14. Glossary

This glossary presents the definitions for some of the main terms used in this publication. Additional definitions of terms can be found in the sources listed at the end of this glossary.

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Attribute. An attribute is a set or collection of data that describe the characteristics of real world entities or conditions. Attribute data are usually alphanumeric. Small amounts of attribute data are frequently used to describe the graphic representation of an entity on a map as a label, e.g., a polygon label. Large amounts of attribute data are usually maintained as separate attribute data sets, related to a map by names or codes.

Bayesian network. Probabilistic graphical model (a type of statistical model). A Bayesian network can incorporate factors of a qualitative or probabilistic nature. For example, factors that influence farmers' perceptions about a particular aquaculture technology. The outcome of the Bayesian modelling would be a reading of the probability of farmers' positive perception of the target technology, which indicates the likelihood that they will adopt it.

Cartesian coordinates. A two dimensional, planar coordinate system in which x measures horizontal distance and y measures vertical distance. Each point on the plane is defined by an x,y coordinate. Relative measures of distance, area and direction are constant throughout the Cartesian coordinate plane.

Cell. The smallest unit of information in raster data, usually square in shape. In a map or GIS data set, each cell represents a portion of the earth, such as a square meter or square mile, and usually has an attribute value associated with it, such as soil type or vegetation class.

Classification. When image pixels are the same colour, or nearly the same colour, an image "classification" computer program can recognize this and group such pixels together. Such a grouping is called a "class" and the process of doing the grouping is called "classification". The remote sensing researcher then has the challenge of identifying exactly what each "class" represents in the real environment.

Contiguity analysis. Concerned with adjacency relationships between any given polygon and its neighbors. Typically this involves summarizing and relating the attributes of neighboring polygons to the polygon being examined.

Coordinate systems. A particular kind of reference frame or system, such as plane rectangular coordinates or spherical coordinates, which use linear or angular quantities to designate the position of points within that particular reference frame or system.

Cost-benefit analysis. Assessment of the direct or indirect economic and social costs and benefits of a proposed project for the purpose of project or programme selection. The cost-benefit ratio is determined by dividing the projected benefits of the programme by the projected costs. A programme having a high benefit-cost ratio may take priority over others with lower ratios.

Data transformation. Converting the coordinates of a map or an image from one system to another, typically by shifting, rotating, scaling, skewing, or projecting them. Also known as rectification, the conversion process requires resampling of values.

Database management system (DBMS). Software that allows a systematic approach to maintaining, accessing and manipulating database files. A DBMS may consist of a single program or a collection of task-specific programs.

Digital elevation models (DEMs). DEMs are data files that contain the elevation of the terrain over a specified area, usually at a fixed grid interval over the surface of the earth. The intervals between each of the grid points will always be referenced to some geographical coordinate system. This is usually either latitude-longitude or UTM (Universal Transverse Mercator) coordinate systems.

Digital orthophotograph. This is a "scale corrected" aerial image, depicting ground features in their exact ground positions, in which distortion caused by camera and flight characteristics and relief displacement have been removed using photogrammetric techniques.

Disequilibrium. Also referred to in this technical paper as spatial disequilibrium. Natural or man-made integrated features or processes may become out of balance such that their prevailing local distribution leads to a break-down or collapse of the eco-system, i.e. such that a system would then be functioning in an unsustainable manner.

Electromagnetic spectrum. The range of energy which contains parts or "bands" such as the visible, infrared, ultraviolet, microwave (radar), gamma ray, x-ray, radio, and which travels at the speed of light. Different parts of the electromagnetic spectrum have different wavelengths and frequencies.

Fuzzy classification. Any method for classifying data that allows attributes to apply to objects by membership values, so that an object may be considered a partial member of a class. Class membership is usually defined on a continuous scale from zero to one, where zero is non membership and one is full membership. Fuzzy classification may also be applied to geographic objects themselves, so that an object's boundary is treated as a gradated area rather than an exact line. In GIS, fuzzy classification has been used in the analysis of soil, vegetation, and other phenomena that tend to change gradually in their physical composition and for which attributes are often partly qualitative in nature.

Generalization. The process of selecting and representing information on a map in a way that adapts to the scale of the display medium of the map. So, cartographers must decide and then adjust the content within their maps to create a suitable and useful map that conveys geospatial information within their representation of the world. In making these decisions maps are simplifying the real world, with only the more important elements being shown.

