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Vienna International Centre, P.O. Box 300, 1400 Vienna, Austria
Tel: (+43-1) 26026-0 · www.unido.org · unido@unido.org

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TECHNICAL ASSISTANCE PROGRAMME TO ELIMINATE IODINE DEFICIENCY DISORDERS (IDD) SUPPORTING THE CHINA SALT INDUSTRY

DG/CPR/91/434

PEOPLE'S REPUBLIC OF CHINA

Technical report: Computer network and data management
Part I — Salt monitoring*

Prepared for the Government of the People's Republic of China
by the United Nations Industrial Development Organization

Based on the work of P. Pembelton, consultant on computer network and data management

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* This document has not been edited.

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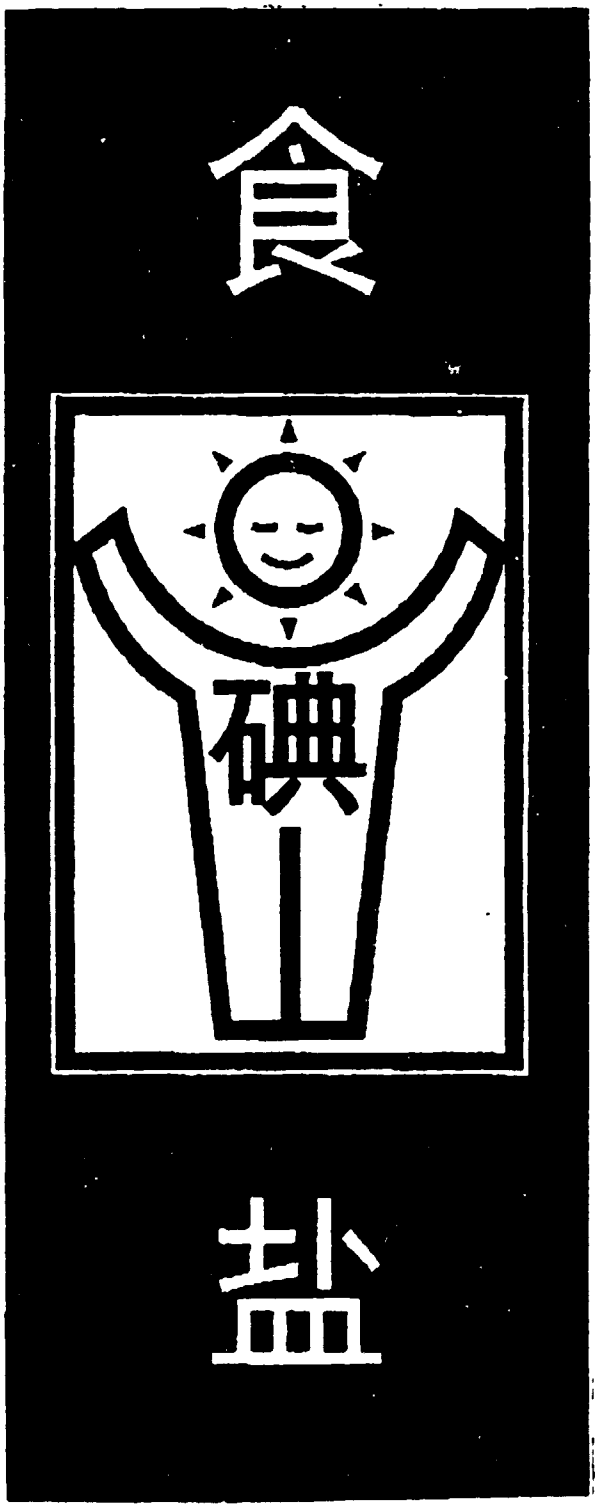
Iodine Deficiency Disorders Network
Salt Monitoring Network Plan
December 1995



List of contents

The Iodine Deficiency Disorders Network

Salt Monitoring

Network Plan

Salt Sector

Commonly-used acronyms

CNCLI	China National Council of Light Industry
CNSIC/NSIC	(China) National Salt Industry Corporation
CPU	Central Processing Unit
HQ	Headquarters
IDD	Iodine deficiency disorders
LAN	Local Area Network
MOPH	Ministry of Public Health
NOS	Network Operating System
NRCEDC	National Research Centre for Endemic Disease Control
NTTST	National Training and Technical Support Team
PC	Personal computer
PSTN	Public switched telephone network
UN	United Nations
UNICEF	United Nations Children's Fund
WAN	Wide Area Network
WHO	World Health Organization

Introduction

The single greatest cause of preventable intellectual impairment in the world today is iodine deficiency[1].

According to the report of the above-quoted meeting (which itself was a further milestone in the sequence of events started by the World Summit for Children in 1990), over one third of iodine deficiency disorders (IDD)-affected people live in China. China has since set itself the objective to eliminate IDD by the year 2000.

The report of the Beijing meeting concedes that the ...*salt industry is the cornerstone of the IDD elimination programme*... In this respect, the salt industry commissioned a feasibility study which states that, in order to monitor progress towards the millennium's objective, ...*a complete salt quality control network which consists of administration, production, distribution and quality control...from CNSIC* (China National Salt Industry Corporation) *to provincial salt industry companies (or bureaus) to production and distribution enterprises...*[2] is required. Further, there is a need to ...*establish an information and statistic system from the (CNSIC) to the monitoring and control points...* (and the) ...*production and distribution enterprises...* which will assist *inter alia* with the management of salt inventories, especially the quality aspects in relation to iodine content at the different network locations.

The following report is based upon a split-mission consultancy undertaken in July and October 1995 which was fielded to review the information management issues for 'monitoring and control' by the salt industry as its contribution to the IDD programme. A national consultancy was also arranged —undertaken concurrently with this author's visits to Beijing—to examine the possibilities for electronic data/message transfer among and between the salt and the health authorities involved in the programme.

The results of these two consultancies are combined in this report in order to provide the reader with a holistic view of the various information management and networking components of the IDD programme.

Background

The report of the Beijing meeting[1] refers to 'surveillance' which should 'watch over' the ...*iodine status of the nation* and ...*check on the iodine content of salt...*, such 'monitoring' requiring ...*rapid feedback of the results...to decision-makers...* thus constituting ...*integral parts of programme management.*

1 *National Advocacy Meeting to Eliminate Iodine Deficiency Disorders by the Year 2000, Beijing, China 22-24 September, 1993*

2 *Project of Universal Iodization of Salt to Eliminate IDD in China, 2nd Version, November 1994, Project C142 by China Becel Engineering Co.*

The following are the key IDD-related **programme initiatives** undertaken in China:

- the 'National Programme of Action for Child Development in China in the 1990s' has been launched;
- the 'National Plan of Action to Eliminate IDD by the Year 2000' has been established;
- the 'National Leading and Coordination Group for IDD Elimination' has been created;
- 'Regulations for the Administration of the Salt Industry' have been issued;
- the Government has issued a decree which sets the legal framework for IDD in China, which states (approximate translation), *inter alia*, that
  ...the salt industry...is responsible for the whole country's supervision and management work of the processing and market supplies of iodized salt[3 & 4] (item 4)
  Further, the
  ...iodized salt, before leaving the factory, must pass quality examination...(item 9)
  and
  ...must be packed before leaving the factory... with *...distinct identification sign...with the name and address of the processing enterprise, quantity of added iodine, batch number, date of production and method of storing* (item 10)
  In addition, the
  ...health administrative sectors...are authorized to...spot check samples and ask for materials...from...production enterprises and the units engaged in processing or selling iodized salt (item 22).
  Penalties for non-compliance or falsification are foreseen;
- the National Salt Industry Corporation commissioned a feasibility study 'Project of Universal Iodization of Salt to Eliminate IDD in China'[2].

The information component

A recent report[5], prepared under United Nations funding, identified a number of shortcomings in China's IDD programme, *inter alia*:

3 *Decree of the State Council, Number 163— 'Management regulations of add iodine to table salt to eliminate the harm of iodine deficiency', August 23, 1994.*

4 *'Regulations on Edible Salt Iodization as a Means to Eliminate Iodine Deficiency Disorders', National Office for Endemic Diseases Control, Ministry of Health, (edited English version of the above Decree)*

5 *National IDD Elimination Programme. Dr. G. Maberly & Dr. J. Seward. June 1995 (CPR/91/434)*

- *lack of a coherent quality assurance programme built from the production site up*;
- *lack of an integrated comprehensive surveillance system*; and
- *lack of...well trained staff.*

Partly to offset these and other problem areas, a coordinating body was established by the Ministry of Public Health (MOPH) and the Salt Industry Office of the China National Council of Light Industry (CNCLI). This coordinating body, the National Training and Technical Support Team (NTTST), which was inaugurated on June 20 1995, will be required to:

- 'network' *...across a wide range of government and nongovernmental agencies*; and
- *...coordinate the surveillance, monitoring and feed-back...of the programme* (among other things).

In addition, UN funding will assist in developing *...a strong management team...with*(in) *the implementing national salt company...*, which, together with the other (above-mentioned) initiatives and agencies, is to *...provide the leadership and framework...* required for the programme. DDrs Maberly and Seward, in the report quoted above, propose that *...some of the support provided to* (this) *unit could be extended to help the NTTST with its functioning (i.e. information networks and linkages to the provinces, etc.)*.

A little further into the report, a call for a *...clear arrangement for sharing of information...* is made, together with the requirement that *...all data and information needs to be presented in a clear and compelling way...* for *...swift appropriate action...*

The Maberly/Seward report proposes further that the quality assurance 'surveillance' programme's information aspects include:

- *...agreed common approaches, standards...*;
- *...a strong internal quality system at the producer and distributor levels...*;
- *...an inspection system that feeds back helpful information locally and then passes on only what is useful*;
- *...what is happening in the factory and at the local level on a daily basis*;
- the development of *...systems that are complementary...* which are *...built together, but each having its own defined role.*

It is understood, if not explicitly stated in the above quotations, that there are two sides to the quality assurance 'surveillance' and therefore to the information component of the IDD programme—one related to salt production/iodization/distribution and one concerned with health issues.

Section 7 of the Maberly/Seward report looks in some detail at the issue of quality assurance which *...starts with the salt industry...* and progresses through

...production, packaging, distribution...to the retail outlet. The different points at which the level of iodization in the salt is tc be tested, and the need for standards in the sampling methodologies applied by the two sides of the network are also discussed.

The *...data network system should extend...to the appropriate regulatory bodies...* and the *...data...needs to be quality assured, collected in the most efficient and reliable way...* and presented *...in a timely, user friendly manner...* The *...system needs to be engineered from the bottom up...designed with the input of all stake holders working together...*, be *...as simple as possible...with a highlight on the essential components...*, *phased in as the programme matures...* and *...buil: into existing infrastructure in a sustainable way.*

Many of the points made in the above-quoted report are echoed in the report of a seminar on quality assurance[6] following which, a technical working group was established with, *inter alia*, the following tasks for 1995 *...review current salt monitoring...methodology, data collection, analysis and interpretation, revise plans from the bottom level up to use data to improve the programme...* and *....develop the framework...for a joint salt quality data management system...*

This latter report clearly divides the programme's activities into responsibilities for the health and the salt authorities, both of which analyse the quantity of iodine in salt at different points in the chain of production and distribution. However, it is considered that *...detailed technical guidelines are needed to implement, manage and share information between the salt and health sectors...*

The senior technical adviser to the Seminar noted, *inter alia*, that the main issues to be addressed by an IDD information system are:

- *careful design of forms*;
- the *feasibility of data collection*;
- *what will be useful to report both within the health sector and across sectors*;
- *how the data will be used*;
- and *what data to report to higher levels*.

The recommendations quoted throughout this introductory Chapter, aimed at the existing institutional infrastructure, indicate that support for national 'capacity-building' is required at various levels. For example, the Maberly/Seward report quoted above implies that training in *...data handling and processing...* and *...presenting information to decision-makers...* are among the

6 *Report on Seminar on quality assurance of salt monitoring, Dr. J. Seward, Beijing, China, June 15-16, 1995*

human resource development issues to be included in the programme, while it is a foregone conclusion that a data collection, storage and exchange mechanism is the foundation for the rest of this component of the programme.

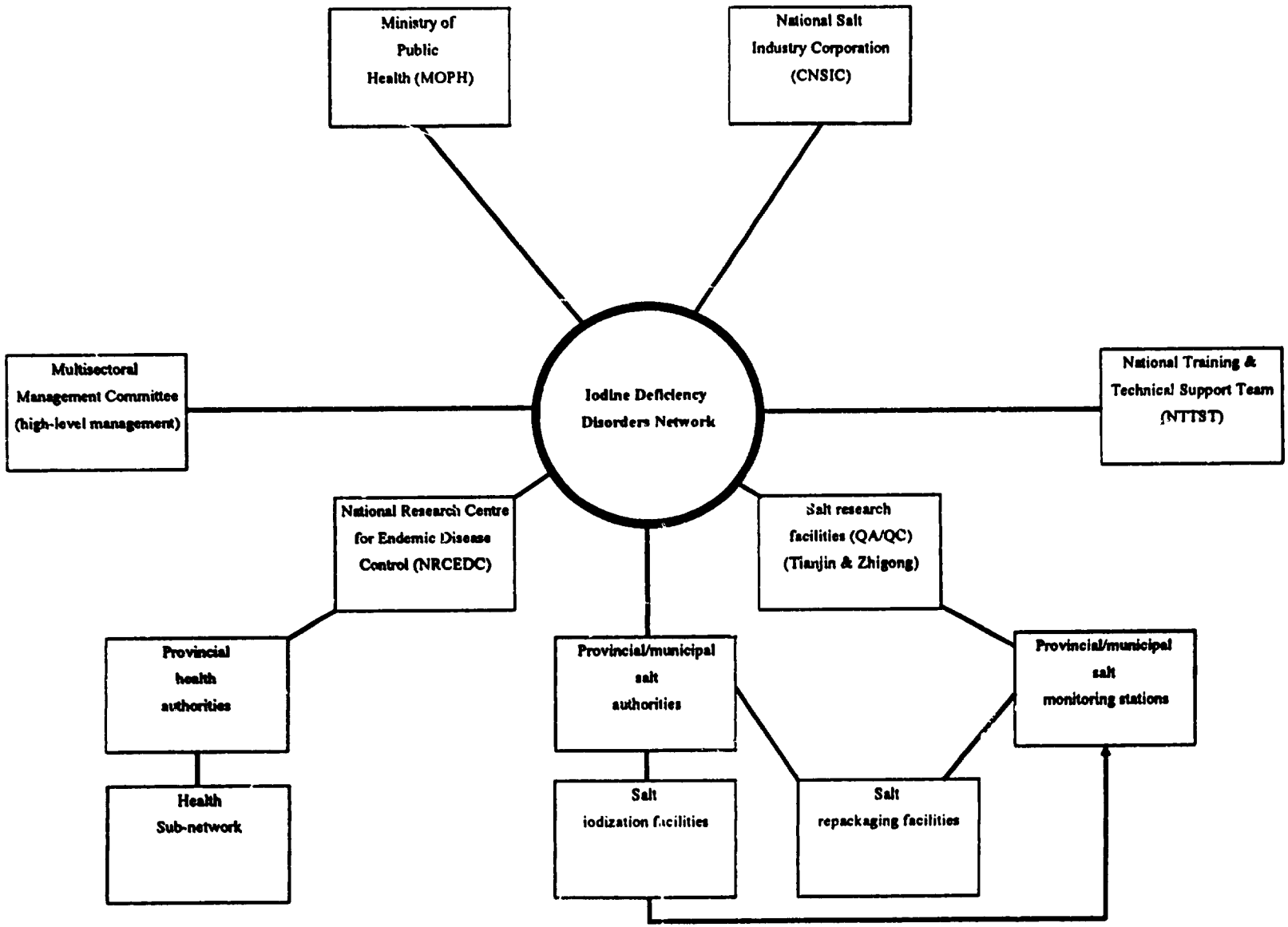
It is expected that the IDD information network will be functional by the end of 1996!

Statement of purpose

Following a review of the previously-mentioned background material, one comes to the conclusion that the purpose of the quality assurance 'surveillance' network (figure 1) supporting the IDD programme in China is to:

provide the Chinese salt and health authorities with a means of monitoring, any place at any time, the level of iodine in nationally-produced salt. The network, as an entity, will collect, store and re-package information related to iodized salt production, packaging, distribution, and the results of testing from production to consumption levels. A two-way flow of information between salt industry affiliates and health sector affiliated institutions and inspectors will provide the basis for a national salt situation analysis which will assist in evaluating the country's objective of eliminating IDD by the year 2000.

Figure 1—Iodine Deficiency Disorders Network



The Network

Network context

Figure 1 is a schematic representation of the IDD network 'context' based upon the previous 'statement' of the network's objective.

The conventions used are:

- the circle—represents the network as a single entity (a virtual institution);
- boxes—show the institutional components/groupings (known as 'terminators') which at the same time represent the boundaries of the network's information system;
- lines—connect one institutional grouping ('terminator') to another, and indicate network hierarchy.

For the sake of simplicity (this first diagrammatic representation of the network is not meant to show too much detail!), an attempt has been made to represent the two 'sides' of the network—salt (top right and bottom middle/right) and health (top and bottom left)—as well as the coordinating bodies (middle right and left). The placing of these organizational groupings also represents their hierarchical standing in the network:

- **Top**
  The institutions above the circle are the national 'terminators' responsible for the salt (right) and health (left) aspects of the IDD programme—these institutions are the **programme management** bodies in their respective fields, to which their various affiliates ultimately report through the network 'filter' and from which the network receives its instructions;
- **Centre**
  The 'terminators' on the right and left of the circle are responsible for **coordination** of the IDD programme activities between the salt and health sector authorities, having representatives of both as members;
- **Bottom**
  The 'terminators' underneath the circle represent the sub-networks which are responsible for **data production, management and reporting**, from bottom up as follows
  - primary data sub-network (salt)
    the salt iodization and repackaging facilities' sub-network, which provides ***primary data*** to higher level sub-networks in the salt sector
    N.B. at the time of writing, transshipment and other salt distribution facilities (e.g. warehouses, wholesalers) do not appear to be valid (i.e. active) network participants. Rather they appear to have the same relationship to the network as retail outlets and households or other salt consumption sites which require monitoring. The consensus seems to

be that it is the role of the health authorities to monitor such facilities, rather than that they actively provide data[7] to the network. However, should any of these come to play a more active role, they should be incrementally incorporated into the network as they become known

- primary data sub-network (health)
  the health sub-network which provides ***primary data*** to higher level sub-networks in the health sector
  N.B. undefined at the time of writing

- secondary data sub-network (salt)
  the provincial/municipal salt authorities' and salt monitoring stations' sub-network, where the 'operational users' are located, which respectively provide the first level of ***data aggregation*** for the salt sector in general and for salt quality in particular

- secondary data sub-network (health)
  the provincial/municipal health authorities' sub-network, where the 'operational users' are located, which provide the first level of ***data aggregation*** for the health sector
  N.B. the actual data to be managed is undefined at the time of writing

- the salt research facilities
  intermediaries between provincial/municipal salt monitoring stations—receiving salt quality data—and national salt authorities. They are responsible for data consistency and quality checks of their own and are generators of the second level of ***data aggregation*** for the salt sector's IDD monitoring activities

- the health research facility
  intermediary between provincial and national health authorities, which is the recipient of health data from the provincial health sub-network and generator of the second level of ***data aggregation*** for the health sector
  N.B. the actual data to be managed is undefined at the time of writing.

As already mentioned, this scheme and diagram is, by necessity, over-simplified and there is one other **major** set of interactions not shown by figure 1, which occur *informally* between the two 'sides' of the network at various levels of their respective hierarchies. As the NTTST was created as **the forum for official interaction**, this figure and the following sections show this rather than the informal contacts.

