REPORT OF THE IUCN/UNEP

WORKSHOP ON ISLAND CONSERVATION

Musée Océanographique de Monaco (30 March - 1 April 1989)

I. BACKGROUND

The workshop was organised by IUCN in the context of a UNEP-funded project to prepare a world directory of islands, and was generously hosted by the Musée Océanographique de Monaco. Nine high-level specialists representing a global range of technical fields, geographical experience and organisations met over three days to consider global island activities. On 31 March, the workshop participants were received by Prince Rainier of Monaco and his son, Prince Albert, with the discussion covering many environmental issues. The list of participants is given in Annex I.

The workshop was intended to review the concepts and contents of the Island Database developed by Arthur L. Dahl for IUCN and UNEP as the basis for producing an Island Directory, but it also took advantage of the presence of high-level representatives of several major international organisations with a particular interest in islands to review their respective programmes and to discuss potential international co-operation in meeting the special needs of islands.

II. IMPORTANCE OF ISLANDS

The participants reviewed the special characteristics of islands that warrant singling them out for special attention.

They are important sites for research in a number of fields:

- in geology, they may provide evidence of significant tectonic activity, often being geologically young or transient, or on the contrary consisting of ancient continental fragments;

- in biology, they represent unique evolutionary laboratories, often with simplified or unusual ecosystems with particular food web structures, without the cross-frontier transfers of continental systems;

- in the social sciences, the human communities on islands illustrate adaptations to small scale and isolation, with simplified human-environment interactions.

Islands harbour a significant part of the world's heritage of biodiversity and genetic resources, with large numbers of endemic species that require conservation action.

Managers of islands systems must be concerned about their vulnerability, including species that have lost their competitive ability, ecosystems that are easily overwhelmed by invasive species, or entire islands that may disappear through global change induced by human activities. While islands may be less threatened than continents by temperature change, they are obviously more sensitive to sea level rise.

The human communities of islands are perfect microcosms of the need for sustainable development within environmental limits. They seek autonomy, yet can only develop through connections with larger economies; there is often a discrepancy between their legal status and the practical realities of independence. All islands are linked with overseas poles of interest in a special geopolitical framework, and many occur in clusters with archipelagic relations marked by remote outer islands around a major island centre. Their small size and distance from continental sources and markets are particular barriers to development. These same features of smallness and remoteness that make development more difficult also mean that islands are frequently overlooked in major development initiatives and aid programmes.

Smaller islands consist entirely of coastal zone, with all the special challenges and conflicts that this represents. They require special social and governmental structures, yet they have often inherited inappropriate systems from colonial times. Since their resources are limited, islanders must use a much wider resource base for survival, requiring integrated management of the whole island and its resources.

III. THE ISLAND DATABASE AND DIRECTORY

When the IUCN Task Force on Island Conservation was established in 1987 with initial funding from the French Ministry of the Environment, it identified a need to develop a global perspective on islands. It was clear that islands shared many features in common, and would therefore benefit from greater interchange and from working together to solve common problems. UNEP agreed to fund the preparation of a directory of islands as a means to encourage more inter-island and inter-regional co-operation, particularly in the context of its Regional Seas programmes in which most island countries and territories, particularly in the tropics, participate. The Island Directory is being prepared under contract by Arthur Dahl, chairman of the Task Force.

It was clear that assembling data for the directory could be done most easily through a computerised database, and the result of a year's effort in developing an island database was demonstrated at the workshop. This preliminary version of the island database is a kind of "electronic directory" designed to be used by non-specialists on standard microcomputers with the most widely available database programme. Such a database not only compiles data and prints it out in formats suitable for the printed directory, it also permits searching and sorting the data by any combination of characteristics, making it possible to list and classify islands to identify those sharing common features of interests. It can be easily distributed or subdivided, making it much more accessible to users in the islands, and incidentally decentralising some of the work in updating the database.

The workshop considered that it would be desirable for the database to focus on the conservation and sustainable development of islands, requiring data making it possible to place any island in different contexts, including:

- geomorphology, climate, isolation;
- biological diversity, uniqueness, occurence of organisms;
- threats and vulnerability;
- legislative status, management/institutional capacity; and
- capacity to meet human needs.

The database as presently constituted can do all except the latter, for which few quantitative data are available.

The workshop identified a number of potential uses for the island database:

- assisting in the planning of regional and international island programmes;
- drawing attention to particular island problems;
- providing data for national conservation strategies and environmental action plans;
- identifying the most appropriate islands for World Heritage listing;
- supporting Red Data Books on endangered species by relating the species to potential threats;
- showing the scientific community where data was obsolete or entirely lacking, and stimulating research on priority questions;
- documenting rapid changes requiring an urgent response;

- identifying the most threatened islands which should be priorities for conservation action;

- allowing island managers or researchers to compare their island with others;

- giving governements concise standardised data on their islands for improved management;

- encouraging researchers and governments to collect and archive island data in standardised forms, as such information is often discarded locally.

There was strong support for the continued development of the database as a most appropriate way to meet these needs. It was seen as a valuable tool which could be easily available to international agencies, governements and non-governmental organisations.

A number of points and questions were raised to be considered as the database is developed further. Quality control of the data entered is a primary consideration. It should be possible to identify who supplied the data, and to note any disagreements, particularly if data are to be contributed by many sources. All data submitted should be subject to central verification. A programme will still have to be developed to merge data from different sources. More can also be done in structuring the database to improve quality control and to reduce the possibility of errors in data entry. Specialists in database programming such as those at WCMC could be of great help with this.

It will take some time to accumulate sufficient data of adequate quality to make certain analyses possible; attempting such analyses prematurely would give misleading results. To build a network of user groups contributing to the database, it will be necessary to demonstrate how it will be of immediate use to them. Simplified formats should be made available initially so that users can learn the system more easily.

The island database should be integrated with other existing databases which could contribute to data input. Certain of the subsidiary databases such as those for species and references could probably be replaced by existing WCMC databases. Conversely, some of the features of the island database could serve as a model for improvements in the WCMC systems.

There was some discussion of priorities in data collection, both to respond to immediate user needs and to build rapidly to a functional data collection able to give regional and then global comparative results. The basic geographic information is already relatively complete. Biodiversity and its conservation status was suggested as a first priority. It may also be advisable to concentrate initially on a few regions where sufficient data are available to permit comparative analyses. It was pointed out that even in the Mediterranean some islands were still not well known, and this was to be the theme of a forthcoming

conference (1990). The U.S. AID is now required to prepare a biodiversity statement on every project, and the island database format could be suggested as an appropriate form. Whenever possible the format should be integrated into such existing data collection programmes.

It was suggested that the database, perhaps in a scaled down form, could be proposed to countries for use in collecting data on their own satellite islands, as a basis for planning their own island management strategies. Both governements and local NGOs could be interested by this application.

IV. TECHNICAL COMMENTS ON THE DATABASE

Some time was devoted to suggest modifications in the specific entries and calculations in the database. Some fields need standard lists or better definitions, such as region, special features and protected areas.

In the geographic section, a measure of vulnerability to sea level rise should be added. The isolation index needs modification to account better for the diversity of island proximity situations. The treatment of climate should be refined to include the diversity of microclimates resulting from climate-island interactions. Information on the water balance and water problems should be added.

Ecosystems should be described through a series of standard categories or types to ensure uniform treatment, and information on their original and present extent should be included to allow derivation of the amount of deforestation and the potential for restoration. FAO may have figures for the annual percent change in forest cover which could be included. The occurrence of fragments of former biota should be highlighted. More weight should be given to ecosystems and less to species in the combined indices, and the amount of species data should be reduced. A rating should be developed for the presence and threat of invasive species.

Under human impact, some provision should be made if possible for time series of data and information on historic and recent changes that might explain the present situation, such as the maximum historical population. Data should be included if possible on the economic development potential of natural resources, although this may be difficult to obtain. A measure of tourism pressure such as annual tourist arrivals would be useful, as would an indication of the type of human habitat. The combined indices for Human Impact and Conservation Interest should be revised, and their output indicated by categories, rather than actual numbers that give an erroneous impression of accuracy. Simplified indices less sensitive to inconsistencies in the data may be needed while much of the data is still inadequate or incomplete. Each record should include a history of the updates and the sources of the data, to allow for quality control and verification.

V. INTERNATIONAL ISLAND PROGRAMMES

The participants described the interest in islands of their respective organisations, and discussed the possibilities of increased co-operation.

IUCN - the World Conservation Union - adopted islands as a priority area several years ago, and appointed a Task Force on Island Conservation of over 20 international island experts chaired by Arthur Dahl, whose activities led to the island database and the present workshop. The primary concern of this group has been to view the needs for island conservation from a global perspective as a basis for defining priorities for action. While the task force is not expected to continue indefinitely, it can easily be modified to suit changing circumstances. IUCN will continue to play a leading role in following up the work of the task force and in pursuing priorities in island conservation.

UNEP's interest in islands is expressed through the large number of island states and territories that are included in its Regional Seas Programmes. The Oceans and Coastal Areas Programme Activity Centre (OCA/PAC) of UNEP provided the funds to IUCN for the preparation of the island database and directory. The fact that the chairman of the IUCN Task Force on Island Conservation and creator of the island database has just been named Deputy to the Director of OCA/PAC will strenghten UNEP's interest in islands.

The World Conservation Monitoring Centre has recently been restructured as a joint activity of IUCN, UNEP and WWF. It is contributing data to the island database and has made a technical review of the database structure. The Centre appears well placed to take on the central responsibility for the island database after the end of the present project, assuming the necessary funds can be found.

UNCTAD has been included in the membership of the island task force because of its interest in the economic aspects of small island states, on which it maintains a database. Unfortunately the invited island experts from this agency were unable to attend the workshop. However, the Assistant Secretary General of UNCTAD did promise the full collaboration of his organisation with IUCN in future global island initiatives.

The Unesco Man and the Biosphere (MAB) programme has had an islands programme for many years emphasizing multidisciplinary studies of islands, including the classic study of the Lau Islands of Fiji. Recent work has concentrated on field studies of several Mediterranean and European Atlantic islands combining research with training of local island leaders. MAB is working closely with the EEC on some of these projects. This approach may be extended to the Pacific and South-East Asia. There have been plans to establish a database on islands, and some data on large islands have already been collected.

The Island Resources Foundation is a Caribbean-based NGO with extensive experience in the practical aspects of island environmental management. It is presently working with twelve island governments to strengthen their institutional capacity and that of local NGOs to deal with environmental problems.

The Department of Island Geography at the University of Bordeaux has been involved in many research programmes on islands, including the CNRS/ORSTOM series of very complete atlases of the French overseas island departments and territories. Atlases have been completed for La Réunion, Guadeloupe, Martinique and New Caledonia, and one is in preparation for French Polynesia. Further atlases are projected for Mauritius and the Seychelles. The CNRS is helping to organise a meeting on the sustainable development of islands in Mauritius on 26-29 July 1989.

All those present were prepared to contribute actively to the continued development of the island database, as it would reinforce their own activities.

