

Title: Frame for better vulnerability assessment

Acronym: VULMENT

Submitted by:

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Postal Address: P O Box 100396, Scottsville 3209, RSA

Theme: Environment (including climate change)

Focus Area: Climate change, pollution, and risks

Type of project: R&D project, including technology demonstration (large scale)

Summary: Global vulnerability assessment has been largely focussed on ecological issues, but it is now recognised that from a human perspective, there are many other issues which need to be addressed. Attempts have recently been made to develop an integrated index approach to vulnerability assessment, and work on the Climate Vulnerability Index has already been published in the scientific press (Sullivan and Meigh, 2005). In this approach, a composite index is combined with scenarios of global change, enabling a more dynamic assessment process to be delivered. While this work provides a start, there is much to be done to develop it to the standard needed to be used as a robust tool. Currently, under FP6, further development and local testing in Europe and Africa of the CVI is taking place as part of the NeWater project. By the time the FP 7 starts, there will be a more comprehensive knowledge base on this issue, on which further work can be built. To address the issues of uncertainty which are rooted in both the physical and the socio-political dimensions of vulnerability, we propose to link this composite index approach to the use of Bayesian Networks, as a way of bringing in participation of stakeholders in the evaluation of the risks. Work on the use of Bayesian networks has been promoted in a number of EU projects, and a number of publications on application of the technique for water management have been produced (Bromley et al 2005). We believe that combining these techniques will provide an excellent basis from which a comprehensive and representative framework for vulnerability assessment can be built. We also feel that this will be particularly useful from the point of adding value to earlier research funded by the EU.

Expertise offered: European expertise in the assessment of vulnerability. Experience in these assessments in developing countries. Partnerships and functional linkages in Africa. Extensive experience in water management issues as well as economics related to water.

Previous FP involvement: Yes

Details of previous FP involvement: Currently the vulnerability index is being further developed in NeWater - FP6 project. Several other projects amongst the consortium members including Logo Water.

Consortium status: Partnership between the INR - Institute of Natural Resources in South Africa with Caroline Sullivan soon to be of Oxford University.

Expertise sought: Additional partners from EU countries and African countries where the models will be further tested and developed.

Related projects: FP6

Title: River Basin Twinning Initiatives

Acronym: RiverTwin

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Theme: Environment (including climate change)

Focus Area: Sustainable Management of Resources

Type of project: R&D project, including technology demonstration (large scale)

Summary: This project will identify basins in two African and two European countries, one from each continent that is making good progress with planning and implementation of IWRM and MDGs or EUWI objectives, and one where there is little move in that direction but where there is the political and structural possibility to advance. The project will compare what made the successes to be successes, and will facilitate the transfer of the incentive and knowledge to the basins where no movement has taken place. In the process the reality of IWRM and of knowledge transfer will be addressed, with the ultimate goal being the ignition of progress to satisfy the MDGs.

Expertise offered: Many years of work and first hand experience in the water management industry in South Africa. Good understanding of the operation of water management in southern Africa. Expert partners and extensive contacts in Africa. Extensive experience in transboundary IWRM projects funded by the EU (FP6) - namely NeWater and Logo Water projects.

Previous FP involvement: Yes

Details of Previous FP involvement: FP6 NeWater Project; Logo Water Project; Review of Inco proposals

Consortium status: A group of South African and other partners from Africa (potentially southern or eastern Africa) under the leadership of the Institute of Natural Resources, but still to be secured.

Expertise sought: EU partners with IWRM experience in European basins and possibly experience in Africa. Ideally partners from an EU country with developed IWRM activities, and others from EU countries where there has been little progress.

Related projects: FP6

Title: Cost-effectiveness and cost-benefit of water policies in Africa

Acronym: CBAfric

Submitted by:

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Theme: Environment (including climate change)

Focus Area: Earth observation and assessment tools

Type of project: R&D project, including technology demonstration (large scale)

Summary: Setting the bench-mark for Africa, South Africa has an innovative and well drafted water and environment policy which is rapidly being mirrored in many African countries. But, implementation is proving to be a challenge in most of these countries; the words were cheap but the reality is proving elusive. With cost being a major obstacle there is an urgent need to establish the cost effectiveness and the benefits accruing from water policies so that meager resources can be better directed. This project will undertake analyses in southern African countries (SADC), of the costs and benefits of environmental policies, with a view to identifying where money is best spent towards supporting sustainable development.

Expertise offered: Many years of work and first hand experience in the water management industry in South Africa, closely linked to the development of the water policy. Good understanding of the operation of water management in southern Africa. Expert partners and extensive contacts in Africa. First hand experience at cost benefit - policy analyses in South Africa, in the consortium.

Previous FP involvement: Yes

Details of Previous FP involvement: FP6 NeWater Project; Logo Water Project; Review of Inco proposals

Consortium status: South African partners available including water management expertise, resource economist, specialist in CBA and policy (wrote the South African guideline)

Expertise sought: Seeking EU partners to assist with policy issues and first hand EU experience at cost effectiveness and benefit analyses.

Related projects: None

Title: Harmful Algal Blooms in Upwelling Systems: GEOHAB Core Research Project

Acronym: HABUS

Submitted by:

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Theme: Environment (including climate change)

Focus Area: Sustainable Management of Resources

Type of project: Networking between organisations in same area

Summary: The Global Ecology and Oceanography of Harmful Algal Blooms (GEOHAB) Core Research Project (CRP) - HABs in Upwelling Systems will identify key HAB species in the Benguela, Iberian and Californian upwelling systems, and determine the ecological and oceanographic processes that influence their population and community dynamics. The physical, chemical and biological processes that define or characterise upwelling systems will be identified and the response of HAB species to these processes will be quantified. The prediction of HABs will be improved by integrating biological, chemical and physical studies supported by enhanced observation and modelling systems. Models of HABs in upwelling systems will support fundamental research and prototype early warning and predictive capabilities. The applicability of regional prediction systems for other upwelling systems may also be tested and the use of observation technologies will provide a useful comparison of predictions with observations. In accordance with the GEOHAB strategy the approach of the CRP will be comparative from the cellular to the ecosystem level. Research that is interdisciplinary, focusing on the important interactions between biological, chemical, and physical processes will be fostered. Finally, research will be international in scope to encompass the global issues of HAB events and benefit from the skill and experience gained by HAB investigators world-wide. The CRP - HABs in Upwelling Systems is built on the premise that understanding the ecology and oceanography of HABs in upwelling systems will benefit from a comparative approach, which is the method of choice when controlled experimentation is not practical. Assessment of the extent to which HAB species across these systems respond in a similar way will allow the oceanographic processes that influence HAB population dynamics and community interactions to be established.

Expertise offered: There is a strong HAB research group in South Africa, based at Marine and Coastal Management and the University of Cape Town. The group focuses on physical forcing and transport mechanisms; algal physiology, nutrient dynamics and production; the detection of blooms through bio-optical techniques and remote sensing, the development and use of HAB-specific autonomous real-time moorings, and the use of hydrodynamic modelling to analyse and predict bloom formation and transport mechanisms.

Previous FP involvement: No

Consortium status: Marine & Coastal Management; University of Cape Town; Instituto Español de Oceanografía, Centro Oceanográfico de Vigo; Instituto de Investigacao Agraria e Pescas; University of California Santa Cruz

Expertise sought:

Related projects: South African national R&D programmes

Title: Nodal Multiple Scale Ocean Observing Systems

Acronym: MUSOOS

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Theme: Environment (including climate change)

Focus Area: Earth observation and assessment tools

Type of project: Networking between organisations in same area

Summary: Effective regional and global ocean observation and prediction systems require multiple-system and -parameter observations over a variety of spatial and temporal scales. This is particularly important in resource-rich coastal marine systems, characterized by complex dynamics and water types relative to the open ocean. The time scale of ecosystem dynamics makes long-term monitoring of ecosystem processes highly desirable, which requires an in situ observational network for complementing and validating satellite data. This project seeks to develop node based ocean observing systems, specifically for ocean colour and temperature, as part of an interoperable global network of regional observation systems. This system will be developed with the aim of providing an integrated regional resource framework within GEOSS, GMES and GOOS structures, and will aim at sustainability, inter-operability, capacity building, and collaborative technology transfer. The core observational components of the system will be polar orbiting environmental satellites, geostationary satellites, and autonomous scientific moorings providing high-frequency multiple-parameter measurements. These will permit ecosystem observation using synoptic and in situ data gathered at a variety of scales. A key aspect of the system is the development of multiple-sensor analytical ocean colour algorithms, allowing the routine derivation of merged and sensor-independent ocean colour products. These will be closely linked to web based dissemination systems able to provide integrated data products to a wide variety of user groups ranging from ocean forecasting systems to resource managers. A key aspect of the system is the use of integrated, inter-operable data streams, consistent with GEOSS and GMES aims. In addition to providing interoperability with regard to regional multi-platform observation, the project will also aim to allow for the cost-effective development of regional observation nodes, by using a template based system design. This will facilitate the establishment of a global integrated observation network, based on interoperable regional observation nodes.

Expertise offered: The consortium offers considerable experience in the development, processing and dissemination of marine remote sensing products, in a variety of different marine ecosystems. In addition there is considerable experience in developing and maintaining autonomous marine mooring systems e.g. in the southern Benguela and English Channel. Lastly the consortium members form part of the existing GOOS/GEO pilot chlorophyll global integrated network programme.

Previous FP involvement: No

Consortium status: University of Cape Town (SA), Marine & Coastal Management (SA), Plymouth Marine Laboratory (UK), Joint Research Centre (EU)

Related projects: FP6

Title: Analytical ocean colour algorithms for harmful algal bloom detection and monitoring

Acronym: HABOPTICS

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Theme: Environment (including climate change)

Focus Area: Earth observation and assessment tools

Type of project: Marie Curie Mobility Instruments

Summary: Ocean colour data are a valuable source of information to marine scientists, allowing a greater understanding of phytoplankton dynamics and the ensuing effects on biogeochemical cycles in the world ocean. An emergent ocean colour application that is of particular importance in coastal ecosystems is the detection and monitoring of harmful algal blooms (HABs) using both in situ and satellite based sensors. Recent research has demonstrated a modelling framework for the algal component of an analytical ocean colour model. This framework uses equivalent algal size distributions, simplified chemotaxonomy, and two layered spheres to simulate the optical properties of algal populations. It allows the simulation of ocean colour across a range of water types, using simple descriptors of algal populations such as biomass, mean size, and chemotaxonomy. The fellowship will therefore focus on the further development, validation, and application implementation of the Standard size distribution/Two layered sphere modelling approach (ST model). The project will focus on the use of the ST model to examine the relationship between algal assemblage descriptors and inherent optical properties, and use radiative transfer modelling to characterize the effects of algal assemblage change on the angular structure of the submarine light field and the light leaving the sea. In addition to model validation, the project will also focus on refining several ocean colour algorithms based on the ST model, and show their routine application to available ocean colour systems. Whilst the core focus of the project is the HAB related applications of ocean colour data, considerable gains are also expected to ocean colour remote sensing application in the global oceans. Primary benefits include improving the understanding of the scattering properties of algae; and development of bio-optical tools that can be applied to a variety of ocean colour data to conduct further studies of phytoplankton dynamics.

Expertise offered: Stewart Bernard obtained M.Sc and PhD degrees in oceanography at the University of Cape Town. His PhD thesis details the bio-optical detection of harmful algal blooms based on a fully analytical ocean colour reflectance algorithm. He has extensive experience of marine bio-optics and ocean colour remote sensing, including algorithm development and satellite validation, and has been involved in the design and deployment of autonomous HAB observation systems. He is actively collaborating with researchers in France, Spain, the UK, and the USA, and is currently involved in the development of specialised ocean colour algorithms and satellite validation.

Previous FP involvement: No

Consortium status: University of Cape Town, Laboratoire d'Océanographie de Villefranche

Expertise sought:

Related projects: None

Title: Sustainable Urban Water Management for Large Cities in Developing Countries

Acronym: SUMWATER

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Theme: Environment (including climate change)

Focus Area: Sustainable Management of Resources

Type of project: R&D project, including technology demonstration (large scale)

Summary: The Millennium Development Goals call for a substantial improvement in water supply, sanitation and drainage in Developing Countries. The problem is particularly acute in larger cities where rapid population growth usually outstrips service delivery, high population densities increase the impacts of poor service delivery, and there are limited resources (human, physical, financial) to address the problem. Current EU initiatives tend to address the issue from the perspective of affluent countries; there is a need for more in-depth study from the perspective of Developing Countries. It has become evident that the only way forward is through Integrated Urban Water Management (IUWM). IUWM has been described by UNEP (2003) as, "The practice of managing freshwater, wastewater and stormwater as links within the resource management structure, using an urban area as the unit of management". Consideration of the various factors impacting on IUWM reveals that the problem is essentially three-dimensional. At their simplest, urban water services may be divided into a number of categories (e.g. water treatment, water supply, greywater management, sanitation, drainage, wastewater treatment, urban rivers). Within each of these categories, there are various aspects to consider (e.g. infrastructure, environment, social, cultural, governance, financial, maintenance). Finally, water is one of a number of services (e.g. water, cleansing, access, power, telecommunications, social etc.); sustainable water services will only be achievable if the planning of all the various considered services is done together as a whole. Given the complexity of the issues, the professional team has to be multi-disciplinary and should include politicians, engineers, planners, architects, ecologists, epidemiologists, economists, and social anthropologists. It is essential that this expertise be sourced, as much as possible, from the Developing World. This project proposes an in-depth investigation into IUWM in large cities in Developing Countries, with a view to providing guidelines for practice.

Expertise offered: The Cities in Africa Network (CIAN), co-ordinated by the University of Cape Town (UCT), but including tertiary and research institutions across southern Africa, has as its mission; "To facilitate a critical urban research and policy discourse for the promotion of sustainable urban development in the South". It seeks to address the challenges facing developing countries by linking academics and projects from a variety of disciplines which have a common desire to promote sustainable cities in Africa. One of the core components of CIAN is the Integrated Urban Water Management (IUWM) group, comprising of civil engineers, environmental scientists, social anthropologists, and epidemiologists that carries out ongoing research into issues of sustainable urban water management, focusing particularly those facing Developing Countries. Additional expertise, e.g. climatologists, planners, economists, chemical engineers may be called in from time to time as required.

Previous FP involvement: No

Consortium status: A number of departments located at the University of Cape Town; tentative links with departments having similar interests at other South Africa universities

Expertise sought: Researchers working in the area of urban water management - particularly focusing on developing countries. A wide range of disciplines required

Related projects: South African national R&D programmes

Title: Land use - climate interactions in southern Africa

Acronym: LUCISA

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Theme: Environment (including climate change)

Focus Area: Climate change, pollution, and risks

Type of project: R&D project (small scale)

Summary: Background: Climate change is a pressing concern for southern Africa with studies suggesting that much of the region will become more arid in the future. These projections arise from global climate models that both work on a large scale (approx 300km) and do not include the direct effects of land-use change e.g. changes in albedo and vegetation etc. Other direct effects on the climate (through increases in airborne dust and aerosols) are largely approximated, as are indirect effects on clouds and precipitation. Given the current expansion of agriculture into marginal lands that suffer degradation, and that land degradation can promote the intensification of dry conditions, it is important to understand the implications of such changes for the future climate of the region. Of pressing concern is the possibility that such changes in land use, combined with greenhouse gas induced changes, may push the environment beyond sustainable limits. Project aim: To determine the effect of human-induced changes in land use, which are not adequately resolved in current climate change projections, to enhance or suppress projected climate change within southern Africa. The following objectives are envisaged and will be achieved using Regional Climate Models (RCMs) as the primary tool: 1. Identify current (satellite-measured) and projected trends in land-use and model their effect on both the recent past and future climate of southern Africa; 2. Use fire distribution and climate models to identify the effect of biomass burning on the future climate (via changes in the land surface, ozone etc); 3. Model the effect of aeolian dust on the climate of the region; 4. Explore interactions between these different components of change, both with themselves and greenhouse gas - induced change; 5. Determine the implications for uncertainty in climate change projections for the region and the potential for land-use change to exacerbate or mitigate these changes.