Geodatabase. A database or file structure used primarily to store, query, and manipulate spatial data. Geodatabases store geometry, a spatial reference system, attributes, and behavioral rules for data. Various types of geographic data sets can be collected within a geodatabase, including feature classes, attribute tables, raster data sets, network data sets, topologies, and many others. Geodatabases can be stored in IBM DB2, IBM Informix, Oracle, Microsoft Access, Microsoft SQL Server, and PostgreSQL relational database management systems, or in a system of files, such as a file geodatabase.

Geographic information systems (GIS). An integrated collection of computer hardware, software and data used to view and manage information about geographic places, analyse spatial relationships, and model spatial processes. A GIS provides a framework for gathering and organizing spatial data and related information so that it can be displayed and analysed.

Georeference system. An (x,y) or (x,y,z) coordinate system that locates points on the surface of the earth as a reference to points on a map. Systems include latitude-longitude, Universal Transverse Mercator, and State Plane Coordinates.

Geostatistics. The branch of applied statistics that focuses on mathematical description and analysis of spatially-based data.

Geotechnology. The application of scientific methods and engineering techniques to the exploitation and utilization of natural resources (such as mineral resources). GIS requires access to techniques and geo-equipment such as GPS, remote sensing, computer associated hardware, data loggers, mobile communications, etc. These technologies may be referred to as "parallel technologies" (to GIS).

Global positioning system (GPS). A system of radio-emitting and -receiving satellites used for determining positions on the earth. The orbiting satellites transmit signals that allow a GPS receiver anywhere on earth to calculate its own location through trilateration. Developed and operated by the U.S. Department of Defense, the system is used in navigation, mapping, surveying, and other applications in which precise positioning is necessary.

Ground truthing. Remote sensing analysts must be sure that their image analysis is accurate. This is done in the field where analysts go out to the actual places shown in the images and confirm that what they think they see on the image is actually true.

Image processing. Encompasses all the various operations which can be applied to photographic or image data. These include, but are not limited to, image compression, image restoration, image enhancement, preprocessing, quantization, spatial filtering and other image pattern recognition techniques.

Keyhole markup language. XML grammar and file format for modelling and storing geographic features such as points, lines, images, polygons, and models for display in Google Earth. A KML file is processed by Google Earth in a similar way that HTML and XML files are processed by web browsers. Like HTML, KML has a tag-based structure with names and attributes used for specific display purposes. Thus, Google Earth acts as a browser of KML files.

Landsat. A series of US polar orbiting satellites, first launched in 1972 by NASA (National Aeronautics and Space Administration), which carry both the multispectral scanner and thematic mapper sensors.

Landscape ecology. The science of studying and improving relationships between ecological processes in the environment and particular ecosystems. This is done within a variety of landscape scales, development spatial patterns, and organizational levels of research and policy.

Map projection. A method by which the curved surface of the earth is portrayed on a flat surface. This generally requires a systematic mathematical transformation of the

earth's graticule of lines of longitude and latitude onto a plane. Every map projection distorts distance, area, shape, direction, or some combination thereof.

Metadata. Information that describes the content, quality, condition, origin, and other characteristics of data or other pieces of information. Metadata for spatial data may describe and document its subject matter; how, when, where, and by whom the data was collected; availability and distribution information; its projection, scale, resolution, and accuracy; and its reliability with regard to some standard. Metadata consists of properties and documentation. Properties are derived from the data source (for example, the coordinate system and projection of the data), while documentation is entered by a person (for example, keywords used to describe the data).

Modelling. The representation of a system by a mathematical analogue, obeying certain specified conditions, whose behaviour is used to simulate and interpret a physical or biological system.

Multi-criteria evaluation (MCE). Decision support tool for Multi-Criteria Evaluation. A decision is a choice between alternatives (such as alternative actions, land allocations, etc.). The basis for a decision is known as a criterion. In a Multi-Criteria Evaluation, an attempt is made to combine a set of criteria to achieve a single composite basis for a decision according to a specific objective. For example, a decision may need to be made about what areas are the most suitable for industrial development. Criteria might include proximity to roads, slope gradient, exclusion of reserved lands, and so on. Through a Multi-Criteria Evaluation, these criteria images representing suitability may be combined to form a single suitability map from which the final choice will be made.

Network analysis. Analytical techniques concerned with the relationships between locations on a network, such as the calculation of optimal routes through road networks, capacities of network systems, best location for facilities along networks, etc.

Pixel (picture element). In a digitized image, the area on the ground represented by each digital number. The spatial variable defines the size (resolution) of the cell, the spectral variable defines the intensity of the spectral response.

Raster. A spatial data model that defines space as an array of equally sized cells arranged in rows and columns, and composed of single or multiple bands. Each cell contains an attribute value and location coordinates. Unlike a vector structure, which stores coordinates explicitly, raster coordinates are contained in the ordering of the matrix. Groups of cells that share the same value represent the same type of geographic feature.

