# Defence Applications

Application

The ERIC range of products and services has its origins in research conducted to support the management of military training lands. A research level capacity is backed up by industry service delivery. The products and services derive from a background of extensive experience in addressing Defence use of training lands.

The products and services also address the provision of intelligence on natural resources to support operations. Aiding the achievement of military objectives through the provision of resource intelligence reduces environmental impact.

Military operations require very site specific

VegMap
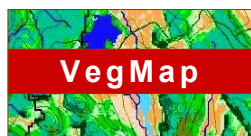
Vegetation map from satellite imagery
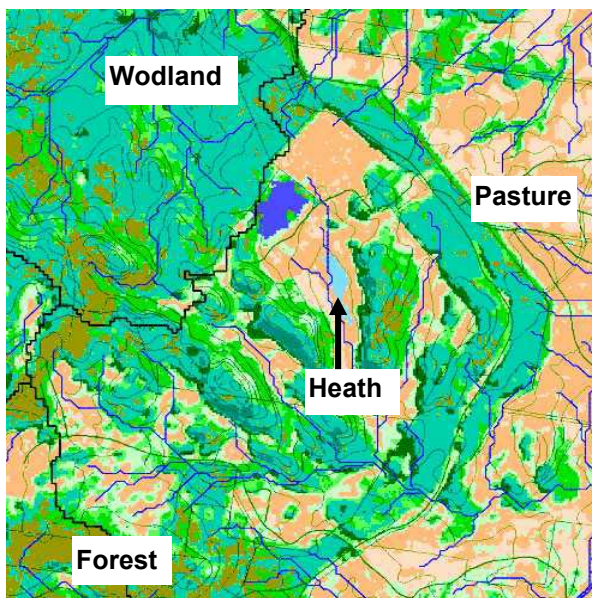
information and such information is also needed for land management. Key products derived from remotely sensed data include detailed maps of soils and vegetation. These maps can be used to identify military constraints such as inter-visibility, parachute drop zones and trafficability while for land management they address issues such as conservation, fire hazard and susceptibility to impact.

The mapping technology also allows the monitoring of land condition and impacts. These impacts can arise through military land use, such as fire, clearing and bombing, or be natural as with floods. Monitoring is used to ensure the sustainability of land use.

The land resource information on terrain, soils and vegetation is combined with mapped climate information to develop intelligence such as trafficability and going. It can also be used to assess risks such as malaria and other diseases. Derivation of resource information using remotely sensed data means that much of the intelligence can be obtained without a need to access the land.

Planning methods used to support the use and management of training lands include risk and management assessment and management planning. Research and development, and expert review and evidence are also provided.

Training areas for which information has been provided include Puckapunyal, Singleton, Shoalwater Bay, Townsville Field, Tully, Cowley Beach, Mt Bundey, Bradshaw, Yampi. Larger exercises addressed include Droughtmaster, Quintus Revenge, Diamond Dollar, and both Tandem Thrust exercises.

VEGETATION / LAND COVER

Native vegetation

Remnant grassland

Road alignment

Weeds

Wetlands, lake

Coastal waters
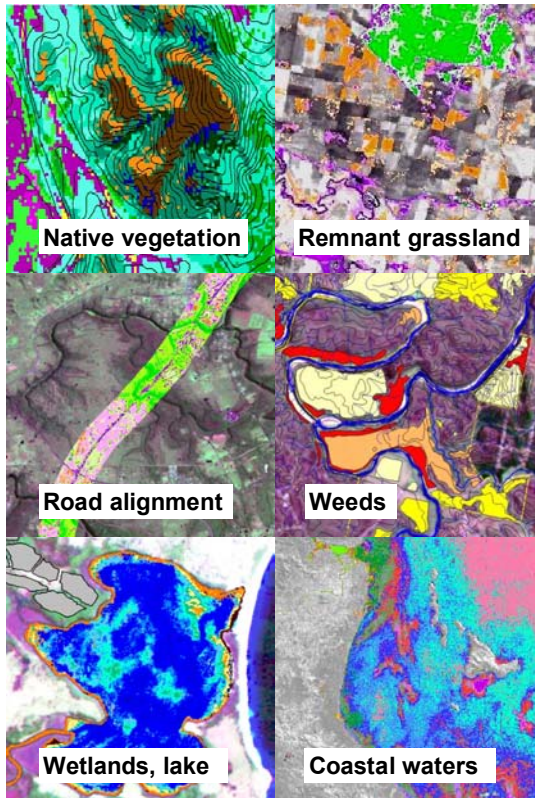
Approach

Spatially detailed information on natural, built and social resources is developed, integrated and analysed to provide intelligence to improve planning and management. Modern technologies are used to provide high quality and reliable information and reduce costs. Support is provided to ensure effective uptake and application of the detailed information.