VI. PROPOSED WORKPLAN

The present UNEP-sponsored project for the island directory is scheduled to end on 30 April 1989, and Arthur Dahl, who is executing the project, will be unable to continue devoting as much time to it as in the past. He will incorporate as far as possible the modifications in the database structure suggested at the meeting, and will print out a first preliminary edition of the island directory which will be published by UNEP and IUCN to encourage co-operation and further input.

It would be desirable for Dr. Dahl to visit the World Conservation Monitoring Centre to work with their database specialists on removing the final bugs in the programmes and on making the refinements necessary to prepare the database for widespread circulation.

Three important conferences on islands are planned in 1989: in Mauritius (July), Japan (October) and Brest (November). It would be desirable to present the island database to those meetings to stimulate further co-operation and support.

The utility and ease of use of the database at the local level should be tested through trials in selected areas. Dr d'Ayala offered the collaboration of MAB in organising trials in association with some eastern Atlantic islands and in a group of smaller Mediterranean islands where considerable data have already been collected. It is also envisaged to approach the Soviet Union MAB Committee which has been working on the Commander Islands. Similarly, Dr Towle of the Island Resources Foundation proposed to organise trials on some Caribbean islands. A particular interest was indicated in the development of a pilot national island database in one of the Caribbean countries with a number of small satellite islands. UNEP could also try out the database with its regional co-ordinating units.

The feedback from these trials, which should be completed by the end of the year, would be used to adapt the database to the interests of different user groups. A workshop would be necessary to finalise the database structure and indices, after which no further modifications should be considered for perhaps ten years. The agreed format should be decided within a year, so that a more definitive edition of the island directory could be prepared within two to three years.

An urgent priority is to find a competent person to work full time on the continued development of the island database over this period. This person could be located in WCMC if space can be found, and if the projects is free-standing and reinforces the rest of the centre. Alternatively, the person could be based with GEMS in Nairobi, or even in OCA/PAC to work under the direct supervision of Arthur Dahl. The Smithsonian Institution is another possible location. In any case, continued collaboration with Dr. Dahl would be desirable.

It was agreed to pursue joint international collaboration between IUCN, UNEP, UNESCO and WCMC in the island database project, with IUCN continuing to take the lead at present. IUCN will prepare a grant application following-up the present project, to be submitted to various potential donors. With the substantial progress made and the concrete results achieved to date, it appears essential to maintain the momentum of this activity.

International Union for Conservation of Nature and Natural Resources

United Nations Environment Programme

ISLAND DATABASE

INSTRUCTIONS FOR DATA FORMS

This database was developed by A. L. Dahl under contract to IUCN with the financial support of UNEP and the assistance of the IUCN Task Force on Island Conservation and ICBP. It is intended to help those living on islands or involved in island development and conservation to understand the environmental problems of islands, to identify islands with special problems or under particular threat, and to compare and classify islands globally to show which islands may share common problems and be able to co-operate in solving those problems.

The database was designed so that island experts and potential users could easily provide information in written form or on diskette. In exchange for the data submitted, we hope to keep the database and outputs from it freely available (apart from the cost of the diskettes). Send new data you compile and revisions of existing outputs to the following address, so that revised and updated versions can be issued from time to time:

Dr. Arthur Lyon DAHL
OCA/PAC, UNEP
P.O. Box 47074
Nairobi, Kenya
Tel. 333 930 ext. 6989
Fax: Nairobi 2542 520 711

Structure of the database

There are four components of the Island Database: country files, island files, species files and reference files. The country files provide summary information on each country, including general statistics and information on environmental responsibility and action at the national level. Most island information is compiled in the island file, with geographic, biological and socio-economic data for each island. The species file is intended to record summary information for each species either of conservation interest or known to be invasive on islands. There are separate records for each island or other geographic entity where the species occurs, in order to facilitate the compilation of island species lists. References are grouped in a references file, both to build a general bibliography on islands and to select reference lists for particular islands, species or countries.

EXPLANATORY NOTES TO DATA FORMS

The following notes explain each entry field as numbered in the replicas of the data forms. Each field entry note is followed in brackets by the length of the field and any particularities of type or format (length, format). Those marked with an asterisk (*) are calculated by the database programme or will be determined on data entry and need not be filled in.

ISLAND Database - ISLAND Record GEOGRAPHY Page 1

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ISLAND NAME [1.....]          Island Code 14xxxxxxx
Other names [8.....](-(in paren)     dec.or m/s
 Group      [2.....] LATITUDE  [10...] [11....]
 Archipelago [3.....] LONGITUDE [12....] [13....]
  COUNTRY [4.....]  CMC Area Code [5.]  RS [31xx]
  REGION  [6.....]  OCEAN [7.....] Include in dir (FFSLX) [42]
Nearby (satellite) islands (including) [9 including.....,.....]
  AREA [15.....] sq.km    ALTITUDE [16.] m    Shoreline [20.....] km
  Submerged Area [17...] sq.km  Reef Area [18...] sq.km Lagoon Area [19...] sq.km
  Index of Insularity 21xxxx  Depth to nearest land [26.] m  Map Scale 1:[22.....]
Nearest Island [23.....] Distance [24..] km
Nearest Continent [25.....]   Distance [26..] km Index of Isolation 27
  ISLAND TYPE[32.....] (C,V,A,L,R) Dominant [29] other [30]
  CLIMATE  Rainfall type [34.....]    Temperature type [35.....]
   [36.....]  Climate code [37] GEOLOGY/SOILS 33_____
_____
  THREATS [38.....]
   [cyclone+volcano+tsunami+drought+fire+oil spill++] Vulnerability Rating: VU [39]
  NATURAL PROTECTION [40.....]
   NP Rating [remote + uninhabited + difficult access + few introductions]:  NP [41]
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1. Name of the island in English [40,Xxxxxx] (40 spaces, with initial capital)
2. Name of island group (if part of a group) [40,Xxxxxx]
3. Archipelago [40,Xxxxxx]
4. Country or territorial unit (with country in parentheses) [40,Xxxxxx]
x5. World Conservation Monitoring Centre area code [2,XX]
6. Region or biogeographic province [20,Xxxxxx]
7. Ocean (or Sea if not part of an ocean) [15,Xxxxxx]
8. Other names for the island (foreign language, obsolete, variant spellings) with most frequently used first [40,Xxxxx, Xxxxx]
9. Small nearby (or satellite) islands included in island description [40,Xxxxxx]
10. Latitude in degrees and decimal fractions of a degree [6,99.999] (measured at the geographic centre of the island)
11. Minutes and seconds of latitude, and N or S [7,99 99 X]
12. Longitude in degrees and decimal fractions of a degree [7,999.999]
13. Minutes and seconds of longitude, and E or W [7,99 99 X]

NOTE: enter <u>either</u> decimal <u>or</u> minute/second divisions of a degree; the programme will automatically calculate the other.

x14. Computer-calculated island code composed of 4 initial letters of name plus degrees of latitude and longitude [9,XXXX99999] (calculated automatically by the database math programme)
15. Land area of the island in square kilometres to nearest tenth [8,999999.9]
16. Altitude of the highest point on the island in metres [4]
17. Underwater area of the island down to 100 metres depth in square kilometres [6]
18. Area of coral reefs down to 10 metres depth in square kilometres [6]
19. Area of lagoon in square kilometres [6]
20. Length of shoreline in kilometres to nearest tenth [7,99999.9]
x21. Computer-calculated Index of insularity from shoreline divided by land area [6,9.9999]
22. Scale of map from which shoreline information was taken, 1:[8,99999999]
23. Name of nearest significant (generally larger) island [40,Xxxxxx]
24. Distance in kilometres to nearest island [5]
25. Name of nearest continent [15,Xxxxxx]

26. Distance in kilometres to nearest continent [5]
*27. Computer-calculated index of isolation based on the square root of the distance to nearest island plus the square root of the distance to nearest continent [2]
28. Minimum water depth in metres between the island and a larger landmass [4]
29. Letter code for the predominant island type [1,X]:
C=continental; V=volcanic; A=atoll; L=low island; R=raised/elevated coral isl.
30. Letter code for secondary island type/structure where this co-occurs [1,X]
*31. Abbreviation for UNEP Regional Seas Action Plan area, if any [5,XXXXX]
MED=Mediterranean; CEP=Caribbean Environment Programme; SPCF=South-East Pacific; SPREP=South Pacific Regional Environment Programme; EAS=East Asian Seas; SAS=South Asian Seas; KAP=Kuwait Action Plan; RED=Red Sea & Gulf of Aden; EAF=East Africa; WACAF=West and Central Africa (not on form)
32. Short word description of island type [30,xxxx xxxx] i.e. "high active volcano" or "oval atoll with 33 islets"
33. Text description of island form, structure, geology and soils [text of unlimited length]
34. Rainfall category: wet, seasonal, dry, etc. [8,xxxxxx]
35. Temperature category: tropical, subtropical, temperate, subpolar, polar [11,xxx]
36. Short word description of climate (in addition to rainfall/temperature) [30,xxx]
*37. Code for climate (for classification and sorting) [3]
38. Major large-scale natural or man-made threats to the island environment: cyclones (typhoons, hurricanes); volcanic eruption; earthquake/tsunami; drought; major fire; oil spill; acid rain, etc. [55,xxxx, xxxx]
*39. Numeric Vulnerability rating based on the number of threats in 38. [1]
40. Features that give the island natural protection: remote from human interference; uninhabited; difficult access (cliffs, no safe landing); few introductions of alien or invasive species [50,xxxx, xxxx]
*41. Numeric Natural Protection rating based on the number of features in 40. [1]
*42. Letter code for inclusion in the island directory or other compilations, giving size of entry: [X] F = full entry; P = partial entry (without species numbers table); S = short entry (without species, protected areas or numerical ratings); L = listing only; X = excluded for depth less than 100 m to adjacent land; O = excluded as oversized island > 17,000 sq. km; I = incomplete record or included with another island (will not print out)

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ISLAND Database: ..(island name)..... BIOLOGY Page 2

ECOSYSTEMS 43_____

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_____ Forest:[44] Coral reef:[45] Mangrove:[46] ECOSYSTEM RICHNESS Terr. ER-T [47]
SPECIES (Taxa): 49_____ (number) Marine ER-M [48]

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Plants	Total	[50...]	Endemic	[51..]	[52]%	Threatened (EVRI)	[53..]
Insects	Total	[54...]	Endemic	[55..]	[56]%	Threatened (EVRI)	[57..]
Other invert	Total	[58..]	Endemic	[59.]	[60]%	Threatened (EVRI)	[61.]
Rept/Amphib	Total	[62]	Endemic	[63]	[64]%	Threatened (EVRI)	[65]
Birds	Total	[66]	Endemic	[67]	[68]%	Threatened (EVRI)	[69]
Mammals	Total	[70]	Endemic	[71]	[72]%	Threatened (EVRI)	[73]
Marine life	Total	[74..]	Endemic	[75]	[76]%	Threatened (EVRI)	[77]

SPECIES RICHNESS [78.....] SR Rating: Terrestrial: SR-T*[79]
(0=few; 1=poor; 2=moderate; 3=good; 4=rich; 5=very rich) Marine: SR-M*[80]
ENDEMISM: Terrestrial:[81.....] Endemism Island: IE-T*[83]
(0=0; 1=1-5; 2=6-38; 3=39-149; 4=150-410; 5=411-915) Rating: Group: GE-T [85]
Marine: [82.....] Island: IE-M*[84]
(*=calculated if nos.avail.) Group: GE-M [86]
SPECIAL FEATURES: Special Features Rating: Terrestrial: SpFe-T [90]
[89.....] Marine: SpFe-M [91]
Seabirds [87.....](,) Marine Turtles [88.....]
INTRODUCTIONS [92.....] [93..]

