Hessequa Municipality
Proposed development to address food security and protect biodiversity

Biodiversity and Conservation Biology
New Dam for small local irrigation scheme & hydroelectric power

Confluence of the Vet & Goukou rivers, Riversdale/ Heidelberg, Western Cape, South Africa

Hi my name is CarbonRoxy. I am a Second Life Avatar representing the Qarbon Qampus Virtual World. Today I would like to focus on an assessment for a development. My Role is that of a Municipal Dam Officer in the local municipal area of Hessequa. I am looking to build a new irrigational dam to assist the local vegetable farmers with water supplies for irrigational purposes and to sustainably meet the basic needs of the nearby town Heidelberg.
Hessequa Municipality
A new sustainable irrigation dam

What is the CarbonRoxy Irrigation Dam and why is it different?

The Carbon Roxy Irrigation Dam is proposed to be a large dam that will be used to increase irrigation and enhance food production in a sustainable way which shall positively influence food security within this region.

The dam is aimed at benefiting the area between the confluence of the Vet and Goukou rivers, near the town of Riversdale for small local irrigation scheme and hydroelectric power.

The new dam will cover 20 square kilometres extending approximately 5km up the Vet and Goukou rivers. It will supply water to local farmers to grow organic vegetables for the local market and provide the nearby town of Heidelberg with 10% of its electricity needs.
Carbon Roxy Irrigation Dam
Confluence of Vet and Goukou Rivers

A potential property for the location of the Carbon Roxy Irrigation Dam has been identified between the confluence of the Vet and Goukou rivers. The proposed dam is likely to be located between the Langeberg Mountains and the Southern Cape coast. It will be built near to the largest town within this region, called Riversdale. The dam will mainly benefit the local farmers as well as the town of Heidelberg that is west of Riversdale.

The map below shows the location of the proposed new dam and its proximity to the town of Riversdale in the Hessequa Municipality.
Hessequa Municipality : Fine-Scale Biodiversity Planning Project

The Hessequa municipal jurisdiction covers the area between the Langeberg Mountains and the Southern Cape coast between the Breede and Gouritz Rivers. Natural land-cover consists mostly of Renosterveld shrubland and grassland with some water bodies and wetlands. Land-use within the catchments comprises mostly dry land and irrigated agriculture and commercial forestry. Urban development is small and comprises mainly residential and industrial developments associated with the coastal settlement of Stilbaai and the inland towns of Riversdale and Heidelberg.

Although the dam that is proposed to be developed within this region may bring about threats to the environment, the main purpose of the dam will certainly meet many of the local towns’ needs. Sustainable living within the surrounding towns using hydroelectric power produced at the dam is seen as a highly beneficial factor to the local people’s way of living. In addition, the local farmers shall also be able to grow their organic vegetables a lot easier now that the dam will be built closer to them, therefore their water supply will not be as restricted than before. With an increase in the local food production, there will most likely be a rise in the local economy.

Hydropower is renewable energy source that doesn't cause global warming because it doesn't release dangerous greenhouse gases. This kind of energy is the most important and widely-used renewable source of energy. Not only is the Dam going to supply the local farmers with their irrigation water, it is also built to retain the water. More electricity is produced with a greater volume of water present within in the reservoir. Potential energy in the retained water is transferred into kinetic energy by water flowing through the pipes with high speed which turns electricity generators. High voltage lines will carry electricity to the town of Heidelberg , where approximately 10% of the electricity produced will be transferred to the town to meet their basic needs.
Hessequa Municipality

Profile

Description
Hessequa Municipality is a local municipality located within the Eden District, in the Western Cape province of South Africa. It is also known as Mother Nature’s Eden. Throughout the Hessequa region you will experience warm “platteland” hospitality, enhanced by world class gourmet products such as, olives, cheese, wine, aloe products and Fynbos beauty. Each town offers a unique experience, ranging from spear fishing, windsurfing, snorkeling, hiking to historical walking tours for those who appreciate nature as well as local heritage.