Expertise offered: The Climate Systems Analysis Group (CSAG) at the University of Cape Town is the START/PACOM designated node for regional climate modelling in southern Africa. As part of its START/PACOM designation it is tasked with the distribution of climate change information to the rest of the region. CSAG has expertise in the downscaling of regional climate change scenarios using both empirical and dynamical models and it has conducted fundamental research into the use of RCMs (MM5, PRECIS and RegCM3) and their biases over southern Africa. CSAG has expertise in land surface - climate modelling, with projects that have modelled the effect on climate of the following: 1. Uncertainty in land surface parameterisation; 2. Fixing soil moisture at wilting and saturation levels; 3. Natural vs observed vegetation cover; 4. Model spin up and soil moisture initialisation.

Previous FP involvement: No

Consortium status: Building

Expertise sought: Land surface - climate modelling / aerosols - climate modelling (needed to realise objectives)

Related projects: International bilateral cooperation South African national R&D programmes

Title: Groundwater nitrate pollution, climatic links, processes and removal technologies

Acronym: Denitrify

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Theme: Environment (including climate change)

Focus Area: Climate change, pollution, and risks

Type of project: R&D project, including technology demonstration (large scale)

Summary: High nitrate levels in groundwater pose a health threat to both humans and animals when ingested. The majority of high-nitrate incidences in groundwater worldwide are due to pollution and are perceived to be a major threat to many water supplies. The relative importance of pollution sources varies from excessively applied fertilizer in the developed world to uncontrolled on-site sanitation and animal husbandry in the developing world. Long-term arid zone observations showed that groundwater nitrate concentrations vary, with excessive values closely related to climatic extremes. This prompts the question of future climate change impacts being superimposed on top of pollution increases. For the longer term management of the problem, full understanding of the nitrate formation processes and pollutant transport through the soil/unsaturated zone to the groundwater table, is required. Research factors for sustainable management practices include: climatic zone, pollution type and load, soil type, unsaturated zone, aquifer type, recharge, etc. Related to this, is the need to develop technologies for in-situ denitrification whereby understanding of the soil processes enables underground water purification. Objectives: 1 Get a thorough grip on the nitrogen conversion and nitrate accumulation processes, 2 Investigate the link between high nitrate occurrences in groundwater and extreme climatic variations, 3 Develop denitrification technologies applicable and economically viable in various situations, e.g. rural water supply, town supply, etc. 4 Transfer of technology for managing nitrogen inputs and denitrification applications suitable to the specific need, e.g. in the rural setting. The project will use test sites in Europe, the Middle East, and Africa in order to characterise processes under various climatic extremes. Furthermore, it would be ideal if the project will span el Nino and la Nina periods as it is evident that major recharge events following drought periods play a key role in determining the nitrate enrichment in arid-zone groundwater.

Expertise offered: Extensive experience in hydrogeological, hydrochemical, microbiological, and environmental isotope expertise, including groundwater pollution studies. They have established a regional network of interested and affected parties encompassing various institutions in several countries. Previous work include compilation of a groundwater nitrate distribution map for southern Africa based on data for some 50 000 boreholes; nitrate specific pollution studies; source identification; field and laboratory studies on denitrification; experience gained regarding longer term observations; knowledge of local conditions, and areas subject to high nitrate in groundwater; the variability of groundwater nitrate; suitable field study sites. The proposers can, at present, call on the collaboration of nitrogen fixation expertise; soil scientists; health risk competencies, and veterinary scientists.

Previous FP involvement: Yes

Details of Previous FP involvement: FP6: RECLAIM WATER-TTC

Consortium status: Individuals and organisations that could be potential partners have been identified in South Africa, Botswana, Namibia, Senegal, UK, France, Austria, Israel and Syria. Organisations such as BRGM, BGR, and others that are presently being approached

Expertise sought: unsaturated and saturated zone nitrate transport & processes, denitrification expertise, climatologists

Related projects: None

Title: Investigation into the relationship between Environmental Change and Health in South Africa

Acronym: ECHSA

Submitted by:

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Theme: Environment (including climate change)

Focus Area: Climate change, pollution, and risks

Type of project: R&D project (small scale)

Summary: Everybody depends on the environment to provide various ecosystem services. These services include provisions such as food, freshwater, wood and fibre; supporting systems such as nutrient cycling, soil formation and primary production; regulatory systems such as climate regulation, disease regulation and water purification and cultural services such as spiritual, educational and recreational (MA 2005). Due to population increase and a growing pressure on the environment, there is a 2/3 decline in these service world wide (MA 2005). This situation puts tremendous pressure on the livelihoods of rural communities particularly in Africa who are largely dependent on what nature provides. Sustainable livelihoods of these communities therefore depend on proper management of agro-ecosystems as well as the natural systems. One of the main consequences of environmental change is deterioration in the human health and increase in infectious diseases (McMichael et al., 2003). Through a modelling approach, Olwoch 2006 had established a close relationship between biodiversity loss and tick-borne diseases in Africa under different climate change conditions. Little is known regarding the relationship between environmental change and human health since the modern approach to alleviate communities of diseases is through the provision of modern medicines. This project will therefore fill this gap through examining the extent of environmental change, the major drivers of change(climate change, land Use and cover change, population increase, urbanisation) and then provide the implications of these changes on the health of the communities involved and environmental management options to supplement health care provisions. Various communities in rural South Africa will be selected particularly those that are already showing high prevalence in vector and water-borne diseases. It is envisaged that the results of this project will highlight the importance of environmental management in health care management.

Expertise offered: In the department of Geography, Geo-informatics and Meteorology we have GIS specialists to map the impacts and distribution of the affected areas, we have Climate forecasters both seasonal and near seasonal, Climate change modellers, we also have vector Ecologist, impact assessment experts to assess the impacts of cc or environmental change and we also have social scientists to assess the indirect social economic impacts.

Previous FP involvement: No

Consortium status: No European Consortium members yet

Expertise sought: Expertise in Health Impact assessments

Related projects: South African national R&D programmes

Title: Resilient Agricultural Systems in a Changing Environment in the Lowveld

Acronym: RASCEL

Submitted by:

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Theme: Environment (including climate change)

Focus Area: Climate change, pollution, and risks

Type of project: R&D project (small scale)

Summary: The most recent climate change projections predict increased rainfall and temperature variability, as well as changes in rainfall patterns over time and space. Such a shift in climate geography would under any circumstances have significant implications for both emerging and large-scale commercial agriculture. In addition to projected increases in climate stress, however, the Lowveld environment in South Africa is also undergoing substantial transformation in the form of changes in land cover and land use. The challenge of creating more resilient agricultural systems in the face of such multiple changes requires an inclusive systems approach that recognizes emerging complexity and multiple non-linear relationships. Such an approach characterizes multiple changes (climate, land cover, land use), their drivers, impacts, implications for resilience-building in agricultural systems and interactions between all of the above. The RASCEL team proposes a modular approach, where a range of expertise is brought together to implement the integrative systems approach described above.

Expertise offered: Climate change modelling, ecological modelling, GIS, remote sensing, field & community surveys

Previous FP involvement: No

Consortium status: Partners sought

Expertise sought: Ecological and land use/cover change expertise

Related projects: None

Title: Land Quality Assessment

Acronym: LQA

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Theme: Environment (including climate change)

Focus Area: Earth observation and assessment tools

Type of project: R&D project, including technology demonstration (large scale)

Summary: Assessment of Land Quality using multi-temporal, multi spectral, and variable scales of satellite imagery coupled with other contextual data. The object would be to develop mechanisms to cost effectively provide a verity of different levels of data to meet a verity of user needs relating to the spatial mapping and monitoring of land quality. A prime focus would be using FPAR linked to plant phenology as a coarse scale filter for productivity, degradation, land use change, deforestation and desertification. Finer scale assessment of priority areas would then be used for more detailed assessment of change and the nature of change. A key issue would be the mapping, monitoring and better understanding the nature and extent of desertification. Also of importance in the mapping and monitoring of land use change, especially as it related to impacts of human settlement. Contextual data such as soil, vegetation type rainfall and known settlements would be combined with modelled data such as potential primary production and remotely acquired satellite data, the synergy of these data sources providing greater informational accuracy than any is currently providing in isolation. For instance land cover can be used in conjunction with known tenure arrangement and environmental potential to give a good estimate of actual land use. Linearity, texture and grain size of settled areas can provide information on the nature of urban settlement and the demographics of the inhabitants.

Expertise offered: Ecology, Desertification, Remote Sensing, Global change

Previous FP involvement: No

Consortium status: not yet formed

Expertise sought: Partners working on desertification, land use change, global change

Related projects: South African national R&D programmes

Title: Role of the Ocean on Southern African Climate**Acronym:** ROSAC**Submitted by:**

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Theme: Environment (including climate change)**Focus Area:** Climate change, pollution, and risks**Type of project:** R&D project (small scale)

Summary: Over the last century, Southern Africa has suffered from dramatic inter-annual changes in rainfall characterized by severe droughts and wet spells. Such variability of rainfall affects the agricultural industry, water reserves and thus the Gross National Product. It has a particularly detrimental effect on rural subsistence farmers, the health of people in rural areas and the management of a sustainable natural environment. In a recent study Jury (2002) shows that summer rainfall in the period of 1980-99 rainfall variability is closely associated with year-to-year changes in the gross domestic product (GDP). Jury (2002) estimates that over U.S. \$1 billion could be saved annually through uptake of timely and reliable long-range forecasts. The most severe droughts happen in Southern Africa during the mature phase of El Nino, when the central and eastern Pacific and the Indian Ocean are warmer. Due to the high sea surface temperature, the important heat content of the first hundred meters and high associated rainfall rates, the equatorial and tropical oceans have a profound effect on Southern Africa climate internal variability and this offers predictability at the seasonal scale as warm event in the Pacific (El Nino), the Indian Ocean and the Atlantic Ocean (Benguela Ninos, Atlantic Ninos) usually last for a long period. The El Nino Southern Oscillation (ENSO) phenomenon is the dominant regulator of Southern Africa summer rainfall but the Indian and Atlantic Ocean have also a role to play. In fact it seems that the warming of the Indian Ocean since the 50's that has made ocean variability more important for southern Africa and this has increased by a factor of two the spatial extension and intensity of drought in Southern Africa. Conversely, wet spells and floods are more likely to happen during La Nina and positive phase of the Subtropical Indian Ocean dipole. On top of it are long term trends, for instance ocean's temperature has risen globally during the last 50 years due to the anthropogenic increase in CO₂. Given the high correlation between ocean surface temperature and Southern African rainfall, this increase is to take seriously. It has been shown indeed that the warming of the Indian Ocean during the last decades is responsible for a tighter association between internal variability of rainfall and the ENSO phenomenon that lead to increased drought intensity and spatial extension since the 70's (Richard et al.; 2000; 2001, Rouault and Richard, 2003; 2005) We wish to accomplish a multidisciplinary analysis of the impact of the ocean on climate variability involving climatology, meteorology, hydrology to better understand and forecast the impact of climate variability on water resources and agriculture. An important goal will be to train the participants, their students and team members in data analysis of large dataset and foster long term visit in between the collaborating institutions and their foreign partners. This project could be a follow-up on the AMMA project in West Africa with a distinct Southern African flavour. Existing collaborations are between several Southern African investigators and the AMMA project. This project will fit in the international GEWEX and CLIVAR project.

Expertise offered: Physical oceanography, climatology, meteorology and hydrology of Southern Africa.**Previous FP involvement:** No**Consortium status:** Consortium in Southern Africa include University of Cape Town, South African Weather Service, University of Kwa-Zulu Natal, University of Pretoria and various Southern African partners.**Expertise sought:** The expertise needed is in the experimental and modelling fields, especially coupled models.**Related projects:** FP6

Title: Promoting, informing and testing structured dialogue in civil society for effective catchment management.

Acronym: DIALOGUE

Submitted by:

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Theme: Environment (including climate change)

Focus Area: Sustainable Management of Resources

Type of project: Networking between organisations in same area

Summary: For natural resource decision making, decentralised and participatory involvement is the order of the day. In South Africa, efforts to achieve this are especially compelling because they support a democratic style and intent in resource allocation and use, both in the objectives set as well as in the human and institutional interactions that support the attainment of these objectives. However the reality is that participants' efforts are largely frustrated. Current decision making systems do not have sufficient structured, quality dialogue in the process and outcomes that should link and integrate diverse values and contributions for the allocation and use of natural resources. Also, many new civil society interest groups have emerged and are still emerging, so that many more values and preferences as well as within- and between-sector interactions must be taken into account. Nowhere is this situation more intense than in the water resource domain. Because the availability of water resources and the needs for these resources change continuously, dialogue within civil society, and between civil society and Catchment Management Agencies and government will have to be a structured, open-ended, ongoing process, continually seeking to establish an optimal solution. Based on this context, the project poses three critical questions: 1. What would be an appropriate structure to promote structured dialogue? 2. What are the rules that direct and regulate the dialogue process? 3. How do parties in dialogue gather, generate and share information and learn together? The project will be run as a phased action research programme that will design and test processes and structures in support of the three questions posed. The programme will be based on the Inkomati (Sabie sub-catchment) [South Africa]. This catchment provides a timely case opportunity in the form of a newly established Catchment Management Agency as well as constructive existing relationships between the research team, government and civil society.

Expertise offered: The project team is a consortium of researchers and practitioners from at least three South African research institutions, providing knowledge and expertise in the fields of: ecology, hydrology, development and management sciences, planning and political sciences. Additional expertise will be drawn from e.g. legal perspective to ensure that the processes and structures developed will be legally feasible. The team is committed to systems thinking, a progressive view of science and knowledge generation and a commitment to regarding social-ecological systems as complex systems with the associated uncertainty, unpredictability and emergence characteristics. Finally, the team offers streamlined project and financial management skills to support the smooth running of a large, integrated, collaborative, multi-institutional programme-level action research initiative.

Previous FP involvement: No

Consortium status: Currently, partners include the CSIR, the University of KwaZulu-Natal and the University of the Witwatersrand. All partners have indicated willingness to commit but there is no formal agreement as yet.

Expertise sought: The project will require an overall commitment from partners to adaptive, systems thinking in order to draw diverse theories into practice under a common philosophical commitment. Specific fields of expertise needed within this will be river ecology, hydrology, social sciences (e.g. political science) and the management sciences.

