

Material Flow Management Database System: An Application of Event-based System Object (EBSO) Data Model

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Introduction

- Sustainable Development
 - Agenda 21, 40.8 (1992)
 - Countries and, upon request, international organizations should carry out inventories of environmental, resource and developmental data, based on national/global priorities for the management of sustainable development.
 - Countries and international organizations should make use of new techniques of data collection.
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Introduction

- The current data models, such as relational data model, object-oriented data model, are not efficient and effective enough for collecting and integrating environmental data to generate the information mentioned above.
 - Event-based System Object (EBSO) data model
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Object

- ❑ Objects are black boxes
 - ❑ Each object is a unique entity with a set of specific attributes, behaviors and relations.
 - ❑ The concept of recognizing and utilizing a complete functional identity as an object for certain purpose is generally used by everyone.
 - ❑ An object consists of a set of interactive components and also a component of a larger object or system, and interacts with other components of the supersystem.
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System

- A system is generally defined as something like a whole of elements and their relationships that achieve some purpose.
 - A functional object can be regarded as a functional system seeing in whole as a black box.
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Event

- As spatially existed substances can be abstracted by system objects, a sequence of countless and endless cause-effect actions or reactions along the timeline should be abstracted by event.
 - Each event involves an activity of an object which proceeds impact of other objects and causes other event.
 - The dynamic real world can be seen as a complex system consisting of numerous known and unknown system objects and their events.
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Event-based System Object (EBSO) Data Model

- ❑ System Object Registration (SOR) data model
- ❑ System Object Event (SOE) data model

Event-Based System Object (EBSO) data model

System Object Registration (SOR) data model

Integrity restrict	Object ID	Object Type	Temporal Attributes	Spatial Attributes	Structural Attributes	Permanent Attributes	Permanent Behaviors	Permanent Relations	Authorized Date	Authorized Organization/person
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System Object Event (SOE) data model

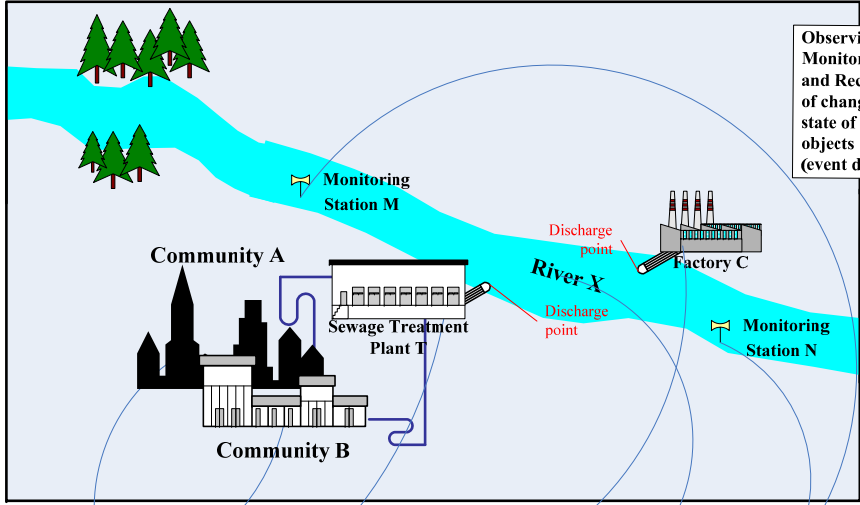
Object ID	Event Type	Temporal Attributes	Spatial Attributes	Structural Attributes	Attributes	Behaviors	Relations	<i>Input data</i>	<i>Output data</i>	Related Event	Recorded Date	Recorder Object ID
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Detail data element groups

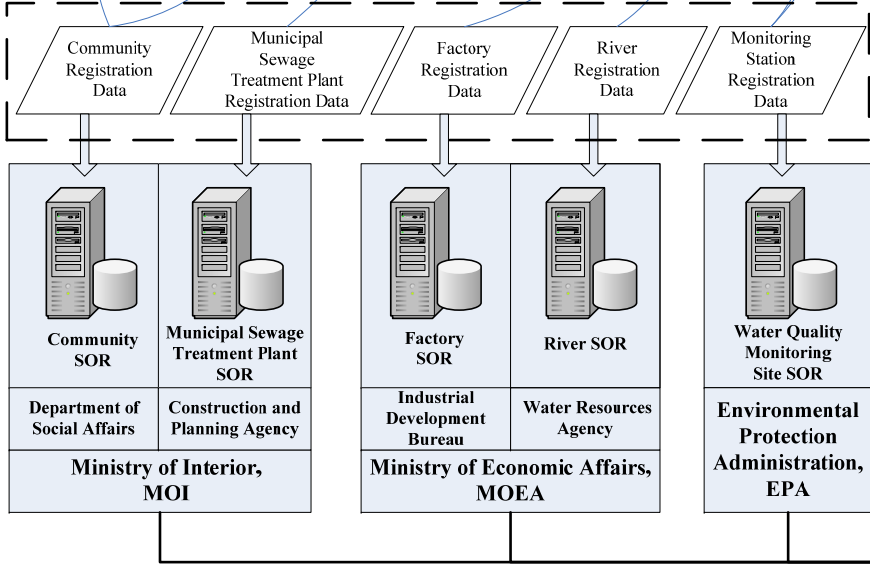
Input/Output (I/O) System Object Change Event Data