The reader may wish to refer to the table in Annex I which lists participating institutions of the salt sector's primary data sub-network (184 salt iodization and repackaging facilities), which will be the focus of the information man-

7 *'Monitoring Universal Salt Iodization Programmes' (Chapter 6, page 44). UNICEF, ICCIDD, PAMM, WHO, MI, January 1995*

agement assistance during the first phase. The table also provides the addresses of the provincial/municipal salt and health authorities as well as of the salt monitoring stations.

A list of the national IDD-affiliated institutions is provided in Annex II, together with their addresses.

N.B. the following sections provide more detail on the information/monitoring system to be implemented for the salt industry, as that 'side' of network data management activities has been the only subject of review so far. The health 'side' will require its own consultancy for closer definition and is therefore only referred to as a data recipient without any attempt being made to define sub-network interrelationships, functions and data flows.

Data flows

Figure 2 is a graphical representation of the data reporting and data flows required to move IDD primary (i.e. 'raw') data from the salt iodization and repackaging sub-network, through the provincial/municipal salt sub-network (which is responsible for data storage, aggregation and reporting) to the higher levels of the network.

The conventions used for this figure are:

- boxes—represent the 'terminators' (6 levels of salt & 1 coordinating level institutions–the provincial/municipal salt authority group is repeated to avoid confusion in the diagram)
  N.B. the health side of the network is shown as providing an unspecified flow, without related activities or data stores, into the coordinating body (NTTST);
- circles—in this case represent a data-related activity undertaken by the 'terminators' of the sub-networks (9 activities)
  N.B. the large circle in the centre of the figure indicates that this is the key network activity;
- 'tram lines' (parallel lines)—data stores resulting from the data-related activities of the sub-network participants (5 stores)
  N.B. the three data stores in the centre of the figure, resulting from activities 2 and 6 will be integrated into a single data store in each provincial/municipal salt authority centre; and
- arrows—data flows from one institutional grouping, through data-related activities and data stores to other institutional groupings. The thicker arrows indicate the critical path (i.e. salt quality data flows) for the salt sector input to the IDD programme.
  A double-headed arrow represents a two-way data flow between an activity and a data store.

Figure 2—Network Data Flow Diagram

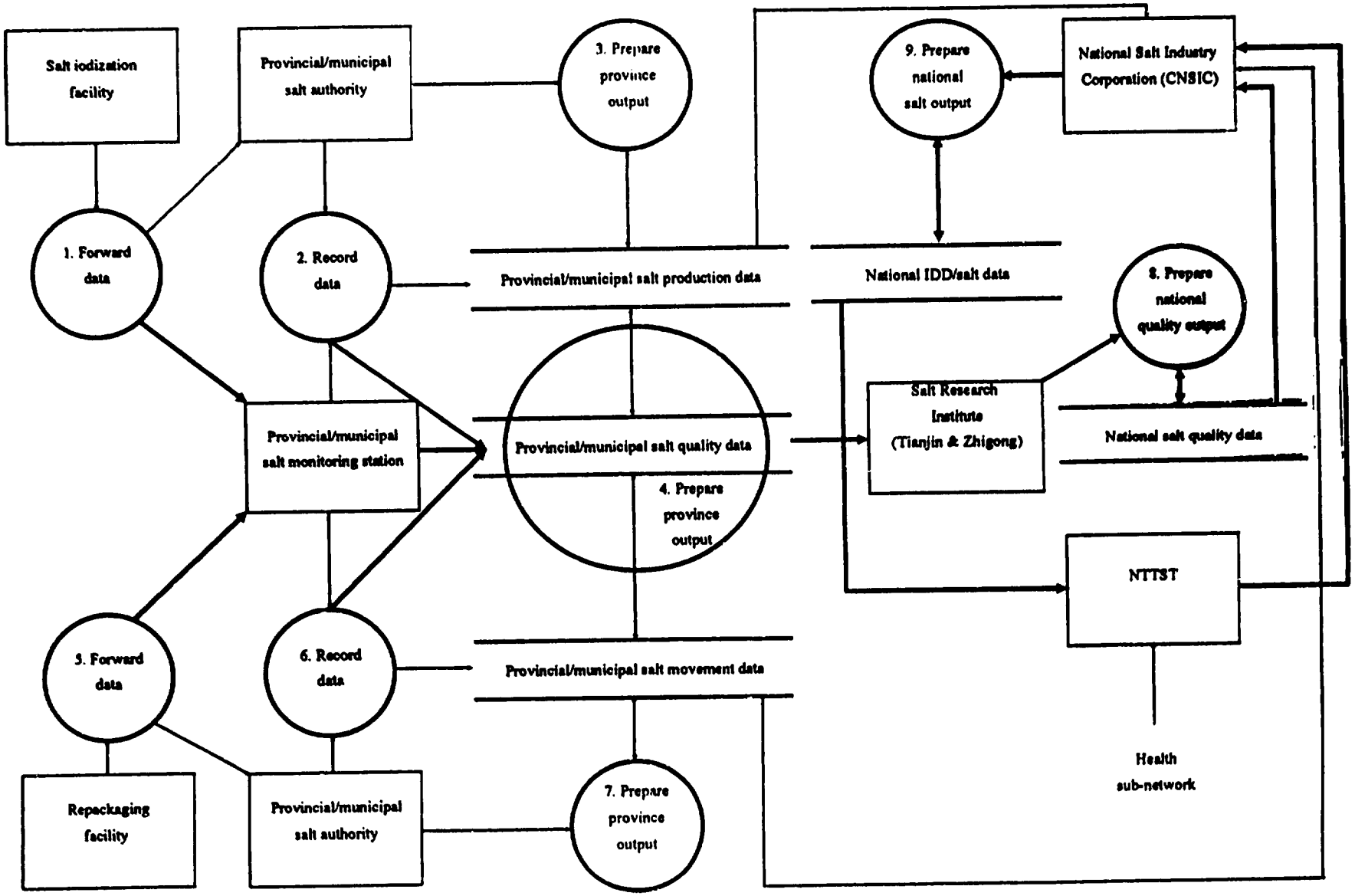


Figure 2 indicates that there are three parallel sets of activities and data flows originating from the salt primary data sub-network (iodization and repackaging facilities). These sets of activities have the following in common:

- **raw data reporting**
  - (*activity 1*)—from salt iodization facilities to provincial/municipal salt authorities and provincial/municipal salt monitoring stations
  - (*activity 5*)—from salt repackaging facilities to provincial/municipal salt authorities and provincial/municipal salt monitoring stations;
- **raw data recording**
  - (*activities 2 and 6*)—activities 1 and 5 provide the raw data on salt production, packaging and movement, as well as on salt quality/iodization, which will be computerized at the provincial level.
    N.B. the provincial/municipal salt monitoring stations also generate their own data through salt sampling, which is added to the data stores;

WARNING!
The salt monitoring stations are responsible for salt quality data in their respective provinces/municipalities!

Although the provincial/municipal salt authorities receive all salt data from iodization and repackaging facilities, they should not record or validate the quality-related data!

All provincial/municipal salt data should be amalgamated into one data store at each salt authority which will contain all salt-related data (production, repackaging, movement and quality). For the sake of a clearer analysis however, each type of information is represented by a separate data store in figure 2, linked by double-headed arrows.

- **data aggregation/output**
  - (*activities 3, 4 & 7*)—aggregation of provincial/municipal (production, repackaging, movement and quality) data for the next levels of reporting;
  - (*activity 8 & 9*)—aggregation of national (quality) data for the next levels of reporting.

Annex III presents the forms, data modules and data elements required for the different levels of recording and reporting.

At the end of this flow of data, a reverse flow occurs, whereby the health authorities, ***through the network intermediary body (NTTST)***, present the salt authorities with their findings which indicate problems they encounter in the chain of distribution—NTTST is the forum for discussion and cooperation between the two sides of the network and should provide for the types of exchanges needed to monitor overall progress as well as bottlenecks, which could be due to many factors, in the IDD programme.

N.B. the NTTST should facilitate the network's feedback mechanism which, through the activities of both the salt and the health sub-networks could, for example, identify cases of poor levels of iodine in salt found in specific locations or at different levels of distribution anywhere from the consumer to the production sites. This body will also act as the programme monitoring agent, and review overall IDD performance.

Problems identified through the NTTST should trigger internal reviews by all participants. For example: the NSIC, using (searching) the aggregated national salt data set could trace faulty batch(es) through the chain of distribution and, if necessary, back to the iodization facility, using their own quality assurance mechanisms and problems found within the realm of authority of the salt industry should be remedied by them; likewise for any problems found to reside within the jurisdiction of the health authorities; problems outside of the jurisdiction of either should be dealt with by the NTTST.

The above types of interaction are not represented in figure 2 as they relate to overall network functions rather than individual data activities of the sub-networks—the reader should refer to figure 1 which shows the interactions of all institutions in the network context.

Entities and their relationships

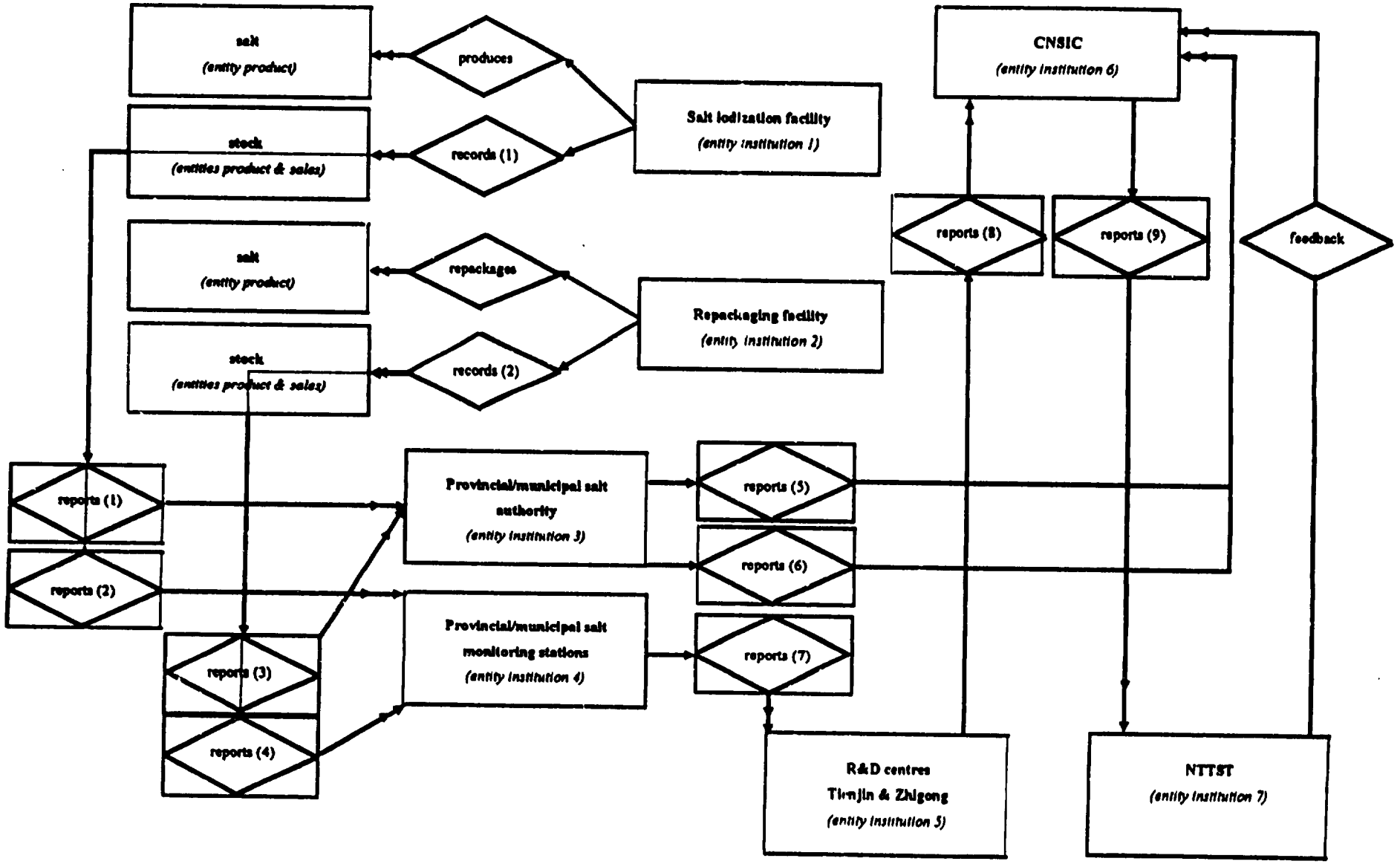
Following the examination of IDD network data flows and activities in the last section, this section will look at the network data model—i.e. the structure of network data and its relationships (figure 3). This section will show the basic data 'types' (logical groups or entities) that are required for the network and how they relate to other data 'types'.

In order to achieve the necessary level of abstraction required to visualize the data model, the following conventions are used:

- boxes (an entity or object)—represent real world 'things' (nouns) ...*each playing a necessary role in the system...*[8] defined by a set of attributes or data elements (see Annex III for details). Each entity has a unique combination of data elements which clearly set it apart from other entities of the same type;
- diamond (a relationship)—represents an action (usually a verb) undertaken by an entity which, together with the arrows, ...*represent a set of connections between objects*[8];
- diamond encased by a box—represents an activity and an entity at the same time, i.e. the writing of a report (verb) and the report (noun) itself. This convention has been adopted to avoid an over-complex figure;

[8] *Modern Structured Analysis*, E. Yourdon, 1989, ISBN 0-13-598624-9

Figure 3—Entity Relationship Diagram



- arrow—connects the activity of one entity to another. A double-headed arrow indicates that one entity repeats an action many times (one to many), i.e. one facility manufactures many batches of salt, or many reports on salt (inventories) are prepared.

In the context of the IDD network, the entity types are few and not very complex, consisting primarily of:

- **institutions/organizations** of the sub-networks (i.e. salt iodization & repackaging **facilities**; various salt **monitoring** authorities; and salt distribution agents & users);
- **salt (or product)** which is the prime object (including its **quality**);
- the salt **sales (packaging/shipping/**movement); and
- **reports** on the salt, its quality and handling.

Figure 3 again shows the groups of network institutions—the iodization and repackaging facilities, provincial/municipal salt authorities, provincial/municipal salt monitoring stations, salt research centres, and national salt and health authorities—already encountered in the sections 'Network context' and 'Data flows'. New entities are the salt itself (the prime object) and the various reports required by the network.

As there is not a great variation of entity types, rather a proliferation of the same types, a convention has been adopted in the following sections which numbers the organizational and report entities in the sequence of their appearance. This will also help in cross-referencing the subsequent parts of this analysis.

The salt iodization facilities—entity institution 1

There are 109 salt iodization facilities participating in the first phase of the IDD programme in 27 provinces and 6 municipalities (see Annex I). These facilities, which have *...the responsibility for routine monitoring...(internal salt monitoring)...* and whose *...observations should be recorded systematically in a register...*[9], constitute the primary data sub-network:

- ° produce, iodize and package salt (entity product);
- ° internally test the salt quality at regular intervals (entity product);
- ° manually* record data on salt production, quality and stocks (entity product);
- ° manually* record data on salt movement (entity sales);
- ° manually* prepare reports on the above (entity reports 1 & 2).

9 *Indicators for Assessing Iodine Deficiency Disorders and their Control through Salt Iodization', WHO, UNICEF, ICCIDD. WHO/NUT/94.6, 1994*

These reports (see Annex III for details), which are sent to the provincial/municipal salt authorities (entity institution 3) and to the provincial/municipal salt monitoring stations (entity institution 4), include data on the salt's quality and its level of iodization.

*N.B. a subsequent phase of the IDD network may wish to consider computerizing this sub-network to reduce the workload which the provincial/municipal sub-network will encounter. This could mean either providing the same computer application or an electronic reporting 'form' which could easily be 'loaded' into the provincial data set—the means will depend upon the resources available to and capacities at these facilities.

The repackaging facilities—entity institution 2

There are 75 repackaging facilities participating in the first phase of the IDD programme (see Annex I) which:

- receive and repackage salt from the iodization facilities (entity product),
- internally test the salt quality at regular intervals (entity product);
- manually* record data on salt repackaging, quality and stocks (entity product);
- manually* record data on salt movement (entity sales);
- manually* prepare reports on the above (entity reports 3 & 4).

These reports, which are also sent to the provincial/municipal salt authorities (entity institution 3) and to the provincial/municipal salt monitoring stations (entity institution 4), contain data on the salt's quality—including its level of iodization (see Annex III for details).

*N.B. a subsequent phase of the IDD network may wish to consider computerizing this sub-network to reduce the workload which the provincial/municipal sub-network will encounter. This could mean either providing the same computer application or an electronic reporting 'form' which could easily be 'loaded' into the provincial data set—the means will depend upon the resources available to and capacities at these facilities.

The salt authorities—entity institution 3

There are 26 provincial and 6 municipal salt authorities participating in the first phase of the IDD programme (see Annex I) which:

- receive manually prepared data on salt production and stocks (entity product) from salt iodization facilities (entity institution 1)—these reports contain data on the salt's quality, including level of iodization;
- receive manually prepared data on salt repackaging and stocks (entity product) from repackaging facilities (entity institution 2)—these reports *may* contain data on the salt's level of iodization;

- receive manually prepared data on salt movement (entity sales) from salt iodization facilities (entity institution 1) and repackaging facilities (entity institution 2);
- record/computerize the reported data on salt production and repackaging (entity product), as well as on salt movement (entity sales);
- prepare reports/transfer data sets on **salt production and movement** (entity reports 5 & 6) to NSIC (entity institution 6).

WARNING!
These authorities are <u>not responsible for salt quality data</u> in their respective provinces/municipalities!—see salt monitoring stations (entity institution 4). Although the provincial/municipal salt authorities receive all salt data from iodization and repackaging facilities, they should not record or validate the quality-related data!

All provincial/municipal salt data will be amalgamated into one data store at each salt authority. The quality data will have been previously validated by the salt monitoring stations.

The salt monitoring stations—entity institution 4

There are currently 18 provincial/municipal salt monitoring stations participating and 11 planned to participate in the first phase of the IDD programme (see Annex I) which:

- receive manually prepared data on salt production and stocks (entity product) from salt iodization facilities (entity institution 1)—these reports contain data on the salt's quality, including level of iodization;
- receive manually prepared data on salt repackaging and stocks (entity product) from repackaging facilities (entity institution 2)—these reports *may* contain data on the salt's level of iodization;
- receive manually prepared data on salt movement (entity sales) from salt iodization facilities (entity institution 1) and repackaging facilities (entity institution 2);
- undertake external quality checks of all salt facilities in their provinces (entity institutions 1 & 2) as well as transshipment and warehouse facilities under their jurisdiction;
- record/computerize the *reported* internal salt quality (entity product) data;
- record/computerize data on salt quality (entity product) from their own external checks;
- prepare reports/transfer data sets on **salt quality** (entity reports 7) to the salt research facilities (entity institution 5).

WARNING!
The salt monitoring stations are only responsible for salt quality data! Although they receive all salt-related data from iodization and repackaging facilities, they should not record salt production or salt movement data!

All provincial/municipal salt data will be amalgamated into one data store at each salt authority. The quality data will have been previously validated by the salt monitoring stations.

N.B. the report form used for external monitoring, which is the same as the one used by the salt research establishments, is detailed in Annex III.

N.B. only 11 of the 29 monitoring stations are at different locations to the salt authorities, sometimes in the same city, other times quite a distance away—the remainder currently have the same address!