43. Text description of ecosystems occurring on and around the island [text of unlimited length]
44. Presence of forest? Y or N [Y]
45. Presence of coral reefs? Y or N [Y]
46. Presence of mangroves? Y or N [Y]
47. Count of the number of terrestrial ecosystem or biome types present (using a standard classification if one exists) [2]
48. Count of the number of marine ecosystems/biomes present [2]
49. Text description of species on the island, general state of the fauna and flora; can include list of species of conservation interest (either entered directly or compiled by the island species data base) [text of unlimited length]
50. Total number of vascular plants (including ferns) in the native flora [6]
51. Number of island endemic plant species and subspecies [5]
52. Percentage of endemic plants in the native flora [2]
53. Number of native plants classed as Endangered, Vulnerable, Rare, Indeterminate or Unknown status (EVRI) according to IUCN criteria [5]
54. Total number of native insects [6]
55. Number of endemic insects [5]
56. Percentage of endemic insects [2]
57. Number of native insects classed as EVRI [5]
58. Total number of native invertebrates other than insects [5]
59. Number of endemic other invertebrates [4]
60. Percentage of endemic other invertebrates [2]
61. Number of other invertebrates classed as EVRI [4]
62. Total number of native reptiles and amphibians [3]
63. Number of endemic reptiles/amphibians [3]
64. Percentage of endemic reptiles/amphibians [2]
65. Number of reptiles/amphibians classed as EVRI [3]
66. Total number of resident/breeding native bird species and subspecies [3]
67. Number of island endemic birds [3]
68. Percentage of island endemic birds [2]
69. Number of native birds classed as EVRI [3]
70. Total number of native mammals [3]
71. Number of island endemic mammals [3]
72. Percentage of island endemic mammals [2]
73. Number of native mammals classed as EVRI [3]
74. Total number of resident coastal/shallow water marine species [5]
75. Number of endemic marine species [3]
76. Percentage of endemic marine species [2]
77. Number of marine species classed as EVRI [3]

NOTE: for all the species numbers in 50-77 above, it is the proportions of endemic and vulnerable species that are important; partial data (i.e just for butterflies or land snails) can be included if it is comparable across the columns. Explanatory notes should be added to the species text (49).

78. Brief word description of species richness [30,xxxx]
*79. Numeric rating for terrestrial species richness, computer-calculated if species numbers available [1]:
    0 = <24 plants and/or <8 birds
    1 = 25-224 plants and/or 9-23 birds
    2 = 225-624 plants and/or 24-39 birds
    3 = 625-1224 plants and/or 40-55 birds
    4 = 1225-2024 plants and/or 56-71 birds
    5 = >2025 plants and/or >72 birds
*80. Numeric rating for marine species richness, computer-calculated if species numbers available [1]
81. Brief word description of terrestrial endemism [30,xxxx]
82. Brief word description of marine endemism [30,xxxx]

*83. Numeric rating for terrestrial island endemism, computer-calculated if numbers available [1]:
0 = no endemic species
1 = 1-5 endemic species
2 = 6-38 endemic species
3 = 39-149 endemic species
4 = 150-410 endemic species
5 = 411-915 endemic species
6 = >916 endemic species

*84. Numeric rating for marine island endemism, computer-calculated if numbers available [1]:
0 = no endemic species
1 = 1-2 endemic species
2 = 3-6 endemic species
3 = 7-12 endemic species
4 = 13-20 endemic species
5 = 21-30 endemic species
6 = 31-42 endemic species

85. Numeric rating for terrestrial species endemism in the island group (entered manually according to the scale in 83 [1]

86. Numeric rating for marine species endemism in the island group (scale in 84) [1]

87. Short word description of importance for seabirds (i.e seabird rookery) [25,xxx

88. Short word description of importance for marine turtles (i.e. turtle nesting ar [25,xxxxx]

89. Word description of special features of conservation importance [60,Ixxxx]

*90. Numeric rating based on number of terrestrial special features [1]

*91. Numeric rating based on number of marine special features [1]

92. Limited text description of impact of invasive species [60,xxxx]

93. Text description of important invasive species; can include species list genera by island species data base [text of unlimited length]

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ISLAND Database: 1..... HUMAN IMPACT Page 3

HUMAN IMPACTS 102_____

Human occupation [94.....]
Population [95.....] [(96.)] Density 97*** persons/sq.km Trend [98] (1=-;2=<1%
Dominant human activities: 1st [99.....] 3=1-2%;4=2-3%;5=>3%)
2nd [100.....] (,) 3rd [101.....]
Urban areas: Population [103...] Size [104] sq.km Urbanization Rating: UR 105
Transportation facilities: (port,) [106.] (airport) [107...]
Percent population in agriculture/mining/fishing [108]% Human Threat Rating: HT 10
Gross Domestic Product [$110..] per capita Economic Pressure Rating: EP 11
SUPPORT FOR CONSERVATION ACTION (tenure + govt support + public support +legis.)
[112.....] PC Rating: PC [113]
PROTECTED AREAS 114_____

Number [115] Area: Terrestrial [116..] Marine [117..] sq.km
Protected Area Coverage Rating: Terrestrial: PA-T [118]
[0=<.5%; 1=<4%; 2=<12%; 3=<24%; 4=<40%; 5=<60%; 6=<84%] Marine: PA-M [119]
DATA RELIABILITY [120.....] DA Rating: DA [121]
[0=none; 1=partial & old; 2=partial or old; 3=good & recent]
Human Impact Rating: HI 122
Conservation Importance Ratings:
NOTES [128.....] Terrestrial: CI-T 123
Marine: CI-M 124
References 125_____
Last updated by [126.....] on [127....]

94. Brief text description of status of human occupation (i.e. uninhabited; inhabited since prehistoric times; visited occasionally; etc.) [40,xxxx]
95. Human population of the island [9]
96. Year of census for population figure in 95 [6,(9999)]
*97. Computer-calculated population density in persons/square kilometre, based on 95 and 15 [5]
98. Numeric rating for the trend in population growth, based on the most recent five year estimate [1]:
    1 = negative growth rate (declining population)
    2 = growth rate 0 to 1% per year
    3 = growth rate >1% to 2%
    4 = growth rate >2% to 3%
    5 = growth rate over 3% per year
99. Brief word description of predominant human subsistence/development activity [25]
100. Word description of second most important human activity [25]
101. Word description of third most important human activity [25]
102. Text description of significant human impacts, historic events, etc. (text of unlimited length)
103. Human population living in urban area(s) [8]
104. Size of urban area(s) in square kilometres [3]
*105. Computer-calculated numeric rating for urbanization, based on proportion on population in urban areas [1]
106. Presence of a port receiving international traffic (enter "port") [5,port,]
107. Presence of an airport (enter "airport") [7,airport]
108. Percentage of the economically active population in agriculture, forestry, mining, fishing [2]
*109. Computer-calculated numeric rating for human pressure on resources, based on 10 [1]
110. Gross domestic product (or GNP or income) per capita (in US$) [6] (use national or territorial statistics if island figures are not available)
*111. Computer-calculated numeric rating for economic pressure on the island based on 110 [1]
112. Brief word listing of factors supporting or facilitating conservation action [50,xxx,xxx]: land tenure or ownership; government support; public support; legislation
*113. Numeric rating based on number of factors supporting conservation action [1]
114. Text description and listing of protected areas and proposed protected areas, including name, size in square kilometres, and category or type of protected status (include all types of de facto protection) (text of unlimited length)
115. Number of protected areas [2]
116. Area of terrestrial protected areas in square kilometres to nearest tenth [8,999999.9]
117. Area of marine protected areas in square kilometres [6]
*118. Computer-calculated numeric rating based on the percentage of the island land surface protected [1]:
    0 = <0.5% protected
    1 = 0.5-4% protected
    2 = 5-12% protected
    3 = 13-24% protected
    4 = 25-40% protected
    5 = 41-60% protected
    6 = 61-84% protected
    7 = >85% protected
*119. Computer-calculated numeric rating based on percentage of shallow (<100 m) submarine area protected, using same scale as 118 [1]
120. Brief word description of reliability of data on the island [40,xxxx] (see 121)
121. Numeric rating based on reliability of available data [1]:
    0 = no reliable data
    1 = poor data (both partial and out of date)
    2 = data recent but partial, or good but out of date
    3= good recent data (within the last 10 years)
*122. Human Impact Rating [2] computer-calculated according to the following formula:

*123. Conservation Importance-Terrestrial Rating [2] computer-calculated using the formula:

CI-T = 2(ERT/10+SRT)+[ENDT+GENDT+enplantpc/10+enbirdpc/10+plant_evri/5

+bird_evri/5+SpFeT+VU+HP+PC+DA

*124. Conservation Importance-Marine Rating [2] computer-calculated using the formula:

CI-M = 2(ERM/5+SRM)+[ENDM+GENDM+enmarinepc/10+marine_EVRI/5+SpFeM

+VU+HP+PC+DA

125. Listing of major references [text of unlimited length], can be entered directly or compiled from island references data base
126. Name of organization or person completing or updating record [15]
127. Date (day/month/year) when record compiled or updated [8]
128. Notes (such as cross-references to other data sources; variant or conflicting data, etc.) [50]

==========

COUNTRY Database

Island Database - Country Record

COUNTRY: [1.....] SHORT NAME: [2.....]
POLITICAL STATUS [6.....] METRO [7.....]
REGION: [8.....] AREA CODES: CNC: [3] ISO: [4] UN: [5.]
LAND AREA: [9.....] sq. km SEA AREA: [10.....] sq. km
POPULATION: [11.....] [12.] DENSITY: [13] persons/sq. km GROWTH RATE [14]%/yr
% POPULATION IN AGE/FISH/MINING [29]% GDP/CAPITA $[30..] or INCOME/CAPITA $[31..]
GOVERNMENT AUTHORITY: 15___ [Text summary of environment/conservation authority]

LEGISLATION: 16___ [Text summary of environment/conservation legislation]

ORGANIZATIONS: 17___ [List of non-governmental organizations in env/cons. field]

SPECIES OF CONSERVATION INTEREST: 18___ [Species data/lists at country level]

NUMBER OF ISLANDS: over 17000 sq. km [19] over 10000 sq. km [20]
over 1000 sq. km [21] over 100 sq. km [22]
over 10 sq. km [23.] over 1 sq. km [24..] < 1 sq.km [25.]
area unknown [26..] total [27..]
REFERENCES: 28

