

Customised GIS System "SimCLIM" for Climate Change Adaptation and Risk Assessments, from CLIMsystems – New Zealand

CLIMsystems Ltd

CLIMsystems Ltd designs, develops and markets advanced, user-friendly software systems for assessing impacts and adaptation to climate variability and change. CLIMsystems offers software licenses, training, services and customised model developments to a range of national and local governments, planners, educators, students, international agencies, private consultants and companies in order to meet their needs for addressing climate risks.

CLIMsystems offers least three core products comprising 10 individual software packages for licensing, along with associated products, technical assistance and training services, to a large customer base throughout the academic, consulting and government market sectors.

Recently CLIMsystems Ltd., was awarded the prize of Innovator of the Year in the category of Agriculture and Environment, at the Bayer-National Business Review ceremony in Auckland, New Zealand.

SimCLIM

SimCLIM is a customised geographic information system (GIS) that can be built for any area. The system supports the creation of smaller geographical areas (sub-regions within States or multiple State area) as special study areas through the application of tools within the system. Also users with local data can either through their own initiative or with assistance from CLIMsystems import local high resolution digital elevation models and other digital data to produce a highly specialised system that suits their specific needs. CLIMsystems has already matched the underlying digital elevation model with a complete set of twenty Intergovernmental Panel for Climate Change (IPCC) approved Global Circulation Model patterns developed by the world's leading modeling groups such as the Hadley Centre in the United Kingdom, the Canadian Climate Centre, the NASA/Goddard Institute for Space Studies in the United States and numerous other agencies in Europe, Japan and Australia. Linked with these patterns are the storylines of the Special Report on Emissions Scenarios. The system also accounts for feedbacks in the global climate system through analysis of change based on low, medium and high feedback mechanisms as defined by the IPCC. This robust and Fourth Assessment-compatible system is further augmented by the inclusion of thirteen ocean sea level rise patterns that have been similarly produced by important international modeling groups such as the Meteorological Research Institute of Japan, CSIRO in Australia and the major modeling groups in the United States and Europe. These models are also linked with the SRES storylines and feedback values to generate site specific outputs of sea level rise for any coastline of the world. These sea level rise projections can be further refined through the inclusion of local tide and land movement data. As Professor Colin Woodroffe, an eminent coastal scientist commented, "SimCLIM enables examination of potential erosion and flooding in response to future climate scenarios including sea-level rise due to climate change, global warming as well as changes resulting from local land movements." The system also includes a data importing tool so that users can import local time series site data for variables such as precipitation, maximum, minimum and mean temperature, wind, relative humidity and stream flows. Other variables can be added depending on the end user's needs. Once time series site data is ingested SimCLIM analysis can begin using the data

browsing tool. As Salesa Kaniaha who heads the Meteorological Office in one of the most climate change affected countries of the world—Vanuatu—noted “SimCLIM is awesome. It allows me to do almost everything I need to do in my work in the Met Office like extreme events analysis and return periods. This software and its data formats will be used in my data digitization project, as well.”

The system is also linked with a number of powerful impact models. The international leaders in hydrological modeling, the Danish Hydraulic Institute, have made SimCLIM the climate change software of choice for linking with its series of Mike models for flood and urban stormwater system design. CLIMsystems is currently developing a similar set of tools for linking with the widely utilized InfoWorks software package marketed by Wallingford in the UK. In terms of agricultural modeling SimCLIM is formally linked with PlantGro, a modeling tool that integrates soils, plant physiology and local climate files for rapid assessments of potential trees, arable crops, vegetables and ornamentals. The system comes preloaded with over 1700 plant, 40 soil and 180 site-specific climate files all of which can be modified and customized by the user. SimCLIM also interfaces with the Decision Support System for Agrotechnology Transfer (DSSAT) program developed by ICASA, the International Consortium for Agricultural Systems Applications. SimCLIM is used to perturb precipitation, temperature, solar radiation and relative humidity files that drive the DSSAT software system. Therefore cropping systems can be tested against current and future climates.

Other widely used impact models included in the SimCLIM system include the rainwater tank model. This innovative model allows the user to design rainwater catchment systems with consideration of not only the roof or other catchment area but also use rates, tank size, and critically, the impact of climate change on rainfall and hence rainwater harvesting potential. There is also a shoreline erosion model that is linked with the sea level rise scenario generator. Other impact models include a degree day model, both site specific and spatial, and a water balance model. New models are regularly being developed and linked with SimCLIM and we work closely with end users to develop interfaces for their customized climate-driven models so they can be run with consideration for climate change.

TrainCLIM

TrainCLIM is a software-supported training package. TrainCLIM has been designed for two purposes: firstly it introduces new users to the powerful modeling capacity of CLIMsystems products; and secondly, through the use of a set of hands-on tools, teaches important concepts that are required when assessing vulnerability to climate change and adaptation.

TrainCLIM software enables a wide range of potential users from school teachers and students to environmentalists and local governments to gain a broader understanding of the real world implication of climate change to local areas and societies. It consists of hard-wired (as opposed to an open-framework) software program and supportive manuals, training modules and exercises. For the purpose of training simulations, the models and materials are designed around a ‘hands-on’ tool based on a fictitious place for learning about climate change, adaptation and vulnerability assessments. It includes an integrated toolbox: a climate and sea level scenario generator, data browser, and extreme event analyser that can facilitate the teaching of a diverse range of concepts and methods. Training modules are designed to expand peoples’ thinking through the integration of concepts that have both environmental ramifications in a climate changed world.

PlantGro

PlantGro is a versatile tool for exploring plant, soil and climate relationships. This program can assist farmers, foresters, agronomists, consultants, horticulturalists, aid agencies, teachers and students to meet the challenge of matching plants to soils and climates. The program is pre-loaded with over 1700 plant files (including annuals, perennials and tree species), over 40 soil files and greater than 180 site specific climate files. A total of 23 parameters can be used in an analysis ranging from pH and cation exchange

A total of 23 parameters can be used in an analysis ranging from pH and cation exchange capacity to salinity and slope. These sample files provide you with the basis for beginning your own assessments.

The beauty of this program is the interface and the ease at which the sample files can be edited and completely new files can be developed based on local data.

One powerful feature of PlantGro 4.0 is its batch mode facility. Multiple plant, soil and climate files can be selected and queried from those available to assess one parameter in reference to the others quickly and efficiently. For example, multiple plant types can be run against soil and climate files to rapidly identify the best adapted plants to a particular location. Output from this analysis is generated in Excel spreadsheet format for excellent management and manipulation potential.

PlantGro + SimCLIM

The integration of SimCLIM with PlantGro allows you to do unique and powerful analysis of the impact of climate change on plant suitability with soils. Climate change can thereby be factored into decision-making with regard to potential changes to cropping systems and tree growth. The powerful combination of SimCLIM and PlantGro software can provide you with the data to make better informed decisions for future sustainability and profitability.

A spatial version of PlantGro can be developed for nearly any location. Planners and policy makers can view different scenarios for land use for their region and this can assist decision makers. Climate change scenarios can also be included for longer-term planning horizons.

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