Related projects: None

Title: Sustainable Transfer and Adoption of Biofuel Technologies**Acronym:** STABT**Submitted by:**

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Theme: Environment (including climate change)**Focus Area:** Environmental Technologies**Type of project:** R&D project, including technology demonstration (large scale)

Summary: Future projections and forecasts indicate the potential of the sub-Saharan African region to participate in the supply of biofuels. To this end, further studies have been undertaken to determine the feasibility of such renewable technologies, and it has subsequently been proposed to implement strategies in regional policies. However, a number of important issues have been raised to ensure the sustainability of biofuel technologies in the sub-Saharan region. For example: awareness and capacity building of all stakeholders in such technological systems, including, but not limited to, relevant government departments, farmers, persons involved in agro-forestry, funding and financial institutions, related industries, NGOs, academic and R&D institutions; a roadmap must be established, whereby detailed stable, long-term, holistic policies can be formulated for such technological systems; and in-depth analyses of the appropriateness of different technologies in a regional context, considering issues such as effective utilization of by-products and effluents, natural resource management in terms of biodiversity, ecology and pollution control, the management of supply and distribution chains, and effective production and applications of biofuels, to name but a few. These issues call for incorporating the concept of sustainable development into the technology management field of knowledge. The research will subsequently focus on the development of technology assessment methods, as they are applied in specific technology management practices that are important in the biofuels context, i.e. Technology Roadmapping and Technology Transfer, which integrate the intrinsic modelling that is researched in the emerging field of sustainable science. The final outcomes from the research will be the development and demonstration of effective management models, at sector and organisation levels. The research will address two distinctive challenges: the effective and sustainable transfer and adoption of biofuel-related technologies, and the interaction between multidisciplinary research teams that will be required to reach sustainable technology management practices.

Expertise offered: A team of researchers lead by the Council for Scientific and Industrial Research (CSIR) brings together a range of sub-Saharan expertise that is fundamental if sustainable biofuel technology adoption is to be achieved in the region: capacity development at first and second economy levels and in urban and rural areas; R&D engagement with the public and private sectors, and communities, at first and second economy levels and in urban and rural areas; ongoing R&D in technology and knowledge management, and sustainability science, i.e. the complexity of social-ecological interactions; technology assessment, modification and deployment in the African context; and understanding of the resource base of the region. To this end the CSIR has been actively undertaking research projects in Africa since 1993 and is currently working in about 23 African countries.

Previous FP involvement: No**Consortium status:** Potential consortium members have been identified in Europe**Expertise sought:** Biofuel technology developers and technology transfer researchers**Related projects:** FP6 South African national R&D programmes

Title: End of Life Vehicles (EU Directive 2000/53/EC)

Acronym: EU 2000/53/EC

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Theme: Environment (including climate change)

Focus Area: Climate change, pollution, and risks

Type of project: R&D project, including technology demonstration (large scale)

Summary: The proposal aims to address the requirements raised in the last stipulation of EU Directive 2000/53/EC on End-of-Life Vehicles, which requires automotive manufacturers to confirm that the levels of the toxic elements Cr(6+), Cd, Hg and Pb do not exceed the maximum levels specified in any part of the vehicle. This includes a wide range of materials such as steel, other metals, batteries, oil, tyres, plastics, glass, paint, etc. As these industries had not traditionally been involved in the field of analytical chemistry, the intention of this proposed project is to identify the most appropriate analytical techniques available for the analyses of these materials - both for industry and at the higher level of metrology. Where applicable, analytical methods should be developed and validated, e.g. GD-OES, TG-MS, FTIR, XRF, etc. In addition, any suitable Certified Reference Materials that are already available should be identified and critically evaluated (e.g. SI traceability of certified values). Where suitably certified reference materials are not available, priority areas (e.g. steels and plastic) can be identified.

Expertise offered: The National metrology laboratory in South Africa has expertise in analytical methods , e.g. GD-OES (Glow Discharge Optical Emission spectroscopy), TG-MS (Thermogravimetric Mass Spectrometry), FTIR(Fourier Transform Infrared), XRF (X ray Fluorescence), etc. The NML can perform referee analysis; develop reference standards, etc.

Previous FP involvement: No

Consortium status: Capability available in South Africa. EU Partners sought

Expertise sought: Automotive manufacturers; Analytical chemistry laboratories

Related projects: None

Title: Hypoxia Variability in the Coupled Equatorial Atlantic - Benguela Systems

Acronym: SEA-Hypoxia

Submitted by:

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Theme: Environment (including climate change)

Focus Area: Climate change, pollution, and risks

Type of project: R&D project, including technology demonstration (large scale)

Summary: This project proposal aims to provide a system scale understanding of how hypoxia (low oxygen water) in shelf ecosystems are driven by a complex feedback between remote ocean climate and local productivity rates. Coastal hypoxia is considered to be one of the most important habitat constraints in highly productive upwelling fisheries systems. The South East Atlantic coupled ocean - shelf hypoxia system is a particularly interesting area because it both controls the Benguela fisheries and ecosystem services and responds to different climate forcing scales to its equivalent in the Pacific. An understanding of these contrasting systems may help explain future responses to climate change in these ecosystems. This is a new area of global concern and scientific efforts are supported by the SCOR Working Group (128) which aims to provide an integrated understanding of coastal hypoxia and its ecosystem consequences.

Expertise offered: Expertise offered by the South African team includes Coastal and Ocean biogeochemical modelling, biogeochemical observational experience, coupled ocean - atmosphere modelling, ecosystem modelling. Institutionally, the strength lies in the newly conceived African Centre for the Coordination of Earth Stewardship Science (ACCESS) which is both transdisciplinary centre and a high performance computing centre.

Previous FP involvement: Yes

Details of previous FP involvement: Catchment2Coast - FP5

Consortium status: early stage discussions

Expertise sought: Large scale oceanographic numerical modelling, observational capacity in the equatorial system, data assimilation into models

Related projects: None

Title: Sub-Antarctic carbon and oxygen biogeochemistry: past, present and future climate

Acronym: SABiogeochem:

Submitted by:

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Theme: Environment (including climate change)

Focus Area: Climate change, pollution, and risks

Type of project: R&D project, including technology demonstration (large scale)

Summary: The Southern Ocean is considered to be one of the two, North Atlantic being the other, most important ocean sinks of anthropogenic CO₂. In addition, the biogeochemical characteristics of the southern Ocean are thought to play an important role in modulating global ocean productivity, explaining glacial - interglacial shifts in the atmospheric CO₂ reservoir as well as modulation of the long term atmospheric oxygen inventory. One emerging common insight is that the sub-Antarctic plays this role through modulating the local and global carbon export production. In this respect, the Southern Ocean to the south of South Africa is a particularly interesting part of the Ocean - Atmosphere System because of the high energy meso-scale eddy activity linked to the convergence and exchange between basins. However, generally, the Southern Ocean remains one of the least sampled and understood ocean domains. This project would aim to use a coupled southern ocean - south Atlantic biogeochemistry modelling approach to understand the scales and processes that explain glacial - inter glacial transitions and on that basis explore future southern African and global climate responses to increased atmospheric CO₂.

Expertise offered: The South African expertise that is envisaged for the proposal includes ocean biogeochemical processes and modelling, coupled ocean atmosphere processes and modelling and palaeoclimate observations and modelling. The SA team has some years of experience in each of these domains and a particular strength and tradition in interdisciplinary science. Institutionally, the strength lies in the newly conceived African Centre for the Coordination of Earth Stewardship Science (ACCESS) which is both transdisciplinary centre and a high performance computing centre.

Previous FP involvement: Yes

Details of Previous FP involvement: FP5 and FP6

Consortium status: under development

Expertise sought: Partnerships in: coupled ocean - atmosphere global and basin scale modelling, coupled biogeochemical global and basin scale modelling,

Related projects: FP6 International bilateral cooperation

Title: Coupled Tropical Terrestrial - Water - Marine ecosystems: system thresholds

Acronym: TESTCoast

Submitted by:

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Theme: Environment (including climate change)

Focus Area: Sustainable Management of Resources

Type of project: R&D project, including technology demonstration (large scale)

Summary: Coastal Ecosystem services in tropical river dependent systems have a vulnerability to the combined effects of climate and human intervention. Modification of river flow and quality characteristics through land use and water allocation needs as well as direct exploitation of coastal resources in the context of changing climate forcing highlights the need for a better understanding of system thresholds. Tropical coastal systems have a wide variety of ecosystem services linked to mangrove, seagrass and coral domains. The complexity that arises from their coupling makes a direct assessment through observation difficult to use and predict the sensitivity of the feedbacks. The aim of this study would be to focus on two contrasting East African coupled river - coastal ecosystems and through modelling and observations assess thresholds and threshold sensitivity for the three most important ecosystem services.

Expertise offered: Southern African teams can provide strong expertise and experience in this domain. It includes tropical coastal oceanography and ecosystem modelling, biological oceanography of species and systems, assessment of ecosystem service flows, modelling of large scale coupled river - coastal systems. The core of the team provided the leadership in the 3 year FP5 Catchment2Coast programme. Institutionally, the strength lies in the newly conceived African Centre for the Coordination of Earth Stewardship Science (ACCESS) which is both transdisciplinary centre and a high performance computing centre.

Previous FP involvement: Yes

Details of Previous FP involvement: FP5 Catchment2Coast

Consortium status: partly in place

Expertise sought: Ecosystem Modelling, Ecological Modelling, River Hydrology modelling, assimilation of remote sensing data to models

Related projects: FP5 FP6

Title: Integrated climate change assessment model: decision-support tool to enable planning for economic growth and community upliftment in times of climatic uncertainty

Acronym: URBAN CLIMATE

Submitted by:

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Theme: Environment (including climate change)

Focus Area: Climate change, pollution, and risks

Type of project: R&D project, including technology demonstration (large scale)

Summary: Globally, migration into urban areas is on the increase. This has resulted in a situation in which cities are increasingly responsible for the generation of greenhouse gas emissions. In contrast, however, urban residents are also critically vulnerable to the impacts of climate change. Dealing with climate change and the appropriate responses at the urban level is a complex issue. This complexity is reflected as follows (Tyndall Centre, 2006): Adapting to and mitigating climate change in urban areas involves complex interactions of citizens, governmental/non-governmental organisations and businesses. This complexity can inhibit the development of integrated strategies, which may for an example involve transportation demand management, land use planning and construction technologies, whose combined effect is more beneficial than the achievements of agencies or organisations acting individually. Set against this complexity, we propose in the research efforts to concentrate on developing a model that enables the simulation, evaluation and comparison of strategic development plans in vulnerable urban areas in the context of climate change. Through this model and the research that underpins it, city stakeholders will understand more about the systemic effects of climate change on cities, will have new insights into greenhouse gas emissions from urban areas and will be able to conduct model-based assessment of the effectiveness of alternative strategic approaches to mitigation and adaptation (Tyndall Centre, 2006).

Expertise offered: Climate impact assessment for both the biophysical and Expertise includes: Urban planning Climate and integrated modelling socio-economic environments Adaptation approaches. Greenhouse gas emission determinations

Previous FP involvement: No

Consortium status: Consortium under development with the Tyndall Centre (UK)

Expertise sought:

Related projects: None

Title: Climate information centre - Southern African region

Acronym: SACIC

Submitted by:

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Theme: Environment (including climate change)

Focus Area: Climate change, pollution, and risks

Type of project: Networking between organisations in same area

Summary: Background: During interaction between climate scientists with climate-oriented stakeholders in sectors such as agriculture, water management and urban planning, it is becoming clear that the demand for clear and professional information and advice on climate-related issues such as variability and change is increasing. Stakeholders require accurate interpretation of scientific output that can serve their specific needs. Currently there are numerous institutions which issue climate forecasts and climate change projections, and the need for an integrated and "official" distribution and dissemination "agency" is apparent. Cooperation between and among the region's foremost scientists and academics does exist but the scientific output often lacks coordination and effective distribution and dissemination. European and British experience in this regard would be invaluable. The model that is used in the UK (UK Climate Impacts Programme) for an example would need to be adapted to suit the needs of Southern Africa, particularly in raising awareness. Forecast scenarios from the leading climate change research group are issued by the UKCIP under license (at a cost or no cost, depending on the nature of the user) to users from different sectors. At the same time the programme creates value from these scenarios by issuing publications on impacts, adaptations and even mitigation strategies that various sectors such as industries, agriculture, urban planning and business can use and understand. By coordinating the outputs from universities, the South African Weather Service, regional NWSs, the Southern African Regional Consensus Forum (SARCOF) and the Global Forecasting Centre for Southern Africa (GFCSA), a comprehensive bank of information would be collated. Project activities and objectives: The climate change forecast scenarios would be made for each location and for each specific user group and maps and graphs that relate to the important climatological variables that may be of interest to each specific sector would be provided. In addition, activities in South Africa would include: Publicity and awareness lectures, talks and discussions: These would involve interest groups, specialist sectors as well as the public at large, and promote discussions to increase coping capacity. At the same time, the training input required to implement the publicity and awareness would create and build capacity among practitioners. Short courses could also be designed for governmental (local, regional and national) policy and decision-makers where an in-depth presentation of climate change science and impacts could be offered. Climate adaptation: risk, uncertainty and decision-making workshops: The aim of the workshops would be to demonstrate the application of the decision-making framework and train attendees in its use. Each workshop would use a different case study, to help illustrate the risk, uncertainty and decision-making framework. Climate change for the rural and agricultural economy workshops: The focus would be on the impacts of climate change for the rural and agricultural economy to focus on impacts for service and product providers, examining the current and projected impacts of climate, and possible adaptation responses. A monthly literature search would be conducted to identify relevant research on climate change science, climate change impacts and climate adaptation in response to these activities. The information would be collated and summarised into a short (2-3 page) document providing the headline messages from key papers and references for each article.

Expertise offered: Researchers at the Climate Systems Analysis Group at the University of Cape Town have extensive experience in communicating climate variability issues, forecasts and climate change information in Southern Africa. Extensive linkages exist with scientists in universities and NWSs in most SADC countries, with a base of foremost climate scientists at the University of Cape Town. Expertise also includes stakeholder workshopping, problem solving and project management.

Previous FP involvement: No

Consortium status: building

Expertise sought: Climate information networks, disseminator and interpretive agencies

Related projects: International bilateral cooperation South African national R&D programmes

Title: Weather and climate prediction on different time scales over Africa

Acronym: TabiaAfrica

Submitted by:

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Theme: Environment (including climate change)

Focus Area: Climate change, pollution, and risks

Type of project: R&D project, including technology demonstration (large scale)

Summary: Some of the most advanced numerical atmospheric models will be used to simulate weather and climate predictions on different time scales (daily, seasonal and longer) for different regions over Africa. Weather predictions can be of great value, for example, to avoid damage caused by extreme weather event. Seasonal forecasts of rainfall might assist farmers and industry in planning and climate change scenario simulations may provide information about expected changes in climate. The simulations will be done in Africa (South Africa) through research and training, and the project will produce information on a regional scale with fine resolution models. The transfer of information in a suitable format for application and interpretation by communities will also form part of the research. The research will link up with existing projects that are funded by this UK High Commission in South Africa and that are running over Uganda.

Expertise offered: Atmospheric modelling experts Meteorologists Climatologists Environmental Scientists Human impact scientists Communicate project information with schools and society Present the only graduate degrees in Meteorology in South Africa - training of Meteorologists for the South African and other African Weather Services Collaboration with the South African Weather Service Collaboration with DEAT Collaboration with other universities

Previous FP involvement: No

Consortium status: UK Embassy South Africa (existing), British Met Office (existing), Uganda Dept of Meteorology (existing), South African Weather Service (existing), Universities, World Meteorological Organisation (existing through the SA Weather Service).