==========

1. Full name of country or territory [40,Xxxxx]
2. Short name of country [15,Xxxxx]
*3. World Conservation Monitoring Centre area code [2,XX]
*4. ISO country code [2,XX]
*5. United Nations country code [3,999]
6. Political status (i.e. independent (1960) from) [27,Xxxxx]
7. Metropolitain country or former colonizer [30,Xxxxx]
8. Region or biogeographic province [8,Xxxxx]
9. Land area of the country in square kilometres [9]
10. Sea area of the country within the 200 mile Exclusive Economic Zone in square kilometres [10]

11. Population [10]
12. Year of the population census or estimate [4]
*13. Computer-calculated population density in persons per square kilometre [3]
14. Population growth rate (to 1 decimal place) based on most recent 5-year average [3,9.9]
15. Text description of the government authorities responsible for conservation and environment [text of unlimited length]
16. Text description of legislation concerning environment, conservation, development planning, etc. [text of unlimited length]
17. Text description of non-governmental organizations concerned with the environment and conservation [text of unlimited length]
18. Text description of the country flora and fauna, including species of conservation interest at the country level (a list can be generated by the species data base) [text of unlimited length]
19. Number of islands over 17,000 square kilometres [2]
20. Number of islands between 10,000 and 17,000 sq. km. [2]
21. Number of islands between 1,000 and 10,000 sq. km. [2]
22. Number of islands between 100 and 1,000 sq. km. [2]
23. Number of islands between 10 and 100 sq. km. [4]
24. Number of islands between 1 and 10 sq. km. [4]
25. Number of islands less than 1 sq. km. [4]
26. Number of islands of unknown area [5]
*27. Computer-calculated total number of islands (sum of 19 through 26) [5]
28. References, entered directly or compiled from references data base [text of unlimited length]
29. Percentage of the economically active population in agriculture, forestry, fishing, mining [2]
30. Gross domestic product (GDP) per capita (in US$) or GNP per capita [5]
31. Income per capita (in US$) [5]

NOTE: Usually either GDP/capita or per capita income figures are available, and either can be used for the island records

==========

SPECIES Database

Island Database - SPECIES Record Category: [1.....] Category No. [2]
(Plant=1; Insect=2; Other inv=3; Rept/amph=4;)
(Bird=5; Mammal=6; Marine=7)
Genus [3.....] species [4.....] ssp [5.....]

Family [7.....] Taxonomic Status Uncertain [6] (*)
Common Name [8.....]
INTEREST: Conservation or Invasive species [11] (C/I)
DISTRIBUTION Type [9.....] Code [10] (E=Island Endemic N=Native)
(Global; Pantropical; Regional; etc.) (G=Group Endemic I=Introd)
LOCATION [12.....] (for this distribution record)
Location Type [13] (O=Ocean; R=Region; C=Country; A=Archip; G=Group; I=Island)
COUNTRY [24.....] (in addition to location)
HABITAT [14.....]
POPULATION Size (Year) [15.....] Trend [16.....]
(Increasing; Decreasing; Stable)
CONSERVATION STATUS [17.....] Listed in Red Data Book [18..] (RDB)
(Endangered; Vulnerable, Rare, Indeterminate, Unknown)
IMPACT [19.....]
Explanatory notes 20_____
References 22_____
Priority [23] (1=high
Record Notes [21.....] 2=medium 3=low)

1. Category of organism: PLANT; INSECT; OTHER INVertebrate; REPTile/AMPHibian; BIRD; MAMMAL; MARINE life [9,XXXXX]
2. Category number: 1 = PLANT; 2 = INSECT; 3 = OTHER INV; 4 = REPT/AMPH; 5 = BIRD; 6 = MAMMAL; 7 = MARINE [2]
3. Genus name (with first letter capitalized) [20,Xxxxxx]
4. Species name (lower case) [20,xxxxx]
5. Subspecies or variety name [20,xxxxx]
6. Enter an asterisk "*" if there is doubt or dispute about the taxonomic validity of the species or variety [1,*]
7. Family to which the species belongs [20,Xxxxxx]
8. Common name if one is widely used, preferably in English [50,Xxxxxx]

NOTE: Make an entry for either 7 or 8, not both (to save space). Families are more usual for plants and invertebrates, common names for birds and mammals. These are included for additional identification, not to be comprehensive.

9. Type of distribution: global, pantropical, regional, disjunct, country endemic, group endemic, island endemic [25,xxxxx]
10. Code letter for distribution: E = island Endemic; G = Group endemic; N = Native; I = Introduced [1,X]
11. Enter "C" if the species is of conservation interest, or "I" if it is to be listed as an invasive introduced species of ecological importance [1,X]
12. The location name (island, group, archipelago, country, region or ocean) for this particular record, using the same spelling as in the island records [40,Xxxxx]
13. Enter a one letter code for the type of location in 12: I = Island; G = Island Group; A = Archipelago; C = Country; R = Region; O = Ocean [1,X]

NOTE: Use the smallest location scale that corresponds to the actual distribution of the species, and repeat species records for each separate area where the species occurs. A species that occurs on all islands of an archipelago can be listed for the archipelago, but if it is only on some islands, make a separate record for each island. Otherwise the archipelagic record will result in listing the species on islands where it does not occur.

14. Brief text describing the habitat or locality where the species occurs [70,xxxx]

For SPECIES OF CONSERVATION INTEREST, complete 15 to 18:
15. Surviving population size or number, with year in parentheses [17]
16. Population trend [10]: Increasing, Decreasing, Stable
17. Conservation status of the species, with a capital if designated by the World Conservation Monitoring Centre [20]: Endangered, Vulnerable, Rare, Indeterminate, Unknown
18. Enter "(RDB)" if listed in a Red Data Book [5,(RDB)]

For INVASIVE SPECIES, complete 19:
19. Short text description of the impact of an invasive introduced species [70]

20. Explanatory notes [text of unlimited length]
21. Notes on the record entry, cross references, etc. not for output [50]
22. References, entered directly or compiled from references data base [text of unlimited length]
*23. Priority rating for this record, if the number of species to be included must be limited [1]: 1 = high; 2 = medium; 3 = low
*24. Country name, in addition to the location in 12, to distinguish records for islands with the same name, and to allow country species lists [40] (not on form)

REFERENCES Database

Island Database - REFERENCE Record

Authors (last name first). Year. Title. Source, City. 999 p.
[1 .....]
[.....]
[.....]
[.....]
[.....]
[.....]

Read: [2] Include in general bibliography: [3] (Y/N)

Subject 1: [4.....] Type: [5]
Subject 2: [6.....] Type: [7]
Subject 3: [8.....] Type: [9]

Subject types:
C = country
I = island
S = species

Notes:
[10.....]

Updated: [11.....]

==========

1. Full reference, formatted for printing on six lines available [80;75;75;75;75;75]:

SAMPLE FORMATS:
Paper in journal:
Authors (last names first). Year of publication. Title of paper. Journal title Volume(number):pages.
Book:
Authors (last names first). Year of publication. Title of book. Publisher, place. Number of pages.
Paper in a collective work:
Authors (last names first). Title of paper, page numbers. In Editors (last names first), Title of collective work. Publisher, place.

2. Has the reference been read or examined? Y or N [Y]
3. Include reference in the general bibliography? Y or N [Y]
4,6,8. Names of specific islands, countries or species under which this reference should be listed; if it is an important reference for more than three, include it instead, or as well, in the general bibliography [75,Ixxxx]

NOTE: A reference can be repeated if more than 3 specific inclusions are needed.

5,7,9. Enter a single letter code for the type of subject in 4,6, or 8: C = country, I = island, S = species. [1,X]
10. Notes concerning the reference (location, question to check, etc.) not to be printed with reference. [80]
11. Date when reference entered or updated (day/month/year). [8,99/99/99]

APPENDIX 10.

PRINCIPLES OF ELECTRONIC INFORMATION EXCHANGE: INTRODUCTORY MATERIALS

10.1
Computers for NGOs

10.2
A General Introduction to Computer Communications

10.1
COMPUTERS FOR NGOs:
AN OPINIONATED ADVISORY

Island Resources Foundation

NGO NEWS for the Eastern Caribbean

Linking Environmental Policy Concerns and NGO Institutional Development

SPECIAL ISSUE **JULY 1988**

COMPUTERS FOR NGOs

An Opinionated Advisory

Programme managers of NGOs (non-government organisations) in the Eastern Caribbean are increasingly faced with difficult decisions regarding the potentials of computerization within their organisation. The risks and costs of building a good computer system are substantial. On the other hand, there are costs and risks associated with not doing so. For example, successful fund raising strategies favour the more efficient NGO -- which is likely to be the one using a computer effectively.

This issue of NGO NEWS will address some of the concerns of NGOs faced with the complexities of the microcomputer revolution. We call it an "opinionated advisory" because we have included specific recommendations based on our own experience with computers and on our observations of many smaller NGOs in the region who have begun to experiment with computers.

For a less opinionated and more deliberate review of the use of microcomputers under conditions often experienced by NGOs in the Eastern Caribbean, we recommend Microcomputers in Development, A Manager's Guide, by Noel Berge, Marcus Ingle, and Marcia Hamilton. The revised edition was published by Kumarian Press in 1986, and Island Resources Foundation can make limited copies available, upon request, to Eastern Caribbean NGOs.

It is important to note that this issue of NGO NEWS is being written in July of 1988. Given the speed of change in the microcomputer arena, many of the opinions and recommendations expressed herein will probably be outdated within a year or two.

POWER

A particularly troublesome problem for the Eastern Caribbean computer user is the lack of a stable electrical power supply. We strongly recommend that you solve this problem before doing anything further. Here is one practical option.

You will need:

1. A reasonably new, 12 volt, car battery. It does not have to be big or extravagant.

2. A small, 12 volt, "automatic" battery charger rigged to work on the local electrical system (110 or 220/240 volt).

3. An "inverter" which converts 12 volt direct current to 110 volts AC, at 60 cycles-per-second. A relatively small inverter (500 watt output) should be large enough. This is the most pricey element of the package, maybe US$300 - $500.

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With these parts, a system can be rigged which protects the computer from line voltage fluctuations and provides abundant backup power for long outages. It also permits the NGO to buy U.S. standard (e.g., 110 AC, 60 cycles-per-second) equipment which would be considerably cheaper than 220/240 volt systems. Total cost of the above items should be approximately US$500, which makes it much cheaper and more flexible and repairable than most commercial "uninterruptible power supplies" (UPS's).

To operate, first plug the computer into the inverter. If you do not have many other extra accessories on your computer, a dot matrix printer can also be plugged into the inverter. Otherwise, the printer can be plugged directly into the local power supply (or into a transformer if required) because, in general, printers are more tolerant of unstable power supplies.

Next, attach the inverter to the 12 volt battery.

Finally, attach the battery charger semi-permanently to the battery, and plug it into the local electrical mains whenever the computer is used.

THE SYSTEM (Hardware)

Having arranged to neutralize the power problem, the NGO must now confront its own worst nemesis -- its unrealistic expectations about what a computer can do for the organisation.

The conventional wisdom says that the way to pick a computer is to:

1. Decide exactly what it is you want to accomplish;

2. Determine exactly which software package does that exact task best; and then,

3. Buy only the hardware system and peripherals which that software package requires.

We maintain this is not the best approach -- if only because the NGO cannot know exactly what it wants, especially in the absence of information about how the computer might (and probably will) change what the organisation is already doing.