The salt research establishments—entity institution 5

There are 2 salt research establishments—Tianjin and Zhigong which:

- receive computerized data sets on salt quality (entity product)—both internal and external checks—from the provincial/municipal salt monitoring stations (entity institution 4);
- undertake external quality spot-checks of salt iodization facilities (entity institutions 1 & 2);
- undertake yearly external quality checks of all salt iodization facilities (entity institutions 1 & 2);
- undertake external quality spot-checks of salt distribution facilities under the jurisdiction of NSIC (not more closely defined at this time);
- prepare reports/transfer data sets (entity reports 8) on salt quality to NSIC (entity institution 6).

N.B. the report form used for external monitoring, which is the same as the one used by the salt monitoring stations, is detailed in Annex III.

The NSIC—entity institution 6

The NSIC, which is the final recipient of data/reports from the salt sub-networks, through the chain of entities and reports previously outlined:

- receives data sets on salt production from the provincial/municipal salt authorities;
- receives data sets on salt repackaging from the provincial/municipal salt authorities;
- receives data sets on salt shipping from the provincial/municipal salt authorities;

- receives data sets on salt quality from the provincial/municipal salt monitoring stations;
- prepares data sets/reports on salt production and distribution;
- prepares data sets/reports on salt quality/iodization; and, most importantly
- receives feedback on salt quality from the NTTST; and
- undertakes searches of the national data set to trace problem batches of salt.

The NTTST—entity institution 7

The NTTST is the coordination body between the salt and the health sides of the IDD network. As such, it is expected to 'network' between the two sides providing the necessary feedback mechanism for the IDD population surveillance and monitoring of iodization levels in the salt. It is expected that NTTST will:

- receive data sets on salt quality from the NSIC;
- receive data sets on IDD prevalence from the provincial/municipal health authorities;
- provide feedback to the NSIC and the health authorities.

N.B. more details on the functions and activities of the NTTST will only be available once an analysis of the health side of the IDD network has been undertaken.

Other entities

Health sector:

- There is a lower-level (primary) sub-network, as on the salt 'side', consisting of **county-level health authorities**;
- There are 32 **provincial/municipal health authorities** participating in the first phase of the IDD programme (see Annex I). These facilities may have a similar set of functions to entity institution 4 and would also function as a sub-network;
- The National Research Centre for Endemic Disease Control (**NRCEDC**), more often referred to as Harbin due to its location, may function along the lines of entity institution 5 (Tianjin and Zhigong);
- The Ministry of Public Health (**MOPH**) which will probably function something like entity institution 6 (NSIC).

However, at the time of writing the data flows and reporting procedures of the health sub-networks, as well as the functions of their 'terminators', are unclear. They all do, however, have a symbiotic relationship with the salt

authorities. A later consultancy should clarify this side of network activities and its relationships with the salt sector. In the meantime, although the health authorities are not included in the figures, they are assumed to be an integral part of the network activities.

Salt or public sector:

- There are an undefined number of **transshipment facilities** involved in salt distribution which do not seem to have a direct network 'function'—i.e. they do not and are *not required to provide data* on their activities to the network, at least during the first phase. Rather, they are likely to be the recipients of external monitoring both by the salt and the health authorities. As part of this monitoring, these facilities should be recorded in the data management system.
  Should they take on a more active role and start providing data themselves, they are likely to function along the lines of entity institution 2 (repackaging facilities);
- There are an undefined number of **warehouses/wholesale facilities** involved in salt distribution which also do not seem to have a direct network 'function'—i.e. they do not and are *not required to provide data* on their activities to the network. Rather, they are likely to be the recipients of external monitoring both by the salt and the health authorities. As part of this monitoring, these facilities should be recorded in the data management system.
  Should they take on a more active role and start providing data themselves, they are also likely to function along the lines of entity institution 2 (repackaging facilities);

Network events

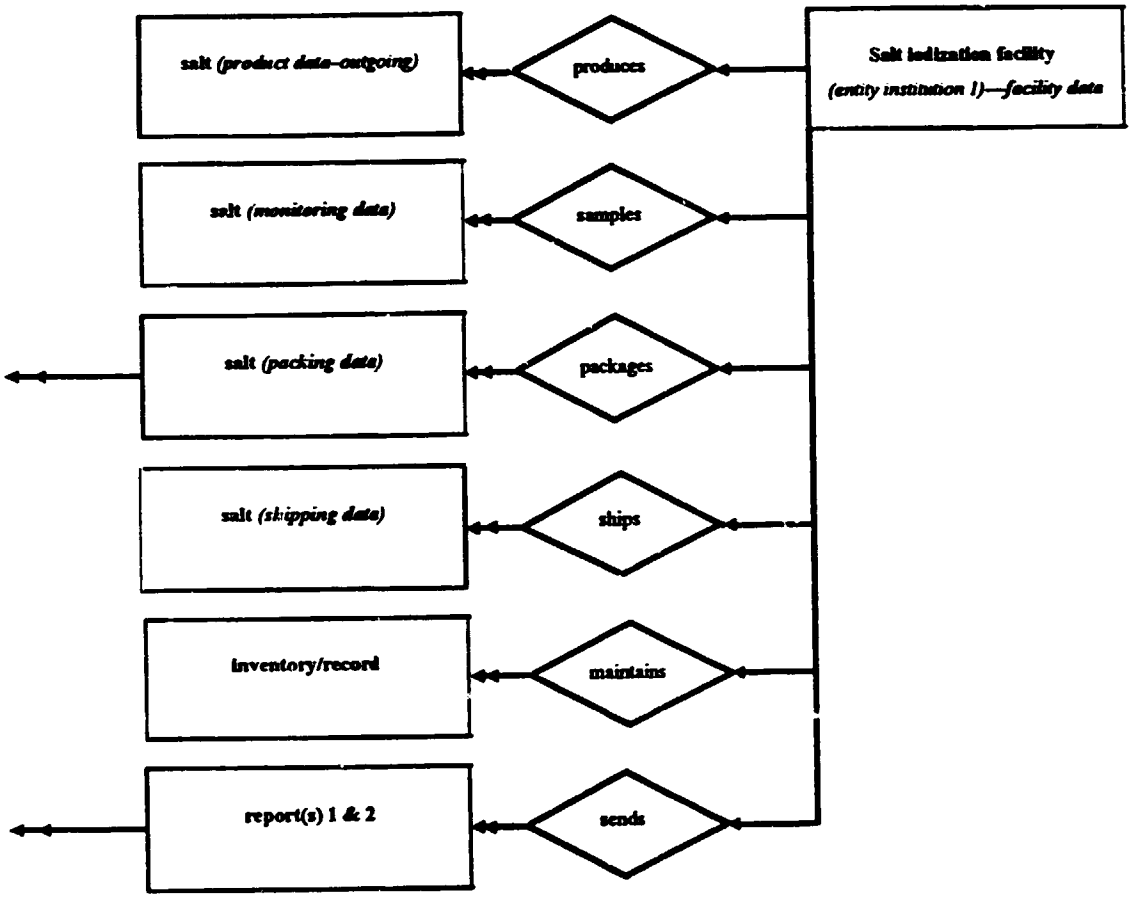
The two previous sections examined IDD network data flows and data types/ relationships at a high level of abstraction. This section of the analysis will review the sequence of events at each level of the network as well as the main types of data which are handled at those levels (see Annex III for full details).

The conventions used in this section and in its related figures are the same as in the previous section—the reader should refer to the beginning of that section for details—as it was thought that a visual representation of events (in contrast to a standard list of events) is a more powerful way of presenting the steps required to generate, record and report network data (i.e. the monitoring required by the IDD programme). The sequence is the same as in figure 3, representing a *...system...* which is *...engineered from the bottom up...*[5]

Salt iodization

Figure 4 shows the first group of network events, which are undertaken by the salt iodization facilities (entity institution type 1) as part of the primary data

Figure 4—Events Diagram (ERD Format)
Salt iodization



Notes:

- Entity institution 1 = salt production or re-packaging facility (which could also be a warehouse)!—insitution entity must be classified by 'function'. The main feature is the capacity/authority to iodize salt.
- The reports are sent by: mail, fax or telephone—fax is the preferred means for the network (several of these facilities already use fax).
- Several reports per month are currently forwarded to the next level. Details on report(s) 1 & 2 can be found in Annex III—see figure III-1 for the reporting form.
  N.B. report 2 should be a copy of report 1—i.e. details on each batch should be forwarded to entity institutions 3 & 4.
- Means of transport: truck, ship & train. Often stocks remain lengthy period in factory due to shipping delays! Iodized salt has been given transport priority by State Decree.

sub-network—the notes at the bottom of the figure show that these could also be repackaging facilities or warehouses! Whatever the real current 'function' of the 109 iodization facilities, iodized salt is produced there under license with the following main events and **main data types** occurring (see figure III-1):

- The facility (***facility data***) produces salt (***product data–outgoing***), samples it (***monitoring data***) and derives data on the quality of the batch;
- The facility then packages and labels the salt (***packing data***);
- Finally, the facility ships the salt (***shipping data***) to the next level of distribution;
- During the above processes the facility keeps an inventory (internal monitoring process) of the salt, its quality and related transactions, and reports on these at regular intervals to the provincial salt authorities and the provincial salt monitoring stations.

It is incumbent upon the facility to monitor *...iodine content during production (in-process monitoring)...* and *...periodically at the end of the processing line...* as well as to *...keep adequate monitoring records...*[7]

A complete list of data elements and details of the reporting requirements for IDD monitoring for this level can be found in Annex III under 'Salt iodization facility—reports 1 & 2'.

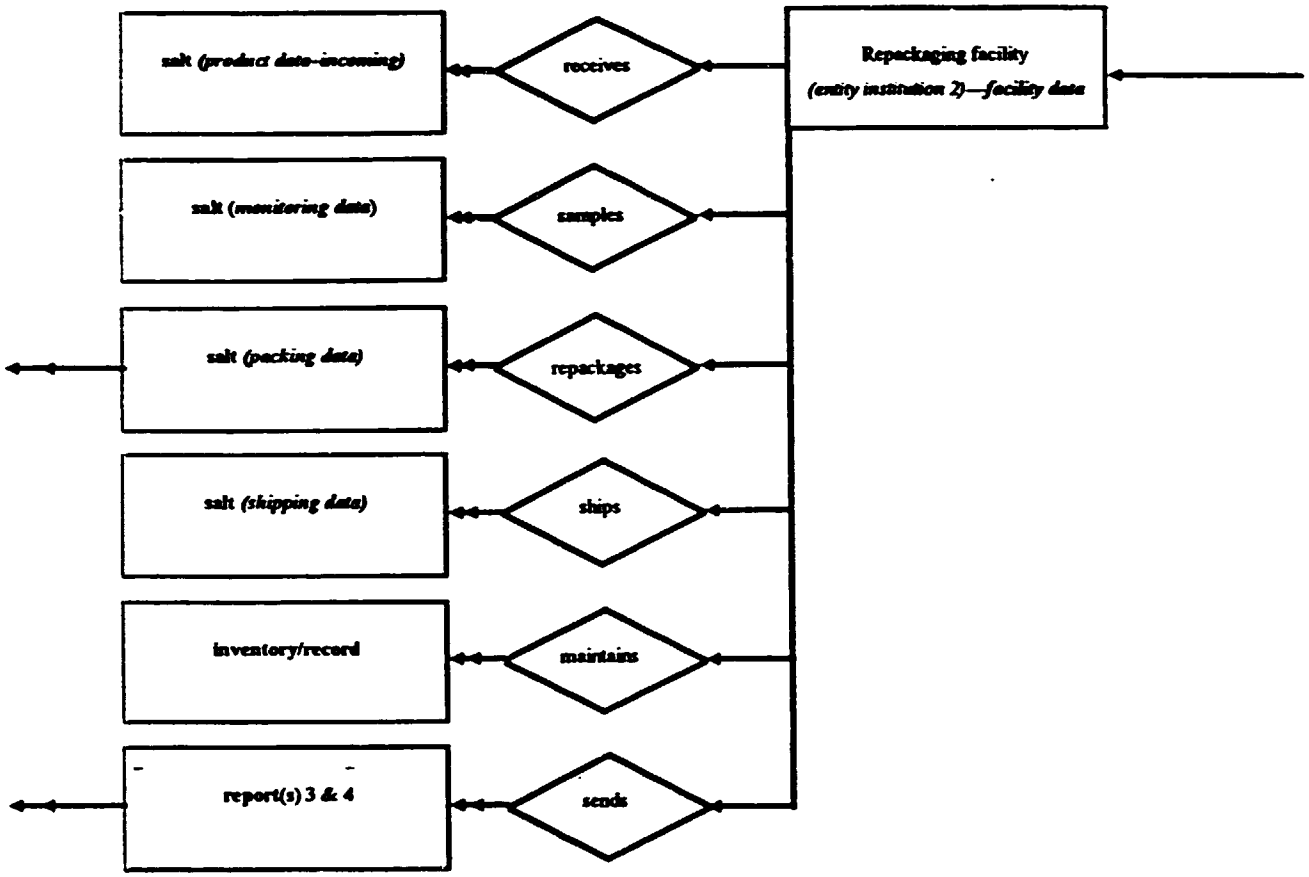
Repackaging

Figure 5 shows the next (possible) step—possible because the salt **may** go straight from the iodization facility to a distribution point. It should be noted here that a repackaging facility (entity institution type 2) may also be a warehouse! Whatever the real current 'function' of these facilities, iodized salt is repackaged there under license with the following main events and their **main data types** (see figure III-2):

- The facility (***facility data***) receives salt from the previous level and records the salient facts (***product data***–incoming);
- The facility *may* also sample some of the salt (***monitoring data***) and derive data on the level of iodization;
- The facility then repacks and labels the salt (***packing data***);
- Finally, the facility ships the salt (***shipping data***) to the next level of distribution;
- During the above processes the facility also keeps an inventory of the salt, its sampling results (internal monitoring) and related transactions and reports on these at regular intervals to the provincial salt authorities and the provincial salt monitoring stations.

It is incumbent also upon this facility to monitor *...iodine content...* during the repackaging exercise as well as to *...keep adequate monitoring records...*[7]

Figure 5—Events Diagram (ERD format)
Repackaging facility



Notes

- Entity institution 2 = Re-packaging facility or warehouse!—need insitution entity to have several 'functions'. The main feature is the capacity/authority to re-package iodized salt.
- Several reports per month are currently forwarded to the next level. Details on report(s) 3 & 4 can be found in Annex III—see figure III-2 for the reporting form.
  N.B. report 4 should be a copy of report 3—i.e. details on each batch should be forwarded to entity institutions 3 & 4.
- The reports are sent by: mail, fax or telephone—fax is the preferred means for the network (several of these facilities already use fax).
- Should report monthly as a minimum.

A complete list of data elements and details of the reporting requirements for IDD monitoring for this level can be found in Annex III under 'Repackaging facility—reports 3 & 4'.

Recording at provincial level

Figure 6 shows the next level within the IDD network—the provincial/municipal salt authorities (part of the secondary data sub-network), which receive primary data from the iodization and repackaging facilities and secondary data from the salt monitoring stations. Here we encounter entity institution type 3 which functions as a data processing intermediary for the NSIC, but also as a decentralized source of 'local' salt data.

N.B. these authorities also receive data on many other aspects of salt production and management, which is not the subject of this analysis. However, the salt authorities should seriously consider integrating the different data which they require into one reporting and recording system, to avoid multiple reporting by the salt facilities and duplicative recording of data at the provincial level! **Special note should be taken of the warning at the end of this section.**

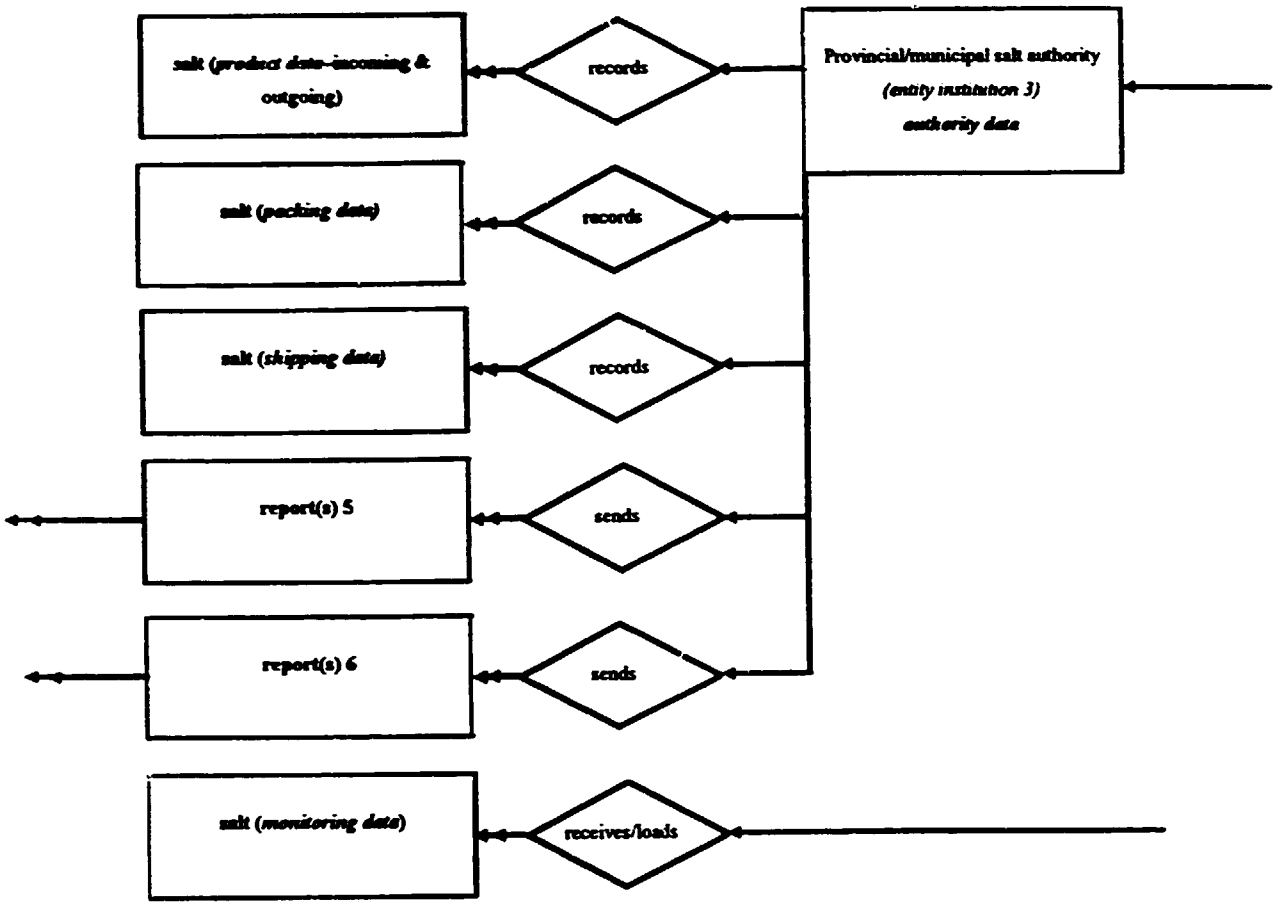
The provincial salt authorities are responsible for the following IDD data management events, together with the **main data types**:

- The authority (***authority data***) computerizes/records the incoming salt ***product data***, ***packing data***, and ***shipping data***;
- The authority prepares reports/data sets for transmission to the next level of the network;
- The authority **does not** computerize/record internal monitoring data, received from primary data sources. Rather, this data is processed by the salt monitoring stations, following which it should be transferred and loaded to the system to produce a provincial/municipal overview for reference purposes.
- The authority **does not** transmit internal or external monitoring data. This is the task of the salt monitoring stations.

Details of the reporting requirements can be found in Annex III under 'Provincial/municipal salt authority—reports 5 & 6'.