Expertise sought: South African Weather Service, British Met Office, World Meteorology Organisation, Met. Offices in Africa

Related projects: International bilateral cooperation South African national R&D programmes

Title: Development of a methodology for optimizing primary productivity and low flows in degraded catchments

Acronym: OPPLFDC

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Theme: Environment (including climate change)

Focus Area: Sustainable Management of Resources

Type of project: R&D project, including technology demonstration (large scale)

Summary: Degraded catchments are globally widespread and increasing in area, especially where rising populations in poor, rural communities over-utilize the limited natural resources available to them. These areas are characterised by significant soil loss, very low primary productivity, and reduced catchment low flows which are often crucial for meeting the basic water requirement of the local inhabitants. Rehabilitation of such catchments is necessary to uplift the rural poor, to conserve soil and water resources, and reduce the magnitude of silting and flooding through downstream rivers and impoundments. Various land use options are available for establishing a vigorous plant cover to promote rain water infiltration into the soil, reduce overland flow, and retard sediment loss. The use of trees for this purpose is particularly widespread and well documented in many countries. However, a negative effect that such land-use change can bring about is a reduction in catchment water yields, especially when trees replace seasonally dormant vegetation such as grasslands with a lower annual water use. A balance is required in which catchment productivity and soil stability is attained in a manner that minimizes reductions in catchment water yield, and especially the critically important low flows. Recent developments in technology suggest a number of ways in which such an optimal rehabilitation strategy can be determined for a given degraded catchment. Those technologies considered most promising include: (i) Mapping the temporal and spatial availability of soil water to plants through multispectral and hyperspectral remote sensing; (ii) Ground-truthing plant water status; (iii) The use of geophysical techniques for characterizing subsoil conditions; (iv) Rainfall-runoff modelling to identify changes in this relationship due to catchment rehabilitation efforts; (v) The use of spatially-distributed catchment hydrological models to assess changes in "green water" associated with different rehabilitation scenarios; (vi) The identification of plant species/genotypes with reduced general water use or enhanced water use efficiency; (vii) Techniques for evaluation of the economic and social benefits of different rehabilitation strategies. The aim of this project is to develop a methodology which will guide the rehabilitation of degraded catchments in many different environments.

Expertise offered: The proposed consortium is able to offer a wide range of expertise that is very appropriate to this research proposal: The South African CSIR, in particular the Ecophysiology Group within its Natural Resources and Environment Competency Area, has widespread experience in hydrological research, both at the scale of whole catchments and at the level of within-catchment process-studies. Strengths include experience in techniques for measuring: (a) evapotranspiration and transpiration from vegetation o rainfall o streamflow o soil water o groundwater; (b) Operation of automatic weather stations; (c) The use of telemetry links for recording field data at distant experimental sites o Modelling catchment hydrological processes; (d) Measurement of water use efficiency in trees. The CSIR Satellite Application Centre has extensive experience in the application of remote sensing imagery to land use questions. The Department of Hydrological and Geo-Environmental Sciences, Faculty of Earth and Life Sciences, Vrije Universitat in Amsterdam has extensive research experience of the hydrology of degraded and rehabilitating catchments in tropical environments. Professor S. Bruijnzeel has wide experience in this research area, and an interest in this proposed project. The Dutch-based WaterWatch group (led by Dr W. Bastiaanssen) has developed a methodology allowing the daily estimation of evaporative loss from vegetation from a combination of remote sensing imagery and ground-based climate information. This method is being applied in many European and African settings, as well as elsewhere globally, and is currently being validated in South Africa.

Previous FP involvement: No

Consortium status: Two potential consortium partners have been identified, and are listed above.

Expertise sought:

Related projects: None

Title: Wastewater reuse for irrigation of lawns, food and biofuel crops

Acronym: Wastelrrig

Submitted by:

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Theme: Environment (including climate change)

Focus Area: Sustainable Management of Resources

Type of project: R&D project, including technology demonstration (large scale)

Summary: Effluent from wastewater treatment plants is seen more and more as an important resource in order to reduce the pressure on fresh water resources, in particular in arid and semi-arid areas. Many examples can be found on wastewater reuse for irrigation of lawns, parks and golf courses, agricultural crops as well as industrial crops (e.g. sorghum, sunflower, jatropha tree) for the production of biofuels (e.g. bioethanol, biodiesel). There is potential to extend these water reuse systems. However, several areas need to be researched in order to optimize wastewater reuse and value-adding production. These research areas are: i) suitability of wastewater (wastewater quality); ii) optimization of water supply infrastructure; iii) availability of marginal sacrificial land; iv) management of irrigation with wastewater; v) impact on soils, surface waters and groundwater, especially in the long run (including microbiological impacts); vi) crop selection, breeding, fertilization and management (in particular, the reuse of biosludge as fertilizer); vii) profitability of the system and socio-economic benefits (in particular, small businesses and job creation); viii) policy and ethical issues; ix) availability of infrastructure and technologies for processing of biofuels, in case wastewater is applied on biofuel crops. This research would aim at addressing knowledge gaps and assessing the feasibility of this practice. It is envisaged that the research would bear impacts on society, economy, health and the environment. Cooperation with European researchers will be essential both in terms of gaining new technical and scientific knowledge, and exchanging technological, scientific and policy experiences.

Expertise offered: The expertise that can be offered in this research topic is following: wastewater quality (Dept. of Earth Sciences, University of the Western Cape through information obtainable from the Department of Water Affairs and Forestry), water supply infrastructure and availability of marginal land (Dept. of Earth Sciences, University of the Western Cape through information obtainable from Municipalities and various National databases), irrigation management and its impact on soils, surface waters and groundwater, modelling of water and contaminant fluxes in the vadose zone (Dept. of Earth Sciences, University of the Western Cape). Some of the other research areas mentioned are in the domain of other Departments at the University of the Western Cape. Our specific interest lies in European experiences in the application of this practice, policies and technologies, in particular for sustainable production of biofuels.

Previous FP involvement: No

Consortium status: Tentative contacts have been made

Expertise sought: Wastewater engineering, land use planning, wastewater policy, crop breeding, biofuels

Related projects: None

Title: Sustainable use of natural resources in developing countries in Africa.

Acronym: AFSUN

Submitted by:

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Theme: Environment (including climate change)

Focus Area: Sustainable Management of Resources

Type of project: Thematic network on specific research questions

Summary: Development of capacity to implement sustainable natural resource practice in African countries. This involves water resource management, cross-boundary water utilisation, air quality management, biodiversity management and environmental tourism.

Expertise offered: Laboratory and technical expertise, access to graduate students in environmental studies.

Previous FP involvement: No

Consortium status: The following organisations are currently considering participation: Imperial College (London), University of Oulu (Finland), Pretoria University, University of Namibia.

Expertise sought:

Related projects: International bilateral cooperation South African national R&D programmes

Title: Development of a multi-temporal system modelling strategy to monitor ecosystems dynamics

Acronym: EcoTemp

Submitted by:

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Theme: Environment (including climate change)

Focus Area: Earth observation and assessment tools

Type of project: R&D project, including technology demonstration (large scale)

Summary: This initiative aims to investigate current models used to gauge ecosystem state, and to adapt these models for remote sensing applications. This entails (i) a thorough review of existing models, (ii) evaluation of model input parameters to gauge which can be sensed using remote sensors and which parameters require in situ measurements, (iii) testing and validation of such integrated models, (iv) robust extension of such models to ensure multi-temporal validity. The proposal is closely linked to efforts of Prof. Pol Coppin (Katholieke Universiteit Leuven; M3-BIORES group) which involves integrated modelling of capital-intensive crop production systems. These studies form part as application development efforts for the planned MSMISat satellite, a South African - Belgium collaborative spaceborne platform that will include a hyperspectral sensor (200 wavelength bands; 400-2500nm; 15m spatial resolution) as part of the payload and has a planned launch date of end-2008. Whereas a crop system model mainly involves growing season parameterisation, an ecosystem approach would require a more extensive multi-temporal approach. Model evolution and parameterisation are required throughout a yearly cycle, resulting in a dynamic approach to system state description. Potential study areas include the Nkomati catchment in northern South Africa, as well the Klein Karoo biome, both of which already have a variety of data types available from previous and existing studies. Spectral data potentially will include MODIS at coarse scales, and SPOT and spectroradiometer data at finer scales. This study also needs to address development of remote sensing sampling and sub-sampling strategies, depending on the scale of applications, i.e., from within catchments to broader biome-wide descriptions. While an ambitious venture, the proposed research will draw from a wide range of existing expertise internal and external to the CSIR.

Expertise offered: The CSIR research group has extensive experience in natural system assessment using a variety of modelling approaches, some of which includes remote sensing as a data source. Expertise stems from a variety of research groups, e.g., ecosystem process, biodiversity, and physiology. The Ecosystems Earth Observation group furthermore has worked on research that ranges from remote sensing applications in uneven-aged, mixed, deciduous forests in the USA, to broadleaf monocultures in Europe and South Africa. Understanding of static system assessment has been well developed, but a need exists to evaluate the temporal dynamics of ecosystem state and changes thereof, as well as the potential of integrating in situ and remote sensing data sources for ecosystem assessment.

Previous FP involvement: No

Consortium status: Multiple organisations (South Africa - CSIR; Belgium - Katholieke Universiteit Leuven; Spain - Instituto de Agricultura Sostenible (IAS)), project in initial and developmental stages.

Expertise sought: Multi-temporal analysis of hyperspectral data; primary and secondary study sites for validation studies; system modelling experience for extraction of pertinent parameters towards modelling initiatives; dynamic system modelling expertise

Related projects: International bilateral cooperation South African national R&D programmes

Title: Evaluating spectral-structural interaction mechanisms for assessment of forest bio-physical state

Acronym: Hyperstruct

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Theme: Environment (including climate change)

Focus Area: Earth observation and assessment tools

Type of project: R&D project, including technology demonstration (large scale)

Summary: This initiative aims to evaluate the interaction between spectral and structural properties of forests towards the assessment of bio-physical state and state changes. Bi-directional reflectance distribution effects, along with leaf clumping, layering, canopy structure, and intra/inter-species structural variations all influence the manner in which forest systems are spectrally perceived. The main objectives of this effort are (i) to assess temporal behaviour of forest spectral indices (e.g., LAI, nitrogen, water stress) based on seasonal and growing season measurements, (ii) to assess tandem structural variations of forests over the same measurement frequency, and (iii) to evaluate and quantify relationships between spectral-structural variations towards increasingly robust predictions of forest state and state change. Potential study areas are located in Kwazulu-Natal, in eastern South Africa, in even-aged, managed plantations of Eucalyptus and Pinus spp. Concurrent data sets are being acquired for this area, which includes fixed area mapped plots, radar, high spatial resolution optical, lidar, and hyperspectral air- and spaceborne acquisitions. Various structural and textural parameters will be extracted from the range and spectral imagery, while spectral indicators, e.g., indices, red-edge, ratios, derivatives, will be evaluated and adapted to identify those indicators best suited to forest bio-physical state assessment. The dynamics of these spectral-structural interactions will be evaluated and quantified in order to increase the robustness of forest characterisation. This effort will increase our understanding of the temporal interactive behaviour of spectral-structural indicators and enable appraisal of this natural resource with increased accuracy and precision. Additional outcomes of this project will involve technology demonstration and training in a South African context.

Expertise offered: The CSIR research group has extensive experience in natural system assessment using multi-spectral, medium/coarse-scale (e.g., MODIS, Landsat, SPOT), structural (e.g., small footprint lidar), and hyperspectral (e.g., CASI, Hymap, AVIRIS, spectroradiometer) sensors. These expertise areas include forest volume and biomass estimation using lidar sensors, characterising forest composition and bio-physical state using hyperspectral data and approaches, time-series analysis using coarse-scale sensors, and forestry BRDF studies. Experience ranges from uneven-aged, mixed, deciduous forests in the USA, to broadleaf monocultures in Europe and South Africa. Understanding of static forest assessment has been well developed, hence the need to evaluate the temporal and interactive nature of these two measurement strategies, namely spectral and structural characterisation.

Previous FP involvement: No

Consortium status: Multiple organisations (South Africa - CSIR, Spain - Instituto de Agricultura Sostenible (IAS), Belgium - Katholieke Universiteit Leuven), project in initial and developmental stages.

Expertise sought: Multi-temporal analysis of hyperspectral and structural data types; primary and secondary study sites for validation studies; system modelling experience for extraction of pertinent parameters towards follow-up modelling initiatives

Related projects: International bilateral cooperation South African national R&D programmes

Title: Safety, Health and Environmental concerns of Persistent Organic Pollutants

Acronym: SHEPOP

Submitted by:

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Postal Address: Private Bag X6001 Potchefstroom

Theme: Environment (including climate change)

Focus Area: Climate change, pollution, and risks

Type of project: R&D project (small scale)

Summary: Recent publications, as well as work in progress, has shown the presence of POPs (such as dioxins, furans and PCBs), as well as other pollutants (such as PBDE, HCB and mirex), in various median in South Africa. These median include soil, water, sediments, bird eggs and breast milk. Very little is known about these compounds, especially their sources and environmental fate. There seems to be differences between congener profiles and phase (e.g. soil and sediment) distributions. A better understanding of distributions, levels and dynamics of the pollutants will greatly assist in the decision-making regarding pollution abatement, as pollution abatement priorities might be quite different from conditions in more temperate areas. Included in this activity, would be considerations of the exposure that community's experience, close to sources, or communities that themselves are sources, due to lack of, or slow implementation of non-combustion based methods for heating and cooking.

Expertise offered: We have limited data from a highly industrialised area. We can take all kinds of samples, except at present air samples. We have extraction infrastructure, and limited analytical facilities. As part of a consortium, we can arrange collection permits and ethical permissions where required.

Previous FP involvement: No

Consortium status: NILU and Norwegian Institute for Veterinary Sciences

Expertise sought: Analytical, technology transfer, risk assessment

Related projects: International bilateral cooperation South African national R&D programmes

Title: Biological methods for the detection and removal of pharmaceuticals in water**Acronym:** Pharmaceuticals**Submitted by:**

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Postal Address: NRE CSIR P.O. Box 395 Pretoria 0001

Theme: Environment (including climate change)**Focus Area:** Environmental Technologies**Type of project:** R&D project (small scale)

Summary: Pharmaceuticals and personal care products including prescription and non-prescription human and veterinary drugs, diagnostic agents, bioactive food supplements and other consumer products are recognized as one group of emerging substances that can give rise to new environmental problems. At present 3000 substances are registered in the European Union for pharmaceutical applications. Some of these agents are very resistant to biodegradation since metabolic stability is necessary for pharmacological action. These substances enter the environment via waste water treatment plant effluents, agricultural run-off from animal husbandry; and the application of sewage sludge and manure to land. Although some of these compounds have only been detected at ng/l to µg/l levels in river water, endocrine effects of estrogens (some pharmaceuticals have oestrogen mimicking properties) in surface waters have been reported at a concentration as low as a few ng/l. To prevent pharmaceuticals entering the environment, especially surface and drinking water it is crucial that effective methods be developed to remove these substances from waste water, and to monitor the removal of these substances during the treatment process; and to test surface waters for the presence of these substances. The most common persistent active components used in pharmaceuticals will be identified and used in this study. Micro-organisms with the potential of biodegrading these pharmaceutical components will be isolated from contaminated sites and cultivated. The efficiency of biofilm reactors combined with physical and chemical pretreatment (incineration, UV irradiation and ozonation) will be investigated to identify the most cost-effective treatment method. It is crucial that these contaminants can be monitored and removed at low levels and therefore concentration techniques (solvent extraction, activated charcoal filtration and molecular imprinting technologies will also be investigated). General and selective toxicity tests (might have to be developed) will be evaluated to monitor the presence of these agents in water.