In the following discussion, we try to address the real world and divide the decisions the NGO needs to address into 3 general scenarios:

(1) Desert Island Computing;
(2) The Social Computer; and
(3) The Donation.

Desert Island Computing

If your NGO does not live on a desert island which has no other microcomputers, then it should choose its computer system based on a very simple dichotomy:

A. The NGO is more concerned with presenting information to outside audiences;

or

B. The NGO is more concerned with assembling and analysing data.

If the NGO is an "A", it should seriously consider an Apple MacIntosh SE for about US$2,000 -- with an Imagewriter dot matrix printer, or a Laserwriter if the organisation can afford the extra US$2,500 and it has a robust battery and inverter in its power system. It is our subjective opinion that most small NGO computer users in the Eastern Caribbean would

benefit substantially from using Apple MacIntosh computers.

If the organisation is a "B", an IBM compatible is probably more appropriate. If the NGO has limited financial resources, that would be an XT model (probably with a high speed processor) at about US$1,000, plus US$300 for a less expensive, 9-pin dot matrix printer. (The Citizen 120D is one model which IRF has used successfully.)

If the NGO has more substantial revenues, it should consider purchase of an IBM AT (hard disk) compatible computer for US$2,000, plus another US$1,600 for a Laser printer. The IBM PS/2 series computers cost more and offer special features which are not [yet] relevant to the needs of most Eastern Caribbean NGOs.

In this scenario there is no "C". We do not recommend other computer systems, including: the Amstrand, the Apple II series (the "old" Apple), the Apricot, CP/M-based computers (including the old KayPro models), the Commodore 500, 1000 or 2000 machines, the various Sinclair computers, or the Amiga ST. See comments below under "Donations."

The prices estimated above are from U.S.-based, mail-order (discount) houses which should be seriously considered rather than buying from a retail dealer. Mail-order options include: Dell, CompuAdd, Bentley, Forty-Seventh Street Photo, or Northgate, all of which can be found advertising in any recent issue of a U.S.-published computer magazine such as Byte or PC Magazine. The risk of having to return equipment purchased off-island because of a defect or other problem is small compared to the 50 percent (or more) cost advantage.

The Social Computer

Most computer users are not totally isolated as most islands in the Eastern Caribbean have a surprisingly wide community of computer users. The wise buyer will therefore identify a system which closely matches the capabilities of existing systems on the NGO's island.

First, run through the criteria given above to determine which machinery would best fit the NGO's needs in the abstract (i.e., MacIntosh or IBM compatible). Then see if there are other computers of that general type already being used. In most places you will find a number of IBM PC compatibles in legal and real estate offices and in government agencies. It is worth taking an extra effort to track down MacIntosh users, if this fits the needs of your organisation. Many printing companies or advertising agencies are starting to use MacIntosh computers for meeting publishing and graphics requirements.

The important point is to build your own backup and support organisation (in other words, a "users group") from among the resources available to your NGO in its local operating environment.

Like many NGOs in the Eastern Caribbean, Island Resources Foundation has vacillated between the display capabilities of the MacIntosh and the greater availability of the IBM. At the present time all our equipment is IBM compatible (partly because many of the institutions with which we work have IBM systems). But we still think seriously about the MacIntosh because of its desktop publishing capabilities. The Mac remains the machine to buy for impressive graphic display and output at moderate prices. In addition, it is a perfectly adequate general purpose computer system for

virtually all of the membership processing, spreadsheet, and accounting needs of most Eastern Caribbean NGOs.

The Donation

If your NGO has had an IBM compatible or Apple MacIntosh computer donated to it, count yourself truly fortunate. Think seriously about up-grading donated machinery with hard disks or extra floppies. Machines which are equipped with regular IBM monochrome display adapters (MDA cards) would benefit from adding a relatively inexpensive Hercules compatible monochrome adapter. IBM machines with less than 640K of memory should be "filled out." Old style MacIntoshes should be upgraded to support at least 512K memory and two double-sided (800K) floppies.

If your NGO has been offered the opportunity to share time and access to one of these machines, accept the offer gratefully. Limit the applications used to self-contained, one-time-only jobs, such as the production of very simple mailing lists or word processing applications. Keep all of the NGO's information on separate diskettes and remove all working files from the donated machine's hard disk at the end of each working session.

Do not develop complex mailing lists, membership, library, or accounting record systems on donated computers which are not fully controlled by the NGO. The cost of developing such systems and the value of the records they contain is such that the NGO cannot afford to start over when the lender decides there are other priorities for the equipment which do not include the NGO.

In general, word processing systems are sufficiently similar that shifting applications and information from one machine and one programme to another (e.g., Wordstar to Word Perfect to Microsoft Word) is no longer a complicated procedure.

If a benefactor of the NGO donates a machine which is not an Apple MacIntosh or IBM compatible, do not think seriously about <u>ever</u> using such equipment. This is particularly important if the donated machine is a so-called "orphan" -- computers whose parent-manufacturers have disappeared like Osborne, Eagle, Televideo, Morrow Designs, and Vector. Any NGO must weigh the problems of securing adequate support (e.g., replacement parts or repair) for non-standard systems against the gain of having "free" equipment. Better to raffle off the donated, non-standard machine at a fund raiser!

APPLICATIONS (Software)

Contrary to expectations, a computer takes extra time and labour - at least initially. It should be fully appreciated that the computer represents a major <u>investment</u> of hours, money and staff/volunteer effort by the NGO. These resources are in critically short supply for NGOs, and if that investment is squandered, computerization could well prove to be a fatal diversion of organisational energy.

Decisions about how to utilise the computer will always be highly political choices and represent a prioritizing of what is important within the organisation. Accepting that fact, the following considerations should influence the use of the computer.

- Seek out fund-raising opportunities to help <u>make the computer pay for itself</u>. Possible options range from improved newsletters to justify increased membership dues, to off-island direct-mail solicitation campaigns, to build-

ing annotated databases which can be made available for reasonable search fees.

- Move from the easy to the more difficult. In general, it will not take long for NGO staff or volunteers to learn how to use word processing programmes to produce simple letters or reports, but it can take several months of experience before the word processing programme is used to generate personalized mailings or cross-referenced indexes. It also makes sense to start using word processing programmes before moving on to more complicated systems such as database managers or desktop publishers.

- Use the right tools. Just as a carpenter would not drive nails with a saw, it is a misuse of computer tools to utilise a spreadsheet or word processing programme to keep voluminous membership information. The proper tool is either a database programme or a special purpose membership application programme. Misusing software programmes results in a great waste of time and effort.

- PRACTICE RIGOROUS BACKUP AND DATA SECURITY MEASURES. As more and more of the group's basic information is embedded in the computer, the success of a specific programme or fund raising strategy may depend on having backup copies. Data security is a surprisingly complex subject. It is worth seeking professional advice each time there is a major change in the applications being used by the NGO or in the equipment configuration.

We strongly recommend that applications programmes used by the NGO be mainstream products, supported by major software companies. Buy through mail-order, discount houses -- there is little or no advantage to buying software from a retail dealer. Recognising that there is enormous room for differing opinions, we offer the following recommendations for IBM compatibles, current as of July 1988.

WORD PROCESSING. For most groups, a word processing programme should be the first major application programme secured. The two best choices in our opinion are Word Perfect and Microsoft Word. The first is slightly easier to learn, and the second is slightly superior in layout and formatting capabilities.

DESKTOP PUBLISHING. Aldus Pagemaker is the current leader, in both IBM and MacIntosh formats.

DATA MANAGEMENT SYSTEMS, including general purpose database management as well as membership, bibliographic reference, and other application-specific programmes. All such programmes should generate database files which are fully compatible with the dBASE III Plus (and eventually, dBASE IV) format which is a world standard.

In recent months we have noted a number of RBASE systems being installed for natural resource applications in the Eastern Caribbean. We oppose this trend because neither the RBASE file formats nor the programming are compatible with the dBASE III standard. There are very few trained RBASE programmers, relative to the number of experienced dBASE III users.

Wherever possible, we encourage the use of flat file managers, such as REFLEX, rather than dBASE III+. In addition, we encourage the use of dBASE clones, such as dBXL, rather than the five times more expensive dBASE III+.

As a point of information, IRF is using a public domain programme called REF-MENU to build a massive bibliographical database (dBASE compatible) of resource management publications dealing with the Eastern Caribbean. For NGOs with a specific interest in this topic, we would be happy to provide copies of the programme or relevant portions of the database as developed to date (i.e., covers St. Lucia, St. Kitts-Nevis, Grenada, Dominica, and the Eastern Caribbean region). Contact Mr. Ian Jones at IRF headquarters in St. Thomas for more information.

SPREADSHEETS. As with data managers, it is important that spreadsheet programmes be capable of writing and working from Lotus 1-2-3 files. Version 2a of 1-2-3, however, is less flexible than such programmes as VP-Planner Plus or MultiPlan which offer "3-dimensional" spreadsheet capability, especially useful for organisations which need to set up fund accounting systems.

ACCOUNTING. Computerized accounting systems are extremely complex and often cost in excess of US$1,000 per module (e.g., General Ledger, Accounts Receivable, Payroll). U.S.-produced systems may not meet reporting requirements for Caribbean governments. Consult with your local accounting firms on options. Although accounting is usually cited as a potential target for NGO computerization, it is seldom the most cost-effective application for small groups.

For those NGOs in the accounting systems market, however, we recommend serious evaluation of so-called "fund accounting" systems in order to have the capability to separate various pools of restricted monies from special purpose grants and contracts. This is critical for groups which may be seeking support from international organisations.

COMPUTER PROGRAMMING LANGUAGES. Most computers come with a version of BASIC. We do not recommend the use of any computer language. Computer programming is beyond the cost-effective needs of any small to mid-sized Eastern Caribbean NGO.

QUESTIONS WELCOMED. Should you have specific questions about the computer requirements of your NGO, we welcome your inquiries. IRF might be able to arrange an on-site visit of our computer specialist to meet with your staff or volunteers. Address your correspondence to IRF's St. Thomas office, attention of Mr. Bruce Potter, who researched and wrote this special issue of NGO NEWS.

NGO NEWS is published by Island Resources Foundation, in cooperation with the World Wildlife Fund-US and Rockefeller Brothers Fund. Questions, comments, and contributions from readers are welcome and should be sent to Island Resources Foundation, NGO Institutional Development Project, Red Hook Centre Box 33, St. Thomas, U.S. Virgin Islands 00802.

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10.2
A GENERAL INTRODUCTION TO COMPUTER COMMUNICATIONS

TABLE OF CONTENTS

BACKGROUND MATERIALS

COMPUTER COMMUNICATIONS WORKSHOP

CAMROSE INTERNATIONAL INSTITUTE, CAMROSE ALBERTA

ALTERNET COMMUNICATIONS, OTTAWA

CANADIAN INTERNATIONAL DEVELOPMENT AGENCY

AN INTRODUCTION TO COMPUTER ASSISTED COMMUNICATIONS

Bob Thomson, AlterNET Communications, Ottawa, February 13, 1990

1.0 Why Computer Assisted Communications?

With the Fax "revolution" still growing on us, why should we be bothered about computer assisted communications when it can be confused, offers a myriad of competing services, often uses a lot of technical jargon, doesn't cost all that much less than the fax and needs more training to use effectively?

