no significant role in improving water quality flowing through it. Its diversion will have a LOW negative impact on water quality in Cloudy Creek or the Vaal Barrage.

Ground & Surface Water

During the construction phase of the berm and river diversion, impacts on surface water quality and catchment yields will be LOW negative. Water-make in the mine from the shallow and intermediate aquifers will be manageable with the implementation of the proposed water handling facilities and no discharges of poor quality water to the Vaal River will result from mining of these aquifers. NO IMPACT on surrounding boreholes should result from the dewatering of the shallow and intermediate aquifers. If boreholes are affected Sigma Colliery will supply the affected users with water of a quantity and quality equal to the water lost.

One outstanding question on groundwater needs to be answered with greater certainty. This relates to the potential rate of inflow from the deep aquifer into the mine. Geohydrological work to date indicates that rates of inflow will be low to moderate. However, due to the known variability of dolomite, a cautious approach has been adopted and further drilling and long duration pump tests have been commissioned. Information obtained from this work will be included in the final EMPR.

The construction of the berms will have NO IMPACT on water levels during 1: 50 or 1: 200 year floods. In the case of the latter, houses on the Gauteng side of the river will be 6.8 m under water and the berms will have no additional negative effects.

Migration of polluted water from the mining area at closure will be prevented by the excavation of an in-pit evaporation facility which will draw down the groundwater level to below the level of the bed of the Vaal River and effectively act as a sink for pollutants.

Air Quality

HIGH to VERY HIGH negative impacts on the most sensitive receptors around the proposed NWSO site could result from total suspended particles if dust control is not managed effectively. A 90% dust control efficiency can be achieved through the use of a combination of water and chemical binding agents on haul roads. These methods will reduce the negative impacts to LOW to MODERATE (below Department of Environmental Affairs & Tourism and US EPA guideline levels). During 24 hr storm events from the south-west, levels of total suspended particles at Boschenvaal will still be HIGH despite a 90% dust control efficiency on haul roads. Special operational procedures during these events, including cessation of mining during these storm events will have to be considered to mitigate this impact. Dust fallout of heavier particles will be restricted to the mining area.

Vibration

Blasting vibrations will not affect any structure in the vicinity of the mine during the construction phase and during most of the operational phase. Impacts on Smaldeel farmhouse may, however, result in the last few years of mining. This house is within the 500 m blasting zone limit stipulated in the Minerals Act and special exemption will be required to blast within this area. Relocation of the caretaker family living in the farmhouse will be negotiated if the project proceeds.

Ducate nb groups C-18

Apart from impacts on fish, which are likely to be HIGH negative during the early years of mining, impacts on domestic animals are unknown due to the paucity of research in the field. Peak Particle Velocities reaching domestic animal farms in the vicinity of the proposed NWSO are very low and NO IMPACTS are expected but this prediction is uncertain. Vibration impacts on fish will abate as mining proceeds away from the Vaal River.

Noise

Due to the construction method of the berms and proposed mitigation of conveyor noise by a 2 m high wall, noise impacts due to mining will be LOW to MODERATE negative. This equates to an increase in ambient noise levels of 2-5 dBA at which little community response with sporadic complaints would normally be expected according to SABS standards. However, the highly sensitive nature of the community around the mine and their complete opposition to the proposed mining operations could elicit an unpredictable response.

This assessment does not take into account single, sharp noisy events such as blasts or engine start in exposed positions and a range of management measures are proposed to minimise these impacts. Prearranged blast times and stemming of blast holes are the most effective methods of mitigating blast noise. No blasting will occur over week ends. Blast noise impacts are likely to be HIGH negative but are of short duration and occur once a day.

Visual Impacts

The highest visual impacts of the mine will occur during the construction phase and will be experienced by residents on river properties opposite the mine. The time scale for the impact is estimated at about 9 years. Impacts over this period will vary from LOW to VERY HIGH negative during the various phases of berm construction. As the berms revegetate this impact will diminish until the berms begin to have a HIGH positive impact on the overall scenic value of the area by adding topographical variety to the existing flat landscape.

Once the berms are up negative visual impacts will reduce significantly to LOW to VERY LOW levels over the life of the mine for river property owners and Boschenvaal Residents. Over the life of the mine negative visual impacts will progressively increase to HIGH to VERY HIGH levels for the south western sector, such as views from the Barrage Road. These impacts can be mitigated by screening views from the realigned Barrage Road using trees. The conveyor will have NO IMPACT on views from Boschenvaal and VERY LOW negative impacts on river property owners.

Socio-economic Impacts

Macro-economic Impacts

[illegible] the proposed NWSO would maintain the *status quo* at the [illegible] level. At a local level, there would be some short term (1-4 years) losses experienced by Sasolburg due to the reduction in employment levels. These losses would be Secunda's gain if the offer of re-employment was accepted by the retrenched mine workers. However, after five years, when the proposed NWSO was in full production and the loss making underground operations were closed, the Gross Geographic Product (GGP) of the region should experience a small gain.

The combined indirect or spin-off effects of the downscaling of Sigma Colliery: Underground Operations and the development of the North West Strip Operation would generally maintain the *status quo* at a macro-economic level. The development of the NWSO would, therefore have a major role to play in underpinning the economy of Sasolburg. The combined effects of downscaling of underground operations and upscaling of the NWSO would have NO IMPACT (either positive or negative) relative to current levels of economic activity at a macro-economic level. This is because intermediate purchasing and expected coal output at the NWSO would counterbalance the potentially significant negative effects of the cessation of underground operations. The NWSO could potentially induce additional benefits to the manufacturing sector of R16.2 m in 1997/98, R97.2 m in 1998/99 and R162 m in 1999/2000 and each year thereafter.

Cessation of Sigma Colliery's underground operations, without the NWSO proceeding, might result in a VERY HIGH negative indirect impact on the economy of Sasolburg and the region, assuming an alternative source of affordable coal cannot be found. This would be due, in particular, to mining's strong forward linkages with the manufacturing sector which uses approximately 90% of coal mining's output.

Residential Impact

A number of riverfront properties in Vaalview, Ardenwold, Driefontein and Marlbank would experience HIGH negative impacts initially, primarily due to the visual intrusion of berm construction and site preparation. Once berm construction is completed, after about nine years, the operation of the mine would have a LOW negative impact.

The potential diminution of the enjoyment value of riverfront properties would be reflected in a HIGH negative impact on the prices of these properties until berm construction and revegetation was complete. Estimates put this reduction in value at between 9 and 19 % in the first ten years of operations and 2 and 6 % for the remainder of the mine's life. After mining is completed there will be NO IMPACT on property prices.

Despite the proximity of Boschenvaal to the NWSO, the topography of the adjacent ridge would screen residents from most of the mine's impacts provided stringent control measures are implemented.

Properties which do not have direct river frontage would probably experience NO IMPACT from the NWSO, primarily because of their distance from the proposed mining operations.

Impacts on boating on the Vaal River will be LOW to VERY LOW negative in the short term while birdwatchers at Cloudy Creek and along the Rietspruit and fishing in the vicinity of the mine would experience VERY HIGH negative short to medium term impacts. If the proposed mitigatory measures are implemented, birdwatchers could experience a HIGH positive impact when the berms are completed.

Many of the attributes of the affected stretch of the Vaal River, which encapsulate its intrinsic value, cannot be rendered in discrete quantitative terms. For many residents, the proposed NWSO represents an intrusion into an area which they value for its relative tranquility, because they believe this intrusion would be absolute, it could not be mitigated against. Direct experience and the passage of time could lessen the perceived intrusion, and thus perhaps offer some mitigation.

C-19

Agricultural Impact

The impact of the proposed NWSO on the agricultural economy of the Sasolburg region will be VERY LOW negative. For the three farms on which the proposed mining operation would take place, the estimated total economic impact on farmers, markets and input suppliers over the 20 year life of the NWSO is lost income of R65m. The indirect economic impacts on adjacent agriculture enterprises cannot be quantified at this stage but are expected to be insignificant. Longer term impacts would depend on the success of the soil rehabilitation programme.

HIGH negative impacts will be experienced by the estimated 20 farmworkers and their dependants (a total of 80 people) currently living on the properties where mining is proposed. They face relocation, social dislocation and the possible loss of housing and jobs. These impacts could be mitigated through negotiation and support to assist them to find alternative accommodation and employment..

Topography

Post-mining topography over the mining area will emulate that of the pre-mining condition, except where an inpit evaporation facility is proposed, and impacts will therefore be LOW negative. By adding topographical variety to the existing flat landscape, the construction of the berm will have a HIGH positive impact on the overall scenic value of the Vaal River from viewpoints across the river once it is completed and vegetation has established.

Soils & Land Capability

The site is generally marginal for agriculture. Provided soils are properly handled, ameliorated and rehabilitated after mining, impacts on soils and land capability will be LOW negative in the long term.

Land Use

Mining will have a HIGH negative impact on current land uses for its duration. Currently Rietfontein is a private nature reserve and Uitkomst and Petronella are used for agriculture. The Vaal River Complex Guide Plan of 1982 does not regulate mining activities. Consequently, the nature area zoning over parts of the proposed site will not preclude the proposed mining activities.

Vegetation

Based on current knowledge the mine will have NO IMPACT on threatened plant taxa. A number of small populations of species protected under the Free State Nature Conservation Ordinance will be affected by the mine. Special permission may be required to relocate specimens.

The majority of the site (61%) has been disturbed and fragmented by agriculture. A large section of old lands on Rietfontein has been invaded by weedy species including former wetland areas which have been drained and ploughed. Notable exceptions to this overall picture are the bottomland grassland adjacent the Rietspruit and bushclump communities around the ridge in the east. Mining will completely remove the former while the latter will be peripherally affected.

The loss of some of the bushclump community will be more than compensated for by the revegetation of the berm with trees, grasses and shrubs. Some compensation for the bottomland community will be achieved through the judicious rehabilitation of the northern section of the river diversion. Due to the changed hydrology of the area after mining, the bottomland grassland is unlikely to re-establish within the mined-out area. This negative impact is HIGH on a local scale and LOW on a regional and national scale.

Animal Life

During the construction period, bird communities in Cloudy Creek will experience a HIGH negative impact. Once the berms have been constructed these impacts will abate to a significant extent. Careful manipulation of the connection of the river diversion to Cloudy Creek could result in habitats for the affected bird species being significantly enhanced with a HIGH positive impact for local populations.

Habitat for a number of threatened or near threatened species such as the Grass Owl will be reduced by the removal of the bottomland grassland which will have a HIGH negative impact locally but a LOW to VERY LOW impact nationally on populations of these species.

No endangered mammal, reptile, fish, amphibian or butterfly species will be affected by the proposed mining operations. A number of vulnerable species of mammals will lose some of their habitat temporarily. With a sound rehabilitation programme, habitat for the terrestrial species will be enhanced after mining.

Fish in Cloudy Creek and the Vaal River adjacent to the mining site will experience HIGH negative impacts due to silt movement during the establishment of the river diversion and blasting vibrations. Fishing in Cloudy Creek and piscivorous birds are likely to experience HIGH negative impacts during the construction phase. Once mining moves away from the river these impacts will abate significantly.

Archaeological Sites

Provided effective mitigatory measures are implemented during the construction of the conveyor over an iron age site and the correct procedures are followed in the relocation of the two grave yards on the site, NO IMPACTS on cultural resources or the graves should occur.

Environmental Management Plan

Avoiding Impacts

Some of the potentially most severe impacts of the mine have been avoided in the mine design and proposed operational procedures. To ensure that the findings of the impact assessment section of this report are realised, it is essential that the procedures for the proposed mining operations are strictly adhered to.

Sigma Colliery: North West Strip Mine

Environmental Impact Assessment Briefing Document

Introduction

This briefing document forms part of the first or scoping phase of the Environmental Impact Assessment (EIA) for the Sigma Colliery's proposed North West Strip Mine (see Map) near Sasolburg in the Freestate Province. It aims to provide information on the proposed project, explain the EIA process, explain how Interested and Affected Parties (IAPs) will be consulted, and invite IAPs to assist the EIA project team by raising their concerns about the project during the scoping phase.

The EIA will be undertaken by Walmsley Environmental Consultants for Sigma Colliery. Communication with IAPs will be ongoing during the course of the project and include meetings, newsletters and review of the draft Environmental Management Programme Report.

Project Motivation

The economic viability of Sasolburg is still very dependent on Sasol Chemical Industries (SCI). SCI requires 7 000 000 tons of coal every year to continue production of more than 100 chemicals and employment of approximately 3000 people.

SCI's entire coal requirement was supplied by the Sigma Underground Mine from 1952 to 1992. In recent years increasingly difficult underground mining conditions, caused by unforeseen horizontal stresses in the geological strata of the remaining reserves, have resulted in progressively lower production from the mine. Despite the introduction of cutting machines with onboard roofbolters to try to prevent rooffalls, production remains very low while mining costs continue to rise. Production of only 3.4 million tons is forecast for 1995/96 and it is clear that the underground reserve has reached the end of its economic life.

In 1992 Wonderwater strip mine was established to partially replace the production capacity of the underground mine. Now a new source of coal is required to replace the remaining production from Sigma Underground Mine and ensure that SCI's coal requirements are met.

A number of alternative coal sourcing options were evaluated on technical and economic grounds, and the North West Strip Mine was considered the most viable option for further investigation.

Project Alternatives Considered

Four coal alternatives to replace the production capacity of the underground mine were considered, namely;

1. A new underground mine in the southern Sigma reserves

   The mineable coal reserve in this coal field is approximately 114 million tons. Three coal seams could be mined. The average depth of the coal is 130 and 240 metres below surface. However, according to geological information, similar difficult mining conditions to those at the existing Sigma Underground Mine can be expected.
   This is not a viable alternative due to the depth of the mine and poor geological conditions.

2. Increase production at Wonderwater to 7 million tons per annum

   The coal reserve of the Wonderwater strip mine is 60 million tons with a mine life of 20 years at a production rate of 2.8 million tons per annum. At a production rate of 7 million tons, the mine's life is reduced to approximately 8 years which does not fulfill the long term supply period required by SCI.
   Due to the short mine life this alternative is not an option.

3. Purchasing coal from other sources

   The possibility of purchasing 4.2 million tons of coal per annum from external sources was considered. No coal reserves are available in the Sasolburg area and coal will have to transported from the Witbank/Middelburg area.
   The high transport costs from Witbank make this a non-viable alternative in the long term.

4. A new strip mine in the north western Sigma reserves

   This alternative provides for the establishment of a new strip mine in the north western Sigma coal reserves. Three coal seams will be mined using draglines. Production will increase to 4.2 million tons per annum over three years to replace the remaining production from the underground mine. Together with the production from Wonderwater this coal will supply SCI's requirements. Production from the underground mine will be phased out over 3 years as the new mine becomes fully operational.
   Strip mining of the north western Sigma reserves is the most viable alternative subject to the finalisation of the geological, mining feasibility and environmental impact study and approvals by the Sasol Limited Board and relevant authorities.

Your Participation

Key opportunities for Interested and Affected Parties to make inputs to the EIA are:

Scoping
Ensure that your issues are communicated to Walmsley Environmental Consultants and recorded during the scoping phase of the project.

Open Day
An open information day has been arranged for 22 June 1996 at Sigma Mine for all Interested and Affected Parties to familiarise themselves with the project and raise any issues they would like to see addressed in the EIA. For further details contact Walmsley Environmental Consultants at the Toll Free Number or P.O. Box 5384, Rivonia, 2128.

Review
Ensure that your issues are addressed in the draft report

Toll Free Number

Description of the Mine Project

Construction Phase

Boxcuts and Berm

During the construction phase boxcuts will be excavated using truck and shovel methods with blasting as required. Overburden will be stockpiled to form a berm between the mining area and the 1:50 year floodline of the Vaal River. The berm will be approximately 25 - 30 m high and 250 m wide at its base, except adjacent to the Rietspruit (see Map), where it will be 10 m high, initially. The primary purpose of the berm will be flood protection and screening of the mine from surrounding residents.

Conveyor and Roads

A conveyor will be constructed from the Uitkomst Shaft to the Boschbank shaft area. The access road to the Boschenvaal resort will have to be relocated off the mining area. In the long term the Barrage road will have to be relocated further southwest to skirt the mining area.

River Diversion

A section of the Rietspruit will have to be diverted to the east with the construction of a dam on the eastern perimeter of the mine. A canal will link the dam to the Vaal River. Electricity lines and an effluent pipeline across the site will have to be rerouted.

Construction Personnel and Buildings
Approximately 100 workers will be employed during construction. Existing accommodation in Sasolburg and offices and workshops at the Uitkomst shaft will be utilised to house staff during the construction phase. No additional facilities are proposed.

Operational Phase

Mining

During the operational phase draglines will be located in the boxcuts and the area will be mined in strips on a NNW-SSE axis progressing in a southwesterly direction. The mining plan is based on a requirement to maximise the strip length, avoid the dolerite cap that covers the southwestern section of the reserves for as long as possible, even out the ash content of coal reserves and begin the boxcut closest to the point at which the berm will be constructed.

During the operational phase the overburden will be removed using a dragline and the coal will be mined using truck and shovel methods. During the first year the mine will produce about 400 000 tons increasing to 4 million tons per annum by the third year of operation.

Coal Transport

The coal will be taken to the Uitkomst shaft for crushing and blending and onward transport to SCI by conveyor with Wonderwater coal.

Rehabilitation

As mining progresses, topsoil will be stripped and stockpiled or used for rehabilitation of mined out areas. During the first year of mining the 10 m high berm around the Rietspruit will be built-up to a height of 30 m. Revegetation of rehabilitated areas will occur after landscaping.

Mine Staff

The operational mine will provide employment for 200 - 250 people. Use of existing facilities for accommodation and offices will continue as during the construction phase. Staff will be transported to the mine by bus or use private cars to get to

Sasol Environmental Policy

Sasol believes that the quality of the air, water and soil should be protected for the continued benefit of all ecosystems. In this way, the needs of present and future generations will be met.

Sasol is committed to acting responsibly and with due regard to the effects of its operations and products on the environment. Protecting the environment is an obligation - not a choice.

Consequently, it is Sasol's policy to judiciously limit the environmental impact of all its activities.

In order to implement this policy, Sasol will:

- manage and use land, raw materials and resources responsibly;
- monitor and audit the environmental performance of all its operations and activities according to internationally accepted environmental management standards;
- conduct environmental impact assessments when establishing new facilities;
- adopt the best affordable technology to limit emissions;
- support research into the protection of the environment;
- practice the recycling, reprocessing and re-utilisation of waste materials and the rehabilitation of disturbed land;
- promote environmental awareness and responsibility among employees, customers, suppliers and the community at large;
- maintain open relations with the employees, relevant authorities and the community;
- as a minimum requirement conform to environmental legislation as well as safety and health legislation.

Some Potential Impacts of the Mine

The following list of possible impacts is not complete and only intended to stimulate your thoughts on the project.

- noise impacts
- dust impacts
- impacts on groundwater quality and quantity
- impacts on surface water quality and quantity
- aesthetic impacts
- impacts on roads
- impacts on vegetation
- impacts on [illegible]

The EIA Process

The Environmental Impact Assessment (EIA) process can be divided into a number of steps.

1. *Scoping (May - June 1996)*
   The main purpose of scoping is to give Interested and Affected Parties (IAPs) the opportunity to communicate their concerns to the project team with a view to focussing the EIA on significant and relevant issues. Separate meetings and an open day will be held with the relevant authorities, affected river property owners, surrounding farmers, trade unions, environmental organisations, the general public.

2. *Investigation (July - December 1996)*
   Various environmental studies will be conducted to provide information for the impact assessment. The terms of reference of these studies will be based on the results of scoping and the experience of the assessment team. Some of the more obvious, lengthy studies (eg. groundwater) may begin before scoping is completed.

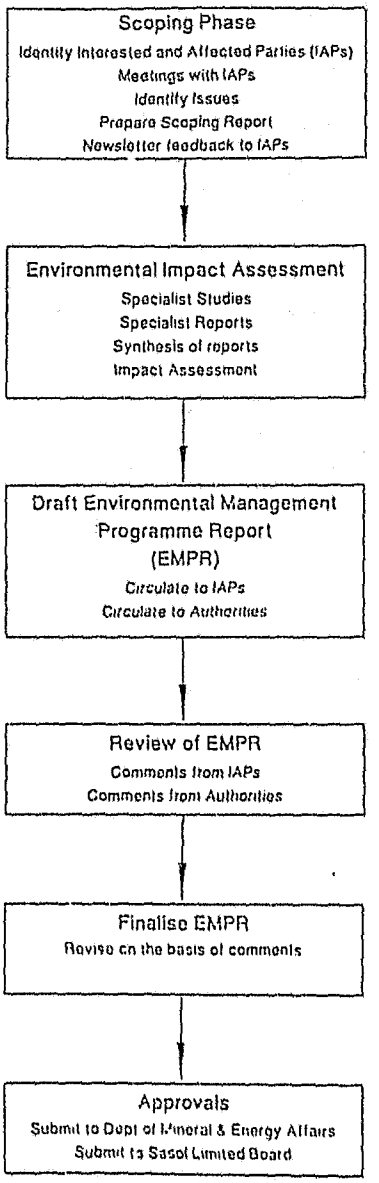
   During the investigation the influence of future mining activities on the environment (including people) will be assessed. This involves the identification of potential impacts, an assessment of their significance, identification of ways to avoid or mitigate significant impacts and an assessment of the residual impacts after mitigation.

3. *Draft Report (Jan 1997)*
   A draft report documenting the investigation will be prepared according to the Environmental Management Programme Report (EMPR) format of the Department of Mineral & Energy Affairs. The EMPR is a legal requirement under the Minerals Act and requires mines to provide a detailed environmental management plan and make financial provision to implement it. The management plan and financial provision are legally binding. The report will include a list of all the issues raised by IAPs and how these were addressed during the study.

4. *Review (February - March 1997)*
   The draft EMPR will be made available to the authorities and Interested and Affected Parties for comment.

5. *Final Report (April 1997)*
   The EMPR will then be finalised and presented to the Department of Mineral & Energy who, in consultation with other Government Departments (eg. Dept of Water Affairs & Forestry, Dept of Environmental Affairs & Tourism, Dept of Agriculture etc) make a decision about granting mining authorisation.

EIA Flow Diagram



EIA Project Team

A team will be assembled to accommodate the wide range of skills required for the EIA. These skills will include:

- Project leader
- Public consultation specialist
- Soil scientist
- Zoologist
- Botanist
- Hydrologist
- Geohydrologist
- Atmospheric scientist
- Noise & Vibration specialist
- Archaeologist
- Specialist

The Project Environment

Location and Geology
The proposed mining area covers sections of the farms Rietfontein 123 and Uitkomst 413 in the Sasolburg District and lies adjacent to the Vaal River (see Map).

Three coal seams occur in the area. The remaining geological strata consist of siltstone, mudstone, sandstone and tillite overlying a dolomitic basement. A capping of dolerite covers the southwestern part of the site.

Climate
The area falls within the Highveld climatic zone where rainfall is mainly in summer in the form of convectional thunderstorms. The average annual rainfall for the area is 677 mm.

In summer the wind blows most frequently from the southwest, westerly, northwesterly, northeasterly and easterly sectors. During the winter months winds from the southwesterly, westerly and northwesterly sectors are most prevalent.

Topography
The site is bounded in the southwest by the Barrage road at an altitude of 1440 metres above sea-level (masl) and gently descends to the Vaal River at 1423 masl on the eastern boundary. The highest point (1455 masl) is on low ridge which protrudes into the eastern corner of the site. The Rietspruit River runs through the site from its southern boundary to the Vaal River in the northern corner.

Soils
The majority of the soils over the area are deep (500 - 1200 mm) and include Longlands, Kroonstad, Avalon, Fernwood, Glencoe, Clovelly soil classes. Shallower soils (300 - 900 mm) occur adjacent to the Rietspruit include Rensburg, Estcourt, Westleigh and Valsrivier soil classes.

Land Use
The proposed mining area covers agricultural land of which roughly 51% is cultivated or fallow lands (408 ha) and the remainder (392 ha) is used for grazing. A farm homestead (Uitkoms) is located on the low ridge in the eastern corner of the property. A homestead and farm labourers' houses (Rietfontein) are situated on the southwestern boundary against the Barrage road.

Land use surrounding the site on the Freestate side of the Vaal River is mainly agricultural and mining. A housing development called Boschenvaal is located approximately 800m to the east of the mine perimeter, between the Vaal River and a ridge.

The Sigma underground mine lies to the southeast with the Uitkomst shaft adjacent to the site. The homesteads and/or compounds of the farms Beginsel, Brakkuil Tweelingsfontein and Goewenourskraal lie to the south of the mine perimeter. The homesteads of Petronella, Smaldeel, Rivierplaas and Fraaiuitzicht occur to the west of the mine perimeter (see Map).

On the Tranvaal side of the Vaal River, immediately across from the mining area, are located a large number of small holdings with cottages and residences. These include areas known as Vaalview, Stille Waters, Three Oaks, The Stables, Vaia Con Dios. Marlbank River is situated to the east of the mining area, across the river from Boschenvaal.

Fauna & Flora
The mine site falls within the northern variation of the Cymbopogon-Themeda Veld (Acocks Veld Type No 48) which is a sparse, tufted veld type. Grass species such as *Setaria flabellata, Themeda triandra, Heteropogon, contortus, Eragrostis racemosa* and *Cymbopogon plurinodis* are common in this veld type. Trees such as Fire Thorn *Rhus pyroides*, Acacia's *Acacia spp* and Buffalo Thorn *Ziziphus mucronata* also occur on the site.

No threatened amphibians, reptiles or fish that are listed in the Red Data Book occur on or near the mine site. The following threatened bird and mammal species may occur in the area:

Common Name	Scientific Name	Status
Grass Owl	*Tyto capensis*	Indeterminate
African Finfoot	*Podica senegalensis*	Indeterminate
Small spotted cat	*Felis nigripes*	Rare
Aardwolf	*Proteles cristatus*	Rare
African striped weasel	*Poecilogale albinucha*	Rare
South African Hedgehog	*Atelerix frontalis*	Rare
Antbear	*Orycteropus afer*	Vulnerable
White-tailed mouse	*Mystromys albicaudatus*	Vulnerable

Surface & Groundwater
The Vaal River forms the eastern boundary of the site while the Rietspruit stream flows diagonally across the site from south to north before joining the Vaal River. The Vaal River is one of South Africa's most important water resources, supplying water for industrial and domestic consumption to the industrial heartland of the country, Gauteng Province. Soon after passing the mine site the Vaal River flows into the Barrage which is one of the extraction points for water supply to Gauteng. Irrigation also occurs along the Vaal River.

Groundwater resources in the area are probably used primarily for domestic consumption and for limited irrigation.

Air Quality
Most pollution sources in the industrial areas of Sasolburg and Vanderbijlpark are situated a number of kilometres to the north and the southeast of the mining area. Regional air quality in the Vaal Triangle is generally considered to be poor as a result of the multitude of industrial pollution sources and dust from cultivated agricultural land.

In winter local air quality is likely to be affected by stable climatic conditions that hamper pollution dispersion and dry conditions that promote dust formation. Dust from agricultural lands is likely to be worst in August-November when farmers till the soil prior to planting.

Noise
The river is heavily utilised for skiing and motorboating on weekends.

Archaeological/Cultural Historical Sites
The occurrence of archaeological sites in the mining area is unknown at present. However, a number of graves are likely to occur on the property.

Aesthetics
Most of the mining area is visible from the Barrage Road, adjacent farmhouses and weekend residences immediately across the Vaal River. The views of the mining area from many of the latter may be obscured by trees growing around the houses or on the banks of the Vaal River. The mining area is obscured from houses further away from the eastern bank due to a combination of tall trees and relatively flat land. The most

Lesson 6

Environmental Impact Assessment

References:

Jollands, P, Barnes, R, and Jollands, P. (1996). "Using an Environmental Impact Assessment Approach" in *Teaching Geography*, vol. 21 (4), pp.173-176.

1. Conflict Matrix

Fill in any other relevant groups into the table.
Score +3 to -3 to show positive and negative interactions.

Coal Mine	Wildlife Society	Sasol	Homeowners	Mine workers
Wildlife society				
Sasol				
Home Owners				
Mine Workers				

Using an Environmental Impact Assessment approach

Peter Jollands, Rhian Barnes and **Philippa Jollands** outline some techniques for A-level students

Introduction

People-environment interactions are now key components of many A-level geography syllabuses. One way in which they can be extended and successfully incorporated into a stimulating and yet manageable study unit for students is through the use of the Environmental Impact Assessment (EIA) approach. EIA can be described simply as a process which provides decision makers with an indication of the likely consequences of their action, and it can contribute to a final decision based on the best practicable environmental options. A general introduction to the background of EIA and techniques used can be found in Wathern (1988) and a discussion of the issues in a recent article in *Geography* by Simpson (1996).