Expertise offered: The Biototoxicology Group of the CSIR has been the leading laboratory in South Africa in aquatic biotoxicology for more than 20 years. Research focused on the development, modification, evaluation and application of biological assays to detect harmful chemicals in water (surface, ground-, drinking), effluents, leachates, hazardous waste, chemical products, material and sediments. The bioassays measure both acute and chronic toxicity, with their corresponding lethal and sublethal effects and use organisms from different levels of the aquatic food chain as well as mammalian cells, biomarkers and enzyme systems. The development of sample preparation techniques (concentration, fractionation and extraction) also received much attention. The Water Treatment and Remediation Group at the CSIR has been involved for many years in the biological remediation of waste water and soil. Facilities include chemical and microbiological analytical laboratories, process rooms and a big wet laboratory to test pilot plant operations.

Previous FP involvement: No

Consortium status: No partners have been sought yet, but some of the CSIR team members are registered for post-graduate studies at the Department of Microbiology and Plant Pathology of the University of Pretoria and have access to facilities and expertise at the university.

Expertise sought: Anaerobic digestion - State of the art reactors - University of Pretoria Pharmacology - Advice re structure of pharmaceuticals, the metabolism of these compounds by humans and animals and the effects of the different active compounds. Pharmacology departments in local universities, and major pharmaceutical companies in Europe. Determination of pharmaceuticals in water - SABS or private pathology laboratory Development of kits based on environmental contaminants as carbon sources for identification of microbial communities - Department of Biotechnology, Lund University where one of the CSIR project team members has worked 6 months earlier this year under the South African -

Swedish Bilateral Cooperation Agreement. Development of commercial toxicity test kits - The Laboratory for Environmental Toxicology and Aquatic Ecology at the University of Ghent in Belgium. The Biotoxicology Group at the CSIR has collaborated with this laboratory under the South African - Belgium Bilateral Cooperation Agreement.

Related projects: International bilateral cooperation

Title: Impacts of Climate Change on Bulk Water Supply in KZN, South Africa

Acronym: CCBWS

Submitted by:

Mark Summerton (mark.summerton@umgeni.co.za)

Theme: Environment (including climate change)

Focus Area: Climate change, pollution, and risks

Type of project: R&D project, including technology demonstration (large scale)

Summary: An existing project in KwaZulu-Natal, South Africa entails addressing water and sanitation backlogs in this Province by 2010 as required by the Millennium Development Goals. The focus is on identifying the water demand, water resources and infrastructure to do this. However, little is known about the potential impacts of climate change on the water resources, which could be a fatal flaw in the project. The proposed project will determine the impact of climate change on water resources by downscaling circulation models for use in hydrological and hydraulic models to determine the impact on water resources. In collaboration with Prof Roland Schulze of the University of KwaZulu-Natal, a technique is currently being developed on one strategic catchment. This methodology needs refinement and expansion to other key catchments in the province.

Expertise offered: GIS, Hydrological modelling, water engineering

Previous FP involvement: No

Consortium status: Hydrological modelling, open channel flow modelling (hydraulics), climatology

Expertise sought:

Related projects: None

Title: The impacts of climate change on the frequency, intensity and impacts of fires

Acronym: FIRECLIM

Submitted by:

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Theme: Environment (including climate change)

Focus Area: Climate change, pollution, and risks

Type of project: R&D project, including technology demonstration (large scale)

Summary: Vegetation fires have important impacts on rural communities, in terms of damage to their safety and risks to their crops, buildings, forests, and other forms of infrastructure. Global climate change will almost certainly change the patterns of rural fires, with consequences for rural communities as well as for the conservation of biodiversity and the ecosystem services that such biodiversity supports. This project aims to identify areas where fire risks are high, and to establish the trends in fire frequency and intensity associated with these fires over the past few decades. It will further seek to establish whether or not such trends are driven by changes in climate, and if so what the prognosis is for further change. The study will require the development of approaches to assess fuel loads and accumulation trends in natural vegetation, the detection and mapping of fires, the establishment of multi-year databases on fire occurrence, and the assessment of the impacts of fires. It will also require the combination of predictions of changes in climate, and fire behaviour modelling techniques, to develop scenarios of future fire regimes. The aim will be to develop the techniques to assess trends in fires and their effects. The results of this study can be used in a number of ways, mainly in planning for the management and reduction of risks in priority areas, as well as in anticipating impacts on biodiversity and identifying means for reducing these impacts.

Expertise offered: Personnel in CSIR have considerable experience in fire research. This includes fire ecology (the impacts of fire on ecosystems), fire behaviour and climate studies, the development of fire danger rating systems and fire management plans, and the development of fire policy. Our recent track record includes the assessment of fire management approaches, the development of fire danger rating systems, and the development of models for the mapping and prediction of fire occurrence and effects. Much of this work has been done in collaboration with international partners.

Previous FP involvement: No

Consortium status: We will seek to form a consortium with the Global Fire Monitoring Centre in the Max Planck Institute based in Freiburg, Germany.

Expertise sought:

Related projects: South African national R&D programmes

Title: Building a sustainable society through a trans-disciplinary understanding of social-ecological systems, ecosystem service delivery and benefit flows

Acronym: ESBF

Submitted by:

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Theme: Environment (including climate change)

Focus Area: Sustainable Management of Resources

Type of project: R&D project, including technology demonstration (large scale)

Summary: The recently completed Millennium Ecosystem Assessment (MA), stresses; (a) that society is totally dependent on the services delivered by ecosystems, and (b) the poorer the society, the more direct and greater that dependence. Society will not be able to achieve a sustainable lifestyle, and maintain long-term freedoms and choices, if the integrity of ecosystems continues to deteriorate. However, ecologists have poor understanding of: (a) how service delivery is affected by the integrity of the ecosystem, (b) how to quantify and spatially represent the flows of ecosystems services; and (c) how to quantify and spatially represent the value of those benefits to society under various ecosystem management scenarios. These gaps need to be addressed if society is to develop policies and governance systems that will move society towards the sustainable management of ecosystems. The envisaged project addresses the sustainability imperatives and improvement of the quality of peoples' lives encompassed in the South African National Research and Development Strategy, as well as the New Partnership for African Development (NEPAD) and the Millennium Development Goals (MDG). We currently have funding which focuses mainly on developing the trans-disciplinary, scientific understanding of the economic and ecological domains needed to integrate these different components for selected river basins in southern Africa. We propose to use EU partnerships and funding to extend this approach to interact with a range of stakeholders and build the trans-disciplinary social-ecological understanding required to develop policies, governance and management systems that encompass this understanding. The ultimate aim is to be able to manage ecosystems so that they can continue to provide the services needed by society in an environment which is changing due to human impacts and global climate change. We are currently in discussion with potential local and EU partners but have not finalised any relationships yet.

Expertise offered: Our CSIR team has substantial experience in the management of some ecosystem services, notably water resources (quantity and quality) in a southern African context, including large, river-basin scale assessments. We have a substantial knowledge base on the ecology of natural and semi-natural ecosystems and the driving forces for those ecosystems as well as the potential impacts of climate change. We can also offer an in-depth understanding of natural resource governance systems in southern Africa. We are developing an understanding of how to assess the state of ecosystems, and how this affects service delivery, as well as how to quantify the flows of benefit flows, and benefit generation, by socio-economic systems.

Previous FP involvement: No

Consortium status: None confirmed yet

Expertise sought: We need partners to: (a) complement our skills, specifically in the area of social sciences focusing on achieving sustainable livelihoods and reducing vulnerability to environmental change; and (b) to strengthen our skills, particularly in resource or ecological economics

Related projects: FP6

Title: Catchment effects on coastal ecosystem processes

Acronym: CECEP

Submitted by:

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Theme: Environment (including climate change)

Focus Area: Climate change, pollution, and risks

Type of project: R&D project (small scale)

Summary: Our ability to manage coastal environments in the face of anthropogenic impacts would be vastly improved by a comprehensive understanding of processes regulating biodiversity and ecosystem functioning over a wide range of conditions. Because manipulative experiments are impossible at the sorts of scales involved, generalisations in this regard can be achieved only by using comparative methods. Through much of the developed world, marine species are heavily exploited and systems subjected to eutrophic conditions, which lead to reduced biodiversity and impaired ecosystem function. But this is only one end of a spectrum. The coastal waters of KwaZulu-Natal, South Africa, are close to the other end. Here, coastal waters are generally oligotrophic, benthic and pelagic biodiversity is relatively high, exploitation is relatively low and pollution from various sources is variable. As such, these waters represent a potentially useful system to which studies in European waters can be compared. In this context, we propose to investigate the effect of river catchment size on biodiversity and ecosystem functioning of coastal waters that ultimately receive the runoff water. By replicating the study in contrasting Northern and Southern Hemisphere ecosystems, a broader understanding of coastal ecosystem functioning in general will be achieved. We predict that larger catchments will result in runoff that has a more lasting and profound effect on coastal biodiversity and ecosystem functioning. This will naturally be mediated by anthropogenic modification of nutrient and sediment loads and also by future climate change scenarios. If this prediction is borne out by observations, it would suggest that coastal conservation initiatives should focus on fewer, large estuaries, rather than many small estuaries. This might contrast with results from the estuaries themselves, but the identification, generalisation and resolution of such paradoxes is important in coastal ecosystem management.

Expertise offered: The newly established research group is young and enthusiastic, and is in the process of developing biological oceanography capacity in KwaZulu-Natal, which has historically been overlooked from a South African marine research perspective. Individual participants bring a wide range of skills to the project, including: local knowledge, experimental design and analysis, stable isotope ecology techniques, ecological network analysis, food-web modelling, algal nutrient ecophysiology, pelagic, estuarine, temperate reef, sandy beach, and fisheries ecology. For more information on individual researchers and their recent papers, see our web page: www.ukzn.ac.za/marinebio

Previous FP involvement: No

Consortium status: None

Expertise sought: We are seeking balanced collaboration with an experienced team of scientists who are prepared to participate fully in all aspects of research, including skills transfer, data exchange, fieldwork, post-graduate student training/supervision, and facilitating access to specialised infrastructure and techniques not otherwise available to the group.

Related projects: None

Title: Trace analysis of organic environmental pollutants

Acronym: GC-MS analysis

Submitted by:

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Theme: Environment (including climate change)

Focus Area: Climate change, pollution, and risks

Type of project: Networking between organisations in same area

Summary: We are interested in developing more robust, cheaper, methods, based on spectroscopy, chromatography and mass spectrometry for analysing air and water pollution, including particle associated compounds

Expertise offered: We have developed methods, based on silicone rubber concentrators, to measure air and water pollutants by GC and GC-MS. This includes denuder studies to differentiate between free molecular and particle associated air pollutants like PAH's. Also included are laser spectroscopic, non-destructive, screening methods of the concentrated sample inside the mentioned multichannel trap.

Previous FP involvement: No

Consortium status: none yet

Expertise sought: partners that have a similar interest in new sampling methods, with experience in pollution monitoring

Related projects: None

Title: Potential for plants to evolve in rapidly changing environments

Acronym: REVOLVE

Submitted by:

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Theme: Environment (including climate change)

Focus Area: Sustainable Management of Resources

Type of project: R&D project, including technology demonstration (large scale)

Summary: During the twentieth century, carbon dioxide emissions grew 12-fold; from 534 million metric tons to 6.59 billion metric tons, resulting in global warming and subsequent climate change, which affects living organisms at the physiological, ecological and microevolutionary levels. Natural evolution allows species to change and evolve in changing environments if they contain inherent genetic variation. The potential of species to survive rapid changing climates is studied through the assessment of the inherent genetic variation. Many species that have resided in stable environments for a very long time, and have over time, evolved to collect genetic compositions suited to the particular environment, causing such populations to become genetically uniform. Such genetic uniformity limits these populations to produce a variety of variants and could face extinction if the environmental conditions should change. Genetically more diverse populations are able to produce different genetic variants, some better to survive changing environments, have the capacity to evolve when faced with a changing environment. In South Africa the Karoo biodiversity "hot spot" contains 5000 species of which 40% are unique, providing an opportunity to investigate the effects of rapid climate change on species that might be facing extinction on various levels. The tree improvement group of the CSIR, also has access to a vast amount of quantitative data on a range of traits providing the opportunity to develop quantitative tools that can be used to assess a species' potential to survive rapid changing climates. The aim of this project is to embark on an extensive investigation into the assessment of the species' potential to survive in rapid changing environments using various genetic tools, molecular as well as quantitative. As little research is being conducted using quantitative methods, we envisage developing quantitative methodology as well as mathematical and computer models to predict survival potential and management of plants facing possible extinction.

Expertise offered: We are a team of 18 people, 11 of which are scientists/researchers. There are 4 PhD's, and the rest are either MSc or currently doing their MSc. Our skills are mainly in classical tree breeding, quantitative genetics, cytogenetics, biotechnology and reproductive biology. Please see our Web page for details. http://www.csir.co.za/tree_improvement/

Previous FP involvement: No

Consortium status: Currently other operational units of the CSIR are involved. We are in the process of forging other links such as with the Centre for Biodiversity and Conservation, School of Biology, University of Leeds, Leeds LS2 9JT, UK and local universities.

Expertise sought: Expertise in mathematical and computer modelling; forest geneticists; ecology.

Related projects: South African national R&D programmes

Title: Optimising land and water use in South Africa in the best public interest using remote sensing technologies

Acronym: OLOWUSA

Submitted by:

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Theme: Environment (including climate change)

Focus Area: Sustainable Management of Resources

Type of project: R&D project, including technology demonstration (large scale)

Summary: An increasing demand for water resources within the constraints of finite and variable quantity and quality requires the optimisation (planning and management) of land and water to be able to adapt to changes in these needs. In South Africa and other countries, near real-time information on the state of water resources, and information on spatial and temporal variation in key factors that determine the availability and quality of water resources (e.g. Rainfall, soil moisture, plant biomass, total evaporation), are still lacking. This information is critical for optimising water use in the best interest of the public. Integrating remote sensing products with ground based auxiliary data through models like SEBAL, provides a tool for managing both land and water use at a spatial scale. However, the use of remote sensing technologies for these purposes is in its infancy in South Africa and requires research to improve its use and incorporation into biophysical modelling, and capacity building to make these technologies operationally viable tools.

Expertise offered: The South African partners can provide a research framework drafted by researchers (domain specialists in the hydrological field) around remote sensing and water resources management. This framework document already provides insight into potential application, outcomes and impacts of improved water utilization of water resources. Interested partners (researchers) have already been identified in South Africa and bring to the table unique ground-truthing information for a variety of applications of these technologies in the field of water resources management. Technologies improved for South Africa, can be extrapolated to the wider Southern African region, with similar climatic conditions.