As this level of the network, together with the salt monitoring stations (see below), constitutes the first level of data aggregation, the first phase of data management/monitoring activities for the IDD programme will be concentrated here. Between them, these two authority types are responsible for the salt activities in their respective constituencies and have the requisite level of administrative control, as well as existing reporting procedures—both **from** the salt production/packaging facilities and **to** the higher reporting levels—which should be capitalized upon, as this is a good basis for the IDD information system.

Figure 6—Events Diagram (ERD format)
Provincial/municipal salt authorities



Note

- Entity institution 3 = Provincial/city salt authorities. This level is responsible for recording and reporting data received from the salt production and repackaging facilities—i.e movement/inventory data—in general. Although it keeps a total provincial/municipal picture, salt quality monitoring data (iodization) is recorded/reported by entity institution 4, which then forwards it to entity institution 3.
- The reports are sent to the next level by electronic means.

WARNING!
Due to infrastructural reasons, there are cross-flows of data and reporting between salt authorities and salt monitoring stations, which apparently cannot be resolved, therefore, care should be taken to have a clear division of labour (i.e. data recording and reporting) between the two.

Also, in the interests of standardized reporting and reduction of reporting load for the primary data sub-network, as well as to maintain data consistency, the data sent to the salt authorities will also be sent to the salt monitoring stations—this is especially important, as there are data relationships which need to be recorded at both authorities.

Monitoring at provincial level

Figure 7 shows another part of the secondary data sub-network—the provincial/municipal salt monitoring stations, which also receive primary data from the iodization and repackaging facilities (**see above warning**). Here we encounter entity institution type 4 which functions primarily as a data processing and validation intermediary for the control of salt quality data.

The provincial salt monitoring stations are responsible for the following IDD data management events, together with the **main data types** (see figure III-3):

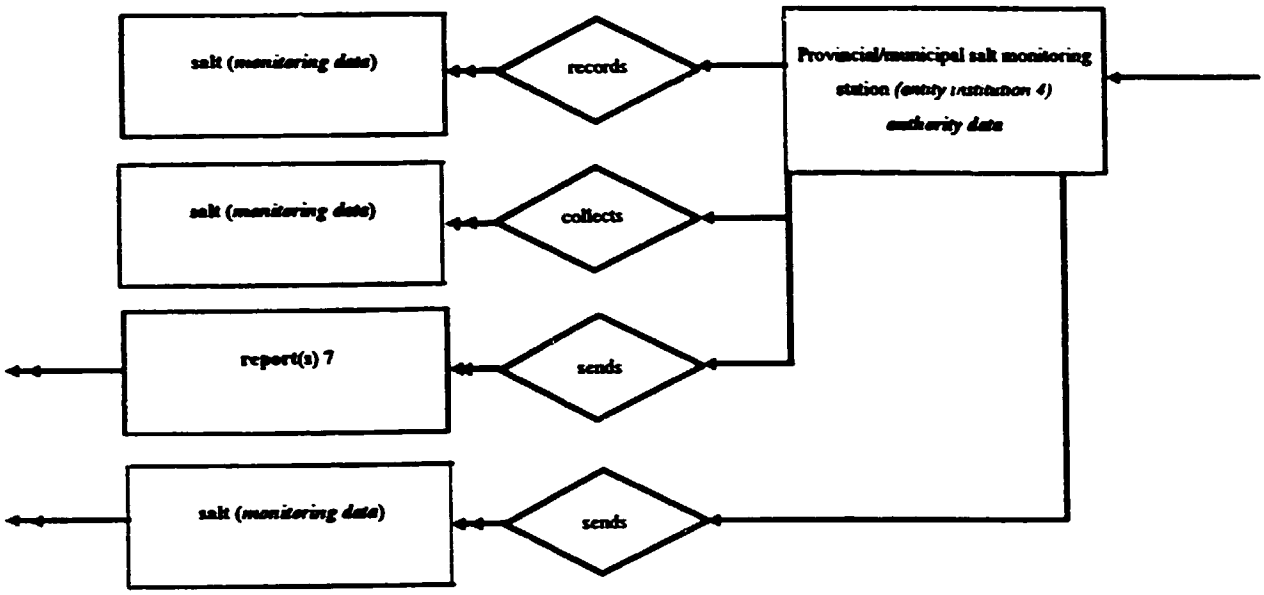
- The monitoring stations (***authority data***) computerize/record the incoming internal ***monitoring data***;
  N.B. it **does not record** production, packing, or shipping data.
- The monitoring station samples salt at iodization facilities (***facility data***), repackaging facilities (***facility data***), transshipment facilities (***facility data***), and warehouses/wholesalers (***facility data***) thereby producing external ***monitoring data*** (to validate reported data from the primary sub-network and beyond);
- The monitoring station sends all of its data to its provincial/municipal salt authority;
- The monitoring station prepares reports/data sets for transmission to the next level of the network.

Details of the report form used at this and the next level can be found in Annex III under 'Provincial/municipal salt monitoring station—report 7'.

Monitoring at national level

Figure 8 represents the data-related activities of the two salt research establishments at Tianjin and Zhigong (entity institution 5), which are responsible for the following IDD data management events, together with the **main data types** (see figure III-3):

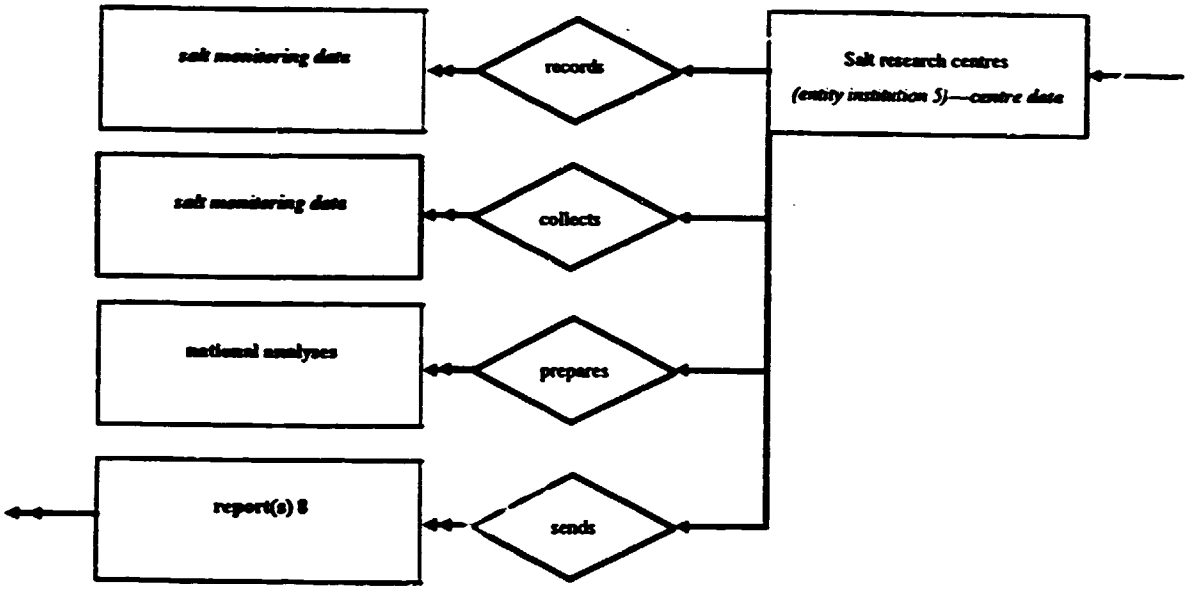
Figure 7—Events Diagram (ERD format)
Provincial/municipal salt monitoring stations



Note

- Entity institution 4 = Provincial or city salt monitoring station, responsible for salt QA/QC/iodization data.
- The reports are sent to the next level (or extracted from these locations) by electronic means. These centres both receive and collect quality/iodization data from the salt production and repackaging facilities in their province and they are empowered to run controls on these reported levels at any of the above as well as other facilites under their jurisdiction.
- The data is also passed on to the provincial/municipal salt authorities which maintain the overview for their constituencies.

Figure 8—Events Diagram (ERD format)
Salt research establishments



- The research institute (***centre data***) receives reports/computerized data sets of salt ***monitoring data***—both internal and external monitoring—from the provincial salt monitoring stations;
- The research institute undertakes external spot-checks (***monitoring data***) of iodization facilities (***facility data***) and repackaging facilities (***facility data***) to validate reported data;
- The research institute undertakes yearly routine external checks (***monitoring data***) of all iodization facilities (***facility data***);
- The research institute prepares reports/data sets for transmission to the NSIC and the NTTST.

Details of the report/form used by this and the previous sub-network can be found in Annex III under 'Salt research establishments—report 8'.

The salt research establishments are key players in the management of salt **monitoring**. Figure 2 shows the critical path of the network which stretches through the centre of the diagram, starting with the salt monitoring stations and the data they manage and ending with the salt research establishments and their data store.

Considering that the chemists and the laboratory facilities are located in the salt monitoring and research establishments, the necessary external quality checks and verifications can be carried out—this is especially important for data reporting in relation to monitoring activities, as factual errors (including data entry errors at the secondary data sub-network centres) can lead to misinterpretations and wrong conclusions. Any questionable entries should be caught here and returned to the originating authority/facility for re-checking. Also, any disputes arising from health external monitoring, which conflicts with salt internal or external monitoring, can be reviewed at this level.

As the research establishments are also responsible for training the chemists of the salt sub-networks, any methodological concerns can be also be addressed from this level.

Coordination at national level

It is foreseen that the NSIC will have *...a strong management team...* and *...provide the leadership and framework...*[4] for the salt side of the IDD programme, which is especially important for a well-functioning data/monitoring network.

As mentioned in the previous section and, as can be seen from the figures, data related to salt production, repackaging and movement is sent by the provincial/municipal salt authorities directly to NSIC. Here it will be concatenated into a national data set, from which a variety of reports and statistics will be compiled.

As also mentioned in the previous section, the salt monitoring data (both from internal and external monitoring undertaken within the salt sub-networks)

is received by the NSIC **after** processing and verification by the salt monitoring stations and the salt research establishments.

However, while any queries by the health counterparts on the quality of salt in the marketplace would best be handled by the research establishments, queries on the source of particular batches of salt or on the chain of distribution would best be traced by NSIC, as they would have the full national data set. Therefore, the network's feedback mechanism is routed through NTTST to NSIC, which can start investigative measures by searching the data system.

At the moment, many general- or specific-purpose salt reports are received by NSIC, which are not required by the IDD programme, some of which contain data relevant to the IDD programme's monitoring activities. In order to reduce the burden on the facilities and the sub-networks and to avoid duplicative reporting, all salt industry reports need to be standardized as far as possible.

Many of the data elements appearing in Annex III appear in some of the other reports currently being prepared by NSIC, therefore some sort of **rationalization is expedient**. It is beyond the terms of the IDD programme to examine the other salt industry reports, but in the interest of network efficiency, NSIC should make an effort to do so.

Other network events

Some potential network intermediaries have been omitted from the analysis at this stage because there is either no clear picture as to which facilities will be actively involved in the network activities—e.g. transhipment and warehouse/wholesale facilities (salt side)—or what their functions, data flows and relationships—e.g. county and provincial health authorities, Harbin and MOPH (health side)— will be. The same goes for the NTTST, which, although having a network coordinating/feedback role, is at an early a stage of development, so it is not clear what exactly it will do in relation to data flows, management and reporting.

Building an Electronic Communications Network [10]

Design considerations

The Iodine Deficiency Disorder information network consists of the following: the salt industry's internal network[11]; health institution's internal network; and inter networking the two internal networks. Within an internal network, there are two aspects to consider: local area network (LAN) which connect computers within the same building; and remote access[12] for provincial PCs. An internal network may look like the following:

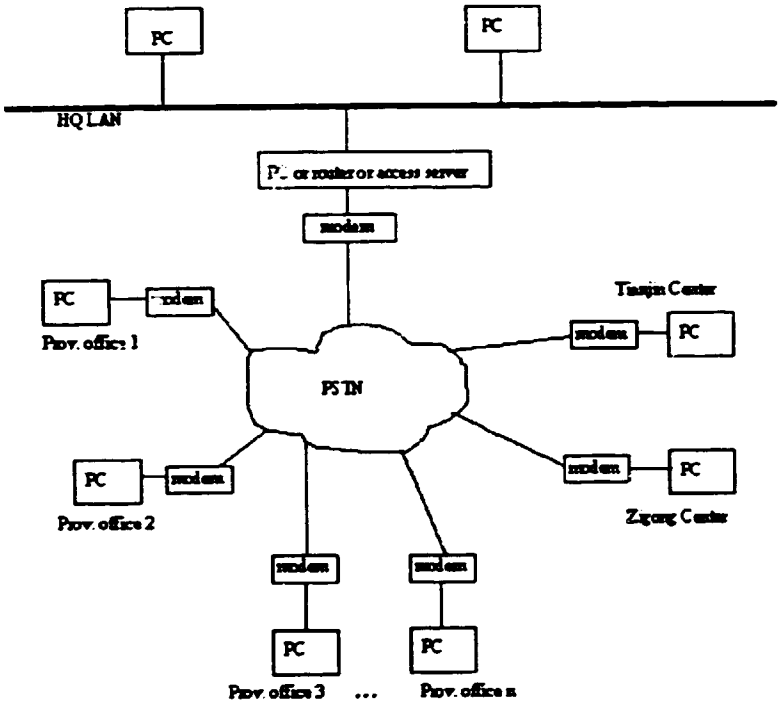


Figure 9. An internal network

Even though this network is drawn with the salt industry in mind, the health side may have a very similar structure, with the Harbin institute replacing the centers in Tianjin and Zigong. PSTN (public switched telephone network—the public telephone network) is used to connect remote provincial PCs to the headquarter's (HQ) LAN.

There are two ways for the remote provincial PCs to access the HQ LAN. One way is remote control, the other is remote node.

10 *Cindy Hao, December 1995 (UNICEF contract)*

11 *Author's note: Internal network = sub-network*

12 *Author's note: Virtual or real Wide Area Network (WAN)*

Remote control software allows the user to dial into a host computer and run applications on that host computer. The telephone connection "attaches" the remote computer's keyboard and screen to the host computer. This connection transfers keyboard input from the remote computer to the host and transfers screen output from the host to the remote computer. The user at the remote site operates the host computer. Remote control is good for running applications remotely. Remote control software packages include pcAnywhere, LapLink, and ReachOut, among others.

Remote node software extends the reach of the LAN to remote computers[13]. A remote access server needs to be set up on the LAN. This server can be a software package running on an existing LAN server or a piece of dedicated hardware. In the case of remote node, the remote computer dialing in to the LAN acts like any other local computer on the LAN; the remote node has access to LAN resources such as file servers and database servers. A major difference between the remote control and remote node access is that in the case of remote control, the remote user operates another computer (the host), while in the case of the remote node, the user always operates his/her own computer. Remote node software packages include Windows NT Remote Access Service and Novell Netware Connect. Shivas LanRover is an example of remote node server hardware.

Another way for the remote PCs to communicate with computers on the HQ LAN is by ***electronic mail*** (e-mail). This method does not provide any LAN *access* to the remote PCs. E-mail packages include Lotus cc:Mail, Microsoft Mail, and Netware MHS (message handling system).

Remote control solutions

Many software packages are available in the US, but in China only a few can be found. Norton's pcAnywhere by Symantec Corp is available in China. PcAnywhere 2.0 for Windows has a list price of $129 in the US, and its price in China is ¥2200. There is no Chinese version available.

A remote control network has been set up at the Beijing Medical University (BMU)[14] for a joint BMU-CDC (Center for Disease Control, USA) project which uses an earlier version of pcAnywhere. The project center has a LAN running Novell's Netware network operating system (NOS), and this LAN connects about two dozen PCs. There are about 60 remote PCs distributed in the project's 30 counties in four provinces; each county office has 2 PCs. Data entry is done in the county office. Once a month, persons at the central office dial into county office PCs and take control to check data integrity and transfer files from county computers to central office computers.

13 *Author's note: Wide Area Network (WAN)*

14 *Dr. R.J. Berry, consultant from CDC*

There are many **advantages** to this centralized approach:

- only the central office staff needs to be trained in operating the remote control software;
- the county computer operators just need to learn data entry skills and a simple procedure to set up their computers to allow dial in access;
- the cost of remote access (mainly long distance phone calls) is borne centrally and network operation cost can be centrally allocated instead of dividing up the budget to give to remote offices;
- the HQ computer takes full control of the remote host and HQ staff can diagnose and fix problems on county computers. This reduces the need to fly people out to provinces to fix computer problems.

The centralized approach also has some **disadvantages**:

- the central office will need to have enough personnel to handle the work load of collecting data from 30 or so computers once a month. The BMU operation has about 10 persons divided into two groups dealing with two different sets of data;
- if the central office does not have enough people, a choice can be made to let provincial or county office computers dial into central office computers to deposit data files, but this requires more training for the provincial computer operators.

The remote control approach is also the most economical way, but networking applications such as e-mail or client-server based database systems cannot be established on top of remote control software. On the other hand, some remote control software, for example, pcAnywhere for Windows 2.0, can be used over LAN connections and, therefore, can supplement the remote node solution discussed below. It is not necessary to have a LAN to run remote control software.

Remote node networking solutions

Even though many networking solutions for connecting PCs exist, the most common ones in China are Microsoft Windows NT (Windows NT) and Novell Netware (Netware).

Windows NT

Windows NT uses the client-server architecture. This means that the work required to handle applications is divided into two parts: some work is done on the server and some done on the client. The client provides an interface to the user. When the user runs an application he/she uses the client software on his/her own PC. When the application requires data or action from the server, the client software interacts with the server to supply what is needed. The server usually runs on a high-end computer with a powerful CPU (Central Processing

Unit), lots of memory and lots of disk space. The client can run on most personal computers.

Besides supporting clients on a LAN, Windows NT also supports remote nodes. The software that supports remote nodes is called Remote Access Service (RAS). So a Windows NT network supporting both LAN nodes and remote nodes consists of the following parts:

- Windows NT server;
- Windows NT LAN clients;
- Remote Access Service (RAS) server;
- Windows NT remote clients.

Windows NT server

The latest version of Windows NT server software is version 3.51. To run the server software, the following hardware configuration is needed:

- at least a 486 computer running at 66 MHz;
- at least 16 MB of memory;
- CD-ROM drive;
- VGA or Super VGA monitor.

None of the existing computers on the salt or the health side of the IDD network are sufficient to run server software. Most of the existing PCs are AST premmia 486/66 computers, with 8MB of memory, and 340 MB of hard disk. Even though some of these computers may be upgraded to act as servers, it is better to purchase computers which are designed to be servers.

No Chinese version of Windows NT server software exists.

Windows NT LAN clients

All the existing computers in the salt and health institutions are capable of running as Windows NT clients. Often client licenses will come with the server software. Clients are supported on the following systems:

- computers running Windows 3.1 (English) or Windows 3.2 (Chinese);
- computers running DOS;
- client software is included in Windows for Workgroups 3.11;
- client software is included in Windows 95—Chinese version is expected to come out at the end of 1995.

Windows NT RAS

Windows NT Remote Access Service can be run either on a Windows NT workstation (which is a Windows NT LAN client) to support 1 dialup port, or

on a Windows NT server to support up to 256 dialup ports. When running the RAS on a network client, this client cannot be used to do other things.

To support more than 1 dialup port, a multi-port serial board needs to be purchased.

Windows NT Remote clients

Remote client software is supported on the following platforms:

- client software license can be purchased for Windows 3.1 or Chinese Windows 3.2;
- client software is included in Windows for Workgroups 3.11;
- client software is included in Windows 95.

Windows NT network can support TCP/IP protocols and therefore become part of the Internet.

Novell Netware

Novell Netware Network Operating System (NOS) is the most widely used NOS for PC networks. The network is mainly a resource sharing network; PCs on the LAN can share files on the Netware file server and share printers via a Netware print server. The latest version of Netware is version 4.1. A popular version is 3.12 which has been localized into Chinese. A Netware network having both LAN nodes and remote nodes also consists of four parts:

- a Netware file server;
- Netware LAN clients;
- Netware Connect (server for remote nodes);
- Netware remote clients.