Object ID	<i>I/O</i> Attributes	Recorded Date	Recorder Object ID
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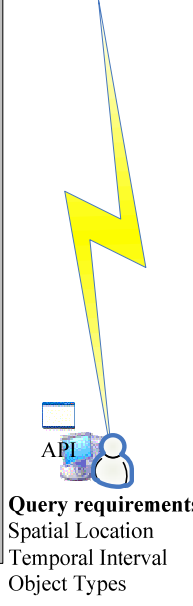
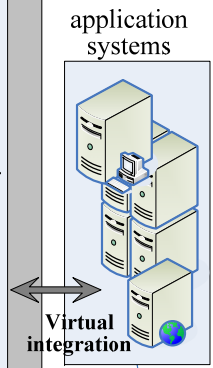
Integrity restrict



System Object Registration Data



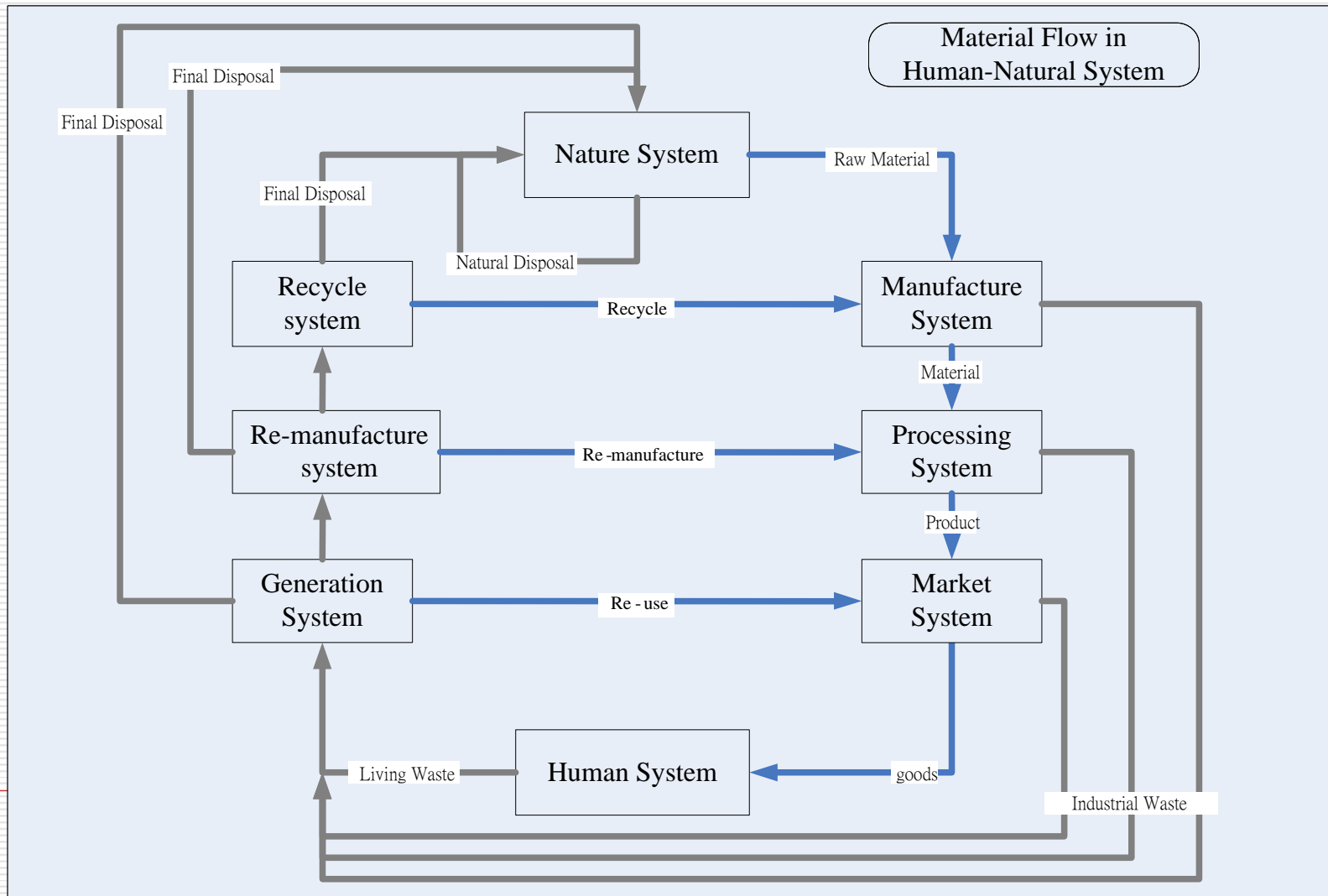
System Object Event Data			
Operational(Regular) Event			Occasional Event
Population Statistics SOE	Quantity of water Usage Monitoring SOE	River Water Quality Monitoring SOE	River Water Pollution (water quality over limit) SOE
Municipal Sewage Treatment Operating SOE	River Water Quantity Monitoring SOE	Factory Waste Water Discharging SOE	Waste Water Discharge Inspections SOE
Municipal Sewage Treatment discharge Water Quality SOE	Factory Operating SOE	Waste Water Discharge Declaration SOE	Punishment Of Over Discharging SOE
MOI	MOEA	EPA	EPA



Event-based System Object (EBSO) Data Model

- ❑ The EBSO data model can easily integrate data and keep the advantages of distributed database systems at the same time.
 - ❑ Through specific information technology, data can be generated to completely represent the state of specific location and period of time and be effectively used to develop various application systems and satisfy different uses.
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Material Flow in Human-Natural System



Conclusion

- Regarding for the EBSO data model, systematically integrating data for complex systems analysis and problem solving will be easier and more effective.
 - The EBSO data model not only can be used to systematically build up new databases, but also to reasonably rearrange existing data from distributed databases through certain data transformation process.
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Conclusion

- Professional skills in field of computer science should be taken into consideration to establish federated distributed material flow management databases.
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