EIA is widely used in environmental management, particularly as a planning tool. EIAs are now mandatory for large-scale development projects (e.g. quarries, barrage schemes, airports) and are often required for smaller scale developments such as roads, landfill sites and marinas, which are likely to have a significant impact on the environment. The integrated approach used in EIA can be simplified to form the basis for A-level geography projects which involve any proposed development. It allows students to incorporate all relevant issues in a structured form and also allows simple quantification. It exposes students to many different and complex people-environment interactions, developing knowledge and understanding as the assessment is carried through. It incorporates a wide range of skills and techniques, particularly emphasised in enquiry-based syllabuses, and is useful in both guided student exercises and in giving a framework for individual project work. It has been extensively field tested with students at Hallsannery Field Centre, Bideford, Devon, and modified during the testing to incorporate feedback.

This example shows how a student exercise was developed for use with A-level students to compare two possible locations for a sewage treatment works in the Bideford area. For many years, sewage has been an issue in the area and in 1989, following a major environmental survey, South West Water consulted local customers on proposals for long-term water quality improvements for the Taw-Torridge Estuary and Bideford Bay. The proposed works are part of a coastal sewage treatment programme which will help achieve European standards for the region's designated bathing beaches. No decision has yet been reached by South West Water or the local planning authority on the siting of the works, though it is likely to be built at one of the two locations considered in this exercise.

The actual proposals for each of the sites are modified slightly to fit in with appropriate and safe viewpoints for site visits and to reduce some of the complexity of the real decision-making process.

The steps below follow the simplified EIA approach summarised in Figure 1 and use the sewage treatment works for the purposes of illustration.

Outline of EIA process

EIA is introduced to students as a decision-making tool which looks at both the positive and negative impacts of a development on the environment. In brief, EIA requires the full positive and negative physical, biological and socio-economic impacts resulting from a development to be assessed. It must include a description of the site and project, and must contain a description of the significant effects, both direct and indirect, on the environment, including flora and fauna, soil, water and air, landscape, agricultural land use, transport, socio-economic considerations, and interactions amongst all of the above.

The end result of an EIA is a written Environmental Statement, drawn up by the developer, or an outside agency employed by the developer, which discusses the impacts on all aspects of the environment and identifies ways of minimising the negative effects and therefore reducing conflicts between developers and objectors. The Environmental Statement is submitted to the local planning authority for consideration with the formal planning application and the planners must then initiate a process of public consultation before coming to a decision. The decision will take into account development policies outlined in the Local Plan, which for any area will be available at the local council offices. If the developers are dissatisfied with the decision of the planners, they may appeal to the Secretary of State for the Environment, whose recommendations are then final.

Introduction of proposed development sites

In this case, information on the development was obtained from material published by South West Water plc as

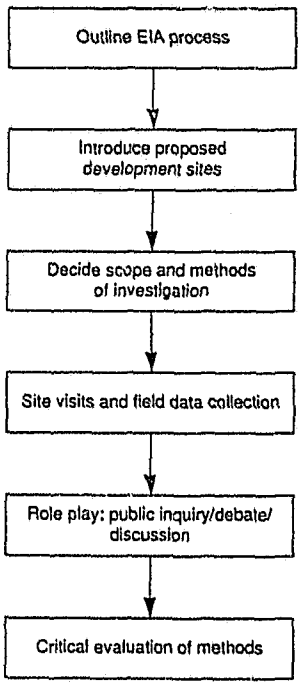


Figure 1. **A simplified Environmental Impact Assessment approach.**

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part of the public consultation on the proposed siting of the sewage works, from press reports and from the Environmental Statement produced by consultants for South West Water plc. Information given to students includes a summary of the existing sewage treatment and discharges in the area, the rationale behind the proposed development and simplified site maps (Figure 2).

Scope of the investigation and methods used

One of the main features of undertaking an environmental impact assessment is that it requires students to consider every possible impact the development might have on the surrounding environment, both physical and socio-economic, and on the interactions that exist. An important first step is to determine which issues are likely to be of importance and this is usually done by drawing up a checklist or matrix of potential impacts. This highlights areas where detailed work may be needed, for example in a sewage works development the main potential impact identified may be the effects of discharges on nearby beaches and this can then be addressed at the design stage with changes to treatment methods and outfall lengths. The Leopold matrix as discussed in Wathern (1988), greatly assists this scoping process.

Leopold matrix

Designing and completing a Leopold matrix encourages a holistic and integrated approach to assessing the development. Students can either be presented with a blank matrix with no impacts or effects specified, or this information can be partially or wholly given. It should be stressed that it is possible to modify this type of matrix to fit any proposed development and that the initial matrix should contain all impacts and effects which are considered possible, even if they are discarded later as not being relevant.

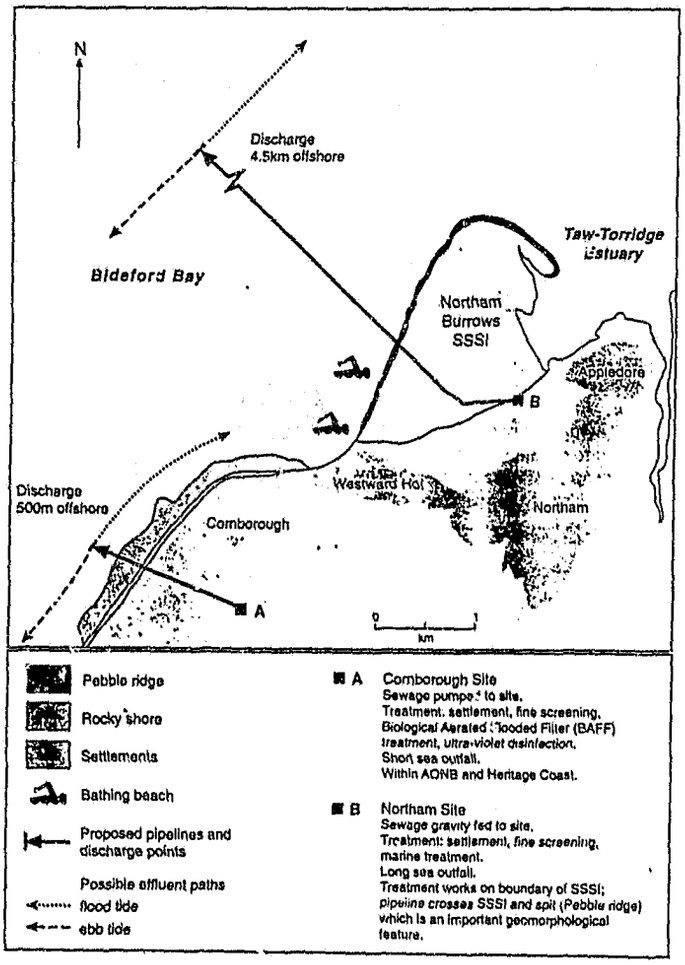

Figure 2. **Possible locations for the proposed development.**

Figure 3 shows the basic outline of such a matrix where students have identified possible activities involved in the construction and operation of the sewage works and pipeline which are listed along the *x* axis of the matrix. Possible areas where these activities might have direct and indirect effects are included along the *y* axis of the matrix. The blank columns and rows are for students to add potential impacts in the field, if required. The effects of the sewage works and pipelines are considered separately.

Various levels of analysis are then possible from this matrix. Students can consider the magnitude and temporal effect, the geographical scale of the impact and whether it has positive or negative implications (see example A in Figure 3) or take a simpler approach (see example B in Figure 3). This technique is useful because it helps students expand the range and depth of analysis in their discussion and the complex subject matter is broken down into manageable discrete parts whilst highlighting the inter-relationships which exist.

Conflict matrix

Possible conflicts of interest can be identified using a conflict matrix which highlights the groups interested in or concerned with a development and how they are likely to interact. By scoring along a scale of +3 to -3, students have to assess what kind of relationship is likely between the pairs of groups given in the matrix. The option exists for the students either to construct a matrix themselves or to complete one as shown in Figure 4. The main usefulness of this technique lies in the way it gets students to consider all the possible interest groups involved in a development and the manner in which they are likely to interact. In this example, various local groups and organisations are considered, with blanks for any further additions in the field. The relationship between Surfers Against Sewage and South West Water scores a -3 at the Northam site because of the lower level of treatment suggested and the outfall pipe extending out into a popular surfing beach. This score might rise to +3 for the Comborough site due to the higher level of treatment proposed, decreasing the risk of bacterial infections to the surfers.

Index of visual quality

An important aspect of any development is the effect it will have on the visual quality of the area and several techniques exist to provide some semi-quantitative measure of this. In this case an index (Hart 1983) is used to give an indication of the visual quality prior to the development and it can be used as a justification for appropriate design and mitigation. The example in

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Northam site		Sewage works						Pipeline		
		Construction				Operation		Construction		Operation
		excavation	construction of buildings	transport of raw materials	noise	noise	smell	fabrication	excavations	sewage discharge
Scenery *Example A*		1 L S / B						*Example B*		
Ecology – SSSI (Northam Burrows)									10 / 1	
– marine environment										
Residents										
Tourists										

Adding information to the matrix:

Example A: indicate where impact may occur using a cross and in each quadrant score:
+ or - = beneficial or adverse S, L or M = short, medium or long term A to E = magnitude, with E the lowest
1 to 3 = geographical scale where 1 = local, 2 = regional and 3 = national
Colour code where red is irreversible and green is reversible

Example B: indicate where impact may occur using a slash and in upper left corner score the magnitude of the impact (0-10) and whether positive or negative (+ or -); in lower right corner score the importance of the impact (0-10)

Figure 3. **A Leopold matrix for the proposed sewage works at Northam Burrows.**

Figure 5 divides the landscape into natural and human elements and the user has to decide how far along the scale from "greatly enhances to the view" to "spoils the view" each feature lies. The results are then converted into a numerical measure and an index of visual quality found through finding the mean value of all the student scores. The limitations of this technique should then be discussed with the students, emphasising that the method is highly subjective and is appropriate only when comparing two or more sites.

Field data collection

Visits of one to two hours per site are allowed, with time given for completion of both matrices and the index of visual quality. Students work in small groups and are encouraged to discuss the issues whilst completing the matrices, either individually or as a group. The results can then be used as a basis for class discussion and, if required, ...atrices produced which reflect the consensus of the whole class. The index of visual quality for each site is calculated by each student and then the means for each site compared.

The exact timing depends on whether students have been given matrices with all potential impacts, effects and conflict groups on the *x* and *y* axes already filled in, or whether they are given blank matrices and have to complete them on site. At both sites, safe and accessible viewpoints are used.

Role play

Possible formats on return from the field are either a public inquiry, with groups of students taking the roles of the different interest groups identified in the conflict matrices, or production of a report to the planning authority individually or in groups. If a public inquiry role play is to be used, time is then given for students to prepare their cases and the role play then takes any appropriate format. Additional materials made available to students at this point are newspaper articles for and against each site, campaign letters from local residents objecting to the development, landscaping plans for each site and, as the works involve pipelines across environmentally sensitive areas, information on how pipes can be laid with little or no environmental damage.

The summing up of the public inquiry can be either teacher- or student-led and should summarise the problems with the existing sewage discharges, the potential impact of sewage discharge at each location, all potential impacts of building the works and possible ways of minimising any environ-

Score +3 to –3 to show positive and negative interactions Northam site	South West Water plc	Northam residents	Cornborough residents	Conservation groups	Surfers	NRA
South West Water plc						
Northam residents						
Cornborough residents						
Conservation groups						
Surfers						
NRA						

Figure 4. **An example of a conflict matrix for the Northam Site.**

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Figure 5. **Index of visual quality.**

Column Score		7	6	5	4	3	2	1
Location: **Time:** **Direction of View:**		Greatly heightens visual quality	Heightens visual quality	Adds some interest	Does not detract or add to visual quality	Detracts from visual quality	Detracts greatly from visual quality	Spoils the view
	Natural Features							
1	Change of gradient		✓					
2	Natural woodland	✓						
3	Variety of vegetation							
4	Running water							
5	Still water							
6	Exposed rock							
7	Natural colour	✓						
8	Skyscape	✓						
9	Wildlife							
	Human Impact							
1	Farm buildings		✓					
2	Industrial buildings							
3	Residential buildings				✓			
4	Recreational facilities							
5	Services							
6	Industrial activity							
7	Site of antiquity							
8	Communication					✓		
9	Influence of vehicles							
10	Agricultural type	✓						
11	Artificial waterworks							
12	Planted coniferous woodland							
13	Hedgerows	✓						
	Analysis							
	Total number of ticks in column	5	2		1	1		
	Number of ticks in column multiplied by column score	35	12		4	3		

Grand total	54
Total number of ticks	9
Index of visual quality	= 54/9 = 6

(Linear scale 0-7, where 7 is the highest visual quality)

mental impacts at each site. It should attempt to reach a decision on a suitable site, from a neutral standpoint.

Evaluation of methods

The final part of the exercise is a critical evaluation of the methods used by the students. The strengths of the approach are that it allows consideration of all likely impacts of a development and that it is predictive and positive (Selman 1992) in that it identifies and considers how to minimise any impacts before they occur. The weakness is that it is relatively subjective at this level.

Conclusion

Information collected in the field has dealt primarily with the visual quality of the environment and the possible impacts of the proposed sites and pipeline routes, together with some information on the possible fate of the discharge in Bideford Bay and subsequent effects on the marine environment and local beaches. It has not considered impacts on local residents and tourists in any real detail, but these could be expanded if required. A further area of interest is measurement in the field of the potential ecological damage at each site and a wide range of methods for this is discussed in Spellerberg (1992), though these require detailed ecological knowledge which is unlikely to be available at this level.

There is a problem in adapting real developments for use in student group exercises as there are many complex issues which it is not possible to cover in the time available. This means that only the main issues are considered and some aspects of an EIA are omitted entirely since the students are being presented with information appropriate to their level and to the aim of an introduction to the concept of EIA. This constraint may not apply to individual project work. Despite these limitations, it provides an excellent framework for both group and individual studies and makes students look at a development from a range of different viewpoints. It leads to stimulating discussions, particularly if a role play format is used, and introduces students to the complexity of real decision-making processes. ■

References

Hart, C. (ed.) (1983) *Field the 16-19 Way*, Schools Council Curriculum Development Project). University of London Institute of Education.

Selman, P. (1992) *Environmental Planning*, Paul Chapman.

Simpson, B. (1996) 'Sustainability and assessment: the increasing prominence of the natural environment in economic decisions', *Geography* 81(3), pp. 205-16.

Spellerberg, I. (1992) *Evaluation and Assessment for Conservation*, Chapman and Hall.

Wathern, P. (ed.) (1988) *Environmental Impact Assessment: Theory and Practical*, Routledge.

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Environmental Imapact Assessment

1. Conflict Matrix

Fill in any other relevant groups into the table.
Score +3 to -3 to show positive and negative interactions.

Coal Mine	Wildlife Society	Sasol	Homeowners	Mine workers			
Wildlife society		-2	+3	-3			
Sasol	-2		-3	+2			
Home owners	+3	-3		-3			
Mine workers	-3	+2	-2				

2. Index of Visual Quality

Complete table below as the area is before mining takes place.

column score	7	6	5	4	3	2	1
Natural Features							
Natural vegetation							
Running water							
Wildlife							
Natural colour							
Skyscape							
Topography							
Human Impact							
Agriculture							
Influence of boats							
Farm buildings							
Residential buildings							
Services							
Roads							
Planted trees							
Influence of vehicles							
Analysis							
Total no. of ticks in column							
No. of ticks in column multiplied by column score							

Grand Total **Total Number of ticks**	
Index of visual quality	

(linear scale 0-7, where 7 is the highest quality)

1. Spoils the view.
2. Detracts greatly from visual quality.
3. Detracts from visual quality.
4. Does not detract or add to visual quality.
5. Adds some interest.
6. Heightens visual quality.
7. Greatly heightens visual quality.

2. Index of Visual Quality

Complete table below as the area is before mining takes place.

column score	7	6	5	4	3	2	1	
Natural Features	✓							
Natural vegetation			✓					
Running water	✓							
Wildlife	✓							
Natural colour			✓					
Skyscape		✓						
Topography				✓				
Human Impact					✓			
Agriculture						✓		
Influence of boats					✓			
Farm buildings					✓			
Residential buildings					✓			
Services							✓	
Roads							✓	
Planted trees				✓				
Influence of vehicles							✓	
Analysis								
Total no. of ticks in column	3	1	2	2	4	1	3	16
No. of ticks in column multiplied by column score	21	6	10	8	12	2	3	62

Grand Total Total Number of Ticks	62
Index of visual quality	3,8

(linear scale 0-7, where 7 is the highest quality)

1. Spoils the view.
2. Detracts greatly from visual quality.
3. Detracts from visual quality.
4. Does not detract or add to visual quality.
5. Adds some interest.
6. Heightens visual quality.
7. Greatly heightens visual quality.

3. *Leipold Matrix*

	Construction	Boxcuts berms	conveyor	roads	River diversion	buildings	Operational phase	draglines	coal	Rehabilitation	polluted	blasting
1.Wetlands												
2.Ground water												
3.Surface water												
4.Air quality												
5.vibration												
6.Noise												
7.Visual Impacts												
8.Macro economic impacts												
9.Residential impact												
10.Property values												
11.Boating												
12.Birdwatching												
13.Agricultural impact												
14.Farmworkers												
15.Topography												
16.Soil and land capability												
17.Land use												
18.Plants												
19.Vegetation												
20.Birds												
21.Fish												
22.Archaeological sites												

key: Use a cross to fill in the above items in each block.

Negative impact - Positive impact +

high h medium m

low l no n

Short * medium # long. &

Environment Questionnaire 2 Name:

Issue	strongly agree	agree	Neutral	disagree	strongly disagree
1. We are approaching the limit of the number of people the earth can support.					
2. The balance of nature is very delicate and easily upset.					
3. Humans have a right to modify the natural environment to suit their needs.					
4. Humankind was created to rule over the rest of nature.					
5. When humans interfere with nature it often produces disastrous consequences.					
6. Plants and animals exist primarily to be used by humans.					
7. To maintain a healthy economy we will have to develop a "steady state" economy where industrial growth is controlled.					
8. Humans must live in harmony with nature in order to survive.					
9. The earth is like a spaceship with only limited room and resources.					
10. Humans need not adapt to the natural environment because they can remake it to suit their need.					
11. There are no limits to growth beyond which industrialised society cannot expand.					
12. Humankind is severely abusing the environment.					

Name:_____

Environment Questionairre

Issue	strongly agree	agree	neutral	disagree	strongly disagree
1. We are approaching the limit of the number of people the earth can support.		✓			
2. The balance of nature is very delicate and easily upset.		✓			
3. Humans have a right to modify the natural environment to suit their needs.				✓	
4. Humankind was created to rule over the rest of nature.		✓			
5. When humans interfere with nature it often produces disastrous consequences.		✓			
6. Plants and animals exist primarily to be used by humans.			✓		
7. To maintain a healthy economy we will have to develop a "steady state" economy where industrial growth is controlled.		✓			
8. Humans must live in harmony with nature in order to survive.		✓			
9. The earth is like a spaceship with only limited room and resources.		✓			

10. Humans need not adapt to the natural environment because they can remake it to suit their need.				✓	
11. There are no limits to growth beyond which industrialised society cannot expand.		✓			
12. Humankind is severely abusing the environment.		✓			

Action on Informal Settlement

	strongly support	support	don't care	don't support	strongly disagree
bulldoze			✓		
give people money				✓	✓
site and service				✓	
low cost houses	✓				
invasion				✓	

SACRED HEART

COLLEGE

HIGH SCHOOL: ECKSTEIN STREET - OBSERVATORY - JOHANNESBURG 2198
PRIMARY: ECKSTEIN STREET - OBSERVATORY - JOHANNESBURG 2198
JUNIOR PRIMARY: ECKSTEIN STREET - OBSERVATORY - JOHANNESBURG 2198
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648-9154 (Junior Primary). 648-1858 (Nursery)
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Dear parent,

I hope by now your child has informed you about the std. 9 geography fieldtrip. Let me give you some details about the fieldtrip. We will be going to the Royal Natal National Park in the Drakensberg. Fieldwork is an essential component of geography and these skills are often tested in geography exams. The following areas will be covered on the trip: geomorphology (river discharge measurements, drainage basins, slope elements, weathering and erosion), mapwork (map orientation, compass direction, bearings, map interpretation), settlement (settlement patterns, electrification of villages, Tugela-Vaal Water Project) environment (phenomenology exercise) . A project will be handed in two weeks after the fieldtrip. While only one day fieldtrips are undertaken in std 8 and 10, we do a longer fieldtrip in std 9. We will be camping in tents on this fieldtrip. I have divided the students into groups of 5. While some are seasoned campers, for others this may be a new experience. Although we will be doing work on the fieldtrip, I am sure the students will also enjoy the experience. The practical details are as follows:

Departure:	**08:00 Thursday 19th September 1996**
Return:	**16:00 Sunday 22 September 1996**
Cost:	**R250 Please pay by 16th September.**

What to bring:

Short pants	sleeping bag	T-shirts
Small pillow	tracksuit	waterbottle
Raincoat	torch, batteries	walking shoes/slip-ons
Towel	hat	plate, cereal bowl
Sun tan lotion	knife, fork, spoon, mug	swimwear
Day pack	pullover	personal toiletries
Notebook, pen, pencil	thin foam mattress (rolled up)	

Each group should have:

Tent/s	dishcloths/dishwasher	pots
Groundsheet	can opener	a gas cooker
Cooking utensils	a gas lamp (with lintels)	matches
A cooler bag with ice bricks	rope for washing line	braai grid
Charcoal/firelighters	plastic basin/sponges	

No chairs or any other unnecessary goods are allowed due to shortage of transport space. No radios, tape recorders, walkmans, CD players are allowed. There are well kept ablution blocks at the Park.

Your's sincerely,

Sadie

Stephen Sadie (head of geography)

Std. 9 Geography fieldtrip **S. Sadie**

Drakensberg – Mont Aux Sources

.....

Programme Outline

Thursday:

8h30	Depart from SHC
1h30	Arrive at Royal Natal Park
	Put up tents
2h00	lunch
2h30	Mapwork
	Map orientation
	Sketch map
	Compass direction
	Map interpretation
	Short walk using compasses and maps
18h00	Supper

Friday:

8h00	Mont Aux Sources
	climb up escarpment
	identification of features
	stop at hotel for a swim
18h00	Supper
20h00	Campfire

Saturday:

8h00	River study
	river discharge measurements
	water testing
	drainage basins
	patterns
	order
	texture
1h00	lunch
2h00	Settlement
	Tugela – Vaal Water Project
	Electrification of villages
	Phenomenology Exercise
18h00	Return

Sunday:

8h00	Horse riding
10h30	Pack up tents
12h00	Depart for JHB
16h00	Arrive at SHC

Project:

Your project is due on Monday 7th October, 1996. The project will be out of 100 marks. It will count 60% towards your third term mark. Any information covered here can be used in the November exam. The questions on the worksheet are to be answered and used as notes for the compilation of your final project. Any additional information you include will be to your benefit. Worksheets will be give to you before each session to assist in your project. Don't forget to take notes at any one place as you won't be coming back later to get any information you missed out on.

Phenomenological Enquiry

Roger Bourquin

Introduction

Phenomenological enquiry involves looking at things from a subjective and not just an objective perspective. It includes an examination as to how one feels about something as well as what other 'objects' feel about a situation.

The aims and the objectives of this fieldwork exercise are as follows.

Aims

- To stimulate an appreciation of nature.
- To encourage the use of all senses in the assessment of ones surroundings.
- To promote thought about man's potential impact on the environment.

Objectives

- To describe their immediate environment using all their senses.
- To write an emotive response about their surroundings.
- To imagine their environment if certain factors were altered and to describe how they would feel about this.
- To discuss the pros and cons of man's potential impact on the environment

This fieldwork exercise could be used at any level in secondary school. It would however be best if it was used as an introduction to and a contextualisation for studies of the environment and ecology.

Before setting out on the exercise teachers should briefly tell their pupils where they are going, how long they are going to be and what they are going to be doing when they get there.

Phenomenological Experience Worksheet

Go sit on your own somewhere. Do not disturb or distract those nearby you.

A: Look at everything around you.

Consider the fact the these hills and rivers have been here for thousands of years and will be here for many years after you are dead. Taking into account the relatively short time you are on this earth think about how you are living your life and how you plan to live it in the future. What would you like to change? Write down a few points.

.....

.....

.....

B: Observing the environment using all five senses.

1. Describe what you see far from you, around you, under you, ext to you and very close to you. (Is it visually appealing?)
.....
.....

2. Touch the thingsaround you first with your eyes closed and then with your eyes open. Describe what you feel.
.....
.....

3. Describe the smells of what is around you. For example air, soil and plants.
.....

4. Taste the things around you such as soil, leaves, grass and water. Describe the texture and what you taste.
.....
.....

5. Sit quietly with your eyes closed for a few minutes and listen to the sounds of your immediate environment. Describe what you hear.
.....
.....
.....

6. Write a short paragraph on your emotional response to your surroundings. What were your feelings with regards to what you have just seen, smelt, heard, tasted and touched.
.....
.....
.....
.....

7. Describe how you would feel and how your mood would change if you were her:
- at night:
- at sunrise or sunset:
- at the hottest time of day:
- in the rain:

8. How would your attitude towards this environment change if you were left here on your own and had to survive on what is around you?

C: Man and the Environment

Answer the following questions either on your own or in small groups (no larger than three people).

1. How would you feel if a large power plant or factory was build close buy?
.....
.....

2. Describe what you think your emotions would be if you returned here in a year to find that massive amounts of erosion had taken place as a result of intensive farming?
.....
.....

3. How would you feel if the river had become severely polluted?

.....
.....

4. How do you think the river would feel if it became polluted? Would it actually care?

.....
.....
.....

7. How would you feel if a lot of people who are now poor and unemployed got jobs as a result of coal being discovered and mined in this area or as a result of intensive farming?

.....
.....
.....

8. Write a short paragraph on your own stating how you feel about the fact that this environment could change. What positive and negative impacts could man have on this environment?

.....
.....
.....

9. Read the following poem and consider the trees around you:

The Tree

Let us pause for the taking of inventory.
To measure the debt we owe the tree.
For the searching root that knits the soil,
The cooling shade for those who toil,
The air we breathe, natures greatest gift,
And the leaf that heralds each seasons shift.

Forget not the fruit that feeds man and beast,
The branch that burns to prepare the feast.
That sturdy frame that builds the home,
And the paper on which you read this poem.
The tree gives all and asks no prize
Even making the axe that ends it's life.

Anon (Enviroteach, April 1994, p.13)

10. Do you think that trees are really willing to "give all and ask no prize"? Are they happy about this situation?

.....
.....
.....
.....

11. Does nature have the right to survive for it's own sake or must it's existence be justified (as it is in this poem) because it is of some use to man?

.....
.....

Settlement

1. The Tugela – Vaal Water Project

1. List the names of the dams in the Tugela – Vaal Water Project.

1..... 2. ..... 3. .....

4. .....

5. How is the water pumped over the escarpment?

.....
.....
.....

6. How do the new dams differ from the old ones?

.....
.....
.....

7. Which water transfer scheme is set to take over from the Tugela Vaal as the major water scheme?

.....

8. The Tugela – Vaal project diverts water from one ocean to another.
Explain.....
.....
.....

9. What storage advantage does the sterkfontein dam have over the Vaal dam?

.....

10. Where is the nerve centre for the Tugela – Vaal project?

.....

11. Why is there a need for the project in the first place?

.....
.....

9. What power is generated by the turbines when pumping the water?
.....

2. Villages

1. What settlement pattern does the village have?

.....

2. What work are the people involved in? .....

.....
.....

3. Describe the following features of the village:

Housing shelters: .....
.....
.....

shops : .....
.....
.....

schools: .....
.....
.....

health: .....
.....
.....

4. Devise a rural development plan for this village

.....
.....
.....
.....
.....

5. Describe the type of agricultural activity observable in this area with regard to the following items:

Crops grown : .....
.....
.....

Methods of agriculture: .....
.....

problems of soil erosion .....
.....

marketing of crops .....
.....
.....

6. Estimate the annual income of the farmers her .....
.....

7. What livestock farming is practiced here? .....
.....

8. Can you find any evidence of migrant labour? .....
.....
.....

9. Describe the electrification project visible here and give reasons for it

.....
.....
.....
.....