Requirements for hardware and software are similar to those for a Windows NT network. Netware is by far the most widely used NOS in the world as well as in China. In China, more than 80% of all PC networks use Netware NOS. New versions of Netware (version 4.x) also have support for TCP/IP.

Electronic mail systems

Without setting up a full-fledged network, remote provincial PCs can still communicate with computers on the HQ LAN by e-mail. All the PC e-mail systems have a similar structure. A post office needs to be set up on a HQ LAN server. A remote access server needs to be set up to support provincial PCs dialing in. Computers connected on the LAN need to run a mail client program for LAN nodes, and remote PCs need to run a remote client program.

E-mail software packages that support Chinese characters are available:

- cc:Mail by Lotus Corporation;

- MS Mail by Microsoft Corporation.

cc:Mail

cc:Mail is a product of the Lotus Corporation. It is an electronic mail software package which can be run over many network protocols or over a telephone link and is independent of any application programs. To have a cc:Mail network that supports both LAN and remote clients, the following components are needed:

- a cc:Mail post office that runs on a LAN server;
- cc:Mail client software for LAN nodes;
- cc:Mail dialup support software;
- cc:Mail Mobile for remote provincial PCs.

A post office is a program that runs on a LAN server, and it handles collection and delivery of mail. PCs attached to the LAN can become cc:Mail users using standard software (the cc:Mail LAN Pack includes license for 10 users; more users can be added by purchasing more licenses). Remote PCs which do not attach to a LAN use the cc:Mail Mobile software package to dial into a dialup server to send and receive mail. Both e-mail messages and binary files can be exchanged using cc:Mail.

Dialup support can be part of the post office or can be a special package that runs on a dedicated PC running DOS. If mail exchange between two post offices is needed, mail routers are required. The router software must run on a dedicated PC and this router can also be used to support dialup mail clients. If the dialup server or the router runs on a DOS system, then only 1 dialup port is supported. To support more than 1 dialup port, a more advanced operating system, such as OS/2, is necessary.

Setup for MS Mail is similar to cc:Mail, but MS Mail is more integrated with other Microsoft software packages such as Word or Excel. Both e-mail systems can be added on top of a full-fledged, LAN-and-remote-node network running either Windows NT or Netware.

Inter networking salt and health networks

If the salt and health sectors are to establish full-fledged networks[15] using either Windows NT or Netware, each of them may allow access from the other side using the same remote node access server they use to provide access to their own provincial PCs. This way, selected or all computers of the IDD network can query and search databases on either the salt HQ LAN or the health HQ LAN. [16]

15 *Author's note: this author does not recommend that a full-fledged electronic network be established during the first stage of activities.*

If either cc:Mail or MS Mail is used as the means of networking to exchange mail between the salt and health networks, message routers must be set up on salt and health LANs to connect the post offices. Other organizations needing to exchange information will have to become remote clients just like the provincial sub-network centres.

If electronic mail exchange (with the ability to mail binary files) among a few key institutions on the salt and health side of the IDD network can satisfy the need for information exchange between the two sectors, dialup Internet accounts from an Internet Service Provider can be acquired for these institutions. These Internet accounts will also allow other organizations, such as UN agencies involved in the programme, to exchange mail with the salt and health institutions. Use of Internet to interconnect the sub-networks for all communication needs is an increasing option in China.

Cost Estimates

Initial costs for setting up the network vary depending on what kind of networking system is adopted. They can be a combination of the following hardware and software costs.

Hardware costs

- 70 14.4Kbps modems: 70 x 200 — 14,000
  (always needed);
- 2 LAN servers: 2 x 5,000 — 10,000
  (only if need LAN);
- 2 4-port serial boards: 2 x 100 — 200
  (for supporting multiple remote dialup ports);
- 2 8-port 10BaseT hubs: 2 x 350 — 700
  (only if need LAN);
- 10BaseT wires for LANs: 2 x 250 — 500
  (only if need LAN);
- 70 Ethernet boards: 70 x 100 — 7,000
  (only if need LAN).

Software costs

- 70 copies of pcAnywhere software: 70 x 129 — 9,030
  (for remote control solution);

[16] *Author's note: the understanding of this author is that external (i.e. from non-salt sector participants) access to the salt industry's data base will not be allowed.*

- 2 sets of (Novell Netware 3.12 with a 50-user license):
  2 x 3200 6,400
  (if use Netware on LAN);
- 2 sets of (Novell Netware Connect for 2 ports):
  2 x 780 1,560
  (to support Netware remote nodes);
- 2 32-user Netware remote node packages: 2 x 6,000 12,000;
- 2 sets of (Windows NT server 3.51 with 10 client licenses):
  2 x 1,600 3,200
  (if use Windows NT on LAN);
- 2 copies of Windows NT RAS: 2 x 700 1,400
  (to support remote Windows NT nodes);
- 60 licenses for remote Windows NT nodes: 60 x 35 2,100
  (to run Windows NT remote nodes);
- 2 copies of cc:Mail LAN Pack (Chinese) with a 10-user license:
  2 x 680 1,360
- 3 sets of cc:Mail Mobile 20-user license packs (Chinese):
  3 x 2100 6,300
- 2 copies of MS Mail server software (Chinese): 2 x 1,200 2,400
- 60 copies of MS Mail Remote Client (Chinese): 60 x 330 19,800
- 10 copies of Internet-in-a-Box: 10 x 100 1,000
  (for Internet accounts).

Notes:
(1) Costs of applications software, such as word processors or spreadsheet software are not considered here;
(2) Some prices are for the Chinese market and are converted from RMB to US$. Buying them (if available) in the US would cost less.

Operating costs

Operating costs are mainly charges for long-distance telephone calls for provincial PCs to dialup to HQ PCs or vice versa. It is difficult to estimate.

Table 1 lists many possible combinations of setting up a network and their associated costs. The most economical networking solution is using remote control software. In this case, only modems and the remote control software are needed. But the remote control approach will not support any networking applications such as e-mail or a distributed database system[17]. Also, remote control software is more difficult to learn to use.

[17] *Author's note: it is not recommended to have a distributed data base system during the first phase—i.e.*

Table 1

Costs Networking Solution	modems	servers	hubs & wires	network boards	serial boards	pcAnywhere	cc:Mail LAN Pack	cc:Mail Mobile	MS Mail server	MS Mail Remote	Netware	Netware Connect	Netware rmt. nodes	Windows NT server	Windows NT RAS	Windows NT Rmt. nodes	Internet software	TOTAL COSTS
Remote Control	$14,000	$0	$0	$0	$0	$9,030	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$1,000	$24,030
Netware LAN + cc:Mail	$14,000	$10,000	$1,100	$7,000	$0	$0	$1,360	$6,300	$0	$0	$6,400	$0	$0	$0	$0	$0	$1,000	$47,160
Netware LAN + MS Mail	$14,000	$10,000	$1,100	$7,000	$0	$0	$0	$0	$2,400	$19,800	$6,400	$0	$0	$0	$0	$0	$1,000	$61,700
Netware LAN + cc:Mail + Remote Ctrl.	$14,000	$10,000	$1,100	$7,000	$0	$9,030	$1,360	$6,300	$0	$0	$6,400	$0	$0	$0	$0	$0	$1,000	$56,190
Netware LAN and Remote Nodes	$14,000	$10,000	$1,100	$7,000	$800	$0	$0	$0	$0	$0	$6,400	$1,560	$12,000	$0	$0	$0	$1,000	$53,860
Netware LAN and Remote Nodes + cc:Mail	$14,000	$10,000	$1,100	$7,000	$800	$0	$1,360	$6,300	$0	$0	$6,400	$1,560	$12,000	$0	$0	$0	$1,000	$61,520
Netware LAN and Remote Nodes + cc:Mail + Remote Control	$14,000	$10,000	$1,100	$7,000	$800	$9,030	$1,360	$6,300	$0	$0	$6,400	$1,560	$12,000	$0	$0	$0	$1,000	$70,550
Windows NT LAN + cc:Mail	$14,000	$10,000	$1,100	$7,000	$0	$0	$1,360	$6,300	$0	$0	$0	$0	$0	$3,200	$0	$0	$1,000	$43,960
Windows NT LAN + MS Mail	$14,000	$10,000	$1,100	$7,000	$0	$0	$0	$0	$2,400	$19,800	$0	$0	$0	$3,200	$0	$0	$1,000	$58,500
Windows NT LAN + cc:Mail + Rmt. Ctrl	$14,000	$10,000	$1,100	$7,000	$0	$9,030	$1,360	$6,300	$0	$0	$0	$0	$0	$3,200	$0	$0	$1,000	$52,990
Windows NT LAN and Remote Nodes	$14,000	$10,000	$1,100	$7,000	$800	$0	$0	$0	$0	$0	$0	$0	$0	$3,200	$1,400	$6,300	$1,000	$44,800
Windows NT LAN and Remote Nodes + MS Mail	$14,000	$10,000	$1,100	$7,000	$800	$0	$0	$0	$2,400	$19,800	$0	$0	$0	$3,200	$1,400	$6,300	$1,000	$67,000
Windows NT LAN and Remote Nodes + MS Mail + Remote Control	$14,000	$10,000	$1,100	$7,000	$800	$9,030	$0	$0	$2,400	$19,800	$0	$0	$0	$3,200	$1,400	$6,300	$1,000	$76,030
Recommended solution salt sector Netware LAN (x 4) + cc:Mail (x 64) + pcAnywhere (x 64)	$12,800	$20,000	$2,400	$2,000	$0	$8,256	$2,720	$6,300	$0	$0	$6,400	$0	$0	$0	$0	$0	$1,000	$61,876

* *Author's recommendation*

Another possibility is to set up a LAN at HQ to support an e-mail system for remote computers in the provinces. Factory salt data are entered and stored in the provincial offices and mailed to the HQ LAN in a predefined format. The advantages of this approach are:

- an e-mail system is relatively easy to use;
- the cost for setting up such a system is not very high;
- operating costs can be low because the provincial computers need only to make the long distance phone call when sending and receiving mail messages; and
- composing messages can be done off-line.

But provincial PCs will not be able to query the databases on the HQ LAN interactively.[18]

After establishing a HQ LAN, it is not difficult to add support for remote LAN nodes. In a full-fledged, LAN-and-remote-node network[15 & 18], computers at HQ and in the provinces will be able to query and search the database. Other network applications, for example e-mail, can also be added to the network. However, having a full-fledged network not only has higher initial costs, but operating costs in terms of long distance telephone bills will also be higher than a remote-client e-mail system, since the remote nodes can interactively use resources on the LAN and interactive use takes more time online.

The most complete setup is a full-fledged network supporting both LAN and remote nodes, with an e-mail application and remote control capability. This way, all the networking applications can be used, and remote control software can be used for diagnosing and fixing computer problems in provincial offices.

Other considerations

New requests by the salt industry[19] make it necessary to add other considerations to the design of the network. Originally, one computer in each provincial salt office was expected to handle the gathering and recording of production and quality data from salt iodization and repackaging facilities in the province. Now the salt headquarters in Beijing wants to have *two* offices--the salt monitoring station and the provincial salt company--handle salt quality and salt production data separately for each province.

From a data management point of view, these two offices should use the same database system. One of the offices, most likely the salt quality monitor-

[15] *through a Wide Area Network*

[18] *Author's note: as they will have their own complete data base, they are unlikely to need access to the national 'picture'*

[19] *Author's note: made during this author's second mission to Beijing*

ing station, should forward its data to the provincial salt company which will take the responsibility of storing all data and forwarding the data to the Beijing HQ or to one of the national salt quality centers[20]. Therefore, electronic data transfer between the two provincial offices is needed.

In some provinces, the two offices are in the same city or the same building, and transfer of data can be done by having a person deliver a diskette. When the two offices are not in the same geographical location, electronic means of data transfer must be used. The best way to do this is to use the remote control approach. For example, the computer at the salt monitoring station can run the pcAnywhere host mode software, and the computer at the provincial salt company can run pcAnywhere remote mode software. The PC running remote mode software can take control of the host computer and do things like synchronizing databases, transferring files, etc.[21]

The salt industry now has one computer for each province, which is located at the provincial salt company—30 more are needed for the provincial salt monitoring stations. More modems and more licenses for the pcAnywhere software also need to be purchased for the second provincial computers which are not located in the same city. The total additional cost may be around $90.000.[22]

Using the Internet to communicate

So far my report has focused on building electronic networks for the IDD, however, there is an alternative to building dedicated networks. Recently, the largest computer network in the world--the Internet--is making great inroads into China.

The Internet has become more and more available here and it may be used for data communications within the IDD program. Even though there are some disadvantages in this approach, one of which is the lack of Chinese-language application programs, access to the Internet is improving day by day. As the Internet reaches beyond academic circles in China, more companies will start working on localizing the application programs into Chinese.

One of the largest Internet projects in China is undertaken by the Chinese Ministry of Post and Telephone (MPT). MPT is establishing an Internet backbone, called ChinaNet, to connect all provincial cities by June 1996. Other ministries or organizations are also building internets of their own. For example, the Chinese Academy of Medical Sciences (CAMS), with the sponsorship of the China Medical Association (USA), is building an internet which

20 *Author's note: see figure 3 and the section 'Entities and their relationships' for details of reporting procedures*

21 *Author's note: should this not prove feasible, diskette-based forwarding will still be an option*

22 *Author's note: US$ 145,600 for hardware*

will connect twelve medical colleges in the following cities: Beijing, Shanghai, Xian, Jiujiang, Hangzhou, Changsha, Lahsa, Guangzhou, and Chengdu.

The provincial offices of the health side of the IDD program should be able to tap into a CAMS internet access point nearest them. This way, the cost of running the IDD information network can be lowered: instead of making long distance phone calls, the provincial office computers can make local calls if there is an Internet access point in the same city, or make calls to the provincial city which should be cheaper than calling Beijing. Also, it is relatively easy to let somebody else provide you with network access than maintaining a network of your own, so training needs may be reduced.

Since the schedule of the IDD programme calls for implementation of the electronic information system by the end of 1996, and by then, more Internet access points will definitely appear throughout China, using the Internet for IDD data communications should be considered seriously.

If the Internet is used, both the salt headquarters LAN and the NTTST LAN can establish permanent connections to the global Internet by leasing dedicated digital circuits from Beijing Telecom Administration (BTA) which is the official Internet Service Provider in Beijing. Provincial PCs can access the Internet via dial up to the service provider nearest to them, which is often the provincial telecom authority and the telephone call to the service provider is probably a local call instead of a long distance call. So the bulk of the costs of operating the IDD network will be the costs for leasing dedicated digital circuits and is more centralized.

As a start, Internet accounts can be obtained from BTA for the major institutions involved in the IDD, so they can start communicating by electronic means, and by so doing, they will come to appreciate power of electronic communications.[23]

[23] *Author's note: It is recommended that the following network configuration be implemented for the salt sector during the first phase:*
a) NSIC, Tianjin, Zhigong & NTTST should each have a Local Area Network, using Novell Netware;
b) These coordinating centres should use cc:Mail (Chinese version) and the provincial/municipal authorities cc:Mail Mobile;
c) All participating centres should also have pcAnywhere, which will allow coordinating centres to run remote diagnostics in case of problems, and restore program files if necessary;
d) The 4 coordinating centres and 6 others (to be selected on their capacity) should have Internet accounts for testing;
e) The provincial/municipal authorities will send pre-formatted data files via cc:Mail to their next levels of reporting (see 'Entities and their relationships' chapter). Should this prove problematic, pcAnywhere could be used by the coordinating centres to create the files and to 'download' them directly. These pre-formatted data files will be loaded electronically to concatenated data sets;
f) The provincial/municipal salt monitoring stations and salt authorities must make sure that their respective data sets are kept up-to-date with the other's data. This may be achieved through cc:Mail, diskette-based exchanges, or with pcAnywhere.
The reader should refer to the next chapter, 'Funding issues' for the hard- and software budget implications.

Funding Issues

The reader also should refer to Annex IV (network schedule) and to table 1 in the previous section. The following items relate to funding groups, their individual activities and associated costs, while the network schedule shows the sequence of the activities:

- 0—Pre-requisites;
- 1—Systems analysis;
- 2—Electronic communications;
- 3—Data system design & implementation;
- 4—Training;
- 5—System installation & usage;
- 6—Equipment; and
- 7—System development management.

Considering that only the salt side of the network has had the benefit of an analysis at the time of writing, only the costs associated with setting up that component of the IDD network are reflected in this section.

However, there will be several economies which can be realized if some of the following activities are undertaken for the salt and the health sides of the IDD network concurrently—the basic assumption underlying this analysis and the IDD programme as a whole is that **one system** will be developed for both the salt and the health sectors.

The above considerations indicate that funding could be divided between the financial contributors to those two groups, so wherever feasible indications of costs for the health sector are given in the following budget.

N.B. only the items which (still) require funding have been budgeted.

0–Pre-requisites

There are three components to this output.

0/1 system operators All system operators (sysops) at salt (& health) authorities should be identified by the national counterparts **before any other work goes ahead**, as these will be the nominees for the first round of training.

It is assumed that there will be 30 sysops each from the provincial/municipal salt authorities, the provincial/municipal salt monitoring stations, and the provincial health authorities, 2 each from the research institutes in Tianjin, Zhigong and Harbin, as well as 2 each from the NSIC, NTTST and MOPH (i.e. a total of 102 system operators/trainees). In addition, thought should be

given to having 'back-up' personnel at each of the provincial/municipal locations.

0/2 translation This report should be translated to Chinese and be distributed to all coordinators and sub-network members as soon as possible. The report should be considered as an operations manual for the network, to be used together with the data base manual.

Cost base—**2 m/m** for a Chinese local recruit

- 40 (days) x 75 — 3,000
- **SUB-TOTAL** — *3,000*

0/3 Printing report. Cost base—25 pages for $1.

- 4 (x 25) x 100 — 400
  (a 100-page manual for 100 salt sector users; 66 sysops & reserve copies);
- **SUB-TOTAL** — *400*
- **TOTAL** — **3,400**

N.B. although this item must be repeated for the health sector once their analysis has been completed, there are likely to be some cost savings, as much of the general text will have been previously translated.

1—System analysis

There are 3 components to this output.

1/1 was a preliminary analysis for the salt industry sub-network, funded by UNDP (TSS2-CPR/91/434) with the travel and subsistence ffunded by the UNICEF/CICETE-executed & UNDP-funded project DG/CPR/91/434

- **Completed**

1/2 finalized the information system analysis for the salt industry under the same funding as 1/1

- **Completed**

1/3 is intended to undertake a systems' analysis for the health sub-network.

- fee 2 x 21 (days) — 10,278
- travel costs x 2 — 7,000
- subsistence x 2 — 5,040
- AOS — 2,028
- **SUB-TOTAL** — *24,346*
- **TOTAL** — **24,346**

All activities under this output must be finalized as soon as possible to allow the data management system to be developed in time for installation and use by the end of 1996.

2—Electronic communications

There are 2 activities required to achieve this output.

2/1 resulted in recommendations on the means of electronic data interchange (hardware and software) for the network and was funded by UNICEF

- **Completed**

2/2 should start once all equipment and the electronic communications software (recommended under activities 1 and 2/1) have been purchased, the system operators nominated and basic PC training (item 4/1) has been given. The consultant will be required to travel to each provincial/municipal salt authority & monitoring station to install the electronic communications software and train the system operators in its use.