A comprehensive range of products and services addresses a wide range of developments and allows clients to select products that best meet their needs. A staged approach can be used whereby requirements are re-evaluated at each stage of a project.

The information is provided as digital maps in GIS to ensure effective and efficient access and facilitate application. This presentation also allows rapid production of purpose specific reports and maps as desired. The visual presentation aids in statutory presentations and public promotion as well as operational and management planning.

Product Range

ERIC has a core capability to develop new information on vegetation, soils, and groundwater resources from remotely sensed data. New information is also derived from other data, such as climate records. This is combined with existing information on natural and social resources and analysed to address client needs.

The reference information developed by ERIC includes detailed maps of:

- Vegetation / Land cover
- Soil
- Subsoil constraints

Existing information accessed, compiled and developed to allow for integration includes:

- Terrain
- Climate
- Infrastructure
- Social constraints

Products developed from this information include maps of:

- Inter-visibility
- Trafficability
- Going
- Salinity hazard & risk

SOILS

Depth

Texture

pH

Dispersibility

pe / pH

Salinity
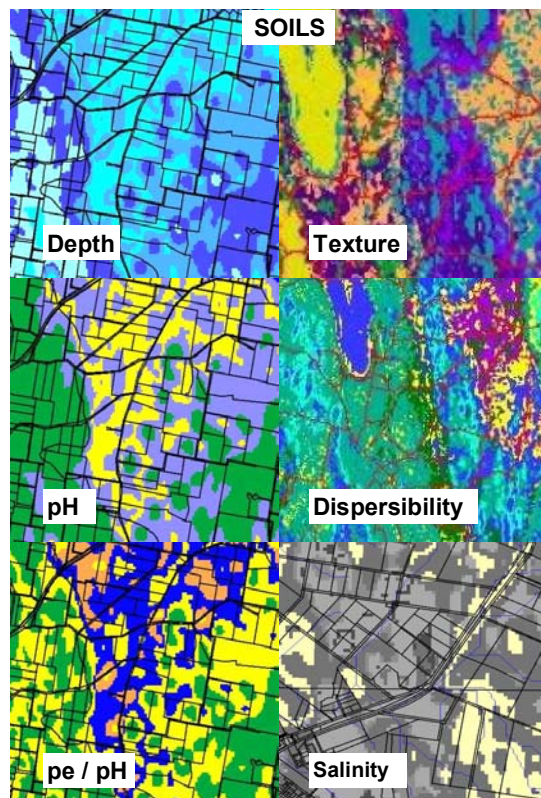
- Fire hazard
- Surface water and cold air drainage
- Flooding
- Land use impacts
- Land condition

Services based on the information include:

- Environmental risk assessment
- Environmental impact assessment
- Environmental management information systems
- Groundwater bore location
- Waste water disposal
- GIS development

The services are based around the integration and application of the products. They include consultation as well as system development and the provision of ongoing support.

TERRAIN

DEM (elevation)

Drainage (modeled)

Drainage pathways

Surface wetness
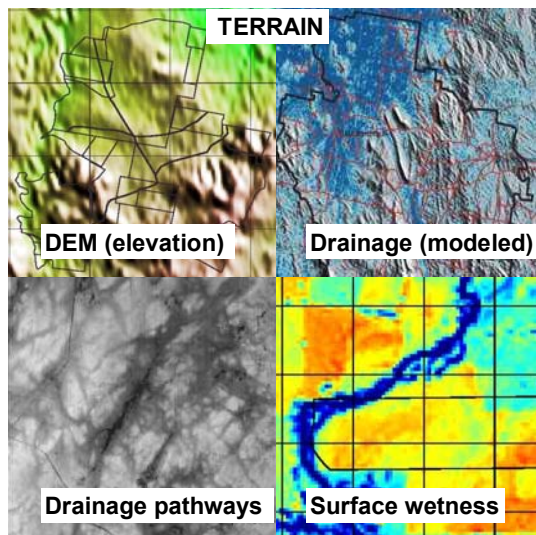
Products

Vegetation / Land cover

The land cover information developed from satellite imagery addresses many needs. Mapping native vegetation identifies the suitability of land for different purposes and addresses conservation issues. Impacts such as erosion and waterlogging can be mapped to identify risks and improve land management. This information can be cost effectively obtained for extensive developments such as training areas, roads, and pipe lines. The fire hazard map, developed to a statutory specification, further identifies constraints to development.

ERIC has previously produced vegetation maps for a number of training areas.