Evaluation Sheet on Coal Mine at the Vaal River

Name:_____

1. Living in South Africa (video on fishing, electricity, water, Sabie River which analyses values, attitudes and behaviour of different interest groups.)

_____

_____

_____

_____

_____

_____

2. Lesotho Highlands Water Project (Mr. David Fig - guest speaker)

_____

_____

_____

_____

_____

3. Introduction - Coal Mine at the Vaal (posters, Selling paradise down the river, SAVE Newsletter, Battle to save wetlands continues, Sasol plan to open mine infuriates Vaal residents)

_____

_____

_____

_____

_____

_____

4. Preparation for Public Enquiry (divide into groups - Sasol, wildlife society, mineworkers, homewowners; executive summary of EIA, The Battle of Rietspruit, letters to president and minister of water affairs, EIA briefing document.)

_____

_____

_____

_____

5. Public Enquiry (Sasol, Wildlife society, mineworkers, homeowners)

6. EIA (Conflict matrix, Index of visual quality, Leipold matrix)

Name: _____

Coal Mine at the Vaal River

1. Living in South Africa (video on fishing, electricity, water, Sabie River which analyses values, attitudes and behaviour of different interest groups.)

I learnt that the Distribution of electricity water and money across South Africa is very un even, there the things we take for granted (water, electricity,) are desperately needed in the rural areas,

2. Lesotho Highlands Water Project (Mr. David Fig - guest speaker)

It was interesting to find out the distribution of the GNP of Lesotho and all the activities Surrounding the area. The talk was good but it went on for too long

3. Introduction - Coal Mine at the Vaal (posters, Selling paradise down the river, SAVE Newsletter, Battle to save wetlands continues, Sasol plan to open mine infuriates Vaal residents)

Very interesting to find out the price nature has to pay in order to support Capitalism.

4. Preparation for Public Enquiry (divide into groups - Sasol, wildlife society, mineworkers, homewowners; executive summary of EIA, The Battle of Rietspruit, letters to president and minister of water affairs, EIA briefing document.)

I felt that this task was quite difficult mainly because I was defending the wrongside, but I found it very enlightening because I was naive to most of the effects of mining

5. Public Enquiry (Sasol, Wildlife society, mineworkers, homeowners)

The Debate was terribly intense, people were getting too emotional, In the end I found that the opposite team had weightier argument

6. EIA (Conflict matrix, Index of visual quality, Leipold matrix)

Through this analysis I found that this development of the mine wouldn't do that much harm to the appearance of the area. And that the development done would.

7. Phenomenology Exercise

APPENDIX D

RESEARCH DATA ON INFORMAL SETTLEMENT - 1

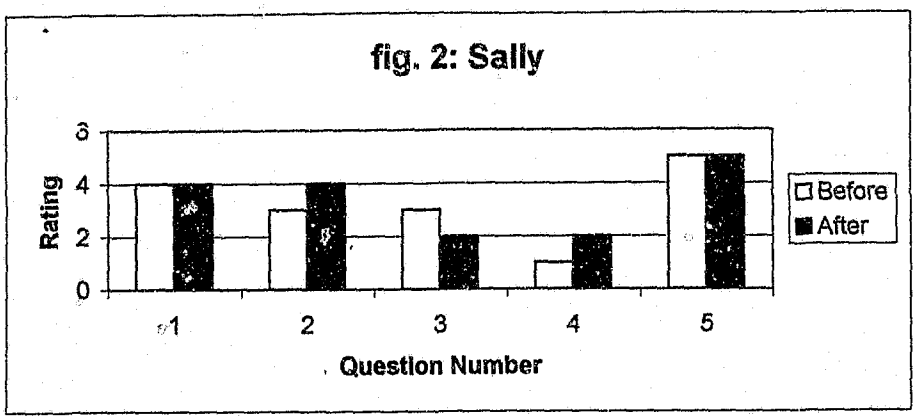


fig. 2: Sally
Rating
0
2
4
6
1
2
3
4
5
Question Number
Before
After

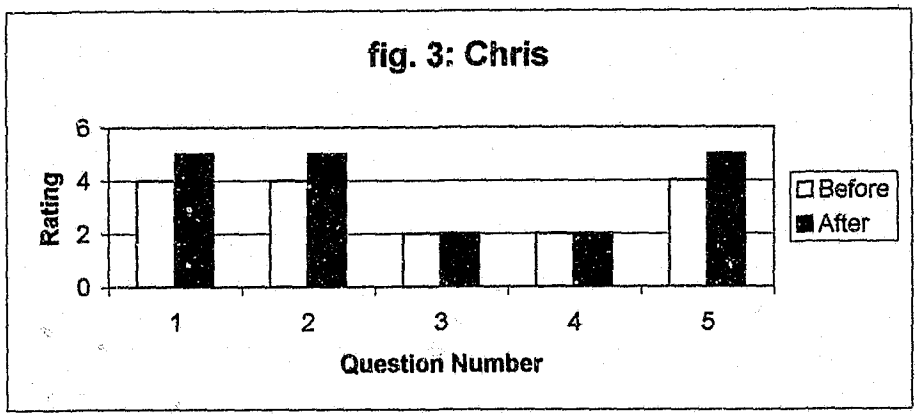
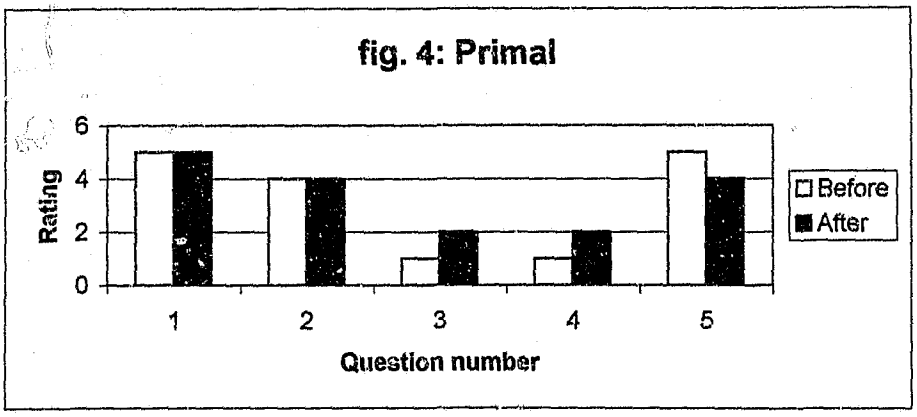


fig. 3: Chris
Rating
0
2
4
6
1
2
3
4
5
Question Number
Before
After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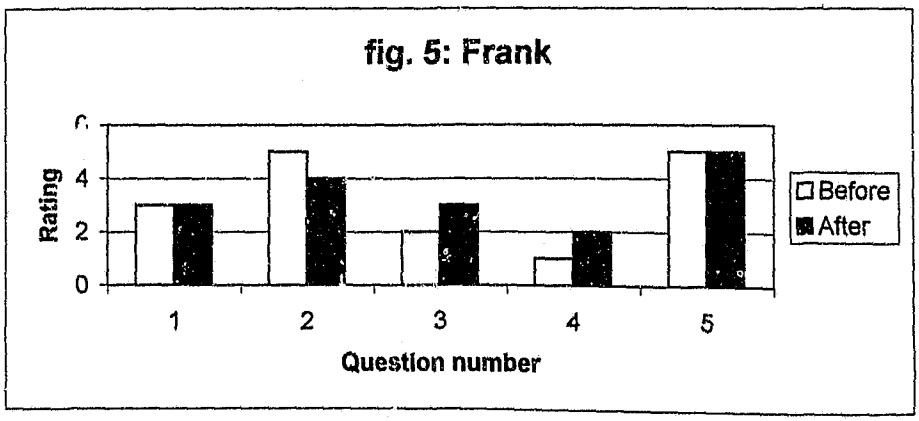
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Before
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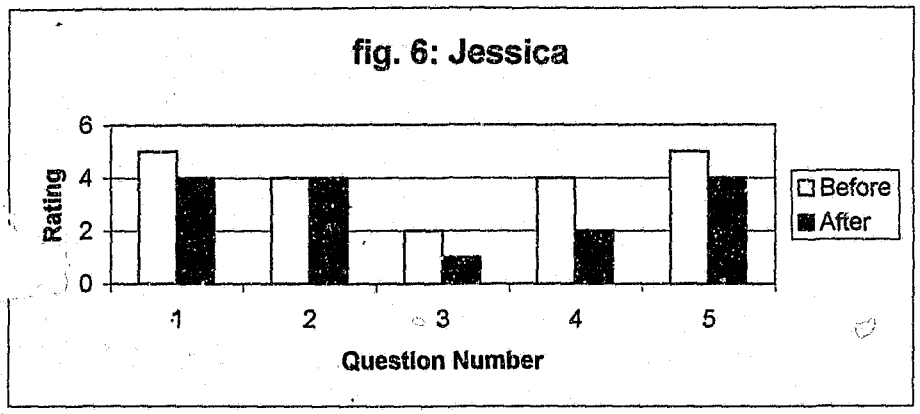
fig. 6: Jessica
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Question Number
Before
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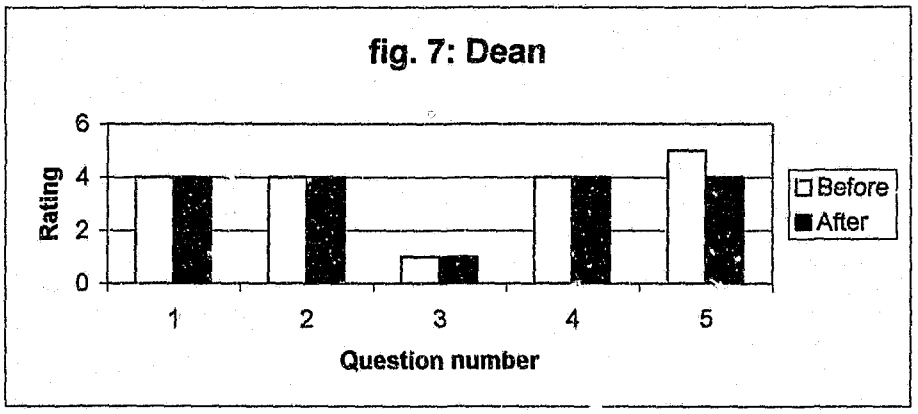
fig. 7: Dean
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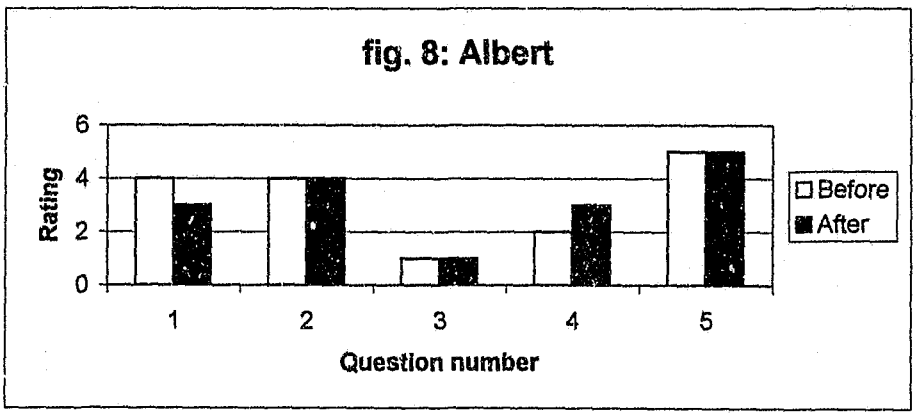
Question number
Before
After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Before
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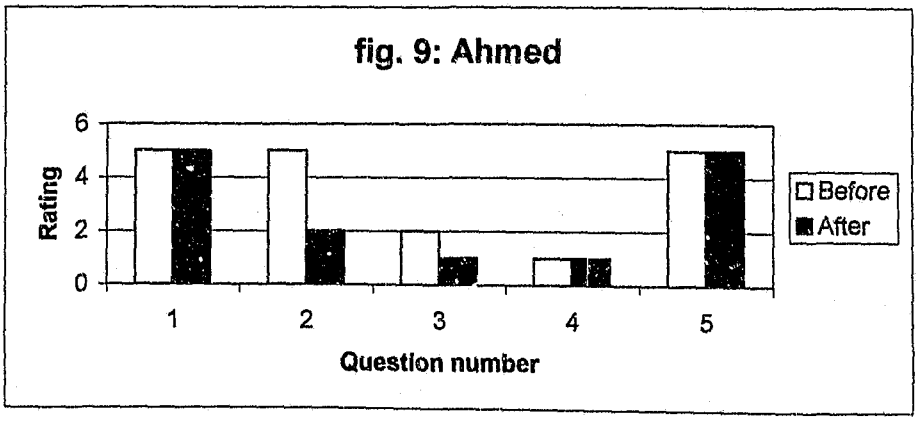
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Before
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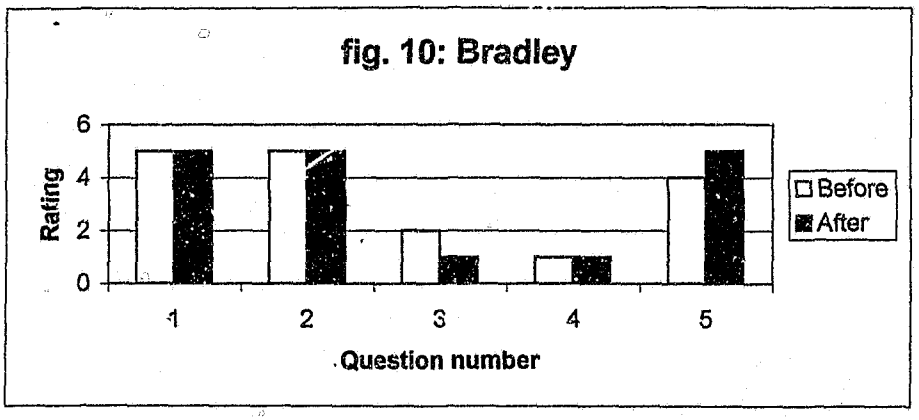
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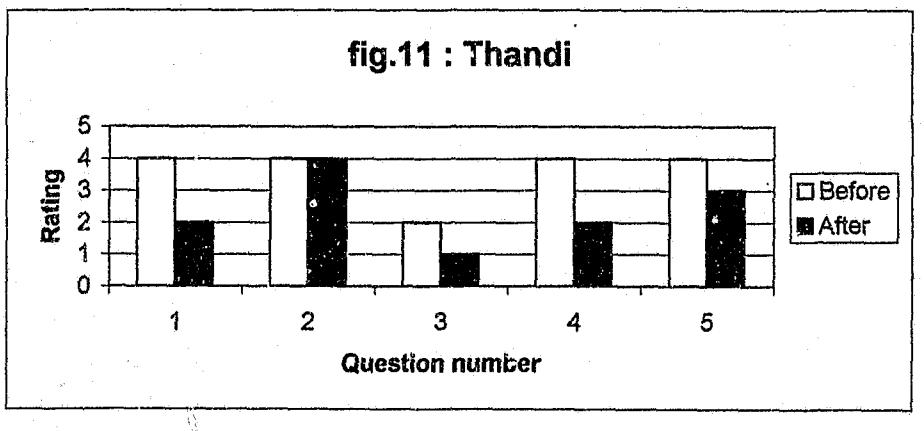
Before
After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Before
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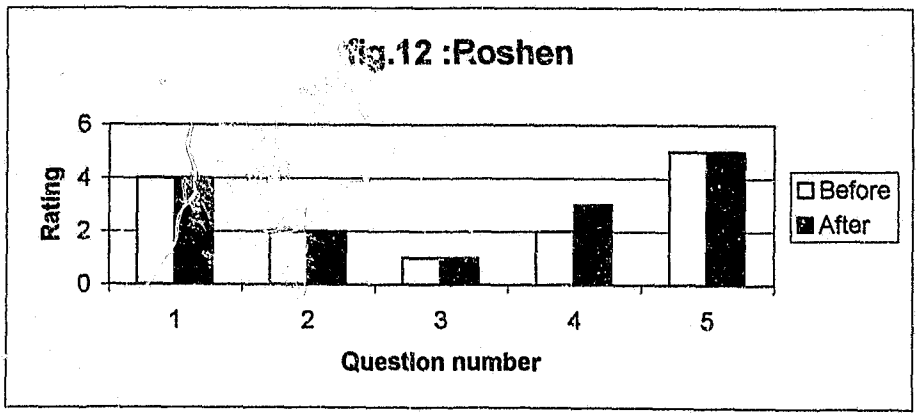
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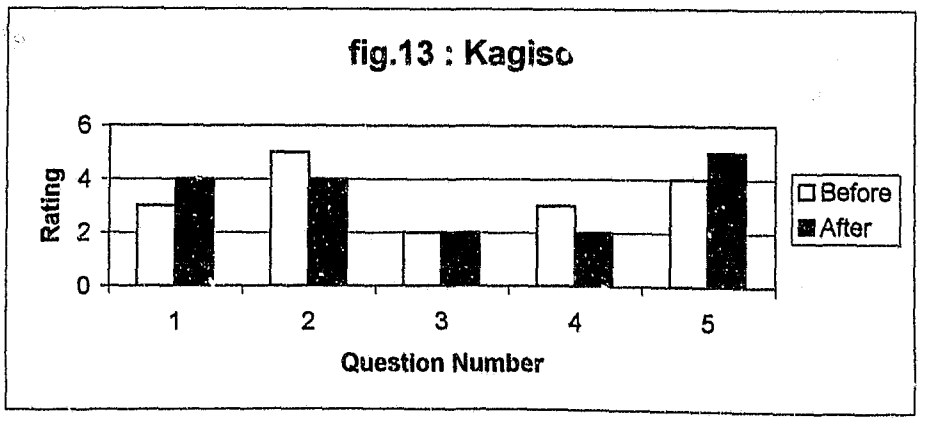
Before
After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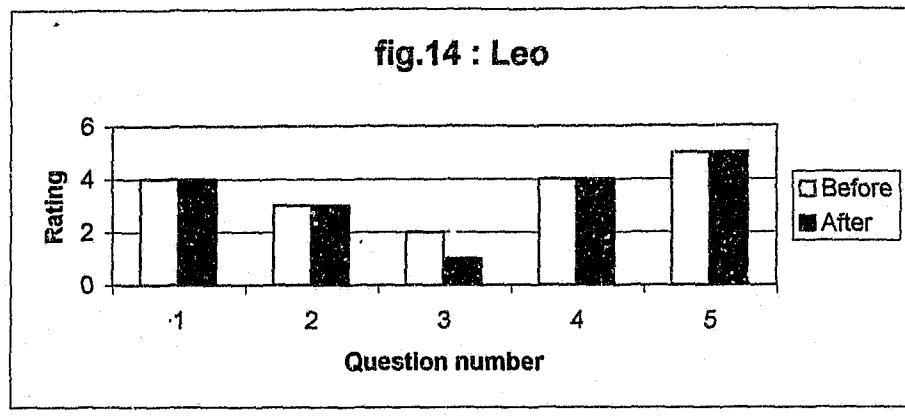
Before
After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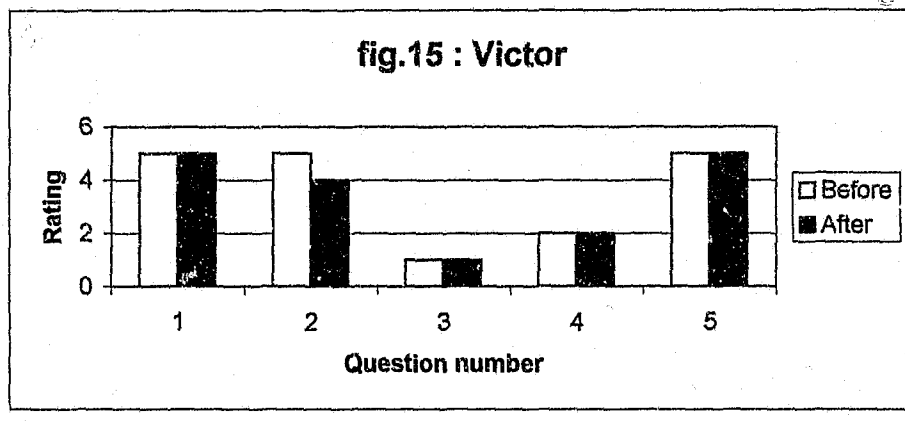
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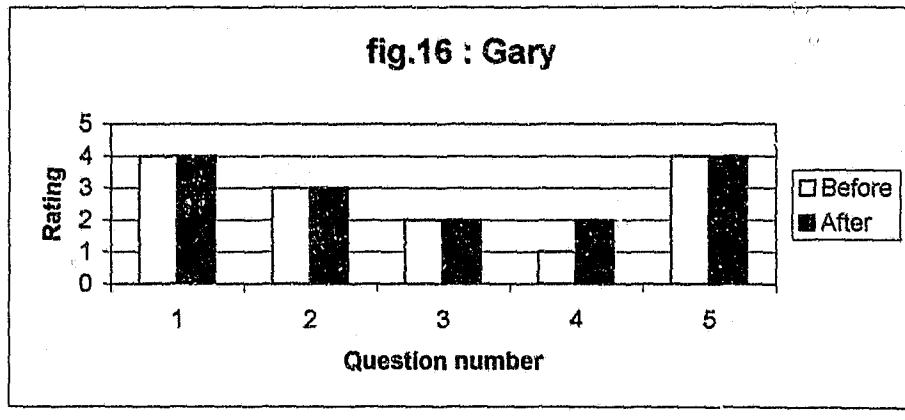
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Question number
Before
After

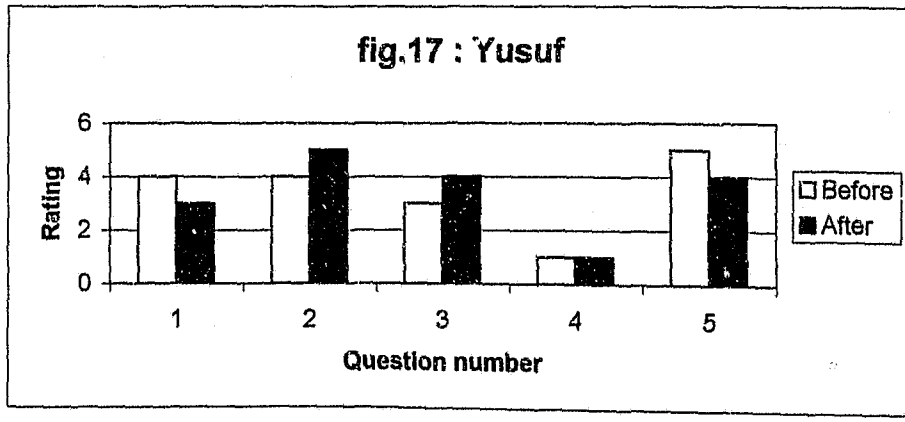
fig.17 : Yusuf
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Question number
Before
After

fig. 22: Dr. Budlender

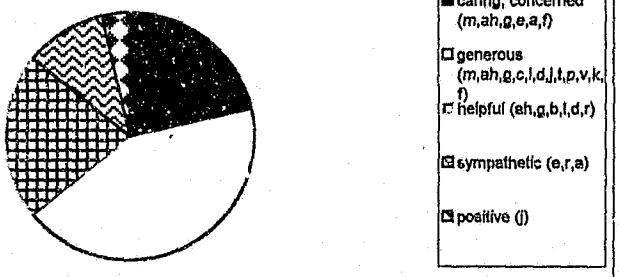


fig. 23: Victoria

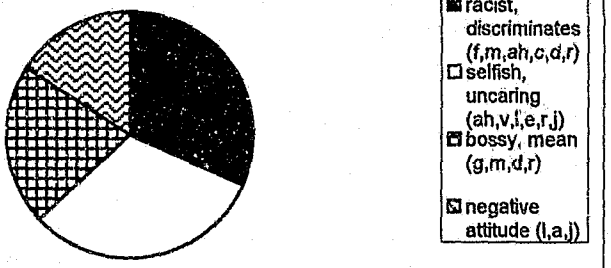


fig. 24: Green helmet

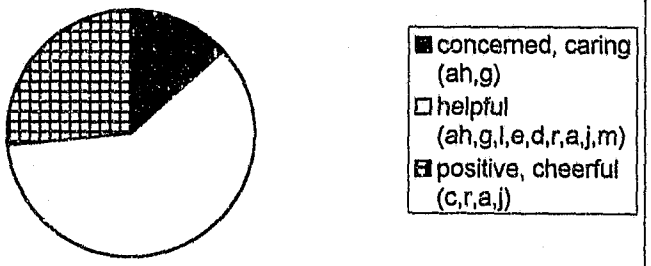


fig. 25: Nonceba

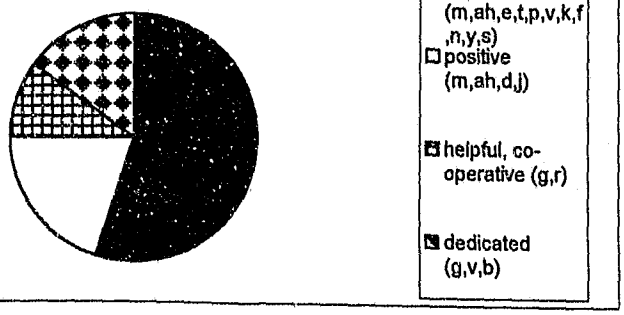


fig. 26: Mary

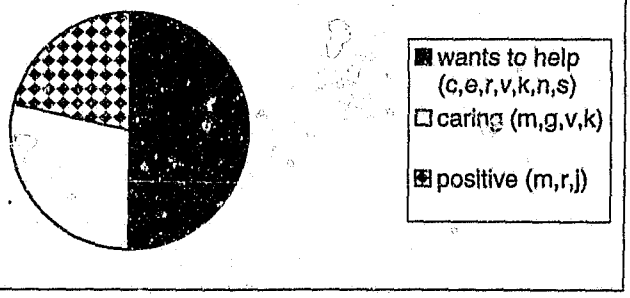


fig. 27: Ali

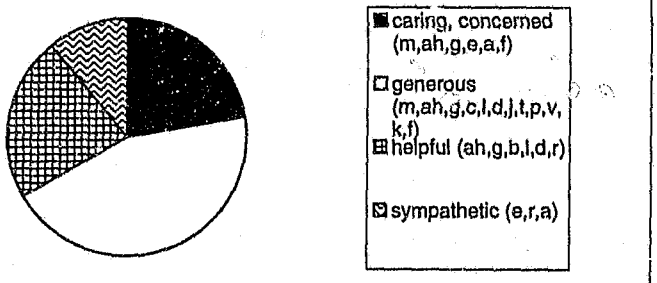
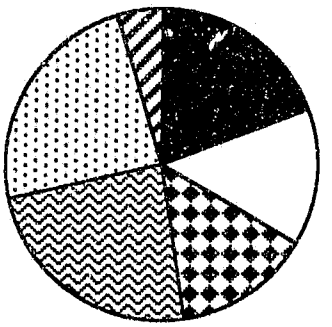
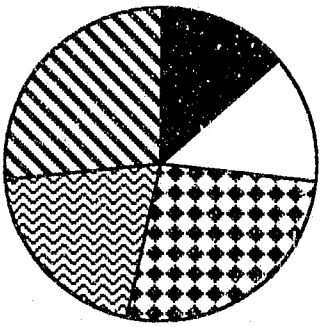


fig. 28: Myself



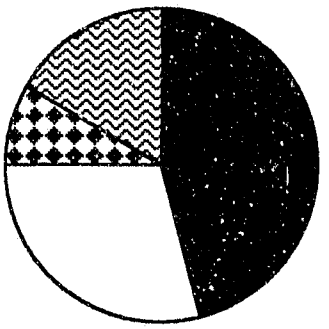
- find solutions (y,j,f,t)
- concerned (y,m,g)
- sympathy (y,e,r)
- helpful (r,ah,l,d,f)
- basic needs (e,l,j,a,d)
- obey the law (b)

fig. 29: Authors



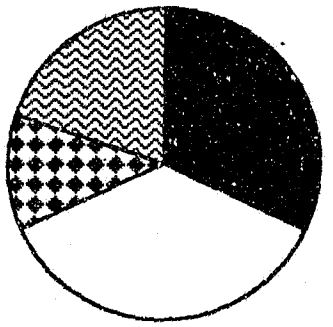
- sympathetic (f,r)
- recognise problems (e,t)
- caring, concerned (b,j,l,ah)
- truthful (g,k,y)
- distance themselves (a,j,k,y)