Remote sensing. Collecting and interpreting information about the environment and the surface of the earth from a distance, primarily by sensing radiation that is naturally emitted or reflected by the earth's surface or from the atmosphere, or by sensing signals transmitted from a device and reflected back to it. Examples of remote-sensing methods include aerial photography, radar, and satellite imaging.

Resolution. The detail with which a map depicts the location and shape of geographic features. The larger the map scale, the higher the possible resolution. As scale decreases, resolution diminishes. The dimensions represented by each cell or pixel in a raster.

Scale. The ratio or relationship between a distance or area on a map and the corresponding distance or area on the ground, commonly expressed as a fraction or

ratio. A map scale of 1/100 000 or 1:100 000 means that one unit of measure on the map equals 100 000 of the same unit on the earth.

Shapefile. A vector data storage format for storing the location, shape, and attributes of geographic features. A shapefile is stored in a set of related files and contains one feature class.

Spatial domain. The geographic concept of area that usually pertains to the two dimensional (x, y) extent of an area or to the extent of a particular surface feature.

Structured query language (SQL). A Syntax for defining and manipulating data from a relational database. Developed by IBM in 1970 s, it has become an industry standard for query languages in most relational database management systems.

System's (or computer) architecture. Refers to the configuration of hardware used that allows for the success of the system (in this case GIS). The architecture can vary from the very basic, which is essentially just the GIS software loaded to a computer that is also connected to a screen and a printer (called a Personal Area Network), to a complex integrated system of information technologies that may be world-wide and which will definitely include the Internet (called a Wide Area Network).

Systeme Probatoire d'Observation de la Terre (SPOT). A French multispectral satellite with pointable sensors first operational in 1986. There are two kinds of SPOT images - one with 10 meter ground resolution in a single panchromatic spectral region; the other with 20 meter resolution in the three spectral regions used for color-infrared maps. SPOT satellites may be pointed at an angle off-axis or off-nadir to collect forward and rearward images, a technique that yields stereoscopic image pairs from which accurate elevation rasters can be computed.

Topographic mapping. A topographic map is a two-dimensional representation of a three-dimensional land surface. Thus it usually shows relief and man-made features of a portion of a land surface distinguished by portrayal of position, relation, size, shape, and elevation of the features. Topographic maps are typically produced by the national mapping agencies of the country represented by the map.

Topology or vector topology. A description of the relationship between node, line, and polygon elements in a vector object.

Triangulated irregular networks (TINs). A TIN is a digital data structure used in a GIS for the representation of a surface. A TIN is a vector-based representation of the physical land surface or sea bottom, made up of irregularly distributed nodes and lines with three-dimensional coordinates (x, y, and z) that are arranged in a network of non-overlapping triangles.

Vector. A coordinate-based data model that represents geographic features as points, lines, and polygons. Each point feature is represented as a single coordinate pair, while line and polygon features are represented as ordered lists of vertices. Attributes are associated with each vector feature, as opposed to a raster data model, which associates attributes with grid cells.

Visualization. The act or process of interpreting in visual terms. The usage in this technical paper refers to the process of perceiving data or information that has been presented in a mapped format.

FISHERIES AND AQUACULTURE TERMINOLOGY

Code of conduct for responsible fisheries. FAO-formulated code, which sets out principles and international standards of behaviour for responsible aquaculture and fisheries practices with a view to ensuring the effective conservation, management and development of living aquatic resources, with due respect for the ecosystem and biodiversity.

Complementary conservation. This is a means of conservation in which more than one approach will be taken towards trying to ensure the sustainability of a species. For instance, because a particular fish species has different environmental needs for spawning, feeding and for resting, it will be necessary that a range of in-stream habitats are conserved in order that the species can survive.

Economic surface. The division of an area into cells or units according to the value of any specified resource that can be supplied from that unit area.

Ecosystem. An organizational unit consisting of an aggregation of plants, animals (including humans) and micro-organisms, along with the non-living components of the environment.

Ecosystem approach to aquaculture (EAA). A strategy for the integration of the activity within the wider ecosystem such that it promotes sustainable development, equity, and resilience of interlinked social-ecological systems.

Ecosystem approach to fisheries (EAF). An approach to fisheries management and development that strives to balance diverse societal objectives, by taking into account the knowledge and uncertainties about biotic, abiotic and human components of ecosystems and their interactions and applying an integrated approach to fisheries within ecologically meaningful boundaries. The purpose of EAF is to plan, develop and manage fisheries in a manner that addresses the multiple needs and desires of societies, without jeopardizing the options for future generations to benefit from the full range of goods and services provided by marine ecosystems.