Previous FP involvement: No

Consortium status: Partners from Europe have expressed interest

Expertise sought: Optimisation of water resources; Remote sensing applications in the water sector

Related projects: None

Title: The potential of market incentives to conserve & manage natural and agricultural ecosystems in a developing country

Acronym: MICED

Submitted by:

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Theme: Environment (including climate change)

Focus Area: Sustainable Management of Resources

Type of project: R&D project (small scale)

Summary: Environmental services (ES) are the end products of nature that yield human well-being (e.g., C sequestration, potential primary production, biodiversity, fresh water, etc.). Since human well-being is dependant on natural ecosystems, the study and measurement of ecosystems and ES provision is essential. This is particularly important because ES are "positive externalities", which means society derives benefits from them without appropriately compensating providers. The consequences of this are that ecosystems are often under conserved or inadequately managed, and services are under-supplied. These problems are prevalent in developing countries such as South Africa where inappropriate or underdeveloped institutions (property rights, finances, and communication), practices and knowledge create incentives for stakeholders to exploit the environment. In addition, the growing demand for ES to reach economic-growth targets and to alleviate poverty (high priorities of the South African (SA) government) is putting further pressures on natural and agricultural systems. Government intervention is often required in such cases in order to provide a socially optimal level of ecosystem conservation. The SA Government, however, does not have the necessary information to set priorities and to make intra- and inter-temporal trade offs in resource allocation, use and conservation. It is therefore proposed that the following challenges be addressed through multi- and inter-disciplinary research: 1) evaluate, in a developing-country context, the market-based, regulatory and co-operative mechanisms available that might facilitate ES procurement; and 2) determine the optimal combination of mechanisms to inform public policy and decision-making. It must be emphasised that market-oriented policies in particular will be investigated because they create incentives for stakeholders to conserve ecosystems and provide ES at minimum cost, which, it is hypothesised, is likely to be the most sustainable approach. Finally, in order to address these aims, the research will also need to estimate and value the relationships between ecosystem integrity, ES provision and the benefits derived by humans from these services.

Expertise offered: The CSIR has extensive and well-developed expertise in ecology, biodiversity, social science and ecological economics research and policy advice. The researchers that will contribute to such a R&D project include: Dr Russell Wise (Ecological Economics), Dr Belinda Reyers (Zoology), Dr David leMaitre (Botany - Ecology) and Dr Patrick O'Farrell (Botany - Ecology). All of these researchers are currently involved in a project titled "The flow of benefits to people provided by ecosystems at multiple scales: a spatial and economic assessment". These researchers also have experience at coordinating and working within large consortiums to ensure cost-effective and timely project delivery. More generally, the CSIR has a long tradition of practicing inter- and multi-disciplinary research involving the natural, social and engineering sciences, which is essential for the study proposed here. The organisation also has well-developed contacts within Government, other research organisation and the private sector, and its state-of-the-art facilities and technology allow it to do innovative research.

Previous FP involvement: No

Consortium status: In discussions with the SA Department of Environment and Tourism (DEAT), the SA Dept' of Science and Technology (DST), and the UN Food and Agricultural Organisation (FAO). Other organisations to involve include: DIVERSITAS and IFPRI

Expertise sought: R&D expertise in 'payments for ecosystem services' (particularly in ecology and economics) to determine and value the relationships between ecosystem integrity, ES provision and the benefits derived from these services in order to help advise on policy.

Related projects: None

Title: Urban Estuaries - air, land and water interfaces

Acronym: Urban-Estuaries

Submitted by:

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Theme: Environment (including climate change)

Focus Area: Sustainable Management of Resources

Type of project: R&D project, including technology demonstration (large scale)

Summary: Estuaries are economically valuable and productive ecosystems, having obvious aesthetic value and providing habitat for commercially and ecologically important species. Estuaries are favoured areas of urban development and major cities across the world are located at river mouths. Given the spread of coastal development and threat to coastal habitats, viable ecological function of urban estuaries is important. Understanding sources and impacts of contaminant loading is critical to sustainable management of these systems. In coastal cities, stormwater runoff is often directed to estuaries. Stormwater contamination has led to pollution in estuaries throughout the world. However, comparatively little research effort has been expended investigating the relative role of air pollution in cities, and particulate fallout on impermeable urban surfaces that is flushed into estuaries. The proposed research intends to address this, using estuaries in the eThekweni Municipality as test systems. eThekweni Municipality comprises of a large, industrialised and urbanised area on the northeast coast of South Africa. Industrialisation and urbanisation have been accompanied by pollution problems. Air quality studies have illustrated high concentrations of organic contaminants in certain areas, with pollution most acute during autumn and winter when calm conditions prevail. During these periods there is probably widespread atmospheric fallout of pollutants. Most estuaries here close off from the sea during these seasons as a result of low flows. Minor rainfall events that do occur are sufficient to flush contaminants from impermeable surfaces to estuaries, but are insufficient to breach sandbars blocking mouths. Contaminants therefore have the propensity to accumulate in waters and sediments, and to elicit adverse biological effects, which may ultimately pose risks to human health. The proposed research seeks to address these concerns and aims to provide an understanding of the relative roles and consequences of different pollution sources in urban estuaries. The research seeks to determine the relationship between chemical and biological contamination of several estuaries within the city and activities conducted in their watersheds and 'airsheds', and to determine the biological impacts and human health implications of this contamination. Estuaries to be evaluated comprise a range of sizes (and associated watershed sizes) and states of watershed development (e.g. industrialised, urbanised, semi-urbanised), permitting examination of linkages between estuarine state, air quality and land based activities.

Expertise offered: Within the local consortium expertise exists in the following fields (to various degrees): Air quality modelling Hydrodynamic modelling Habitat mapping GIS Analytical laboratories (water, sediment, biota) Analytical chemistry (inorganic, organic and microbiological) Environmental chemistry Geochemistry Ecotoxicology Botany Benthic ecology Ichthyology Ecology

Previous FP involvement: No

Consortium status: Two local organisations have indicated intent to participate in the research (in addition to the CSIR): Marine Geosciences Unit, Council for Geosciences and Oceanographic Research Institute

Expertise sought: Participation in this research is sought by a wide range of partners and collaboration would be welcomed in fields of expertise offered by the consortium in its present form. There is probably little immediate expertise available within the local consortium for predictive modelling of runoff flows in urban environments. Chemical expertise is needed to realise the project objectives, especially in the field of organic chemistry and speciation (particularly PAH's and industrially derived atmospheric emissions and particulates). Expertise in the fields of estuarine and marine water-and sediment chemistry is also needed.

Related projects: None

Title: Geophysical Monitoring Technologies

Acronym: GEOPHENVMONITOR

Submitted by:

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Postal Address: PO Box 395, Pretoria, 0001

Theme: Environment (including climate change)

Focus Area: Environmental Technologies

Type of project: Networking between organisations in same area

Summary: The aim of this project is to develop geophysical tools, as well as adapt existing tools for the use of: (i) cavity detection (for example old mine workings, geophysical tools that can be used: 3D acoustic tool combined with borehole radar); (ii) safer working environment in mines (e.g. relating radar data to rock mass ratings, as well as mapping fracture patterns using a combination of ground penetrating radar & other geophysical logging techniques such as acoustic televiewers).

Expertise offered: The Mining Competency at CSIR NRE has the following geophysical expertise: (a) Ground Penetrating Radar; (b) Borehole radar; (c) Radio Imaging; (d) Electrical Resistance Tomography; (e) Microseismics

Previous FP involvement: No

Consortium status: None

Expertise sought: OGS, Italy - Guiliana Rossi, TNO,

Related projects: None

Title: Sustainable development planning within the resilience limits of social-ecological systems

Acronym: SDPResilim

Submitted by:

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Theme: Environment (including climate change)

Focus Area: Sustainable Management of Resources

Type of project: Networking between organisations in same area

Summary: Although environmental decision making tools such as Environmental Impact Assessment (EIA) and Strategic Environmental Assessment (SEA) have a long history of application worldwide, their developed world origin has led to a focus on biophysical environmental aspects. There is currently widespread concern regarding the effectiveness of these traditional approaches in Southern Africa (Mbeki, 2006). This is because of the urgency to address basic human needs whilst acknowledging the source and sink capacity of the natural resource base. Sustainability issues are highly complex and their resolution lies beyond the contribution of any single scientific discipline or suite of independent disciplines (Clarke et al., 2005). The response to this challenge has seen the emergence of sustainability science, an "interface science", aimed at bridging the perceived social-ecological system divides, including divisions between scientific disciplines, science and other knowledge sources, and knowledge generation and political decision making. The theory of sustainability science is reasonably well established in the developed country context (Clark and Dixon, 2003); however, it is poorly established in developing countries and countries in transition (such as those in Africa and Eastern Europe), where the needs for development and poverty alleviation, supported by science, are critical (IUCN, 2006). The research envisaged in this proposal will build on CSIR's current investment in sustainability science as well as its well established track record in development planning, specifically in Integrated Development Planning, SEA and EIA as well as that of its partner institutions in Eastern Europe, where similar development challenges occur. The envisaged outcome of the research is a new approach to development decision making that marries the emerging theory of sustainability science with the experience and lessons from existing development planning approaches. References Clark W.C., Crutzen P.J. and Schellnhuber H.J., 2005. Science for Global Sustainability: toward a new paradigm. Centre for International Development Working [http://www.cid.harvard.edu/cidwp/120.htm]. Clark, W.C. and Dixon, N., 2003. Sustainability science: the emerging research paradigm. Proc. Natl Acad. Sci. USA 100 (14): 8059-8061. IUCN, 2006. The future of sustainability: Re-thinking environment and development in the twenty-first century. www.iucn.org. Mbeki, T., 2006: Cabinet lekgotla media briefing. www.info.gov.za/speeches/2006/06073111151003.

Expertise offered: The project will draw on CSIR's broad multidisciplinary competency base, which, traditionally has been able to serve a wide variety of sectors and markets in Africa. CSIR has also gained valuable expertise and experience in facilitating large complex projects which have required the integration of knowledge from various disciplines (eg Integrated Environmental Management (particularly in the form of complex EIAs), Water Resources Management, the Cape Action Plan for People and the Environment and Conservation Planning (eg Addo and the Wild Coast) and CSIR's contribution to the Millennium Ecosystems Assessment).

Previous FP involvement: No

Consortium status: In the process of linking up with Centre for Transdisciplinary Environmental Research (Stockholm University) and the Regional Environmental Centre for Central and Eastern Europe (Prague).

Expertise sought: Putting transdisciplinary and resilience theory into practice and learning from experience in sustainability planning issues in countries in transition.

Related projects: South African national R&D programmes

Title: Integrated risk and vulnerability assessment methods for air pollution exposure

Acronym: VULRISK

Submitted by:

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Theme: Environment (including climate change)

Focus Area: Climate change, pollution, and risks

Type of project: R&D project (small scale)

Summary: This project would explore the relative contribution of vulnerability factors in modifying susceptibility and exposure of population groups to environmental air pollution, resulting in specific health outcomes. These investigations would inform the development of a comprehensive Vulnerability and Risk Assessment Tool that would assess individual susceptibility and variability factors to environmental pollution. A scoping meeting with local and international organisations will be initiated wherein a data collection and analysis plan will be defined. Specific pollutants, health outcomes and susceptibility groups will be decided upon as well as which modifying factors will be investigated.

Expertise offered: Health Risk and vulnerability assessment of air pollution Community research Medical sciences

Previous FP involvement: No

Consortium status: Possible interest from Norway research organisation

Expertise sought: Biostatistics (specifically multi-level, multi-variety analysis) is required in order to analyse large datasets of socio-economic and disease factors

Related projects: None

Title: Biogenic Organic Emissions and Impacts on Air Quality

Acronym: BVOCplatform

Submitted by:

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Theme: Environment (including climate change)

Focus Area: Environmental Technologies

Type of project: R&D project, including technology demonstration (large scale)

Summary: Poor air quality impacts on quality of life by affecting peoples' health and livelihoods. While the contribution of human activities to air pollution are relatively well understood, any attempt to understand and manage air quality must take emissions from plants and animals into account. Many plants give off compounds that are known as biogenic volatile organic compounds (BVOC's). It is understood that large amounts of BVOC's are emitted within regions (such as southern Africa), yet the nature and amount of these emissions is not well understood. The impact of BVOC's on air quality is not well known but is a critical component of our knowledge if air quality is to be understood, and managed efficiently. This initiative plans to establish a world class technology platform to address the knowledge needs concerning BVOC's. This will be achieved through building capacity and skills in partnership with appropriate organisations such as tertiary education institutes with access to the necessary equipment.

Expertise offered: Atmospheric chemistry

Previous FP involvement: No

Consortium status: Collaboration is being sought with Max-Plank - Germany and the National Centre for Atmospheric Research in Boulder, Colorado

Expertise sought: Novel technologies to measure and analyse organic air pollutants, BVOC scientists, Photochemical modelling

Related projects: None

Title: Development of support systems and tools to improve sustainability of new and existing drinking water technologies in rural South Africa and developing countries

Acronym: SUSWATTREAT

Submitted by:

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Theme: Environment (including climate change)

Focus Area: Sustainable Management of Resources

Type of project: R&D project (small scale)

Summary: The project concerns the development of support systems and tools for improved transfer and application of new water treatment technologies in South Africa and developing countries, with specific emphasis on technical and socio-economic aspects of small-scale treatment systems, rainwater harvesting, water reclamation and reuse, and multi-barrier treatment systems (e.g. membranes). These tools will also include knowledge-based methodologies for improvement of the sustainability of existing treatment technologies. A critical element that will form part of the main aims of the project will be enhancing the interaction between social structures and technology development, thereby ensuring optimal benefit for all groups involved in utilisation of these technologies for sustained community development. The products of the project will be used to develop strategic plans for drinking water treatment in rural South Africa and developing countries, and will include results of technology assessments and studies of the social interactions with technology selection and application. Achievement of the Millennium Development Goals will form an important focus of the objectives of the project. Amongst the specific issues and problems that will be addressed in the project are lack of capacity, poor operation and maintenance, lack of management involvement, commitment and resources, as well as a general lack of knowledge and understanding of the importance of effective water service delivery. Other barriers to achieving sustainable water supply are a general lack of trust and transparency at sector levels, funding structures being too short term for the sector to be sustainable, and insufficient levels of funding / margins. The application of the support systems and tools is expected to result in more sustainable development and improving quality of life in rural South Africa and developing countries.

Expertise offered: Chris Swartz Water Utilisation Engineers has been involved with research and capacity building projects for the South African Water Research Commission, Department of Water Affairs and Forestry, provincial government, Water Boards and District and Local Authorities for the past 15 years. These projects includes evaluation of technologies and treatment systems, drawing up of guideline documents for water treatment technologies, sustainability of small-scale water systems, compiling manuals and training material on operation and maintenance of water treatment plants, and developing guidebooks for evaluation and selection of water treatment technologies. Key areas: Small Water Treatment Systems Project Management Evaluation of water treatment plants Developing water treatment guidelines and manuals Upgrading of water treatment plants Applied research on water supply projects Membrane systems and desalination Social studies for acceptance of technologies Training of water treatment plant operators Feasibility studies for rural water supply projects

Previous FP involvement: Yes

Details of previous FP involvement: Partner in TECHNEAU project (FP6)

Consortium status: Within South Africa research programmes (including FP6 TECHNEAU) undertaken with the Water Research Commission. Also collaboration with University of Stellenbosch on research projects and initiatives has been formed. No consortium discussions yet for the current proposal.