fig. 30: Police



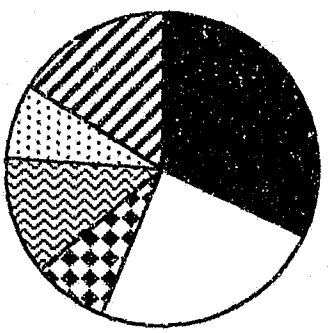
- decrease crime (t,b,v,k,s,m,e,r,l,j,a)
- violent, unkind (t,y,s,r,ah,a,d)
- relocate without violence (f,d)
- community concern (y,m,j,g)

fig. 31: Squatters



- security, familiarity (t,v,k,p,m,e,r,a)
- basic requirements (t,n,s,m,r,a,g,d,v)
- shelter (n,p,m)
- convenience (f,y,m,l,j)

fig. 32: City council



- certain interests (g,l,r,e,m,p,n,y)
- selfish (d,j,ah,s,b,t)
- have to do their job (g,k)
- take action (a,j,s)
- negative (j,n)
- understanding (r,e,v,y)

fig. 33: Bulldoze

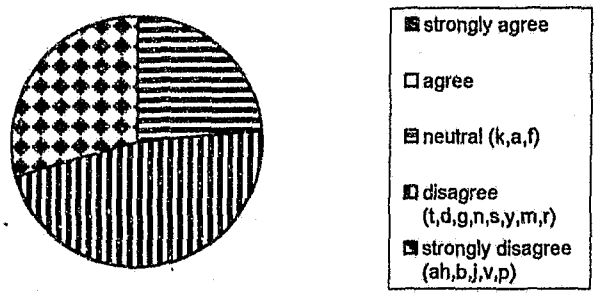


fig. 34: Give people money

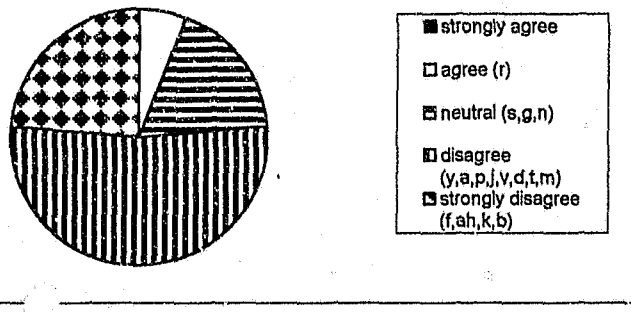


fig. 35: Site and service

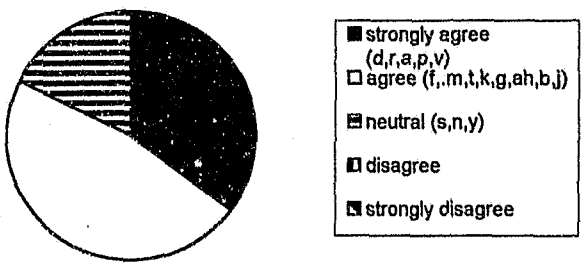


fig. 36: Low cost houses

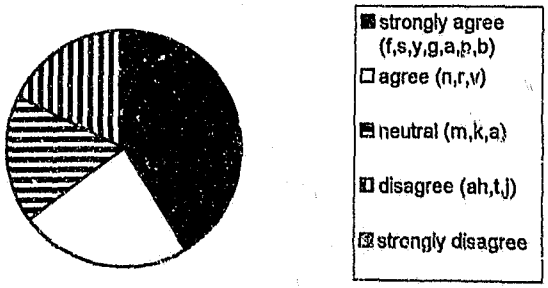


fig. 37: Land invasion

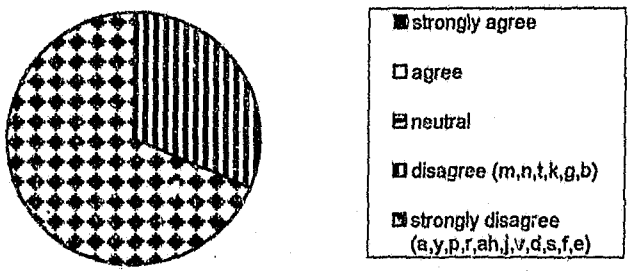


fig. 38: Crime rate will increase

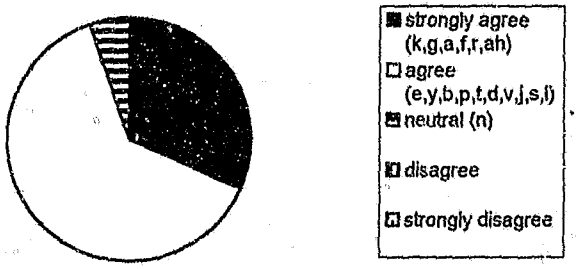


fig. 39: A place must be found but not in my neighbourhood

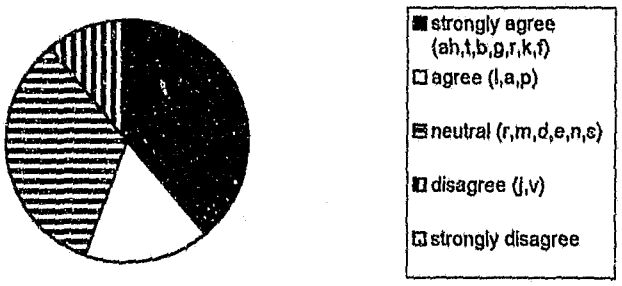


fig. 40: My property value will decrease

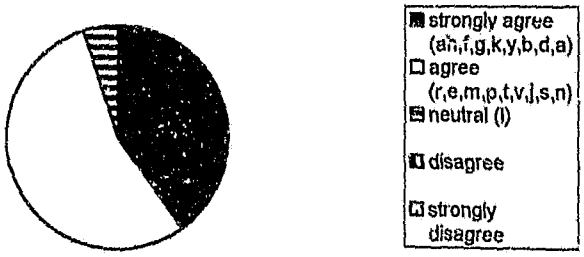


fig. 41: Pollution and disease will increase

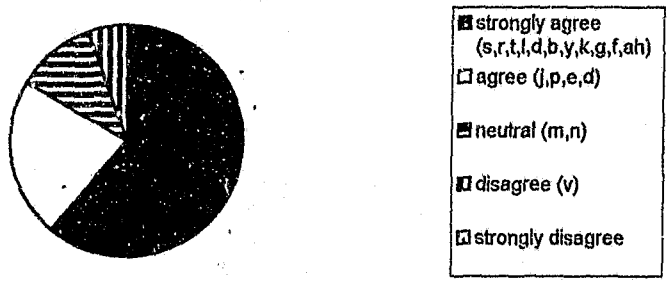
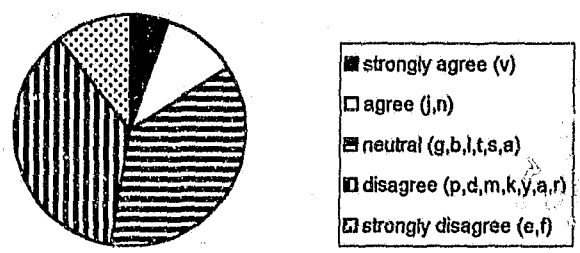


fig. 42: An opportunity to bridge the gap between different communities



APPENDIX E

RESEARCH DATA ON INFORMAL SETTLEMENT - 2

fig. 44: Dr Budlender

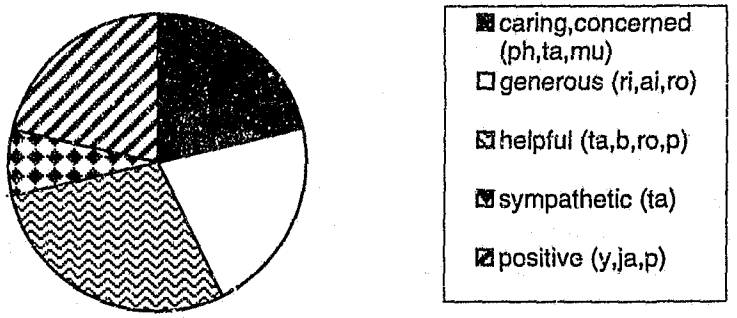


fig. 45: Ali

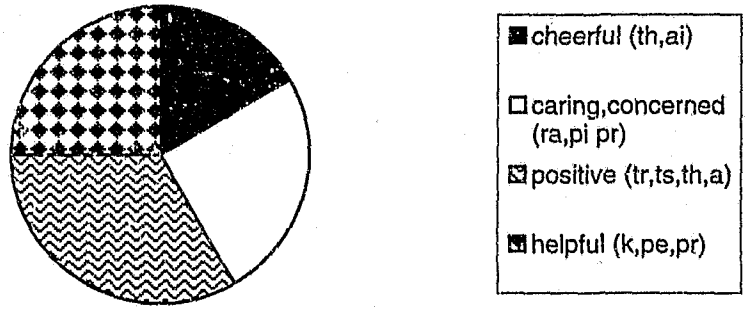


fig. 46: Green helmet

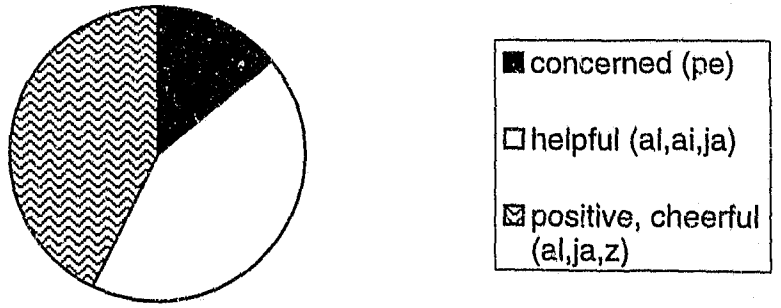
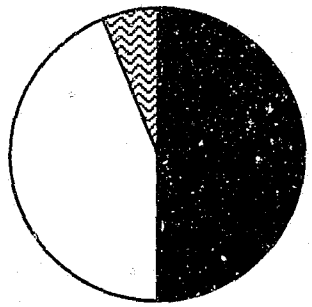
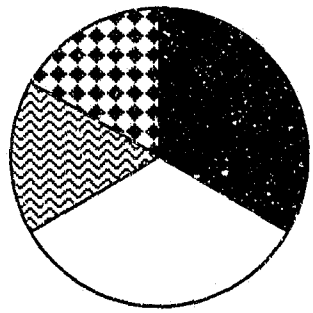


fig. 47: Mary



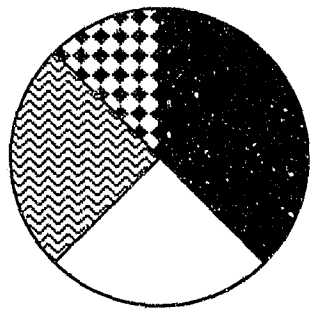
- wants to help (ph,ro,ra,jo,th,al,k,ge)
- caring (ai,y,ta,ph,d,al,jo)
- positive (ta)

fig. 48: Nonceba



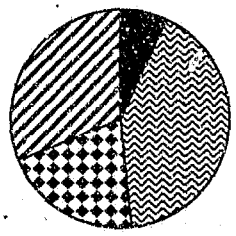
- motivated for improvement (z,ts)
- positive (ai,a)
- helpful, co-operative (z)
- dedicated (pe)

fig. 49: Victoria



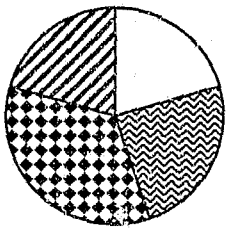
- rascist,discriminates (ai,pe,ty)
- selfish,uncaring (ja,ba)
- bossy, mean (ba,pe)
- negative attitude (a)

fig. 50: Bulldoze



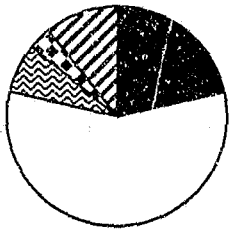
- strongly agree (tr,pe)
- agree
- neutral (a,k,g,ty,ta,ts,ph,pa,w,ro,y,pr)
- disagree (mo,ai,ge,ja,jo,mu)
- strongly disagree (t,ra,al,sh,br,th,s,pi,b)

fig. 51: Give people money



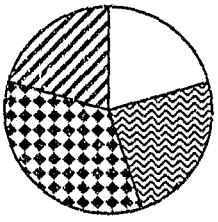
- strongly agree
- agree (t,al,tr,jo,pa,ty)
- neutral (ra,sh,b,mo,w,ai,y)
- disagree (a,br,s,pl,g,ta,ts,ph,ro,pe)
- strongly disagree (th,k,pr,ge,ja,mu)

fig. 52: Site and service



- strongly agree (ra,al,tr,jo,pa,ty)
- agree (t,al,y,a,k,g,ty,tr,mo,ge,w,pl,s,ph,jo,b)
- neutral (pa,ro,)
- disagree (pe)
- strongly disagree (pr,ja,mu)

fig. 53: Low cost housing



- strongly agree
- agree (t,al,tr,jo,pa,ty)
- neutral (ra,sh,b,mo,w,ai,y)
- disagree (a,br,s,pl,g,ta,ts,ph,ro,pe)
- strongly disagree (th,k,pr,ge,ja,mu)

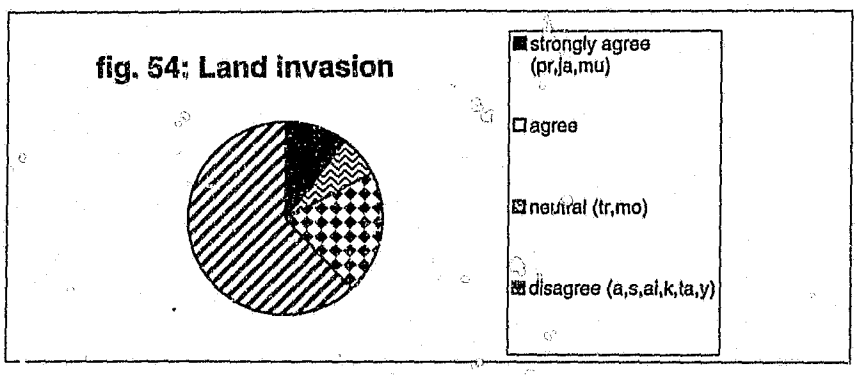
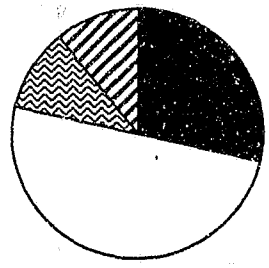


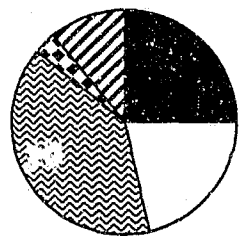
fig. 54: Land invasion
strongly agree (pr,ja,mu)
agree
neutral (tr,mo)
disagree (a,s,ai,k,ta,y)

fig. 55: Crime rate will increase



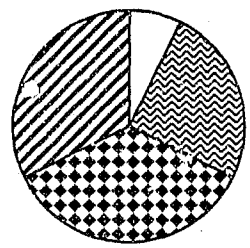
- strongly agree (pe,ra,br,g,ta,ge,ph,jo)
- agree (y,pa,w,t,a,ty,tr,sh,ro,mo,t h,,k,ts,ai)
- neutral (al,b,pl)
- disagree
- strongly diagree (ja,pr,mu)

fig. 56: A place must be found, but not in my neighbourhood



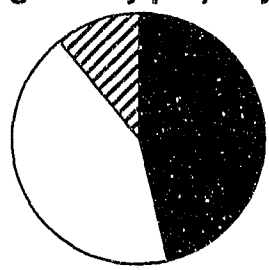
- strongly agree (pe,ra,y,k,g,ge,ta)
- agree (a,sh,mo,ts,w,al)
- neutral (t,tr,al,b,br,th,ty,p,ph,rro,pa)
- disagree (jo)
- strongly disagree (ja,pr,mu)

fig. 57: An opportunity to bridge the gaps between different communities



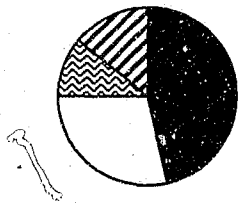
- strongly agree
- agree (th,pa)
- neutral (t,tr,ro,bf,mo,pl,w)
- disagree (y,a,g,ta,ph,ts,jo,b,th,al)
- strongly disagree (ra,al,pe,sh,k,ge,pr,ja,mu)

fig. 58: My property value will decrease



- strongly agree (pe,y,t,a,ra,al,br,g,ta,pa,ge,ph ,jo)
- agree (tr,sh,w,b,ty,mo,th,ro,p,k,ts,a)
- neutral
- disagree
- strongly disagree (ja,pr,mu)

fig. 59: Pollution and disease will increase

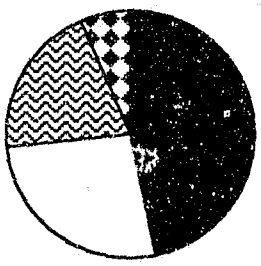


- strongly agree (pe,y,tr,ra,al,sh,pi,g,ta,br,ge,ph, jo)
- agree (t,a,ro,mo,th,b,ty,al)
- neutral (ts,pa,w)
- disagree
- strongly disagree (k,ja,pr,mu)

APPENDIX F

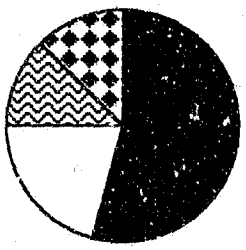
RESEARCH DATA ON WATER ACCESS AND CONSERVATION

fig. 61: Action on tap exploitation



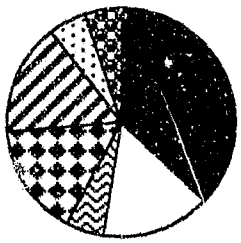
- allocate other taps (f,v,k,b,d,l,ah)
- build obstructions (f,s,e,r)
- guard the taps (g,e,r)
- confront, negotiate (a)

fig. 62: Action on sewerage problems



- introduce proper sanitation (k,s,v,r,d,e,ah,c,g,l,d,m,b)
- introduce long drops (k,s,v,j,m)
- provide mobile toilets (f,y,t)
- education, awareness (ah,g,l)

fig. 63: Water sources



- build more dams (s,y,c,ah,a,r,v)
- evenly distribute (p,t,y)
- neighbouring countries (t)
- Vaal (d,f,v)
- Lesotho (k,ah,v)
- sea (g)
- underground (v)

fig. 64: Attitudes of S.A. government

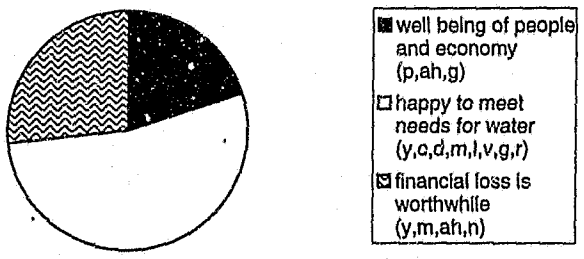


fig. 65: Behaviour of S.A. government

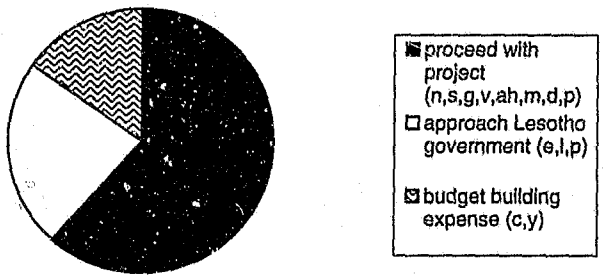


fig. 66: Attitudes of farmers in the Northern Cape

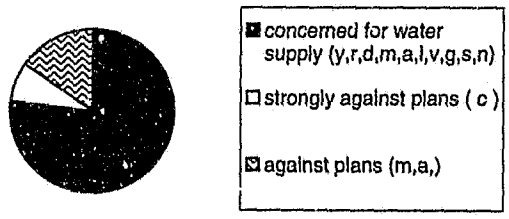


fig. 67: Behaviour of farmers in Northern Cape

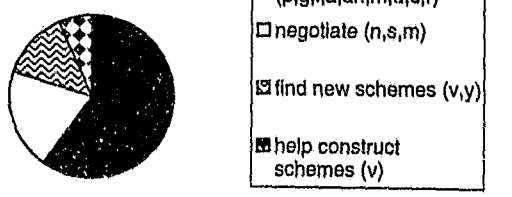
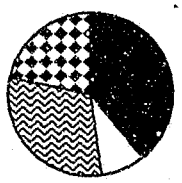
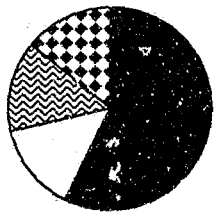


fig. 68: Attitudes of peasant farmers in Lesotho



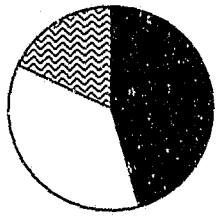
- superstitions opposing project (e,r,d,m,ah,n,g,v,a)
- against moving (r,y)
- strongly against moving (y,d,m,ah,a,s,n)
- fear loss of valuables (l,v,g,s,n)

fig. 69: Behaviour of peasant farmers in Lesotho



- protest (n,s,v,ah,m,d,c,r)
- complain (g,a)
- obstruct movement (v,y)
- move out (l,e)

fig. 70: Attitudes of Lesotho government



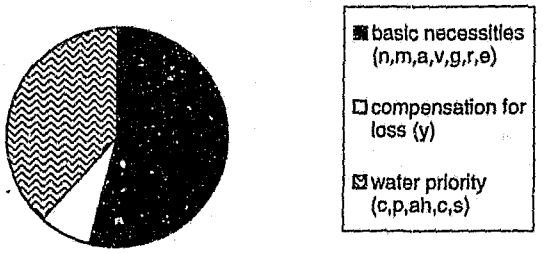
- improve economy (r,y,c,m,ah)
- concerned relocation (d,m,a,s)
- need money to address problems (v,g)

fig. 71: Behaviour of Lesotho government



- co-operate with S.A. plans (g,v,l,a,ah,d,c,y)
- encourage deal (p,r,a)
- give benefits to people (n,s,m)

fig. 72: Personal attitudes



APPENDIX G

RESEARCH DATA ON COAL MINE AT THE VAAL RIVER

fig. 74: Chris

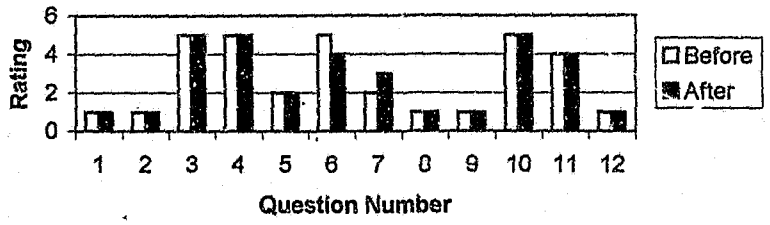


fig. 75: Sally

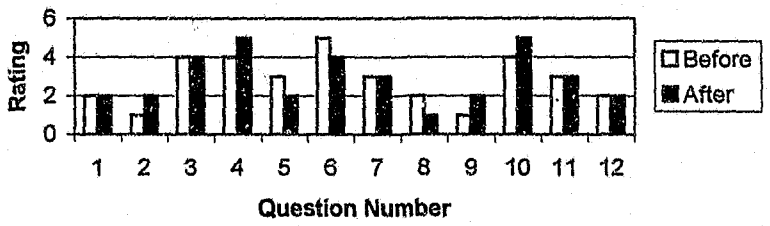


fig. 76: Jessica

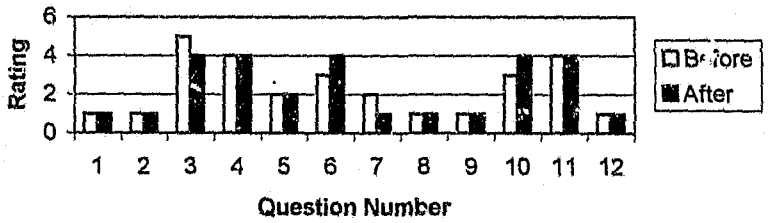


fig. 77: Nathan

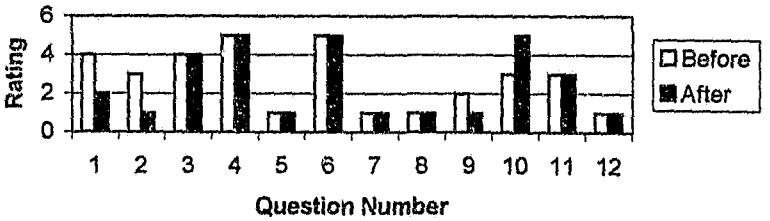


fig. 78: Kagiso

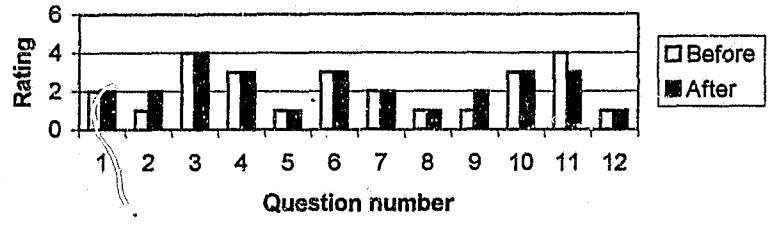


fig. 79: Gary

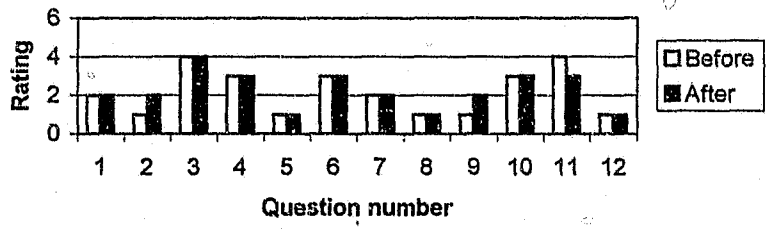


fig. 80: Albert

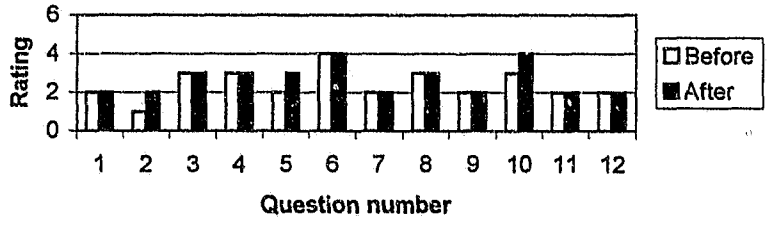


fig. 81: Leo

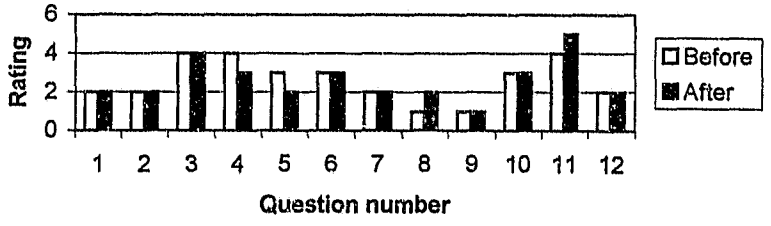


fig. 82: Dean

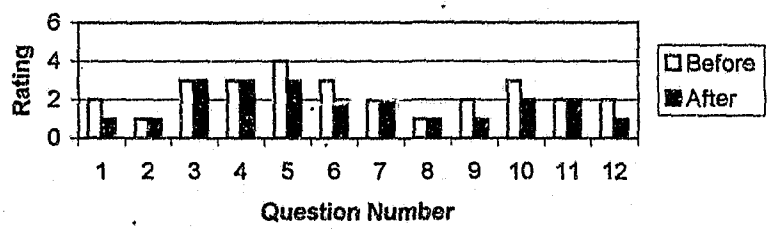


fig. 83: Thandi

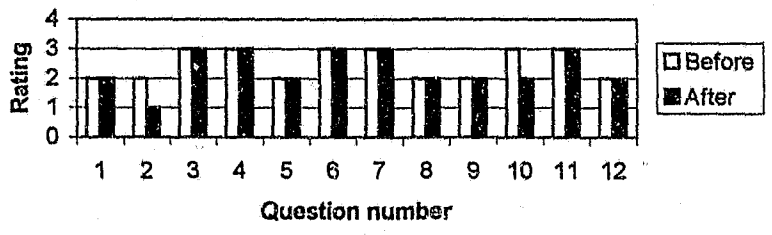


fig. 84: Roshen

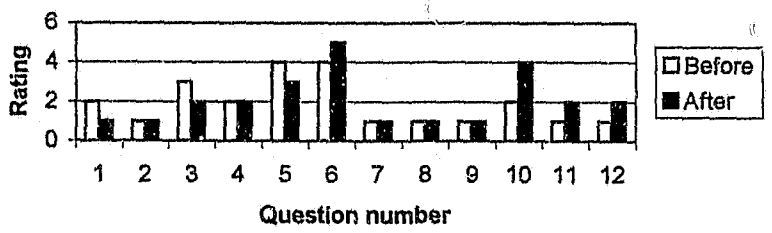


fig. 85: Primal

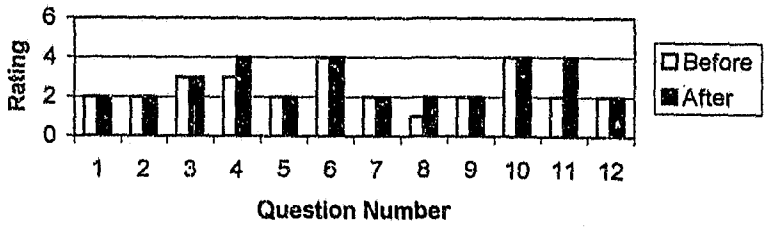


fig. 86: Bradley

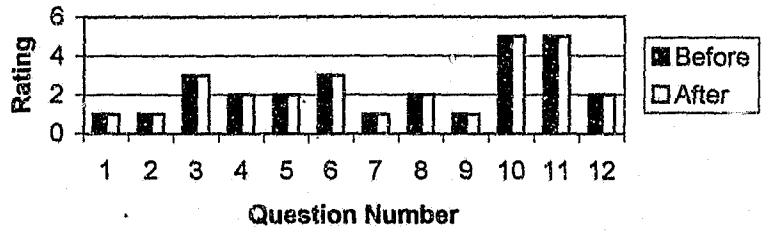


fig. 87: Ahmed

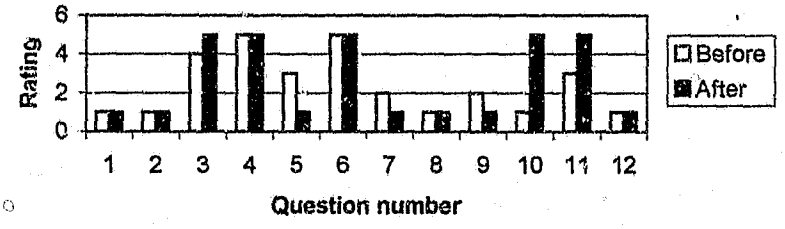


fig. 88: Ebrahim

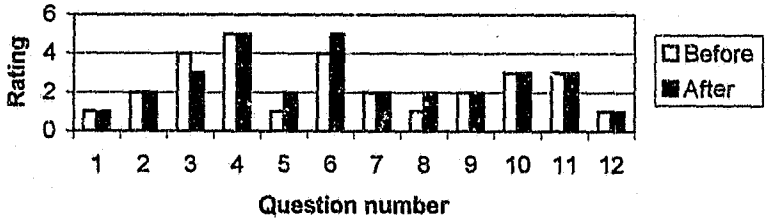
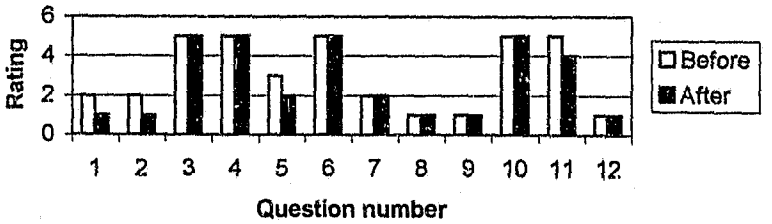