Essential fish habitats (EFH). Areas designated as EFHs contain habitat essential to the long-term survival and health of a fishery. Thus, certain properties of the water column such as temperature, nutrients, or salinity are essential to various species, but other species may be more dependent on certain bottom types such as sandy or rocky bottoms, vegetation such as seagrasses or kelp, or structurally complex coral or oyster reefs.

Gap analysis. An assessment of the protection status of biodiversity in a specified region which looks for gaps in the representation of species or ecosystems in areas where the species might be expected to be present. It is thus a formal means to identify and correct gaps between desired presence and actual presence of a species or ecosystem.

Integrated multi-trophic aquaculture (IMTA). Practice which combines, in the appropriate proportions, the cultivation of fed aquaculture species (e.g. finfish/shrimp) with organic extractive aquaculture species (e.g. shellfish/herbivorous fish) and inorganic extractive aquaculture species (e.g. seaweed) to create balanced systems for environmental sustainability (biomitigation), economic stability (product diversification and risk reduction) and social acceptability (better management practices).

Large marine ecosystem. Large area of ocean space of approximately 200 000 km² or greater, adjacent to the continents in coastal waters, that has distinct bathymetry, hydrography, productivity and trophically dependent populations.

Mariculture. Cultivation, management and harvesting of marine organisms in their natural habitat or in specially constructed rearing units, e.g. ponds, cages, pens, enclosures or tanks. For the purpose of FAO statistics, mariculture refers to cultivation of the end product in seawater even though earlier stages in the life cycle of the concerned aquatic organisms may be cultured in brackish water or freshwater.

Marine protected area (MPA). A protected marine intertidal or subtidal area, within territorial waters, EEZs or in the high seas, set aside by law or other effective means, together with the overlying water and associated flora, fauna, historical and cultural features. It provides degrees of preservation and protection for important marine biodiversity and resources; a particular habitat (e.g. a mangrove or a reef) or species, or sub-population (e.g. spawners or juveniles) depending on the degree of use permitted. The use of MPAs for scientific, educational, recreational, extractive and other purposes including fishing is strictly regulated and could be prohibited.

Marine spatial planning (MSP). A process of analysing and allocating parts of three-dimensional marine spaces to specific uses, to achieve ecological, economic, and social objectives that are usually specified through the political process; the MSP process usually results in a comprehensive plan or vision for a marine region. MSP is an element of sea use management.

Morphoedaphic index. This index measures the total dissolved solids (in mg/litre divided by mean depth in metres) in lakes or reservoirs. It was originally developed by Richard A. Ryder in the mid-1960s as an estimator of potential fish yield in lakes, and it can be used to predict both fish harvest and standing crop in freshwater bodies.

Multisectoral development. Many sectors of the government or the economic system may be involved in the planning and development of aquaculture, i.e. aquaculture can be considered as a "cross-sectoral" activity.

Parameter-specific suitability functions. This is a score allocated to any production function (at a given site) that is important to aquaculture production, with the score varying between 0 and 1 according to the relative importance of that function to the production process.

Production function. Those factors or variables that, in various combinations, influence the success of the production activity. Most factors affecting the success of fisheries or aquaculture will be physical inputs such as various aspects of water quality or water quantity, though a range of economic (cost) factors will also be important. It is likely that in the future, i.e. under EAA, EAF and MSP principles, social factors will additionally become a major consideration.

Riparian zones. Riparian buffer zones are vegetated areas along both sides of water bodies that generally consist of trees, shrubs and grasses and are transitional boundaries between land and water environments.

Stakeholder. Any person or group with a legitimate interest in the conservation and management of the resources being managed. Generally speaking, the categories of interested parties will often be the same for many fisheries, and should include

contrasting interests: commercial/recreational, conservation/exploitation, artisanal/industrial, fisher/buyer-processor-trader as well as governments (local/state/national). The public, the consumers and the scientists could also be considered as interested parties in some circumstances.

Strategic planning. A systematic, formally documented process for deciding what are the key decisions that an organisation, or local or national government must get right in order to thrive over the next few years. The process results in the production of a strategic plan.

Trophic level. Position in food chain determined by the number of energy-transfer steps to that level. Plant producers constitute the lowest level, followed by herbivores and a series of carnivores at the higher levels. The various levels represent a trophic chain.

TROPOMOD. Particle tracking model used for predicting output, movement and deposition of particulate waste material (with resuspension) and the associated benthic impact of fish farms.

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