Expertise sought: Expertise required in: technology assessment and integration with social structures; small-scale water treatment systems.

Potential partners: Technical University Delft (TUD) (The Netherlands); Kompetenzzentrum Wasser Berlin (KZW) (Germany); Eawag (Switzerland)

Related projects: FP6

Title: Biodiversity values, sustainable use and livelihoods (6.2.1.4.3)

Acronym: BioVal

Submitted by:

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Theme: Environment (including climate change)

Focus Area: Sustainable Management of Resources

Type of project: R&D project (small scale)

Summary: Perceptions regarding the value of biodiversity greatly influence the investment that is made in the management of the asset. Furthermore, conservation of natural resources is influenced by the extent to which users realize that the benefits of improved management outweigh the costs. This project will therefore develop methods and determine what the cultural, social, spiritual, economic and other values of biodiversity are in a range of target countries, as perceived by the public and local resource users. This information will be used as a step towards identifying the key drivers of use and management of biodiversity. Another key issue will be developing an understanding of what influences how people value biodiversity, e.g. living standards, quality of life, culture, access to alternatives, education and awareness etc. in the different countries. Conservation of biodiversity is of international interest, yet the costs of managing and conserving global biodiversity is largely borne at a country level. This understanding of how and why different people value biodiversity will therefore be used to develop mechanisms and policy instruments for managing conflict over the use and management of biodiversity nationally and internationally. The information will also be used to develop strategies to provide national and international incentives (e.g. establishing activities that improve local livelihoods) or compensation (to avoid deterioration in livelihoods) to improve the management of biodiversity. A review of policy would also be undertaken assess the presence of true incentives and make recommendations on the removal of perverse incentives for the improved management of biodiversity and to promote sustainable livelihoods and lifestyles. Given the international implications of biodiversity management, the project would be undertaken in a number of developing and EU countries to develop an understanding the variation in valuation of biodiversity in these countries. This would inform international policy and the global management of biodiversity.

Expertise offered: The Institute of Natural Resources (INR) offers extensive expertise in the fields of integrated environmental assessment and management, socio-economic assessment and development, natural resource commercialisation and enterprise development, development of environmental management systems, preparation of criteria and indicators for environmental monitoring and evaluation. The INR has extensive working experience in South Africa, as well as a number of other African countries. The INR has established networks with a number of other African research institutions and organisations.

Previous FP involvement: No

Consortium status: In principle agreement between the Institute of Natural Resources (RSA) and LTS International (UK) to collaborate on this initiative

Expertise sought: Given the international implications of biodiversity management, partners are sought from other developing and EU countries to undertake parallel investigations on understanding the value of biodiversity in their countries. Particular expertise should include integrated environmental management, environmental valuation, socio-economic assessment, policy and legislation.

Related projects: None

Title: Tools and Methodologies for Basin Scale Water Resources Observation, Management and Planning

Acronym: WATER - OMP

Submitted by:

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Theme: Environment (including climate change)

Focus Area: Earth observation and assessment tools

Type of project: R&D project, including technology demonstration (large scale)

Summary: There is ongoing concern regarding the decline of water resources related monitoring networks. Recent advances in satellite mounted observation systems provide opportunities to address this. However, the usefulness and accuracy of such observations is largely unknown and the development and testing of methods to apply these is a critical research need. Estimates derived from such observations are likely to form the basis of determining real time water utilization, water use efficiency for water allocation purposes, and for payment for ecosystem services. The range of potential applications and observations is vast and include real time rainfall and flood observations to land use monitoring and the estimation of evaporation (often termed "green water flows") and soil moisture from different land surfaces. On the ground measurements are needed to validate any satellite based methodologies used to estimate these aspects. Through networks of organisations in South Africa and links to the rest of the continent, opportunities to validate these estimates exist where historical and ongoing data collection operations exist. These include fairly "traditional" rainfall and runoff monitoring to ongoing research projects where other water resources related criteria such as soil moisture, evaporation and transpiration. The incorporation of these into hydrological modelling and water resources planning systems are likely to form a critical component of water resources planning and management in the future.

Expertise offered: BEEH offers expertise in hydrological modelling backed up by extensive field research and expertise with various forms of field instrumentation. These include rainfall and runoff monitoring as detailed hydrological process observation including: soil moisture monitoring at point (tensiometers and TDR), hillslope (ERT) and larger scales (SEBAL applications) Evaporation measurement with a Large Aperture Scintillometer and application of SEBAL and SEBs methods and many other field based systems. BEEH has a strong academic staff and undergraduate and postgraduate student groups and is well known as the premier hydrological research group in South Africa

Previous FP involvement: Yes

Details of Previous FP involvement: FP4

Consortium status: Some contacts made. Additional Remote sensing expertise needed

Expertise sought:

Related projects: None

Title: Purification and recycling of water by environmentally friendly means

Acronym: PuReWater

Submitted by:

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Theme: Environment (including climate change)

Focus Area: Environmental Technologies

Type of project: R&D project, including technology demonstration (large scale)

Summary: Potable and irrigation water needs to be cleaned or recycled to ensure sufficient supply of healthy water. Membrane filtration is one of the most widely used techniques. The membrane filters lose their efficiency with time because of the deposition of organic matter and other pollutants (fouling) that form a biofilm on the surface. Since the filter materials are expensive, the life time has to be prolonged by in-situ cleaning. There are different objectives to be achieved. Firstly, to understand what substances cause the fouling for different types of water, beverages, dairy products and other natural effluents. Secondly, to develop efficient in-line cleaning methods, combining mechanical cleaning (e.g. with infrasound) and chemical cleaning with food compatible, biodegradable substances. Thirdly, to combine the experimental set-up with an on-line monitoring of the formation of the biofilms (e.g. ultrasound).

Expertise offered: Longstanding experience in the field of water purification, experience with ultrasonic monitoring, recent positive results using infrasound, recent positive preliminary results using chemicals for the cleaning (not yet combined), experience in post-mortem analysis of membrane materials.

Previous FP involvement: No

Consortium status: Preliminary talks with prospective partners in Poland, Spain, and Germany (in academia and industry)

Expertise sought: Expertise in the analysis of different aqueous effluents, manufacturing membrane filters, analysis of used filter materials, design or modification of instrumentation.

Related projects: International bilateral cooperation South African national R&D programmes

Title: Alien invasive plant species: biology/ecology, monitoring of spread and management

Acronym: APR

Submitted by:

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Theme: Environment (including climate change)

Focus Area: Sustainable Management of Resources

Type of project: R&D project, including technology demonstration (large scale)

Summary: Study of the interference mechanisms of selected alien invader plant species in southern Africa, specifically their allelopathic potential. Identification of principal allelochemicals and the dynamics of their production and release by the species. Phytotoxicity of allelochemicals towards selected test species is assessed. The persistence of allelochemicals in the environment, and factors that determine their fate is also studied.

Expertise offered: Knowledge of weed management practices, biology/ecology of weeds (principally allelopathy).

Previous FP involvement: No

Consortium status: Collaboration exists with University of Hohenheim, Germany, through collaborators Dr Regina Belz and Prof Karl Hurler

Expertise sought: Long-term monitoring and remote-sensing expertise is being sought. Also, expertise in plant ecology, especially plant-to-plant competition and allelopathy.

Related projects: South African national R&D programmes

Title: Mid-IR laser remote sensing of atmospheric pollutants

Acronym: MIR-Sens

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Theme: Environment (including climate change)

Focus Area: Environmental Technologies

Type of project: R&D project, including technology demonstration (large scale)

Summary: Laser remote sensing (lidar) technology is well established for remote pollution and atmospheric monitoring. Differential Absorption Lidars (DIAL) can detect gas concentrations in the atmosphere versus distance. Combined with a laser scanning device, 3D mapping of gas concentrations is possible. However, a large number of pollutants cannot be detected by current systems. Often, these have a characteristic spectrum in the mid-infrared region (2 to 5 μm), the so-called "fingerprint spectral region". The main obstacle for robust lidar systems operating in the mid-IR is the lack of robust and efficient laser sources with high enough energy and power in this spectral region. The project will therefore concentrate on both the laser source development and the lidar technology. The aim of this project would be to demonstrate a functional prototype of a mid-IR lidar system for atmospheric pollutants. The project will include research in the following areas: (a) High-power, high-energy laser sources; (b) Non-linear conversion into the mid-IR region (OPO); (c) Narrow-band operation of OPOs; (d) Automatic tuning of OPOs; (e) Mid-IR spectroscopy; (f) Lidar (DIAL) system design; (g) Operational aspects; (h) Detection algorithms; (i) Pollution detection and control

Expertise offered: - High-power high-energy 2 μm laser sources - Non-linear conversion into the mid-IR - Single-frequency pulsed operation of lasers - Electronic control of lasers - Wavelength control of lasers and OPOs - Mobile lidar technology - Mid-IR spectroscopy

Previous FP involvement: No

Consortium status: We have initial discussions with potential partners.

Expertise sought: Lidar experts; MIR detection; Experts in atmospheric pollution; Large scanning systems; Integrated computer control systems; Detection algorithms

Related projects: None

Title: African marine biogeographic data management for the Ocean Biogeographic Information System

Acronym: AFROBIS

Submitted by:

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Theme: Environment (including climate change)

Focus Area: Environmental Technologies

Type of project: R&D project, including technology demonstration (large scale)

Summary: The Census of Marine Life (CoML) programme, initiated in 2000 to determine the composition and diversity of life in the global sea involves scientists from 70 countries. One of the projects within CoML is OBIS, the Ocean Biogeographic Information System (www.obis.org), which is affiliated with the Global Biodiversity Information Facility (GBIF) and aims to obtain and store all possible marine biodiversity information. OBIS has become the largest, most authoritative, on-line, global database for marine biodiversity data and contains over 10 million observations of 70 000 species. Free, online access allows integrated interrogation of the data irrespective of the data origin. OBIS comprises of seven regional "nodes", each one collating data from data providers within its "target area". Data is regularly uploaded from the regional node to the global node (iOBIS) at Rutgers University, USA. AFROBIS (afrobis.csir.co.za), the sub-Saharan African Node, has been established with seed funding from the Sloane Foundation in 2005 and has to date loaded more than 300 000 records of 15000 species, and plans to load a further 1.5 million records before 31 December 2006. In spite of this significant achievement, AFROBIS is unable to support many marine organisations on the African continent that do not have the resources to digitise and submit data to the AFROBIS. Initial data scouting suggests that Africa is largely underreported, and this has a negative impact on countries' ability to manage their marine resources and also handicaps the growth potential of human scientific resource capacity in the fields of marine biodiversity and marine biology in general. The proposed project aims to support the management of such data, which includes the process of scouting, digitisation (converting the information from the identified taxonomy to a computerised record), transferring the data to AFROBIS and uploading to iOBIS.

Expertise offered: AFROBIS has expertise in marine biogeographic data management within Africa, as well as networking skills further afield. The specific disciplines lie in the domain of computerised database design, programming, data reformatting and quality control, as well as broader project management acumen such as data scouting, subcontracting, operational management, reporting, promoting and networking. These skills are supported by science insights in the CSIR as well as infrastructure for financial and business processes

Previous FP involvement: No

Consortium status: AFROBIS partners with data providers in South Africa, and with potential providers in many coastal countries in Africa. AFROBIS has very good links with EUROBIS, the European OBIS Node in Belgium.

Expertise sought: Expertise in database design, portals, marine biogeographic data handling, networking in Africa, visualisation tools, aspects of data beneficiation, quality control

Related projects: None

Title: Nile crocodile (*Crocodylus niloticus*) primary hepatocytes as diagnostic tools for aquatic pollution monitoring

Acronym: CrocHep

Submitted by:

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Theme: Environment (including climate change)

Focus Area: Climate change, pollution, and risks

Type of project: Implementation support to FP7s

Summary: The overall objective of this project is to evaluate the value of primary hepatocytes from the Nile crocodile as a diagnostic tool in investigating aquatic pollution. This has not been attempted before. No crocodile in the wild will be culled specifically for this purpose, as hepatocytes will be harvested from farmed crocodiles. Young crocodiles are slaughtered and their skins and meat exported to Europe and the East.

Expertise offered: We can harvest the hepatocytes from slaughtered crocodiles. Publication in press.

Previous FP involvement: No

Consortium status: None

Expertise sought: Partners with interest in: crocodile primary hepatocytes, gene expression

Related projects: None

Title: Regional Coastal Ecosystems Assessment for Sustainable Development

Acronym: ReCESD

Submitted by:

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Theme: Environment (including climate change)

Focus Area: Sustainable Management of Resources

Type of project: R&D project, including technology demonstration (large scale)

Summary: Ensuring the integrity of ecosystem services and sustainable resource utilisation in coastal ecosystems facing global change (that often includes pressures of rapid coastal and catchment development as well as the potential impacts of climate change), requires that these systems are understood and assessed at appropriate ecosystem scales. While recent studies have included ecosystem linkages between the catchment, the estuary, nearshore and coastal shelf environments (i.e. shore-normal links), there is increasing evidence of a strong coast-parallel linkage between estuaries along coastlines with many both small and large estuaries/ rivers, suggesting a more regional approach in managing resources in such coastal ecosystems. The intention of this project is to understand the nature of and to develop a method to assess the significance of these functional links (i.e. connectivity) in both a shore-normal and shore-parallel vector in (temperate to tropical) coastal ecosystems, using appropriate (mostly biotic) indicators and predictive techniques that are able to handle both a) the wide range of spatial and temporal scales of relevance in determining the "connectivity" within the coastal ecosystems being assessed and b) the paucity of data typical encountered in many such environments. The extent and significance of such connectivity and associated thresholds of change for the ecosystem services of importance will inform policy development and the nature/scale of management systems required for such coastal ecosystems. It is proposed to focus on a southern African sub-tropical coastal ecosystem that is both complex (with potentially significant linkages between the estuaries of this region as well as between coastal ecosystems and adjacent catchments and/or adjacent offshore regions) and located in a water scarce region experiencing rapid coastal/catchment development, but for which there is a reasonably comprehensive existing knowledge base upon which to build. However, the expertise and methodology developed is intended to be generic and more widely applicable. The intention is to link this project to existing research endeavours in the region (e.g. Agulhas-Somali Current Large Marine Ecosystem programme and the African Coelacanth Ecosystem Programme).

Expertise offered: The consortium expertise will include in-depth scientific expertise in the core disciplines required to understand and assess the coastal ecosystem being studied. This will include hydrodynamic modelling, biogeochemical and nutrient dynamic expertise and sediment dynamic expertise and modelling. In addition the team has significant transdisciplinary expertise with which to integrate these scientific disciplines in terms of assessing ecosystem service threshold of change and system complexity.