Cost base—top national consultant costs US$ 75/day, travel to 30 provinces/municipalities--3 days per province + travel time (1 day each/air)

- fee 30 (provinces) x 4 (days) = 120 (days) x 75 — 9,000
- travel costs 30 (provinces) x 200 — 6,000
- subsistence 120 (days) x 50 — 6,000
- **SUB-TOTAL** — *21,000*
- **TOTAL** — **21,000**

N.B. it is advisable to install the electronic communications and train the system operators of the salt and health sectors at the same time, otherwise the above costs must be repeated. This would presume that the sysops of the health sector have received their basic PC training first. If this is possible, a provincial group training in electronic communications may be arranged for all sysops, which would also reduce the above budget and the consultant's time required in each province.

3—Data system design & implementation

This is **the most important output**, as it is at the heart of the IDD information management issue, however, there are ***currently no budget allocations for this output***.

There are 8 sets of activities required to achieve this output.

N.B. all the following budget items are based on the system analysis for the salt sector only. A budget increase will be necessary for the health sector, even assuming that their system analysis has been completed and is available to the

team of programmers—however, one can assume that some economies can be achieved if this is the case.

3/1 System design. Cost base—**1 m/m** international consultancy based upon the systems' analysis with 1 week briefing in Vienna

- fee 6,500
- travel & subsistence 2,500
- **SUB-TOTAL** *9,000*

3/2 System programming. Cost base—**3 m/m** international consultancy with 2 weeks briefing in Vienna

- fee 3 x 6,500 19,500
- travel & subsistence x 2 5,000
- **SUB-TOTAL** *24,500*

3/3 System testing in Beijing. Cost base—**0.5 m/m** international consultant (programmer) together with system development manager and national system managers.

- fee 0.5 x 6,500 3,250
  (no fee for system development manager as covered under 7/1!);
- travel 2 x 3,500 7,000
- subsistence 2 x 11 days x 180 3,960
- terminals 2 x 110 220
- **SUB-TOTAL** *14,430*

The national counterparts should pay the travel and subsistence costs for the national system managers—2 each from NSIC, Tianjin and Zhigong—who will be involved in the testing and later as assistant trainers under 4/2.

N.B. it is recommended that the national system managers for NTTST and MOPH attend.

N.B. it is also recommended that the counterparts undertake a 'dry run' after the software testing—i.e. all network participants should receive their forms and test data.

3/4 System debugging. Cost base—**1 m/m** international consultant with 1 week briefing in Vienna

- fee 6,500
- travel & subsistence 2,500
- **SUB-TOTAL** *9,000*

3/5 Translating system menus, messages etc. Cost base—**3 m/m** a Chinese-/English-speaking operator from IDD network (or a national consultant

familiar with the network) will be needed to translate system menus, messages, output forms etc. and **0.5 m/m** for an international (junior) consultant to integrate the language changes into the system.

- fee (national expert) 40 (working days) x 75 — 3,000
- fee (national expert) 10 (working days to assist the junior international consultant to translate the system on the basis of translator's work) x 75 — 750
- fee international (junior) consultant 1 x 2,000 — 2,000
- travel 1 x 3,500 — 3,500
- subsistence 1 x 11 days x 180 (DSA) — 1,980
- terminals 1 x 110 — 110
- **SUB-TOTAL** — *11,340*

3/6 Translating user manual. Cost base—**2 m/m** for a Chinese local recruit to translate the users' manual and other instruction sheets

- fee (national expert) 40 (working days) x 75 — 3,000
- **SUB-TOTAL** — *3,000*

3/7 Printing user manual. Cost base—25 pages for $1.

- 2 x 100 (a 50-page manual for 100 salt sector users; 66 sysops & reserve copies); — 200
- Miscellaneous budget (e.g. printing & binding, pages of brief instructions for sysops & for salt iodization & repackaging facilities) — 5,000
- **SUB-TOTAL** — *5,200*

3/8 System upgrading. Cost base—**1 m/m** international consultant with 1 weeks briefing in Vienna

- fee — 6,500
- travel & subsistence — 2,500
- **SUB-TOTAL** — *9,000*
- **TOTAL** — **85,470**

4—Training in data management

There should be 2 *group* training programmes. Other on-the-job training will take place in the provinces in relation to activities 2/2 and 5/1.

4/1 A 5-day (1 week) basic training in PC usage. Cost base—group training for all system operators in Beijing i.e. 66 trainees for 5 days

- travel 66 (salt sysops) x US$ 200 — 13,200
  national contribution;
- subsistence 66 (salt sysops) x 50 x 6 (days incl. 1 for travel) — 19,800
  national contribution;
- training fee — 20,000
- **SUB-TOTAL** — *20,000*
  (provincial authorities should pay travel & subsistence for training of their staff members in their own country).

N.B. considering the size of the groups, all system operators (salt and health sectors—total 102 trainees) cannot be trained at the same time, therefore a series of courses should be arranged.

4/2 A 10-day (2 x 1 week) group training for all system operators in the network's software--should be in Beijing. Cost base—66 trainees for 10 days and **0.5 m/m** international consultant together with system development manager

- travel 66 (salt sysops) x 200 — 13,200
  national contribution;
- subsistence 66 (salt sysops) x 50 x 6 (days) — 19,800
  national contribution;
- fee 0.5 x 6,500 — 3,250
  (no fee for system development manager as covered under 7/1!);
- 2 x 11 (days) x 180 (DSA) — 3,960
- travel 2 x 3,500 — 7,000
- terminals 2 x 110 — 220
- rent of premises & PCs — 20,000
- **SUB-TOTAL** — *34,430*
  (provincial authorities should pay travel & subsistence for training of their staff members in their own country)

N.B. it is advisable to train the system operators of the salt and health sectors during the stay of the international consultants, otherwise the above project costs must be repeated. This would presume that the sysops of the health sector have received their basic PC training first and that their components of the IDD data management system have been completed.

- **TOTAL** — **54,430**

5—System installation & usage

There are 2 components for this output.

5/1 Installation of data management system and conversion of existing data (in Tianjin & Zhigong). Cost base—international (junior) consultant, travel to 30 provinces/municipalities), 3 days per province + travel time (1 day each/air) & 10 days to assist in the sysops' training course in Beijing. Accompanying national counterpart for language support and on-the-job training in supervision

• fee 5 x 4,000	20,000
• international travel 1 x 3,500	3,500
• national travel 30 (provinces) x 200 x 2	12,000
• terminals 1 x 110	110
• subsistence provinces (internat.) 120 (days) x 100	12,000
• subsistence provinces (nat.) 120 (days) x 50	6,000
• subsistence Beijing 10 (days) x 180	1,800
• **SUB-TOTAL**	*55,410*

N.B. it is advisable to install the system for the salt and health sectors at the same time otherwise the above costs must be repeated. This would presume that the sysops of the health sector have received their training first and that their components of the IDD data management system have been completed.

5/2 Test run following the beta testing of the software (no associated costs for the project).

5/3 System usage by all network participants for 1 year (no associated costs for the project).

• **TOTAL**	**55,410**

6—Equipment

6/1 Hardware. Cost base—purchase missing PCs

• 4 (PCs & printers) x 4,000 (missing from first deliveries);	16,000
• 30 (PCs & printers) x 4,000 (new request from NSIC for the salt monitoring stations)	120,000
• 4 (servers) x 5,000 (for NSIC, Tianjin, Zhigong & NTTST)	20,000
• 4 (LAN peripheries) x 1100	4,400
• 64 (fax/modems) x 200	12,800
• 64 (backup hard/software) x 400	25,600
• 64 (UPS sets) x 400	25,600

- 184 (fax machines for salt iodization & repackaging facilities) x 300 — 55,200
  national contribution;
- 64 (fax machines for provincial/municipal authorities, NSIC, Tianjin, Zhigong & NTTST) x 300 — 19,200
  national contribution;
- **SUB-TOTAL** — *224,400*

6/2 Software

- 4 (Novell Netware) x 780 — 3,120
- 4 (cc: Mail–Chinese) x 680 — 2,720
- 64 (pcAnywhere) x 129 — 8,256
- 3 (cc:Mail Mobile–20-user packs) x 2,100 — 6,300
- 10 (Internet accounts) x 100 — 1,000
  (for test use at best sites)
- **SUB-TOTAL** — *21,396*
- **TOTAL** — **245,796**

7—System development management.

In order for all developments from 1-6 run smoothly and to integrate the different components, it is necessary to have a system development manager to oversee things. This would include time for supervising the international consultants, attending the testing and training sessions and suggesting improvements based on own experience of data management. Cost base—**2 m/m** spread over 2 years (for the salt sector only)

- **TOTAL** — **14,000**
- **GRAND TOTAL** — **503,852**

National contributions

The foregoing figures do not take into account the 'running costs' of the network, which will consist of the following (un-budgeted) main items:

- system operators — **minimum 1 full-time** person per authority, more necessary for lead centres;
- correspondence — mailing, telephone, e-mail charges;
- hardware — maintenance/problem-solving, spare parts, diskettes;
- standard software — user support, problem-solving, upgrades.

Health authorities	Salt monitoring stations	Salt authorities	System ID	Facility	Function
No. 85 ChangJiang Road Hefei, Anhui 230001	No. 4 SuZhou Road Hefei, Anhui 230001 Sys. ID: INS-ANHU000002	No. 4 SuZhou Road Hefei, Anhui 230001 Sys.ID: INS-ANHU000001	INS-ANHU000003	DingYuan Salt Mine	Iodization
			INS-ANHU000004	He Fei Salt Company	Packaging
			INS-ANHU000005	An Qing Salt Company	Packaging
			INS-ANHU000006	Fu Yang Salt Company	Packaging
			INS-ANHU000007	Huai Nan Salt Company	Packaging
			INS-ANHU000008	Su Xian Salt Company	Packaging
			INS-ANHU000009	Wu Hu Salt Company	Packaging
No. 2 HuiBaiShu Jie XuanWu District Beijing 100053	No. 39 YongWai DaJie Chongwen, Beijing 100075 Sys. ID: INS-BEIJ000002	Beijing Salt Company No. 39 YongWai DaJie Chongwen, Beijing 100075 Sys. ID: INS-BEIJ000001	INS-BEIJ000003	Beijing Salt Company	Packaging
No. 61 GuPing Road Fuzhou, Fujian 350003	No. 1 Shengfu Rd. Fuzhou, Fujian 350001 Sys. ID: INS-FUJI000002	Middle Section WuYi Road Fuzhou, Fujian 350003 Sys. ID: INS-FUJI000001	INS-FUJI000003	FuZhou Transfer Station	Iodization
			INS-FUJI000004	ShanYao saltworks	Iodization
			INS-FUJI000005	QuanZhou Transfer Station	Iodization
			INS-FUJI000006	DongShan Transfer Station	Iodization
			INS-FUJI000007	ZhangZhou Transfer Station	Iodization
			INS-FUJI000008	PuTian Transfer Station	Iodization
No. 63 ChangJia Xiang ChengGuan District Lanzhou, Gansu 730030	No. 1 Yizhichuan North Rd. Lanzhou, Gansu 710004 Sys. ID: INS-GANS000002	No. 1 Yizhichuan North Rd Lanzhou, Gansu 710004 Sys. ID: INS-GANS000001	INS-GANS000003	ZhangXian saltworks	Iodization
			INS-GANS000004	GaoTai saltworks	Iodization
			INS-GANS000005	Lan Zhou Salt Distribution Co.	Packaging
			INS-GANS000006	He Xi Salt Distribution Co.	Packaging
			INS-GANS000007	Tain Shui Salt Distribution Co	Packaging
No. 17 XianLie South Road Guangzhou Guangdong 510060	Jinying Building, 20th Floor No. 316 Sihuanzhong Rd. Guangzhou 510060 Sys. ID: INS-GUAD000002	No. 116 YueHua Road Guangzhou Guangdong 510034 Sys. ID: INS-GUAD000001	INS-GUAD000003	DianBai saltworks	Iodization
			INS-GUAD000004	HaiKang saltworks	Iodization
			INS-GUAD000005	XuWen saltworks	Iodization
			INS-GUAD000006	GuangZhou Refined Salt Plant	Iodization
			INS-GUAD000007	ShanWei saltworks	Iodization
			INS-GUAD000008	QingZhou saltworks	Iodization
			INS-GUAD000009	Mei Zhou Salt Company	Packaging
			INS-GUAD000010	Shao Guan Salt Company	Packaging
			INS-GUAD000011	Zhong Shan Salt Company	Packaging

No. 35 TaoYuan Road Nanning, Guangxi 530021	No. 51 JianZheng Road Nanning, Guangxi 530023 Sys. ID: INS-GUAX000002	No. 51 JianZheng Road Nanning, Guangxi 530023 Sys. ID: INS-GUAX000001	INS-GUAX000003	HePu saltworks	Iodization
			INS-GUAX000004	FangCheng Transfer Station	Iodization
			INS-GUAX000005	BuoBai saltworks	Iodization
			INS-GUAX000006	Nan Ning Salt Company	Packaging
			INS-GUAX000007	Liu Zhou Salt Company	Packaging
			INS-GUAX000008	Yu Lin Salt Company	Packaging
Provincial Govt. Compound Guiyang, Guizhou 550004	No. 29 YanWu Jie Guiyang, Guizhou 550001 Sys. ID: INS-GUIZ000002	No. 29 YanWu Jie Guiyang, Guizhou 550001 Sys. ID: INS-GUIZ000001	INS-GUIZ000003	Kai Li Branch Co.	Packaging
			INS-GUIZ000004	Gui Yang Branch Co.	Packaging
			INS-GUIZ000005	Zun Yi Branch Co.	Packaging
No. 42 HaiFu DaDao Haikou, Hainan 570003	No. 10 HaiDanYanJiang Yi Xi Rd. Haikou Hainan 570001 Sys. ID: INS-HAIN000002	No. 10 HaiDanYanJiang Yi Xi Rd. Haikou Hainan 570001 Sys. ID: INS-HAIN000001	INS-HAIN000003	YingGeHai saltworks	Iodization
			INS-HAIN000004	DongFang saltworks	Iodization
			INS-HAIN000005	HaiKou Salt Company	Iodization
No. 6 HeZou Road Shijiazhuang, Hebei 050051	No. 88 Tiyu South Rd. Shijiazhuang, Hebei 050021 Sys. ID: INS-HEBA000002	No. 51 XinHua XieJie ShijiaZhuang, Hebei 050051 Sys. ID: INS-HEBA000001	INS-HEBA000003	NanPu saltworks	Iodization
			INS-HEBA000004	DaQingHe saltworks	Iodization
			INS-HEBA000005	JianHe saltworks	Iodization
			INS-HEBA000006	Shengjiuqu saltworks	Iodization
			INS-HEBA000007	LuanNan saltworks	Iodization
			INS-HEBA000008	HuangHua saltworks	Iodization
			INS-HEBA000009	ZhingJie saltworks	Iodization
			INS-HEBA000010	YiuenMeng Salt Plant	Iodization
			INS-HEBA000011	TangShan Salt Company	Packaging
			INS-HEBA000012	Zhang Jia Kou Salt Company	Packaging
			INS-HEBA000013	Shi Jia Zhuang Salt Company	Packaging
No. 47 YiMin Jie NanGang District Harbin, Heilongjiang 150001	No. 486 Xuanhua Rd. Nangang Harbin, Heilongjiang 150001 Sys. ID: INS-HELO000002	No. 21 Xie Er Dao Jie DaoLi District Harbin, Heilongjiang 150010 Sys. ID: INS-HELO000001	INS-HELO000003	Ha Er Bin Salt Company	Packaging
			INS-HELO000004	Da Lian Salt Company	Packaging
			INS-HELO000005	Jia Mu Si	Packaging
			INS-HELO000006	Mu Dan Jiang	Packaging
			INS-HELO000007	Qi Qi Ha Er	Packaging
			INS-HELO000008	Ji Xi	Packaging
			INS-HELO000009	He Gang	Packaging

No. 45 Wei 5th Road Zhengzhou, Henan 450003	No. 30 JinSuiQiao DaDao Zhengzhou, Henan 450053 Sys. ID: INS-HENA000002	No. 30 JinSuiQiao DaDao Zhengzhou, Henan 450053 Sys. ID: INS-HENA000001	INS-HENA000003	PingDingShan Salt Mine	Iodization
			INS-HENA000004	YeXian Salt Mine	Iodization
			INS-HENA000005	WuYang Salt Mine	Iodization
			INS-HENA000006	An Yang Branch Co.	Packaging
			INS-HENA000007	Shang Qiu Branch Co	Packaging
			INS-HENA000008	Zhou Kou Branch Co	Packaging
			INS-HENA000009	San Men Xia Branch Co.	Packaging
			INS-HENA000010	Nan Yang Branch Co.	Packaging
No. 27 DongHu Road Wuchang, Wuhan Hubei 430077	Chezhan Rd. Changjiangpu Yingcheng 432450 Sys. ID: INS-HUBE000002	No. 1 JiangHan Road Wuhan, Hubei 430014 Sys. ID: INS-HUBE000001	INS-HUBE000003	YingCheng Salt Mine	Iodization
			INS-HUBE000004	9045 Salt Plant	Iodization
			INS-HUBE000005	9047 Salt Plant	Iodization
			INS-HUBE000006	9510 Salt Plant	Iodization
			INS-HUBE000007	XiaoGan Salt Plant	Iodization
			INS-HUBE000008	LiChuan Salt Plant	Iodization
			INS-HUBE000009	YingChen City Salt Plant	Iodization
			INS-HUBE000010	JiangHan Salt Chemical Plant	Iodization
			INS-HUBE000011	Hu Bei Salt Packing Factory	Packaging
No. 16 BeiZhan Road Changsha, Hunan 410008	No. 15 YinPen South Road Changsha, Hunan 410006 Sys. ID: INS-HUNA000002	No. 15 YinPen South Road Changsha, Hunan 410006 Sys. ID: INS-HUNA000001	INS-HUNA000003	XiangLi Salt Mine	Iodization
			INS-HUNA000004	XiangHeng Salt Mine	Iodization
			INS-HUNA000005	Chang Sha Salt Company	Packaging
			INS-HUNA000006	Yue Yang Salt Company	Packaging
			INS-HUNA000007	Shao Yang Salt Company	Packaging
			INS-HUNA000008	Chen Zhou Salt Company	Packaging
No. 42 ZhongYang Road Nanjing, Jiangsu 210008	Town Houzui Lianyungang 222069 Sys. ID: INS-JIAS000002	No. 10 HaiLian Middle Road XinPu, Lianyungang Jiangsu 222001 Sys. ID: INS-JIAS000001	INS-JIAS000003	HuaiHai Salt Plant	Iodization
			INS-JIAS000004	YunTai Transfer & Sales	Iodization
			INS-JIAS000005	XinTan saltworks	Iodization
			INS-JIAS000006	QiDong saltworks	Iodization
			INS-JIAS000007	GuanDong saltworks	Iodization
			INS-JIAS000008	HuaiAn saltworks	Iodization
			INS-JIAS000009	HuaiYin Salt Chemical Works	Iodization
			INS-JIAS000010	XuZhou Salt Plant	Iodization
			INS-JIAS000011	Su Zhou Branch Co.	Packaging
			INS-JIAS000012	Wu Xi Branch Co	Packaging
			INS-JIAS000013	Nan Jiang Ka Zi Men Branch Co	Packaging
			INS-JIAS000014	Chang Zhou Branch Co.	Packaging
			INS-JIAS000015	Xu Zhou Branch Co.	Packaging