Well, the straight answer is, information is power these days and if we want to get our message across, save a lot of time and be more effective in our work, we have to have access to more than a one-on-one, point to point media like the fax.

Computers store vast amounts of information that can be useful if we know how to get at it by remote access to many shared systems.

But I already have access to more information than I can cope with you say!

Yes, but you can organize, sort, select, store, copy and discriminate amongst electronically available information far more effectively than that pile of unread papers, clippings, magazines, reports and fading fax papers on the corner of your desk.

And it doesn't require sophisticated databases or costly data input to get access to those vast amounts of electronic data, much of it the same stuff as the physical pile on your desk.

What's more, the information you receive, send, organize, sort, select, store, copy and edit using your computer and modem doesn't ever have to be retyped, and the quality of reproduction is 100% every time, unlike second and third generation photocopies and faxes.

True, you can't send graphics (photos, drawings, etc.) as easily as with the fax, but we're not arguing fax vs computer communications exclusively here. Both have their niche and their uses. And their costs (more on that later). You can however, with some patience and training, send graphics using computer communications.

Experience has shown that greater time and effort put into computer communications by NGO's will have a greater payoff than fax technology with respect to access and effective management of information.

2.0 What is Computer Assisted Communications?

Computer assisted communication allows people, at different times and places, to exchange text messages through the use of terminals or personal computers connected by a communication link such as the telephone system, radio or telex. There's no need for everyone to be available at the same time as on the telephone, or to have a dedicated phone line as with a fax.

Third party computer communication services allow the sharing of disk space, international access, multiple copying, etc. Some even allow you to send faxes and telexes from your personal computer.

In essence, computer assisted communications use computers to store and forward computer generated material for two or more people wanting to exchange data, messages, documents, files, etc. Anything you can produce on your computer can be transmitted via a modem attached to your computer over the phone lines (or radio waves) to any other computer also equipped with a modem.

Normally this is done by using a third party computer to receive and store the material until someone else calls to retrieve it. It can be stored in public areas (often called conference areas), or in password protected private areas accessible to only a few individuals or a group with special internal communications needs.

Public areas, or conferences, and their contents, are as varied as the users and contributors of the particular computer communications service being offered, and there are literaly thousands of services available in North America, Europe and the Third World. Some of these are commercial services, but many are operated by non-profit or volunteer groups and are virtually free with a local phone call.

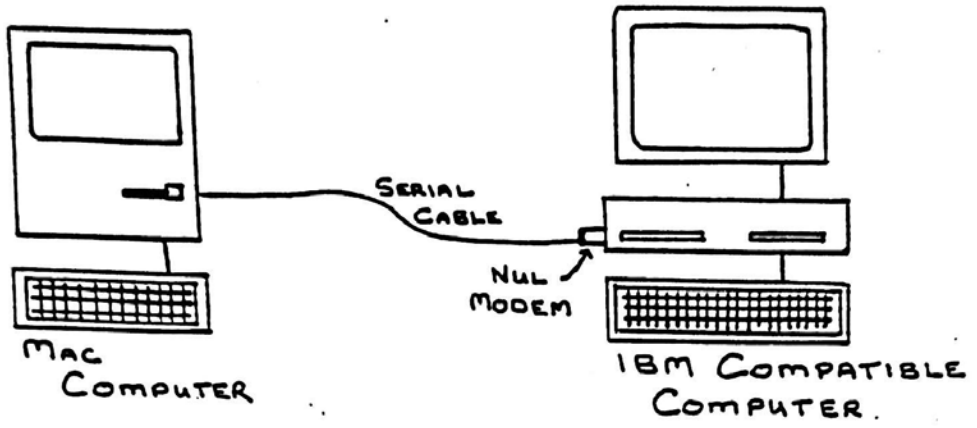
Examples of conference material and electronic message or mail services available on four systems of particular interest to Canadian NGO's are provided below and in the appendices of this brief guide.

Computers "talk" to each other over the phone lines and there are a number of ways to do this, most involving a local phone call, no matter where the computers are located with respect to each other, across Canada, around the world or in the same town or city or village.

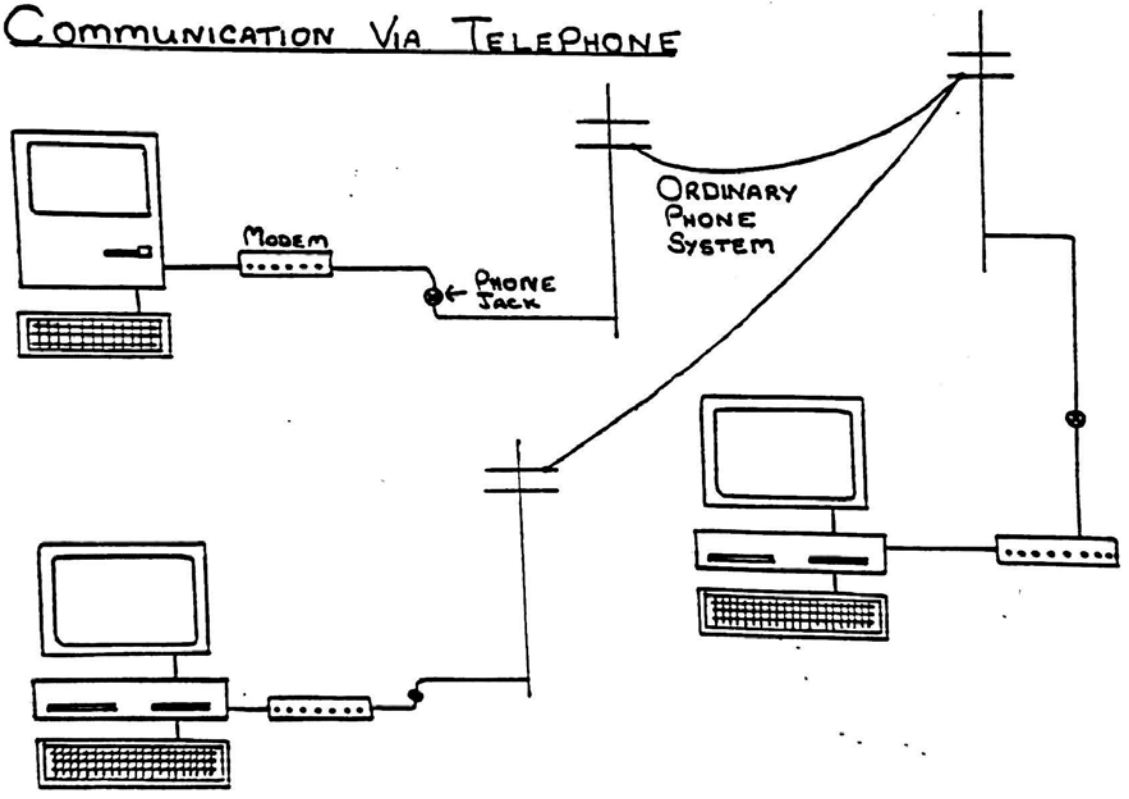
The cheapest way to connect computers is via a packet switching carrier service run, in most cases, by the local telephone company. In Canada, the largest packet switching network is Datapac, which allows you to call a local number in almost 200 municipalities in Canada and connect to their central computer.

Basics of Computer Communication

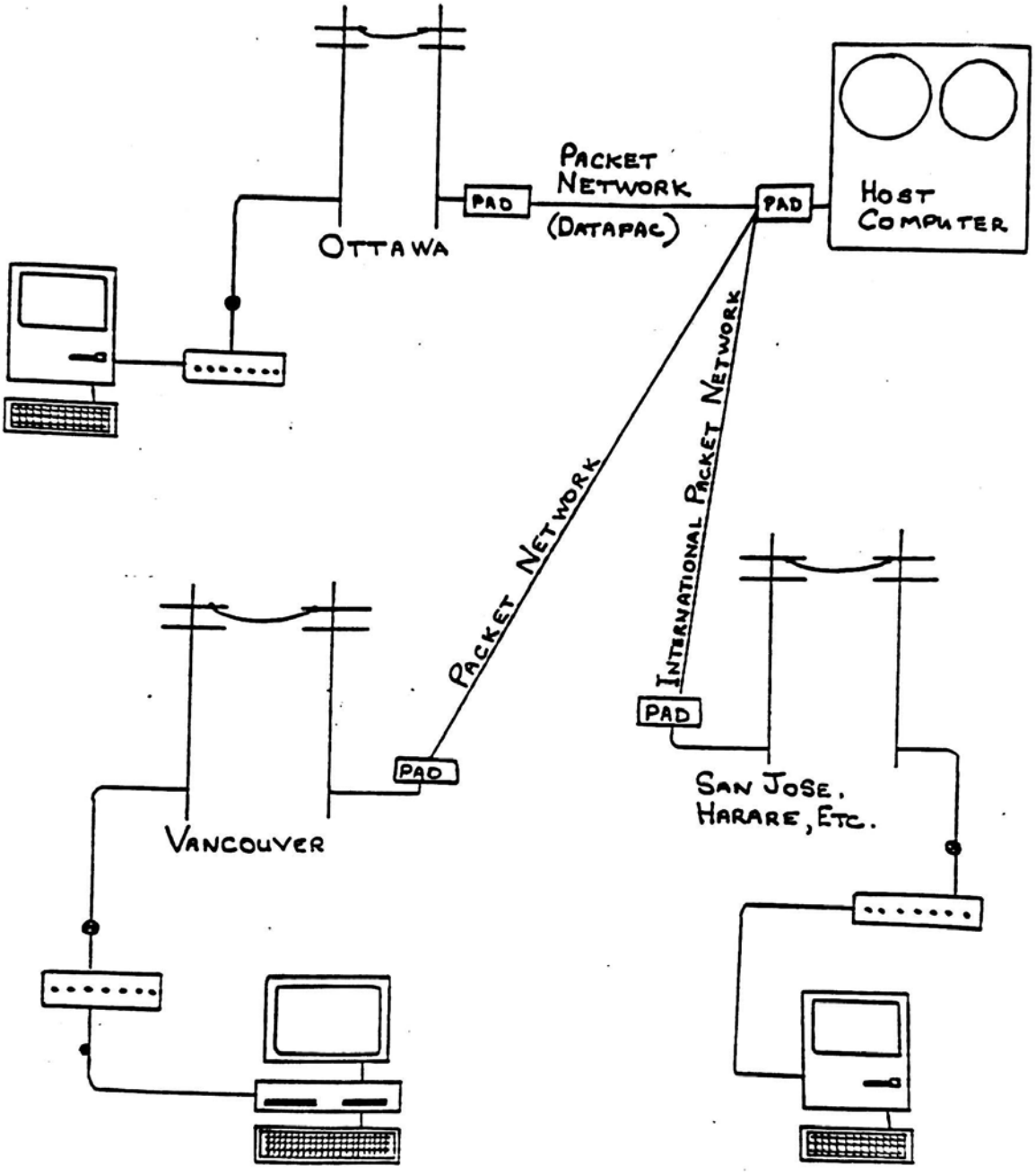
Direct Communication



Communication Via Telephone



"PACKET SWITCHED" NETWORK TO HOST COMPUTER



When you get your computer to call the local Datapac telephone number and establish a connection with their computer, you type in an 8 digit "address" for yet another computer connected to Datapac. You do this using a computer communications software programme running on your computer. This programme controls the connection between your computer, your modem, the phone line and the computer or computers on the other end of the phone line. The most commonly used computer communications programmes are ProComm for IBM or compatible computers and Red Ryder for MacIntosh computers.