Previous FP involvement: No

Consortium status: The intention is to involve both local partners (Oceanographic Research Institute, University of Cape Town, Marine and Coastal Management, Council for Geosciences), and EU-partners (most likely WL| delft hydraulics and Delft Technical University)

Expertise sought:

Related projects: None

Title: Sustainable exploitation of offshore non-living marine resources

Acronym: SustExMar

Submitted by:

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Theme: Environment (including climate change)

Focus Area: Sustainable Management of Resources

Type of project: R&D project, including technology demonstration (large scale)

Summary: A renewed interest in the EEZ of countries world-wide, together with recent technological advances, has resulted in a globally revived focus on the exploitation of non-living marine resources (e.g. diamonds, heavy minerals, natural gas) in coastal and offshore marine environments. Rapid development in these relatively new ventures has resulted in a demand for the development of new technologies and techniques/science to assess ecosystem effects of such resource exploitation. This would include the requirement that; 1) industries be as competitive as possible (to ensure an adequate resource base to effectively manage and mitigate and ecosystem impacts that may occur in the marine environment); 2) there is a careful and strategic consideration of how these industries should evolve so as to develop a holistic view of the optimal utilization of the natural resource base. In particular there needs to be a clear understanding of how emerging industries are likely to impact existing offshore industries. The project aims to provide the science underpinning the assessment of the resource exploitation on ecosystem services (through the application of techniques, many adapted from shallow coastal areas, which address the efficiency of mining approaches and appropriate environmental design supporting sustainability principles) and the development of policy and detailed guidelines on sustainable marine non-living resource exploitation in this emerging industry in the marine environment. The project would contrast exploitation of non-living marine resources in two diverse ecosystems in southern Africa, and the effect that such exploitation has on ecosystem services in the two regions: 1) The West Coast, where dredge mining (100 m to 130 m depth) in a productive coastal upwelling system results in a strong potential conflict for resources exists (mining vs fisheries); 2) The East Coast, where potential and existing exploitation of heavy minerals occurs in a complex subtropical system where there is a potentially strong coupling of land and marine ecosystems.

Expertise offered: Key to this project will be a depth of science in understanding and assessing the biophysical impacts of such resource exploitation and the experience (>16 yrs) of CSIR personnel in marine and coastal mining assessments, including a UNOPS-funded investigation on the cumulative effects of sediment discharges from on-shore and near-shore diamond mining activities on the Benguela Current Large Marine Ecosystem (BCLME), and multiple studies (>30) focussed on coastal processes and environmental effects associated with coastal and offshore mining. In-depth science and modelling of sediment, biogeochemical and coastal processes (modellers with extensive experience from numerous projects, primarily in Southern Africa, will employ state-of-the-art modelling tools incorporating the DELFT3D suite of models) and the teams expertise in mobilising transdisciplinary expertise will be essential in assessing the effect that such exploitation has on ecosystem services (i.e. assessing thresholds of change, etc.) and informing appropriate policy development and guidelines for sustainable resource utilisation in these domains.

Previous FP involvement: No

Consortium status: Intended collaboration with Delft Hydraulics and possibly TU Delft, with whom MOU's for collaboration have been previously established.

Expertise sought: Supplementary and specific modelling expertise (coastal processes, turbidity flows); Geological expertise.

Related projects: None

Title: Mitigating the Impact of Climate Change on Environmentally Driven Diseases

Acronym: CCIED

Submitted by:

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Theme: Environment (including climate change)

Focus Area: Climate change, pollution, and risks

Type of project: R&D project, including technology demonstration (large scale)

Summary: Climate change and inter annual climate variability play a major role in the emergence and re-emergence of environmentally driven diseases such as malaria and cholera. No single intervention exists to reduce or eliminate the impact of these diseases. Insufficient understanding of the links between pathogens, people, places, political economics and perceptions of health risks together with a limited knowledge of the extent of populations and systems' vulnerability or level of resilience to climate change and variability contributes to the complexity associated with these diseases. In order to mitigate the impact of climate sensitive diseases, it is necessary to understand a) the ecology of these diseases and major environmental factors influencing the spread and intensity of outbreaks, b) the vulnerability and reasons for the level of vulnerability of communities, c) direct and indirect costs associated with the diseases and intervention types and approaches, d) to link and integrate the biophysical understanding of the diseases with the epidemiological, and socio-economic aspects of the diseases. The modelling of the bio-complexity associated with cholera, i.e. focusing purely on the ecology of the disease is currently being funded by and done at the CSIR. We propose to, a) use EU partnerships and funding to extend this cholera research and approach to other climate sensitive diseases such as malaria; and b) to interact with a range of stakeholders in Africa and Europe and build the trans-disciplinary social-ecological-health understanding required to develop policies, governance and reliable early warning and management systems. The ultimate aim is to be able to provide decision and policy makers with sufficient and timely information or warnings in order to mitigate the health impacts of climate change.

Expertise offered: Research work on the modelling of the bio-complexity associated with cholera is currently done at the CSIR. CSIR team has substantial expertise in a) the mathematical and statistical modelling of the environmental factors linked to the ecology of *Vibrio cholerae*; b) mathematical modelling of the epidemiology, and bacteriology associated with cholera; c) development of prediction models; d) use of remote sensing & GIS for spatial modelling; e) laboratory techniques associated with the identification of pathogens in environmental samples; f) has a substantial knowledge base on the ecology of aquatic systems and the driving forces for those systems as well as the potential impacts of climate change. Expertise and technologies also exist in the HSRC to conduct large-scale community surveys for vulnerability purposes and malaria research is conducted by the MRC (potential partners)

Previous FP involvement: Yes

Details of previous FP involvement: INCO-DEV (International Cooperation with Developing Countries): Policy implications of contamination of rural water between source and point of use in Kenya, South Africa and Zimbabwe (FP6). Aquatest. Low cost water test for developing countries- Preparatory study (FP6). SODISWATER (Solar Disinfection of Drinking Water for use in Developing Countries or in Emergency Situations) (FP6)

Consortium status: Local and international: None confirmed yet

Expertise sought: Expertise in advanced mathematical & statistical modelling of the biocomplexity associated with diseases; spatial epidemiological modelling using remote sensing and GIS; vulnerability modelling of communities and areas; climate change prediction and modelling on a regional scale; expertise in cholera and malaria modelling; microbiology; health economists; management of large integrated multi-disciplinary, multi-national and institutional projects

Related projects: FP6 International bilateral cooperation South African national R&D programmes

Title: Aquifer Based Catchment sustainability**Acronym:** ABCs**Submitted by:**

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Theme: Environment (including climate change)**Focus Area:** Sustainable Management of Resources**Type of project:** R&D project (small scale)

Summary: Aquifers are the foundation of the water cycle and typically represent more than 90% of available fresh water stored in catchments. The natural and managed links between aquifers and the surface environment are critical in semi-arid areas, where groundwater is often the principal and most reliable source of water. In southern Africa extensive semi-arid areas exhibit high coefficients of rainfall variability (40% MAP), high aridity indices (5-10), are dominated by secondary aquifers with unpredictable heterogeneity and often occur where rainfall gradients are steep and vulnerable to climate change. The current paradigm of Integrated Water Resource Management (IWRM), enshrined in the South African National Water Act, assumes participative, scientifically informed decision making. However, our scientific knowledge of these hydrogeologic systems is often poor, with low levels of data, insufficient understanding of linkages within the integrated system and poorly capacitated management institutions which struggle to adapt to change. Crisis management during drought periods may exacerbate sustainable management and result in unintended long term consequences. We hope that this project would be able to extend and deepen our understanding of the role of aquifers in semi-arid catchments where people and nature are critically dependent on groundwater. We would aim to link with European scientists and water managers to test and develop new concepts and technologies to monitor the links between aquifers and surface water resources, aquatic and terrestrial ecosystems, and agriculture and human household use. The approach for the project would include: 1 - field scale monitoring of the integrated hydrogeologic system with a special focus on the linkages between groundwater and the other components of the system; 2 - testing remote monitoring methods (linked to ESA Tiger initiative) ground-truthed by field studies; 3 - assessment of long term data records with respect to evidence of change within the system; 4 - assessment of the ability of IWRM agents to assimilate and respond to scientific knowledge in decision making. 5 - recommendations for stream-lined critical science-management links to inform sustainable resource management. Some of the outcomes of the project would include: 1 - strengthening ties between African and European scientists and water resource management institutions; 2 - technological leap-frogging to appropriate monitoring technology; 3 - improved assimilation of scientific knowledge into existing IWRM agents; 4 - improved understanding of the space and time scale of aquifer processes in semi-arid areas and the boundaries of sustainable impacts. The latter point is particularly important in terms of quantifying groundwater-surface water interactions and quantifying evapotranspiration in areas where deeply rooted trees have access to the water table. We intend to build on existing monitoring and research initiatives which link groundwater to IWRM. Sites for the field elements of the project would be selected in consultation with Department of Water Affairs and Forestry (DWAF) and may include areas within the Limpopo catchment, the Breed catchment, the Gouritz catchment, or the Berg catchment. In summary, this project would aim to answer the following key questions: 1 - How can we detect where aquifers are linked to semi-arid areas? 2 - What are the best techniques to quantify how much groundwater is being used in riparian, aquatic and terrestrial ecosystems? 3 - How do aquifers and their linked catchments respond to climate change? 4 - How should groundwater be managed in these semi-arid areas to ensure sustainability?

Expertise offered: The CSIR offers significant expertise in hydrogeology (hydrogeochemistry, hydrogeophysics, numerical modelling, aquifer dependent ecosystems), and catchment monitoring particularly for groundwater, climate and evapotranspiration. We have an established track record in South African landscape hydrology and the impacts of vegetation on water availability, plus assessments of aquatic ecosystem health, surface water quality and human health linked to water resources. We have a well established network of scientific collaborators within African universities and science councils, particularly focussing on plant physiology, unsaturated zone processes and climate change. We also have an MoU with the South African Department of Water Affairs and Forestry which ensures our multi-disciplinary water resources research is directed towards the meeting the national needs.

Previous FP involvement: Yes

Details of previous FP involvement: Catchment2Coast

Consortium status: Initial discussions

Expertise sought: Hydrologists (semi-arid systems); plant eco-physiologists (water use); remote sensing for hydrology.

Related projects: None

Title: Mercury Monitoring and Risks to Environmental and Human Health

Acronym: MMREHH

Submitted by:

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Theme: Environment (including climate change)

Focus Area: Climate change, pollution, and risks

Type of project: R&D project, including technology demonstration (large scale)

Summary: A recent global estimate of emissions suggests that Hg emissions from sources in South Africa (SA), primarily those associated with coal combustion and gold mining, contribute more than 10% to global Hg emissions, and the paper ranks SA second after China on the list of major global Hg polluters. In addition, these estimates indicate that Hg emissions in SA have increased in the last decade and are a cause for concern. Measurements of Hg in SAs natural environment are limited and there is little information in the published literature. Most of the studies in SA relating to Hg levels in fish have been associated with point source contamination, such as that linked to the Hg-contaminated effluent spill into a river in KwaZulu-Natal. While there appears to be substantial sources of Hg input into southern Africa, the amount of Hg emissions released to the atmosphere and surface waters of the region is unknown. Thus, the extent to which regional Hg inputs contribute to environmental degradation and human health risk is unknown. There is a need to assess all the implications of Hg pollution for South Africa's people and the environment, which can form a sound scientific base for the design, testing and application of new methods for monitoring and predicting the impacts of Hg pollution on SAs natural ecosystems and people. In turn, such results can provide input to the SA Government's national monitoring programmes, and can provide the basis for developing effective Hg policies and advisories in the region. The aim of such a project would be to investigate the effects of Hg pollution on human health and the environment in SA by firstly developing a long-term monitoring system for Hg emissions and pollution in SA, with the intention of developing a passive monitoring system, and secondly by evaluating the impacts of Hg on human health and the environment. Ultimately, all of these factors should inform the development of mitigation activities to minimize Hg pollution.

Expertise offered: Dr Joy Leaner has a PhD degree in the field of environmental chemistry and toxicology. Her PhD focused on the Bioavailability of Mercury to Fish and she has published extensively in this field. She has developed skills in chemical speciation, chemical kinetics and determining the bioaccumulation of Hg in various fish species, and has recently started on focusing on understanding Hg dynamics in ecosystems and its impact on human health. She joined the CSIR in 2002, where she heads the Water Ecosystems Research Group. She leads a large team of researchers, senior researcher and principal researcher in Hg research in South Africa, and is the Co-ordinator of the South African Mercury Assessment Programme, which is the principal Programme through which Hg research in South Africa will be directed. Her current international collaborators include Prof Robert Mason (Univ. of Connecticut, USA) and Prof Jozef Pacyna (NILU, Norway).

Previous FP involvement: No

Consortium status: Have established contact with Prof Jozef Pacyna (NILU, Norway) and Prof Nicola Pirrone (Italy)

Expertise sought: Mercury expertise in atmospheric, water and terrestrial ecosystems, as well as expertise related to effects of Hg on human health.

Related projects: None South African national R&D programmes

Title: Palaeo14Carbocean

Acronym: P14C

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Theme: Environment (including climate change)

Focus Area: Climate change, pollution, and risks

Type of project: R&D project (small scale)

Summary: The oceanic carbon reservoir is subject to natural fluctuations, and the sheer magnitude of the reservoir requires a clear understanding both from the perspective of it being a carbon source, and of being a potential sink for anthropogenic carbon emissions. One perception is that the Southern ocean is a net carbon sink, yet high precision atmospheric 14C proxies derived from tree rings in the northern and southern Hemispheres suggest that the southern Hemisphere is actually 40 years (average) "older" than the northern Hemisphere. Because atmospheric mixing is relatively fast this suggests either that carbon returned to the atmosphere through reservoir turnover is more prolific in the southern Hemisphere than in the North, or that oceanic carbon turnover rates are considerably shorter in the northern Hemisphere. This project aims to quantify temporal and spatial variation in carbon turnover in the ocean by comparing the 14C "age" of the marine reservoir with the contemporary value of the atmosphere. Quantification of the modern system can be done by real-time measurements (see the Carbocean project), but other sources of data are required in order to establish the stability of these systems over time. The proxies can be derived from the analysis of corals and other marine carbonates that grow over extended periods of time and that can be independently dated, while simultaneously reflecting the ambient 14C conditions in the ocean. A broad base of coral observations will establish the spatial and temporal variance in the oceanic signal. Tree rings and speleothems provide the source material from which the atmospheric variance can be derived. By developing a spatial observation basis particularly between the northern and southern Hemispheres it will be possible to better understand the relative contributions of the different oceans as carbon sources and sinks, and furthermore to better understand the stability of the system through time.

Expertise offered: The CSIR has a number of speleothem samples and an analytical facility for isotope and 14C analyses. The CSIR has also participated in the quantification and modelling of carbon in the savanna ecosystem in support of global carbon budget modelling.

Previous FP involvement: No

Consortium status: The ACCESS consortium of South African institutions includes CSIR, UCT, Council for Geosciences. Other participants include Dominique Genty (CNRS, France), Hans van der Plicht (U.Groningen, Netherlands), Miryam Bar-Matthews (Geological Survey, Israel).

Expertise sought: The IRD (France) has been contacted and "in principal" support has been offered. This will be followed up directly with Guy Cabioch in respect of the "climate change from coral reef formation" project. Further assistance is required in the acquisition of suitable corals (coral cores) from localities in the northern and southern Hemispheres, as well as for the securing of suitable speleothem samples. Analytical facilities for AMS 14C analyses are available both at Groningen and CNRS, but high temporal resolution is required and the sample demand will be high. Partners with access to high latitude sample sites are critical.

Related projects: FP6