Soil Properties

Soils affect virtually every aspect of land use and are often critical for military operations, particularly in how rain affects mobility. However, the necessary soils information is rarely available in the detail and form needed for such decisions. The ERIC soil mapping method is designed to cost effectively provide the detailed information on the soil properties needed to evaluate land use options and effect management and remediation.

The mosaic identifies soil properties that are routinely mapped at paddock level detail across regions. All of these properties affect the performance of plants and susceptibility to risks such as erosion, waterlogging and salinity. The detailed mapping of surficial salinity allows identification of existing hazards and risks and the potential for change.

Soil depth and texture are of particular consequence in determining changes to going following rain.

Environmental Assessments

Environmental assessments turn the baseline resource information into military and business intelligence. Some of the methods are designed to allow for self assessment in routine operation. Others depend on the application of a high level of specialist skills and knowledge.

RADAR

Flooding

Irrigation application

Channel leakage

Multi-band airborne
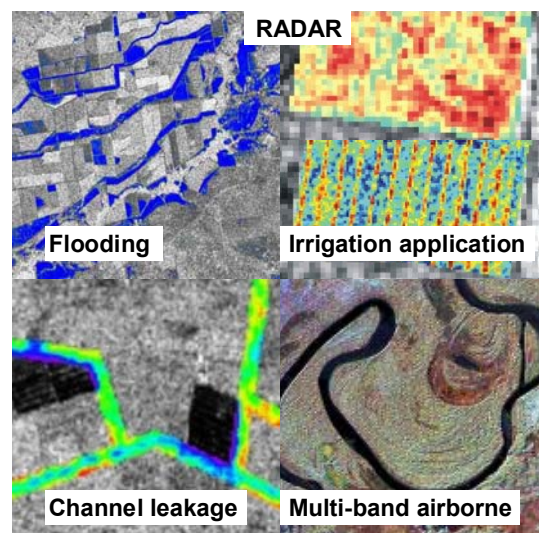
Environmental Constraints Mapping

China Rainfall — CLIMATE — Turkey Temperature — Mahogany homoclime — Neem homoclime
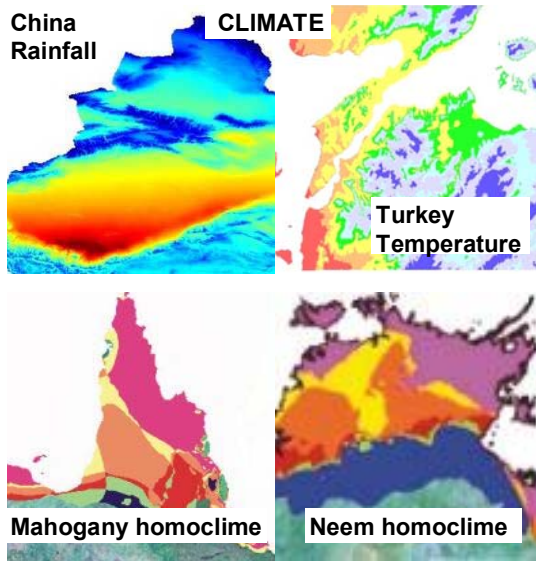
ERIC has developed packages to address specific applications such as viticulture and forestry. The same approach and technology can be used to provide intelligence to support military operations. For example, land suitability for different crops is predicted from climate where the same approach can be used to map the suitability, and hence risk, of different areas for mosquito borne diseases such as malaria. Such analyses integrate information on climate, terrain and land use with biological responses.

Analysis of terrain, soils and land use / vegetation is used to provide intelligence on factors such as trafficability, inter-visibility. When combined with climate it can be used to map going. The ability to provide detailed soils information and to directly map flooding from satellite imagery greatly improves results


RISKS — Frost risk — Salinity — Cold air drainage — Fire hazard
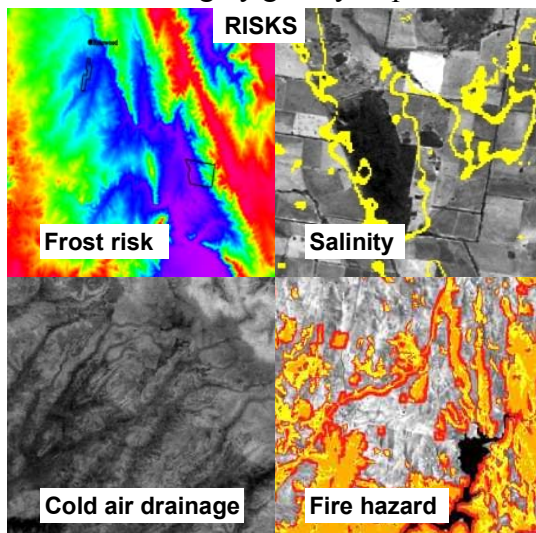
compared to other procedures.