fig. 89: Frank



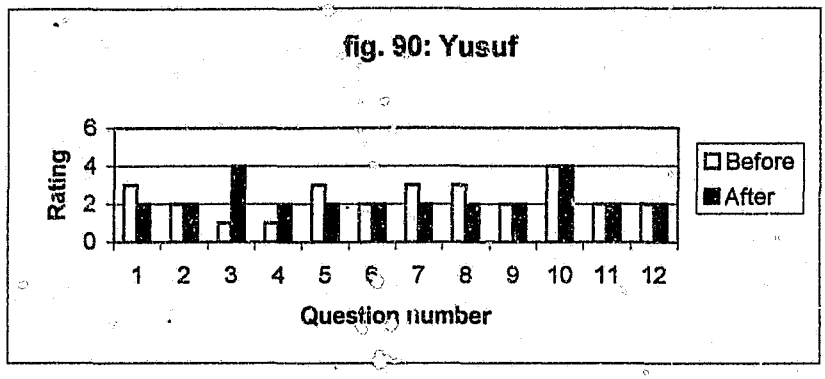


fig. 90: Yusuf

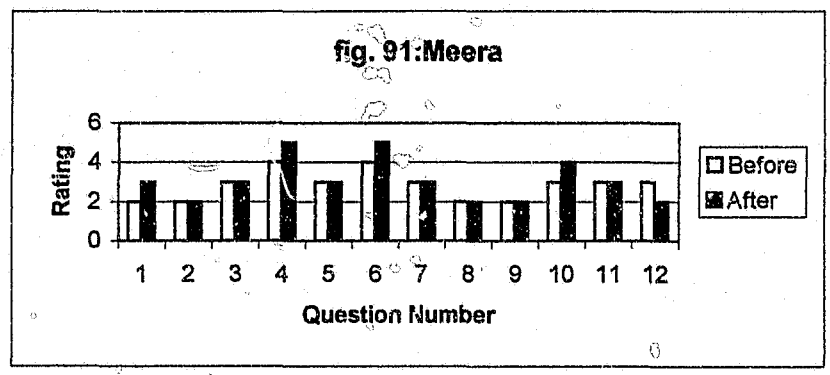


fig. 91:Meera

fig. 92: Views of big fishing companies

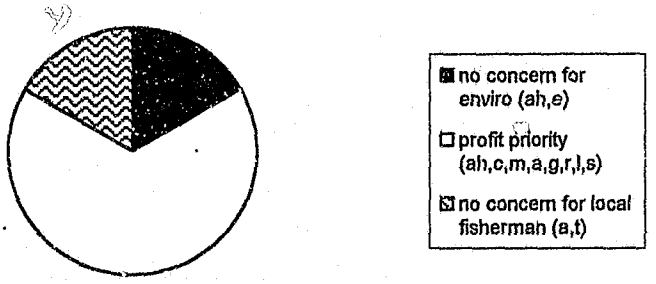


fig. 93: Behaviour of big fishing companies

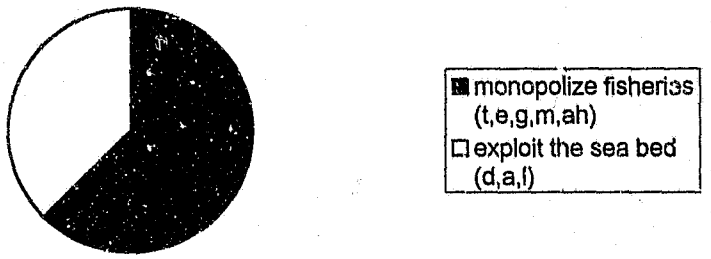


fig. 94: Views of local fishermen

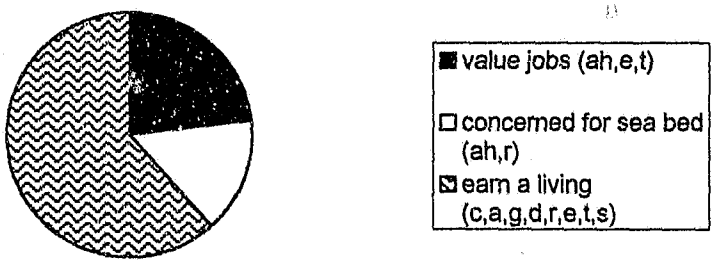


fig. 95: Behaviour of local fishermen

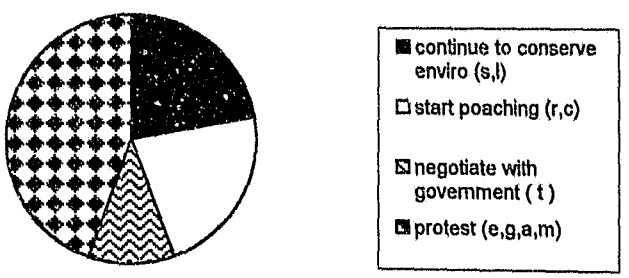


fig. 96: views of township residents

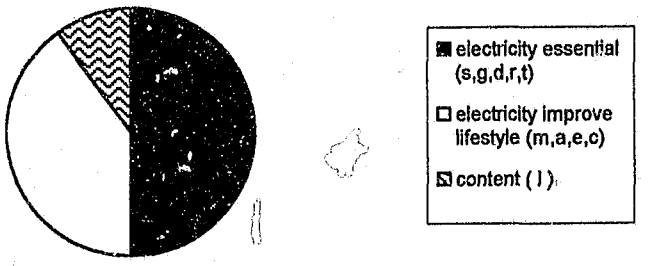


fig. 97: Behaviour of township residents

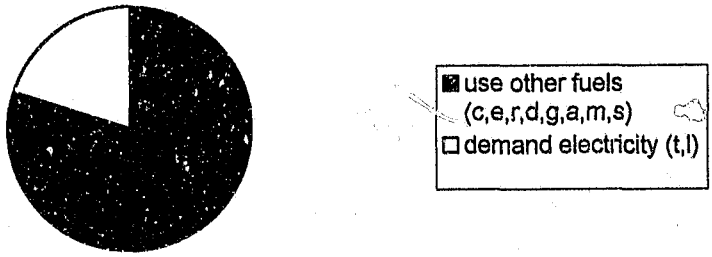


fig. 98: Views of rural dwellers

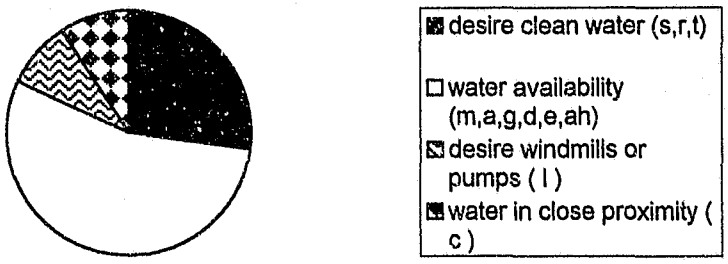


fig. 99: Behaviour of rural dwellers

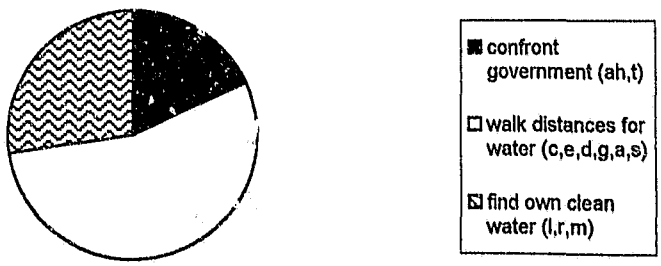
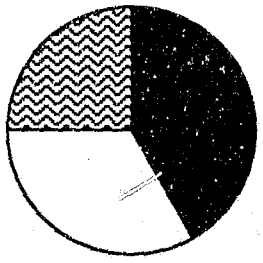
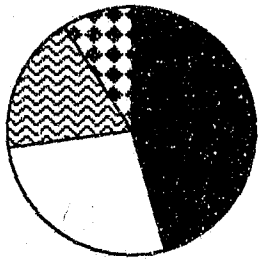


fig. 100: Views of urban dwellers



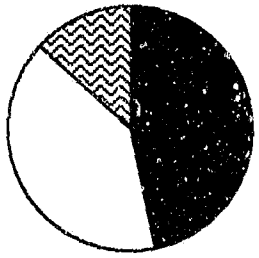
- clean, flowing,available water (m,a,d,e,ah)
- abundant water (a,d,l,t)
- demand water for industry (s,g,r)

fig. 101: Behaviour of urban dwellers



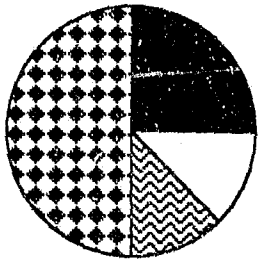
- pay for water (e,d,g,a,m)
- use benefits for themselves (l,g,a)
- ignore rural requests (ah,s)
- build water schemes (r)

fig. 102: Views of power stations



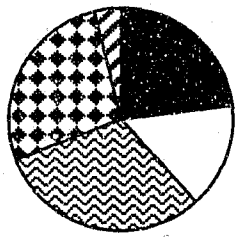
- supply electricity (c,m,a,d,t,e,s)
- make a profit (c,g,p,r,l,e)
- sacrifice for this priority (d,a)

fig. 103: Behaviour of power stations



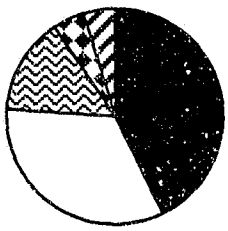
- continue providing electricity (e,t)
- produce more pylons (r)
- economic growth (a)
- ignore pollution problems (s,d,m,c)

fig. 105: Feelings if power plant was erected



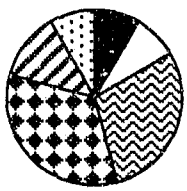
- distressed (pi,t,tr,w,jo,ja)
- disappointed (th,ta,a,pa)
- angry (th,ge,g,ta,ai,sh,ra,ty)
- sad (br,al,ma,s,tr,y,ro)
- concerned (ra)

fig. 106: Feelings if intensive farming caused soil erosion



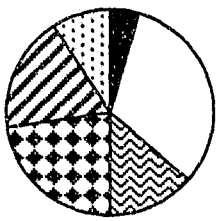
- disappointed (th,a,br,ge,br,pa,ta,tr,jo)
- upset (pa,tr,t,sh,ja,al,ro)
- angry (ta,ty,ai)
- concerned (ra)

fig. 107: Feelings if river became polluted



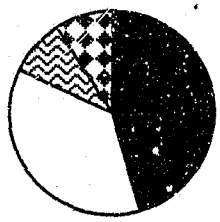
- motivated to help (pi,g)
- disappointed (th,sh)
- angry (ro,al,th,ge,g,tr,ra)
- upset (pa,ro,t,ai,ta,br,s,t

fig. 108: River's feelings on becoming polluted



- restricted (pi)
- sad (ge,pa,t,al,z,jo,ma)
- neglected (ja,s,g)
- misused (ta,br,ra,tr,w)
- abused (ta,br,ty,w)
- emotionless (jo,ai)

fig. 109: Coal is discovered providing job opportunities



happy (ai,jo,z,pa,w,a,t,ta,tr, ma,)

sad (ai,jo,w,ro,s,t,ma,g)

angry (a,sh)

APPENDIX H

TRANSCRIPT OF RECORDED LESSONS

Informal settlement unit

Lesson 2

Soul City Video (video - not recorded)

Lesson 4

Newspaper Article Analysis and Role Play (class 2)

Teacher:
Today we are going to do two things. Firstly we will analyse some newspaper articles and secondly we are going to have a role-play. The newspaper aricles will give us a chance to analyse the values and attitudes of the different groups of people. The role-play will give us a chance to see how well you can act. Let's look at the headlines of the newspaper articles. Squatters stone 200 in defence of shacks..... Squatter invasion of city parks growing daily.....Big police search in Phola Park.....Sheriff to carry on Alex squatter evictions today. I would like you to read the articles and while you are reading them see if you can find the values, the attitudes and the behaviour of these different groups... the squatters, the city council, the police, your own and the authors. Fill them in on the space provided on the worksheet.

The class fills in the worksheet.

Teacher:
Now we are going to do a role-play. Half of you are squatters and the other half are suburban residents. Let's draw a line down the middle of the class. This half of the class are squatters and this half of the class are suburban residents.

The class does the role-play

Teacher:
I am going to give you three minutes to crystallize your arguments, work out who is going to say what, because now we want to have quite a high level of debate. So make a few points about exactly what you are going to say in this debate.

The groups discuss their arguments.

Teacher:
We've come now to this public meeting. Let us listen to the other group's point of view.

Primal:
We can come to some kind of compromise. We are not kicking you out of the area, but the thing is we don't expect you to drop the value of the land. If we can provide sites and services and lost cost housing and stuff like that, your part of the deal would be towards the government, providing houses and whatever and then we help out with the services.

Thandi:
The thing about the low cost housing scheme, is that most of us are unemployed, right. We have tried speaking to the government and so on. Thats why we decided to move to your place. What I am basically saying is we don't have money for this low cost housing thing.

Sally:
You're complaining about not having jobs and whatever and I would give you guys some odd jobs in my area and then pay you.

Thandi:
If you give us little odd jobs .....

Sally:
Not little odd jobs, jobs.

Primal:
Like cutting the grass.

Thandi:
It's not going to make a difference to the bank.

Bradley:
I'm just adding to what Sally was saying: if we find employment, let's say that we drop or lets say we create our own social services and you people do the social services and you build your own houses and you start your own schools and that and we put money into that to help you. Is that not enough?

Teacher:
Through the chairperson. Frank do you also want to say something?

Frank:
I told her what to say.

Thandi:
About the building of the houses, some of us are uneducated, so what are you going to do - train all the guys to build or are you going to bring in people from outside?

Teacher:
Right, Thandi are you finished?

Thandi:
They didn't answer my question, sir.

Teacher:
Ok, answer her question.

Bradley:
What I wanted to say is that send certain group of you to be educated in how to build things and how to do this and how to do that.

Bell rings to end lesson.

Lesson 5

Lesson 5

Action on informal settlement (Class 2)

Teacher:
This lesson is about action on informal settlement. What can actually be done? Let us assume that you are the minister of housing in Gauteng. Given the background that we have gone through in the last few lessons, how would you deal with the housing situation? Put a small cross next to each solution. In the same block give a reason why you put your cross there.

The first option is bulldozing the shacks that people put up. Secondly, you could give people money to go and build or buy a house. A whole range of things can be done through site and service. The present government is trying to build low cost houses. We are talking about a house that costs R40 000. Should the government provide low cost houses where people take out bonds which they will pay off over twenty years. The next category is land invasion. We saw some examples where people just move in on the land and take over. Put down your cross on each of those five categories.

Learner:
Must we put down more than one cross?

Teacher:
No, just put down one cross in each category.

The learners fill in their worksheets.

There is a heated discussion between two learners.
Learner:
R20 000 is too much for a house

Learner:
R4 000 is enough.

Teacher:
Let's pick that one up later.

Sally:
Do we have to say how much money we want to give them?

Teacher:
OK, what I want you to do now that you have finished is to go through each one and check for differences and similarities in your groups. If you put bulldoze – strongly agree see what someone else got in your group and discuss it why you put it there and not somewhere else. Try and pick up what the differences are in your group. Go through each one like that.

Group work ensues.

Teacher:
What you should be picking up is how your opinion is different to other people – I mean there is no right or wrong – as long as you can back up what you say, that's fine. You don't all have to think exactly the same. There is absolutely no right or wrong on these things, it's a question of justifying your opinion. Let's try another one on the next page, called "Nimby". Who knows what "Nimby" stands for?

Class:
Not in my backyard.

Teacher:
Ok, it says there everybody realises that the squatter phenomenon is here to stay. Most people think that place must be made for them, as long as it is not in my backyard. So what happens when a group of squatters moves on to an open piece of land across the road from your neighbourhood? Indicate your response to the following issues, share your answers with the group and discuss the differences and similarities.

Learners fill in their worksheets.

Teacher:
OK, go through the discussion. Check if your answers are different or the same as the others in your group. It is important to pick up your values. Why do you say this and why does somebody else say that?

Group work.

Teacher:
We've spent five days on this informal settlement unit: The question there is "How have my values and attitudes changed in this unit?" They may not have changed at all, they may have changed slightly, you may be more aware of things. The second question is: "Is there a need to do anything about the situation of squatters? If so, what would you like to do? Would you like to go and visit a squatter camp, whatever. It is up to you, I'd just be interested to know what you write there.

The learners write down their answers to the questions.

Action on Informal Settlement (Class 1)

Teacher:
Let's look at how your values and attitudes have changed in this unit. We've been through about 5 lessons now.
How have my values and attitudes changed?
Is there a need for you to do anything about the situation of squatters?
If so what would you like to do?

The class answered the above questions in writing.

Teacher:
The last thing we are doing for this unit is an evaluation sheet, now this is important because we need to know what you've learnt in these lessons. Plus it is important for me to know what you've actually got out of these lessons.
Give an evaluation of the lessons above. Points to consider are: what did I learn about values and attitudes? What did I learn about informal settlements? Were the lessons enjoyable? Did I clarify my own values and attitudes? How could the lessons have been improved? The first one is "Sipho comes to town", the second one was the "Soul City" video, the third one was "Informal Settlements in the 3rd World", the fourth one was a newspaper analysis, and the fifth one was "Action on informal settlements" which we have just done. Right. Do this on your own and try and use all the space allowed.

The class starts to work on their evaluations.
This is a report back.

Teacher:

Right, bulldozing. What have you got?

Ahmed;
It causes conflict.

Jessica:
It only causes more problems, more homeless people and more poverty, whereas if they solve the problem, instead of just chasing them away. It just causes the problem in another place because they move somewhere else.

Teacher:
Give people money

Yusuf:
I strongly disagree. Because people won't necessarily use the money for housing. Even if they do use it for housing they might not use it as efficiently as the government.

Learner:
I agree. Subsidize them.

Teacher:
There are subsidies for people who earn less than R2500.00 a month. They qualify for a R10 000.00 subsidy. They must be first time homeowners, they have to be over 21 and they have to be married. Then they'll give you a subsidy. Right, site and service.
Roshen:
I said I agree because people need the basics.

Teacher:
That in fact is one of the most popular methods in the world for governments, it doesn't cost them much, all they got to do is provide the land and provide some basic services and people build their own houses. The alternative method is low cost housing. What have you got there?

Meera:
I strongly agree with low cost houses. Because it is low cost there is less money involved so they can build more houses then.

Teacher:
The big debate in the housing department is whether to provide site and service or whether to provide low cost housing. The big debate going on in the present government is if you provide site and service you can get to a lot more people. If you build houses for R40 000.00 only a few people will be able to get houses, in terms of all the homeless and so on.
Right, lastly land invasion?

Nathan:
I strongly disagree. Because people must consult the government about the land and land shortages. They must negotiate.

Teacher:
Moving on to number two. NIMBY. This stands for "not in my backyard". Everybody realises that the squatter phenomenon is here to stay. Most people think that a place must be made for them as long as it is "not in my backyard". So what happens when a group of squatters moves onto an open piece of land across the road from your neighbourhood? Indicate your response to the following issues. Share your answers with your group and discuss the differences and similarities.

The class spends time doing the worksheet.

Water Access and Conservation Unit

Lesson 2

Water Conservation (class 1)

Teacher:
As you come down the river, you'll see another problem: pollution. There are plenty of things in this poster. If you analyse this poster carefully: there's sewerage coming out of the shacks, straight into the river; there's effluent coming out of the factory straight into the river; there's more sewerage coming from those shacks.

Air pollution combines with the rain water to form acid rain. Sulphur in the air that is given off forms sulphuric acid which comes down in the rain, gets into the river, and again, kills the fish and so on. As you come down the river there is a dam over here – what do you notice about the dam?

Learner:
It's dirty!

Teacher:
It's got a lot of water hyacinth growing on it – all those green plants – it covers up the dam, uses up all the oxygen and if there is no oxygen in the water the fish die. If you go to Hartebeespoort dam you will see the problem. Hyacinth grows on sewerage, so if there is sewerage coming into the river, it feeds on it and that's why it multiplies and multiplies.

As you come down you can see some more pollution coming into the river. There's cattle grazing, denuding the grass, which means that there is going to be soil erosion – soil is going to be washed into the river. Eventually we get to the end where we should have an estuary, which should have lagoons between the sea and the river. There is no estuary there, it hardly even trickles into the sea.

So there is a lot to this poster which is an example of a badly managed river. There is also a well-managed river and if you go through all those little things, you will understand why it is a well managed river. Each of those things illustrates a particular issue.

The class splits up into two groups to do group work and to work through a worksheet.

Report Back:

Leo:
They are cleaning up the vegetation – the alien vegetation, which is taking too much water, also there are no natural predators in the wild there.

Teacher:
Why are they doing that?

Learner:
Because it uses up too much water.

Brian:
Looking at this dam here, it is full of quite a lot of weeds, or hyacinth, which use up too much oxygen in the water and reduces oxygen levels which means that the fish die because they can't survive. In South Africa our landscape does not allow us to have good dams because we do not have any deep narrow valleys.

Leo:
The sewerage system here is very well planned so the sewerage does not go into the river and does not pollute the river.

Jessica:
The people are doing proper gardening or plantation of fruit and they are using their water well.

Roshen:
First of all the plantation is too close to the river creating problems and pesticides as described for the plants and farming crops washing into the river.
Another problem is the windmills – windmills are too close to the river, windmills should actually be further away. They should try and control the pesticides.

Meera:
In informal settlements people have to walk – they only have taps within 200 metres of where they live, because the government does not acknowledge informal settlements.

Teacher:
They have already at 200 metres, or that's the plan to have it?
It's not only people in informal settlements, but a lot of rural people in South Africa walk kilometres every day, so the plan is that every one should not have to walk more than 200 metres and there should be clean water in the tap, 25 litres per person, at least, per day.

Primal:
But that's not a lot of water.

Teacher:
Well how much do you use when you bath every day? Not just to drink, for washing, for cooking, everything.

Albert:
The problem with the cattle is that they eat all the grass, through over grazing - this causes soil erosion.

End of Report Back

Lesson 4

Water Consumption (class 2)

Teacher:
Today's lesson looks at water consumption. At the end of this exercise we are going to look at how much you use per day. On page one we have some pie charts. The first one illustrates who uses water. Metropolitan areas use 69% of our water, rural areas 16%, towns with a population of less than 5000 use 3%, towns with a population of greater than 5000 use 12%. So we get some idea of who is using most of the water. So in terms of our break down of water, who is using the bulk of water in South Africa?

Learner:
Metropolitan areas.

Teacher:
Which are?

Learner:
Big cities.

Teacher:
Which are the big cities?

Learner:
Cape Town, Durban, Johannesburg, Gauteng.

Teacher:
Let's go to the next one. In terms of a particular household, bathing, toilets, and other activities use water. So if you look at a household, you can see that bathing uses a substantial amount of water. For a toilet it is normally an average of eleven litres per flush. Most people use an average of 4.2 flushes per person per day. A double flush system as described by the University of Cape Town has got two flushes on the toilet If you only need a small flush you push the first one, if you need a big flush, you push the big handle. Some people have that system, or you can also put a coke bottle or a brick inside your toilet tank or something like that, so that you use less water.

Let's look at government water schemes. Private irrigation takes more than half of our irrigation. Irrigation boards take quite a substantial amount and the water schemes take about a quarter.

Our average is 170 litres per person per day all over South Africa. That is how much South Africans use. What does this mean to say? Does this mean each person in South Africa uses 170 litres?

Learners:
No.

Teacher:
So what does it mean?

Primal:
It means that the average per person is 170 litres, for example it would probably be different for younger children or older people. And people in the rural areas,

Teacher:
People in the rural areas certainly don't use 170 litres, and we probably use a lot more than 170 litres.

Primal:
Why is it only whites that use 170 litres?

Teacher:
Well, let's come to that. The figures that we have are taken from a book called "Going Green". The white population on average uses 140 cubic metres per capita consumption per year. That is seven times more than black people and four times more than coloureds and Asians. A place like the Ciskei in the Eastern Cape uses nine litres per person. That is again an average for the area. The Eastern Cape, nineteen litres – that's the Eastern Cape Townships. Port Elizabeth townships, eighty litres. Your average white suburb uses something like 200 to 350 litres of water per person.

Primal:
200, sir?

Teacher:
Well how much goes into a bath? About eighty litres per bath?

Sally:
They say that if you shower it saves water but how does that work out, because when you are showering water is constantly going through, and if you wash your hair it is going to take longer?

Teacher:
Who wants to answer that question?

Primal:
I think it depends on the length of your shower. If you shower for five minutes, that is about the amount of time it would take you to fill up half a bath. If you're showering for ten minutes then it's about the same amount of water used in a bath.

Bradley:
It seems like a lot of water but our shower drain got blocked our shower is about 200mm deep and it took us 15 to 20 minutes to fill up that 200mm with water coming out of the shower.

