**Annex xx Examples for the four archetypal business models**

The four proposed models are generic archetypes which can be varied or combined in specific ways, according to the country’s needs and development and maturity level of the NHMS. In any case it is important to have an open view of possible arrangements which go beyond traditional pathways to find future proof solutions which work under the difficult infrastructural conditions in developing countries.

Cooperation with the private sector can make usage of already available infrastructure and leapfrog developments especially at the beginning of the capacity development of a NHMS.

1. **Public model - Fully State/NMHS owned and operated**

The observation system is owned, maintained and operated by the NHMS in all detail. This is the historic model of nearly all NHMS and has been proven successful in many countries. In developing countries, staff fluctuation, missed training and insufficient finance to maintain, operate and repair have been the main obstacles for successful performance for this type of model.

The instruments themselves are provided by the private sector, during the guaranteed phase replacements are made by the provider, depending on the coverage of the guaranteed conditions. To estimate the financing for the total costs of ownership it is necessary to know and include the costs for staff training and the staff costs themselves.

1. **Observation as a Service Model**

More of the activities are in this case undertaken with or by the private sector partner. The NHMS contracts (and funds at least partly upfront) a private partner for a design proposal and to construct and operate the SOFF observations infrastructure. AWS, upper air soundings are typical examples, but also elements of the ICT infrastructure are often subject of an arrangement of this type. The training for the NHMS staff focuses on the usage of data and feedback procedures in cases of problems.

Total cost of ownership is more straightforward to estimate, as the essential part of the total costs is known by the contract with the partners from the private sector. A transfer of the system to the NHMS is a possibility after a defined period, which allows sufficient training and built-up of the necessary infrastructure and capacity development.

Country tailored agreements are essential and necessary.

1. **Concession model**

If relevant data are available in a country by private sector operators these data can be of high value for the NHMS. Sometimes adaptations or enlargements of observed and necessary observing parameters are needed. Security concerns are often dealt with already by private operators (oil platforms, mining industries, airport operators, energy utilities, agricultural industries, telecom providers etc.). Data of this type can partly or after adaptations fully cover the minimum GBON needs of a country or contribute with moderate costs to a GBON high density network.

At least partial investments by the contracted private partner enable the observation system to be built, unlike under model 2 which is funded up front by the public sector. The contractor is responsible for operation and maintenance. Data ownership is with the contractor. The State pays the contractor to make data available in the public domain free of charge in the form of a well-defined concession. Payment occurs after data delivery. Data have to be delivered in a form that fulfills GBON criteria. Long-term contracts are an advantage both for the NHMS and the GBON system as a whole.

The total cost of ownership for the share of this data in a network of the overall GBON costs can be exactly calculated with the given contracts. It is necessary to have a clear perspective of the long-term availability of the data and to include exit strategies (penalties) in the contracts should the operator not be able or interested in fulfilling the contract over the whole time period.

Country-tailored agreements are essential and necessary.

1. **Data as a service model**

As in model 3, relevant data are often already available by private sector (oil platforms, mining industries, airport operators, energy utilities, agricultural industries, telecom providers etc.) with the necessary security and infrastructure provisions in place and/or . This can therefore be a partial solution to fill the GBON gap (also e.g. ICT as a service) or an integral system for all components necessary.

The system is fully owned and operated by the private partner on a direct contract with the NMHS. The contractor is responsible for operation and maintenance. Data ownership is with the contractor. A well-structured concession contract is required for the NMHS to use and share the data free of charge in the public domain. This model encourages a competitive market, especially in the ICT sector (e.g. WIS 2.0 as a service) and can be the basis for leapfrogging development in countries with little or poor infrastructure.

Total costs of ownership can be well calculated. Country-tailored agreements are necessary. It is necessary to have a clear perspective of the long-term availability of the data and to include exit strategies (e.g. penalties, bank garantees) in the contracts should the operator not be able or interested in fulfilling the contract over the whole time period.