Land Condition Monitoring

Satellite imagery provides a cost effective means of monitoring land condition and land use impact. ERIC used optical satellite imagery to map impacts associated with the first Tandem Thrust exercise in the Shoalwater Bay training Area. The results quantified what had been stated but not measured, that impacts are mainly associated with infrastructure such as roads.

Other requirements addressed by monitoring change using satellite imagery include the general condition of training areas, the occurrence of fires and patterns of fuel accumulation, the patterns of flooding, and the consequences of natural impacts such as cyclones. ERIC has provided information on patterns of fires and flooding on training areas.

IMPACTS — Military impacts — Vegetation clearing — Fire scar — Erosion, waterlogging
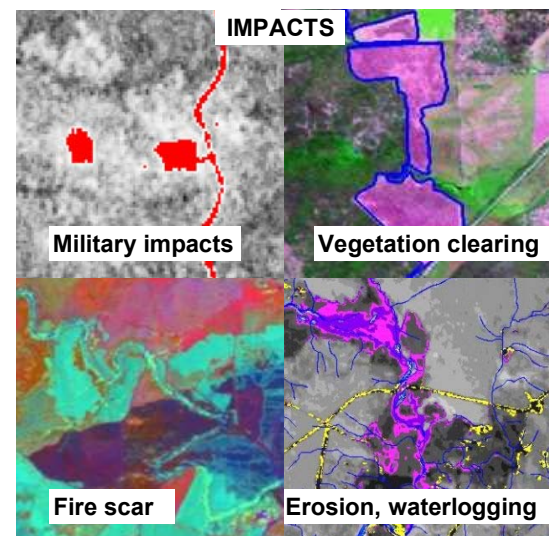
Environmental Management Information Systems

The Generic Environment Management Methodology was designed to cost-effectively address environmental issues. Modules are linked in a feedback cycle to achieve continuous improvement in performance. The ERIC products and services provide the basic components for implementing this management system that incorporate the ISO1404 principles for environment management.

An approach to managing military training areas was developed and implemented that promotes conservation by supporting military activities. Land use planning is based on detailed resource information and application of sound management principles rather than using restrictive zones (no red lines on maps). This approach is largely responsible for the conservation status of the land area of the Shoalwater Bay Training Area.

Risk Management Assessment

A risk assessment methodology that provides a rapid and comprehensive means of ensuring all planning and management issues are identified and addressed. The method pinpoints deficiencies and can provide a statistical evaluation of performance. Such assessment provides the basis for the development of plans and actions essential to demonstrate environmental and management compliance. The risk assessment method allows for self assessment and the quantitative result can be used to monitor performance.

Environmental Impact Assessment

A generic method that assesses the economic, social, and environmental impact of proposals.

The method identifies priorities and provides a measure of performance in addressing environmental impact. It allows for self assessment and can provide statistical comparison of different options. The method

provides a means of comparing the highly disparate economic, social and environmental impacts.

The method was designed to be fully comprehensive and transparent but be simple to allow for application and appreciation by community groups. It is cost-effective and designed to prevent inappropriate application of results. Overall it:

- Identifies all potential impacts, good and adverse
- Allows ranking of alternatives
- Allows focusing of effort where it is needed
- Promotes community involvement and education

The method provides most benefit when used at the beginning of an assessment process.

ERIC personnel have extensive experience in the evaluating the impact of military training activities across Australia.

Expert Evidence

ERIC personnel can provide expert evidence on the impacts of military activities and the use of remote sensing in addressing land use issues. Experience includes being at the centre of the Commission of Inquiry held on the Shoalwater Bay Training Area and the review for Defence of all forms of environmental assessment and land management plans.

Research & Development

ERIC maintains an ongoing R&D program to continuously upgrade products. The R&D capacity is also used tailor products and services to address specific client needs. Such products for Defence address requirements such as trafficability and going.