Provincial Govt. Compound Nanchang, Jiangxi 330046	No. 33 Si Jing Lu Nanchang, Jiangxi 330006 Sys. ID: INS-JIAX000002	No. 33 Si Jing Lu Nanchang, Jiangxi 330006 Sys. ID: INS-JIAX000001	INS-JIAX000003 INS-JIAX000004 INS-JIAX000005 INS-JIAX000006 INS-JIAX000007 INS-JIAX000008 INS-JIAX000009	JiangXi Salt Mine JiuEr Salt Plant XinGan Salt Plant FuDa Salt Plant Nan Chang Branch Co. Gan Zhou Branch Co. Ji An Salt Company	Iodization Iodization Iodization Iodization Packaging Packaging Packaging
No. 47(B) Musilin DaJie Changchun, Jilin 130051	No.29 Longli Rd Chaoyang District Changchun, Jilin 130021 Sys. ID: INS-JILI000002	No. 29 Longli Road Chaoyang District Changchun, Jilin 130021 Sys. ID: INS-JILI000001	INS-JILI000003 INS-JILI000004 INS-JILI000005	Chang Chun Salt Company Ji Lin Salt Company Yu Shu Salt Company	Packaging Packaging Packaging
No. 82 Nan Da Jie Heping District Shenyang, Liaoning 110005	No 32 Zhenxing Rd. Jinzhou Dalian, Liaoning 116100 Sys. ID: INS-LIAO000002 Sys. ID: INS-DALI000002	No. 28 Nan Si Ma Lu Heping District Shenyang, Liaoning 110001 Sys. ID: INS-LIAO000001 (Dalian is a directly reporting city; no computer yet.) Sys. ID: INS-DALI000001	INS-LIAO000003 INS-LIAO000004 INS-LIAO000005 INS-LIAO000006 INS-LIAO000007 INS-LIAO000008 INS-LIAO000009 INS-LIAO000010 INS-LIAO000011	YingKou saltworks JinZhou saltworks Chao Yang Salt Company Dan Dong Salt Company FuZhouWan saltworks JingZhou saltworks PiHua Plant Shen Yang Salt Company Da Lian Salt Company	Iodization Iodization Packaging Packaging Iodization Iodization Iodization Packaging Packaging
No. 6 Zhongshan East Road Hohhot, Inner Mogolia 010020	Guangming Rd. Huimin Huhehaote 010050 Sys. ID: INS-NEIM000002	No. 1 Zhongshan East Road Hohhot, Inner Mogolia 010010 Neimong* Sys. ID: INS-NEIM000001	INS-NEIM000003 INS-NEIM000004 INS-NEIM000005 INS-NEIM000006	JiLanTai saltworks YaBuLai saltworks EJiZhouEr saltworks ChaHanChi saltworks	Iodization Iodization Iodization Iodization
No. 37 JieFang XiJie Yinchuan, Ningxia 750001	No. 14 QianJin Jie Yinchuan, Ningxia 750001 Sys. ID: INS-NINX000002	No. 14 QianJin Jie Yinchuan, Ningxia 750001 Sys. ID: INS-NINX000001	INS-NINX000003	Yin Chuan Branch Co.	Packaging
No. 66 Xi Da Jie Xining, Qinghai 810000	No. 12 Renmin Road Delingha, Qinghai 817000 Sys. ID: INS-QING000002	No. 12 Renmin Road Delingha, Qinghai 817000 Sys. ID: INS-QING000001	INS-QING000003 INS-QING000004 INS-QING000005 INS-QING000006	ChaKe saltworks KeKe saltworks GeErMu saltworks Xi Ning Branch Co.	Iodization Iodization Iodization Packaging
No. 34 Lianhu Road Xi'an, Shanxi 710003	No. 547-1 East Zigiang Rd. Xi'an, Shanxi 710015 Sys. ID: INS-SHAA000002	No. 1 Dong Si Dao Heping Road Xi'an, Shanxi 710001 Sys. ID: INS-SHAA000001	INS-SHAA000003 INS-SHAA000004 INS-SHAA000005 INS-SHAA000006	Dingbian saltworks Bao Ji Salt Company Xi An Salt Company An Kang Salt Company	Iodization Packaging Packaging Packaging
No. 23 DongHua Men Taiyuan, Shanxi 030013	No. 71 LiuXiang NanLu Taiyuan, Shanxi 030002 Sys. ID: INS-SHAX000002	No. 71 LiuXiang NanLu Taiyuan, Shanxi 030002 Sys. ID: INS-SHAX000001	INS-SHAX000003 INS-SHAX000004 INS-SHAX000005	Tai Yan Salt Company Da Tong Salt Company Lin Fen Salt Company	Packaging Packaging Packaging

No 1 QingNian DongLu Jinan, Shandong 250011	Daijiawa Shouguang Shandong 262737 Sys. ID: INS-SHAD000002 Sys. ID: INS-QIND000002	No 151 GongQingTuan Road Jinan, Shandong 250012 Sys. ID: INS-SHAD000001 (Qingdao is a directly reporting city no computer yet) Sys. ID: INS-QIND000001	INS-SHAD000003 INS-SHAD000004 INS-SHAD000005 INS-SHAD000006 INS-SHAD000007 INS-SHAD000008 INS-SHAD000009 INS-SHAD000010 INS-SHAD000011 INS-SHAD000012	YangKou saltworks CaiYang/i saltworks QuingDao JianXing Salt Plant TaiAn saltworks Wuli Salt Plant QuanYao Refined Salt Plant LaiZhou saltworks Ji Nan Branch Co. He Ze Branch Co. Ji Ning Branch Co.	Iodization Iodization Iodization Iodization Iodization Iodization Iodization Packaging Packaging Packaging
No. 223 Hankou Road Shanghai 200002	No. 39 MoLing Road Jabei District Shanghai 200070 Sys. ID: INS-SHAN000002	LuFeng Building 7th Floor No. 39 MoLing Road Jabei District Shanghai 200070 Sys. ID: INS-SHAN000001	INS-SHAN000003	Shang Hai Salt Company	Packaging
No. 80 WenMiao XiJie Chengdu, Sichuan 610041	No. 39 TiDu Jie Chengdu, Sichuan 610061 Sys. ID: INS-SICH000002 Sys. ID: INS-CHON000002	No. 39 TiDu Jie Chengdu, Sichuan 610061 Sys. ID: INS-SICH000001 (Chongqing is a directly reporting city no computer yet.) Sys. ID: INS-CHON000001	INS-SICH000003 INS-SICH000004 INS-SICH000005 INS-SICH000006 INS-SICH000007 INS-SICH000008 INS-SICH000009 INS-SICH000010 INS-SICH000011 INS-SICH000012 INS-SICH000013 INS-SICH000014 INS-SICH000015 INS-SICH000016 INS-SICH000017 INS-SICH000018	DeAn Salt Plant DengGuan Salt Plant ZhangJiaBa Salt Plant Special Type Salt Plant ChuanDong Salt Plant PengLai Salt Plant NanChong Salt Plant QuXian Salt Plant LaingShanZhou Salt Mine EMei Salt Chemistry Corp. YuYang Salt Plant Chang Du Salt Company Ching Qing Salt Company Mian Yang Salt Company Fu Ling Salt Company Yi Bin Salt Company	Iodization Iodization Iodization Iodization Iodization Iodization Iodization Iodization Iodization Iodization Iodization Packaging Packaging Packaging Packaging Packaging
No. 98 Nanjing Road Heping District Tianjin 300040	Shuixian Rd. Tanggu Tianjin 300450 Sys. ID: INS-TIAN000002	No. 20 MuNan Dao Heping District Tianjin 300050 Sys. ID: INS-TIAN000001	INS-TIAN000003 INS-TIAN000004 INS-TIAN000005	Tianjin HangOu saltworks Saltworks in S.R.I. Tianjin Transfer Sale Company	Iodization Iodization Packaging

No. 66 LongQuan Jie Urumqi, Xinjiang 830001	No. 18 Jiankang Road Urumqi, Xinjiang 830002 Sys. ID: INS-XINJ000002	No. 18 Jiankang Road Urumqi, Xinjiang 830002 Sys. ID: INS-XINJ000001	INS-XINJ000003	YuanTu Chemical Plant	Iodization
			INS-XINJ000004	QiQuanTu Chemical Plant	Iodization
			INS-XINJ000005	QiJiaoJing Salt Chemical Plant	Iodization
			INS-XINJ000006	HeFeng saltworks	Iodization
			INS-XINJ000007	YiLiZhou Transfer Station	Iodization
			INS-XINJ000008	ATuShi saltworks	Iodization
			INS-XINJ000009	WunSu saltworks	Iodization
			INS-XINJ000010	YuTain saltworks	Iodization
			INS-XINJ000011	BaZhou Salt Company	Iodization
			INS-XINJ000012	LunTai saltworks	Iodization
			INS-XINJ000013	BaiChen saltworks	Iodization
			INS-XINJ000014	ShaChe saltworks	Iodization
WuHua Shan Kunmin, Yunnan 650021	No. 10 ShiJia Xiang TuoDong Road Kunmin, Yunmin 650011 Yunnan Sys. ID: INS-YUNN000002	No. 10 ShiJia Xiang TuoDong Road Kunmin, Yunmin 650011 Yunnan Sys. ID: INS-YUNN000001	INS-YUNN000003	YiPingLang Salt Mine	Iodization
			INS-YUNN000004	KunMing Salt Mine	Iodization
			INS-YUNN000005	MoHei Salt Mine	Iodization
			INS-YUNN000006	QiaoHou Salt Mine	Iodization
			INS-YUNN000007	FengGang Salt Mine	Iodization
			INS-YUNN000008	LanPing Salt Mine	Iodization
			INS-YUNN000009	Qu Jing Salt Company	Packaging
No. 634 QingChun Road Hongzhou, Zhejiang 310006	No. 8 MeiHua Bei Hongzhou, Zhejiang 310009 Sys. ID: INS-ZHEJ000002 Sys. ID: INS-NINB000002	No. 8 MeiHua Bei Hongzhou, Zhejiang 310009 Sys. ID: INS-ZHEJ000001 (Ningbuo is a directly reporting city no computer yet) Sys. ID: INS-NINB000001	INS-ZHEJ000003	NingBo Tansfer Station	Iodization
			INS-ZHEJ000004	SanMen saltworks	Iodization
			INS-ZHEJ000005	DaiShan saltworks	Iodization
			INS-ZHEJ000006	XiangShan saltworks	Iodization
			INS-ZHEJ000007	Hang Zhou Salt Company	Packaging
			INS-ZHEJ000008	Xiao Shan Salt Company	Packaging

NB: 17 centres with same address

NB: 8 centres with different address

* 11 salt monitoring stations still to be established

China National Salt Industry Corporation

Mr Guo Wenhui, IDD Programme Manager
55 Taoranting Rd
Xuanwu District
Beijing 100054

Salt Research Institute

Mr Chen Ziqiang, Director
27 Yingkou Rd.
Tanggu
Tianjin

Salt Research Institute

?
Zhigong

National Training and Technical Support Team

?
Beijing

General

In the body of the analysis, repeated reference is made to the types of information required for IDD monitoring activities. These can be grouped into the following categories (record types or modules):

- i) **institutions**—iodization/repackaging facilities and salt authorities/monitoring stations/salt research establishments;
- ii) **product**—the salt itself as produced by the iodization facilities;
- iii) **quality**—the sampling/monitoring data related to the constituent elements of the salt as measured by all above institutions;
- iv) **packages**—the salt in units of delivery/shipping, either prepared by the iodization or the repackaging facilities; and
- v) **Destination**—shipping details.

These record types form the **modular** basis of this annex and the proposed data management system for IDD monitoring. The following sections show the modules and their associated data elements which are required for each stage of network ***reporting***. The reader should note that some of the modules appear all the time, while others appear only at certain stages; some are fixed items (once recorded, to be used as reference points throughout the network) while others are variable (depending upon the situation at the time of reporting); yet others are recorded but do not appear on the forms.

Salt iodization facility reports 1 & 2

The salt iodization facilities represent one component of the primary data reporting sub-network, which during the preparatory phase, will be conducted manually by form/fax.

Figure III-1 shows the data modules and related items that the salt iodization facilites should report. By referring back to figure 3 in the body of the report, one can see that the salt iodization facilities report to provincial/municipal salt authorities at two levels:

- [entity institution type 1]—>[records (1)]—>[report(s) 1]—>[entity institution type 3]; and
- [entity institution type 1]—>[records (1)]—>[report(s) 2]—>[entity institution type 4].

The form shown in figure III-1 should be used for both reports—i.e. **completed once only** but sent to both the provincial/municipal salt authorities and the provincial/municipal salt monitoring stations. The former is responsible for recording and transmitting data dealing with salt production and distribution, while the latter is responsible for salt quality and its monitoring.

Figure III-1 **Reports 1 & 2--iodization facility**

Facility		
Facility ID	*Nature*	*Authorization number*
INS-ANHUD00003	Iodization	1234
Name	Ding Yuan Salt Mine	

Product data (outgoing)	
Batch number/date	19951012
Volume (metric tons)	1500
KIO3 used (Kg)	
Month	

Monitoring data			
Type of salt	Refined	*Standard used*	
Sample number			
NaCl	99.10%		
Solubles	%		
CaSO4	0.03%		
MgSO4	0.60%		
MgCl2	0.90%		
Na2SO4	%		
CaCl2	%		
Insolubles	0.05%	*Monitored by*	
Moisture level	0.30%	*Checked by*	
Whiteness	75	*Rechecked by*	
Grain size (unscreened)		*Approved by*	
0.85mm	10%	*Test result*	
0.15mm	70%		
Iodine level (mg/kg)	33.7	*Date of expiration*	
Problem areas			

Packing data			
Means of packing	Machine		
Package size	50k	*Metric tons*	200
Means of packing	Machine		
Package size	1k	*Metric tons*	300
Means of packing	Machine		
Package size	0.5k	*Metric tons*	300

Shipping data			
Date of transport		*Invoice no.*	
Volume weight			
Mode of transport			

Destination

Name	*Facility ID*
Address	

This report form consists of the following 'data modules':

- i—facility data
  - fixed data elements—which vary from one facility to another and which should be pre-printed on the forms by the provincial salt authority;
- ii—product data
  - variable data elements—dependant upon volume and time of iodized salt production;
- iii—sampling/monitoring data
  - variable data elements—quality of the salt dependant upon sampling of each batch;
- iv—packing data
  - variable data elements—dependant upon means of packaging and amount from each batch;
- v—shipping data
  - variable data elements—dependant upon date, mode, volume and destination of each batch of packages sent out from the facility.

The following provides a break-down of the data elements:

- i—Facility data
  - a) **Facility ID/Code** (consisting of record type [INS—institution record type], province/municipality acronym [ANHU–Anhui], sequential number [000003—third facility entry in that province's data system]—***see Annex I for facility locations and system codes***
  - b) **Nature of facility** (i.e. there are several levels of facilities in the network with varying **functions** which sometimes cut across logical definitions (e.g. a salt factory, a warehouse or a repackaging facility all iodize salt) [iodization];
  - c) **Authorization/permit number** [to be defined]
  - d) **Name** of facility [facility name];
- ii—Product data (outgoing)
  - a) **Batch/lot number** (date of production) [YYYYMMDD]—also the date of reporting
  - b) **Total volume** produced for the batch (in metric tons) [n]
  - c) **KIO3 used** (in Kgs) [n] for a given month
  - d) **Month** [YYYYMM] for which KIO3 recorded;

- iii—Sampling/monitoring data (representing a batch average for each reported item)
  - a) **Type of salt** [vacuum refined|crushed-washed|solar salt]
  - b) **Standard used** (fixed data element for sampling) [GB5461-92]
  - c) **Sample number** [n]
  - d) **NaCl** (salt content) [n%]
  - e) **Solubles** [total %]
  - f) **Soluble $CaSO_4$** [n%]
  - g) **Soluble $MgSO_4$** [n%]
  - h) **Soluble $MgCl_2$** [n%]
  - i) **Soluble Na_2SO_4** [n%]
  - j) **Soluble $CaCl_2$** [n%]
  - k) **Insolubles** [n%]
  - l) **Moisture level** [n%]
  - m) **Whiteness** [n]
  - n) **Grain size** (unscreened) 0.85mm [n%] & 0.15mm [n%]
  - o) **Iodine level** (in mg/kg=ppm) [n]
  - p) **Test result** [free text]
  - q) **Date of expiration** [YYYYMMDD]—deduced as a fixed period from date of production (minimum 1 year)
  - r) **Problem areas** [e.g. equipment not delivered|equipment maintenance problems|insufficient KIO_3 available|insufficient KIO_3 added to salt];
    NB: The salt iodization facilities do not measure the levels of trace elements in the salt!

Apart from the requirements of this report/form, there are periodic tests of iodine level undertaken (each shift tests every 8 hours) and the results recorded in the facility's log book. This data is not sent to provincial authorities.

Additional data elements relate to the people involved in the sampling procedure at the monitoring, approval, checking, re-checking levels—these are signature blocks and do not need to be recorded in the data system, as long as the contact person has been recorded and is in a sufficiently responsible position in the facility.

- iv—Packing data
  - a) **Means of packaging** [machine|hand]
  - b) **Package size** [0.5k|1k|50k]

- c) **Volume** (in metric tons) [n];

This module is repeated, as there is the possibility of one facility producing three sizes of package from one batch of salt.

- v—Shipping data
  - a) **Transport date** [YYYYMMDD]
  - b) **Invoice number** [n]
  - c) **Volume weight** (in metric tons) [n]
  - d) **Mode of transport** [ship|rail|truck]
  - e) **Destination** [name|address]—could be transshipment, warehouse, repackaging or wholesale facility
  - f) **Facility ID** [system code]—can be entered if known, in which case there is no need to enter the address of the destination;

NB: Copies of this form should be attached to each consignment and accompany the salt during its movement from producer to final sales outlet. It should be noted that some of the data on this form will also be stamped onto the package label.

Repackaging facility reports 3 & 4

The salt repackaging facilities represent another component of the first level (primary data sub-network) of network data reporting and transfer on the salt side of the IDD programme, which during the preparatory phase, will be undertaken manually by form/fax.

Figure III-2 shows the data modules and related items that the salt repackaging facilities should report. By referring back to figure 3 in the body of the report, one can see that the salt repackaging facilities also report to provincial/municipal salt authorities at two levels:

- [entity institution type 2]—>[records (2)]—>[reports (3)]—>[entity institution type 3]; and
- [entity institution type 2]—>[records (2)]—>[reports (4)]—>[entity institution type 4].

The form represented by figure III-2 will be used for both reports—i.e. **completed only once** but sent to both the provincial/municipal salt authorities, and the provincial/municipal salt monitoring stations. The former is responsible for recording and transmitting data dealing with salt production and distribution, while the latter is responsible for salt quality and its monitoring.

Figure III-2 Report 3 & 4--Repackaging facility

Facility		
Facility ID	*Nature*	*Authorization number*
INS-ANHU000004	Packaging	1234
Name	He Fei Salt Company	

Product data (incoming)	
Batch number/date	19951012
Date received	
Volume weight	1500
Sender ID:	

Monitoring data			
Type of salt	Refined	*Standard used*	
		Monitored by	-
	-	*Checked by*	
		Rechecked by	
		Approved by	
		Test result	
Iodine level (mg/kg)	33.7	*Date of expiration*	
Problem areas			

Packing data			
Means of packing	Machine		
Package size	1k	*Metric tons*	300
Means of packing	Machine		
Package size	0.5k	*Metric tons*	300

Shipping data			
Date of transport		*Invoice no.*	
Volume weight			
Mode of transport			

Destination

Name	*Facility ID*
Address	

This report form consists of the following 'data modules':

- i—facility data
  - fixed data elements—which vary from one facility to another and which should be pre-printed on the forms by the provincial salt authority;
- ii—product data
  - variable data elements—dependant upon batch received from the salt iodization facilities;
- iii—sampling/monitoring data
  - variable data elements—quality of salt dependant upon sampling (if undertaken within 5 days of receipt) of each batch received;
- iv—packing data
  - variable data elements—dependant upon means of packaging;
- v—shipping data
  - variable data elements—dependant upon date, mode, volume and destination of each batch of packages sent out from the facility.