General statistics
Area: 5,733 km²
Total Population 2011: 52,642
Population density: 9.2/km²

Summary of Hessequa Integrated Development Plan IDP
- Hessequa’s vision for 2027: A cooperative community where everyone reaps the fruit of a growing economy through sustainable development and utilization of our human potential and our natural resources. The aim is to have vibrant, equitable and sustainable rural communities with food security for all.
- It was noted in the IDP that Hessequa has been experiencing serious pressure on its sources of income together with rising cost factors.
- The local economy is a typical rural economy that cannot count on the mineral resources and manufacturing sectors to drive the local economy. To a large extend the local economy is and was one where agriculture played a major role. In recent years however a change in the economy occurred. The natural beauty of the region and its accessibility attracted more holiday makers and tourists to the coast. This stimulated the development in the coastal towns and villages and the associated good infra-structure increased their attractiveness as retirement destinations.
- Hessequa is a rural region in which agriculture has been the economic mainstay for a very long time. The future of Hessequa’s agriculture is of special importance to the economic future of the region. The opportunities provided by new activities such as tourism and induced growth projects. Hessequa’s economy must grow in order to achieve the goal of a community where everyone reaps economic benefits. There is a need to satisfy demand from local suppliers. Too much money flows out of the local economy to other regions. Too little value is added locally to primary (mostly agricultural) products.
- The mountains, hills, shores, soils, fauna and flora of Hessequa have secured countless generations of humans. This must be continued as we seek sustainability. Hessequa has many under-utilized natural resources; these will be developed in ecologically sustainable ways. Spatial development must support sustainable settlement patterns.
Hessequa Municipality
Transformation and protection

Total area: 573353.9 ha

Landscape transformation
Nearly half of the municipal area has been altered to a state where not natural habitat remains.

Protected areas
Formal land-based protected areas
20 reserves covering 49642.7 (8.7%)

Marine Protected Areas (MPA's)
0 adjacent to municipality
Hessequa municipality
Vegetation types – original extent

Main vegetation types (>5% of municipal area)
- Albertinia Sand Fynbos - 10.65%
- Canca Limestone Fynbos - 17.56%
- Eastern Ruens Shale Renosterveld - 23.18%
- South Langeberg Sandstone Fynbos - 7.24%
- Mossel Bay Shale Renosterveld – 7.88%

Other vegetation types (<5% of municipal area)
- Blombos Strandveld - 1.04%
- Cape Coastal Lagoons – 0.05%
- Cape Estuarine Salt Marshes – 0.01%
- Cape Inland Salt Pans – 0.02%
- Cape Lowland Alluvial Vegetation – 1.21%
- Cape Lowland Freshwater Wetlands – 0.01%
- Cape Seashore Vegetation – 0.05%
- Central Coastal Shale Band Vegetation – 0.31%
- Garden Route Shale Fynbos – 1.88%
- Groot Brak Dune Strandveld – 0%
- Little Karoo Quartz Vygieveld – 0.76%
- Montagu Shale Fynbos – 0.11%
- Montagu Shale Renosterveld – 3.07%

Other vegetation types cont.
- North Langeberg Sandstone Fynbos – 4.03%
- North Outeniqua Sandstone Fynbos – 0.04%
- Overberg Dune Strandveld – 0.07%
- Ruens Silcrete Renosterveld - 2.15%
- Southern Afrotropical Forest - 0.12%
Hessequa Municipality
Nationally listed threatened ecosystems

Percentage of municipal area now covered by threatened ecosystem shown:

**Critically Endangered (EC)**
- Cape Lowland Alluvial Vegetation - 0.35%
- Eastern Ruens Shale Renosterveld - 2.71%
- Ruens Silcrete Renosterveld - 0.16%

**Endangered (EN)**
- Groot Brak Dune Strandveld - 0%
- Mossel Bay Shale Renosterveld - 2.1%
- Western Cape Milkwood Forest - 0.09%

**Vulnerable (VU)**
- Albertinia Sand Fynbos - 6.31%
- Garden Route Shale Fynbos - 1.25%
- Montagu Shale Renosterveld - 1.59%
- Swellendam Silcrete Fynbos - 4.54%
Hessequa Municipality
Nationally listed threatened ecosystems

Map showing the original extent of the ecosystems which are now threatened
Hessequa District Conservation Plan Assessment

Assessment location

The map to the right shows the assessment area which was run for the identified potential location of the Carbon Roxy Irrigation Dam along the confluence of the Vet and Goukou rivers.

Assessment results

The assessment report is a compilation of data of various spatial biodiversity data sets and planning production. These are:

1. National terrestrial or aquatic spatial data sets and protected area boundaries and

2. The most relevant Biodiversity Conservation Plan BCP for the municipality in which the assessment is located. In this case the most relevant SCB is the Hessequa District Conservation Plan.
Hessequa District Conservation Plan Assessment
Ecosystems, forests and soils

Threatened Ecosystems
Section 1.1.1 of the report lists 17 national threatened ecosystems which occur with the assessment area. Although this information is extracted from the original extents of these ecosystems both the SCP results discussed below and examination of imagery confirm that natural vegetation may well exist within the area of the assessment. If this is the case it is critically endangered CR. The ecosystem in question is:

1. Cape Lowland Alluvial Vegetation (AZa 2)

Soils
The soil classes encountered (section 1.1.4) are probably associated with several of the ecosystems. Further investigation into their properties revealed that

1. Association of Classes 7 and 14: Undifferentiated texture contrast soils may have favourable physical properties, somewhat high natural fertility; relative wetness favourable in dry areas but can get water logged.