Environment Management Information System

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Risk Management Assessment

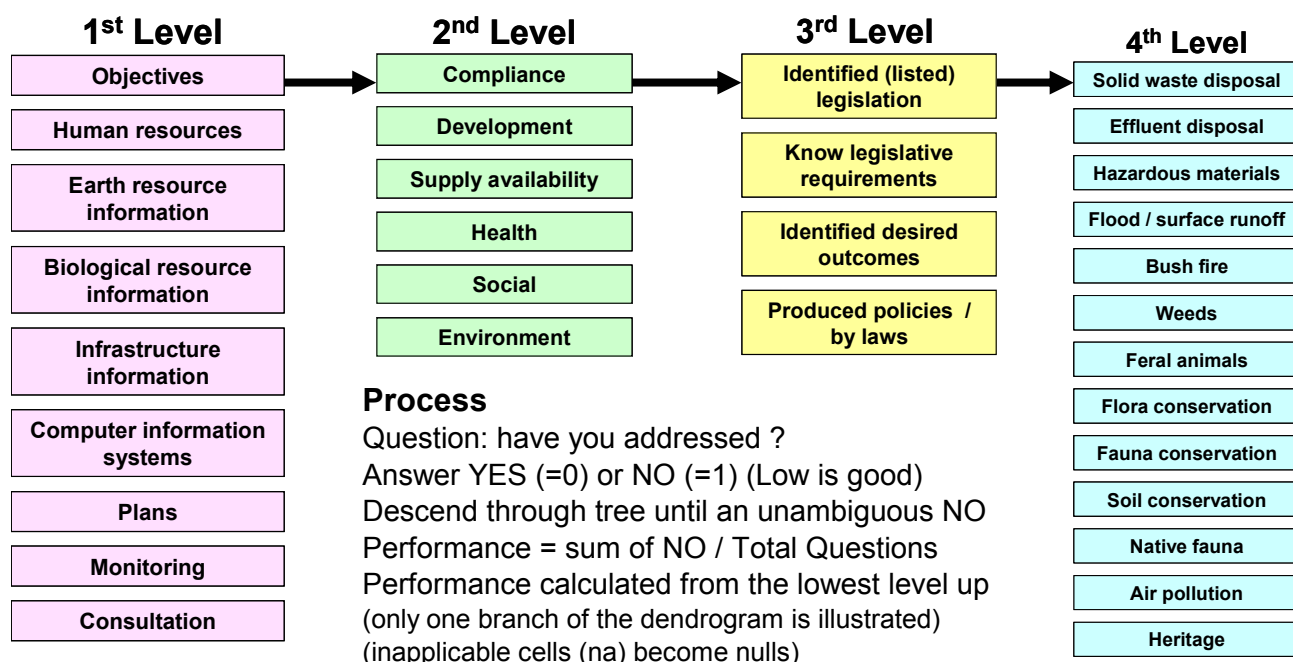| 1st Level	2nd Level	3rd Level	4th Level
Objectives	**Compliance**	**Identified (listed) legislation**	**Solid waste disposal**
Human resources	**Development**	**Know legislative requirements**	**Effluent disposal**
Earth resource information	**Supply availability**	**Identified desired outcomes**	**Hazardous materials**
Biological resource information	**Health**	**Produced policies / by laws**	**Flood / surface runoff**
Infrastructure information	**Social**		**Bush fire**
Computer information systems	**Environment**		**Weeds**
Plans			**Feral animals**
Monitoring			**Flora conservation**
Consultation			**Fauna conservation**
			Soil conservation
			Native fauna
			Air pollution
			Heritage

Process

Question: have you addressed ?
Answer YES (=0) or NO (=1) (Low is good)
Descend through tree until an unambiguous NO
Performance = sum of NO / Total Questions
Performance calculated from the lowest level up
(only one branch of the dendrogram is illustrated)
(inapplicable cells (na) become nulls)

Environmental Impact Assessment

Landscape Element	Landuse Activity	Economic	Social	Environment
Urban Land	**Agriculture**	**Production**	**Employment**	**Vegetation**
Rural Land	**Forestry**	**Supply**	**Health**	**Native plants**
Industrial Land	**Horticulture**	**Transport**	**Social Services**	**Weeds**
Waterways	**Housing**	**Demand**	**Education**	**Native animals**
Littoral	**Retail**	**Personnel**	**Communications**	**Vermin**
Offshore Marine	**Manufacturing**	**Power**	**Public Transort**	**Water yield**
	Tourism	**Water**	**Heritage**	**Water quality**
	Recreation	**Sewage**	**Noise**	**Soil health**
	Fishing	**Roads**	**Dust**	**Soil erosion**
	Mining	**Communications**	**Air pollution**	**Soil salinity**

The economic, social and environmental attributes are evaluated for every combination of Land Use Activity and Landscape Element. Each cell is scored with a +1, 0 or -1 (an impact can be positive, neutral, or negative). Inapplicable cells (na) are nulls.

The scores can be variously presented as:

- average score for all entries
- average score for combined positive and negative entries
- separate totals for positive and negative scores.

Results are given as a proportion for each category when comparing between the social, economic and environmental categories.