The computer at the other end of the Datapac phone connection has special equipment and a special phone connection to Datapac. It is usually an "information provider" or "information service", as opposed to a "carrier" such as Datapac. Charges for the use of Datapac as a carrier are normally calculated by the information service and billed back to the user by the information service. It is possible to get a "network user identifier" or NUI from Datapac and to use Datapac to call other carriers or services at an international level and pay Datapac directly for this carrier service. Most NGO's however can make do without that level of service unless they are large organizations and can justify the costs of their own private connections to Datapac.

Information providers connected to Datapac are "host" computers which offer services such as the ability to leave and receive messages or to read files left there by others or to search through data bases of information provided by others.

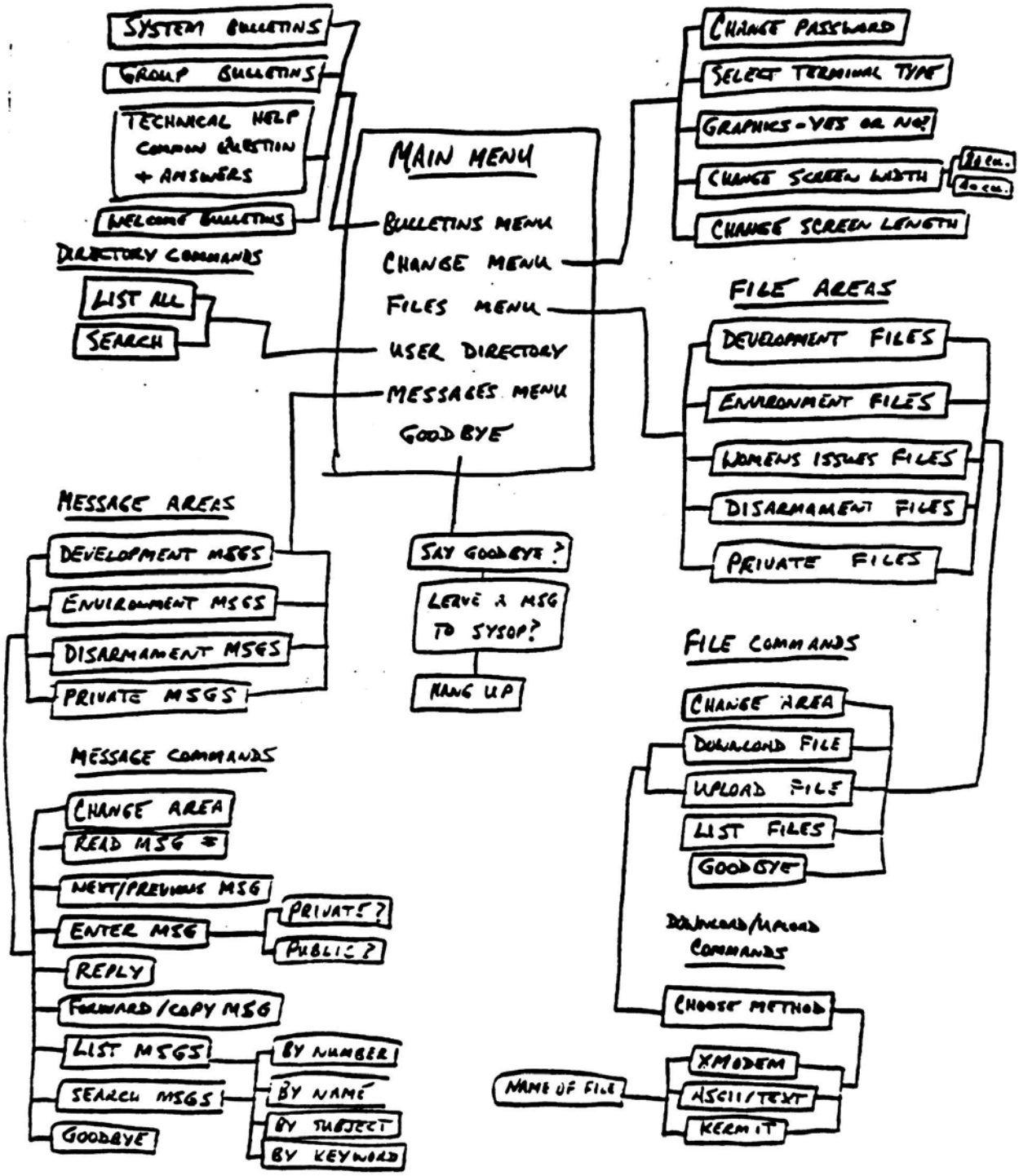
They do this using special information service software which organizes the files on it's own disk drives in a way that allows outside users to "wander around", see what's there and "ask" the "host" computer to send some of that information or to receive something from the users computer. The communications software you use on your personal computer (ProComm or Red Ryder) has commands that allow you to turn on your own disk drive to receive and "capture" data coming in over the phone line or to send data from your own disks to the host computer.

The computer communications software which controls all of these interactions between computers can be very simple to use or very difficult.

The best software uses a menu style to present choices to the user. A menu only requires the selection of a number or a letter from a group of options displayed on your screen in plain English (or French or Spanish or whatever).

The worst software requires you to learn a bunch of commands and to type them out from your keyboard without much prompting from the host as to what your options are at that

SAMPLE FIDO BBS MENUS AND COMMANDS



particular point in your online session. This might be fine if you are a frequent user of the service and know your way around, but it is the single greatest frustration of new users and possibly the greatest obstacle to access to this new information technology.

Most systems use a combination of both menu and command oriented software. Some can actually vary the levels of prompts, menus, command summaries, etc. that are shown on the screen, according to whether the subscriber is a novice, intermediate or expert user. Without good documentation however, most novices find it difficult to even find out this much, get frustrated at the lack of overview they see from the screen and can't even change their help level to the novice setting.

Most services however, will start you off assuming you're a novice and you have to change to a higher level yourself once you know what's going on. The detailed menus at the novice level are usually somewhat repetitive however, and many users are driven to distraction as they choose menu or command options, get it wrong and have to go back to the same slowly scrolling screen again and again. It is at this point that many users feel the pressure of the clock ticking away the dollars, further adding to their frustrations.

For these reasons, good documentation, subsidies for the first few hours of online learning time and easy to use, menu oriented systems are important components of any introduction to computer assisted communications.

3.0 So what's out there?

There are dozens, perhaps even hundreds of computer communications services available today, each with its own sets of commands, prices, features, etc. There are only three or four however which Canadian NGO's need to be concerned about in order to have access to a wide range of information. Since they are all structured more or less the same way, the commands you type on your screen are relatively straightforward and often use simple menus which steer you around a system to the areas you want to get information from.

If you've learned to use a word processor, learning to use communications software and one or two computer communications systems such as iNET, the WEB or a local electronic Bulletin Board System (BBS) is not that daunting. The purpose of this general introduction is to provide you with a basic appreciation of what is involved and how to use the software and systems you might use in your daily work.

3.1 iNET

We begin with the system called iNET, a commercial computer communications service offered by Bell Canada and the

Provincial telphone companies. iNET offers a messaging or electronic mail service (called ENVOY 100), as well as access to databases such as InfoGlobe and Southam's Infomart press indices. iNET's principle advantage is its wide user base, with thousands of users already online across Canada.

One feature of iNET is its Noticeboards. These are special conference areas which provide material of interest to specific interest groups such as CCIC members and other Canadian NGO's involved in international development. As a pilot project, CCIC has set up a CCIC Noticeboard on iNET under an Association Agreement. The Association Agreement not only gives all iNET subscribers that join under the Agreement access to this Noticeboard, it also waives the $55 first time iNET subscription fee for CCIC members. CCIC's Noticeboard contains minutes of CCIC meetings, a calendar of upcoming events, articles from "The Political Scene" before printing, etc. This service will be updated regularly with current information requested by and found to be of use to the CCIC membership.

With access to iNET's messaging service (Envoy 100), CCIC members can submit proposals and reports to the R & R Fund and other CIDA designated funds operating out of 1 Nicholas St. such as Partnership Africa Canada, South Asia Partnership, etc. at a fraction of the cost, inconvenience and delay involved with couriers, fax or Canada Post.

iNET also offers a feature, called an "outdial modem", which allows you to call local computers and BBS's in 18 Canadian cities at per minute rates which are quite competitive. iNET allows access through 800 numbers across Canada as well and so may be seen as a carrier service, as well as an information service. So, with a portable computer, you can be in touch from the cottage, from a hotel, anywhere you can get to a phone.

iNET e-mail service has a large commercial user base but costs some $19/hour of connect time during the day because it has a wide range of services and databases which aren't necessarily of use or interest to most non-profit organizations. Their connect charge for access to the "outdial modem" and to some "information providers" (for which they act as a carrier or transport service) is $8.40/hour from 6 am to 6 pm and $6.50/hour from 6 pm to 6 am. Depending on the "information provider" used, there is an additional charge above this carrier charge.

One of the "information providers" of interest to Canadian NGO's is the WEB, described below and in the appendices. In addition, any local BBS located in one of those 18 cities can be available at reasonable rates to anyone in Canada, making locally controlled yet globally inter-connected sharing of information a relatively low-cost reality.

3.2 WEB/APC

The WEB is the Canadian node of the Association for Progressive Computing (APC), which includes PeaceNET in California, GreeNet in London England, Nicarao in Managua, AlterNEX in Rio de Janeiro, Pegasus in Australia, FredsNaetet in Stockholm and other systems still in the process of being established. The WEB is associated with the Ontario Environmental Network (OEN) and is located in Toronto.

The WEB is accessible via Datapac, a computer communications carrier available through a local phone call in almost 200 Canadian towns and cities, and via iNET's Gateway and outdial modem services. In addition to providing access to hundreds of North American, European and Third World NGO subscribers in the environment, peace and international development communities, the WEB's rates are quite reasonable.

A list of organizations using WEB/APC systems and an outline of some of the topics and material available in their electronic conferences is attached in the appendices.

3.3 FIDO Bulletin Boards

Through the efforts of countless volunteer "hackers" around the world, there is a de facto software "standard" for electronic bulletin boards (BBS's) called FIDO. FIDO BBS software is used on over 5000 systems around the world and has the capability to network (ie. exchange messages and files) with any other FIDO based BBS in the FidoNET. Local BBS systems can be set up for the cost of a computer and a local phone line. If operated as a part-time BBS (eg. in the evenings), even these costs can be shared with other users of the same computer and phone. Many systems are set up by teenagers and the set-up and maintenance requirements are well within the technical competence of anyone with a basic understanding of DOS (the IBM compatible Disk Operating System) and a few hours a week to run a volunteer system.