The following provides a break-down of the data elements:

- i—Facility data
  - a) **Facility ID/Code** (consisting of record type [INS—institution record type], province/municipality acronym [ANHU—Anhui], sequential number [000004—fourth facility entry in that province's data system]—***see Annex I for facility locations and system codes***
  - b) **Nature of facility** (i.e. there are several levels of facilities in the network with varying **functions** which sometimes cut across logical definitions (e.g. a transshipment station can also repackage salt) [packaging]
  - c) **Authorization/permit number** [to be defined]
  - d) **Name** of facility [facility name|province];
- ii—Product data (incoming)
  - a) **Batch/lot number** (date of production) [YYYYMMDD]—received from previous reporting level
  - b) **Date received** [YYYYMMDD]
  - c) **Volume weight** (in metric tons) [n]
  - d) **Sender ID** (of iodization facility, consisting of record type [INS—institution], province/municipality acronym [ANHU—Anhui], sequential number [000003—third facility entry in that province's data system]—should be on accompanying report form 1—***see Annex I for facility locations and system codes;***

- iii—Sampling/monitoring data
  - a) **Type of salt** [vacuum refined|crushed-washed|solar salt]
  - b) **Standard used** (fixed data element for sampling) [GB5461-92]
  - c) **Iodine level** (in mg/kg=ppm) [n]
  - d) **Test result** [free text]
  - e) **Date of expiration** [YYYYMMDD]—deduced as a fixed period from date of production (minimum 1 year)
  - f) **Problem areas** [e.g. equipment not delivered|equipment maintenance problems|insufficient KIO_3 measured];

The repackaging facility should undertake sampling/monitoring of the iodization levels in the salt within five days of receipt of the batch, in which case the above details should be added to the report form. Otherwise, the original sampling/monitoring data provided by the iodization facility will be considered valid.

Additional data elements relate to the people involved in the sampling procedure at the monitoring, approval, checking, re-checking levels—these are signature blocks and do not need to be recorded in the data system, as long as the contact person has been recorded and is in a sufficiently responsible position in the facility.

- iv—Packing data
  - a) **Means of packaging** [machine|hand]
  - b) **Package size** [0.5k|1k]
  - c) **Volume** (in metric tons) [n];

This module is repeated, as there is the possibility of one facility producing two sizes of package.

- v—Shipping data
  - a) **Transport date** [YYYYMMDD]
  - b) **Invoice number** [n]
  - c) **Volume weight** (in metric tons) [n]
  - d) **Mode of transport** [ship|rail|truck]
  - e) **Destination** [name|address]—could be transshipment, warehouse, or wholesale facility
  - f) **Facility ID** [system code]—can be entered if known, in which case there is no need to enter the address of the destination;

NB: Copies of this form should be attached to each consignment and accompany the salt during its movement to final sales outlet. It should be

noted that some of the data on this form will also be stamped onto the package label.

Provincial/municipal salt authority reports 5 & 6

The next level of the network—the secondary data sub-network on the salt side of the IDD programme—is responsible for electronic data recording and transmission which involves two groups within the provincial/municipal salt administration: the provincial/municipal salt authorities; and the provincial/municipal salt monitoring stations.

As can be seen from the data reporting requirements of the primary data sub-network (sections 1 and 2 of this Annex), data on salt iodization, repackaging and shipping (distribution), as well as on salt quality (which is **the key component** of the IDD reporting system) is generated here and transmitted to both groups at the secondary sub-network level. However, the **quality data**, although transmitted to the provincial/municipal salt authority, **will not be recorded at or transmitted upwards from this level**, rather by and from the provincial/municipal salt monitoring station (see section 4 of this Annex).

By referring back to figure 3 in the body of the report, one can see that the provincial/municipal salt authorities report directly to the NSIC:

- —>[report(s) 5]—>[entity institution type 6]; and
- —>[report(s) 6]—>[entity institution type 6].

In fact, no printed reports should be prepared, rather the facts that are received and computerized at this level should be transmitted at specified intervals as electronic data sets to NSIC.

NB: This sub-network has no data collection function, simply computerization and transmission of the data collected from the previous levels.

Provincial/municipal salt monitoring station report 7

The provincial/municipal salt monitoring stations constitute the second group of the secondary data sub-network. During the preparatory phase, this group will:

- 1) receive manually prepared (internal monitoring, primary data) reports on **the key component** (salt quality data) of the IDD programme. As can be seen from the data reporting requirements of the primary data sub-network (sections 1 and 2 of this Annex), overall salt production/iodization, repackaging and shipping (distribution) data is also generated here. This data, although transmitted to the provincial/municipal salt monitoring station, will not be recorded at or transmitted upwards from this level,

rather by and from the provincial/municipal salt authority (see section 3 of this Annex).;

- 2) collect their own primary data as part of their responsibilities for external monitoring and evaluating the salt industry's progress towards IDD reduction.

Figure 3 in the body of the report, shows that the provincial/municipal salt monitoring stations:

- —>[report(s) 7]—>[entity institution type 5].

In fact, no printed reports should be prepared, rather the facts that are received, collected and computerized at this level should be transmitted at specified intervals as electronic data sets to the next level of the network, namely the salt research establishments.

In relation to the external monitoring that these stations will undertake, a variation of the standard reporting form as shown in figure III-3 will be used. This report form consists of the following 'data modules':

- i (a)—facility data
  - ° variable data elements—depends upon which facility is being monitored, but should be pre-printed on the form before visting the facility (i.e. a record of the facility, whatever its function in relation to IDD, should have been made in advance by the provincial/municipal salt authority);
- i (b)—monitoring agency
  - ° fixed data elements—which vary depending upon which monitoring body is involved but should also be pre-printed on the form;
- ii—sampling/monitoring data
  - ° variable data elements—quality of the salt dependant upon sampling at each site and for each batch;

The following provides a breakdown of data elements:

- i (a)—Facility data
  - ° a) **Facility ID/Code** (consisting of record type [INS—institution], province/municipality acronym [ANHU—Anhui], sequential number [000003—third facility entry in that province's data system]—***see Annex I for facility locations and system codes***
  - ° b) **Nature of facility** (i.e. there are several levels of facilities in the network which are involved in the chain of distribution which must be monitored, even though they are not active in providing data [iodization|packaging|transshipment|warehouse|wholesale]
  - ° c) **Authorization/permit number** [to be defined]

Figure III-3 External monitoring form

Facility			Date
Facility ID	*Nature*	*Authorization number*	
INS-ANHU000003	Iodization	1234	
Name	Ding Yuan Salt Mine		

Monitoring agency	
Agency ID	*Name*
INS-ANHU000001	

Monitoring data			
Type of salt	Refined	*Standard used*	
Sample number			
NaCl	98.10%		
Solubles	%		
CaSO4	0.03%		
MgSO4	0.60%	*Flourine*	Pass
MgCl2	0.90%	*Arsenic*	Pass
Na2SO4	%	*Lead*	Pass
CaCl2	%	*Anti-caking agent*	Pass
Insolubles	0.05%	*Monitored by*	
Moisture level	0.30%	*Checked by*	
Whiteness	75	*Rechecked by*	
Grain size (unscreened)		*Approved by*	
0.85mm	10%	*Test result*	
0.15mm	70%		
Iodine level (mg/kg)	33.7	*Date of expiration*	
Problem areas			

Packing data	
Package size	5(k
Package size	1k
Package size	0.5k

- d) **Date reported** [YYYYMMDD]—i.e. date of monitoring exercise
- e) **Name** of facility [facility name];

- i (b)—monitoring agency data
  - a) **Agency ID/Code** (consisting of record type [INS—institution], province/municipality acronym [ANHU—Anhui], sequential number [000001—first facility entry in that province's data system]—*see **Annex I for facility locations and system codes***

- ii—Sampling/monitoring data
  - a) **Type of salt** [vacuum refined|crushed-washed|solar salt]
  - b) **Standard used** (fixed data element for sampling) [GB5461-92]
  - c) **Sample number** [n]
  - d) **NaCl** (salt) [n%]
  - e) **Solubles** [total %]
  - f) **Soluble $CaSO_4$** [n%]
  - g) **Soluble $MgSO_4$** [n%]
  - h) **Soluble $MgCl_2$** [n%]
  - i) **Soluble Na_2SO_4** [n%]
  - j) **Soluble $CaCl_2$** [n%]
  - k) **Insolubles** [n%]
  - l) **Moisture level** [n%]
  - m) **Whiteness** [n]
  - n) **Grain size** (unscreened) 0.85mm [n%] & 0.15mm [n%]
  - o) **Iodine level** (in mg/kg=ppm) [n]
  - p) **Flourine** [Pass|fail]
  - q) **Arsenic** [Pass|fail]
  - r) **Lead** [Pass|fail]
  - s) **Anti-caking agent** [Pass|fail]
  - t) **Test result** [free text]
  - u) **Date of expiration** [YYYYMMDD]—deduced as a fixed period from date of production(minimum 1 year)
  - v) **Problem areas** [e.g. equipment not delivered|equipment maintenance problems|insufficient KIO_3 available|insufficient KIO_3 added to salt];

- iv—Packing data
  - a) **Package size** [0.5k|1k]
  - b) **Volume** (in metric tons) [n];

In relation to sections 3 and 4 of this Annex, the *ideal* situation is that the system operators (at least) of both these authority types are located in the same set of offices and share the same computer resources—this will avoid double reporting, the possibilities of double recording and subsequent confusion of data, as well as reduce the costs to the project and increase overall monitoring and system efficiency. However, it appears that in some provinces, these authorities are under the jurisdiction of different departments of local government and, although they may be in the same municipality, may be a hundred or more kilometers away from each other.

If it is not possible to 'join' the data activities of the two authority functions, a clear division of labour (i.e. data recording) must be imposed. This will entail that, although both receive the same form from the previous sub-network level, each is required to enter only those items for which it is responsible—i.e. the salt monitoring stations DO NOT enter facility IDs and addresses or salt production, packaging and shipping (distribution) data; the salt authorities DO NOT enter the sampling data.

NB: The salt monitoring stations are required to 'validate' the reported (internal) data from the previous sub-network through a review of what is reported as well as through their own external monitoring activities. Therefore, there is a need to maintain separate records for each—i.e. what is reported by a salt iodization facility (or even modified when clerical errors have been identified) should constitute one occurence of quality data in relation to that facility, while the data resulting from external monitoring, should constitute another occurence. Although the basic data elements are the same, the data function is different.

Salt research institutes

report 8

There are two salt research institutes involved in the IDD programme which represent the third level of data reporting, recording and transfer.

These institutes will:

- 1) receive electronically prepared (internal and external monitoring) reports on **the key component** (salt quality data) of the IDD programme;
- 2) collect their own primary data as part of their responsibilities for external monitoring and evaluating the salt industry's progress towards IDD reduction.

By referring to figure 3 in the body of the report, one can see that the salt research establishments:

- —>[report(s) 8]—>[entity institution type 6].

In fact, although printed reports will be prepared, the facts that are received, collected and computerized at this level should be transmitted at specified intervals as electronic data sets to NSIC.

The salt research institutes will utilize the same report form as the salt monitoring stations (see figure III-3) when they undertake external monitoring of salt facilities and will record:

- i—facility data
  - ° variable data elements—depending on which facility is being monitored;
- ii—sampling data
  - ° variable data elements—quality of salt dependant upon sampling;

For full details on the reporting requirements at this level, refer to section 4 of this Annex.

Summary

Figure III-4 shows all the 'modules' and the data elements required for the various levels of IDD reporting, recording and monitoring. As shown in sections 1-5 of this Annex, some of the 'modules' will be recorded some of the time by some of the networks participants, while others will be recorded all of the time by all of the participants.

Everything has been put together on a single sheet to show the totality of the data management system required for IDD ***reporting***. However, there are other data components required for system maintenance which are not indicated on this form and which must be ***recorded*** at the provincial level.

The main record type to which the above refers is the 'institution' and its 'fixed' data elements—once recorded in the data system, mostly available for reference purposes only. Some of these do not appear in the foregoing sections, others should be available as pre-printed items on the form to be completed during the reporting/monitoring activities. The 'institution' record type consists of:

- ° a) **ID/Code** (consisting of record type [INS—institution], province/municipality acronym [ANHU—Anhui], sequential number [000003—third facility entry in that province's data system];
- ° b) **Nature of facility** (i.e. there are several levels of facilities in the network which are involved in the chain of distribution which must be

Figure III-4 Master form

Facility			Date
Facility ID	*Nature*	*Authorization number*	
INS-ANHU000003	Iodization	1234	
Name	Ding Yuan Salt Mine		

Monitoring agency	
Agency ID	*Name*
PRQ-ANHU000001	

Product data (outgoing)		Product data (incoming)	
Batch number/date	19951012	*Batch number/date*	19951012
Volume (metric tons)	1500	*Date received*	
KIO3 used (Kg)		*Volume weight*	1500
Month		*Sender ID:*	

Monitoring data			
Type of salt	Refined	*Standard used*	
Sample number			
NaCl	99.10%		
Solubles	%		
CaSO4	0.03%		
MgSO4	0.60%	*Flourine*	Pass
MgCl2	0.90%	*Arsenic*	Pass
Na2SO4	%	*Lead*	Pass
CaCl2	%	*Anti-caking agent*	Pass
Insolubles	0.05%	*Monitored by*	
Moisture level	0.30%	*Checked by*	
Whiteness	75	*Rechecked by*	
Grain size (unscreened)		*Approved by*	
0.85mm	10%	*Test result*	
0.15mm	70%		
Iodine level (mg/kg)	33.7	*Date of expiration*	
Problem areas			

Packing data			
Means of packing	Machine		
Package size	50k	*Metric tons*	200
Means of packing	Machine		
Package size	1k	*Metric tons*	300
Means of packing	Machine		
Package size	0.5k	*Metric tons*	300

Shipping data			
Date of transport		*Invoice no.*	
Volume weight			
Mode of transport			

Destination

Name	*Facility ID*
Address	

monitored, even though they are not active in providing data [iodization|packaging|transshipment|warehouse|wholesale];

- c) **Name** of facility;
- *d) **Salt type** produced by the iodization facility;
- *e) **Address** of facility [buidling|street|city|county|province];
- *f) **Contact person** (family name|given name(s)|function|section (of the organization));
- *g) **Telecommunications** (telephone| telefax|telex|e-mail).

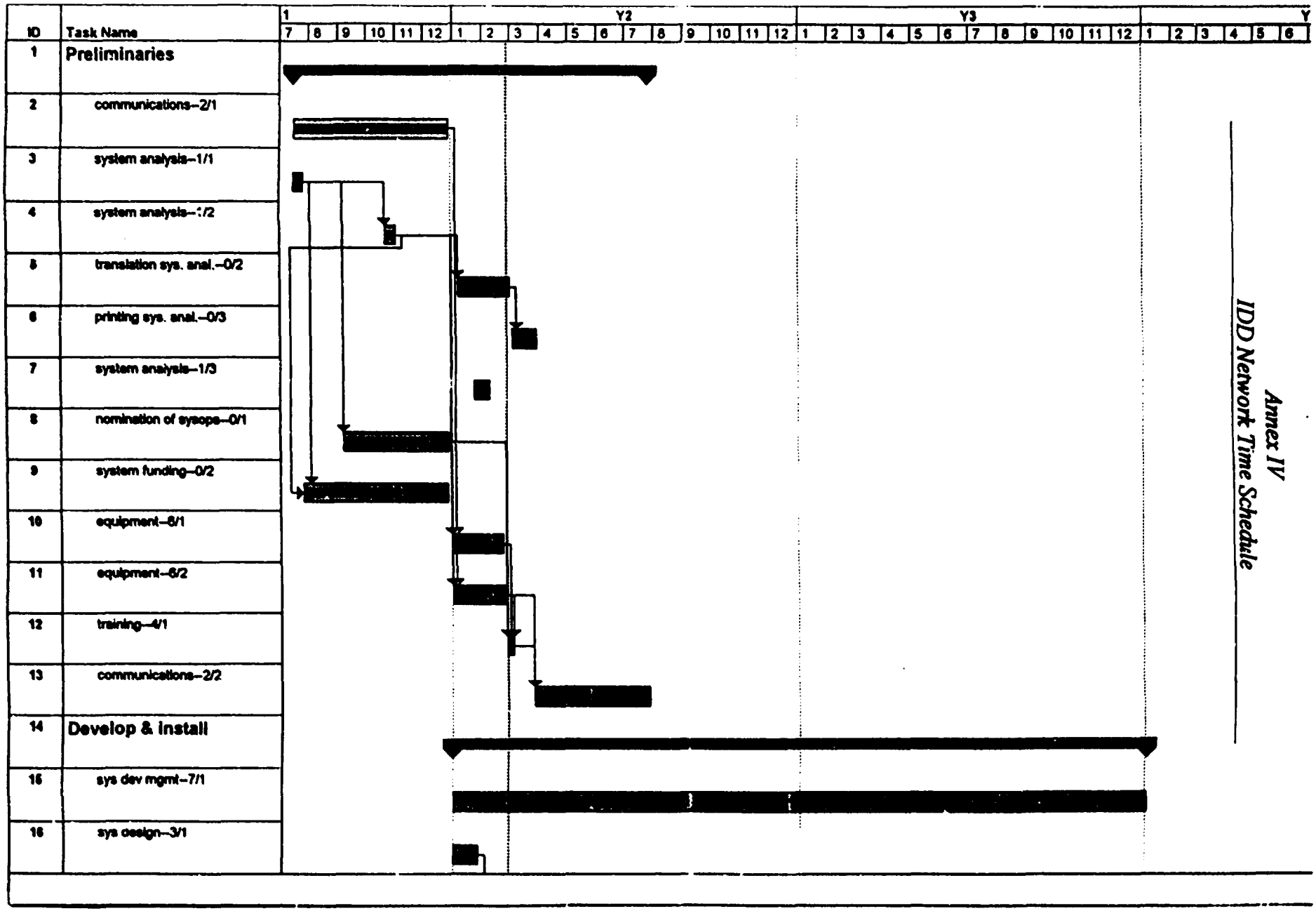
NB: * = not to be pre-printed on the report form.

Another data item 'missing' from the report form is a system-assigned code, as in a) above, which should appear with each iteration of the other record types. This code is needed to maintain the uniqueness of each record and its links—as the system is object-oriented, relationships of one object to another must be maintained, and this is best achieved through unique record identifiers. Suggestions for the first part of this code are:

- i) **institutions**
  - [INS]—NB: there are several groups of 'institution' active in the IDD network, and they should be distinguished by their 'function' as opposed to their 'type'. The various functions are [iodization|repackaging|salt authority|salt monitoring|salt research|transshipment station|warehouse|retail outlet]. Some of these will constitute the 'destination' of salt when it is shipped from the iodization or the repackaging facilities;
- ii) **product**
  - [PRD];
- iii) **quality**
  - [QAC];
- iv) **packages**
  - [PAC];
- v) **Destination**
  - [INS];

The remaining two parts of the code would be:

- the province (see Annex I for full details)
  - [ANHU|BEIJ|CHON|DALI|FUJI|GANS|GUAD|GUAX|GUIZ|HAIN|HEBA|HELO|HENA|HUBE|HUNA|JIAS|JIAX|JILI|LIAO|NEIM|NINB|NINX|QIND|QING|SHAA|SHAD|SHAN|SHAX|SICH|TIAN|XINJ|YUNN|ZHEJ];
- the sequential number
  - [000001-999999].



Annex IV
IDD Network Time Schedule

ID	Task Name
17	sys programming--3/2
18	sys testing--3/3
19	sys debugging--3/4
20	sys translation--3/5
21	user manual transl.--3/6
22	user manual printing--3/7
23	training--4/2
24	sys (data) installation--5/1
25	sys updating--3/8
26	**System use**
27	sys usage/test run--5/2
28	sys usage--5/3