Teacher:
It also makes a big difference how the water comes out and it also depends on how big the holes in the nozzle are – if the holes are very fine then less water will come out, if holes are big then a lot more water comes out. Again I think Primal's point is important. If you are going to shower for half an hour, it's practically the same as bathing, but if you do a quick shower for five or seven minutes, you'd save a lot of water.

Bradley:
But who stays in the shower for half an hour?

Teacher:
Some people do. Some people sing songs in the shower and shampoo their hair three times.

The WHO – the World Health Organisation, the standard they would like to set is 50 litres per person per day. Now how does that compare with our figures from yesterday?

Learner:
25 litres per day.

Teacher:
25 litres! So we are even below the WHO's standard. They reckon that an average healthy person needs at least 50 litres per day to lead a healthy life. Alright, we've got some interesting figures there. Again, that book "Going Green" probably came out about 1989 – 1990. Things will have changed a little bit over the last five or six years. Again, when they have taken readings it was based on the old group areas act where you had white suburbs – today these suburbs are quite mixed so it is hard to get these kind of figures. But I think the broad patterns – if you go to the Ciskei – you'll still find people there don't have that much water. Nelson Mandela only last year, his little village where he comes from in the Transkei, it's the first time they had piped water. So they're beginning to bring water to all these areas that previously didn't have, but I would imagine that a lot of the places still have the same amount of water that they have had for a while.

Teacher:
Water And Economic Growth.59% of South Africa's GDP – Gross Domestic Product – comes from Gauteng Province.

Learner:
What's GDP?

Teacher:
That is how much wealth the country produces. If you add up all the jobs and all the services that everybody provides, we call that GDP. So we can compare different countries.

Population: 42% of the urban population is in Gauteng. The Vaal catchment area provides only 8% of mean annual run-off. So the Vaal catchment area, of our total run-off in South Africa, only catches 8%. 50% of the mean annual run-off is already captured in dams, only 50% - the other 50% goes into the sea.

One dam per annum is lost to siltation – silt which is carried in the rivers, dams silt up very quickly and each dam silts up a little bit each year, but if you add it all up it would be the equivalent of one of our big dams being lost per annum due to siltation.

So we have got water problems in terms of that. What other problems are you picking up in those five points there?

Bradley:
That our dams are not big enough.

Kagiso:
The dams are not built right. They are too big and not deep enough.

Teacher:
They are shallow and large. A lot of water evaporation takes place; they should be deep and narrow. But what are we noticing about the Gauteng area and the Vaal area?

Primal:
We have so much economic activity in Gauteng, also we have such a large population – over population, and compared to the amount of water we do have in the Vaal it's not equal – it is not close to being equal.

Teacher:

We have one small little river – the Vaal River. If you go to Natal, they've got hundreds of rivers. So we have only got that one river here which we can get water from, only 8% of our mean annual run-off. So we've got problems in Gauteng. We've got too many people, too many factories, too many mines and not enough water. Now it is difficult trying to discuss water conservation when you look outside and you've got water pouring out of every little hole. What do we make of that? So much rain outside, the dams are all full, do we have to worry about conservation?

Roshen:
Yes! Because didn't you say some man researched it over a period of I don't know how many years, and South Africa experiences hail and all that for 5 years and after that for 5 years there is no rain anymore.

Teacher:
Ok! It's Professor Tyson of Wits University; it's a 7-year cycle more or less. We have 7 dry years and 7 wet years. So we have been through some pretty heavy droughts in South Africa – just two years ago there was a heavy drought. In 1981 – 1985 was a big drought and again, in the last two years we've had floods. So again we are going to go through this cyclical thing where we have flooding at some point and then drought again.

Roshen:
Won't the droughts we have be worse now because now we are supplying more people with water than we were before?

Teacher:
Now all these people are now going to get water who didn't have water before. Yes you are right.

Primal:
Won't those cycles change though because we are building more dams and stuff like that?

Bradley:
Where else can we build dams?

Teacher:
Well it doesn't help to build another dam on the Vaal River, because the Vaal Dam catches most of the water. If you build two dams it is not going to help us. The point is, if you look at where most of the rain happens – you see the blue and green on the map up on the wall – that's about 1000 millimetres. Most of it would run down to the Indian Ocean and it is wasted. Whereas the western half of the country is dry. So what we need is to get water from that side over on to this side. How do we do that?

Kagiso:
Pump water – we build dams on that side and pump the water over to the other side.

Teacher:
Like, for example?

Learner:
The Tugela-Vaal.

Teacher:
The Tugela-Vaal water scheme. It is just there in the Drakensberg, it pumps water over the escarpment. Plus, the Lesotho Highlands Water Project – that's water that should be going down to the Caledon River, and down to the Orange, now going to be diverted to Gauteng. But again, that will only last us for about twenty years. Then we are going to need more water

again. So we've got a problem whichever way we look at it. Let's go to that table over there – Water Consumption – you try and calculate for your own household. How much do you personally drink per day? Put it all in litres, so you can add it up. First do yourself, then you do your household, using the following categories: drinking, personal cleaning, toilet, dishwashing, clothes washing, garden, washing car or bike, swimming pool and any other. When you have done that, draw a pie chart showing your daily household consumption. Then draw a bar graph comparing the monthly household consumption totals for your group of four. Did anybody find any water bills at home? Yesterday you were supposed to read your water bills.

Sally:
How many litres are there in a bath?

Teacher:
How much water do you put in your bath? Do you fill up your bath a quarter, half, three-quarters or full? Most people fill it to half. The average bath is 90 litres, to flush a toilet - 9 litres, a shower - 11 litres.

Group work.

Water Consumption (class 1)

Teacher:
Today's lesson looks at water consumption. At the end of this exercise we are going to look at how much you use per day. On page one we have some pie charts. The first one illustrates who uses water. Metropolitan areas use 69% of our water, rural areas 16%, towns with a population of less than 5000 use 3%, towns with a population of greater than 5000 use 12%. So we get some idea of who is using most of the water. So in terms of our break down of water, who is using the bulk of water in South Africa?

Learner:
Metropolitan areas.

Teacher:
Let's go to the next one. In terms of a particular household, bathing, toilets, and other activities use water. So if you look at a household, you can see that bathing uses a substantial amount of water. For a toilet it is normally an average of eleven litres per flush. Most people use an average of 4.2 flushes per person per day. A double flush system as described by the University of Cape Town has got two flushes on the toilet If you only need a small flush you push the first one, if you need a big flush, you push the big handle. Some people have that system, or you can also put a coke bottle or a brick inside your toilet tank or something like that, so that you use less water.

Let's look at government water schemes. Private irrigation takes more than half of our irrigation. Irrigation boards take quite a substantial amount and the water schemes take about a quarter. This does not include industries -- this is just domestic water, water which comes through your house.

Teacher:
Our average is 170 litres per person per day all over South Africa. That is how much South Africans use. What does this mean to say? Does this mean each person in South Africa uses 170 litres?

Learners:
No!

Teacher:
So what does that mean?

Learners:
Some use more, some use less.

Teacher:
Right, some use a hellava lot more, some use a hellava lot less. Let's have a look at some of these figures. 140 cubic metres per capita consumption per year. It is about seven times more than black people use and about four times more than coloureds or Asians use. Per capita consumption for the Ciskei: 9 litres per person per day. Eastern Cape Townships: 19 litres per person per day, Port Elizabeth townships: 80 litres per person per day.

Learner:
How do they manage on so little?

Teacher:

Remember the Ciskei includes a lot of rural areas. The Eastern Cape is a very, very poor area. The average white suburb, per person 200 to 350 litres per day. I'd like to check your figures if you guys say you're using only 70 litres a day.
The WHO, the World Health Organisation's standard: that's the standard they set for a minimum requirement for water that every person should have 50 litres per day. The source where I got those figures from is a book called "Going Green"

Teacher:
Water And Economic Growth. 9% of South Africa's Gross Domestic Product comes from Gauteng. Gross Domestic Product is how much wealth we create. So if you add up all the companies, we call that the GDP, Gross Domestic Product. 59% of South Africa's wealth comes from Gauteng. It is a lot. There are nine provinces. 42% of our urban population lives in Gauteng. The Vaal Catchment area provides only 8% of the mean annual run-off. Mean annual run-off is all water that runs off through the rivers of South Africa and the Vaal catchment area catches only 8% of all the water that flows through South Africa. 50% of the mean annual run-off is already captured in dams, so we catch 50%, and the other 50% goes back into the sea. And one dam per annum is lost to siltation. What is siltation?

Chris:
Siltation – isn't it when the water gets too mucked up – when it is low?

Teacher:
Yes, too much silt, the silt starts depositing so the dam basically fills up with all that stuff that collects at the bottom, all that silt or mud, collects up and collects up till there is no place for the water. So they say we are losing one dam per annum – we are not losing one dam, each dam loses a little bit of space and it all adds up to one dam. So there is a lot of soil erosion in South Africa, carries all that mud and sand and it is deposited into dams.

Water consumption daily: there is a table for you to fill in: fill it in in litres. Drinking, personal cleaning, toilet – how many times do you flush a day; dishwashing, clothes washing, garden, washing the car or bike, swimming pool, and other. Some of those things will go under household, for example the swimming pool.

Work out your daily figures, then your monthly figures, multiply by 30, then, you were supposed to check your water bills the other day. Did any of you do that?

Gary:
It's confidential.

Teacher:
Who says it is confidential?

Gary:
My brother.

Teacher:
Your brother. Tell him it's not confidential. Fill the water bill figure in that block – I want to see the correlation with what you guys estimate. The water bill is the only accurate recording of how much your household uses. For homework you get that piece of paper from your mother and father and you fill it in here. Then draw a pie chart of your daily household consumption. Then draw a bar graph comparing the monthly household consumption totals for your group of four. And then explain any differences you might find.

Learner:
How many litres does a washing machine use?

Teacher:
I'll give you some figures to help you calculate the amount. A bath is 90 litres. A shower is 11 litres. You might find that.. Gary have you got a swimming pool?

Gary:
Yes.

Teacher:
Jessica have you got a swimming pool?

Jessica:
No.

Teacher:
You will find that Gary's monthly water bill will be a lot higher than Jessica's. I want you to compare your differences in your group.

Teacher:
I will give you some figures to help you. A bath is 90 litres. A shower is 11 litres.

Ahmed:
Sir, how long is that shower?

Teacher:
It's an average shower. You work it out. Imagine if you had to open the tap and fill those coke 2 litre bottles. How many could you fill while you are having your shower?

Animated discussion occurs in the groups.

Jessica:
Sir, how much does a dishwasher use? How much does a washing machine use?

Teacher:
It depends on your washing machine. Do you just fill up once or does it fill and empty by itself?

Nathan:
Sir, how many litres in a swimming pool?

Teacher:
Gary says his pool has 125 000 litres. Have you seen Gary's pool?

Meera:
How much do you use in dish washing?
Jessica:
I use 450 litres a day.

Ahmed:
How much do you use to wash a car, sir?

Teacher:
Some people use 10 litres in a bucket. Others use 20 litres. Some use a hosepipe.

Teacher:
What you need to do now is get your monthly totals for each person in your group of four. Then draw a bar graph with that.

Lesson 5

Water Transfer Schemes (video – not recorded)

Lesson 6

Role Play on Different Water Sector Consumers (class 2)

Teacher:
We are coming to the end of this water section. By now you should be building up a fairly good picture of who needs water in South Africa, who has water, who doesn't have. We have spoken quite a bit about access to water. And today we are going to do a little bit of a role-play where you decide who is going to get water in South Africa, how much people are going to pay for it and you might have already picked up on certain problems, for example white farmers of the old big commercial farms get water very cheaply, and they can irrigate their crops twelve hours a day and things like that.

In the test yesterday you did this pie chart of who has water and who doesn't, ok, and you saw how the big user the irrigation and stock-watering was the major user of water. So I'm going to give you each a little pack of information, we are then going to go into groups and each group is going to put forward their position of how water usage should change in South Africa. The groups are as follows:

Group 1 - Commercial Farming
Group 2 – Subsistence Farming
Group 3 – Municipalities
Group 4 – Industry and Mining

I'll let you guys choose quickly which groups you want to go into.

What you are going to do now is prepare a position. There is quite a lot of information here and you'll notice some of these articles raise some of the issues for you. How you think the water situation should change in South Africa in terms of use. A lot of it revolves around who pays for it and how much they pay for water, also who has rights to water – if there is water on your farm, underground – is that your water, and so on. So on all those issues, you must prepare a report saying what you think should happen to these issues – these articles will raise a number of issues and you already know some of the issues, for example squatters. Where would squatters fall under here?

Bradley:
Municipalities.

Teacher:
OK, municipalities don't only provide water for fancy suburbs but for townships and squatters as well. The question of payment and all those things, you have to make suggestions about them.

The class broke up into the four designated groups.

Teacher:
So draw up a report in your group. Any changes, any suggestions.
Read the articles and then draw up a report. You have 15 minutes to prepare your report. You may want to take notes as you read.

The class begins work on their reports.

REPORT BACK FROM THE GROUPS:

Teacher:
Let's listen very carefully now because we have the Department of Water Affairs here and they actually make the decision in the end whether they agree with you or not. So you guys are making representations to the Department and the Department will then decide how much people pay for water and who can use what water and so on. I will hand over to you guys to chair the meeting.

Municipalities

Bradley:
We need more pipes and water reservoirs, so we can pipe water to the rural areas. We've also got piping in areas like Soweto where 70% of the piping is broken.

Yusuf:
Basically what the problem is we have got piping in these areas but they are not working, they have not been cleaned. Instead of replacing the piping to save costs we can repair these pipes, and in places like Soweto and areas where they are not receiving proper water now, can receive proper water and they can still pay this flat rate and we can keep charging them a flat rate of 25 bucks because then they receive proper water. Then we can charge them normal rates.

I agree that commercial farmers are being charged too little because they are not putting on their budget, on their overheads they are not putting water irrigation, they only put fertilisers and stuff.

We should charge farmers more, by increasing this we can get enough money to put piping and all these things in. For subsistence farmers, because they have been receiving water for free before they have tried to survive as subsistence farmers, because they could survive off whatever they grow, and stuff. But now our country is growing in such a way that you don't let people function like that living off crops. They should all go into the free market economy and they should try to convert into commercial farming.

Bradley:
The metropolitan areas sustain 70% of the population and also commercial farmers over-waste water. They don't really need to irrigate their farms for a thousand hours. They only need to irrigate for three or four hours running, so it's a waste of water.

Primal:
How do you support that answer. Show us the figures.

Yusuf:
Basically, we don't know the exact figures of how they irrigate their crops and stuff, what we should do is we should try to boost the issue of water conservation because most of these farmers don't listen – they think that we don't have water problems. We should try to educate them first about the lack of water.

Teacher:
Write down the points you want to make, Primal.

Industry and Mining

Victor:

The mining industry is the biggest export, it brings in more revenue than agriculture does, it provides jobs and also without the mining industry we wouldn't have any electricity which is paramount to the supply of water anywhere so therefore it is very important that our water is not cut and that we receive a little bit more because we don't need the.... going to the farmers, because they don't need that much water and we need it a lot more. Industry and basically the mining industry is the only way in which we can get the South African economy out of the slump which it is in at the moment.

Kagiso:
South Africa is more of a consumer country than producing. The only way of getting out of that would be to produce more and export more.

Teacher:
I think we've got a fair idea that each group has got fairly different needs. Now I'm sure you want to debate things that people have said so put your hands up and you must direct your questions to who ever you want to answer the question.

Primal:
I just want to correct Bradley. This sheet here says that 400 000 children die in South Africa as a whole, so it is not 400 000 children in the municipal areas.
What about flat rates?

Teacher:
Where do most of those kids die?

Learners:
In rural areas.
Yusuf:
Hey, these politicians.

Primal:
Secondly, flat rates. Flat rates occurred because of the inefficiency of the municipality. You guys did not get a bill sent out to everyone. You could not get money paid by the Soweto residents. You opted for the easy way out. You said fine R35 is OK. Let's charge everyone R35. The problem is that we have flat rates – we have the municipality sitting back and saying that R35 per household is fine. It is not fine.

Bradley:
There is a difference between using a couple of hundred kilolitres and using a couple of thousand kilolitres.

Primal:
Ok, very good. The problem is that we have flat rates. We have the municipality sitting back and saying R35 per household is fine. But it is not fine.

Thirdly, we need to start an initiative through mining and commercial farming to say that we need to have a body to keep a check on us, we need to be able to say that three hours of irrigation a day. We need to say that water has to be used through the mines at least three times. We need to be able to say water in the long run has to be conserved.

Bradley:
They can't collect money for water in Soweto and that, the ANC and everybody caused it that they mustn't pay their rates to bring down the government and people haven't got that out of their thick skulls yet – that you mustn't pay your rates.

Thandi:

If they can't get accounts to people then how are they supposed to know how much to pay?

Teacher:
Talk through the chair.

Yusuf:
Sir, you know what. The major problem here was that people never paid their bills and stuff in Soweto, right. Now that was the old municipality, right, now we are all in the New South Africa and we've got to try to supply everybody with water in order to find solutions to the problems. So that's why we said, if we supply proper piping to these areas, people will be receiving proper water and they will get their bills, so in that case, we can afford to send bills and charge people the proper rates.

Primal:
How many years is that going to take?

Teacher:
And what are you going to do if people still don't pay?

Yusuf:
If they don't pay their water then they won't receive water. We'll cut if off.

Primal:
Eldorado Park. Eldorado Park they shut up the place.

Yusuf:
If they don't pay for their water, they won't receive any water.

Teacher:
Cut their water off?

Yusuf:
Yes, exactly.

Primal:
It just proved that that is not going to work. Those guys had a flat rate, they were also not paying but they never had their water cut off. You guys are dumb.

Nathan
They say that this is the new South Africa and right now we can see that if they don't pay for their water they cut it off.

Teacher:
Speak through the chair.

Kagiso:
The Boksburg City Council, when they found that people were not paying their bills, they gave them water troughs and they just leave water there and they don't pipe their water so it is quite an inconvenience for them, and it actually gets them to pay.

Teacher:
What's a water trough?

Kagiso:
Like a big massive thing with water in it which is just left out there and it is quite an inconvenience for people to have to go and collect their water.

Teacher:
So they pay now?

Kagiso:
Yes.

Bradley:
Sir, can I ask you a question? This goes back again to this paying thing. Say if I lived in Observatory and I don't pay my water bill, they'll cut my water. It is the same if I lived in Soweto, if I don't pay my water bill, my water must get cut.

Teacher:
You know what happens Peter? You see, you're probably the only person in the whole of Observatory who hasn't paid, but what happens when half of Soweto hasn't paid their water bill?

Bradley:
Then all their water must be cut.

Thandi:
You don't live there.

Yusuf:
You can cut water off for one house, but you can't cut water off for a whole area, because in the long run it's going to cost you more money. the piping and stuff will get damaged, that's what happened in Soweto now, so what basically you have to do is, the rates and stuff that people are paying now is quite high and Soweto were paying R35 bucks flat rate.

Thandi:
They are paying.

Yusuf:
Ok,what Kagiso said about those water troughs, if people refuse to pay the flat rate then they should resort to those water troughs or stuff like that.

Kagiso:
I think this municipality guy is confused because first he says if people don't pay their water then they'll cut the water, now he says they can't just cut the water.

Primal:
The commercial farmers are being used as a scapegoat because of the amount of water we need. Not because of the amount of water we want. Because of the municipality messing around, they lose money, water is over-used, water is not paid for and we get the brunt of it.

Bradley:
If everybody in Observatory didn't pay their water, they would cut all the water to Observatory. Am I right? They would, so if everybody in Soweto hasn't paid they must cut off their water.

Primal:
Everybody in Observatory has a job

Bradley:
Let's say I've got no income and I can't pay my water. They are going to cut my water.

Sally:

We subsistence farmers already are not making enough money from our farming and we are barely able to survive.

Kagiso:
You are not making enough money?

Nathan:
No we are not making money. With subsistence farming you don't grow food to sell on the market, you just farm so that you can survive. So what we are saying is that we are not making enough money to pay for water. Because today they are charging farmers for the water on their own land. So what we are saying is that we don't even make enough to even survive on so we can't find money to pay for water. That is our main point Then also we feel that more water should be supplied to our areas because our women have to walk long distances in order to collect water. So we feel that we should have more water and not have to pay.

Yusuf:
Basically what our argument is, you can see on this graph, this pie chart comparing residential areas and water supplied to farmers, they receive more water compared to municipal areas, whereas the people that really need the water are the people that live in domestic areas and urban areas and due to apartheid in the past many areas never received water and now over 200 000 children die every year because they don't receive fresh water. And they die from that. Certain diseases come because there is no proper sewerage and stuff like that. Basically what the problem is if we don't receive enough water, if you don't give enough water to these areas then we have water diseases breaking out and then these farmers are not going to have enough people to sell their crops to or whatever, so what we should do is, we should carry on supplying water to the farmers but we should raise the tariffs and stuff because then the farmers wouldn't use as much water as what they were using before. They wouldn't waste as much water and they can't say that the economy will drop because they are not receiving enough water. But because they were receiving enough water before they were taking advantage of the situation and exploiting normal people. Like their crops – they were producing much more, but they were charging people still a lot more for their vegetables and stuff like that. Now they should look for a better solution with their prices and stuff because now they know their water is cheaper.

Primal:
About the diseases that children are dying from, dysentery and whatever, the point is that it's not that they don't have enough water, a lot of people don't have water, but the sharing out of water is inconsistent. We have people who don't have the same problems receiving a lot more water. But now we have children who are dying of the stuff, it's not because the water is – there's not enough water, it's because the water is not properly looked after, so it is not us who are the final people who have the say whether the water is not looked after, it's that the department of water or the municipality are not replying to their needs, the sanitation is not taken care of and as a result water is polluted. It is not that we are not giving the water in.

Yusuf:
No, you see the reason why the water is getting polluted is because the area is not receiving the water.

People are going to the nearby rivers and they do not know how to use this water properly.

Primal:
So then education is the problem!

Yusuf:
No! Where you live in your house you can just open a tap and get water. If these people were receiving water like that then they wouldn't have to go to rivers and bushes.

Bradley:
I just want to say that the reason that we can't supply enough water to them is because there isn't enough water for us to supply. We are getting such a small cut of the water that we don't have enough water to pipe out to the rural areas so that they can get water.

Nathan:
I think that Bradley is talking a whole lot of nonsense. Saying that there is not enough water. South Africa has the most water supply and I agree with Primal in his point that the water is there but it is not being taken care of properly, they are not distributing water properly and they are not storing it properly.

Primal:
We understand the current situation and we realise and we state over and over again that it is so important for the country as a whole that our industry, that our sector survives and prospers because of the revenue, but we also have long term plans that need to be implemented by the local government.

Role Play on Different Water Sector Consumers (class 1)

Teacher:
What we are going to do today is we are going to look at who uses the water in South Africa. Remember that pie chart in the test that I gave you? There are different users. You guys will represent particular groupings so if you represent commercial farmers, you have to argue about why water should be cheaper for you, seeing that you pay a lot less than most other people.
If you are a subsistence farmer, probably the only way you get water is to walk two kilometres with a bucket on your head, so there is no piped water for you guys, there's no irrigation. But your water is free. When you get to the river there is no one there to charge you for your bucket full.

What you have to do is: I'm going to give you some information, you are going to draw up a report about what you would like – how you would like to change the water laws, and how much you think you should pay. Ok, there are two things there: water prices and water supply. Other people are going to argue with you so you must justify why you get water.

Municipalities: in certain areas there's a flat rate like Soweto, it's R35 per household, regardless of whether there are five people in the house or ten people, so all these issues come under your particular group.

Class breaks up into groups to work on the reports.

REPORT BACK FROM THE GROUPS:

Teacher:
Let's come together. We will start off taking reports and then afterwards we will have a debate between the different groups.

Municipalities:

Roshen:
With regards to the rates we said that commercial farmers need to pay more because after all farming is their business and they are aiming to make a profit, so they should be able to afford to pay more for their water and the industrial and mining sectors also, because they use the bulk of the water and they also can afford it. People like domestic users, water for domestic use, people in some areas can't afford it, rates should coincide with the average income of the area or suburb. If you have water on your land, in farming it should be taken away from them, it doesn't belong to them; it belongs to the country.

Subsistence Farmers:
Dean:

Water prices don't affect us, except commercial farmers, industry and mining should pay higher rates compared to the rest. Municipalities should pay normal or standard rates and squatters, if there is a tap in that area should be charged a flat rate per squatter. For subsistence farmers they should pay the same rates as municipalities due to the fact that commercial farming, industry and mining they usually do it for a profit. Subsistence farmers don't farm for a profit; they do it for a living, just to survive. The reason why we pay nothing at the moment for water is because we don't have an adequate water supply to us, we have to walk. Now if they were to supply water and pipes to us, once we get proper clean water then we will pay for it. Because if we get pipes running to us, then we'll get clean water, because more than 75% of existing water schemes in rural areas are out of order, plus 20 000 children each year die of water-borne

diseases in rural areas. So we say we'll pay for the water if we can get a clean supply of it. We also think that farmers with water on their property, it should belong to the whole country.

Commercial Farmers:

Meera:

We think we should get special prices because we provide most of the staple diet of the country, like mielies and stuff like that and also the government makes money out exporting the stuff and if we get good water it's going to improve the quality of things and there's going to be more of a demand for it, in the country and in countries that we export to. And with the supply of water, the dams, a lot of the dams are built for commercial farmers, so we are happy with that. And when they say that if we buy a farm with windmills on it, it is not your water, but we are also paying a higher price for a farm that has got windmills on it, depending on how many windmills there are. So I mean at the end of the day, you are paying off your debt, because you are paying an extra price for the plot that's got a windmill on it. It's the same thing as paying for the water.

Teacher:
So you should own that water?

Learner:
Yes, because we are paying a higher price.

Mining Industry:

Chris:

We feel that every body should pay the same price for water, and that if you use lots of water, you must pay more money, because it must be a set price for a set amount of water. So that you'll find like farming, commercial farming and industry and municipalities which use the majority of the water, will have to pay more money, than the rest. We feel that water must be affordable, it mustn't be too cheap or too expensive. Because if it is too cheap then it will be running at a loss because it takes a lot of money to purify the water and to store it.

Teacher:
What about your pollution of the water?

Ahmed:
Well we are paying for the water.

Municipalities:

Leo:

We say that we should pay a flat rate because we don't have jobs and these guys have higher salaries than us so we shouldn't be paying an equal amount as they are. These guys should donate money to us to supply us with water. People shouldn't own water because we don't even have water in our area – there is one tap in the whole area, so everyone should share the water, not own it.

Teacher:
Good. We have time for debating and discussing. If you want to ask any questions or disagree with a particular group.

Albert:

The commercial farmers say that if they had to buy their farms which had a windmill on, then why should they pay for water, I'd like to know if they bought farm land and it had no windmill on, and you bore a hole would that still count, I mean would you still have to pay more?

Jessica:
No, but still, no matter if you do bore your own hole or not, you are still going to pay more for that piece of land because there is water there anyway. Even if you still have to bore for it.

Dean:
The commercial farmers say that they should pay special prices on the water because they provide agriculture for the country. But isn't most of that agriculture exported out of the country?

Jessica:
But the country is still making a profit, we aren't.

Dean:
No! Listen here. Commercial farming, you guys are pocketing all the profit that ... are making, its not going to the country. Where do you see it going to the country?

Lesson 7

River Study at Bezuidenhout Park (not recorded)

Coal Mine at the Vaal River Unit

Lesson 1

Living in South Africa (video - not recorded)

Lesson 2

Lesotho Highlands Water Project (guest speaker – not recorded)

Lesson 3

Introduction to Coal Mine at the Vaal River (Class 2)

Teacher:
I hope by now you are getting some idea of what's going on with this stuff. The last thing we are going to do is on environmental problems. I've got some posters, which I'll explain just now. Just before we start that section, I want to just give you a little questionnaire on which you'll put what you think about the environment and then I'll give you another one when you are finished at the end of next week and see if there is any difference in what you think about the environment.

What you'll be checking to see after we do this unit for two weeks is whether there is any shift in your attitudes to the environment. So we'll try and pick up after the unit whether there is any significant difference.

There are many ways of looking at the environment. The way that I thought we'd look at is to take an issue and unpack that issue and see how people feel about that issue. The issue we are going to look at is the proposal that SASOL wants to mine for coal along the edges of the Vaal River. Have any of you heard about that?
Let's have a look where we are. This little thing called Tyler Creek – that's the Vaal River, here is a little tributary that joins the Vaal River, this is basically the Tyler Creek area, and the proposal is to mine this area, to close off this river and to put a coal mine there. What type of mine will it be? It will be what we call open cast mining, from the surface. It is not underground. When we say it is a wetland, what do we mean by wetland?