FIDO software, in addition to its simplicity and low cost ($75), permits the automation of message and file exchanges with other FIDO BBS's via a network of nodes based on Area Codes within North America. European and Third World FIDO systems can be accessed via long distance or even via gateways offered by some commercial systems. The long distance phone costs of this networking are minimal, since most systems are programmed to exchange material in the middle of the night. Many use data compression techniques and new high speed modems to further reduce phone time. Transmission of text from Canada to Australia using equipment within the budget range of volunteer systems is becoming possible at a rate of close to 50 pages per minute.

FIDO Bulletin Boards of interest to Canadian NGO's include AlterNET in Ottawa, Catalyst in Vancouver, Alternatives in

Winnipeg and ISISHQ (now in Ottawa, moving soon to Toronto). As noted above, there are hundreds of other local BBS systems (50 in Ottawa alone), although many of these are technically oriented and more of interest to "hackers" than to social activists.

3.4 GeoNET

GeoNET is a London UK based computer communications system widely used by European and Third World NGO's. An outline of some of their users and conferences is provided in the appendices.

It can be an expensive system to use since you need an account with Datapac to cover their transatlantic carrier charges and then pay for GeoNET's costs as well. Messages between APC nodes and GeoNET are now easily available however, because GreeNET and GeoNET share offices in London. A message sent on the WEB "To: gn!geo2!ciir-dr" will go to GreeNET from Toronto, across the room to the GeoNET computer and be picked up in their electronic "mailbox" by the office of the Catholic Institute for International Relations in the Dominican Republic when they next check their GeoNET account.

4.0 You CAN get there from here!

One legitimate concern of users and potential users of computer assisted communications is the plethora of commercial and volunteer systems available. To be able to communicate with someone electronically, both parties have to have access to the same system, as well as having both a computer and a modem. Until recently, this meant having to subscribe to the same systems.

In the past year however, considerable advances have been made in automated gateways between many systems. Without getting into the technical jargon, it is now possible to automatically send a message or a file to someone on another system by putting the appropriate address and connecting path from the system you're using.

This may be as easy as choosing from a menu on some systems that encourage inter-connectivity (instead of monopoly), or may be as arcane as putting a complex line of text at the beginning of your message describing the electronic "path" that it has to follow to get to the user on the other system.

For example, a message left on the WEB in Toronto can be sent to AlterNET's FIDO BBS in Ottawa by simply addressing it to "AlterNET!bob_thomson" at the WEB mail prompt "To:". In other cases, eg. from a FIDO system to a UUCP system like the WEB, another FIDO system might act as a gateway to the WEB. This would require sending a FidoMail message to another system (eg. FidoNet 1:163/162) from AlterNET

(FidoNET 1:163/113) and putting "To: WEB!support" in the first line of the message. Another example would be ">INTERNET: jdoe@hostb!@hostc.bitnet" which would send a message from CompuServe (a US commercial system - more about it later) to user "jdoe" on the computer "hostb" via "hostc" on the Bitnet system. The point is not so much that you have to be a technical wizzard to get from here to there, but that it CAN be done and all you need is a simple guide and the electronic address of whoever you want to communicate with.

5.0 What's it gonna cost?

Assuming you've already got a computer and just need to buy a modem, the costs are much less than fax.

A 2400 baud modem (bauds are the measure of speed of transmission of data and 2400 is the fastest widely available service at this time) will cost you between $150 and $200.

In addition, you'll need communications software. The most widely used and least expensive software packages are ProComm for the IBM and compatibles ($25) and Red Ryder for the MacIntosh (about $100). They are both what is known as Shareware programmes, ie. the owners of the copyright are not into gouging you, and only try to recover the costs of distributing and supporting (and improving) the programmes at these prices.

Both Procomm and Red Ryder support "command files" which allow you to automate the process of calling, entering your "id" and password and even uploading or downloading messages and files on any of dozens of separate systems. If you aren't interested in learning how to do that, someone can set up a disk for you with the appropriate command files for the e-mail systems you want to use. You may want to learn at least how to modify them however, as it is recommended that you regularly change the password on any computer account you use. This can usually be done with your word processor and is not a difficult task.

The costs of accessing the various systems described above vary and are outlined below.

5.1 iNET

iNET normally charges $55.00 as a one time registration fee and $3.30 per month for administration of an iNET account. As noted above however, you can have the $55 waived by telling iNET when you call that you are joining under the AlterNET Association Agreement. Call iNET at 800-268-9102 to register. You can also call collect to 416-430-7525. Be su you mention the AlterNET Association Agreement.

If the $3.30 a month ($39.60 per year) is more than you can afford, you can do this another way, although you'll have to make a special request to have access to the CCIC or other Noticeboards on iNET. Join the Canadian Airlines International frequent flier programme (it's free) and then join iNET under the Canadian International Association Agreement. Not only do they cover the $55 registration fee, but they waive the $3.30 a month administration fee. Apparently CAI has generated enough new iNET users under this promotional offer that it more than covers the monthly administration cost. You may find that joining under this arrangement brings you a lot of "junk" e-mail from Canadian Airlines International or other companies that they allow to promote. You don't have to read this and incur the online time charges for downloading stuff you don't want, but you'll have to learn to recognize messages from people you don't know and you can delete them before reading them.

After you've registered, iNET sends you a (free) binder with instructions on how to use the system and its many features. (Editorial comment: You'll find that iNET is not as easy or intuitive a system to use as others. However, there is an online tutorial and the manual. If you join under the AlterNET Association Agreement, the first thing you should see on your computer screen the first time you use the account will be the CCIC Noticeboard. The Noticeboard is menu rather than command oriented, and thus easier to follow for newcomers. iNET also offers a free 1-2 hour introductory lesson in most large cities, as well as an 800 number for voice assistance while you're learning.)

iNET's user rates are $16.50/hour from 6 am to 6 pm and $12.40/hour for non-prime time, ie. 6 pm to 6 am. The user rate while in the outdial modem service is $9.80/hour prime and $8.16/hour non-prime. To these rates are added a 9-10% federal tax and a 7% Provincial tax (in Ontario).

5.2 The WEB

The WEB's membership fee on joining is $25 for individuals and non-profit organizations. Public sector rates are a bit higher.

WEB subscriptions cost $100 per 6 months or $180 per year. This includes 5 hours of usage in the first month and 2 hours of usage every subsequent month.

System usage (after the initial amounts shown above) are:

Direct dial users (nearest minute)	$4.00/hour
Datapac & iNET users	2.50/hour

Telecommunications surcharge (carrier cost)

Datapac (billed by WEB)	$7.70/hour
iNET (billed by iNET)	3.30/month plus
	8.40/hr. prime
	6.00/hr. non-prime

Private Conferences (Public Conference access is free)

Private conferences cost $30/year plus storage charges. Storage charges are: 1st 200 kb free & $1/mon. for each 50 kb or part over 200 kb.

Inter-system e-mail and file transfers

A list of rates for sending mail or files to other APC systems and to other commercial systems is attached in the appendices.

5.3 Local BBS's or FIDO systems

As these are primarily volunteer run systems with access only to local users (ie. within the local Bell calling area), there is usually a nominal annual membership fee and no connect time charges.

Some systems that offer regular, reliable and extensive FidoMail services charge on a per message basis and may require a deposit against which usage can be deducted. This varies according to the system, but AlterNET for example requires a $25 FidoMail deposit and charges $0.66 per message for mail to FidoNodes within North America.

APPENDIX 11.

POSSIBLE RESEARCH AREAS RELATED TO ISLAND DEVELOPMENT
(Alison Hess, 1986)

Table of Suggested Research Areas and Questions

CATEGORIES OF SUGGESTED RESEARCH AREAS	BASIC QUESTIONS
Insular resources and resource systems	What is there and how does it work? How do ecosystems and ecosystem components interact?
	What "downstream" impacts can be expected from various "upstream" ecosystem changes?
	How do insular resource systems differ from continental systems? How are they similar? What information applies to both areas?
Island demography	Who is there? What do they want?
	What skills are available?
	What opportunities or constraints are posed by insular culture?
Traditional resource uses	What resource use techniques did people use historically to fulfill their needs without crossing environmental limits?
	To what extent are these systems still practiced? What benefits do they impart to island populations?
	Can these systems be upgraded to be more productive, or less labor-intensive, without sacrificing the aspects that make them sustainable on islands?
	What principles can be derived from these systems that can be applied to "modern" systems?
	What resource conservation techniques were traditionally used by island populations?
	To what extent are the foregoing techniques still used?
	Can the "traditional" conservation techniques, in part or in total, provide the basis for current conservation efforts?

Table of Suggested Research Areas and Questions (Cont.)

CATEGORIES OF SUGGESTED RESEARCH AREAS	BASIC QUESTIONS
Resource preservation	What mechanisms are available--and suitable--to protect resources with value transcending local needs, (e.g. endangered species) without excessively restricting local development options?
	How can island populations derive economic benefit from resource preservation?
	What means are available for islands to conduct effective surveillance and enforcement of conservation measures?
Resource restoration	What mechanisms are available--and suitable--to reclaim the productivity of degraded resources and ecosystems?
Resource enhancement	What mechanisms are available--and suitable--to expand insular resource productivity beyond natural levels?
Sustainable resource development	What opportunities are there to increase the income-earning capabilities of resource uses (e.g. agriculture, fisheries, aquaculture, tourism) without decreasing their long-term productivity?
	How can it be determined where certain technologies may be most successfully introduced?
	What linkages might improve the benefits imparted by investments (e.g. between public infrastructure development and water collection and storage?
Provision of human services	What mechanisms can ensure provision of required human services (e.g. waste disposal, energy generation and distribution, water distribution, transportation) without degrading resource productivity?
	How can these mechanisms be adapted to provide benefits to resource productivity?
Non-resource-dependent development options	What opportunities are there to provide employment and income through means that do not depend on natural resources (although taking advantage of such opportunity may still require freshwater, waste disposal, etc.)?

Table of Suggested Research Areas and Questions (Cont.)

CATEGORIES OF SUGGESTED RESEARCH AREAS	BASIC QUESTIONS
Planning and decision-making systems	What uses--given the resource constraints; the current limits of technology; and human constraints and objectives--are at least feasible?
	What means are available--and suitable--to simplify reconciliation of the needs of resources, populations and technology in future development decisions?
Development strategies and trade	What is needed for entry of small islands into international trade? What opportunities are offered?
	How well have past strategies (e.g. regional cooperation, import substitution, export promotion) done?
	What components of these strategies could be improved? Combined?
	What new theories of economic development are arising that may be more suitable to islands than the more orthodox theories?
	What development policies can capitalize on the natural and human resources (e.g. traditional labor skills) extant on islands?
Information management and institution building	How might environment and development information be managed to be most useful to researchers? To local decision makers? To practitioners?
	What systems would facilitate sharing of information? analysis of information?
	What training needs are evident on islands? How might these best be fulfilled?
	How can local institutional capabilities be improved without losing the necessary flexibility of individual or institutional focus?