2. Lithosols (shallow soils on hard or weathering rock).

3. Soils with a pedocutanic horizon.

Indigenous Forest Patches
There were nine indigenous forest patches (section 1.1.3) found within the assessment area.
National Aquatic data sets and PAs

Hessequa District Conservation Plan Assessment
Rivers, wetlands and protected areas

National Fresh Water Priority Areas (NFEPA)

Wetlands

One hundred and seventy-four wetlands occur in the analysis area (section 2.1.1), ninety-seven of these are artificial with condition Z3 where the percentage natural land cover <25% and thirty natural with condition Z1 classed as artificial by Surveys and Mapping. All these wetlands have the FEPA ranks ranging from 2, 5 and 6.

Rivers Units Sub-quaternary catchments

The analysis area intersected fifteen units of the Vet and Goukou river (section 1.2.2), with 6 units of a condition D largely modified, 7 units with a condition C moderately modified and 2 units with a condition AB either unmodified, natural or largely natural with a few modifications. The analysis area was located in these river unit sub-quaternary catchments that had 2 units with a FEPA status of FEPA (Freshwater Ecosystem Priority Area), and 1 with a FEPA status of FishFSA (fish support area) and another with a FEPA status of Phase2FEPA (phase 2 freshwater ecosystem priority area).

Protected Areas (NBA 20011)

The analysis area intersected a formal protected area known as Kruisrivier (Broomvlei) Nature Reserve (Section 1.3) It should be redrawn to avoid this intersection.

Note: The analysis area was not located in one of the focus areas for Protected Area.
Hessequa District Conservation Plan Assessment CBAs and ESAs

In the Hessequa District Conservation Plan a lookup layer is provided which divides the area of the plan into units each of which gives biodiversity feature information responsible for the classification of the unit’s CBA map category CBA, ESA or PA. The analysis area intersected 1000 such units (section 2). In the report each unit is listed separately rather than in a table due to the amount and complexity of information it contains.

Critically Endangered ecosystems (CBAs)

Most of the analysis area intersected with lookup layer units which were classified as Critical Biodiversity Areas 280 were non-natural and 275 were other natural land with 430 units in total. The biodiversity features responsible for this classification indicated potential occurrence of both endangered species and national threatened ecosystems. These units corresponds with the critically endangered ecosystem that was mentioned above.

Ecological Support Areas (ESAs)

The analysis area did not intersect any CBA map lookup layer units which were classed as ESA or important for maintaining aquatic processes and may be transformed from natural e.g. farmland.

Protected Areas (PAs)

The analysis area intersected fifteen CBA map lookup layer units which were classed as Protected Area and probably corresponds with the intersection of the Goukou and Vet rivers mentioned above although the SCP does not include the PA name.
Hessequa Municipality – Carbon Roxy Irrigation Dam
Confluence of the Vet and Goukou Rivers

As a Municipal Dam Officer, after taking a look at the assessment location and the results that were obtained from the LUDS Report for the site, the conclusions made on this development could either be positive or negative.

Almost every human activity you can think of involves some use of water. For example the local markets are dependent on the products that are grown by farmers and in turn the farmers are dependent on the water supplies needed for irrigational purposes.

The disadvantages of building this development would be that of the presence of many Critically Biodiversity Areas (CBA’s) within the assessment location. This would then mean that many of the natural land would be transformed or damaged, therefore leading to a loss in fauna and flora. On the other hand, with high voltage power lines, the fauna that reside within that region would need to be protected from injury or mortality incase of contact with these lines (eg. Fencing). Therefore, the area is not favoured for such a development to occur due to the destruction that it may cause to the surrounding natural environment. Perhaps, this kind of development could be re-located to a less critically endangered area or offsets of the vegetation grown within this area could be translocated to another area with similar living conditions.

Although the development would bring about a change in the environment, it would really benefit the surrounding local communities...The advantages of this development being built on this site would be that of in a hydropower system, dams on a river, capture its power and direct the fast-flowing water through turbines and turning generators to produce electricity. Thereby, the location along the two rivers Vet and Goukou would be appropriate. Fuel for a hydro plant is renewable and costs nothing. Another benefit is that hydro plants do not affect the surrounding air quality. Renewable energy resources are always available to be tapped, and will not run out. This is why some people call it Green Energy.
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