It is more than just a river, so in other words, what congregates there?
Birds and things like that, so obviously this is going to affect all the bird species, which you find in that area. One of the arguments against this is that they want to protect the wildlife and birds. And obviously if SASOL were to mine there, the birds would not come there anymore.

This is the Barrage; the Barrage is a kind of a storage dam, used to store water. It is not actually part of the Vaal Dam; the Vaal Dam is totally separate. Here is the Rietspruit River and the Vaal River. The Rietspruit is a little river, which goes off on the side there. So SASOL wants to mine that area. At present it is a farm. And there are people who have bought houses there.

The committee, a group called SAVE – Save the Vaal Environment – says there are about 12 different sites SASOL can use. So it is a typical argument: on the one hand you have a group wanting to mine the area, and on the other hand, you have people wanting to conserve it. And this debate carries on all the time. I'm sure you remember the St Lucia debate. They wanted to mine the sand dunes of St Lucia and after much public protest they eventually decided not to. It went on for about five years until the government took a decision. There have been other areas as well. Can you think of any other controversial issues? Environmental controversial issues?

Learner:
The Maputo Corridor in Mozambique which is supposed to be very rich in minerals.

Teacher:
Ok! Can you think of any other controversial issues about the environment?
Ok, well every week in the paper there is some or other environmental problem. What the government has decided, is that before you want to do something like this you have to do an EIA - what does EIA stand for? Environmental Impact Assessment. So with all these sensitive issues now, you have to go through an EIA and then they only make a decision afterwards – you have to apply to the government for permission.
These people have done that and they haven't really got permission. SASOL employed a company and they found ..... but it seems SASOL is going to go ahead. Mrs. Cummings' mother, she is an old lady of about 76 and she goes to all these meetings and I got most of my stuff from her and she has written letters to the press and to the President and so on to try and garner support for people who have bought houses in that area. But the bottomline is: SASOL wants to create jobs, they want to grow the economy, they want to improve economic development in the country, so there is an argument on their side as well. We need some economic development, don't we? Otherwise we won't get anywhere as a country. So it is a question of weighing up those two sides. I'm going to give you some material on this which will help you to understand the issue and then tomorrow we'll take it further.
The first thing I'm going to give you is a newsletter from this group, SAVE.
The next thing is an article from The Star two weeks ago.
There's some letters to the newspapers.

I'm going to give you some time to read all that, then tomorrow we are going to work out a debate or something along those lines, so use this time to work out your position on the whole issue. Do you agree with SASOL or do you agree with SAVE about the issues in the area. Try and work out where you stand in relation to all this.

Right! Listen carefully to what you have to do. You've got those documents I gave you. I'm going to give you a few more things here. The first thing I'm going to give you is what's called an Executive summary. It's 300 pages, which has been summarised into 4 pages. Go through this thing, it talks about high impacts and low impacts. High impact means there is going to be a lot of impact, low impact, medium impact and so on. Read very carefully about your particular thing.
The other thing I'm going to give you is a thing put out by SASOL, which explains the whole process. They do not just start to mine. There is a whole process that they have got to go through, they explain the process there and it tells you the main issues, they invite people to come and see the site, they have to do a report then they have to take the decision to the Minister of Mineral Affairs in the region. He then makes the decision whether they go ahead or not. And lastly I found a nice article in a magazine called "On Track", a nice nature magazine, called "The Battle of Rietspruit" which gives you some nice pictures and things. Now what you have to do: On Monday we are going to have a debate. You must draw up a report as to what your argument is whether mining should go ahead or not and are there any conditions, or so on. What is your argument? So if you're the Wildlife Society, and you say all the birds are going to be killed off, or they are not going to come there anymore, etc, work out a very detailed and comprehensive report.

The class then worked on their reports.

Lesson 3

Introduction to Coal Mine at the Vaal River (class 1)

Teacher:
The issue we are going to look at is coal mining on the Vaal River. I don't know if any of you know about this issue, have any of you read about it? Who of you have been to the Vaal, for skiing or boating? SASOL wants to mine this area for coal. Now you know SASOL needs coal for its production. They need coal to make plastics and petrol. And they have been mining somewhere else, a place called Wonderwater, but apparently that mine has now started closing. They are planning to mine about five kilometres from this area. It's called the Rietspruit Wetlands. Why is it called a wetland? Because of birds, reeds, it is a place for the river to recycle itself, it is like a sponge. So that whole area is called the Rietspruit Wetlands. It has lots of birds and things, and that's the Vaal River. You can see boats going down there. People have holiday houses there, and the plan is build this coal mine in that area over there. Let's look at Cloudy Creek. Which is part of that Rietspruit wetland, there is the Vaal River. See this little river which is a tributary of the Vaal River. They are going to mine this area, they are going to close this river down, and it is called the Rietspruit Wetland. There is a farm there, where they want to mine, growing mielies.

Let's have a look at what type of mining they are going to actually do. It is called coal strip mining. It is open cast mining, it is not underground mining, they basically just cut into the earth like that, and there is the Vaal Barrage area, the barrage is a place where they store water, and it is along the Vaal River. So what we are interested in is that little area called the Rietspruit Wetland, and SASOL has this plan to mine coal.

Now any controversial area, or any place where you want to make a development programme or where you are going to interfere with nature, what do you have to do?Can you just go there and mine?

Learner:
You have to do an environmental survey.

Teacher:
What is the correct name for it? An Environmental Impact Assessment – an EIA. Any company, which wants to do any kind of development in a natural area, has to first do that study. SASOL has now spent two hundred thousand rand on an EIA. It is still controversial, it is in the papers, they haven't started with the mining process yet. Who do you think is upset about this?

Learner:
All the people who have houses there.

Teacher:
Why are they upset?

Learner:
There will be pollution; the value of their properties will go down.

Teacher:
Yes, the pollution, the value of their properties going down, the noise, the dust that is going to come off there – this is a nice holidaying area, and having a mining operation there will be very noisy, very dusty, lights shining at night and so on. Also people are bird watchers and nature lovers and they come out here to see the birds, and all the birds are going to go away when they start the mining operation. So it's a very controversial issue.

What I want you to do is to choose one of those four groups there: and I am going to give you a number of documents to look at. SASOL; obviously committed to mining this area, they need coal. Because the other mine is already caving in, there's rocks falling down and mining has become very dangerous because of geological instability. So they want a new area, there is coal here and they have the mining rights to coal. They want to go ahead, otherwise they have to transport coal from the Eastern Transvaal and they need something like one truck arriving every minute in order to supply enough coal and they have to build new roads and all that kind of thing so it is going to be very difficult. SASOL want to mine the area.

The Wildlife Society; they are against it. They want to preserve this nature. It is a wetland, it's an important wetland in South Africa, it is very important. They want to preserve this area. A wetland is an important area for South Africa – once an area comes to be declared a wetland in terms of ..... which is an international thing, you are not allowed to mine on it, internationally. St Lucia is a wetland area.

Homeowners; they've spent hundreds of thousands on their homes here, how would you feel about it? Obviously they are going to be upset.

Mine Workers; there is a mine down the road, which is going to be closed, they are going to lose their jobs, unless a new mine opens up, then they will get employment. Do they really care about the birds? They would rather survive. Have a job, employment; they are not really interested in these people's holiday houses.

The class is divided up into the four groups.

Teacher:
I'm going to give you a resource pack. Basically, SASOL did this environmental impact assessment - it's 300 pages. You will read the summary, which is 5 pages. It sums up the major issues. I'll give you a few things so you don't have to go and do too much research on your own. The first thing I'm going to hand out is a letter written by one of the home owners, he has written to the President, the Minister of Water Affairs, Kader Asmal, it has been signed by a lady who is Mrs. Cummins' mother. Next thing is a little article in The Star, which sums up the main issues and a newsletter from an organisation called SAVE – Save the Vaal Environment – that's a group that is made up of people who live on the Vaal.

Now obviously, if you are the Wildlife Society, you are going to get a lot of arguments from SAVE – you are going to have to draw up a two-page report on your opinion on the matter. So if you're SASOL look for things that'll back up your argument.

This is "On Track". It is an environmental magazine. It sums up the main issues "The Battle of Rietspruit". There are two more letters to the Press – the Sandton Chronicle, so you can see what people think about it, and build up your arguments.

The last thing I'm going to give you is a thing from SASOL, which outlines the whole process of this environmental impact study, and we can see where we are in the process. It gives you dates. This document which is 300 pages – a specialist writes a report on the birdlife, someone else writes a report on the water, someone else writes a report on the vegetation.

Right! What are we looking for? Let's be clear on this. Don't just read, you highlight or you make notes or underline in pencil, arguments that are going to support your opinions as to whether the mine should go ahead or not. So find arguments which will back up your point of view. Work in your groups and then on Monday we will have a debate like we had last time. You will present arguments, using your reports as the base of your arguments.

The class begins work on the reports.

Lesson 5

Public Enquiry (Class 1)

SASOL Report:

Ebrahim:
The mine will benefit most of the people with jobs – jobs will be created – about 1300 jobs. There will be no impact on the value of properties at the end of the construction. After 9 years the operation or mine will have a low negative impact and the impact on birds will also be very low. Construction will have a low impact on water levels. The loss of wetlands will have a low negative impact.

Teacher:
Ok, so basically what you're saying is that there is not going to be much impact on most of these things.
Is there anything more to add?

Roshen:
We need to mine this area because we need to mine 7 million tons of coal a day to support the demand for fuel in our country and to mine it anywhere else means that transport costs... we'll have to build roads and lots of extra, added things besides roads and it will be too expensive and inefficient. It means it will cost people more to buy coal, it will cost more for fuel – there will be price increase and SASOL's primary concern is to support economic growth in South Africa and as coal is used for a variety of things like plastics and fuel, and we need to keep supplying these industries with fuel. Basically building this mine will not impact the area as much as people think.

Teacher:
So basically what they are saying is that there is not going to be an impact. Right, Chris you want to ask some questions.

Chris:
First of all they said there'd be no decrease in the properties along the Vaal, the general report says that the value of properties along the Vaal will decrease. The reduction in the property value is estimated at around one billion rand.

Dean:
If you read your report you would see that is says "No impact!" in large bold letters. "No impact on property prices".

Chris:
But it also says there .....

Teacher:
Hang on, hang on. There are different reports

Ahmed:
The property value will go down.

Teacher:
So are you saying the properties are going to go down?

Chris:

Yes. The river is not wide. The actual houses are very close to the river.

Home Owners Report:

Ahmed:
Digging in the wetland will have a negative impact on the environment. The recreational value of the Vaal will also be affected. SASOL is only looking at the profits they will make. Mining is also not the best solution for this piece of land. It is not worth it. SASOL is not looking at the constitutional right to an environment, which is not detrimental to our health and well being. Strip mining is very difficult, as this area is a wetland. The air quality of the area will be very negatively impacted by dust. There'll be visual impact because of all the dust – it will affect the visibility of the place. These dumps they are going to build are like mine dumps.

Teacher:
You are not very impressed with these berms?

Ahmed:
No.

Chris:
I want to comment on the noise and the dust and fumes. SASOL said they would use the latest techniques in order to reduce the amount of dust and fumes but we feel that no matter how much water they spray, they are still going to generate exhaust fumes from the machinery that they use. They said 90% would be controlled. In that report they excluded such things as generators.

Teacher:
Who wrote that report?

Chris:
Some moron working for SASOL.

Teacher:
So you have problems with that, you think SASOL paid them?

Ahmed:
Ja, SASOL paid them.

Teacher:
So you are unhappy with this report?

Ahmed:
I think we should get a second opinion.

Dean:
According to the report 2 - 5 decibels would be loud in a small community, according to SABS standards, but this is a large area which will be covered and the mine is still opposite the river, so it doesn't affect them at all. And the visual effects - there would be no visual affects according to the construction method of building. Mine dumps that will be built will stop most of the noise only 2 to 5 decibels will be going through, and also there'll be privacy, you won't see the mining operation and vegetation will be grown on the mine dumps.

Roshen:
So I don't see how the visual impact of the mine will decrease the property value. And these people are really holiday-home owners, so they are not there all the time. They are only there for three weeks, maybe a month.

Dean:
And the mine will not affect any boating.

Teacher:
So, Dean is coming in here . You'r a mineworker Dean. Do you want to give your report.

Mine workers Report:

Dean:
Well first of all it will increase jobs if the other mine doesn't close down, and if the other mine does close down, then it will secure our jobs. If the mine is not built then they will have to increase production at Wonderwater, to seven million tons per annum which will not fulfill the demand and supply and will bring down the mine's life by about eight years, so if this mine is built it will secure people's jobs and the existing jobs at Wonderwater will be made longer. There will be no impact on archaeological sites.

Teacher:
Why won't there be any impact?

Dean:
It said so. And in SASOL's environmental policy, they promised to practice recycling of waste material and the rehabilitation of the vegetation. And they'll support research and the protection of the environment.

Chris:
Where are they going to house all these miners?

Dean:
They'll build hostels. On the other side, as far as possible from the houses.

Chris:
Can you guarantee that these workers are not going to go near the river?

Dean:
Why what are they going to do at the river? Wash?

Leo:
We can't guarantee, but we'll supply them with water and electricity, everything, we'll do our best.

Teacher:
How many workers are involved with this mine?

Roshen:
1300.

Teacher:
Where will they be coming from?

Roshen:
From the other mine that is closing down, Wonderwater.

Ahmed:
So once this thing is finished where will all these mine workers go?

Dean:
They'll go to another mine.

Teacher:
Are the homeowners happy that these mineworkers are coming to live in your area? Why not?

Chris:
We built holiday houses to be able to get away from it all, now we are going to have a little community just across the river from us.

Ahmed:
There'll be skelms and shebeens and things like that. Drinking on the weekends.

Roshen:
Without these mines the economy of this country would be so bad, we are supplying fuel for the economy, and these people on this Vaal River, they would not be able to afford to buy these places.

Chris:
There are other companies, which produce the same products.

Roshen:
Ok, name another company, which supplies coal and stuff as big as SASOL. I can promise you, most of the coal in South Africa comes from SASOL

Teacher:
Does it? Does most of the coal come from SASOL?

Learner:
Well, a lot comes from SASOL.
Ebrahim:
The mine only affects these few people: they are hardly there the whole year. So it doesn't really make much of a difference, the rest of the country is benefiting from this mine.

Chris:
No, not the rest of the country, you guys – SASOL.

Dean:
If SASOL didn't mine coal, and Anglo-American did everything, in another two years they'd also be coming to that area looking for coal, sooner or later. So I don't know what you guys are crying for. They are going to come there sooner or later.

Wildlife Society Report:

Meera:
The South African Bass Association objects to the mining thing because it is going to have a negative impact on Bass breeding, and fish. In the wetland there is also 200 species of bird and 20 mammal species which are also going to be affected and a lot of ecosystem is going to be disturbed or destroyed.

Albert:
Bird communities will be highly affected in a negative during the construction. The grass owl will be threatened due to the fact that the removal of the bottom land, grassland will have a high negative impact, locally but not nationally. Fish in cloudy creek and the adjacent river will experience high negative impact due to silt movement during the establishment of river diversion and blasting vibrations.

Teacher:
Any questions to the wildlife society?

Roshen:
Are the birds going to be moved or killed?

Teacher:
No they are not going to be killed; they are just going to leave the area.

Jessica:
At least they are not dying off then, be positive – they are migrating to another area.

Chris:
There are only a few species of birds, which actually migrate – the rest live in an area for the whole of their lives.

Jessica:
So why are they going to move?

Chris:
Because they are going to be scared away by the mine and the noise.

Chris:
The majority of birds cannot migrate to other places – they live in their ecosystem. They cannot say ok, well this ecosystem is going shitty and then fly away. There is a web of life, you remove the birds, you remove everything else. The birds are not going to migrate or fly away to another area. If they do then they'll be destroying another ecosystem, because then that ecosystem will be out of balance. So even if these birds do move they'll be disrupting other ecosystems, and they actually belong in this area. And they will die eventually. They are not going to kill them initially but because they will have no place to breed they will die.

Roshen:
SASOL is doing research and is trying to find ways to help these birds. They take them to new areas, pump them up and take new species

Jessica:
Pump them up and shoot them. (joke)

Teacher:
What do you say to that Wildlife society? Are you happy with what SASOL is doing for birds?

Albert:
Even though SASOL has employed Andrew Duthie for this EIA business, I don't think much will be taken from this point of view as SASOL will still want to continue. I don't think they will have a very objective point of view for the wildlife.

Chris:
Big business will bowl you over. They will start at one place on the Vaal and move further and further down. It is not going to stop there.

Teacher:
Where else have we had this problem between big business and the environment?

Chris:

St. Lucia

Teacher:
So there is always this ongoing problem.

Ebrahim:
But you can't stop it happening; it keeps the country going.
A mine doesn't last forever, so they'll have to build a new one. It will last about eight years. Then they'll find somewhere else. Eventually there'll be mines all over the place. It is to keep the country going. Coal is a natural resource so the best we can do is exploit it to the best.

Ahmed:
They say that when coal is mined in one place and then another place and another place, eventually South Africa won't have any coal left And then where are they going to go?

Teacher:
You are introducing a new issue now because what happens when all the coal is gone? For your children's children?

Chris:
Big business says all of this is for the benefit of the consumer, for the benefit of the mineworkers , but the only persons who are going to benefit is themselves, because the only reason they have chosen this site is because, it is clearly stated that they won't have to pay lots of transport costs for moving their coal.

Dean:
But somewhere it says if they had to transport coal, there will have to be a truck arriving every minute.

Ebrahim:
That just shows the demand for coal in the country. That's how much people use it. So people in the townships use it to supply power there, for everything. So that's why they say one truck every minute has to arrive. That's capitalism – supply and demand.

Roshen:
So even if we weren't making a profit, these people still need coal from somewhere. So if we are selling coal at a loss, or even at cost, we won't have to go into research, into 300-page research documents, into environmental studies and research on how to save birds and stuff like that.

Ahmed:
So what is SASOL going to do once they have exploited all the resources in South Africa?

Roshen:
Well, that's not going to happen now.

Ahmed:
So you are just looking at the short term? And secondly, what about all the coal that is exported all over the world?

Roshen:
It keeps the country going, it keeps the economy going, it brings money to our country. Do you think other countries just give us money for nothing? We have to import stuff and export stuff. Stuff that we have we export and stuff that we don't, we import. We have lots of coal that's why we export it.

Teacher:
What about you guys – are you happy with SASOL?

Dean:
Ja. SASOL paid us off so that's why we are not arguing.

Chris:
I was actually surprised because whatever articles we've seen compared on a report that SASOL issued, there are lots of contradictions, in the one article it says visual impact will be a big problem, but in the report it says it won't be a big problem.

Dean:
But aren't the people who wrote those articles just generalising?

Teacher:
SASOL makes petrol from the coal, but it is not the cheapest form of petrol, it is very expensive. It is much cheaper for us just to buy oil from the Gulf. Why do we need to use coal for that? But they also use coal for other things, plastics and other chemical products.

I'll give you one minute each just to summarise where you stand at this point in the debate.

Jessica:
I support SASOL because the Wildlife Society hasn't substantiated their position
SASOL has presented more facts. In this debate they have convinced me because wildlife just sits there and asks questions.

Meera:
Most of the information you gave us wasn't about wildlife: it was so hard to find information.

Dean:
All you had to do was just add a bit of your own information. Don't teach, deliver. Am I right?

Jessica:
The reason why I thought those guys were the wildlife society is because all the time they are giving wildlife facts, wetland facts and things like that, they never spoke about their homes once.

Chris:
The reason why we are buying here is (a) for the wildlife, which attracts us; (b) for the serenity; (c) for the peace and quiet, and (d) to get away from it all. So you can't say that the environmental issue doesn't affect us. SASOL argues that this benefits everybody. The only person I see them benefiting is themselves.

Jessica:
We are not benefiting ourselves. You are the only homeowners around the Vaal, what about the other people in South Africa who benefit from that coal. It is a minority that live by the Vaal anyway, and how long are you going to be by the Vaal? Two or three weeks?

Roshen:
The top percentage of rich in the country. The chances are that we put you there. SASOL. Maybe your countries need coal and we supply it.

Ahmed:
Jessica says we are in the minority, but it's the miners who are in the minority.

Ebrahim:
No, they are the minority compared to the rest of the country. They are nothing compared to the rest of the people in South Africa.

Chris:
I'd just like to ask SASOL, is this site on the Vaal the only place left in South Africa where you guys can make a profit?

Roshen:
It's the cheapest for us and the rest of the country because we then have to transport coal from wherever else.

Ebrahim
You know why we chose the Vaal? Because it's close to Gauteng which is more than half the population in South Africa – that's why it is built by the Vaal, so we don't have to transport so far. And then we don't have to charge people so much. Not everyone can afford to build some nice house and have hundreds of boats and stuff.

Teacher:
He is criticising you guys for living on the Vaal!

Chris:
And the managing directors and the board of governors and the groot koeke at SASOL; where do they live?The people who are actually going to benefit from this move in the end are managers and the MDs of SASOL.

Dean:
Well, that's what we do, that's our job. Tell me, do they work for charity? Everybody makes a living, so that's how we make our living.

Chris:
How can they criticise us for having big houses when they say everybody has to make a living? It's our democratic right to spend our money how we want to.

Lesson 6

Environmental Impact Assessment (mostly group work – not recorded)

Lesson 7

Drakensberg Fieldtrip (fieldwork – not recorded)

APPENDIX I

[illegible]TERVIEWS WITH LEARNERS

[illegible]iew with Primal

Q: How did you feel about informal settlements before the lessons were presented to you?

A: Well I think I was sympathetic and empathetic to their situation and I understood why they didn't have homes to start off with. But I think after the lessons I began to realise their hardships a lot more, a lot clearer, wasn't just that shame, they don't have homes. Now I realise why, and the government and forced removals and just what they go through.

Q: Ok, so your values did change towards the way you felt about them?

A: Ja I think they did change – they were about the same, but I think they were just clearer at the end of the lessons.

Q: Ok, that's good. What is your attitude at the moment towards squatters? I know you said you felt a bit sorry for them and it's a hard sort of life, but do you feel they have certain rights, if you understand what I mean, you know like, do they have a right to just live wherever they feel like living?

A: Well I think so. I think they do have that but they do have the right to live the way they want to and that is their constitutional right, but the thing is that you can't really believe that these people like the situation they're in, so although they do have the right I doubt that many of them choose that life.

Q: So you believe that the constitution should protect them – a person who decides to live on the street or wherever, should be protected in their job?

A: I think they should be protected to a certain extent but I think that, like what I said just before this, is that nobody is going to choose that, I think it is up to the government to provide for them.

Q: Alright, now, if we can link that in to the water problems that were discussed – how do you think the government can plan to solve certain water problems that these squatters have, like with the availability of taps and so on?

A: I think that if you start giving water to squatters just like by bucket loads it doesn't help their situation, it helps them temporarily, but not in the long run, so I think that we need to have longer goals set by the government to have housing projects implemented, and to provide water along with that – not for a temporary situation, that is.

Q: Right, and do you feel that the knowledge that you gained from these lessons affected your attitude towards squatters – you've said a bit about that - overall, in general.

A: Ja, I think it has, I think I've become more sensitive to their needs, to people who don't have as much as I do and on the whole it's made me far more aware of the problems of everyday life.

Q: Great. Onto the water itself. How do you feel about the government saying that each person should have 25 litres a day?

A: I still think 25 litres is a very little amount when considered what I use and what you must use as well now and I think 25 litres is probably most realistic as possible and I think that 25 litres if you think about it – it just hilights how little water they do have right now if that is a long term goal for 25 litres.

Q: So you say it is not enough for a general middle class family?

A: No, never.

Q: All right – how much do you use a day? Can you remember roughly?

A: It was at least 2000 litres.

Q: How do you feel about role play and debate as an educational tool to help understand problems like this? You did a lot of it.....

A: It is very interesting because it is not the usual teacher just blabbing out facts to you, it's where we become involved and we understand a lot of the issues clearer in our heads because we have to fight on these issues and it not only makes us aw[illegible]e of the water issues,

it makes us aware of our class mates as well and what they think and that's very effective because you get to know your people in the class better.

Q: Right, good. On to the Vaal. Apparently you saw a movie or a video on environmental problems. Do you think South Africa has real serious problems from just what you've seen?

A: I think at the moment that it is not as serious as it really is because of the media and the media coverage. That there are a lot of people out there who don't have the water but it is not known to many of us and I think that the water problem is just going to escalate in the next few years with population growth and with lots of people coming to live in South Africa.

Q: Ok! How do you feel about, or what is your attitude towards environmental issues versus economic growth?

A: I think that there is a very fine line – a very difficult question, because for people to get water services better, we need the money and the money comes through the economics but if you don't have the water to live off, then there is nobody living to make the money. So it's a very fine line and I think that it has to be a clear cut between the two to say that water is very important and money, but there has to be a distinguish to say what goes where.

Q: How would you feel if you were put in as the MD of SASOL? What would you obviously be looking at – environmental issues or do you think your main objective would be your economic growth?

A: Well, to get to be the MD of SASOL you would have to be completely, at all times in mind of SASOL and have SASOL at heart. But I think that SASOL has a responsibility and I as MD will have to be able to take that up there. We SASOL are a multi-million rand company and we need to be able to have the community's interests at stake and the environment. So again, there is a very fine line and SASOL has to make its money through an eco-friendly system, I suppose.

Q: Just one final question: Did you find that after studying the three different sections that you have now sort of clarified your own values on Informal Settlement, on Water Problems in South Africa and one specific Environmental Problem? Have your values become clearer?

A: Yes, values definitely have become clearer but I think that also right now my values change all the time according to what I see the needs as being and what my needs are especially and I think values have definitely changed and become clearer and I hope that that gets carried on to the rest of the things I do other than the Geography classroom.

Q: So you believe that Values Teaching is worthwhile?

A: Yes it is.

Q: Ok, thanks very much.

Interview with Nathan

Q: Ok, we are first talking about informal settlements. I'd just like to ask you how you felt about informal settlement before the lessons began?

A: Before the lessons began I just felt they were just like another thing, you know, they were just a burden to the community and whatever, they just caused theft and stuff like that. That's what I felt before the lessons.

Q: Ok. After we had been through all the different problems they have and what have you, did it change?

A: Ja, it definitely changed because I saw that they do suffer as well – the rate of crime that we suffer is due to their suffering as well because of no sanitation, no money, no means of getting money and they have quite a bad life.

Q: Ok. What is your attitude towards squatters right at this point?

A: At this point I think something should be done to help them, help them out because most of the time most squatters emigrate and come here and they think that Johannesburg and stuff is like a good place where money is and stuff but it is like a rat race out here.

Q: Do they have a constitutional right to just plant themselves where they feel like planting themselves?

A: I don't think they do, but I think that some compromise could, there could be some compromise.

Q: There has got to be a definite protection for them?

A: Yes.

Q: Ok. What do you think we could do to solve the problem of their water supply? Often they just sort of make their little camps on the side of the road where there's no flowing water or whatever. What do you think we or the government should I say, could do to solve that problem?

A: We had that lesson with the renting of the seven taps and I think that's a good idea, providing taps, a constant supply of water and I don't think we could charge them a low rate because they don't really have jobs, so I think just supplying taps within everyone's reach.

Q: Ok, when we talked about learning, let's say obviously at school, did the knowledge that you gained during the lessons on informal settlement – did it affect your attitudes towards them? So the information that you got, did it change your attitude?

A: Ja, most definitely it did.

Q: Ok, onto the Water part – what was your first feeling when you read that information that says that on average a person must have or should have 25 litres a day of water? How did you feel about that?

A: I was pretty shocked because I think that I myself in my house uses much more water, much more than that.

Q: Do you think that a person can survive on 25 litres a day, when we're talking about health and what the body needs?

A: I think the thing is we can but we've taken water for granted so much that now we won't be able to. If we were disciplined from the beginning we could have.

Q: Do you believe it's enough for a middle class family? Lets say for a family of four, that a hundred litres?

A: No, I don't think so.

Q: How much roughly do you think you use a day?

A: I myself or as a whole?

Q: Lets say your family.

A: Well, more than enough.

Q: Ja, more than enough, so you feel that, I mean, I'm not saying you must, but your family could sacrifice, you know what I mean?

A: Ja, I think definitely – I think we waste a lot of water.

Q: And then how would you feel about – during these lessons you've had these last four or five weeks there has been quite a lot of role play and debate used as like an educational tool to understand things – how did you feel about that?

A: I thought it was very good because last year we didn't have anything like this and it's a new way because you're bringing out your own emotions, you're not just writing stuff out on paper all the time – you're honestly giving your own feelings and your own opinions so I think it works much better than just writing on the sheets and stuff.

Q: Right, on to the Vaal issue in general. You watched a video on environmental problems – do you think we've got real serious environmental problems in South Africa at the moment?

A: Ja, most definitely.

Q: Ok, can you think of any in particular that come to mind, that are sort of really serious?

A: To do with the Water Project?

Q: To do with anything – just in general.

A: I think the SASOL – this whole coal-mining issue – I think it is very important because I mean the Vaal River is our only like major supply of clean water here in South Africa.

Q: Ok, and how do you feel about environmental issues versus economic growth? What are your feelings towards that?

A: I'd sooner side with the environmental half of it, but the thing is that the economy also counts – it's what keeps us going – what keeps our country.....

Q: Ok now, working on that, if you were the MD of SASOL, SASOL South Africa, what do you think your sort of attitude now would be? If you were sitting in that position?

A: It would be very difficult because I mean you have the environmentalists and stuff and they put up a very strong fight, but I think the thing is if I was the MD that mining the coal would be the most important thing because the economy is picking up and my job's on the line as well.

Q: Ok, just one last question – if we look at the three sections that you have already covered do you think that what you've learned and what's been talked about – do you think you have clarified your own values towards these three different things – you've now got a stand point – you believe that it has helped you to form something?

A: Ja I think it definitely has – before I wasn't – I'd just go with the flow but now it teaches like, you learn about yourself, your main values – ja that's basically it.

Q: Ok, thanks very much.

APPENDIX J

PROFILE OF LEARNERS' VALUES AND ATTITUDES AND PERSONAL DATA

1. Profile of Learners' Values and Attitudes

This profile was drawn up by the Religious Education Coordinator.

Ahmed:
Ahmed is Hindu and arrived recently from an Indian school. He underwent a cultural conversion and is very open to the new reality. He experienced rapid change and growth relative to the somewhat closed world he came from. Ahmed shows compassion but is hesitant about commitment.

Albert:
Albert is very quiet yet caring. Albert's parents were involved in the struggle although he is somewhat reticent about it. As a coloured person, he is a little wary of the black struggle. Albert is christian.

Bradley.
Bradley has some social awareness and has a strong Catholic background. However he is more keen on fun and music than social responsibility.

Chris:
Chris is from a Catholic family. In the past he was more influenced by one parent who is more religious and socially aware. He now appears to identify more with the other parent who is an atheist and has little concern over social issues. He is very interested in fun and music.

Dean:
Dean is more interested in his own personal world than the broader social reality. He is still emerging from the pain caused by a death in his family. He is christian.

Ebrahim:
Ebrahim is a gentle person who is more focused on his own internal world than the broader social reality. He is Muslim.

Frank:
Frank is keen on personal development through sport, girls and fun. He cares for those in his world but is insensitive to the world of social responsibility.

Gary:
Gary is interested in fun and music and is not very sensitive to social inequality. Gary is christian.

Jessica:
Jessica has compassion, courage and an enthusiasm for life. She is from a strong Catholic family. She is an active YCS member and is keen to help the poor.

Kagiso:
Kagiso's parents were involved in the struggle and are Catholic. He is a YCS member and fasted to raise money for a water pump in an informal settlement. He is now wealthier and unsure about compassion for the poor. He is concerned about gaining wealth through personal advancement.

Leo:
Leo is an immigrant and is keen on social mobility. South Africa is a stepping stone to learning English and then the family will move to a less conflict-ridden society.

Meera:
Meera is very committed to spiritual growth and good works. She is Hindu and feminist. She is a diligent YCS member. She is compassionate and committed to caring for the poor.

Nathan:
Nathan is full of fun, charming and cares for people around him who are facing difficulties. He is not yet sensitised to the reality of the poor beyond his world.
Nathan is Catholic.

Primal:
Primal grew up in exile. He has a strong sense of justice, compassion and non-racialism. He is a member of the SRC and YCS. He feels more at home at SHC than at an Indian school where the values are more consumerist. He fasted to raise money for a water pump in an informal settlement.

Roshen:
Roshen comes from a strong Catholic family. He is quiet but is a leader with his friends. He is a bit ambivalent about active involvement in working for justice but is sympathetic.

Sally:
Sally comes from a protected immigrant family where she learnt to care for people from a Catholic perspective. She is open to compassion for those less fortunate but not very sensitised to the social reality. She is very interested in music, parties and boys.

Thandi:
Thandi comes from a wealthy family and is keen on social mobility. She cares for those close to her but is uncomfortable with poverty in a world she would like to leave behind.

Victor:
Victor comes from a strong Catholic family and although he is white identifies more with black learners. He is an active YCS member. Victor is aware of the social reality.

Yusuf:
Yusuf is full of fun. He comes from a wealthy family. He cares for those around him but is not interested in the broader social reality.

2. Personal Data

Name	Gender	Race
Albert	Male	Coloured
Yusuf	Male	Indian
Roshen	Male	Coloured
Ebrahim	Male	Indian
Meera	Female	Indian
Nathan	Male	Indian
Ahmed	Male	Indian
Dean	Male	Coloured
Jessica	Female	White
Leo	Male	White
Gary	Male	White
Chris	Male	White
Primal	Male	Indian
Bradley	Male	White
Sally	Female	White
Frank	Male	White
Kagiso	Male	Black
Thandi	Female	Black
Victor	Male	White
Total No. of learners – 19	Female - 4 (21%) Male - 15 (79%)	Coloured - 3 (15%) Indian – 6 (32%) White – 8 (42%) Black – 2 (11%)

Table 4: Grade 11 - 1997 learners by gender and race

Name	Gender	Race
Yves	Male	Black
Alice	Female	White
Feroz	Male	Indian
Tyrone	Male	White
William	Male	White
Peter	Male	Black
Rouhana	Female	Indian
Muhammed	Male	Indian
Josephine	Female	Coloured
Paul	Male	Indian
Basil	Male	Coloured
Zanele	Female	Black
Phumzile	Female	Black
Gino	Male	White
Timothy	Male	White
Raisa	Female	Indian
Kebo	Male	Black
Angela	Female	Coloured
Mondli	Male	Black
Tshepo	Male	Black
Mangaliso	Male	Black
George	Male	Coloured
Themba	Male	Black
David	Male	Whites
Trevor	Male	White
Sarah	Female	White
Shaira	Female	Indian
Brandon	Male	Black
Phindi	Female	Coloured
Tammy	Female	White
Riyaad	Male	Indian
Jatin	Male	Indian
Aidan	Male	White
Total No. of learners - 33	Males – 22 (67%) Females – 11 (33%)	Whites - 10 (30%) Coloured – 5 (15%) Black – 10 (30%) Indian – 8 (25%)

Table 5: Grade 11 - 1996 learners by gender and race

APPENDIX K

TRIANGULATOR REPORTS

Tony Williams

I was approached by Mr Stephen Sadie a fellow teacher at Sacred Heart College, to observe and report on a series of lessons which aim to determine whether there is room for values education in a geography classroom. This forms part of Mr Sadie's thesis for his M. Ed.

The study was limited to Grade 11 pupils at the College and I observed lessons over a five-week period, which covered the following topics;

- informal squatter settlements
- water access and conservation in South Africa and
- coal mine at the Vaal River.

I had no prior knowledge of Mr Sadie's teaching methodology methods, but it was immediately clear that he encouraged his pupils to question and discusses any new information that they encountered during the lessons. Group work, role-play and debate were often tools used in the classroom. Mr Sadie furthermore used questionnaires to try to understand the pupils' values and attitudes towards the topics before and after the topics were examined. A tape recorder was used to record any teacher-pupil or pupil interaction.

At the conclusion of three topics, I conducted both formal (recorded) and informal interviews with some of the pupils so as to determine if there had been any change in attitudes and values towards the topics during the study.

Mr Sadie had a good relationship with his pupils and was always willing to listen to any questions the pupils may have had or any queries that may have occurred. These queries were opened to discussion and this seemed to help with the overall understanding and allowed various attitudes towards the topics to be surfaced. The teacher-pupil interaction was a healthy one in which learning was made easy. He had a relaxed classroom atmosphere with himself as the 'initiator' and the pupils the 'continuers' of the interaction. The pupils, while working under Mr Sadie's guidance, were thus actively involved in the learning process and as a result I was able to gain a clearer understanding of how their values and attitudes may have changed towards the topics concerned.

Steve had researched the background information to the topics well and provided the pupils with a wide range of information from various sources (newspapers, textbooks, government papers and research papers). Rather than Mr Sadie telling the pupils about his attitude towards the topics he seemed to be a neutral observer. He was often asked by the pupils how he felt and what his view on the topic was but he did well in allowing the pupils to develop their own attitudes and values and not just copy him. This worked well.

The first topic, which centred on the development of informal settlements, was an excellent opportunity to determine if values education is worthwhile in geography. The pupils at Sacred Heart are from an upper middle class background and I had the immediate impression that the pupils were against the formation of these settlements. They seemed to have a generalised view of these areas e.g. they bring crime, increased waste and associated social problems.

Mr Sadie ensured that the pupils were able to form their own points of view about informal settlements. There was a large emphasis placed on values, attitudes and the corresponding behaviour of various individuals and groups involved directly or indirectly with informal settlements. Role-play was used extensively throughout this topic, and this led to 'outstanding' debates and arguments from differing perspectives. The post topic interviews concluded that the pupils did learn something from this section. Personally I believe that the new knowledge that the pupils acquired in this topic did affect their attitudes and values. Most pupils believed that their values were clarified and that earlier pre-topic generalisations were often incorrect. They believed that role-play reinforced these new attitudes. They saw the informal settlements not only from their own perspective but also from those

of planners, government officials, local residents and the squatters themselves. This, I believe, was a successful and worthwhile topic.

The second topic of water access again looked at water from the point of view of usage/access, conservation and economic benefit. Although there had been abundant rainfall while the lessons were underway, the pupils had preconceived knowledge of South Africa's water problems.

Methodological techniques, which included questioning, discussion, role-play and group work, were well utilised. This allowed pupils to gain a greater awareness of South Africa's need to conserve clean water, the use of water within South Africa and water provision for informal settlements. This last topic tied in well with the previous lessons.

During post topic interviews most pupils commented on the difference between their personal daily use of water versus what the governmental recommended daily water allowance is. This brought pupils' 'down to earth' and had distinct affect on changing attitudes towards South Africa's water problems.

A summarising role play of water needs of commercial farmers, subsistence farmers, local municipalities and the Department of Water Affairs and Forestry allowed attitudes to be 'cemented' with differing views being debated and needs understood. Once more this topic was a real problem which was successfully taught using an emphasis on values education.

The third and final topic was an environmental problem. This revolved around the intention of SASOL to strip mine the Rietspruit wetland area. This area runs alongside the Vaal River and could have many impacts on local residents.

Initially an environmental questionnaire determined what pre-topic attitudes and values the pupils had towards environmental problems in South Africa. This also highlighted how the pupils felt about mans' interference with the environment and his/her role with regard to protecting it.

The pupils initial knowledge of environmental problems in South Africa seemed limited and an almost 'lack of concern' was noted. Mr. Sadie introduced and discussed this specific environmental problem and immediately concern and interest was evident.

The methodological method of determining 'who has the right to land' was examined by the use of role-play in which pupils were divided into groups of SASOL directors, environmentalists, workers and local homeowners. This allowed for a variety of viewpoints to be observed and an enjoyable debate followed.

A change in attitude was evident and values changed in most pupils, but they all seemed sympathetic towards parties concerned. Economic growth was seen as important but not at the cost of future polluted environment.

Overall I feel that the lessons allowed the pupils to form their own ideas and attitudes towards the modern day phenomena. Interviews confirmed that pupils felt that their values had been clarified and that greater knowledge of the topics had allowed for this.

My view - based on this observation, there is definitely room for values education in the geography classroom.

Lorraine Marneweck

Introduction

Stephen Sadie approached me in September 1996 to ask me to be the external triangulator in an M ED research report he was working on. He explained that this meant I would have to observe him teaching several Geography lessons and to discuss each lesson with him. We were able to do this during November 1996.

Stephen gave me his proposal to read, before I attended any of the lessons. He also briefly explained that he was focussing on teaching values and attitudes in a high school Geography classroom.

After observing each lesson, I drafted a short written report which I gave to Stephen. On some occasions, we had a short meeting to discuss my observations. I did not hear from Stephen until early in December 1998. He asked me to write a single report, combining my observations during the triangulation period. I have attempted to do so in this report.

It must be noted, that after such a long time, I have had to depend on my written notes, as my recall memory is too vague. I hope this proves useful to Stephen. After reading the report myself, it seems to contain more questions and issues to be researched, rather than a meaningful engagement with what was actually being researched by Stephen. But maybe that is the nature of research.

Description

Given that I had my own teaching time-table and administration responsibilities to see to, I managed to attend six of the twelve lessons Stephen had designed for his research. The lessons took place in November 1996 very close to the final examinations. I think this factor affected the outcomes of his lessons negatively.

I observed Stephen teaching two groups of Std 9 (Grade 11). Three lessons were taught to each class. An interesting point, was that in both classes, the majority of students were male. This raises questions about subject selection process at Sacred Heart College: Are the majority of students who select Science-based subjects male? Or, were these two groups unique? And, if the groups were unique, why was this?

These students had reached a stage of formal schooling where they had already made curriculum choices for the Matriculation examination. The students had all elected to take Geography as one of their subjects over others.
Also, many of the students had attended school at Sacred Heart College for many years. Sacred Heart College is a school where curriculum innovation and alternative curricula have been implemented for many years. One of the main curriculum aims at Sacred Heart is to, "develop values and attitudes that are appropriate to an open and just society[1]". Therefore, these students should have been familiar with lessons covering social issues with no clear answers.

I feel that these comments are significant, given the nature of Stephen's study *Values Education in a South African Geography Classroom*. I assumed that some, if not all of the students already valued Geography as they had selected it as a learning discipline. Also, I expected to see signs that most of the students already had some experience with an alternative and progressive curriculum (that is, Integrated Studies at Sacred Heart College).

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[1]SACRED HEART COLLEGE (1996) "Integrated Studies Department Plan" in **Integrated Studies Readings.**

Lesson 2: Soul City Video (Class 2)

This was the first lesson I observed, but not the first in the series of lessons Stephen designed for the purpose of his research. Stephen set out by defining values as "deep beliefs", he explained that attitudes were "simple attitudes [towards] a range of subjects".

During the lesson, students were not asked to consider what they thought values and attitudes were, nor where they invited to speak of their own values. Only attitudes in the supplied text and the video were discussed. The students were not asked to think about the assumptions they made about other people's values and attitudes. They were only asked to identify what they thought the values of people in the learning material were.

After the observation, I felt that the lesson was based on the assumption that there is a universal set of values common to all people who find themselves in the same place at the same time. I am not sure if this was intended, or even if it was problematic, merely that it existed.

Lesson 2: Soul City Video (Class 1)

The next lesson I attended was a repeat of the first lesson, but to a different group of students. I looked forward to seeing what changes Stephen had made in his lesson.

I was not disappointed Stephen had obviously thought about the previous lesson and possibly deepened his own understanding of the complex issue of values and attitudes.

In this lesson, Stephen said:

> *We all have values. These are things we really believe in. For example, equality, punctuality and pleasures. Attitudes are higher up the scale. For example, how you relate to women or people of other colour. You have very few deep values, but thousands of attitudes.*

It was interesting to note that some confusion existed in the students' minds over what type of lesson they were participating in - Geography, Religion, Psychology - were suggestions made by the students. What does this says about their previous experiences with Geography? One would have assumed that the students were used to more innovative approaches to teaching and learning, but apparently they were not. Clearly, this is an indication that Stephen's lessons were indeed "something different". This was illustrated by the students' struggle to understand how attitudes and values "fit" with their conception of what Geography is.

However, the content, if not the context of the video material was irrelevant to these privileged students. While the video was a local production, it dealt with a housing crisis currently being experienced by the more under-privileged members of South African society. As one girl put it:

> *I don't have to worry if my house will break down. I don't need to get a stable job to support myself.*

This alienation from the subject matter made the values and attitudes in the lesson very far removed from the students' own. This was apparent by the rather cavalier attitude the students portrayed to the plight of the people in the video. The issues being dealt with were not taken seriously.

I think the challenge facing all Geography teachers is to find lessons that display attitudes and values that the particular students need to interrogate. But this needs to be done within the context of appropriate Geography content and knowledge suitable for academic purposes.

Lesson 3: Informal Settlement in the Third World (Class 2)

During this lesson, the students were asked to investigate the plight of poor people in Peru. At one point in the lesson, one student turned the class' attention to the current problem of squatters who were forcibly removed from an area in Marlborough, close to the M1 motorway, linking Johannesburg and Pretoria. I think it was unfortunate that Stephen did not know anything about this crisis, and a real opportunity was missed to interrogate the students' own attitudes and values towards the homeless.

Stephen's proposal talks about learning exercises which could contribute to the formulation of values in students. I think that the attitudes of teenagers are constructed in social settings, and therefore can also be challenged in such settings. For this reason, it was unfortunate that the exercises had to be done by individual students working alone.

Lesson 3: Informal Settlement in the Third World (class 1)

Once again this was a repeat lesson to a different class.

During the lesson Stephen revealed some of his own values to the class. For example, he used the upcoming end-of-year examination as a means to focus the students' attention on their work. I found this particularly interesting later in the lesson when Stephen called out his own answers to the exercise questions. No matter what the student's had discussed or written down, as soon as Stephen committed himself to suggesting answers, the students rubbed their own out and replaced them with the teacher's point of view.

I think Stephen needs to consider what this says about power relationships in a classroom, and how these relationships impact on marginalising students' attitudes and values in favour of the teachers. Especially, if I may say, when the teacher who sets the examination, reminds them that it is looming shortly! What else could Stephen have expected to happen?

Lesson 4: Role Play (class 1)

It was during this lesson that Stephen first invited a student to reflect on his own definition of attitudes and values. The student said:

Values are what you want to happen, attitudes are what you believe will happen.

This lesson was made up of a role play between "Sandton rate payers" and "squatters". The students had to assume the roles and discuss the fate of squatters living on land supported by Sandton rate payers. Stephen appeared to randomly divide the class into two groups for the activity. I found it very interesting that the rate payers ended up being the "white" students, while the students playing the role of squatters were "black"!

I had closely observed how Stephen divided the class, it appeared to me that the choices had been randomly made. Though Freud would say otherwise. Eventually one of the students noticed the "colour divisions" in the role play. When she pointed it out to the class everyone laughed together about the "trick" fate had played on them!

Lesson 5: Action on Informal Settlement (class 2)

This was the last of Stephen's lessons which I observed.

At this point in the curriculum, Stephen introduced the concept of "actions". I believe the point he was making related to the idea that values and attitudes are not static concepts, but deep-seated beliefs which strongly influence the way an individual acts.

The activity the learners participated in was, I believe, an authentic attempt to encourage students to make some of their own values explicit through the choices they made. The students appeared to enjoy doing this, but unfortunately were hurried through the activities because of lack of time.

Conclusions

Obviously no learning or teaching experience is conducted in a vacuum where there are no attitudes or values. But Stephen did make a very real attempt to fore-ground values and attitudes in his teaching. The fact that this made some students feel uncomfortable and insecure about what they thought they should have been doing in Geography, indicates that to some extent Stephen was successful. I think another success was that the students could competently indicate what the values and attitudes of other people appeared to be.

But what about the values and attitudes that the students themselves revealed? Were these attitudes age-related and superficial? Did the students "show-off" in front of a visitor? Or, more worryingly, do they really hold values which comments such as "white chick" reveal?

I would argue that, in this context, this type of language reflected their obvious need to impress both a visitor, and their peers. I do not think any of their deep-seated values or attitudes were made explicit in the lessons. I think Stephen missed several opportunities to challenge, if not their values, then most certainly their attitudes.

The context of the lessons was characterised by a classroom atmosphere which was distant and fairly cold. But values and attitudes are intensely private and personal things to teach, or talk about. I think Stephen would have been more successful if he had exposed his own values and attitudes to more scrutiny, in an honest attempt to help his students do the same.

But this does not mean that Stephen's work was unsuccessful. On the contrary, I think it is an important piece of work which raises many questions about the complexity of values in Geography education. In my opinion, Stephen's next step would be to help his students interrogate their own values and attitudes.

BIBLIOGRAPHY

Bailey, P. (1980). "Relating Subjects in the School Curriculum". *Teaching Geography,* vol. 6 (3), pp.27-29.

Bailey, P and Binns, T. (1987). *A Case for Geography.* (Sheffield, The Geographical Association)

Bamber, C and Ranger, G. (1990). "Values Inquiry in Practice: Investigating a Local Controversial Issue". *Teaching Geography*, vol. 15 (2), pp.60-61

Berens, P. *et al.* (1992). *Making a Difference: Ideas for Change in Schools.* (Johannesburg, Oxford University Press)

Botes, L. *et al.* (1991). *Informal Settlements in Bloemfontein.* (Bloemfontein, The Urban Foundation)

Botha, W. *et al.* (1998). *Curriculum 2005 – The Story of the Grade 1 Pilot Project* (Johannesburg, CTP Book Printers)

Bridges, D. (1982). " 'So Truth be in the Field...?' Approaches to Controversy in World Studies Teaching" in Hicks, D. and Townley, C. *Teaching World Studies: An Introduction to Global Perspectives in the Curriculum.* (London, Longman) pp.37-55.

Brochure Design Consultants. *Katse Dam - Lesotho Highlands Water Project.* (Johannesburg, Concor)

Camp, S. (1996). *On Stream: Promoting Water Awareness,* Issue 6. (Pietermaritzburg, Umgeni Waters)

Camp, S. (1996). *101 Ideas for National Water and River Day.* (Johannesburg, Rand Water)

Camp, S. *et al.* (1994). *Teacher's Kit: Water Week 1994.* (Pietermaritzburg, External Educational Services)

Camp, S. *et al.* (1996). *Teachers Kit: Water Week 1996,* (Pietermaritzburg, External Education Services)

Chapman, C. (1994/1995). "Building Hope and Houses in Besters". *New ground.* pp.16-19 (Johannesburg, Environmental Development Association)

Collinge, J. (1994). "Knowing Plot with no Script" in *The Star,* 1 November.

Cowie, T. (1994). "The Place of Secondary School Geography in a Changing South Africa," in Hurry, L. (ed.) *A Case for Geography in the New South Africa,* (Pietermaritzburg, The Geography Curriculum Initiative in South Africa) pp.74-84.

Cox, A. (1997). "Bacteria in Sandspruit now 100 Times the Limit," in *The Star*, 10 February.

Davidson, B. (1994/1995). "Shelter from the Storm". *New Ground,* pp.7-8

Davis, G. (1995). "There Shall be Houses for All," in *Mail & Guardian,* 19-25 May.

Day, A. and O'Brien, R. (1990). "South American Housing Crises" in *Teaching Geography.* vol.15 (1). pp23-26.

Department of Housing. *The Housing Subsidy Program.* Undated manuscript. (Johannesburg, Department of Housing)

Department of Housing. (1994). *White Paper on Housing.* vol. 23. (16178) (Pretoria, Department of Housing)

Department of Water Affairs and Forestry. (1994). *Lesotho Highlands Water Project,* (Pretoria, LHDA)

Department of Water Affairs and Forestry. (1997). White Paper on a National Water Policy for South Africa. (Johannesburg, Department of Water Affairs and Forestry)

Department of Water Affairs and Forestry. (1997). *National Water Bill - Fourth Draft.* (Pretoria, Department of Water Affairs and Forestry)

Department of Water Affairs and Forestry. (1995). *Water: Fact and Fiction in South Africa, (*Pretoria, Department of Water Affairs and Forestry)

Department for Education. (1995). *The National Curriculum.* (London, HMSO)

Du Toit, J. (1995). "Spending a Penny in the New South Africa". *On Track.* (August/September) pp.16-18.

Evans, R. and Tomas, O. *Teaching Against Prejudice and Stereotyping: A Practical Handbook for Use with the 15-19 age range,* (Oxford, Oxford Polytechnic)

Fien, J. and Martin, L. (eds) (1996.). *Environmental Protection in Australia – A Professional Development Workshop Manual for Teachers,* (Brisbane, Griffith University)

Friedel, G. (1996). *Hands On: Vlei and Marsh Wetlands.* (Howick, Share-Net)

Gelsthorpe, T. (1977)."The Contribution of Geography to Political Education". *Geography and Political Education,* vol. 6., pp.103-114.

Gill, D. "The Contribution of Secondary School Geography to Multicultural Education: A Critical Review of some review of some Materials". *Multicultural Education,* pp.13-26.

Griffiths, R. (1997). *Toktokkie -Theme: Water.* Vol. 18,(1).

Harrison, D. (1984). *Concejo - Services, Housing, Land.* (Oxford, Oxfam Youth and Education Department)

Hicks, D. (1981). "Teaching About Other Peoples: How Biased Are School Books?" *Education,* vol. 9 (2), pp.14-19.

Hope, G. (1997). "Enviro go-ahead for New R500m Coal Mine". *Mining Weekly,* vol. 3 (8).

Hopkin, J and Serf, J. (1986). "Geography and Political Education". *Teaching Geography,* vol. 1 (1), pp.82-85.

Kellet, P. (1990). "Self-Help Housing" *Geography Review,* vol.6 (2). pp.7-19.

Mofokeng, D. (1996). The Budget Speech to the Gauteng Provincial Legislature. 4 June.

Morrish, M. (1984). *Geography 16-19: Squatter Settlement in the Third World.* (Essex, Longman)

O'Donoghue, R and Camp, S. (1996). *Audit Water Quality.* (Howick, Share-Net)

Osler, A. (1988). *Do it Justice! – Resources and Activities for Introducing Education in Human Rights,* (Burmingham, Development Education Center)

Rand Water. (1997). *Aspects of Water Quality Monitoring in Gauteng.* (Johannesburg, SWAP)

Rand Water (1997).*Water - The Essence of life.* (Johannesburg, Rand Water)

Rand Water Board. (1994). *Rand Water - Annual Report.* (Johannesburg, Rand Water Board)

Rand Water Board. (1992). *Providing The Lifestream - Additional Water Supply Scheme.* (Johannesburg, Rand Water Board)

Rawling, E.M. (1985). *Geography 16-19: Urban Planning for a Third World City.* (Essex, Longman)

Richardson, R. (1982). "Culture and Justice: Key Concepts in World Studies and Multicultural education," in Hicks, D. and Townley, C. (eds.) *Teaching World Studies.* (London, Longman) pp.20-37

Rooth, E. (1997). *Introduction to Lifeskills: Hands-on Approaches to Lifeskills Education,* (Cape Town, Via Afrika)

Shelembe, E. B. (1995). *Monitoring Visible Water Life.* (Howick, Share-Net)

Slater, A. (1991). "A Squatter Settlement Simulation". *Teaching Geography*, vol. 16 (1), pp.19-20.

Slater, F. (1986). "Latin American Migrants: A Tale of Three Cities" *People and Environments: Issues and Enquiries.* (London, Collins Educational)

Sloan, D. (1980). *Education and Values.* (New York, Teachers College)

Sosibo, S. (1993). "A Squatters Life". *New Ground,* vol. 12 (2).

Tomlinson, M. R. (1995). *Problems on the Ground? Developers' Perspective on the Government's Housing Subsidy Scheme.* (Johannesburg, Centre for Policy Studies)

Tomlinson, M.R. (1996). *From Rejection to Resignation - Beneficiaries' views on the Government's Housing Subsidy Scheme.* (Johannesburg, Centre for Policy Studies)

Umgeni Valley Project. (1996). *Hands On: Stream and Pond Life.* (Howick, Share-Net)

United Nations. (1996). "The Habitat Agenda: Goals and Principles, Commitments and Global Plan of Action," in *The United Nations Conference on Human Settlements.* (New York, United Nations)

Van Wyk, J. (1998). "River Dry, Mountain High", in *The Star,* 24 November.

Whitaker, B. (1985). *Teaching about Prejudice: The Minority Rights Group,* Report 59 (London, Expedite Graphic)

Wright, D. (1973). "Colourful South Africa? An Analysis of Textbook Images" *Multicultural Education*

Yeld, J. and Gubb, A. (1992). "Shack Dwellers? Not in my Back Yard!" *African Wildlife,* vol. 46 (3)

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